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ORGANIC AGRICULTURE COURSES EXERCISES - HANDBOOK FOR TEACHERS

Handbook for teachers and trainers with exercises material for organic agriculture courses in Secondary agricultural schools and Vocational centres

FAO Regional Office for Europe and Central Asia
Coordination Office in Serbia
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List of Tables and Schemes

Abbreviations

COP – Centre for Organic Production

EU – European Union

FBS - Farmer Business School

FFS - Farmer Field School

GAP – Good Agricultural Practices

IFOAM - International Federation of Agriculture Organic Movements

MAFWM - Ministry of Agriculture, Forestry and Water Management

SA – 'Serbia Organica' (National Association for Organic Production)

NCOA – National Consultant for Organic Agriculture (FAO)

NGO – Non-governmental organisation

NPM – National Project Manager (FAO)

OA – Organic Agriculture

SAS – Secondary Agricultural Schools

SRB – Serbia (Republic of)

VET – Vocational Education and Training

Foreword

The publication “Organic Agriculture Courses Exercises - Handbook for Teachers” is intended to be used by the stakeholders in organic sector in Serbia. It has been developed within the framework of the UN FAO Project GCP/SRB/001/HUN: “Assistance to the Development of Capacity and Support Services for Organic Agriculture in Serbia“, implemented by FAO and financed by Hungarian Ministry of Agriculture. The project is implemented in coordination with the Ministries of Agriculture and the Ministry of Education of Serbia.

The project aims to improve capacity of farmers and other value chain stakeholders in organic market oriented value chains through participatory training in farmer field schools and farmer business schools. That is further supported by strengthening of Center for Organic Production in Selenca which has been empowered to provide training and facilitation of market linkages and business development. Project visibility and awareness about organic agriculture was enhanced by numerous activities and publicity work of National Association for Organic Agriculture Serbia Organica.

Broader base of competences for organic agriculture has been supported by upgrading secondary education curricula for organic agriculture and inclusive practical training of teachers and high school students. Overall institutional environment for inclusive organic value chain development will be strengthened by participatory formulation of National programme for capacity development and provision of support services for region-specific organic production development.

The materials produced within the framework of the project have been tested and validated during the workshop and training sessions.

“Organic Agriculture Courses Exercises - Handbook for Teachers” was prepared by dr Vladislav Popov.

We gratefully acknowledge contributions of all participants and principal authors, as well as all project team members: Aleksandar Mentov, National Project Manager; Olga Keselj and Bratislav Stamenkovic, National Consultants; Zhupan Martinovski and Vladislav Popov, International Consultants; Gyongy Kurthy, International Team Leader; as well as Nevena Aleksandrova and Stjepan Tanic from FAO Regional Office for Europe and Central Asia for their technical guidance and supervision of project implementation. The manual layout and design were prepared by Alexander Swanwick.

Preface

Why this handbook?

Organic agriculture (OA) in Republic of Serbia experienced significant growth in the past 14 years. The Serbian Government as well as organic operators and stakeholders such as farmers, processors, traders, farm advisors, scientists, NGOs, are determined to continue this trend in the next years.

Besides the Government support and the policy measures, key factors for this development are broad-based education and capacity building in organic agriculture sector, as well as development of appropriate support services for market oriented organic agriculture. However, capacity development of future organic farmers (and other organic groups) is closely related with assuring their organic qualifications and skills. Involvement of rural youth through provision of an adequate secondary education curriculum in organic and sustainable agriculture, addressing the region's specific agricultural products, is considered among the major priorities.

One of the major components of the FAO project GCP/SRB/001/HUN: 'Assistance to the Development of Capacity and Support Services for Organic Agriculture in Serbia' concerns the changes in organic agriculture education in Secondary Agricultural Schools (SAS) in Serbia that are necessary to 'produce' better qualified organic farmers and future experts in the sector.

The Needs Assessment executed by the FAO project highlighted the problems and gaps in organic education in SAS. It also suggested possible measures and solutions to address these gaps. Among others, an improved capacity of future organic SAS graduates may be anticipated only if the organic teachers and trainers provide better practical training, improve the information supply and assure know-how exchange.

Therefore, the present Exercise Handbook is aimed to serve as a format for delivery of information, know-how and examples to SAS organic students. Using the handbook, the SAS teachers and trainers could achieve better quality practical skills of their SAS students.

WHAT CHANGES IN OA CURRICULA ARE NECESSARY?

Based on situation analysis of Serbian OA sector and the Needs Assessment, the project proposed changes that focus mainly on two areas of the secondary education:

a) Theoretical lessons

Gradually, the teachers should introduce modular system of education. It is better structured and suited to provide practical knowledge to students.

b) Practical lessons (exercises)

Possible changes (or additions) to the existing (elective) programmes in OA may include:

- splitting up the existing 64 hours per OA subject at 40 h. theoretical classes per year per subject plus 24 h. practical exercises per year per subject, or
- about 30% (*2 h*.) of their 6 hours weekly practice (1 day/week) to devote to OA practice (e.g. on the SAS field or glass-house), and
- about 30% (*or higher where suitable*) of the professional practice (during the summer II-nd semester) to be done in premises of OA operators such as private farms, processing factories (bakeries, butcheries, dairy, etc.), certification firms, marketing places (open-market, supermarkets), research institutes, university labs or fields, etc.

In competence based learning, participants learn through assignments that derive from professional practice. Assignments are conducted individually or in groups of 4-5 participants. Through practical assignments, learning is a purposeful, active and interactive process. Therefore, the teachers will be provided with examples of practical assignments for OA students (groups) for 24 h. exercises, including teaching methods and tools, approaches to get practical skills, etc.

Other (long-term) options aimed to strengthen practical (business) skills of the SAS students are:

- Introducing a new elective subjects within the existing OA curricula to respond to new prospects – e.g.

'Marketing and Management in OA' and 'Processing in OA', or

- Introducing a new mandatory subject at Year 2, e.g. **'Technology for OA production'** consisting of 5 h. theory, 2 h. exercises, 4 h. practice per week.
- Introducing changes in the timing of education, e.g. the subject 'Organic animal husbandry' can be moved to Year 2 or 3, not at the end of student education (i.e. Year 4).

However, usefulness and applicability of such new subject need be further fine-tuned with SAS Directors and SAS teachers in OA. Then, the practical exercise programme (24 h. per OA subject) will be tested in pilot SAS already in 2014-2015 school year.

How teachers and trainers could benefit from the handbook?

The Exercise Handbook relies on international experience and know-in the field of organic secondary education. Examples of possible content of practical exercise programme including students' group assignments should be incorporated in the existing education curricula in organic agriculture in Serbian SAS.

However, the content of the group assignments might be alternated by SAS teachers. The adaptations might depend on a number of factors such as specific SAS conditions and available facilities to provide practical organic training, regional organic sector development and regional agricultural specialisation, availability of qualified teachers, possibilities for organic certification, utilisation of regional or/and national markets, possibilites for apprenticeship or know-how exchange with regional farms or processing units, and last but not least the future perpectives to SAS organic graduates.

Examples in the handbook concern proposed changes in the four existing programmes of OA, practical exercise programme, students group assignments, training methods and tools, approaches to get practical skills, examples of organic agriculture learning modules, reference literature and electronic sources of information (including projects).

The focus of the project was also put on a new organic subject of 'Marketing and Management in OA' (see below), including conversion to OA, organic certification requirements and planning. This is because SAS organic teachers and students should be equiped with sufficient marketing and management knowledge to eventually connect with the Serbian Centres for Organic Production (COP) and Farmer Field School (FFS) and Farmer Business School (FBS). These links may generate interest in school students and provide them with business ideas and business attitude to further speed up the OA sector development.

Authors sincerely hope that the Exercise Handbook will be successfully adopted by SAS organic teachers, so that they will be equipped with modern know-how and tools for providing high quality organic education in Serbia.

I. Structure of the Exercise Handbook

I.1 Content

A.1 TEACHING AND TRAINING METHODS AND TOOLS

Suggestions on **training modalities and tools for organic agriculture education in Secondary Agricultural Schools in Serbia** are listed. They are based on international experience and knowledge.

A.2 PROGRAMME OF ORGANIC SUBJECTS

Below, each of the programme of the 4 existing (elective) subjects on organic farming in the SAS-Serbia is presented.

Each Table presents proposals for possible changes / or additions to the existing (elective) programmes in Organic Agriculture. The changes concern introduction of practical training of students.

The tables present:

a) a reduced teaching load of theoretical classes, i.e. down to 40 h. per year/per organic subject, and

b) a programme of practical exercises, i.e. a total of 24 h. per year /per organic subject.

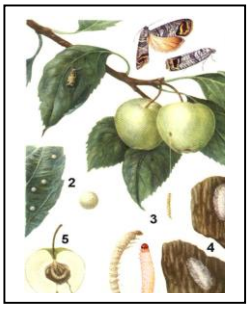
Recommendations on topics for practical lessons are mentioned (in red colour) in the existing (and approved) organic teaching curricula.

A.3 CONTENT OF PRACTICAL EXERCISE PROGRAMME

After each Table with the improved OA subject (curricula) marked in red, certain example(s) (suggestions) for **the content of practical exercises** are given.

These exercises are in a form of an **Assignment** (practical task) that should be completed within the entire period of 24 h. per semester devoted to practical exercises (Table 1).

Table 1. Practical exercise programme for students in organic agriculture in SAS.

<table>
<tr><td colspan="12">Week – Semester 2</td></tr>
<tr><td>1</td><td>2</td><td>3</td><td>4</td><td>5</td><td>6</td><td>7</td><td>8</td><td>9</td><td>10</td><td>11</td><td>12</td></tr>
<tr><td>Written plan:
Introduction
Farm (field) description
Explanation of the choice of crops
Technology map
Marketing
A labour chart</td><td>PP presentation (optional):
Plan content, followed by plan evaluation</td><td colspan="8">Field observations or other investigations on:
- Crop stages
- Pests (or diseases)
- Plant protection
- Certification /inspection
 
  </td><td>Preparation of final report by the student group</td><td>PowerPoint presentation of the results/findings</td></tr>
</table>

In competence based learning, participants learn through assignments that derive from professional practice. Assignments are conducted individually or (better) in groups of 4-5 participants. Through practical assignments, learning is a purposeful, active and interactive process.

The assignments for OA students (groups) for 24 h. have certain structure which should be followed by students and teachers.

The assignments' content may include among others the objective of assignment related to the chosen topic of OA, duration, logistics, detailed plan of execution, assignment' methods and tools, approaches to get practical skills, instruction on documentation and reporting by students, references and resources, etc.

The content may be alternated by OA teachers depending on the importance of the OA topic, regional importance of the OA sub-topic, background and perspectives of students in the group, availability of information, materials and tools of investigation, etc.

B.1 INTRODUCING A NEW (ELECTIVE) SUBJECT 'MARKETING AND MANAGEMENT IN OA' WITHIN THE EXISTING OA CURRICULA

This (long-term) proposal aimed to address the need to strengthen practical (business) skills of the SAS students and to respond to new prospects and challenges of the OA sector, i.e. specialists who are qualified to structure the increasing availability of OA products on Serbian (and international) market.

The added-values of this chapter are the suggestions for developing theoretical lessons in a form of modules. The module examples are suggested with certain structure, timing, content, etc.

The usefulness and applicability of the proposed new subject should be further discussed with and tested by the teachers in OA in the SAS-Serbia.

I.2 Annexes

Annex 1, References and Information resources and Annex 2, Summary of projects, products and innovative approaches to organic education in secondary schools, high schools and VET are meant to provide additional information for teachers in OA. Based on these resources, they can develop their teaching modules and assignments or get in touch with fellow colleagues from EU and exchange of information and knowledge, or design future partner projects.
In Annex 3, additional example-modules based on recent international projects are presented. They can be used to design assignments for students.

Guidelines for preparing and executing a student group assignment

Below, a set of guidelines of how to design a practical exercise programme for a given student group are presented.

The guidelines should:

- comprise the topic of the OA subject, for instance Organic fruit production, or Organic vegetable production,
- be informative, concise and clear to students,
- set up clear target (goals) to student,
- offer 1, 2 or more options for assignments to choose from,
- set up clear criteria for marking the quality of execution of the assignment,
- provide directions to students on which materials and methods to use,
- suggest possible (and available) sources of information and knowledge.

The structure of assignment programme and its content are presented on Table 2 below.

Table 2. Content of assignment programme and guidelines for teachers in organic agriculture

Year of study … **Semester ……..**	**Title of assignment** /time (hours) per semester/
Introduction	Introduction to the topic of assignment. Short description of the identified problems in organic production or processing and gaps in present knowledge Short reasoning for undertaking this topic of assignment, e.g. to understand relationships or processes, or others. Brief descriptions of options to solve problems and fill in gaps in understanding. Brief description of what students should learn during the practical assignment period and during their concrete task execution.
Competence	What competences students should acquire?
Practical targets	What practical knowledge, skills and understanding in organic agriculture students should obtain? What type of decision-making skills students should acquire, e.g. planning, accounting, analysis, presentation? What type of communication skills students should acquire, e.g. working in a group, decision-taking, written and oral presentation, etc.?
Assessment of knowledge and skills	**How the acquired knowledge and skills should be assessed?** **For instance, on the basis of:** 1. Contents of the report (40%) – quality of received and processed data, reasoning, task assigning, discussions, conclusions, etc. 2. Making judgements (20%) – clear planning and appropriate decisions, estimations, etc. 3. Communication (20%) – clear reporting based on thorough group discussions, written and oral presentations, school competitions, etc. 4. Group Work (20%) – individual contribution.
Role	**Offer different assignments to choose from, e.g.:**

	Assignment 1: An aspect of the problem of the assignment, e.g. a crop production technique a methodology or a problem. **Assignment 2: Applicability of a method, a technique or a human intervention, e.g.** testing green manuring or plant protection method in organic crop production. **Assignment 3**: **Aspect of certification, legislation, marketing or management.**
Group size and composition	Groups of 2 to 4 students should be the optimal size The teacher should support selection process based on students' knowledge, skills, and preferences for future job. Techniques such as Brainstorming or Tick-box can be used to select similar students in a group.
Assignment	Title of suggested assignment(s) Short description of assignment (if necessary).
Expected Outcomes	**<u>Content of expected results in the Assignment (per 12 weeks practical exercise programme for organic students):</u>** • **Week 1**: Written plan to be presented by each student group, containing: 1. Introduction, 2. Description of the farm (or School fields) 3. Explanation for the choice of crops and area per crop 4. Marketing options 5. A labour chart (labour demand per crop and per field or farm 6. A plan of the necessary equipment (machinery) 7. Plan for monitoring the plant growth or animal breeding, etc. • **Week 2**: Power Point presentation (optional for the student groups): Plan content, followed by evaluation of the plan, according the criteria presented in the introduction. Is it possible to reach the target? • **Week 3 to Week 10**: Filed observations • **Week 11 and 12:** Preparation of final report (content to be consulted within the group and the teacher), PowerPoint presentation.
Methods	**Suggest and describe to students possible methods for executing the assignment, e.g.:** • Collecting information by desk-studies, farm visits, interviews, Internet data, etc. • Field or glass-house visual observations • Setting up field or glass-house experiment (simple design, easy to do for about 10 weeks..) • Collect the results, use simple statistics for processing results. • Desk-work on analysis of results, compare results with other groups or schools, and state simple recommendation for solution of the problem or improvement.
Coaching	Offer consultation with the teacher(s) relevant to the assignment topic and objectives.
Supportive Modules	Provide students with information and literature from other organic topics (modules), e.g.: 1. Plant growing 2. Mechanisation in plant production 3. Principles of plant protection. 4. Plant nutrition.
Time planning	Provide suggestion and plan of how the students should utilise the 12 weeks for the assignment execution, use so called step-wise approach, fix dates and time, e.g.:

	Step 1. Preparatory activities – work-plan, strategy, expected results, etc. *Step 2*. Preparatory activities – logistics, farm, field, crop, animal, method of observations, collecting data, processing results, compiling report, etc. *Step 3*. Assignment execution activities: farm visits, interviews with farmers, workers, managers, certification bodies, desk-studies, data, processing, etc. *Step 4*. Review the project tasks, screen against major results received, documentation, registers, etc. *Step 5*. Write a Final Report with conclusions and recommendations.
Resources	Ask students to prepare a plan of what materials and tools they need for execution of assignments. They could consult these with the OA teachers, school agronomists, researchers or other experts.
References	Provide to students a List of References (literature, Internet sites, handouts with methodology, sample student project reports, etc.). Use also the Supportive Modules.

A.1 Teaching and training methods and tools

Below, a number of participatory training modalities and tools for organic agriculture education in Secondary Agricultural Schools in Serbia are suggested.

They can be altered or modified (adjusted) by teachers in SAS-Serbia according to:

- availability of school land, premises, information resources;
- capabilities and qualifications of the teachers that are training OA students;
- demand of the OA sector regionally;
- level of education and qualification of students;
- interest of students to 'learning by doing'
- possibilities for visits and practical exercises in farms, processing factories, certification bodies – transport, time, permissions, etc.

SUGGESTED CHANGES IN THE ORGANIC TEACHING CURRICULA IN SERBIAN SAS

Options for strengthening practical training /*under OA teachers' guidance*/:

- 64 hours per OA subject to split up at 40 h. theory and 24 h. practical exercises, or
- about 30% (*2 h*.) of their 6 hours weekly practice (1 day/week) to devote to OA practice (e.g. on the SAS field or glass-house).
- about 30% (*or higher where suitable*) of the professional practice (during the summer II-nd semester) to be done in premises of OA operators
    - farms,
    - factories,
    - bakeries, butcheries, milk processors,
    - certification firms,
    - marketing places,
    - research institutes, university labs, etc.

From field and glass-house to work-groups and processing factories

LEARNING METHODS AND APPROACHES – BASED ON INTERNATIONAL EXPERIENCE:

- Student-centered learning
- Use of written instructions and assignments
- Manuals and self-learning
- Seminar discussion groups / reports
- Coaching by mentor / supervisor / teacher
- Students to be asked to develop Personal (or Group) Development Programme
- Content of education curricula
- Based on future student activity or professional role / job profile related to real life professional development
- For students – possibilities to work in discussions groups,
- For teachers – possibilities to work together and make a coherent programme – e.g.agrobiodiversity..??

USING PARTICIPATIVE TECHNIQUES

They are important for involving students in the learning process and can be used in the following ways:

1) *To start a training event*
   - Questions and discussions
   - Tick-box discussion

2) *To change the subject or restart*
   - Questions and discussions
   - Brainstorming

3) *To deepen understanding and give practice*
   - Training visits
   - Exercises

4) *To gain commitment to take action or to change*
   - Action plans

First task – Initiate a Group Work

Aim: to exchange ideas, experience, knowledge

Formation of groups:

1. Depending on the course topic, e.g. Organic Viticulture
2. Use Brainstorming technique
3. Assign 4-5 topics per class according to sub-topic of interest:

- randomly: ensures mixing of different people and ideas
- homogenously: based on region, product, background, etc.

4. Provide instructions on tasks to each group
5. Instruct orally or appoint facilitator to explain per group
6. Check if every group understand the task or have questions
7. Encourage proper documentation
8. Encourage use of MS PowerPoint presentations
9. Encourage Internet for exchange of info, reporting, etc.

BRAINSTORMING:

EXAMPLE: ORGANIC VITICULTURE

1. Ask students about sub-topic of their interest
2. Ask them to write it down on carton paper
3. Ask them to stick them to the board
4. Collect papers and form small sub-groups
5. Consider similar sub-topics, e.g. plant protection, growing stages, conventional vs organic, agro-biodiversity, certification, etc.
6. Consider student region + perspectives upon graduation

TICK-BOX QUESTIONNAIRE AND DISCUSSION:

Aims:

- To determine what students' group knows about the chosen topic,
- To initiate discussion among students, based on interest to specific questions,
- To direct the scope of the Assignment to the group

Plan the content of instruction

/for field monitoring, experiments, desk-work, investigations, visits, etc./

Select main headings

Select main sub-headings:

- places of actions to be taken
- areas where decision must be made
- information necessary to do the job

Make action points:

The students need to know:

What to do? When to do it?

