Training Course on Agri-Genomics and Molecular Diagnostics in Agriculture

Professional Development Training Course Outline

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

Course Introduction

The integration of agri-genomics and molecular diagnostics in agriculture has revolutionized the way we understand, manage, and improve crop and livestock production. This cutting-edge course offers agricultural scientists, geneticists, and biotech professionals an opportunity to gain hands-on skills and theoretical knowledge essential for driving innovation in sustainable agriculture, precision breeding, and pathogen detection. With the increasing demand for food security, climate-resilient crops, and early disease diagnosis, agri-genomic technologies and molecular tools have become indispensable in modern agricultural systems.

Training Course on Agri-Genomics and Molecular Diagnostics in Agriculture key genomic applications such as marker-assisted selection, genome editing, high-throughput sequencing, and molecular markers for pathogen resistance. Participants will explore real-world case studies that illustrate how molecular diagnostics are used to monitor plant and animal diseases, track genetic diversity, and develop climate-smart solutions. Through expert-led modules, interactive labs, and practical sessions, trainees will develop the skills needed to contribute meaningfully to agricultural innovation and global food security.

Programme Curriculum

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Course Objectives

1. Understand the fundamentals of agri-genomics and molecular diagnostics.
2. Explore the application of next-generation sequencing (NGS) in agriculture.
3. Learn DNA barcoding techniques for species identification.
4. Apply molecular markers for crop improvement and genetic diversity analysis.
5. Master real-time PCR and other molecular tools for pathogen detection.
6. Understand genome editing technologies such as CRISPR/Cas9 in agriculture.
7. Conduct SNP genotyping for trait mapping and breeding programs.
8. Analyze transcriptomics and gene expression for stress-resilient crops.
9. Interpret bioinformatics data for genomic studies.
10. Implement lab-to-field strategies for molecular diagnostics.
11. Identify genetic traits for climate adaptation in plants and animals.
12. Design molecular diagnostic protocols for early disease detection.
13. Evaluate ethical, legal, and regulatory aspects of agricultural biotechnology.

Target Audience

1. Agricultural scientists and researchers
2. Molecular biologists and geneticists
3. Agribusiness professionals
4. Plant breeders and seed technologists
5. Veterinary and livestock professionals
6. Biotech startup teams
7. Graduate and postgraduate students in agriculture/life sciences
8. Policy makers and extension officers

Course Duration: 10 days

Course Modules

Module 1: Introduction to Agri-Genomics

- History and scope of agri-genomics
- Importance in modern agriculture
- Core genomic technologies
- Role in sustainability and yield
- Key terms and definitions
- **Case Study:** Success story of genome-based maize improvement in Kenya

Module 2: DNA Extraction and Quantification

- Sampling techniques
- DNA/RNA extraction methods
- Gel electrophoresis principles
- Spectrophotometry and fluorometry
- Troubleshooting and contamination prevention

- **Case Study:** DNA isolation in drought-tolerant wheat

Module 3: Molecular Markers and Marker-Assisted Selection

- Types of molecular markers (SSR, SNP, AFLP)
- Application in crop breeding
- Marker-trait associations
- Marker-assisted backcrossing
- Pros and limitations
- **Case Study:** MAS for disease resistance in rice

Module 4: PCR and Real-Time PCR Techniques

- Fundamentals of PCR
- Primer design
- RT-PCR setup and troubleshooting
- Quantitative PCR data analysis
- Diagnostic applications
- **Case Study:** Detecting bacterial wilt in potatoes

Module 5: Genomic Selection and Trait Mapping

- Concept of genomic selection
- Genotyping platforms
- QTL mapping and GWAS
- Predictive breeding
- Integration with conventional breeding
- **Case Study:** GWAS in soybean for drought tolerance

Module 6: Gene Editing and CRISPR-Cas9 Technology

- CRISPR/Cas9 mechanics
- Target gene selection
- Guide RNA design
- Off-target effects and mitigation
- Regulatory framework
- **Case Study:** CRISPR use in tomato shelf-life improvement

Module 7: Transcriptomics and Gene Expression Analysis

- RNA-seq workflows
- Data normalization and interpretation
- Differential gene expression
- Stress-responsive genes
- Integration with phenotyping
- **Case Study:** Heat stress response in cowpea

Module 8: Plant Pathogen Detection and Diagnostics

- DNA-based detection techniques
- Virus and fungal pathogen ID
- Portable diagnostic tools
- Field validation
- Data reporting
- **Case Study:** Rapid detection of banana Xanthomonas wilt

Module 9: Livestock Genomics

- Genomic tools in animal breeding
- Trait selection for productivity
- Disease resistance markers
- DNA testing in herd management
- Ethics in animal genomics
- **Case Study:** Genomic selection in dairy cattle in Africa

Module 10: Bioinformatics and Data Analysis

- Genome databases and tools
- Sequence alignment (BLAST, Clustal)
- Phylogenetic analysis
- NGS data interpretation
- Software and online platforms
- **Case Study:** Wheat genome assembly analysis

Module 11: Climate Resilience through Genomic Innovations

- Climate-smart agriculture overview
- Genes for heat, salinity, and drought tolerance
- Molecular phenotyping
- Breeding climate-adaptive crops
- Cross-sector collaboration
- **Case Study:** Salt-tolerant rice project in Bangladesh

Module 12: DNA Barcoding and Species Authentication

- Principles of DNA barcoding
- Barcode regions (matK, rbcL, COI)
- Lab protocols
- Application in seed authentication
- Biodiversity conservation
- **Case Study:** Coffee variety authentication in Ethiopia

Module 13: Molecular Diagnostics for Seed Health

- Seed-borne pathogens
- Testing standards
- Molecular detection workflows
- Integration in seed certification
- Economic importance
- **Case Study:** Detection of aflatoxin-producing fungi in maize seed

Module 14: Regulatory and Ethical Considerations

- Biosafety regulations
- IP rights in molecular tools
- Data privacy and ownership
- Public perception
- Ethical dilemmas in gene editing
- **Case Study:** GMO policy and CRISPR trials in Africa

Module 15: From Lab to Field: Practical Deployment

- Scaling molecular diagnostics
- Field kits and mobile labs

- Training local technicians
- Partnering with extension services
- Monitoring and feedback systems
- **Case Study:** Deployment of field PCR kits for cassava disease

Training Methodology

- Hands-on laboratory training sessions
- Case-based learning and real-world examples
- Group projects and collaborative exercises
- Interactive lectures with multimedia aids
- Expert guest speakers and panel discussions
- Field exposure and diagnostics toolkit demonstrations

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
09 Nov 2026	20 Nov 2026	Online	$2,000
09 Nov 2026	20 Nov 2026	Physical	$3,000
09 Nov 2026	20 Nov 2026	Physical	$6,000

Start Date	End Date	Location	Price
09 Nov 2026	20 Nov 2026	Physical	$6,000
09 Nov 2026	20 Nov 2026	Physical	$12,000
09 Nov 2026	20 Nov 2026	Physical	$9,000
09 Nov 2026	20 Nov 2026	Physical	$12,000
09 Nov 2026	20 Nov 2026	Physical	$12,000

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