

Soil management and agricultural techniques (2nd Year, 1st semester)

Credit value (ECTS) 4

Course category

Domain (Imposed)

Course holder:

Assoc. Prof. Denis TOPA

Discipline objectives (course and practical works)

The goal of *Soil management and agricultural techniques* is to present how to protect soil and enhance its performance, how can be raised the farm profitability and preserve environmental quality for decades to come. Soil Management show how to increase the crops productivity, reveal how to control tillage, crop rotations, soil amendments, and other management choices. Through these choices the soil structure can be changed also biological activity and chemical content of soil, the erosion rates are influenced, pest populations, nutrient availability, and crop production.

Students has to be aware of how tillage can break up soil structure, speed the decomposition and loss of organic matter, increase the threat of erosion, destroy the habitat of helpful organisms, and cause compaction. They will have to acquire knowledge about main tillage systems for agriculture, explain the influence of different vegetation factors and they influence to crops and to evaluate the impact and the consequences of different systems on natural and agricultural ecosystems.

Soil management and agricultural techniques deals with issues concerning the definition, recognition and classification of the main species of weeds and development of integrated control methods, toxicology of herbicides, the biology of weed plants that essential for their effective management and knowledge regarding propagation, dispersal and persistency behavior of weeds; the importance of crop rotation, climatic and pedological principles and requirements, socioeconomic; knowledge of measures to increase the productive potential of low productive and unproductive soils, improving soil tillage systems for different climatic conditions, differentiated agricultural technique; farming systems, organic farming, biological, etc., development of a system of sustainable land use and sustainable agriculture.

Practicum seek to clarify the levels of application of different tillage systems, to know how to compare the effects of different soil treatments on the soil profile; describe appropriate soil testing methods for different situations; analyze a soil test report in order to evaluate the soil for agricultural or horticultural use; discuss ways that human activity can destroy soil structure.

Contents (syllabus)

Course (chapters/subchapters)
The object of study, the history and the importance of <i>Soil Management</i>
1. Factors affecting the plant growth and ways to improve them
1.1 Temperature. 1.2. Light. 1.3. Air. 1.4. Water. 1.5 Ways to control and improve thermal, water and air regime in soils 1.6. The soil as a medium for plant growth and development. 1.7. The influence of soil physical properties on crops development.

<p>2. Soil tillage</p> <p>2.1. Tillage influence on physical, biological and chemical soil properties. 2.2. Classification of soil tillage. 2.3. Primary cultivation: Ploughing/Chisel, Scarification. 2.4. Secondary cultivation – discs stubble cultivators, disc or tined seedbed cultivators or various kinds of harrows. 2.5. Seed bed preparation.</p>
<p>3. Tillage systems</p> <p>3.1 Conventional (traditional) tillage system. 3.2 Conservation tillage system.</p>
<p>4. Soil compaction</p> <p>4.1 The soil compaction processes. 4.2. The effects of soil compaction. 4.3. Measures to prevent and combat soil compaction.</p>
<p>5. Seeding and tillage after sowing.</p>
<p>6. Crop weeds</p> <p>6.1. Damages caused by weeds. 6.2. Biological particularities of weeds. 6.6. Sources weeding of crops. 6.4. Classification of weeds. 6.5. The mapping of weeds.</p>
<p>7. Weed management technique</p> <p>7.1. Preventive methods. 7.2. Agro-technical methods. 7.3. Physico-mechanical methods. 7.4. Biological methods. 7.5. Chemical methods - herbicides. Importance. The structure and classification of herbicides. Absorption, translocation and herbicidal action. The absorption and translocation of herbicides action. The persistence of herbicides in soil. Some aspects concerning the effects using herbicides on crops, soil and the environment. Factors that influence the effectiveness of herbicides. Safety measures when using herbicides. The herbicides used, doses and method of the main groups of cultivated plants. Integrated control of weeds.</p>
<p>8. Crop rotations</p> <p>8.1. General considerations. 8.2. Principles underlying the organization of rational crop rotations. 8.3. The rotation period of crop rotation. 8.4. Classification of crop rotation. 8.5. The place of crop groups in rotations. 8.6. The development of crop rotation. 8.7. The relationship between crop rotation and the main agro-technical measures to increase production.</p>
<p>9. Soil management for areas with distinct climate and different types of soil</p> <p>9.1. Soil management in steppe and forest steppe zones. 9.2 Soil management in the forest area. 9.3. Soil management for erosion control. 9.4. Soil management for sandy soils. 9.5. Soil management for acid, saline and alkaline soils. 9.6. Soil management for soils with moisture excess and those recently taken in culture.</p>
<p>10. Agricultural systems</p>