Where to do it? How to do it?

Example: Plant protection in organic viticulture			
1. High air and soil moisture leads to more problems with diseases	☐	☐	1. High air and soil moisture do not lead problems with diseases
2. Farmers may choose varieties that will produce more grapes and bring more money.	☐	☐	2. Farmers have to choose resistant varieties to diseases based on regional conditions.
3. Grapes need chemical pesticides to be protected from pests and diseases	☐	☐	3. Grapes can be protected from pests and diseases using mulching system, on-time branching and bio-pesticides
4. Pesticides may contaminate grapes and residues can be found in wine production	☐	☐	4. Pesticides cannot contaminate grapes, they quickly degrade and residues cannot be found in wine production
5. In organic farming it is forbidden to use any chemical pesticide	☐	☐	5. In organic farming it is allowed to use pesticides from natural origin
6. Use of herbicide instead of mechanical soil cultivation saves energy	☐	☐	6. Use of herbicide instead of mechanical soil cultivation or mulching spends more energy and affect soil fauna
7. If farmers don't use pesticides they may lose a part of their yield	☐	☐	7. If farmers don't use pesticides they can lose the entire yield
8. Modern pesticides are highly selective, have short quarantine period and don't harm nature	☐	☐	8. Modern pesticides are selective, have short quarantine period but may accumulate and harm nature
9. Farmers should regularly check vineyard and spray with bio-pesticides when necessary	☐	☐	9. Farmers should check vineyard every week and spray with chemical pesticides
10. Organic farmers may use copper and sulphur preparations to cope with mildew, powder mildew and *Botritis*	☐	☐	10. Organic farmers should use only chemical pesticides to destroy mildew, powder mildew and *Botritis.*
11. Organic farmers should use only pesticides to destroy pests and diseases.	☐	☐	11. Organic farmers may use buffer strips of trees, shrubs and flowers/ herbs to avoid pesticides.

A.2 Programme of organic subjects

Examples of existing (and improved) OA curricula, added by practical exercises (assignments), are presented in below tables.

(Content continues on the next page)

Table 3. Teaching Programme of the subject Organic crop farming
(offered as an optional subject in the teaching programme of specialty 'Agricultural technician' – Year 2).

Course: **ORGANIC CROP FARMING**

No of classes annually: **64**

Grade: **Second**

Expected outcome:
1. Getting knowledge of importance and biological aspects of organic agriculture
2. Getting knowledge on characteristics of organic field crop farming
3. Getting knowledge on organic fertilisation in organic field crop farming
4. Getting knowledge on agro technical measures available in organic field crop farming
5. Getting knowledge on cultivation in organic field crop farming

TOPIC	GOALS	**OUTCOME** at the end of the course student will be able to:	**OBLIGATORY AND RECOMMENDED CONTENT ACCORDING TOPICS**	**WAYS TO IMPLEMENT PROGRAM**
Principles of organic production	• Introducing students to development of sustainable food production systems • Introducing students to principles and importance of organic production	• understand and comprehend the difference between traditional, conventional and sustainable agriculture • define and explain principles of good agricultural practice (GAP), integral production • define and list principles of organic production	• Development of sustainable systems • Principles of good agricultural practice • Principles of integral production • Principles and importance of organic agriculture	At the beginning students should be introduced with the goals and outcome of the course that includes teaching, plan of program and principles of evaluation. Realization of the class: • theoretical class **<u>Venue of realisation of the class</u>** • theoretical class would be realized in the classroom or appropriate cabinet, partly on experimental field with organic production within school fields - school economy. • practical exercises would be realised on-field, in a glass-house or in laboratory, in collaboration with certification body (e.g. joint inspection visits) or with private farm (visit during vegetation season). **<u>Recommendation for realisation of the class</u>** • insist that students overmaster knowledge on principles of organic production • insist that students overmaster knowledge on biological principles of organic agriculture • insist that students overmaster knowledge on common characteristics of the crop production • insist that students overmaster knowledge on crop farming in organic production
Biological principles of organic production	• Introducing students to specificities of growing plants in organic agriculture • Introducing students with the Rulebook on organic production	• understand and explain importance of biogenic elements cycle • list factors necessary for development of organic matter in agro-ecosystems • define crop rotation and list the most important functions of crop rotation in organic production • explain tillage in organic production • explain plant nutrition in organic production • define companion planting and explain importance of companion crops in organic production	• Cycle of biogenic elements • Biological cycles of plants • Crop rotation in organic agriculture • Tillage in organic production • Plant nutrition in organic production • Companion planting in organic production	

		• use rulebook and understand the law on organic production	• Statements from the rulebook on organic production	**Evaluation** Grading of achieved outcome is to be done through: • monitoring of achieved outcome • examination through tests • evaluation of practical assignments **Average number of classes against topics** **Theoretical class** • principles of organic agriculture (6 classes) • biological principles of organic production (10 classes) • common characteristics of crop production (10 classes) • field crop farming in organic production (14 classes) **Practical class:** • *Assignments 1 on principles of organic agriculture*: developing GAP and organic conversion plan for specific farm/ enterprise. • *Assignments 2 on biological principles of organic production*: develop monitoring plan on growing crops in rotation, links between crops in mixed plots (incl. Allelopathy), tests on various bio-fertilisers, etc. • *Assignments 3 on common characteristics of crop production*: test and monitor crop varieties, use of bio- plant protection products, etc. • *Assignment 4 on field crop farming in organic production*: test crops with different tillage practices, weeding / polyethylene film / mulching, preparation of plant protection sprays and application, use of colour and pheromone traps, etc. Each assignment consists of 20-24 classes per school year and can be executed by individuals or group of students.
Common characteristics of field crop production	• Introducing students to common characteristics of organic production in field crop farming	• list basic principles of field crop farming • understand the difference between conventional and organic field crop farming • make the scheme of crop rotation for organic field crop farming • select varieties and hybrids for organic field crop production • explain and select appropriate systems of tillage and fertilization in organic field crop farming • explain principles of sowing in organic field crop farming • describe plant treatments in organic field crop farming • establish time of harvest	• Basic principles of field crop farming • Organic production of crops • Managing organic field crop farming: - crop rotation and selection of forecrops - selection of variety - hybrid - tillage system - fertilization system - sowing - plant health - harvest	
Field crops in organic agriculture	• Understanding of tillage importance, sowing, plant protection and harvesting with the goal of achieving high and stable yields in agricultural production	• understand tillage importance • understand fertilization importance • describe preparation of seeds for sowing • recognize seeds of cultivated crops • understand importance of plant protection in achieving high and stable yields • understand the importance of adequate application of treatments • determine time of harvest and recognize different phases of maturity • identify specificities of harvesting and maintenance of cultivated plants • understand importance of crop rotation in plant protection and its planning	• Tillage • Fertilization • Seeds and sowing • Plant treatments • Harvest and plant maintenance • Crop rotation	

CORRELATION WITH OTHER COURSES

- Biology

- Soil science and agro chemistry
- Agricultural production 1

A.3 Content of practical exercises

Example – Practical Exercise program - Assignment on Organic Crop Farming

/plan of 24 hours of practical training for student groups/
Year 2 Semester 1 or 2

Table 4. Assignment on planning field crop growth	
Year 2 Semester 1 or 2	**Planning the next growing season** /adapted from VHL College – The Netherlands/
Introduction	Graduates from secondary schools are prepared to work as agricultural technicians or organic farmers (plant producers) at their family farms. Each year during autumn and winter time plant producers (farmers) have to make decisions about the crops and varieties they will grow in the next year on their arable or vegetable farm. Farmers can also decide to establish a crop rotation or change the present one. Factors impacting their decision making are: • Possibilities to sell the products at premium prices thus getting extra income • Rotation aspects (soil preparation, planting and harvesting times, weeds, diseases etc). • Human labour and available machinery The organic farmer need to secure organic seeds, organic fertilisers, bio-pesticides from the suppliers. He will also consider the necessary equipment for the crop growing. During the practical period of 24 hours for this semester, the student should learn to apply basic knowledge of organic plant production like mechanisation, organic fertilization, bio- plant protection, weeding, harvesting in real life situations.
Competence	To run a sustainable and profitable organic plant production farm (unit)
Practical targets	To obtain knowledge, apply practices and understand organic crop husbandry: • Environmental conditions for crop growing • Plant production • Mechanisation, buildings • Field crop management, profitability, business management Making judgements 1. Analysis and the use of information 2. Mathematics and numeracy Communication • Judgement, decision making and problem solving • Oral communication skills • Writing skills • Team work / project management • ICT skills: application of calculations in Excel
Assessment of knowledge and skills	**Marking** 5. Contents of the report (40%) 6. Making judgements (20%) 7. Communication (20%) 8. Group Work (20%) **Assessment criteria** • Contents of the report (-s). • The proposed crops are suitable for the environmental conditions for crop growing / The reasons for establishing crop rotation are well explained . • The proposed crops fit in a sound rotation / the establishing plan comprehends and foresees all

	necessary steps. • The labour chart and mechanisation plan are carried out well and in line with the cropping plan / establishing plan. • The cropping plan shows insight in how to run a farm (unit) in profitable way / overview of costs is realistic. **Making judgements** • Decisions are justified • Appropriate sources are used to justify decisions • Clear and sound estimates and calculations are presented that support the decisions made **Communication** Written communication • Clear style of writing of the report • Appropriate layout • Calculations are presented in Excel in a proper way Oral communication • Duration of the presentation is 10 -15 minutes • Contents of the presentation • Structure of the presentation (intra, main, finish) Group Work • The work is carried out according a clear work plan •Each team member has contributed well in the work
Role	**Assignment 1:** You are in the role of an organic farmer, who runs an arable or vegetable farm **Assignment 2:** You are in the role of a farm owner, who wants to establish a new crop rotation (or group of crops)
Group size and composition	Groups of 3 to 5 students are formed by the teacher.
Assignment	**Students choose from two assignments:** Assignment 1: You are assigned to make a monitoring plan for the upcoming vegetation season for your arable or vegetable farm (fields) and follow the plant growth. Assignment 2: You are assigned to make a plan for establishing a new crop rotation (or group of crops) and monitor the plant growth during the upcoming vegetation season.
Expected Outcomes	**Assignment 1:** • **Week 1**: written plan, containing: 1. Introduction (indude your criteria for a good cropping plan for an arable farm), 2. Description of the farm (or School fields): location, area, farm buildings (storage facilities), equipment, soil types, water supply etc. Present a table and a map of the fields of this farm. Mention in this table the planned crops for upcoming vegetation season and the crops grown in the two or three previous years. 3. Explanation for the choice of crops and area per crop. Decision supporting calculations in Excel of the income they can generate after the sells. 4. List of trading companies or processing industries to which the crops will (or can) be sold. 5. A labour chart in which the iabour demand per crop and per field and the labour demand in totai (as mandays) to be presented. Is in some periods of the year assistance from neighbours or contractors necessary? 6. A plan of the necessary equipment (machinery) and relation to the actual available equipment of the farm. 7. Plan for monitoring the plant growth – soil cultivation, planting, crop stages, fertilisation, plant protection, weeding, problems, harvesting, etc. • **Week 2**: PP presentation (optional): Plan content, followed by evaluation of the plan, according the criteria presented in the introduction. Is it possible to reach the target? • **Week 3 to Week 10**: Field observations • **Week 11 and 12:** Preparation of final report (content to be consulted within the group and the teacher), PowerPoint presentation.
	Assignment 2: **Week 1**: written plan, containing: 1. Introduction (reasons for establishing a new crop rotation (or group of crops), how it fits in management of the farm, reason for choosing certain plant species, situation on the market, expected yield and income, etc.). 2. Description of the farm: location, area, farm buildings (storage facilities), equipment, soil types, water supply, labour force etc. 3. Climate and soil features in relation to crop demands 4. Decision of crop varieties, cultivation, pollinators, spacing, green (flower) buffers 5. Plan of all needed measurements: • Land clearing if needed • Soil improvement, including fertilisation • Soil tillage and preparation for sowing or planting • Sowing and planting • Weeding and plant protection from pests and diseases

	• Irrigation • Harvesting 6. A labour chart in which the iabour demand per crop and per field, and the labour demand in totai (as mandays) to be presented. Is in some periods of the year assistance from neighbours or contractors necessary? 7. A plan of the necessary equipment (machinery) and relation to the actual available equipment of the farm. 8. Plan for monitoring the plant growth – soil cultivation, planting, phenol-phases, fertilisation, plant protection, weeding, problems, harvesting, etc. • **Week 2**: PP presentation (optional): Plan content, followed by evaluation of the plan, according the criteria presented in the introduction. Is it possible to reach the target? • **Week 3 to Week 10**: Farm (field) observations • **Week 11 and 12:** Preparation of final report (content to be consulted within the group and the teacher), PowerPoint presentation.
Methods	• Collect information about the location of the fields (maps), soil types, buildings (storage facilities) and equipment, etc • Choose the crop fields, assure machines and equipment for soil cultivation, calculate fertilisers and bio-pesticides. • Collect information on market prices of different crops, prices of inputs, trading companies and processing industries etc. Look for these data on the intemet, in agricultural magazines or make telephone calls to trading companies. • Make comments on the results of monitoring of plant growth during weekly practice classes (Week 3- Week 10) and state simple recommendation for improvement. • Make a simple balance sheet (income and costs) per organic crop or field
Coaching	Coaching sessions with the leading teacher(s) are possible by appointment.
Supportive Modules	5. Plant growing 6. Mechanisation in plant production 7. Principles of plant protection. 8. Plant nutrition
Time planning	Step 1. **Prepare a Work-plan** to organise practical (24 h.) period and the implementation of the student project. The aim of this plan is to make clear to all students what has to be done. **Work-plan** /short and simple/ • Introduction (or background) of the project • Project assignment • Project activities • The products • Quality • Organisation of the group work • Planning of the group work, e.g. time schedule, division of tasks, reporting, etc Step 2 Contact the agronomist of the School fields or an arable farmer in the region and ask for co-operation in this project assignment. Step 3 Visit the farm and ask the farmer questions you prepared in advance. Ask your teacher to check your questions. Step 4 Make a cropping plan (on paper) for the next growing season for this farm (or for the school fields). Step 5 The report must be handed in on ..... .(date) to .....
Resources	Agricultural inputs or other materials to be prepared in advance under teacher's / farmer or school agronomist guidance
References	References will be given within supportive modules

Examples of practical assignments for students (content and plan)

ASSIGNMENT 1. ANALYSIS OF ORGANIC AND CONVENTIONAL AGROECOSYSTEMS

Agroecological (Conversion) Plan for organic agroecosystems. Identification of a list of major points of conversion or establishments of ecological methods and practices. International rules and regulations.

Objectives

1. To learn how to analyse the suitability of an agricultural production unit to become organic.
2. To use the analysis for making an agroecological plan for development of an organic unit and apply for organic certification.

Expected results:

A proposal for an agroecological plan of given production unit, for instance organic staple crop, vegetable, fruit, viticulture or livestock (mixed).
Proven ability to describe and present major steps, approaches, aspects, information and resources for designing sound agroecological plan for organic production.

Step 1. Analyse practices used in conventional and organic agriculture

Students should be introduced to theoretical basis of organic mixed farming (plants and animals) (see Figure 1 below).

Figure 1. Various aspects and practices in organic farming

Step 2. Describe major steps in the agroecological planning

1. Identify the land size, documentation, ownership
2. Collect and read the necessary information about principles and practices of ecological crop and animal husbandry.
3. Choose the certification and control organisation that you will be working with.
4. Collect and read normative documents (standards) for practicing ecological agriculture.
5. Collect and read requirements for crop and/or animal production.
6. Take decision what part of the farm should be converted to ecological agroecosystems.
7. Plan an optimal term for conversion of crop and animal production.
8. Decide on optimal combination of activities (crop or crop/animal and/or processing).
9. Decide on optimal crop rotation, and other agro-technical measures, i.e. fertilisation, plant protection,

harvesting – techno-maps.

10. Assess the present infrastructure – machines, buildings, units for collection of manure and making compost, etc.

11. Assess the present system of breeding animals – types of animals, breeds, adaptability to local fodder, grazing, forage, milking, climate, etc.

Step 3. Describe important aspects in designing (agroecological) plan of an organic production unit

- Selection of suitable and adapted crops and varieties
- Measures for improving soil conditions
- Animal waste and animal manure – collection, storage and processing
- Crop rotation plan
- Fertilisation plan
- Soil tillage plan
- Plan for biological plant protection
- Mechanical tools and labour requirements
- Conditions for collecting and storage of harvest
- Production and financial balance
- Marketing plan
- Regular financial balance of the total farm, incl. forage supply.

Step 4. Use the plan when request organic certification of your crop production (Table 5 to 8 below)

1. Name/Organisation:
2. Address/ Location / Phone
3. Road to farm – description:
4. We require certification:

   European Unionθ 834/2007 θ NOP θ Others ……

5. Do you know the basic requirements for ecological agriculture?

   Yesθ Noθ

6. Inspector:

   Name:

   Address:

7. Farm description
8. Total farm size in ha:
9. List of parcels and crops, which are to be certified:

   Location, Parcel №

   Size / ha /

   Crop expected yield

10. Processing

    Do you process products on-farm? Noθ Yes θ

    What type of products you process?

    What buildings and facilities you have available for processing/storage ?

Table 5. Land (field) description and crop history.

№	**Land parcel**	**Identificator / № of the parcel /**	**Crop / type, variety /**	**Size / ha /**	**Status / Eko, in conversion**	**Year of establishing**	**Expected yield / кg /**

Table 6. Registry of sells

№	Date	Identificator / № of parcel /	Product, variety	Quantity	Quality	Place sold

Table 7. Control over cleaning of used equipment/ instruments

Equipment	Method of cleaning	Date	Signature of responsible person

Provider should declare if seeds are treated with agro-chemicals (not listed in the permitted inputs of EU Regulation 889/2008 and non-GMO

Table 8. Seeds – origin and quality

Seeds, seedlings (Type, variety)	Origin (Name, Address of provider)	Seed treatment	
		non-treated	treated
		non-treated	treated
		non-treated	treated
		non-treated	treated
		non-treated	treated

Maps and other graphic material

A map of not less than 1:5000, on which field parcels borders are clearly drawn should be presented to certification body.
Fields in the crop rotation or permanent pastures or orchards should be identifiable
Places of building, storages, water resources, etc. should be drawn.
Protected areas (reserves, national parks, protected zone, and buffers) should be drawn.
Traditional elements of landscape (hedges, trees, terraces, wind protection zones) should be mentioned.
Rare or protected plants and animal species to be drawn as well.

Animal breeding

If animals are bred at the farm:
- describing all animals in the agroecosystem
- animal breeds
- animal category – for milk, meat, for fattening, etc.
- identification number of the animal
- information needed to calculate farm storage capacity for animal manure

Planning of animal manure in the ecological farm (м3)

- calculate necessary capacity for storing animal manure in the beginning of the year
- volume of existing storage places in the farm
- annual quantity of animal manure, which is used for fertilisation of agricultural field for the respective year;
- annual amount of manure that is sold
- excess of manure at the end of the year.

