Training Course on Plant Genetics, Breeding, and Biotechnology for Crop Improvement

Professional Development Training Course Outline

Category	Agriculture	**Duration**	5 Days
Base Fee	$1,500 USD	**Delivery Mode**	Online / On-site Hybrid

Course Introduction

Training Course on Plant Genetics, Breeding, and Biotechnology for Crop Improvement is designed to equip agricultural professionals, researchers, and policymakers with the latest tools and scientific knowledge in crop enhancement. In today's climate-challenged agricultural environment, modern plant breeding techniques and biotechnological innovations are vital for developing high-yielding, resilient, and nutritionally superior crop varieties. This course will explore cutting-edge concepts including molecular breeding, CRISPR gene editing, genomic selection, and sustainable biotechnology practices.

Participants will gain hands-on experience and scientific insights into DNA marker-assisted selection, genomic tools, trait discovery, and hybrid development to revolutionize productivity. With a strong emphasis on genome engineering, biotech regulation, and agroecological adaptation, the course also highlights real-world case studies, innovations in gene mapping, and the socio-economic impact of plant biotechnology. This course is essential for those aiming to lead in the field of agricultural biotechnology, crop improvement, and food security enhancement.

Programme Curriculum

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Objectives

1. Understand the fundamentals of plant genetics and inheritance mechanisms.
2. Explore the principles of conventional and molecular breeding techniques.
3. Gain proficiency in DNA marker technologies and gene mapping.
4. Apply genomic selection and predictive breeding models.
5. Assess the role of CRISPR and genome editing in crop improvement.
6. Learn the use of biotechnology in enhancing crop resistance to diseases and pests.
7. Analyze the ethical, legal, and regulatory frameworks governing GMO crops.
8. Evaluate bioinformatics tools in plant breeding and genetic analysis.
9. Investigate the impact of climate-smart breeding on food systems.
10. Design breeding programs that promote agrobiodiversity and resilience.
11. Interpret case studies of successful crop biotechnology programs.
12. Integrate data-driven approaches into modern crop breeding pipelines.
13. Promote sustainable and inclusive adoption of biotechnological innovations in agriculture.

Target Audiences

1. Plant Breeders and Geneticists
2. Agricultural Research Scientists
3. Biotechnology Experts
4. Agronomists and Crop Scientists
5. Seed Industry Professionals
6. Agricultural Extension Officers
7. Graduate Students in Plant Science
8. Policy Makers in Agriculture and Food Security

Course Duration: 5 days

Course Modules

Module 1: Fundamentals of Plant Genetics

- Mendelian and non-Mendelian inheritance
- Chromosome behavior and genetic variation
- DNA structure, replication, and gene expression
- Epigenetics in plant systems
- Genetic mapping and QTL analysis
- **Case Study:** Inheritance of rust resistance in wheat

Module 2: Principles of Plant Breeding

- Breeding objectives and methods
- Hybridization techniques
- Backcross and recurrent selection
- Participatory plant breeding
- Breeding for biotic and abiotic stress

- **Case Study:** Development of drought-tolerant maize in Sub-Saharan Africa

Module 3: Biotechnology in Crop Improvement

- Genetic engineering and transgenic crops
- RNAi and gene silencing
- Plant tissue culture and micropropagation
- Agrobacterium-mediated gene transfer
- Safety and risk assessment of biotech crops
- **Case Study:** Bt cotton adoption in India

Module 4: Molecular Markers and Genomics

- Types of DNA markers (SSR, SNP, AFLP)
- Marker-assisted selection (MAS)
- Genotyping platforms and genome-wide association studies (GWAS)
- Functional genomics and transcriptomics
- Marker-assisted backcrossing (MABC)
- **Case Study:** Use of SNP markers in rice breeding

Module 5: Genome Editing Technologies

- Introduction to CRISPR-Cas9
- TALENs and ZFNs applications
- Off-target effects and regulatory issues
- Precision breeding vs conventional breeding
- Applications in disease resistance and quality traits
- **Case Study:** CRISPR-edited tomato for shelf-life extension

Module 6: Bioinformatics and Data Management

- Genome databases and sequence retrieval
- Gene annotation and comparative genomics
- Breeding data management software
- Genomic prediction and selection tools
- Integrating phenotypic and genotypic data
- **Case Study:** Bioinformatics for wheat genome analysis

Module 7: Climate-Smart Breeding and Sustainability

- Breeding for heat and drought tolerance
- Carbon-smart crop improvement
- Nutritional biofortification strategies
- Use of wild relatives and landraces
- Sustainable seed systems and scalability
- **Case Study:** Iron-biofortified pearl millet in India

Module 8: Policy, Ethics, and Adoption

- National and international biotech regulations
- Intellectual property rights in plant breeding
- Public perception and communication strategies
- Ethical implications of GMOs and gene editing
- Ensuring equitable access to biotech innovations
- **Case Study:** Regulation of GM maize in Kenya

Training Methodology

- Interactive lectures using multimedia tools
- Hands-on laboratory and field exercises
- Group discussions and brainstorming sessions
- Expert guest presentations and panel discussions
- Case-based learning with real-world examples
- Evaluation through quizzes, assignments, and practicals

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	27 Nov 2026	Online	$1,000
23 Nov 2026	27 Nov 2026	Physical	$1,500
23 Nov 2026	27 Nov 2026	Physical	$3,000
23 Nov 2026	27 Nov 2026	Physical	$3,000
23 Nov 2026	27 Nov 2026	Physical	$6,000
23 Nov 2026	27 Nov 2026	Physical	$4,500

Start Date	End Date	Location	Price
23 Nov 2026	27 Nov 2026	Physical	$6,000
23 Nov 2026	27 Nov 2026	Physical	$6,000

Ready to enroll or request a customized program? Book online or contact us:

Register Online Now

Email: info@fineskilltrainingcenter.com | Website: www.fineskilltrainingcenter.com