Practicum
<p>1. The presentation of the laboratories: Soil Management (Agrotehnics), Agricultural Soil Physic/Chemistry – Institute of Research for Agriculture and Environment, Mobile laboratory for air quality monitoring, Lysimeter station. Work safety rules; Laboratory equipment and utensils; Standard Operation Precedures in laboratories.</p>
<p>2. Soil sampling and preparation for analysis (Mortar Grinder RM 200, Retsch crusher, Planetary Ball Mills)</p> <p>Augering & soil sampling equipment (Dutch probes, Edelman auger, the Riverside auger probes set agrochemical percussion drilling - Cobra TT Hammer, Sample ring kits for undisturbed soil/modified probe roots, soil sampling kits containing volatile compounds).</p>

3. Analysis and assessment of soil compaction - Bulk density (Sample ring kit for undisturbed soil)
4. Soil Moisture Testing – gravimetric method, TDR, Thetaprobe, Profile Probe, Trime FM, e+soil MCT
5. Analysis and assessment of soil compaction. Soil penetration resistance (penetrologger Eijkelkamp, penetrometer FieldScout SC 900 – Spectrum)
6. Soil aggregate stability – Kemper&Rosenau Method (Eijkelkamp Wet sieving apparatus)
7. Quality of tillage and seedbed preparation
8. Machinery and equipment in sustainable agriculture (No-till seeders - Fabimag FG-01, Wintersteiger Monoseed DT). Quality of seeding
9. Recognition of major groups of weeds in crops/ weed seeds recognition
10. Determination of the pool of weed seeds in soil
11. Develop agricultural crop rotations
12. Employment in the rotation fertilization system
13. Prepare the mixture for spraying with the main herbicides.
14. Final colloquium of knowledge evaluation

Bibliography

- Gerard Jitoreanu, Denis Țopa, Costică Ailincăi, Anca Elena Calistru și colab., 2020 – *Tratat de agrotehnica*, Ed. “Ion Ionescu de la Brad” Iași, ISBN: 978-973-147-353-6.
- Gerard Jitoreanu, Costică Ailincăi, 2016 – *Agrotehnica*, Ed. “Ion Ionescu de la Brad” Iași, ISBN: 978-973-147-183-9.
- Denis Țopa, Gerard Jitoreanu, Costică Ailincăi, Lucian Răus, 2013 – *Impactul unor sisteme minime asupra producției și fertilității solului*. Editura “Ion Ionescu de la Brad”, Iași. ISBN 978-973-147-122-8.
- Teodor Rusu, Ileana Bogdan, Adrian Ioan Pop, 2012 – *Îndrumător de lucrări practice de Agrotehnică*. Editura Grința, Cluj Napoca. ISBN 978-973-126-409-7.
- Hillel Daniel - *Environmental Soil Physics*. ISBN-9780123485250.
- John H. Martin, David L. Stamp, Richard P. Waldren, 2006 - *Principles of Field Crop Production*. ISBN 0-13-025967-5.
- Robert E.L. Naylor, 2002 - *Weed Management Handbook*. ISBN 0-632-05732-7.

Evaluation

Evaluation form	Evaluation Methods	Percentage of the final grade
Final Exam	Oral examination	50%
Labs Colloquium	Oral examination	10%
Partial exam	Written assessment	30%
Evaluation during the semester	Oral examination	10%

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