<u>Step 5.</u> Formulate and ask students to answer following questions

1. Can you choose a land or farm in your region that can be converted to ecological?
2. Should you check farm documents, organic farm history, inputs (fertilisers, pesticides, plants, animals, etc.?
3. If you find the farm appropriate, what necessary information you will require in order to convert it to ecological?
4. Do you plan to collect and read normative documents (standards) ?
5. What are requirements for implementing ecological crop and/or animal production –soil fertility, crop rotations, crop and animal biodiversity, breeding animals, plant protection, etc.?
6. What do you plan for optimal combination of activities (crop or crop/animal and/or processing) – number and variety of crops and number and type of animals?
7. Can you suggest agro-technical maps for each crop?
8. How can you assess organic farm infrastructure – machines, buildings, storage and collection of manure and making compost, etc.?
9. How can you assess the present system of breeding animals – types of animals, breeds, adaptability to local fodder, grazing, forage, milking, climate, etc.?

ASSIGNMENT 2. THE EFFECT OF SOIL POLLUTION AND MANAGEMENT ON PLANTS

The effect of soil pollution and management on plant eco-cenoses. Plant responses to contrasting type of soil management – conventional (mineral fertilisers), ecological (organic fertilizers) and natural (untreated soils).

Objectives

1. To determine the scale of impact of pollutants on plant growth in soil from different agrocenoses.

Expected result:

A report with observations on the effect on pollutant or soil additive on plant growth, for instance organic staple crop, vegetable, fruit, grape, etc.

Proven ability to use simple methods for testing soil properties (for instance a biotest) and present major differences in plant growth in contrasting soils (conventional vs. organic).

There are significant changes in growth of plants that are representative for various types of phyto-cenoses (natural, human-impacted) upon pollution with various chemicals.

What changes and parameters may be observed?

- total plant habitus – e.g. physiological parameters - chlorophyl florescence method ..?!,
- biometry – length of vegetative and root biomass, % of seeds emerged, biomass (fresh and dry weight of plants)
- pollutant residues in plants or soil – using 'most probable concentration' method
- gas-chromatography analyses.

<u>Step 1.</u> Soil sampling, collecting and processing

- Students go outside – they are split up in 3-4 groups
- Students make an agroecological assessment:
  - what plants are grown there – e.g trees, shrubs, grass
  - signs for human activity – plant protection, soil cultivation, fertilisation, etc.
  - signs of animal activity
  - colour and structure of soil
  - SOM (Soil organic matter?) content – low, medium or high
  - biotic interactions between plants (which plants are dominant?) or between plant and animals
  - signs of actual or potential pollution.
- Students choose parcels with non-polluted soil and take with spade about 2 kg of soil from 3 spots to make a composite sample.

Process of sampling earth-worms by chemical extraction and further hand-sorting of dug soil

- Spread the soil onto a plastic sheet – count earthworms and other organisms, record them.
- The sample is kept in laboratory, dried and sieved.
- Content of N, P, and K, organic matter and pH is analysed and data are written in a Table (see Table 9 below)

Table 9. Soil characteristics

Number of the sample	Type of agroecosystem (conventional, organic, natural)	Nutrient content			Organic matter content, %	Soil structure
		Nitrogen	Phosphorus	Potassium		
1						
2						

Step 2. Use of a simple Biotest method

Vegetation experiment (so called Biotest) is a relatively quick method for detecting the impact of various substances on test-organisms (e.g. plants, animals, microorganisms).

The substances such as pesticides, fertilisers, oil-derivates, detergents, etc. can be tested.

Factors for growth such as temperature, moisture, humidity, light, nutrients can be monitored and controlled.

Sufficiently-susceptible test-plant species should be used – with quick growing.

In this biotest experiment:

Test-pollutants – representative for a certain region, industrial or agricultural production, landscape or farm-type. May use petrol, detergent, pesticide, nutrient fertiliser, various acids in solution e.g. $CuSO_4$, $FeSO_4$, etc.

Test-plants – relatively quick-growing (emerging), susceptible to pollutants, to have a homogene growth, not so demanding to soil-climate conditions. Oat, wheat, rye, maize, sunflower, radish, or grass species can be used.

Control pots with clean soil – to compare with artificially-polluted soils.

Step 3: From the composite sample (sieved through a sieve of 3-4 mm holes), students make following variants:

1. **Soil (untreated) – control pots**
2. **Soil + pollutants**
3. **Soil + organic compost (org. residues) + pollutants** – may use either compost or grinded straw (310 g. biomass in 9 kg soil).

Soil or mixtures are filled in plastic cups of 200 g. or pots of 0,5-1 kg (size ~15x40 см, depth to 20 см) soil:
Variant 1 – 3 cups soil + oat seeds (5 in each cup);
Variant 1 – 3 cups soil + radish seeds (10 in each cup);
Variant 2 – 3 cups soil + $CuSO_4$ + oat seeds (5 in each cup);
Variant 2 – 3 cups soil + $CuSO_4$ radish seeds (10 in each cup);

Variant 2 – 3 cups soil + org.matter + CuSO4 + oat seeds (5 in each cup);
Variant 2 – 3 cups soil + org.matter + CuSO4 + radish seeds (10 in each cup);
Variant 3 – 3 cups soil + petrol + oat seeds (5 in each cup);
Variant 3 – 3 cups soil + petrol + radish seeds (10 in each cup);
Variant 3 – 3 cups soil + org.matter + petrol + oat seeds (5 in each cup);
Variant 3 – 3 cups soil + org.matter + petrol + radish seeds (10 in each cup);
Variant 4 – 3 cups soil + detergent + oat seeds (5 in each cup);
Variant 4 – 3 cups soil + detergent + radish seeds (10 in each cup);
Variant 4 – 3 cups soil + org.matter + detergent + oat seeds (5 in each cup);
Variant 4 – 3 cups soil + org.matter + radish seeds (10 in each cup).

Step 4. Necessary materials and maintaining the biotest

Variants are kept n a room temperature (20-25°C) in laboratory or glass-house. Water is given by capilary way, e.g. – all cups are kept in a deep tablet, and water is added on the bottom in 14-21 days.



Step 5. Recording and reporting of indicator-parameters

Observe plants during growth – look for visual changes, phyto-toxicity signs, habitus, colour changes, etc.
The relative temperature and humidity should be recorded.
After 14-21 days, cups are washed off under running tap-water.
Using a ruler, the following parameters are measured by each group of students for each pollutants:

- root length, см
- stem length, см
- biomass (fresh or dry), g.
- number of emerged seeds (% from total seeds sown in 1 cup)

The data are filled in a table (see Table 10 below) and later in a computer (students learn how the MS Excel can be used).

Table 10. Variants with different pollutants and test-plants.

N:	Variant	Seeds /plants	Root length, см	Stem length, cm	Biomass, in g.	Emerged seeds, %
1	Control (unpolluted) soil	Oat or rye	Average from 3 replicates - 3 cups	Average from 3 replicates - 3 cups	Average from 3 replicates - 3 cups	Average from 3 replicates - 3 cups
		Radish				
		Plant seed				
2	Soil + CuSO4 (200 and 400 mg/kg)	Oat or rye				
		Radish				
		Plant seed				
	Soil + org.matter + CuSO4	Oat or rye				
		Radish				
		Plant seed				
3	Soil + petrol (1000 and 2000 mg/kg – 0,2 – 0,4 ml)	Oat or rye				
		Radish				
		Plant seed				
		Oat or rye				
		Radish				

N:	Variant	Seeds /plants	Root length, см	Stem length, cm	Biomass, in g.	Emerged seeds, %
	Soil + org.matter + petrol	**Plant seed**				
4	**Soil + detergent (0,3 – 0,6 ml)**	**Oat or rye**				
		Radish				
		Plant seed				
	Soil + org.matter + detergent	**Oat or rye**				
		Radish				
		Plant seed				

<u>Step 6.</u> Analysis of the received results

Following parameters are analysed:

- Quality changes in plants between variants,

- Quantity changes in plants (biotest data):

- differences in root length – between variants and control;
- differences in stem length – between variants and control;
- differences in biomass (average weight) – between variants and control;
- differences in % emerged seeds – between variants and control
- differences in soil nutrient and SOM content – between test-soil types
- impact of abiotic factors – temperature, moisture, humidity, light.

<u>Parameters to measure</u>

Record biometric and quality parameters of test-plants from variants:

1. Quality parameters:

number of emerged seeds (% from total sown)

Recorded for each variant.

$$\% \text{ emerged seeds} = \frac{\text{Number emerged}}{\text{Number seeded}} \times 100$$

2. Biometric parameters:

Root length, mm

Stem length, mm

The smallest plants are excluded from measuring – not representative.

The total length (mm) from the 3 replicates is divided on 30 to calculate average emerged.

Biomass root, g

Biomass leaves, g

Roots and leaves are cut with scissors – weighted on technical balances.

Table 11.

Teaching Programme of the subject Organic vegetable production (offered as an optional in the teaching programme of specialty 'Agricultural technician' – Year 2).

Course: **ORGANIC VEGETABLE PRODUCTION**

No of classes annually: **64**

Grade: **Second**

Course outcome:

6. Getting knowledge of importance and biological principles of organic agriculture;
7. Getting knowledge on characteristics of organic vegetable production;
8. Getting knowledge on managing organic vegetable production;
9. Getting knowledge on application of agrotechnical measures in organic vegetable production;
10. Getting knowledge on cultivation of organic vegetables.

TOPIC	GOALS	OUTCOME at the end of the course student will be able to:	**OBLIGATORY AND RECOMMENDED CONTENT ACCORDING TOPICS**	**WAYS TO IMPLEMENT PROGRAM**
Principles of organic production	• Introducing students to development of sustainable food production systems • Introducing students to principles and importance of organic production	• explain the difference between traditional, conventional and sustainable agriculture; • define and explain principles of good agricultural practice (GAP), integral production; • define and list basic goals of organic production, • understands and define (sustainable) marketing, • comprehends activities within marketing.	• Development of sustainable agricultural systems; • Basic of good agricultural practice; • Basic of integral agricultural practice; • Basic and significance of organic agriculture.	At the beginning students should be introduced with the goals and outcome of the course that includes teaching, plan of program and principles of evaluation. Realization of the class: • theoretical class, • practical exercise class **<u>Venue of realization of the class</u>** • theoretical class would be realized in the classroom or appropriate cabinet, partly on experimental field with organic production within school fields - school economy. • practical exercises would be realised at school economy, open fields, glass house or laboratories, or in collaboration with certification body (e.g. joint inspection visits) or with private farm (visit during vegetation season). Cooperation in realization of the exercises should be achieved also with local Center for OP and Farmers field schools in the region. **<u>Recommendation for realization of the class</u>** • insist that students overmaster knowledge on principles of organic production;
Biological principles of organic production	• Introducing students to specificities of growing plants in organic agriculture • Introducing students with the Rulebook on organic production	• explain importance of biogenic elements cycle; • list necessary factors for development of organic matter in agro-ecosystems; • define crop rotation and list the most important functions of crop rotation in organic production; • explain tillage in organic production; • explain plant nutrition in organic production; • define companion planting and explain importance of companion crops in organic production; • use rulebook and understand the law on organic production.	• Cycle of biogenic elements; • Biological cycles of plants; • Crop rotation in organic agriculture; • Tillage in organic production; • Plant nutrition in organic production; • Companion planting in organic production; • Statements from the rulebook on organic production.	

Organic vegetable production - gardening	• Getting knowledge on bio gardening	• list types of organic vegetable production; • understand role of companion plants; • make the scheme of crop rotation in organic vegetable production; • properly chose varieties and hybrids in organic vegetable production; • explain and chose an adequate system of tillage and fertilization in organic vegetable production; • understand operation and mulching techniques; • explain principles of sowing in organic vegetable production; • describe maintenance measures in organic vegetable production; • determine harvest period; • organize plant distribution in bio garden.	• Types of organic vegetable production; • Bio gardening; • Mixed varieties; • Beneficial plants - friendly plants; • Increase of soil fertility; • Manure; • Compost; • Other organic fertilizers; • Microbiological fertilizers; • Mulching; • Variety selection; • Plant protection in bio garden; • Harvest and storage of vegetables; • Organization of bio garden.	• insist that students overmaster knowledge on biological principles; • insist that students overmaster knowledge on bio gardening; • insist that students overmaster knowledge on production technology of organic vegetables, • exercises realized in block classes. **Evaluation** Grading of achieved outcome is to be done through: • monitoring of achieved outcome • examination through tests • evaluation of practical assignments **Average number of classes against topics** **Theoretical class**

Vegetables varieties in organic production	• Getting knowledge and raising awareness of students on ways of cultivation of vegetables in organic production • Getting knowledge on economic and nutritional values of produced organic products	• determine affiliation of cultivated crop; • explain significance of cultivated crop from the aspect of organic production; • meet agro-ecological conditions of organic vegetables; • describe technology for organic vegetables production; • list and explain plant maintenance measures in achieving high and stable yields; • understand significance of beforehand application of agro technical measures for regular plant growth; • determine time of harvest and identify different maturity phases; • list harvesting specificities of cultivated plants and recognize different maturity phases; • list specificities of harvest, storage and packing organic products. **CORRELATION WITH OTHER COURSES** – Biology – Soil science and agro chemistry – Plant production 1	• Fruit bearing vegetables in organic production (tomato, pepper and cucumber); • Vine like vegetables in organic production (watermelon, melon and zucchini); • Cruciferous vegetables in organic production; • Leafy vegetables in organic production; • Bulb vegetables in organic production; • Root vegetables in organic production; • Tubers vegetables in organic production; • Legumes in organic production.	• principles of organic agriculture (6 classes) • biological principles of organic production (6 classes) • organic vegetable production - bio gardening (10 classes) • vegetables in organic production (18 classes) **<u>Practical class:</u>** • *Assignments 1 on principles of organic agriculture*: developing GAP and organic conversion plan for specific vegetable farm/ enterprise. • *Assignments 2 on biological principles of organic production*: develop monitoring plan on growing a vegetable crop (or family), compare growing of conventional and organic vegetables – biodiversity of species, effect of various bio-fertilisers, etc. • *Assignments 3 on common characteristics of crop production*: test and monitor vegetable varieties test various bio- plant protection products, compare growing with and without mulch, etc. • *Assignment 4 on field (or glass-house) organic vegetable farming*: test crops with different tillage practices, weeding / mulching practices, preparation and application of plant protection sprays, methods for bio-control of pests, etc. Each assignment consists of 24 classes per school year and can be executed by individuals or group of students (recommended).

ASSIGNMENT 3. MIXED CROPPING, DIVERSITY AND ALOPATHY

Possibilities of producing organic vegetables by using mixed cropping. The role of vegetable diversity and allelopathy on plant growth.

Objectives

1. To determine the possibilities of producing organic vegetable production using combination of crops (mixed cropping).
2. To monitor the effect on allelopathic changes on plant growth.

Expected result

A report with observations on the effect on allopathic substances on growth of vegetable crops.
Proven ability of certain vegetable crops to control plant growth in mixed organic farming and possibilities for companion planting.

Practical tasks

1. To observe the effect of vegetable plant extracts (for instance from dill, parsley, onion and carrot that are grown as mixed crops) on growth of tomato and pepper plants.
2. To observe if the biodiversity in vegetable agroecosystem leads to better plant growth.

Step 1. Making a Plan of the assignment

Week 1: selected group of students write a Plan, containing:

Introduction:

Reasons for vegetable growing, reason for choosing certain species and varieties, situation on the market, expected yieid and income, etc.).

Description of the vegetable garden: location, area, soil, farm buildings (storage facilities), equipment, growing types, water supply, labour force etc.

Climate and soil features in relation to crop demands
Decision of vegetable varieties, cultivation, pollinators, spacing, green (flower) buffers, etc.

Plan of necessary plant protection measures:
Branching, soil cultivation and fertilisation, mowing or weeding, spreading mulch or green manure plants, vegetable protection from pests and diseases using bio-pesticides, etc.

Plan of field observations:
Time (weeks), crop rotation (mixed vegetable field), vegetable plants (leaves, stems), description of pests, diseases, damages (picture, sketch, photo).

Plan of documentation of observations and pot experiments:
Location, materials and methods, type of plant preparations (extracts), time of application, dose, measuring plant responses, tables, figures, etc.

Reporting:
Maintain an observation diary, collect process (weekly) information, prepare final report.

Week 2: PP presentation (optional): Plan content, followed by evaluation of the plan, according the criteria presented in the introduction. Is it possible to reach the target?

Step 2. Laboratory experiments - sampling, processing, preparing extracts, measuring, observing

Week 3 to Week 10: Application of a biotest method to determine the potential effect of plant extracts (allelopathic effect) on pepper and tomato plants grown in mixed vegetable field.

- Students go outside – they split in 3-4 groups;

- Each group makes an agroecological (field) assessment (if seedling vegetables are grown in glass-house the monitoring can be done inside the glass-house) :

  - what vegetables crops (and varieties) are grown – which botanical families..?
  - human intervention – plant protection, soil cultivation, fertilisation, etc.
  - structure of soil and its org. matter content – low, medium or high

- biotic interactions inside the vegetables garden – e.g. between plant and insects.
- impact of existing plant protection measures
- signs of actual damages caused by pests, diseases or weeds, etc.

Students choose vegetable crops and start visual observations.

Then, the selected group starts a laboratory (or green-house) experiment from observing the effect of vegetable plant extracts (for instance from dill, parsley, onion and carrot that are grown as mixed crops) on growth of tomato and pepper plants.

1. Growing vegetable seedlings for obtaining plant extracts.

Soil samples (from field or green-house is sieved (at 0.5 см holes) and dried. A set of 12 plastic cups of 0,5 l each are filled with soil and 10 seeds from parsley, dill, onion and carrots are sown in each pot in three replications. The soil moisture is maintained. Plants are grown under room temperature and daylight cycle for about 21-28 days. Then well grown plants are taken from pots, their roots are cleaned from soil and extracts can be prepared from roots and vegetative parts.

Simultaneously, plastic cups of 0.5 l each, filled up with the same soil as for growing plants for extracts, are added by 10 seeds of pepper and tomato per each cup in three replications. The cups are grown under the same conditions as those for plant extracts.

2. Method of preparation of plant extracts.

Fresh biomass of the plants (either roots or stems and leaves) is cut on small pieces by scissors and placed in a ceramic pot. Then the milled biomass is added by water to prepare a solution as following:

- Carrots – 45 g added by 450 ml distilled H_2O;
- Parsley – 45 g added by 450 ml distilled H_2O;
- Onion – 15 g added by 150 ml distilled H_2O;
- Dill – 40 g added by 400 ml distilled H_2O.

After 24 h., the above solution is prepared in working concentrations of 1:1 (100 ml of the initial solution added by 100 ml of H_2O) and 1:3 (50 ml of the initial solution added by 150 ml of H_2O).

3. Monitoring the allelopatic effect of companion vegetable plants

Plastic cups with pepper and tomato plants are added twice (in 3 days) by 50 ml of the prepared solutions of parsley, carrots, onion and dill. Meantime, the cups are watered to maintain soil moisture

Following biometric parameters are to be measured:

- Quality changes in plants between variants,

- Quantity changes in plants (biotest data):

- differences in root length – between variants and control cups (only water but no extract solutions);
- differences in vegetative length – between variants and control;
- differences in biomass (average weight) – between variants and control;
- impact of abiotic factors – temperature, moisture, humidity, light.

The results can be presented in tables (see example Table 12 below):

Table 12. Biometric parameters and their quantitative values for tested vegetable crop

Biometric parameters in pepper, average values from three replications				
Vegetable crop (extract)	Variant (concentration)	Root lenght, cm	Vegetation lenght, cm	Biomass weight, g
Parsley	1:1			
	1:3			
Carrot	1:1			
	1:3			
Onion	1:1			
	1:3			
Dill	1:1			
	1:3			
Control	1:1			

Step 3. Registering the results from observations and experiments followed by analysis

The teacher shows the students how to maintain a register of fields and vegetable crops monitoring. This is useful for students from the point of view of the mandatory status of such register for organic farmers when they prepare for the visit by inspectors from the organic certification organisation.

Analysis of received experimental data

This is in order to formulate conclusions on test-allelopatic plants (parsley, carrots, onion and dill) and their effect on biotest-plants (pepper and tomato).

