Training Course on Soil Microbiology and its Role in Crop Productivity

Professional Development Training Course Outline

Category	Agriculture	**Duration**	10 Days
Base Fee	$3,000 USD	**Delivery Mode**	Online / On-site Hybrid

Course Introduction

Soil microbiology plays a fundamental role in sustainable agriculture, soil health, and crop productivity. With increasing global focus on regenerative agriculture and organic farming, understanding microbial ecosystems has become crucial. This training course aims to equip participants with the scientific knowledge and practical tools to enhance crop yield through beneficial soil microbial activity. The course covers microbiome dynamics, microbial-plant interactions, nitrogen fixation, organic matter decomposition, and biocontrol of plant pathogens, all within a framework of climate-smart agriculture and precision farming.

Training Course on Soil Microbiology and its Role in Crop Productivity is designed to bridge the gap between traditional farming practices and modern microbiological innovations. It provides hands-on case studies and real-life applications to ensure learners can apply the knowledge immediately in agricultural planning and farm management. With a focus on data-driven decision-making, this program will empower professionals to integrate microbial technologies for improving soil fertility and sustainable crop intensification.

Programme Curriculum

Training Course on Soil Microbiology and its Role in Crop Productivity

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Course Objectives

1. Understand the principles of soil microbial ecology and biodiversity.
2. Explore microbial interactions with plant roots (rhizosphere dynamics).
3. Learn about biofertilizers and their impact on soil fertility.
4. Analyze the role of mycorrhizal fungi in nutrient cycling.
5. Examine nitrogen-fixing bacteria and sustainable nitrogen management.
6. Understand the role of decomposer microbes in organic matter breakdown.
7. Study biocontrol agents and their effectiveness in pest management.
8. Identify techniques for soil microbiome assessment and monitoring.
9. Evaluate the impact of climate change on soil microbial populations.
10. Learn how to restore degraded soils using microbial techniques.
11. Understand carbon sequestration by microbes for climate-smart agriculture.
12. Develop skills in precision agriculture using microbial inputs.
13. Promote organic and regenerative farming through microbial integration.

Target Audiences

1. Agricultural extension officers
2. Soil scientists and agronomists
3. Organic and regenerative farmers
4. Agroecology researchers
5. Sustainable agriculture practitioners
6. University students in agriculture and biology
7. Farm input suppliers
8. Policy makers and agricultural NGOs

Course Duration: 10 days

Course Modules

Module 1: Introduction to Soil Microbiology

- Definition and importance of soil microbiology
- Microbial types: bacteria, fungi, actinomycetes, protozoa
- Microbial diversity and functions
- Soil microbial food web
- Indicators of healthy microbial activity
- **Case Study**: Assessing microbial diversity in organic vs. conventional farms

Module 2: Rhizosphere Microbiology

- Rhizosphere definition and importance
- Root exudates and microbial attraction
- Plant-microbe signaling
- Rhizodeposition and nutrient exchange
- Rhizosphere engineering
- **Case Study**: Rhizobacteria promoting wheat root growth

Module 3: Biofertilizers and Plant Growth-Promoting Microbes

- Classification of biofertilizers
- Mechanisms of plant growth promotion
- Commercial biofertilizer products
- Application methods
- Regulatory and safety considerations
- **Case Study**: Biofertilizer effects on maize yield

Module 4: Nitrogen Fixation by Soil Microbes

- Biological nitrogen fixation process
- Free-living vs symbiotic nitrogen fixers
- Legume-rhizobium symbiosis
- Inoculant preparation and application
- Environmental conditions for nitrogen fixation
- **Case Study**: Soybean production using rhizobium inoculants

Module 5: Mycorrhizal Associations

- Types of mycorrhizae
- Functions in nutrient uptake (P, Zn, Cu)
- Mycorrhizal inoculants
- Integration with cropping systems
- Constraints and opportunities
- **Case Study**: Tomato yield improvement with AMF

Module 6: Decomposers and Nutrient Cycling

- Microbial decomposition of organic matter
- Carbon and nitrogen mineralization
- Compost microbiology
- Enzyme activity in soil
- Nutrient bioavailability
- **Case Study**: Compost tea microbial profiling

