

Discipline: Soil Management

Identification

Code: SOL 854

Credits: 4 (2 hours theory - 2 hours practice)

Level: Master and Doctorate

Professor: Telmo Jorge Carneiro Amado

System: Annual (I semester)

Discipline objectives

Knowledge of the causes, indicators, processes, and indicators of degradation of agricultural soils and alternatives for degraded soil recovery. Study of soil management and its effects on the physical, chemical, and biological properties of soil and soil management aimed at increasing and diversifying soil life.

Syllabus

The course covers soil degradation processes and their recovery, organic matter dynamics in agricultural systems, soil quality indicators, effects of management systems on soil properties, and developing sustainable agricultural production systems. The course is based on conservation agriculture principles, regenerative agriculture, and climate-resilient agriculture (climate-smart agriculture).

Methodology and/or teaching instruments

Individual seminars, expository classes, practical classes (in field), practical class (in laboratory), group work, visits to experiments, and blackboards.

Forms of evaluation

Written exam, seminar, scientific papers, class participation, and class reports.

Program: Title and Breakdown of Units

Unit 1

Climate characterization of the subtropical and tropical environment

1.1 - Precipitation and solar radiation

1.2 - Temperature, relative humidity, and biological activity

Unit 2

Chemical, physical, and biological degradation of agricultural soils

Unit 3

Soil as an open system

3.1 - Energy flow

3.2 - Flow of matter

3.3 - Effect of cropping intensity

3.4 - Soil organization and emergent properties

3.5 - Soil quality

Unit 4

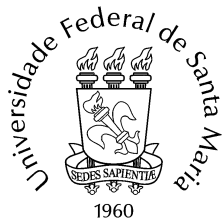
Organic matter dynamics

4.1 - Dynamics

4.2 - Modeling

4.3 - Functions performed

Unit 5



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Agroforestry systems

- 5.1 - Crop-livestock integration
- 5.2 - Silvo-pastoral integration

Unit 6

No-till farming

- 6.1 - History
- 6.2 - Principles and requirements
- 6.3 - Management principles
- 6.4 - Ground cover plants
- 6.5 - Complementary strategies aimed at alleviating limitations

Unit 7

Effect of management systems on soil physics

- 7.1 - Soil structure
- 7.2 - Aggregate stability
- 7.3 - Resistance to root penetration
- 7.4 - Water infiltration into the soil

Unit 8

Effects of management systems on soil fertility

- 8.1 - Formation of a favorable profile for the deepening of the root system
- 8.2 - Correction of subsurface layers - principles and strategies
- 8.3 - Fertilization of cropping systems
- 8.4 - Nutrient cycling

Unit 9

Effect of management systems on soil biology

- 9.1 - Biological Inputs
- 9.2 - Strategies for microbiota maintenance and diversification

Unit 10

Greenhouse gas fluxes in soil management systems

- 10.1 - Global warming and its relation to agriculture
- 10.2 - Strategies to increase the potential of agricultural soils to act as a greenhouse gas sink

Unit 11

Strategies to increase soil resilience

- 11.1 - Recovery of carbon stock in the soil
- 11.2 - Strategies for degraded soil recovery

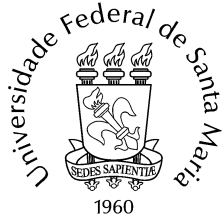
Recommended literature

DORAN, J.W. & JONES, A. **Methods for assessing soil quality**. Soil Sci. Soc. of America, Madison, 1996, 410p.

DORAN, J. W. & ZEISS, M. R. Soil health and sustainability: managing the biotic component of soil quality. *Applied Soil Ecology* 15 3–11, 2000.

DORAN, J.W.; MOLINA, J.A.E. & HARRIS, R.F. **Defining Soil Quality for a sustainable environment**. Soil Science Society of America, Special Publication no. 35. 244p. 1994.

FOLLETT, R.F.; HATFIELD, J.L. **Nitrogen in the environment: Sources, Problems and Management**. Elsevier, 2008, 509p.



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LAL, R. & Sanchez, P.A. **Myths and Science of Soils of the Tropics**. Soil Science of America Society, Special Publication no. 29, 185p. 1992.

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LAL, R.; KIMBLE, J.; LEVINE, E. & STEWART, B.A. **Soils Management and Greenhouse Effect**. Lewis Publishers, Boca Raton, Florida, USA, 1995. 609p.

LAVALLEE, J. M.; SOONG, J. L. & COTRUFO, M. F. Conceptualizing soil organic matter into particulate and mineral-associated forms to address global change in the 21st century. *Global Change Biology* 26:261–273, 2020.

PLASTER, E. **Soil Science and management**. 5th ed., 2008.