Following questions can be answered by students:

1. Is there significant differences between of variants regarding the values of the measured parameters?– root length, vegetative length, biomass weight, etc.
2. What are the differences compared to the control plants ?
3. What are the possible reasons for differences? - impact of allelochemicals exuded by plants, or abiotic, biotic or other reasons?
4. Can we point out dominant (or suppressive) species and their expected impact on other plants?
5. Can we use these results and provide advice to vegetable farmers on which of these vegetables can be grown as mixed stand in organic green-house or organic field?

Step 4. Documenting and Reporting. Preparation of Final Report. Presentation and promotion.

8.1 Maintain an observation diary, collect process (weekly) information, start compiling results for the final report.

8.2 **Week 11 and 12:** Prepare of Final report (content to be consulted within the group and the teacher), Present it in front of other students using PowerPoint (15 minutes + discussion).

8.3 **Promote it at school:** Make a poster and display at the student hall, or during school 'eco-competition'..?!

Table 13. Teaching Programme of the subject Organic fruit growing and viticulture (offered as an optional subject in the teaching programme of specialty 'Agricultural technician' – Year 3).

Course:	**ORGANIC FRUIT GROWING AND VITICULTURE**
No of classes annually:	**64**
Grade:	**Third**
Expected outcome:	1. Getting knowledge on importance and biological aspects of organic agriculture; 2. Getting knowledge on characteristics of organic fruit growing and viticulture; 3. Getting knowledge on management in organic production in organic fruit growing and viticulture; 4. Getting knowledge on application of agro technical measures in organic fruit growing and viticulture; 5. Getting knowledge on cultivation of fruit and vine in organic production.

TOPIC	GOALS	OUTCOME at the end of the course student will be able to:	OBLIGATORY AND RECOMMENDED CONTENT ACCORDING TOPICS	WAYS TO IMPLEMENT PROGRAM
Principles of organic agriculture	• Introducing students to development of sustainable food production systems • Introducing students to principles and importance of organic production	• understand and comprehend the difference between traditional, conventional and sustainable agriculture • define and explain principles of good agricultural practice (GAP), integral agricultural production • define and list principles of organic production • understands and define (sustainable) marketing • comprehends activities within marketing	• Development of sustainable systems • Principles of good agricultural practice • Principles of integral agricultural production • Principles and importance of organic agriculture •	At the beginning students should be introduced with the goals and outcome of the course that includes teaching, plan of program and principles of evaluation. Realization of the class: • theoretical class , • practical exercises class. **Venue of realisation of the class** • theoretical class would be realized in the classroom or appropriate cabinet, partly on experimental field with organic production within school fields - school economy. • practical exercises would be realised at school economy, open fields, glass house or laboratories, or in collaboration with certification body (e.g. joint inspection visits) or with private farm (visit during vegetation season). Cooperation in realization of the exercises should be achieved also with local Center for OP and Farmers field schools in the region. • **Recommendation for realisation of the class** • insist that students overmaster knowledge on principles of organic production • insist that students overmaster knowledge on biological principles of organic agriculture,
Biological principles of organic production	• Introducing students to specificities of growing plants in organic agriculture • Introducing students with the Rulebook on organic production	• understand and explain importance of biogenic elements cycle • list factors necessary for development of organic matter in agro-ecosystems • define crop rotation • list the most important functions of crop rotation in organic production • explain tillage in organic production • explain plant nutrition in organic production • define companion planting and explain importance of companion crops in organic production • use rulebook and understand the law on organic production	•	

Common characteristics of fruit growing and viticulture	• Introducing students to common characteristics of organic production in fruit growing and viticulture	• list basic principles of fruit growing and viticulture • understand the difference between conventional and organic fruit growing and viticulture • explain crop rotation in organic fruit growing and viticulture • select varieties and brand in fruit growing and viticulture • explain and select appropriate systems of tillage and fertilization in organic fruit growing and viticulture • explain production of seedlings of fruits and vine for organic production • explain principles of planting • describe plant treatments in organic fruit and vine cultivation • establish time of harvest	• Cycle of biogenic elements • Biological cycles of plants • Crop rotation in organic agriculture • Tillage in organic production • Plant nutrition in organic production • Companion planting in organic production • Statements from the rulebook on organic production	• realized exercises in block classes. • **Evaluation** Grading of achieved outcome is to be done through: • monitoring of achieved outcome • examination through tests • evaluation of practical assignments **Average number of classes against topics** **Theoretical class** • principles of organic agriculture (6 classes) • biological principles of organic agriculture (8 classes) • common characteristics of fruit growing and viticulture (20 classes) • fruits and vine varieties in organic production (6 classes) **Practical class:** • *Assignments 1 on principles of organic agriculture*: developing GAP and organic conversion plan for specific farm/ enterprise. • *Assignments 2 on biological principles of organic production*: develop monitoring plan on growing specific fruit /vine type, compare growing in conventional and organic orchard – biodiversity of species, effect of various bio-fertilisers, soil cultivation and machinery etc. • *Assignments 3 on common characteristics of crop production*: test and monitor fruit/ vine varieties, test various bio- plant protection products, compare growing with and without mulch, etc. • *Assignment 4 on field crop farming in organic production*: test crops with different tillage practices, weeding / mulching practices, preparation of plant protection sprays and application, use of colour and pheromone traps, etc. Each assignment consists of 24 classes per school year and can be executed by individuals or group of students (recommended).
Fruits' and vines' varieties in organic production	• Getting knowledge and raising awareness of students on cultivation of fruits and vine in organic production • Getting knowledge on economic and nutritional value of organic products	• explain importance of cultivated plant and variety from the aspect of organic production • explain importance of cultivated vine variety from the aspect of organic production • list agro-ecological conditions of cultivation some fruit types and varieties • introduction to agro-ecological conditions of cultivation of some vine varieties • list and explain plant's maintenance measures in achieving high and stable yields • understand significance of beforehand application of agrotechnical measure for regular growth of plants • determine time of harvesting of fruits and vine and recognize different phases of maturity • list specificities of harvesting and storage of cultivated plants	• Basic principles of fruit growing and viticulture • Organic production of fruits and vine • Management of organic production in fruit growing and viticulture: - selection of forecrops - selection of variety - tillage systems - fertilization systems - production of seedlings - planting - maintenance measures - harvest	
	CORRELATION WITH OTHER COURSES – Plant production 2 – Soil science and agrochemistry	•	• Pomes fruit in organic production • Stone fruits in organic production • Nut fruits in organic production • Berry fruits in organic production • Vine variety in organic production	

ASSIGNMENT 4. PLANT PROTECTION

The effect of plant protection on plant growth in organic crop farming. Plant responses to organic plant protection.

Objectives

1. To monitor changes in fruit trees caused by pest and disease attacks.
2. To determine the impact of plant protection measures on plant growth in organic fruit orchard.

Expected results:

A report based on observations on how fruit trees (vine-shrubs) respond on pests and disease attacks – the fruits and vegetation could be damaged, the organic production could be compromised.
Acquire knowledge how to use plant protection measures such as pruning, cultivation, use of colour and pheromone traps, bio-preparation to reduce damages on fruits.

What changes in parameters can be observed?

- overall tree habitus – stages of growth,
- biometry – length of vegetative biomass, etc.
- visible signs of damages – from diseases, from pests
- type of pests – e.g. flies, butterflies, beatles, aphids, larvae, etc.
- changes after application of biological control.

Step 1. Making a Plan of the assignment

Week 1: write a Plan, containing:

Introduction - reasons for fruit tree growing, reason for choosing certain species and varieties, situation on the market, expected yield and income, etc.).
Description of the fruit orchard: location, area, soil farm buildings (storage facilities), equipment, growing types, water supply, labour force etc.
Climate and soil features in relation to crop demands
Decision of fruit varieties, cultivation, pollinators, spacing, green (flower) buffers
Plan of necessary plant protection measures:
Branching, Soil cultivation and fertilisation, Mowing or weeding, Planting mulch or green manure plants, Tree protection from pests and diseases, Irrigation, Harvesting
Plan of field observations:
Time (weeks), Trees (leaves), Pests, Diseases, Damages (picture, sketch)
Plan of bio-protection:
Type of preparations (sprays), pheromone or colour traps, time of application, dose, etc.
Reporting:
Maintain an observation diary, collect process (weekly) information, prepare final report..

Week 2: PP presentation (optional): Plan content, followed by evaluation of the plan, according the criteria presented in the introduction. Is it possible to reach the target?

Step 2. Field (tree) observations - sampling, collecting and processing

Week 3 to Week 10: Making the planned monitoring at private farmer (or school orchard):

- Students go outside – they split in 3-4 groups
- Each group makes an agroecological (field) assessment:
    - what trees (and varieties) are grown – e.g apple, plums, or vine shrubs..?
    - human intervention – plant protection, soil cultivation, fertilisation, etc.
    - structure of soil and its org. matter content – low, medium or high
    - biotic interactions inside the tree orchard – e.g. between plant and animals
    - impact of existing plant protection measures
    - signs of actual damages cause by pests and diseases, etc.
- Students choose tree type, tree-rows and start observations according to methodology.
- Collect leaves (branches) with damages or insect caterpillars/ butterflies, etc.
- Some groups may investigate soil organisms by taking sample the soil onto a plastic sheet – count earthworms and other organisms, record them !

Example: Soil sampling, collecting and processing

Example: Tree (leaves, branches, insects) sampling, collecting and data processing

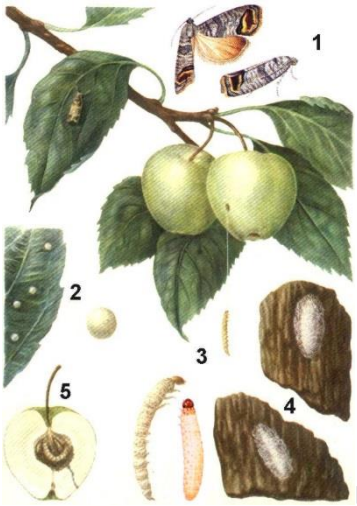
- Leaves' samples, jars with insects, etc. are analysed and data are written in tables (see below):

Table 14. Registration list of pest and disease damages and protection measures

Tree type and variety	Number of sample	Description of pest or disease /picture, photo, sketch, verbal/			Tree protection measure	Notes
		Week				
1		1	2	3 ……..		

Example: Ask the group to investigate, document and analyse the stages of certain pests or diseases.

Damages from Codling moth



Butterfly (1) Egg (2) Larvae (3) Pupae with larvae under tree bark (4)

Damages from Apple scab (*Venturia inaqualis*)

Step 3. **Registering and documenting results from observations, investigations, experiments**

Show the students how to maintain a register of fields and crops/ trees they monitor. This is useful for them having regard to obligatory status of such register for organic farmers when they expect a visit by inspectors from the organic certification organization.

РЕГИСТЪР НА ПОЛЕТО

_____

(име на оператора)

№	Дата	Идентификатор / № на имот /	Площ / ха /	Култура	Мероприятие	Използвани торове / препарати	Доза

Example: Ask student group to investigate what type of biological plant protection measures they could use to control pests and diseases, e.g. colour and pheromone traps, soil cultivation, spraying with bio-pesticides, etc.



<u>Step 4.</u> Documenting and Reporting. Preparation of Final Report. Presentation and promotion.

Maintain an observation diary, collect process (weekly) information, start compiling results for the final report.

Week 11 and 12: Prepare of Final report (content to be consulted within the group and the teacher), Present it in front of other students using PowerPoint (15 minutes + discussion).

Promote it at school: Make a poster and display at the student hall, or during school 'eco-competition'..?!

Table 15. Teaching Programme of the subject Organic livestock breeding (offered as an optional in the teaching programme of specialty 'Agricultural technician' – Year 4).

Course: **ORGANIC LIVESTOCK BREEDING**

No of classes annually: **64**

Grade: **Fourth**

Expected outcome:

1. Getting knowledge of importance and biological aspects of organic agriculture
2. Getting knowledge on characteristics of organic livestock production
3. Getting knowledge on organic breeds and species in organic livestock breeding
4. Getting knowledge on feed production according to organic principles
5. Getting knowledge on animal nutrition according to organic principles

TOPIC	GOALS	OUTCOME at the end of the course student will be able to:	OBLIGATORY AND RECOMMENDED CONTENT ACCORDING TOPICS	WAYS TO IMPLEMENT PROGRAM
Principles of organic agriculture	• Introducing students to development of sustainable food production systems • Introducing students to principles and importance of organic production	• understand and comprehend the difference • between traditional, conventional and sustainable agriculture • define and explain principles of good agricultural practice (GAP), integral production • define and list principles of organic production • understands and define (sustainable) marketing • comprehends activities within marketing	• Development of sustainable systems • Principles of good agricultural practice • Principles of integral agricultural production • Principles and importance of organic agriculture	At the beginning students should be introduced with the goals and outcome of the course that includes teaching, plan of program and principles of evaluation. Realization of the class: • theoretical class • practical exercise class **<u>Venue of realisation of the class</u>** • theoretical class would be realized in the classroom or appropriate cabinet, partly on experimental field with organic production within school fields - school economy. • practical exercises would be realised at school livestock economy, or in collaboration with certification body (e.g. joint inspection visits) or with private farm (visit during vegetation season). Cooperation in realization of the exercises should be achieved also with local Center for OP and Farmers field schools in the region.

Principles of organic livestock breeding	• Introducing students to specificities of organic agriculture	• specify deficiencies of intensive animal breeding • explain significance of animal breeding according to organic principles • adopt managing techniques in animal breeding	• Specificities of organic animal livestock breeding • Significance of organic agriculture • Animal treatment • Conditions of our country for organization of organic animal livestock breeding	**Recommendation for realisation of the class** • insist that students overmaster knowledge on principles of organic production • insist that students overmaster knowledge on biological principles of organic agriculture, • realized exercises in block classes. **Evaluation** Grading of achieved outcome is to be done through: • monitoring of achieved outcome • examination through tests • evaluation of practical assignments **Average number of classes against topics** **Theoretical class** • principles of organic agriculture (6 classes) • biological principles of organic livestock breeding (6 classes) • type and breed for organic production (10 classes) • feed production on organic principles (10 classes) • animal nutrition in organic production (8) **Practical class:** • *Assignments 1 on principles of organic agriculture*: developing GAP and a conversion plan for specific livestock farm/ enterprise. • *Assignments 2 on biological principles of organic livestock breeding*: develop monitoring plan on breeding a specific regional type and race of animal, compare breeding in conventional and organic farms – animal welfare, stocking rate, breeding technology, etc.
Types and breed in organic production	• Introducing students to breed adequate for organic livestock breeding • Introducing students to breeding technology • Introducing students to conditions of keeping and animal welfare	• specify breed which can be bred in organic production • apply breeding technology • explain conditions of keeping and animal welfare	• Busha, Podolac, domestic cattle • Moravka, Resavka, Mangulica - domestic pig for meat production • Pramenka and its varieties, Cigaja • Domestic goat breed • Domestic poultry breed • General principles of animal breeding • Formation of herd and flock • General principles of keeping animals and animal welfare	

Feed production according to organic principles	• Introducing students to green feed • Introducing students to preserved and feed of roots and tubers origin • Introducing students to granular plant feed and its by-products • Introducing students to concentrated feed from organic production • Introducing students to auxiliary substances in feed processing	• select green feed • list preserved and feed of roots and tubers origin • list the most important granular feed from our region as well as their by-products • prepare concentrated feed from organic production • list auxiliary substances in feed processing	• Green feed from natural or sown pastures • Green feed from arable land • Hay • Hayage • Silage • Feed of roots and tubers origin • Granular plant feed • Protein feed • Carbon hydrate feed • Concentrated feed	• *Assignments 3 on type and breed for organic production*: proposal on breeding techniques for a chosen livestock type (cattle, sheep, chicken, etc.), including e.g. the effect of housing conditions and race on e.g. lactation, liveweight gain, birth rate, etc. • *Assignment 4 on feed production on organic principles*: proposal on fodder production for (regionally) specific animal type and breed, incl. monitoring of growing, harvesting, processing, preparation and storage, or monitoring extensive pastures, re-growth of grass, biodiversity of species, dry matter, etc. • *Assignment 5 on animal nutrition in organic production:* proposal for feeding diet for (regionally) specific animal type and breed according to organic principles of nutrition. Each assignment consists of 20-24 classes per school year and can be executed by individuals or group of students.
Animal nutrition according to organic principles	• Getting knowledge on ruminant nutrition • Introduction to nutrition of monogastric animals • Getting knowledge on poultry nutrition	• define basic principles of ruminant nutrition according to breed and species • explain nutrition of monogastric animals according to breed and species • explain principles of correct poultry nutrition	• Cattle feed • Sheep feed • Goat feed • Pig feed • Poultry feed	

Example – Practical Exercise program - Assignment for Organic Animal Farming

/plan of 24 hours of practical training for student groups/

Year 4 Semester 1 or 2

Table 16. Assignment on planning of fodder production for farm animals

Year 4 Semester 1 or 2	**Planning of fodder production for animal nutrition needs** **/adapted from VHL College – The Netherlands/**
Introduction	Graduates are often in the role of a livestock farmer who needs to be familiar with technology of animal nutrition, depending on species, breeds, categories of farm animals, aims and levels of animal farm production. It is of great importance to make **a plan of fodder production** and the land needed for this purpose, and also to estimate the costs for planned fodder production. For this reason, every livestock farmer needs to know, according to nutritional value, various fodder species, their average yields and quality. Livestock farmers, who are in the role of fodder producer, knowing when, what and how to grow a certain fodder crop or fodder mixture, should aiso have knowledge about their quality. In order to achieve quality fodder production, it is necessary to know the right moment for harvesting a certain fodder crop in relation to its nutritional value**.** The most precise way to determine the nutritional value of fodder is by using data from chemical analysis of fodder, or by using tables with data about chemical composition and nutritional value of fodder. For every livestock production it is important to produce sufficient quantities of qualitative animal feed according to planned animal feeding on a daily basis. That is the reason for farmers to decide at the end of growing season, late in the autumn or in winter, what fodder crops they are going to produce in the next season, to decide about the organic crop varieties, to plan the land for this production and to decide about the way of using the fodder. Important issues about these decisions are: • Nutritional needs in relation to animal species and herd size of the farm • Available land for fodder production and its quality • Crop rotation • Farm capacities regarding number of employees, machinery, equipment etc. • Estimated costs of planned fodder production In this assignment you will implement basic knowledge about fodder production, fodder use and principles of animal nutrition in a real life situation.
Competence	Efficient organic livestock production
Practical targets	To obtain, applying and understanding knowledge on: • Animal nutrition • Environmental conditions for crop growing • Production of forage crops and grass • Mechanisation, buildings Making judgements •Analysis and the use of information •Mathematics and numeracy •Judgement, decision making and problem solving Communication •Oral communication skills •Writing skills •Team work / project management •ICT skills: aoolication of calculations in Excel
Assessment of knowledge and skills	Mark on the basis of contents of the report (40%) and presentation (20%) (resp. 40% and 20% of the final mark): • The proposed crops are suijable for the environmental conditions for crop growing • The proposed crops fit in a sound rotation • The labour chart and mechanisation plan are carried out well and in line with the • cropping plan. • The cropping plan shows insight in how to run a farm in profitable way Making judgements (20 % of the final mark) • Appropriate sources are used • There are clear and sound estimates and calculations presented that support the decisions made • The way decisions are made is explained clearly Communication (20% of the final mark) • The oral advice is convincinq • The report is written in a clear style of writing and appropriate layout