Module 7: Biocontrol of Plant Pathogens

- Microbial antagonism and competition
- Common microbial biocontrol agents
- Suppressive soils
- Application strategies
- Limitations and precautions
- **Case Study**: Trichoderma use in chili disease management

Module 8: Soil Microbiome Assessment Tools

- Soil DNA extraction and sequencing
- qPCR and metagenomics
- Soil respiration tests
- Microbial biomass estimation
- Bioinformatics tools
- **Case Study**: Soil health monitoring in degraded fields

Module 9: Microbial Soil Amendments

- Types of microbial amendments

- Formulation and carrier materials
- Compatibility with fertilizers
- Shelf life and storage
- Field application techniques
- **Case Study**: Use of microbial consortia in rice paddies

Module 10: Organic Farming and Soil Microbes

- Principles of organic soil management
- Microbial roles in organic certification
- Use of compost and green manures
- Soil microbial resilience
- Integration of livestock and microbes
- **Case Study**: Soil health in certified organic banana farms

Module 11: Regenerative Agriculture Approaches

- Cover cropping and microbiome restoration
- No-till and minimum tillage effects
- Crop rotation impacts
- Integration with agroforestry
- Soil carbon enhancement
- **Case Study**: Regenerative coffee farming in East Africa

Module 12: Climate Change and Microbial Dynamics

- Temperature and moisture effects
- Greenhouse gas emissions
- Microbial climate feedback loops
- Microbial adaptation strategies
- Climate-smart practices
- **Case Study**: Microbial response to drought in Kenyan soils

Module 13: Precision Agriculture and Microbial Inputs

- Soil microbiome mapping
- Integration with sensor technology
- Variable rate microbial application
- Data analytics for microbial health
- Return on investment
- **Case Study**: GPS-based microbial application in sugarcane farms

Module 14: Soil Microbiology in Degraded Lands

- Causes of soil degradation
- Rebuilding microbial populations
- Bioremediation strategies
- Microbial indicators of restoration
- Policy interventions
- **Case Study**: Bioremediation of saline soils in India

Module 15: Future Trends in Soil Microbiology

- Synthetic biology and microbiome engineering
- CRISPR in microbial strain development
- AI and microbiome data analytics

- Microbiome-based products
- Global research collaborations
- **Case Study**: AI-powered microbial mapping in precision viticulture

Training Methodology

- Interactive lectures with visual aids
- Hands-on field demonstrations
- Group discussions and problem-solving
- Laboratory-based experiments
- Guest speakers from industry and academia
- Real-world case study analysis and group presentations

Register as a group from 3 participants for a Discount

Send us an email: info@fineskilltrainingcenter.org or call *+254769199797*

Certification

Upon successful completion of this training, participants will be issued with a globally- recognized certificate.

Tailor-Made Course

We also offer tailor-made courses based on your needs.

Key Notes

a. The participant must be conversant with English.

b. Upon completion of training the participant will be issued with an Authorized Training Certificate

c. Course duration is flexible and the contents can be modified to fit any number of days.

d. The course fee includes facilitation training materials, 2 coffee breaks, buffet lunch and A Certificate upon successful completion of Training.

e. One-year post-training support Consultation and Coaching provided after the course.

f. Payment should be done at least a week before commence of the training, to Fineskill Training Center account, as indicated in the invoice so as to enable us prepare better for you.

Upcoming Scheduled Sessions

Start Date	End Date	Location	Price
23 Nov 2026	04 Dec 2026	Online	$2,000
23 Nov 2026	04 Dec 2026	Physical	$3,000
23 Nov 2026	04 Dec 2026	Physical	$6,000

Start Date	End Date	Location	Price
23 Nov 2026	04 Dec 2026	Physical	$6,000
23 Nov 2026	04 Dec 2026	Physical	$12,000
23 Nov 2026	04 Dec 2026	Physical	$9,000
23 Nov 2026	04 Dec 2026	Physical	$12,000
23 Nov 2026	04 Dec 2026	Physical	$12,000

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