	• The work is carried out according a clear work plan • Each team member has contributed well in the work • There are calculations presented in Excel in a proper way
Role	Farm owner (dairy farm), livestock breeder
Group size and composition	Groups of 3-4 students are formed by the leading teacher
Assignment	To define the amounts of animal fodder needed throughout the year for chosen animal species. Make a fodder production plan and fodder usage plan. Determine self sufficiency of farm land for fodder production. Plan machinery and equipment for the fanm regarding feed production, feeding and other working operations in the field and in the stables, which are mechanized or automated. Plan capacities and structure of machinery and equipment and the ways of usage (own machinery, contractors services, machine rings ...) comparing feasibility of different solutions.
Expected Outcomes	Written report with the following content: Introduction (about the importance of continuous fodder supply, influence of fodder quality on efficiency of farm production ... Define criteria for a good plan for fodder production and usage). Detailed description of the farm: location, land, soil type, fanm buildings (stables, storage capacities etc.), machinery, equipment, number of animals on fanm, animal species and animal categories that are taken in account in the assignment etc. Make a plan of the farm or plots/ pastures. Description of present fodder production and sowing plan for the planned year. Take in account: agro ecological conditions on fanm land and possibilities of production of certain crops/mixtures, crop rotation (write down the crops raised on fanm plots during the last two years), available machines and storage capacities. Explanations, how and why you decided to choose certain crops and land used for these crops.
Methods	Choose a farm in the regional neighbourhood (or in the Secondary School) that is willing to co-operate for execution of this assignment. Collect information about animals (number, species, categories ...) and their nutritional needs. Collect infonmation about the location of the fields (maps), soil types, buildings (storage facilities) and equipment. Collect information about prices of different crops, prices of inputs, etc. Look for these data on the Internet, in agricultural magazines or make telephone calls to trading companies. Use Excel for data analysis (if familiar with this).
Coaching	Coaching sessions with the leading teacher(s) are possible by appointment.
Supportive Modules	Physiology and Animal Nutrition Forage Crops and Grass Production Cattle Breeding
Time planning	Step 1. **Prepare a Work-plan** to organise practical (24 h.) period and the implementation of the student project. The aim of this plan is to make clear to all students what has to be done. **Work-plan** /short and simple/ •Introduction (or background) of the project •Project assignment •Project activities •The products •Quality •Organisation of the group work •Planning of the group work, e.g. time schedule, division of tasks, reporting, etc Step 2 Contact the livestock breeders of the School stables or an arable (forage) farmer in the region and ask for co-operation in this project assignment. Step 3 Visit the farm and ask the farmer questions you prepared in advance. Ask you teacher to check your questions. Step 4 Make a Plan of production and usage of fodder crops for the upcoming year. Step 5 The report must be handed in on ..... .ldate) to .....
Resources	Agricultural inputs or other materials to be prepared in advance under teacher's / farmer or school agronomist guidance
References	References will be given within supportive modules

B.1 Introducing a new (elective) subject ‘Marketing and Management in OA’ within the existing OA curricula

(Content continues on the next page)

Table 17. New subject for existing programme of profile 'Agricultural technician'				
Course:		**ORGANIC MARKETING AND MANAGEMENT /NEW SUBJECT/**		
No of classes annually:		**64**		
Grade:		**Fourth**		
Expected outcome:		1. Getting knowledge on importance and biological aspects of organic agriculture; 2. Getting knowledge on preparation of agro-ecological (conversion) plan for organic production; 3. Getting knowledge on major requirements to organic certification; 4. Getting knowledge on management of organic production or processing enterprises, 5. Getting knowledge on marketing of organic production.		
TOPIC	GOALS	**OUTCOME** at the end of the course student will be able to:	**OBLIGATORY AND RECOMMENDED CONTENT ACCORDING TO TOPICS**	**WAYS TO IMPLEMENT PROGRAM**
Principles of organic agriculture and agroecological planning	• Introducing students to development of sustainable food production systems • Introducing students to principles and importance of organic production	• understand and comprehend the difference between traditional, conventional and sustainable agriculture • define and explain principles of good agricultural practice (GAP), integral agricultural production • define and list principles of organic production	• Development of sustainable systems • Principles of good agricultural practice • Principles of integrated development of organic agricultural production • Principles and importance of planning the conversion to organic agriculture	At the beginning students should be introduced with the goals and outcome of the course that includes teaching, plan of program and principles of evaluation. Realization of the class: • theoretical class **<u>Venue of realization of the class</u>** • theoretical class would be realized in the classroom or appropriate cabinet, partly on experimental field with organic production within school fields - school economy. • practical exercises would be realised at School experimental fields, in collaboration with a certification body (e.g. joint inspection visits) or with private farm (visit during vegetation season), by visiting marketing firms or processing factory, etc. **<u>Recommendation for realisation of the class</u>** • insist that students overmaster knowledge on principles of organic production
	Introduce students to: • Importance of planning organic production during conversion process • Getting knowledge on major requirements to agroecological planning depending on organic standards and regional crop/ animal specialization and marketing.	• understand and explain importance of planning agricultural production each vegetation season • understand the difference between conventional and organic farming • list major points for designing agroecological (conversion) plan for farm or processing factory • understand and explain operations, tools, preparations for organic crop production that should be provided in the conversion plan • list the most important measures in the agroecological plan, e.g. crop rotation, tillage, plant nutrition, plant protection, harvesting, storage, animal breeding, marketing, etc.		

Basic principles of organic certification	Introduce students to: • Importance of standards (norms) for producing authentic organic production • Importance of control (inspection) procedures to assure implementation of standards and provide traceability options to consumers. • Importance of certification to provide guarantee to consumers and strengthen market opportunities for producers.	• Understand and explain importance of standards to apply appropriate organic practices in private farms • List Serbian and EU Standards (legislative) framework for organic production, processing and labeling • Understand and explain basic control (inspection) procedures • List basic certification procedures (incl. application, administration, penalties). • Explain maintenance of organic certification for farming or processing – requirements, documentation, administration, use of certificates. • Explain importance of certification procedures for organic marketing.	• Organic standards / guidelines of Serbia, IFOAM or the EU • Control (inspection) procedures for production • Control (inspection) procedures for production • Permitted inputs for soil fertility • Permitted inputs for plant protection from pests, diseases and weeds • Permitted inputs for processing • Basic requirements to animal breeding, i.e. housing, feeding, veterinary treatments, documentation, etc. • Basic requirements to marketing, incl. labelling, displaying, etc.	• insist that students overmaster knowledge on conversion to organic, management organic ventures and marketing of organic produce. **Evaluation** Grading of achieved outcome is to be done through: • monitoring of achieved outcome • examination through tests • evaluation of practical assignments **Average number of classes against topics** **Theoretical class** • principles of organic agriculture and conversion plan (10 classes) • basic principles of organic certification (8 classes) • basic principles of management of organic enterprises (10 classes) • characteristics of organic marketing (12 classes) **Practical class:** • *Assignments 1 on principles of organic agriculture and conversion plan*: developing GAP and organic conversion plan for specific farm/ enterprise. • *Assignments 2 on basic principles of organic certification*: Plan for certification of individual crop or entire farm/ enterprise (fruits, vegetables, field crops, livestock). • *Assignments 3 on basic principles of management of organic enterprises*: Farm situation analysis; Production
Basic principle of management of organic enterprises	• Getting basic knowledge and skills on organisation of organic produce • Getting basic knowledge on management of farms or processing units	• Understand how to assess farm resources and possibilities for growing crops and/or animals. • Understand and demonstrate how to make 'technological map' of farm plants or fields • Explain how to calculate expected income and expenditures from organic production. • Explain requirements to a simple organic farm budget, incl. fixed and variable costs. • Describe factors affecting cost price and profitability in organic farms.	• Agroecological assessment of farm resources • Requirements to 'technological mapping' • Requirements to income and expenditure statements. • Fixed and variable costs in organic farms. • Profitability and cost prices of organic produce	

Characteristics of marketing of organic produce	• Getting basic knowledge and skills on planning marketing of organic produce • Getting knowledge on economic value of organic marketing • Getting knowledge on marketing tools and methods for adding value.	• Understand and demonstrate formulation of marketing aims and objectives. • Understand and explain the elements of organic marketing. • Understand and explain how to make a simple marketing strategy and marketing plan. • List the anticipated marketing places, promotion and quality measures for organic produce.	• Basic definitions of marketing of agricultural produce • Basic principles of organic marketing compared to conventional one. • Marketing mix and its significance for organic marketing - product, place, price, promotion, personal sales • Basic elements of organic marketing strategy and marketing plan.	Plan incl. costs price, Design and test a Farm development plan for an organic unit/ farm / enterprise including technological maps for crop or mixed farm. • *Assignment 4 on characteristics of organic marketing*: Market potential analysis; Design and test a marketing plan for an organic crop/ farm or an enterprise including promotion and sales at regional agricultural markets/ fairs. Each assignment consists of 20-24 classes per school year and can be executed by individuals or group of students.

Example – Practical Exercise programme – Assignment for practical lessons on organic management

/plan of 24 hours of practical training for student groups/

Year 4 Semester 1 or 2

Table 18. Assignment on basic principles of management of organic enterprises

Year 4 Semester 1 or 2	**Planning of organic farm management /adapted from VHL College – The Netherlands/**
Introduction	Sustainable management of an organic farm includes the operative and financial management but also the management of the naturai environment (land and soil, water and air). Through this assignment, the sustainability of management practices of an organic farm would be evaluated. Tools for making such an evaluation, including the use desk studies, Internet, group discussions and presentations, will be applied.
Competence	• Understand how to assess farm resources and possibilities for producing crops and/or animals. • Understand and demonstrate how to make 'technological map' of farm plants or fields. • Explain how to calculate expected income and expenditures from organic production. • Explain requirements to a simple organic farm budget, incl. fixed and variable costs. • Describe factors affecting cost price and profitability in organic farms.
Practical targets	To understand, learn and apply necessary knowledge of: 1. environment protection measures 2. environmentaily friendly and economically sustainable farm practices 4. managerial and agronomic skills Development of analytical skills: 1. agroecological analysis - sampling spots surveying 2. sampling techniques to assess sustainability of practices 3. data processing and results interpretation Communication skills and team work building 1. preparation of the written report 2. oral report presentation techniques 3. team work (proper distribution of tasks within the proiect)
Assessment of knowledge and skills	Marking • Content of the report and presentation (60% of the final grade) • Making judgements (20% of the final grade) • Communication (10% of the final grade) • Cooperation (10% of the final grade) Assessment criteria • Content of the report and presentation • Sustainability and organic "hotspots" and problems are properly determined • Realistic and simple remediation measures are proposed according to organic standards Making judgements • appropriate sampling sites, literature quotes and sampling methods are proposed • adequate analyses are proposed / used • decisions are explained properly, through the use of proper calculations, analyses, literature examples, etc Communication • the report is fulfilling given rules of the writing • the language is grammatically correct • the use of the proper terminology • the oral presentation is organized timely and clearly presented Co-operation • team members contributed fully within their specific tasks • group dynamic had been proper • the proiect is conducted according the planning
Role	Farmer, farm manager
Group size &composition	Groups of 3-4 students are formed by the leading teacher

Assignment	To identify, describe and analyse sustainability of organic practices in organic farm (or school fields) Design a plan for sustainable management of an organic unit/ farm / school fields including technological maps for crop or mixed farm.
Expected Outcomes	**Assignment 2:** **Week 1**: written plan, containing: 1. Introduction, based on literature sources and personal information on farming impact on environmental resources, existing measures for crop productivity, complying with organic standards, and expected yieid and income, etc.). 2. Inventory of the farm: location, landscape, farm buildings (storage facilities), equipment, soil types, water supply, climate and soil features in relation to crop demands, 3. Description of problems and solutions to labour force, fertilisation, weeding, plant protection, market, etc. and environment, e.g. crop varieties, cultivation, pollinators, spacing, green (flower) buffers, etc. 4. Plan of all needed measurements: • Land restoration (if needed) • Soil improvement, including fertilisation • Soil tillage and preparation for sowing or planting • Sowing and planting • Weeding and plant protection from pests and diseases • Irrigation • Harvesting • Marketing 5. A labour chart in which the iabour demand per crop and per field, and the labour demand in totai (as mandays) to be presented. Is in some periods of the year assistance from neighbours or contractors necessary? 7. A plan of the necessary equipment (machinery) and relation to the actual available equipment of the farm. 8. Simple financial balance of the farm (or organic school fields) including: field 'technological map', income and expenditure statement, incl. fixed and variable costs. **Week 2**: PP presentation (optional): Plan content, followed by evaluation of the plan, according the criteria presented in the introduction. Is it possible to reach the target? **Week 3 to Week 10**: Farm (school field observations) **Week 11 and 12:** Preparation of final report (content to be consulted within the group and the teacher), PowerPoint presentation.
Methods	Oral Presentation A description of a family owned farm in given region with the specific environmental condition, representative of specific agricultural region. Specific sub-assignments may be divided among group members.
Coaching	Coaching sessions with the leading teacher(s) are possible by appointment.
Supportive Modules	• Agricultural Ecology and Environmental Economics • Information Technologies in Agricuiture • Organic Management of Soil • Plant production • Organic crop farming • Organic fruit growing and viticulture
Time planning	*Step 1* Start of the project: 1. primary meeting with the participant 2. groups formation and assignment of the specific tasks within the group 3. work planning 4. time schedule for following steps *Step 2* Field work: 1. visit of the model farm with the group 2. farm environment and agronomic surveying, with the determination of the potential sampling locations ("hot-spots") for organic practices 3. farm production data collection (through the interview with the farm owner/manager *Step 3* 1. Data analysis: 1. 2. 3. *Step 4* Conclusive process: 1. results compilation and interpretation 2. evaluation for observed ecological impacts remediation 3. economical analysis for observed nonsuslainable farm practices 4. recommendations for further sustaniable farm management *Step 5* Report: 1. preparation of the written report 2. oral presentation.
Resources	Agricultural inputs or other materials to be prepared in advance under teacher's / farmer or school agronomist guidance.
References	References will be given within supportive modules

ELLECTIVE SUBJECT: *MARKETING AND MANAGEMENT in ORGANIC AGRICULTURE*

MODULE 1

1. Title / Number	**Organic principles and conversion planning**	
2. Module size	10 hours – structured learning hours.	
3. Module level	Level 3	
4. Module Aim and Description	The aims of the Module are to introduce the learner to the principles underlying organic production and to gain an understanding of the key concepts which govern the production of organic food. The Module is designed to help learners understand the specific organic principles in order to design an agroecological (conversion) plan towards organic production. The principles are introduced through coursework and assignments in a particular enterprise of relevance to the learner. The unit provides opportunities to demonstrate key skills in communication and problem solving.	
5. Prior Learning	Students educated through the programme should have passed the subjects Soil Science and Agrochemistry, Plant production or Agricultural production; or A basic knowledge of crop, livestock or horticulture production. Vocational experience in farming or horticulture production would be a great advantage.	
6. Core Competences and Learning Outcomes	**Core Competence**	**Learning Outcomes** ***Evidence must confirm the learners ability to --***
	a. Understand the governing principles of modern organic production	• identify the key principles of modern organic production in the agriculture and horticulture sectors. This will include – ○ ethical issues (plants, animals, people) ○ food quality and safety ○ respect for natural biological cycles ○ biodiversity ○ pollution prevention ○ shorten processing and food chain length ○ transparency and consumer information ○ wider social issues and quality of life ○ influence of organic principles on demand for organic produce. • describe in general terms how these are applied in an enterprise with which he/she is familiar.
	b. Know how organic produce is differentiated from other produce.	• describe in general terms the assurance process which differentiates organic produce as applied at farm and local processing levels • identify how organic produce is differentiated from other produce. • understand the specific market characteristics for an organic product related to farmer's enterprise.
	c. Understand the major requirements to agroecological (conversion) planning	• design conversion plan depending on organic standards and regional crop/ animal specialisation and marketing. • list the most important measures in the agroecological plan, e.g. crop rotation, tillage, plant nutrition, plant protection, harvesting, storage, animal breeding, marketing, etc. • identify ways in which the critical implications can be effectively managed

7. Content outline	• Key organic principles as identified by IFOAM, EU or national standards and in guiding documents. • Illustration through case studies of relevant enterprises • Principles of good agricultural practice (GAP) • Principles and requirements of planning the conversion to organic agriculture • Typical conversion operations and timescales. • Financial implications of conversion and standard application to the farm business.
8. Guidance	**Delivery**. Delivery will be achieved through the structured learning programme supplemented with assignments, case studies and or visits appropriate to the local organic production enterprises. **Resources required**. Access to library and / or internet facilities. Cases studies and / or access to organic production units. **Assessment methods** Project (course) work on agriculture/ horticulture situation (can be presented to the teacher through on-line and/or report). All the Learning Outcomes identified above must be covered in the programme but sampling of assessment can be used. Where assessment is based on a sample of the skills / knowledge identified in the Learning Outcome then sampling must be such as to reflect the key elements of each learning outcome and must be controlled to ensure candidates cannot foresee the sample chosen.
9. Bibliography	International Federation of Agriculture Organic Movements (IFOAM) www.ifoam.org/ See References at the end of this document.
10. Glossary	

MODULE 2

1. Title / Number	**Basic principles of organic certification**	
2. Module size	8 hours – structured learning hours.	
3. Module level	Level 3	
4. Module Aim and Description	The aims of the Module are to develop the knowledge and skills which the learner will require to comply with the principles and practices of organic production as required by certification schemes. The Module is designed to help learners • understand the specific requirements of the organic certification schemes which operate within the country and the overarching EC Regulations 834/2007 and 889/2008. • apply these requirements in planning the operation of a farm unit according to these requirements; • developing a plan for conversion of a unit or enterprise to satisfy the requirements of a certifications scheme The principles are developed through a case study in a particular enterprise of relevance to the learner. The unit provides opportunities to demonstrate key skills in communication and problem solving.	
5. Prior Learning	Students educated through the programme should have passed the subjects Soil Science and Agrochemistry, Plant production or Agricultural production, or should have a basic knowledge of crop, livestock or horticulture production. Vocational experience in farming or horticulture production would be an advantage. Entrants to the programme must have completed Module 1 Organic Principles	
	Core Competence	**Learning Outcomes** ***Evidence must confirm the learner's ability to --***

6. Core Competences and Learning Outcomes	**1. Understand organic certification schemes as operated within EU**	• explain how organic certification operates within EU.
	2. Know the specific organic standards applied by a Sector Body	• describe the main organic standards operated by an approved organic sector body.
	3. Apply the standards to an organic production system	• outline the implementation of the standards within one business with which he/she is familiar.

7. Content outline	• Serbian Organic Law, EC Regulations 834/2007 and 889/2008. • National standards relating to the regional situation. • Study and implication of standards to individual enterprises and the whole farm business.
8 Guidance	**Delivery.** **Resources required**. **Assessment methods**
9. Bibliography	
10. Glossary	

Module 3

1. Title / Number	**Characteristics of Marketing Organic Produce**
2. Module size	12 hours – structured learning hours
3. Module level	Level 3
4. Module Aim and Description	The aims of the Module are to develop the knowledge and skills which the learner will require to market his / her organic produce. The Module is designed to help learners • understand the concepts and practice of modern marketing methods; • carry out basic market analysis relevant to their own situation; • developing a marketing plan to utilise suitable marketing approaches for their organic produce. The principles are developed through a case study relating to farm produce of relevance to the learner. The unit provides opportunities to demonstrate key skills in research, communication and problem solving.
5. Prior Learning	Students educated through the programme should have passed the subjects Soil Science and Agrochemistry, Plant production or Agricultural production, or should have a basic knowledge of crop, livestock or horticulture production. Vocational experience in farming or horticulture production would be an advantage. Entrants to the programme must have completed Module 1 Organic Principles and Conversion planning and Module 2 Organic Certification.

6. Core Competences and Learning Outcomes	**Core Competence**	**Learning Outcomes** ***Evidence must confirm the learner's ability to --***
	1. Understand the Concept of Marketing	• apply marketing concept to organic produce in a situation with which they are familiar • apply the concept of 4 Ps to an organic farming product in a familiar marketplace.
	2. Understanding your market	• carry out simple market study relating to one product or opportunity.
	3. Preparing a marketing plan	• develop a simple marketing plan for an organic product

	4. Delivering market performance	• Outline how they would go about implementing a marketing plan including setting the price, promoting the product, achieving sales and evaluating performance
7. Content outline	• Application of the marketing concept to organic products. • The marketing mix (4 Ps) • Principles and application of basic market study • Inventorising farm resources and production process. • Deciding the price. Appropriate promotion.	
8 Guidance	**Delivery.** **Resources required**. **Assessment methods**	
9. Bibliography		
10. Glossary		

MODULE "CERTIFICATION OF ORGANIC PRODUCTION (Example of practical lessons)

Background

Organic farming is still developing in Serbia. Producers in rural areas started to produce organic produce in small amounts mainly from garden plots or small farms. Organic certification system, including standards, control and certification guarantees organic producers that there is an objective system at place that will protect their organic produce from incorrect and fraud competition. Consumers have also guarantees that "organic" produce on the market places is produced by strictly following organic principles and practices. When small and medium producers sell out their organic food on the market they should provide a certificate from independent control organization that declares that the produce has been produced in accordance with nationally-adopted organic norms (standards). Lack of knowledge and on organic standards and certification may lead to unauthorized use of forbidden (chemical, GMO, etc.) inputs thus misleading consumers in 'organic' quality. Lack of knowledge on organic standards and procedures may lead producers to loss of income that they should receive for their environmental service to consumers and environment. Also, in such cases, the produced food is not healthy and cannot be labeled and sold as organic.

Objective

Give information and knowledge to local advisors and ecological producers on:

- Importance of standards (norms) for producing authentic organic production
- Importance of control (inspection) procedures to assure implementation of standards and provide traceability options to consumers.
- Importance of certification to provide guarantees to consumers and strengthen market opportunities for producers.

Expected results

Local advisors know and can explain farmers during the training:

- Importance of standards to apply right organic practices in farms
- Basic control (inspection) procedures (internal control) are understood
- Certification procedures (incl. application, administration, penalties) are understood.

Sections topics:

Section 1: Standard (legislative) framework for organic production, processing and labeling

Section 2: Control and certification of organic farm production and processing – requirements, documentation, administration, use of certificates.

Section 1: Standard (legislative) framework for organic production, processing and labeling

Place of the section. This section is providing information about legislative framework of organic agriculture. Following legislative adopted national norms (standards) will provide basis for organic farmers to produce organic foodstuffs that are healthy for their families and for consumers. Following standards will make them eligible for control by an authorised inter (national) inspection body and to receive a certificate of organic producer, processor or trader.

Background

Farmers can produce agricultural products by applying methods, practices and techniques that are safe for environment, human and animal health. However, in organic farming they have to follow a set of written rules and practices called norms or Standards. In such a way, all farmer organic production gets uniform; farmers do not suffer incorrect competition and are eligible for certification.

Explanation of organic standards by advisors to farmers is vital, because it will assure that all of them will follow the universal rules and practices. Providing written standards will provide blueprint for all farmers how to do crop and animal husbandry using organic farming methods. Most aspects of organic plant growing are mentioned, basic and specific principles, guidelines how to produce, important exemptions and annexes with inputs allowed in organic farming. It will allow farmers to assess their own capabilities to go organic way and apply for certification. And they will be equiped with a reference book where they can check daily the correctness of farming operations.

Aim of the section

Students:

- Know concept of organic farming and basic principles
- Can describe the meaning of organic standards and its basic content
- Can analyse aspects of their own organic farming in farm-specific conditions

Required time

90 minutes

Procedures

1. Explain aim of the section
2. Teacher sets out the topic using prepared material
3. Taking into account number of students, the teacher divides them into small groups and gives task to describe the meaning of organic standards for crop (and/or animal) production. Small groups choose crop rotation and type of cropping of the task, but teacher can make minor corrections.
4. Each group makes presentation.
5. Teacher, together with students, makes analysis of elaboration of group tasks paying attention to standards per type of production.
6. Questions, answers, discussions, summarising and completion of the section.

Plan of teaching /example/

No	Content	Time	Method	Materials
1	Explanation of aim of the section	5 min	Oral	Flipchart
2	Setting the topic out	20 min.	Mini-lecture	Board, flipchart, marker (or multimedia PowerPoint)
3	Meaning of organic standards for crop (and/or animal) production (based on organic principles)	40 min	Work in small groups	Forms of organic standards, paper, markers
4	Summarising and analysing work in small groups, discussion	15 min	Presentation	Board, flipcharts
5	Summarizing, completion of the section	10 min	Questioning, observation	Flipcharts, markers

Necessary materials

Forms for filling in appropriate organic principles, methods and practices for the chosen crops in rotation in particular farm situation, in A-4 and flipcharts (for example, questionnaire of self-assessment of trainees (farmers) or other type of tests), paper, markers, calculator, and handouts.

Resources

Module “Certification of Organic Production”, Dr. Vladislav Popov, vpopov_bg@abv.bg

Handout /example/

Standard (legislative) framework for organic production, processing and labeling

What is organic farming?

According to FAO and the WHO "Codex Alimentarius", Organic Agriculture (OA) is "a complete system for production management, which supports sustainability in agroecosystems, including biodiversity, biological cycles, and biological activity in soils. The focus is put on mobilizing internal farm resources, while minimizing external inputs. Biological System considers the fact that regional conditions require agroecosystems adapted to specific region. This is done by using agronomic, biological and technical methods as opposite to synthetic inputs, and for implementation of specific activity. Overall, the OA is a specific method of agriculture that maintains ecological balance, and produce products that follow required principles of ecological cycle plant-animals-soil. OA contributes for sustainable development of rural areas, to environment protection and guarantees good conditions for animal welfare.

How did organic farming start?

External link: www.ifoam.org http://ec.europa.eu/agriculture/organic/index_en.htm

After the "green revolution", many farmers mainly in Western Europe realised that the use of synthetic pesticides and fertilizers and intensive methods of production have harmful effect on nature and do not contribute to agricultural sustainability. They turned back to traditional extensive methods of farming and biodynamic practices, which were promoted in early 1920-s by people like Rudolph Steiner and others. In order to protect the rights of "organic" farmers, their associations formed an International Federation of Organic Agricultural Movements (IFOAM) during its first Congress in Paris in 1972. Since then, IFOAM is the major caterpillar of changes and improvements in organic agriculture worldwide, leading to improvement of quality of life of rural population.

Universal principles of organic agriculture

External link: www.ifoam.org

Organic farmers should consider universal principles of organic agriculture. These principles encompass the fundamental goals for producing high quality food, fibre and other goods in an environmentally sustainable way.

Principle of Health

Organic Agriculture should sustain and enhance the health of soil, plant, animal and human as one and indivisible.

The role of organic agriculture whether in farming, processing, distribution or consumption is to sustain and enhance the process of health at all stages and levels.

External link: From Farm to Fork – Safe food for Europe's consumers. http://www.europa.eu.int/comm/publications

Principle of Ecology

Organic Agriculture should be based on living ecological systems and cycles, work with them and help sustain them.

Production, through farming or wild harvesting, should not be exploitative. It should be managed in accordance with the cycles that are observed in nature and all living systems. These cycles are universal but their operation must be adaptive and appropriate to local conditions, ecology, culture and scale.

Organic agriculture should also ensure that it does not adversely affect living systems, such as landscape, habitat, biodiversity, water or the general environment, which exist outside of its production areas.

Principle of Fairness

Organic Agriculture should be built upon relationships that ensure fairness with regard to the common environment and life opportunities.

The management of natural resources should demonstrate how production and consumption can be socially and ecologically equitable and just by developing relationships built on fairness. Human relationships whether within or touched by organic agriculture should ensure fairness at all levels and to all parties – producers, farm workers, processors, distributors, traders or consumers – and should be seen to do so. This principle insists that animals are provided with living conditions in accordance with their physiology, behavioral characteristics and well-being.

Principle of care

Organic Agriculture should be managed in a precautionary and responsible manner to protect the health and well-being of current and future generations and the environment.

Organic agriculture is a living and dynamic system. Existing practices and technologies need to be reviewed and if necessary changed, new ones assessed and introduced. Efficiencies can be found and improvements made but this should not be at the risk of jeopardizing the health and well-being of current and future generations and the environment.

MAIN PRINCIPLES OF ORGANIC AGRICULTURE PRODUCTION

External link: Law on organic productions of Rebublic of Serbia

- ✓Maintaining stable soil fertility by recycling nutrients (composted organic manure, plant residues, etc.) and by using legumes and green manure between trees or within forage and vegetable crop rotations.
- ✓Prohibiting synthetic fertilizers and herbicides to stop water, soil and air pollution. Using mechanical control (soil cultivation), crop rotations including cereals (rye, wheat, etc.) and mixed cropping to suppress weeds.
- ✓Choosing prevention methods such as resistant tree or crop varieties to diseases and adapted to the local agro-climatic conditions thus avoiding sprays.
- ✓Diversifying farm by including variety of crops and animals, which gives flexibility on the market and adaptability to local conditions.
- ✓Creating ecologically balanced gardens by using birds, predators and parasites (such as ladybirds, lacewings and *Trihograma*/parasitic wasps, etc.) for plant protection or biological sprays made from natural plant extracts (*Pyrethrum*, tobacco, soybean oil, etc.), or pheromone traps against flies, aphids and other insect pests.
- ✓Crops and animals free of Genetically Modified Organisms (GMO).
- ✓Livestock husbandry adjusted to animal's needs, providing open space for grazing and walking and prohibited use of hormones, growth promoters and antibiotics (the latter allowed for use only in life-saving cases).

Why the organic standards and legislation are necessary?

The need for implementing organic legislation, placing uniform norms for organic production and system of control and certification is determined by following factors:

- Increasing share of organic production worldwide
- Increasing demand for organic production by consumers
- Guaranteeing fair competition between organic farmers
- Safeguarding and maintaining of consumer confidence to products labelled as 'organic' or 'ecological'.

Stages of development of organic legislation and standards in Serbia.

- first law on organic production adopted in 2000,
- 2006-2010 was in force law on organic production and organic products as the guidelines for organic production,
- from 1/1/2011 was adopted the new law on organic production prepared in accordance with the EU Reg. (not totally in compliance),
- 6 authorised and accredited control bodies for 2014.

Which agricultural products can be certified as "organic" (or ecological) ?

1. Fresh or non-processed agricultural products;
2. Processed agricultural products, aimed to provide food;
3. Forage;
4. Seeds and seedling materials;
5. Pellets used for forage or used for food;
6. Aquaculture;
7. Wine (but labeled as 'wine produced from organic grapes')

In particular, organic production:

- Restricts the use of pesticides that could harm environment or to accumulate pesticide residues in agricultural produce
- Uses preventive methods in control of pests, diseases and weeds
- Uses organic and inorganic (from nature origin) fertilisers
- Restricts the use of GMO and products derived from GMO

- Restricts the use of radiation
- Excludes the use of hydroponic plants and products
- Does not permit livestock breeding without farm-available land.

Specific principles applicable to organic crop husbandry

- Maintaining and increasing soil microbial activity and natural soil fertility, soil biological diversity, measures against soil erosion, feeding of plants based on soil ecosystem.
- Fertility and biological activity of soil are maintained and increased by:
  - Perennial crop rotations,
  - Luminous crops,
  - Green manuring,
  - Use of animal manure or organic fertilisers, composted if possible, that were produced as a result of organic production;
  - Biodynamic preparations
- Minimal use of external and non-renewable resources

Scheme 1. Principles of recycling organic matter and nutrients in ecological farms and maximum use of internal farm resources.

Rules of organic crop production

Crops and crop products:

- Conversion (transition) period

2 years for perennial crops such as fruit trees, grapes or alfalfa, 1 year for annual crops such as cereals, vegetables, legumes, etc.; Minimum transition period is 1 year, given that sufficient bulk of evidence is presented to certification body.

- Maintaining soil fertility – (see permitted inputs in Annex 1, EC Regulation 889/2008)
- Control of pests, diseases and weeds (see permitted inputs in Annex 2, EC Regulation 889/2008)

- Collecting products from wild nature - (see also requirements of Serbian standards and EC Regulation 889/2008)

Derogations related to lack of organic seeds and other plant growing material

- Seeds and seedlings

Organic seeds should be used where available at the local market.
Control bodies may permit the use of conventional seeds and seedlings for fruit growing only when organic seeds are not available to obtain on the local market. In such cases, a written declaration (certificate, or hand-written declaration on receipts) should be obtained by organic farmers that 'seeds or seedlings are produced without use of chemical pesticides or are GMO'.

How to label and recognise organic produce

Compulsory labelling and information on organic labels:
Code number of certification body: for instance
SRB-ECO-XX,
Logo of Serbian organic products
Information on the place of growing agricultural organic produce, for instance:
"Product from region of Vojvodina, Serbia",

EU logo for OP

Serbian logo for OP

ANNEXES
Annex I Fertilisers and soil additives
Annex II Pesticides — products for plant protection
Annex III minimum open and closed space and other features of stables used for breeding animals
Annex IV Maximum number animals per hectare
Annex V Forage raw materials
Annex VI Forage additives and substances used to feed animals
Annex VII Products for cleaning and disinfection
Annex VII Model of declaration of the trader of seeds and seedling material

QUESTIONNAIRE FOR SELF-ASSESSMENT OF TRAINEES – ORGANIC FARMING /it is an example, please add more questions relevant to standards described above/

Question 1. What is organic agriculture? (please circle the right answer)
A) system of farming that exclude application of pesticides and mineral fertilisers;
B) system of farming that maintains ecological balance, and produce products that follow required principles of ecological cycle plant-animals-soil as well as protect environment;
C) system of farming that contributes for sustainable development of rural regions, for fair distribution of incomes and for guarantee the animal welfare;
D) all aforementioned answers are true.

Question 2. How organic farming started? (please circle the right answer)
A) in the early 1920s, but completely developed after 1960s;
B) in the early 1920s and then after so called "green revolution", when farmers realize that conventional farming methods of using synthetic pesticides and fertilizers have harmful effect on environment;
C) in the early 1990s, after the changes in Central and Eastern Europe and the EU response;
D) The EU forced farmers to accept organic farmers in early 1980s.

Question 3. What are universal principles of organic farming? (please circle the right answer)
A) to protect plants and soils using chemical pesticides and fertilisers;
B) principles of health, ecology, fair and care;
C) to maintain traditional farming practices using less inputs and receiving less outputs;
D) all aforementioned answers are untrue.

Question 4. What does principle of health means? (please circle the right answer)
A) use of all permitted inputs and tools aimed for protection of health of plants and animals;
B) use of all means and tools for production without limitation as soil and water can be cleaned;
C) organic farming should maintain and increase soil fertility, plant health and health of animals and people as a whole.
D) all aforementioned answers are untrue.

Question 5. What does principle of ecology means? (please circle the right answer)
A) organic production through farming or collecting wild nature products should not be exploitive to nature.
B) organic farming should be adapted to and should be managed in accordance with ecological cycles in nature and all living systems;
C) organic farming should have a positive effect on all living systems, landscape and habitats.
D) all aforementioned answers are true.

Question 6. What does principle of fair means? (please circle the right answer)
A) fair to natural resources – production and consumption could be equally important in social and ecological context;
B) fair to people – fair human relationships at all levels – producers, farm workers, processors, distributors, traders or consumers;
C) fair to animals – to provide suitable conditions to animals in accordance to their needs and their physiological and behavioural characteristics;;
D) all aforementioned answers are true.

Question 7. What does principle of care means? (please circle the right answer)
A) organic farming will increase quickly the incomes of present generation of farmers;
B) organic farmers use old traditional technologies that do not harm peoples' health;
C) organic farming should be managed with careful approach in order to protect health and welfare of present and future generations of farmers and consumers and the environment;
D) all aforementioned answers are true.

Question 8. Which are basic principles of organic agriculture? (please circle the right answer)
A) maintaining stable soil fertility by recycling farm nutrients (composted organic manure, plant residues, domestic waste, etc.) and by using legumes and green manure;
B) synthetic fertilizers and pesticides are prohibited in order to reduce and stop pollution of water, soil and air and substitute polluters with biological preparations, mechanical control (through soil cultivation), crop rotations, etc.;
C) Animal husbandry that is adapted to animal needs, having sufficient space for grazing and walking, prohibited use of hormones, growth promoters and antibiotics;
D) all aforementioned answers are true.

Question 9. Which are main principles of biological plant protection? (please circle the right answer)
A) establishment of ecological balance of pests and their predators, use of preventive measures, use of resistant species and varieties, adapted crops, natural plant extracts to produce bio-pesticides, etc. ;
B) partial use of chemical pesticides when it is needed during vegetation period against pest-insects or plant diseases;
C) growing of limited number of crops and varieties to reduce risk of pests and diseases infestations;
D) use of frequent mechanical cultivation of soil combined with application of herbicides for weed control.

Correct answers:

Answer 1. D)	Answer 6. D)
Answer 2. B)	Answer 7. C)
Answer 3. B)	Answer 8. D)
Answer 4. C)	Answer 9. A)
Answer 5. D)	

Section 2: Control and certification of organic farm production and processing – requirements, documentation, administration, use of certificates.

Place of the section. This section is providing information about legislative requirements and control procedures undertaken by national or international approved certification body in order to assure that farmers have produced in accordance with required organic standards. Following legislative control procedures, for instance related to group or individual certification, organic farmers have may obtain written approval (called certificate) from third (independent firm) that their organic methods of production are sound and safe.

Background

Farmers that are applying organic methods of farming should be controlled (inspected) by a third party independent firm in order to prove they followed organic standards. In such a way, they are eligible for certification.

Explanation of organic inspection and certification procedures by advisors to farmers is necessary, because it will assure that farmers understand their obligations related to control and they are willing to provide access to inspectors of the certifying firm to their farms to do the control. Farmers should understand the importance of inspection. They should be given clear indication that control and certification bodies are being authorised (acreditted) by international or national authority (e.g. Ministry of Agriculture) to do the inspection of their farms and accredited against EN 45011, that is SRPS ISO 17065 regulation by which all certification bodies should be accredited by 2015.

Most aspects of organic control should also be explained by inspector(s) to farmers. Below, short and basic explanation is only presented.

Aim of the section

Students:

- Understand the meaning and importance of control of organic farms
- Understand basic inspection procedures and can fill in the required by inspectors information
- Understand the meaning and power of certification.

Required time

90 minutes

Procedures

1. Explain aim of the section
2. Teachers sets out the topic using prepared material
3. Taking into account number of participants the trainer divides them into small groups and gives task to describe the meaning of inspection of organic crop (and/or animal) production units. Small groups choose type of farms and individual or group inspection to complete the task, but trainer can make minor corrections.
4. Each group makes presentation.
5. Teacher together with students makes analysis of implemented group tasks paying attention to inspection procedures and required inspection forms and documentation.
6. Questions, answers, discussions, summarising and completion of the section.

Plan of teaching /example/

No	Content	Time	Method	Materials
1	Explanation of aim of the section	5 min	Oral	Flipchart
2	Setting the topic out	20 min.	Mini-lecture	Board, flipchart, marker (or multimedia PowerPoint)
3	Meaning of inspection and certification of organic crop (and/or animal) production units; procedures, documents to be filled in.	40 min	Work in small groups	Forms of organic control forms (fertilisers, bio-preparations, etc.) paper, markers
4	Summarising and analysing work in small groups	15 min	Presentation	Board, flipcharts
5	Summarising, completion of the section	10 min	Questioning, observation	Flipcharts, markers

Necessary materials

1. Brochures from Certification/control company
2. Instructions for group or individual certification
3. Forms (examples) for filling in necessary application documents when apply for first time and prior to regular yearly inspection of respective farms, in A-4 and flipcharts (for example, examples of assignments), paper, markers, calculator, and handouts.

Resources

Module “Controlling organic farm production and processing”, Dr. Vladislav Popov, vpopov_bg@abv.bg
Serbian written control procedures, presentation, application forms, regular farm information documents, farm record books, etc.

Handout

/example of information to provided to students/

Control is exercised by the supervisory authorities (controlled entities) authorized by the Minister of Agriculture, pursuant to a contract manufacturer of agricultural product or foodstuff.

Control bodies operating in accordance with the National law of the Republic of Serbia and have:
- standard inspection procedure, which contains a detailed description of requirements and measures that apply to operators involved in the control system;
- a system of sanctions to be applied in establishing the inconsistencies

Control system - general requirements
Any operator (producer, processor or trader) who produces or manufactures biological products for sale shall:
- Inform the supervisory body to be registered and controlled by this body
- until 31.01 annually to provide the control authority with a production plan
- keep record and account books making it possible to trace the origin, type and amount of purchased raw materials and their use, the amount and direction of manufactured products;

Operators should provide access control authority to the inspected areas, places for processing and storage, accounting documents and provide all necessary information for the control activity

Explaining steps of control followed by certification
The system of inspection is based on at least one full year on-site inspection the operator.
The number of inspections is based on risk analysis.

If necessary, you may take samples for analysis for the presence of unauthorized substances.

During the inspection checked the various stages of production, documentation and procedures depending on the manufactured products to be certified:

Steps in control and certification
1. Application for certification
2. Initial on-site inspection (inspection)
3. Inclusion in the control system
4. Planned inspections
5. Decision on certification
6. Maintenance of Certification

Preparation of producers or processors for inspection
1. Understand the requirements of the legislation – Serbian Regulations
2. Connect to control body
3. Understand the requirements of the controller (the documentation), supervisory authorities shall provide manufacturers an initial package of documents required for inclusion in the control system. These documents can be in various forms (questionnaires, tables, etc..), but it must contain information on:
a) a full description of the available productive land and premises to be used for storage or processing of products;
b) a description of any specific measures to implement the farm premises, areas or activities to ensure compliance with organic production;
c) precautions must be taken to reduce the risk of contamination by unauthorized products or substances, and measures to clean storage areas and the entire production chain.

If the operator has introduced a system of quality control, these measures may be part of it.

4. Develop a plan for concrete measures
5. Preparation of documentation
6. Submission of Application

Checking the farm / crop plan presented by the candidate organic farmer

- Description of the farm
- Border of the plot - a risk of contamination and precautions
- Means for maintaining and improving soil fertility
- Methods of plant protection
- Measures for cleaning machinery and equipment that benefit and non-organic fields
- Measures for the separation of production in mixed farming
- Measures to maintain and enhance biodiversity
- Maintain records of the holding

Accepting the candidate organic farmer in the system of control

- Check the documentation of the inspection body
- Organize on-site inspection
- Assessment of compliance with the information
- Assessment of compliance with the requirements for organic production
- Regulatory
- Results of the inspection - an inspection report

If a **positive result is seen the farm is included in the farm control system.**

Next procedures
Regular monitoring and control
At least one spot check per year
Check production areas and facilities
Check Inspection of records (logs holding accompanying documents)
Take any samples for analysis (if in doubt)
Make an inspection report
Decision on certification
Maintenance of certification

Overall certification
Certification of organic production is completely voluntary process, but the operator needs to know that entrance into the control system assumes the following major commitments:

a) to conduct all operations in accordance with the organic production;
b) adopt, in case of infringement or irregularities, the imposition of sanctions by the supervisory authority;
c) if it finds that the products do not meet the requirements for organic production, notify in writing the buyers of the product to ensure that the indications for organic production are removed from non-compliant products.

Organic farmers must keep and update documentation records of the farm where it is shown:
Who are the suppliers of raw materials;
Are qualified as "organic" if necessary (eg seeds and seedlings);
Types and quantities of organic products delivered to the unit;
Types and quantities of organic products stored on the premises;
Conducted agricultural activities;
Type, quantities and consignees of products sold.
Operators should keep records and documents proving the information available there. Such documents as invoices for materials purchased or sold products, transceivers records, receipts, copies of certificates and samples of labels and other packaging.

Possible non-compliance with organic standards
MINOR
Inaccurate or incomplete filling of the production plan;
Improper maintenance of records of the farm;

Incomplete or inaccurate description of the farm

SIGNIFICANT
Availability of substances incompatible with organic production methods in all organic farm;
Denial of access of inspectors to the sites of production and / or storage;
Use of unauthorized vehicles;
Availability of the same variety / breed as organic and conventional.

Possible sanctions
Prescription
Warning letter
Revocation of a certificate for a particular area / lot
Suspension of certification
Exclusion of operator control system

Type of certificates

Declarations of control - to show which products (processes) are included in the farm system for control, but do not prove the conformity of the product
Certificates of conformity - show which products (processes) on the farm qualify. Based on these certificates operators issued their own declarations of conformity of the concrete batch
Certificates of Compliance of the lot - are issued for specific lots of products after analysis for the presence of residues of unauthorized substances

Module “MARKETING of ORGANIC PRODUCTION” (example)

Background

Organic farming has been taking serious steps ahead in Serbia. Rural groups of organic farmers help each other with seeds, small equipment and know-how on organic production. Small and medium-size producers from these rural groups produce organic foods and with the help of regional NGOs such as COAD ‘Selenca’ sell them on mainly local and regional markets. It is appreciated by retailers and wholesalers, because of its quality, durability and health guarantees. But prices of organic produce are still close to conventional and organic producers see little advantages of producing and selling such foods. From another hand, consumers need guarantees that “organic” produce in market places is produced by strictly following organic principles and practices. Organic farmers still need more extensive knowledge and skills on appearance, market places, advertisements, customer education, promotion of organic foods, etc. which prevents them to explore new market niches and obtain better prices. They should target ‘premium prices’ in order to generate additional income for their families as returns to their environmental service to consumers and environment. Also, customers should understand that produced organic food is healthy and be ready to pay for that. SAS students, as future graduates and organic farmers, should receive competences on marketing of organic produce.

Objective

Provide more information and knowledge to SAS students (future organic producers) on:

- Importance of planning the marketing of organic foods.
- Importance of promotion of organic foods to educate consumers, retailers and wholesalers and achieve bigger volumes and better prices on the market.

Expected results

SAS students understand and explain:

- Importance of marketing appraisal, analysis and planning to achieve better quality and sales practices in organic farms
- Basic actions and procedures for promoting organic foods
- Students are capable of developing individual or group marketing strategies.

Sections topics:

Section 1: Marketing plan
Section 2: Promotion strategy.

SECTION 1: MARKETING PLAN

Place of the section. This section is providing information about basic elements of marketing. It also shows ways of making internal analysis of current situation with individual or group marketing and aspects that should be taken into account when design sales. It explores various marketing channels and options that they offer to organic farmers. Following this analysis and questions students should be able to develop an individual or group marketing plan.

Background

Farmers can produce organic agricultural products and sell them at various places on the market (e.g. direct markets, specialised stores, supermarkets, etc.) But without clear understanding of organic market, its functioning, its possibilities and options it is impossible to receive good sustainable economic results. Organic farming and organic produce are known on the Serbian market and therefore individual strategies and plans should be prepared and implemented.

Aim of the section

Participants of the training:

- Know concept of organic marketing and its basic aspects
- Can analyse aspects of their own organic farming and related markets
- Can develop own market plans based on farm-specific and region-specific conditions.

Required time

120 minutes

Procedures

1. Explain aim of the section
2. Teacher sets out the topic using prepared material
3. Taking into account number of students, the teacher divides them into small groups and assign task to describe the meaning of organic marketing for crop (and/or animal) production. Small groups choose certain crop production types at farm or at regional scale, perform analysis and design simple marketing plan.
4. Each group makes presentation.
5. Trainers together with participants make analysis of fulfilled group tasks paying attention to marketing strategies per type of production.
6. Questions, answers, discussions, summarising and completion of the section.

Plan of teaching /example/

No	Content	Time	Method	Materials
1	Explanation of aim of the section	5 min	Oral	Flipchart
2	Setting the topic out	20 min.	Mini-lecture	Board, flipchart, marker (or multimedia PowerPoint)
3	Meaning of organic marketing for crop (and/or animal) production (based on organic and universal marketing principles)	40 min	Work in small groups	Forms of organic standards, paper, markers
4	Summarizing work in small groups	20 min	Presentation	Board, flipcharts
5	Analyzing group work, discussion	20 min	Questions, answers	Flipcharts, marker
6	Summarizing, completion of the section	15 min	Questioning, observation	Flipcharts, markers

Necessary materials

Forms for filling in appropriate organic principles, methods and practices for the chosen crops in rotation in particular farm situation, in A-4 and flipcharts (for example, questionnaire of self-assessment of trainees (farmers) or other type of tests), paper, markers, calculator, and handouts.

Resources

Module “Marketing of Organic Production”, Dr. Vladislav Popov, vpopov_bg@abv.bg

HANDOUT
/example of information to be provided to students/

ORGANIC FARM PLANNING AND MARKETING
Milestones:
1. Setting goals and objectives
2. Perform an inventory of resources on the farm
3. Identification of opportunities
4. Evaluation of gross earnings and choice of procedure
5. Preparation of total farm budget and action plan

Preparation of a simple 'technological map' per crop and fields:
Example: wheat (for 1 xa) – please add or adjust according to organic crops and farm crop rotation

Month	Necessary measures	Resources	Required amount for payment of costs
October	Soil analysis	Methodology, payment	
October	Adding compost or other organic materials for fertilisation	Compost + tractor + 1 (or more) mandays of work	
October	Ploughing	Tractor + 1 or more mandays	
October	Buying certified seed (or conventional with declaration)	Seeds	
October	Sowing	Tractor + 1 or more mandays	
March	Spreading compost or other organic fertilizer	Tractor + 2 or more mandays	
March - April	Cultivation and weeding	Tractor + harrow-comb (zubna brana) + 1 or more mandays	
August	Harvesting of yields, cleaning, sorting and storage.	Combine + 5 or more mandays	
TOTAL COSTS OF WHEAT PRODUCTION:			

Note: Every autumn, organic farmers should prepare cropping plan according to crop rotations, organic standards, existing market opportunities, mechanization and applicability of crop inputs (e.g. fertilizers, green manuring, botanical sprays, etc.). In this cropping plan, a technological map should be prepared for all planned crops for the next farming season.

What is Marketing?
Marketing means the understanding of what consumers want and what to produce for them in obtaining a profit for the farmer.

Agricultural marketing covers a number of tasks, including: collection, harvesting, grading, sorting, packaging, transportation, storage, processing, distribution and sale of the product. With an effective marketing strategy farmers can provide long-term gains.

Four important elements of marketing:
1. User/consumer override: Farmer must begin with the product and the user.
2. Selection process: the farmer must decide whom to sell the product, which determines the time and manner of sale of the product.
3. Promotion: The farmer must be sure that the product is one that people want to buy. The farmer must provide

the product and explain how good it is and why they should buy it.
4. Trust: A good marketing occurs when a user believes the farmer.

Farmers must answer six questions beginning with "P":

1. Users: Who are the users (or consumers) ? What they need or want? Who actually buys a product on the market?
2. Plan: What steps should be taken to sell the product?
3. Product: What product is marketed? He meets a consumer need? This should be decided by the consultant service extension.
4. Markets: Where to sell a product? At what distance from the farm?
5. Sale price: At what price the farmer will sell your product? Is it the right price for the farmer and for the consumer?
6. Promotion: How the farmer will inform consumers about his/her product?

Marketing Plan

Purpose of the marketing plan is to identify customers and competitors, to outline a strategy for attracting and retaining customers, identifying and anticipating changes.

The first and most important step involves understanding the market by its study, i.e. conducting market research.

Marketing plan for a product (or several related product or group of products) must answer the following questions:
• This product has a constant demand?
• How many competitors producing the same product?
• Can the demand for the product increase?
• Can the farmer compete effectively in price, quality and delivery?

Information related to product

The organic product and its benefits should be described from point of view perspectives for its realization. Organic farmers should know what consumers demand on the market:

- What are crops and animals that are grown including varieties and breeds? What are their nutritional requirements?
- When the yields should be harvested? What is expected yield per ha per crop, are there preliminary contracts with buyers, shops, retailers? What will be the total farm output?
- What are advantages of the selected organic crops compared to other species, e.g. regarding their yields, prices, quality, and seasonality?
- Is there different quality of organic produce? Can we sort different quality? How we measure quality?
- Is there a need for packaging? What type of packages are used – size, recycled, transportability, etc.?
- What is the balanced price for each crop/produce, e.g. cost-benefit analysis?
- What are total costs per crop per farm, e.g. production costs, harvesting, storage, transport, etc.?
- Are there new technologies and practices of growing these crops?
- What are major production problems?
- Are suppliers of organic inputs willing to give advices to farmers, e.g. how to prepare botanical solutions, how to spray, how to fertilise, etc. Are these advices beneficial?
- Does the farmer capable to pay all production costs?
- Do farmers have access to credits?
- What are available sources of crediting, e.g. banks, credit unions, cooperations?
- Can the farmer get easy access to machines and equipment regardless of buying or renting them?

What is the existing local marketing system?

- What is the agricultural production that is on sale now?
- Who is buying the organic produce and when, e.g. season, day of the week/month?
- Who is the most important buyer or retailer? How organic buyers may convince him in better quality of their produce?
- Who of the buyers have got a better reputation?
- What prices are paid by which buyer?
- Is there competition between buyers?
- Is there large difference in prices between farmers for one and same organic product in one region? Why these differences? How can organic farmers improve prices?
- Do traders provide credits to producers and at what price, at which conditions?
- How products are transported to markets and when?
- Describe the market that the produce is sold usually, e.g. size, number of people, level of prices, interest to organic products, etc.?
- Who is doing transport, e.g. farmers, or groups of farmers, or rented vehicles?
- What is the price of various transports to different markets? Is transport of fresh produce a problem? What kind of measures could be employed, e.g. refrigerating truck, lease of local (close to market) refrigerating cameras, or else?
- Can farmers cooperate for transporting larger volumes of fresh produce to direct markets, e.g. to lower costs, sell larger volumes and keep it fresh?
- What are the most suitable days for transport of organic produce to local markets?
- How many contacts farmers should make on the market per day? What are sources of information about prices, competitors, volumes, requested quality, etc.?
- What the retailers complain more often of?
- What farmers complain more often of?

Marketing requirements to organic produce?

Type and form of produce:

- What types of products are produced by the farmer?
- What is the existing marketing form (fresh, raw material, partly-processed, packaged, etc.)?

Competition

- Is the market of organic produce competitive? How many farmers sell similar produce and at what prices?
- Which are the main suppliers at particular markets?
- What are the volumes of particular product sold at the market, how regularly these volumes are sold (every day, once a week, once a month, or more often)?
- What are advantages and disadvantages of farmers' organic produce compare to conventional equivalent? Are there any negative practices that can be used to compete with conventional producers before the buyers?

External factors

What external factors may impact sales of organic produce (e.g. local/regional economic growth, municipality support, inflation, seed availability, increased prices of access to open-markets, processors monopoly on fruits, vegetables or grain processing (packaged foods), etc.?

What type of legislative standards and norms may impact the market?

Consumers/buyers

- What are characteristics of potential and real buyers, e.g. age, education, average income, environmental awareness, health conscious, etc.? If we do not know our consumers, we cannot sell more because we do not know their preferences?
- How they use the products that organic producers sell, e.g. fresh, processed, cooked, etc.?

Market share

- How big is the market for organic produce? Are we talking about small (direct-) market or medium and big shops and supermarkets? How much these markets can consume, e.g. how much the farmers can sell?
- What market share can a farmer (or farm group) take?

Storage

- How organic produce is stored? Where and who is taking care? Is it properly stored so less pollution or pest damages can be expected?
- What quantity of produce should be stored? Is it not too much for the space provided?
- What storage conditions are necessary (by organic standards, e.g. temperature, humidity, etc.), how the store-place is maintained?

Quality Standards, Packaging, Prices

- What quality standards are obeyed, international or only national?
- What prices can be obtained depending on quality, what is the impact of quality?
- What type of packaging is necessary? Were the package material, form, size, appearance consulted with organic certification firm or quality assurance specialist?

Marketing costs

- What the marketing costs are, e.g. for searching buyers, for establishing new connections, for printing promotion materials, for reklama or other announcement?

Factors impacting sales

- Summary of all factors that could possibly have an impact on volume of sales, e.g. weather, transport on-time, best retailer, time of the week, open-days, festival, etc.
- What is the potential to increase sales, e.g. personal education and training, improving appearance of organic foods, prices, on-line sales, subscription system, etc?

Marketing channels

There are several types of marketing channels for organic farmers. Most used are:

- Direct sales – consumers coming to buy from organic farms.
- Open market sales – stall at village or regional markets mainly for selling fresh or partly processed foods, e.g. pickles, dried, smoked, etc.
- Supply to processing factories – e.g. fruits to juice, jam or dried; vegetables for dried, powder, pickles; cereals for baked, bread, etc.
- Supply to retail shops, supermarkets specialised organic (or health food) stores;
- Supply to specialised institutions – e.g. hospitals, kindergartens, army, municipalities, etc.
- Supply to hotels, restaurants and other places of leisure/tourism
- Supply to wholesale buyers – e.g. long-term contracts to supply internal or export market whole-sellers.
- On-farm primary processing and sells through the channels listed above – e.g. pickled, dried marinated, pasted vegetables; fruits in compotes, jams, juices, etc.; cereals to pasta, bread, biscuits, etc.

A number of new marketing channels raise profile and became modern ways of selling organic produce, e.g.

- *Basket or subscription system* – i.e. subscribing families or firms/companies for weekly supply of a 'basket' containing fruits, vegetables, herbs, wine, cheese, or other organic foods.

- *Internet sales* – also using subscription system or on-demand whenever fresh fruits, vegetables or other organic produce is available.
- *Supply to high-profile institutions* – such as embassies, ministries, private persons/opinion leaders or leading companies in bigger cities – the advantage being to raise the profile of organic foods and raise the profile of suppliers.

SECTION 2: PROMOTION STRATEGY

Place of the section. This section is providing sample information means and tools to perform promotion of organic agriculture produce/food. Following analysis of consumers and perspective market (local, regional, national or export), advisers should provide farmers, processors or traders with alternative and modern means of promoting and advertising organic produce in order to attract more customers, to educate them and raise farmers income. This will provide incentive to organic farmers to produce organic foodstuffs that are healthy for their families and for consumers, and safe the environment.

Background

Farmers can produce organic products by applying organic practices and techniques that are safe for environment, human and animal health. However, organic produce when in early stages of development is not properly appreciated by consumers, retailers and other members of local communities.

Providing examples and tools for promotion of organic foods to advisors and farmers is vital to strenghten their capacities to increase volume of sales and get better prices and better income. Proper and timely promotion will open the eyes of retailers to increase buying volumes to pay higher prices and even ask for higher organic amounts. Consumers will be better informed about organic food advantages and it will improve the health of their families and their own. Most important aspects of promotion tools for organic foods are mentioned as well as basic and specific means and guidelines how to promote. It will allow farmers to assess their own capabilities to go promote organic foods and increase their selling (market) power.

Aim of the section

Participants of the training:

- Know how to analyse their customers
- Can describe the meaning of promoting organic foods and tools for it
- Can make their own promotion plan for organic farming foods given their own farm-specific and market-specific conditions.

Required time

130 minutes

Procedures

1. Explain aim of the section
2. Teacher sets out the topic using prepared material
3. Taking into account number of students, the teacher divides them into small groups and assigns task to describe the main actions to analyse consumers, the core of promotion of organic foods to customers and the main tools/means to execute promotion plan for organic production. Small groups choose type of crop production, target markets, tools and means of promotion, etc., but the teacher can make minor corrections.
4. Each group makes presentation.
5. Teacher, together with students, makes analysis of executed group tasks paying attention to best-suited and adapted to local situation promotion strategies, also considering the region-specific crop production and other market factors.
6. Questions, answers, discussions, summarising and completion of the section.

Plan of teaching /example/

No	Content	Time	Method	Materials
1	Explanation of aim of the section	5 min	Oral	Flipchart
2	Setting the topic out	30 min.	Mini-lecture	Board, flipchart, marker (or multimedia PowerPoint)
3	Description of the main actions in customers' analysis, meaning of promotion of organic foods to customers and adapted tools/means to execute promotion plan for organic production	30 min	Work in small groups	Forms of organic standards, paper, markers
4	Summarising work in small groups	30 min	Presentation	Board, flipcharts
5	Analysing group work, discussion	20 min	Questions, answers	Flipcharts, marker
6	Summarising, completion of the section	15 min	Questioning, observation	Flipcharts, markers

Necessary materials

Forms for filling in appropriate organic principles, methods and practices for the chosen crops in rotation in particular farm situation, in A-4 and flipcharts (for example, questionnaire of self-assessment of trainees (farmers) or other type of tests), paper, markers, calculator, and handouts.

Resources

Module "Marketing of Organic Production", Dr. Vladislav Popov, vpopov_bg@abv.bg

ANNEX 1

References and Information resources

1. Organic Farmer Manual, 2012. Issued by a project co-funded by EU through the Bulgaria – Serbia IPA Cross-border Programme.

2. The National Action Plan for the implementation of the Strategy for the Development of Vocational Education and Training in the Republic of Serbia 2009-2015.

3. Study on the organic production potential in South East Europe Albania, Bosnia and Herzegovina, Croatia, FYR Macedonia, Kosovo, Montenegro and Serbia. GIZ, 2012.

4. Concept for a European E-Learning platform for Further Education in Organic Food Retailing. The Partnership Project conducted within the framework of the European Union's Leonardo-da-Vinci programme, carried out between 01.08. 2008 and 31.07.2010.

5. Agricultural Advisory Services in the West-Balkan states and their necessities for human capacity development. Concluding report for the FAO facility project TCP/RER/3206.

6. Eco-qualify – A European Project for Vocational Training in the Organic Food Retail Trade Standards - Certification - E-learning.

7. Learning in Future Farming and Food Systems: European Education in Organic Agriculture and Agroecology. Proceedings of ENOAT Workshop Lyon, France: August 30 – September 1, 2012

8. THE EUROPEAN QUALIFICATIONS FRAMEWORK FOR LIFELONG LEARNING (EQF). 2008. http://ec.europa.eu/dgs/education_culture.

9. Kalo Organic Agriculture College. Denmark, www.kalo.dk

10. HANDBOOK TO ACQUIRE KEY COMPETENCES FOR THE PROFESSIONAL QUALIFICATION 'EcoJob-AP' ON EUROPEAN STANDARDS. Training on European standards for ecological agricultural production - EcoJob-AP. EU Leonardo da Vinci Programme.

11. Organic Agriculture E-learning (FINESSA), 2008-1-FI1-LEO05-00455

http://www.adam-europe.eu/adam/project/view.htm?prj=4607

12. Training needs analysis of organic agriculture operators in Balkans. Gh. V. Roman, M. Toader, A. Atanasov, N. Krizman.

13. Sustainable Agriculture Resources and Programs for K-12 Youth. 2011, Updated January 2013. Prepared by Joan Benjamin, with assistance from Brandon Thompson, for the Sustainable Agriculture Research and Education (SARE) Program.

14. About Training Needs in Organic Agriculture in Bulgaria, Romania and Slovenia: Some results of the survey conducted during the national workshop meetings organized in the project ORGANIC.BALKANET 2009-1-RO1-LEO05-03584 LLP-LdV-TOI-2009-RO-008 in Bulgaria, Romania and Slovenia.

15. Teaching Organic Farming and Gardening, 2005. Edited by Albie Miles and Martha Brown. Resources for Instructors UCSC Farm & Garden Apprenticeship Center for Agroecology & Sustainable Food Systems University of California Santa Cruz.

16. Organic Agriculture in Serbia - At a Glance, 2013. Serbia Organica and GIZ publication.

ANNEX 2

Summary of projects, products and innovative approaches to organic education in secondary schools, high schools and VET.

Project	Content	Documents and contacts
EQF	European Qualification Framework - Schools	http://ec.europa.eu/education/
COMPASS	An EU LEONARDO DA VINCI Community Vocational Training Action Programme, Second phase : 2000-2006 Title: Further development of post secondary education program in the topic of ecological farming, for EU and Candidate countries, harmonising their education program (COMPASS).	http://anubis.kee.hu/leonardo/comp_subjects.htm **Organization** Former: Szent István University, Faculty of Horticultural Science, Present: Budapest University of Economic Sciences and Public Administration Faculty of Horticultural Science, Dept. of Ecological and Sustainable Production Systems Head Office: Street Villányi, N: 29-43. 1118 Budapest, Hungary **Contact person:** Name Mr. László Radics professor dr. Position Head of Department Telephone ++36 1 /372 6235 Fax ++36 1 /372 6235 E-mail mezg@omega.kee.hu Website http://anubis.kee.hu
EDUECO	The EDUECO project is developed to meet the expected increase of consumer demands on food produced on ecological principles through improved teaching at non-university educational institutes.	http://edueco.edu.rs/?q=contacts http://edueco.edu.rs/sites/default/files/KVALITET_PROIZVODA_IZ_ORGANSKE_PROIZVODNJE.pdf **Project coordinator:** Van Hall Larenstein Foundation, (NL) Mr. **Ben Rankenberg** e-mail: **ben.rankenberg@wur.nl** **Serbian coordinator:** Educons University, Sremska Kamenica **Prof. dr Dejana Panković** e-mail: **dejanapankovic@yahoo.co.uk**
EcoQualify	14 partner organisations from 8 European countries met in the Leonardo da Vinci project called E(co)-Qualify to work together to improve the quality of national professional education.	http://ecoqualify.at.o-r-a.org/index.php?option=com_content&task=view&id=24&Itemid=68 E(CO)-QUALIFY: ORA - Ralph Liebing office@o-r-a.org
EcoJob - AP	An EU Leonardo da Vinci pilot project "EcoJob-AP - Training on European standards for ecological agricultural production" started in 2006 and created an e-based Learning management environment for acquiring knowledge and skills	http://www.ecojob-ap.org/ Portfolio with key competences of the professional qualifications: EcoExpert – AP and EcoFarmer.

	for ecological agrarian production (organic farming). It developed modules for level 3 (for eco-farmers) and for level 5 (for eco-experts) according to the requirements of the EQF. The project ended in 2008.	HANDBOOK TO ACQUIRE KEY COMPETENCES OF PROFESSIONAL QUALIFICATION ECOJOB-AP ON EUROPEAN STANDARDS
FINESSA	Organic Agriculture E-learning (FINESSA) Project Number: 2008-1-FI1-LEO05-00455 Year: 2008, Project Type: Transfer of Innovation, Country: FI-Finland The FINESSA project successfully developed a modular curriculum for organic production (agriculture and/or horticulture) VET at EQF Level 3. The curriculum is intended for use in blended learning, with strong emphasis of learning at the workplace and supported by e-learning components.	http://www.adam-europe.eu/adam/project/view.htm?prj=4607#.UvUmO7Ri06M
CIAS	This curriculum is developed by the Center for Integra-ted Agricultural Systems (CIAS) at the University of Wisconsin-Madison College of Agricultural and Life Sciences (CALS). Development of this curriculum was funded in part by a grant from the North Central Region Sustainable Agriculture Research and Education Program (SARE).	http://www.cias.wisc.edu/curriculum/modl/index.htm
EQF E-learning Courses for Eco-Farming	The on-line courses for Eco-farmers and Eco-experts are primarily intended to add the organic components to an existing course in agriculture rather than to be a complete course on their own. Learners should ideally have Level 3 or 4 qualifications in agriculture or horticulture. In the Eco-farmer modules, the content is linked to the competences required to organic producers and the standards and principles appropriate for their enterprises. The Eco-expert modules are targeted at extension workers and advisers working to help farmers produce and market organic produce. The course levels are compatible with the European Qualifications Framework (EQF) at EQF Level 3 (Eco-farmer course) and at EQF level 5 (Eco-expert course).	www.e-ecofarming.eu
Georgia High School Organic Farming	Georgia Organics, a nonprofit organization that promotes locally grown food and organic farms, has created a new curriculum to help educate high school agricultural students and adults about organic farming and gardening. "Fundamentals of Organic Farming and Gardening: An Instructor's Guide" aims to fill the gap between demand and supply of organic food by encouraging more education.	http://eeingeorgia.org/resource/about.aspx?s=44476.0.0.4863
Austria Biolo-gical Secon-dary School	The most comprehensive and practical programme of teaching and training school students.	http://www.bioschule.at/

„Organic agriculture – challenge or responsibility for our nature“	„Organic Farmer Manual“ within the framework of the project financed by the Programme of the EU for Transborder cooperation IPP Bulgaria-Serbia. The project is executed in partnership with Regional Agrobusiness Centre – Vidin, Bulgaria, Agroproject – Zaychar, Serbia, and Allianc for regional and civil initiatives, Sofia, Bulgaria.	1. Регионален Агробизнес Център – Видин, гр. Видин 3700, Област Видин, ул. „Герго Божинов“ № 2, базата на ОКС, тел:/факс: + 359 94/600 281, е – mail: rabc_vidin@abv.bg, www.rabc-vidin.com Agency for Rural Development 2. Агро Проект Тимок – Зайчар Гр. Зайчар 19000, Сърбия Област Зайчар Ул. „Никола Пашича“ Е7/32 Тел:/факс: +381 19 429 185 е – mail: agroprojekt@nadlanu.com 3. Алианс за регионални и граждански инициативи (АРГИ) Гр. София 1504, Област София Бул. „Евлоги Георгиев“ № 167 А, ет. 1, ап. 1 Тел:/факс: +359 2 944 6389 е – mail: arci_ngo@abv.bg

ANNEX 3

List of relevant documents and links

List of registered plant protection products, fertilizers, soil enhancers that could be used in organic production
http://www.dnrl.minpolj.gov.rs/novo%20organska/Lista%20SIB%20i%20SZB.pdf

Law on organic production (published in Official Gazette RS no. 30/10 in 7/5/2010
http://www.dnrl.minpolj.gov.rs/novo%20organska/Zakonoorganskojproizvodnji.pdf

Guideline on control and certification in organic production and measures in organic production (published in Official Gazette RS no. 48/11)
http://www.dnrl.minpolj.gov.rs/novo%20organska/Pravilnikkontrolsertifikaciji.pdf

List of authorized control bodies for control and certification in organic production for 2014

1)„CONTROL UNION DANUBE" ltd, Belgrade, 21/6 Boulevard Mihajlo Pupin.
2) „ECOCERT BALKAN" ltd, Belgrade, 13m/III Glavna street,
3) „ETKO PANONIJA" ltd, Novi Sad, 3 Trg slobode,
4) „ORGANIC CONTROL SYSTEM" ltd, Subotica, 15/I Trg cara Jovana Nenada,
5) „SUOLO E SALUTE BALKAN" ltd, Belgrade, 98 Boulevard King Alexander,
6) „TMS CEE" ltd, Bekgrade, 2 Rudnicka street.

ANNEX 4.

Organic plant production in 2013 in RS

Organic plant production in 2013.				
Crop	**Variety**	**In conversion (ha)**	**In organic status (ha)**	**Total (ha)**
Cereals	barley	253.7758	118.8242	**372.6000**
	maize	911.6160	53.3152	**964.9312**
	maize silage	0.4302	309.2672	**309.6974**
	oat	80.9196	7.3773	**88.2969**
	millet	0.3249	1.4740	**1.7989**
	wheat	223.9912	44.4525	**268.4437**
	spelt	15.7531	43.0446	**58.7977**
	rye	13.3919	45.8980	**59.2899**
	triticale	105.9428	36.8629	**142.8057**
	buckwheat	2.1382	4.6240	**6.7622**
	Total	1608.2837	665.1399	**2273.4236**
Industrial plants	tobacco	0.0000	0.3800	**0.3800**
	flax	0.0000	1.8000	**1.8000**
	poppy	0.7770	0.3800	**1.1570**
	sorghum	2.4027	2.3964	**4.7991**
	soy beans	254.3467	155.9199	**410.2666**
	sunflower	182.3206	5.3595	**187.6801**
	oil seed rape	65.8064	1.0000	**66.8064**
	Total	505.6534	167.2358	**672.8892**
Vegetables	gombo	0.0000	0.0982	**0.0982**
	garlic	1.1769	0.8015	**1.9784**
	Swiss chard	0.0335	2.0617	**2.0952**
	French beans	0.1718	1.4744	**1.6462**
	broccoli	0.0200	0.7053	**0.7253**
	peas	0.7717	0.5677	**1.3394**
	melon	0.0167	2.5035	**2.5202**
	cauliflower	0.0271	0.6400	**0.6671**
	kohlrabi	0.0125	0.8009	**0.8134**
	kale	0.0072	0.3582	**0.3654**
	Brussels sprouts	0.0200	0.3282	**0.3482**
	cucumber	0.0881	1.5853	**1.6734**
	potato	3.0852	3.8892	**6.9744**
	pop corn	0.0110	0.6000	**0.6110**
	sweet maize	0.0812	0.1859	**0.2671**

	cabbage	0.3140	4.0437	**4.3577**
	watermelon	0.0320	2.4051	**2.4371**
	chives	0.0110	0.6860	**0.6970**
	fennel	0.0200	0.0500	**0.0700**
	carrots	0.1507	3.1937	**3.3444**
	pepper	1.0351	9.7149	**10.7500**
	tomato	2.0495	2.8341	**4.8836**
	beans	2.7568	8.4848	**11.2416**
	turnip	0.0156	0.2581	**0.2737**
	parsley	0.0431	0.5253	**0.5684**
	leafy parsley	0.0115	0.8982	**0.9097**
	blue eggplant	0.0181	1.4727	**1.4908**
	leek	0.0025	0.5332	**0.5357**
	wild cabbage	0.8000	0.0000	**0.8000**
	horse radish	0.3550	0.1442	**0.4992**
	beet	0.1000	1.5727	**1.6727**
	little radish	0.1265	0.2505	**0.3770**
	rucola	0.0130	0.8448	**0.8578**
	lettuce	0.1545	2.2064	**2.3609**
	lenticels	0.2000	0.4000	**0.6000**
	spinach	0.0948	3.6593	**3.7541**
	gourd	0.5900	5.8109	**6.4009**
	zucchini	0.1004	1.8936	**1.9940**
	red beet	0.1630	3.3518	**3.5148**
	celery	0.1074	0.6842	**0.7916**
	onion	0.4356	4.3065	**4.7421**
	sunchoke	12.1365	0.6116	**12.7481**
	asparagus	0.0000	0.3000	**0.3000**
	broad leaved dock	0.2864	0.0000	**0.2864**
	other	1.3337	0.0500	**1.3837**
	Total	28.9796	77.7863	**106.7659**
Forage	legume	0.2552	0.3000	**0.5552**
	clover	39.0994	1.0024	**40.1018**
	Italian ryegrass	0.0000	68.7749	**68.7749**
	alfalfa	236.8796	161.1615	**398.0411**
	cattle beet	0.0200	0.2075	**0.2275**
	cowpea	1.7959	42.9400	**44.7359**
	sorghum sudanese	1.9700	40.2900	**42.2600**
	other	0.2670	0.0000	**0.2670**
	Total	280.2871	314.6763	**594.9634**
Fruits	aronia	12.4904	1.7389	**14.2293**
	almond	1.6945	2.0303	**3.7248**
	blueberry	0.9573	0.6982	**1.6555**
	peach	0.5067	0.9145	**1.4212**
	sour cherry	28.2537	54.0640	**82.3177**
	goji	0.0191	0.0000	**0.0191**

	grape	16.0086	7.6353	**23.6439**
	cornelian cherry	0.0800	0.0000	**0.0800**
	mulberry	0.0027	0.0000	**0.0027**
	quince	2.5190	138.7987	**141.3177**
	elderberry	0.0000	2.3393	**2.3393**
	apple	6.8014	328.1615	**334.9629**
	strawberry	1.9525	142.7057	**144.6582**
	jostaberry	0.0000	0.0005	**0.0005**
	apricot	0.2060	1.4584	**1.6644**
	pear	11.6581	1.5296	**13.1877**
	blackberry	22.3450	68.4427	**90.7877**
	hazelnut	9.1495	2.2777	**11.4272**
	raspberry	118.5266	223.1874	**341.7140**
	common medlar	0.0000	0.1958	**0.1958**
	nectarine	0.7500	0.0000	**0.7500**
	gooseberry	0.0000	0.0982	**0.0982**
	walnut	1.1991	2.4706	**3.6697**
	currant	0.4855	0.0010	**0.4865**
	fig	0.0000	0.0982	**0.0982**
	cherry	3.4988	0.1532	**3.6520**
	blackthorn	0.0010	0.0000	**0.0010**
	Golden berry	0.0000	0.9000	**0.9000**
	wild white plum	0.4142	0.0000	**0.4142**
	rose hip	0.0572	0.4700	**0.5272**
	plum	80.4805	169.5727	**250.0532**
	other	4.3682	10.0083	**14.3765**
	Total	324.4256	1159.9507	**1484.3763**
Aromatic and medicinal plants	marshmallow	0.0000	0.2500	**0.2500**
	basil	0.0010	0.2932	**0.2942**
	ginger	0.0005	0.0000	**0.0005**
	estragon	0.0000	0.0200	**0.0200**
	sage	0.0000	0.0600	**0.0600**
	chamomile	0.0000	0.0982	**0.0982**
	st. john's wort	0.0000	0.0600	**0.0600**
	cumin	0.0000	1.0267	**1.0267**
	nettle	0.0000	0.3000	**0.3000**
	coriander	0.0000	0.0500	**0.0500**
	lavender	0.0000	33.9050	**33.9050**
	sweet bay	0.0000	0.0982	**0.0982**
	marjoram	0.0000	0.0300	**0.0300**
	wild thyme	0.0000	0.1682	**0.1682**
	lemon balm	0.8498	3.3902	**4.2400**
	hyssop	0.0000	0.0500	**0.0500**
	dill	0.0023	0.7360	**0.7383**
	menthe	0.0030	0.5382	**0.5412**
	marigold	0.0050	0.2481	**0.2531**
	oregano	0.0000	0.0300	**0.0300**

	rtanj herbs	0.1000	0.0000	**0.1000**
	rosemary	0.0000	0.1182	**0.1182**
	lavas	0.0000	0.1700	**0.1700**
	black mustard	25.2222	57.5270	**82.7492**
	dwarf everlast	0.0000	6.6213	**6.6213**
	thyme	0.0000	0.0200	**0.0200**
	yarrow	0.0000	0.0700	**0.0700**
	summer savory	0.0000	0.0500	**0.0500**
	saffron	0.0020	0.0000	**0.0020**
	other	0.5361	0.0000	**0.5361**
	Total	26.7219	105.9285	**132.6504**
Other	non cultivated	9.8931	40.8423	**50.7354**
	buffer zone	0.1435	0.3300	**0.4735**
	experimental fields	0.0000	2.0800	**2.0800**
	fallow land	15.2346	0.0000	**15.2346**
	mushrooms	0.0000	0.0100	**0.0100**
	various crops	18.5947	0.0000	**18.5947**
	not sown	2.2100	0.8475	**3.0575**
	Total	46.0759	44.1098	**90.1857**
Total arable		**2820.4272**	**2534.8273**	**5355.2545**
Meadows/pastures		**2220.7569**	**651.9809**	**2872.7378**
TOTAL SURFACE		**5041.1841**	**3186.8082**	**8227.9923**