



1-Month Hands-On AgriSMART Workshop Schedule

WEEK 1: 6 Days On-Premise Immersive Workshop

A highly intensive, mentor-led workshop designed to establish strong foundations in AgriGenomics and Linux processing with special focus on High Performance Computing (HPC), NGS data analysis, variant calling, annotation, interpretation and data visualization.

Session 1: Introduction to Agrigenomics

- Understand the evolution, scope, and significance of agrigenomics in modern crop improvement.
- Explore how genome science accelerates breeding and crop resilience.

Activity:

- Icebreaker: “How genomics can shape the future of breeding”.

Session 2: Understanding HA-IR (Handling-Analysis-Interpretation-Reporting)

- Introduction to HA-IR and its global relevance.
- Explore career pathways and roles of Genome Analysts in industry and research.

Activity:

- Group discussion: “What makes a strong Genome Analyst?”

Session 3: Overview of Multi-Omics Integration

- Understand genomics, transcriptomics, proteomics and metabolomics synergy.
- Learn how multi-omics accelerates plant trait discovery.

Activity:

- Interactive visualization demo using sample omics datasets.

Session 4: Plant Genome Organization

- Explore genome structure, chromosomes, genes, alleles, variations/mutations and regulatory elements.

Activity:

- Interactive quiz: “Decode the Genome!”

Session 5: Agrigenomics Case Studies & Ethics

- Study real-world examples of genomics in crop improvement.
- Understand ethical, legal and responsible data handling.

Activity:

- Group discussion on responsible genomic data usage.

Session 6: Agrigenomic Databases - Foundations

- Learn to retrieve, interpret and compare genomic datasets from public resources.

Activity:

- Hands-on extraction of gene/SNP data from agrigenomic databases.

Session 7: Sequence Querying with BLAST

- Understand sequence similarity search concepts.
- Learn BLAST types and interpretation of alignment outputs.

Activity:

- Hands-on BLAST search using crop genomes.

Session 8: Molecular Markers & Breeding Strategies

- Explore SNPs, SSRs, Indels and marker-assisted selection for plant breeding.
- Understand QTLs and their relevance.

Activity:

- Identify markers associated with yield-related QTLs.

Session 9: Introduction to Next-Generation Sequencing (NGS)

- Learn sequencing technology generations and platforms.
- Understand their applications in plant genomics.

Activity:

- Discussion on sequencing workflows using real crop datasets.

Session 10: Linux for Bioinformatics

- Master essential commands for navigating and managing biological data.

Activity:

- Hands-on practice: navigation, file creation, compression, searching, permissions.

Session 11: Linux Commands for NGS Data Analysis

- Work efficiently with FASTA, FASTQ, and other genomic data formats.

Activity:

- Process FASTA/FASTQ files using real datasets.

Session 12: Understanding NGS Data Formats

- Explore BCL, FASTQ, GFF and BED formats.

Activity:

- Hands-on inspection of FASTQ headers and quality values.

Session 13: High-Performance Computing (HPC) for Genomic Data Analysis

- Understand the role of HPC clusters in large-scale NGS data processing.
- Learn HPC concepts: nodes, cores, workflow structure, data security, and resource sharing.

Activity:

- Discussion on Best practices for resource allocation, storage management and workflow optimization.

Session 14: Quality Control & Preprocessing

- Perform QC, trimming, filtering, and preprocessing of raw sequencing reads.

Activity:

- Run FastQC, generate MultiQC, trim reads.

Session 15: Read Mapping & Alignment

- Map reads to reference genomes using industry-standard tools.
- SAM/BAM file structure.

Activity:

- Convert SAM → BAM, sort, index and assess alignment statistics.

Session 16: De Novo Assembly & Quality Assessment

- Learn assembly strategies and understand N50, L50 and completeness metrics.

Activity:

- Build a de novo assembly.

Session 17: Variant Calling Fundamentals

- Detect SNPs and Indels using industry workflows.
- Variant Call File (VCF) structure.

Activity:

- Hands-on variant calling and output interpretation.

Session 18: Introduction to Secondary Engines

- Understand secondary analysis engines (e.g. GATK, DeepVariant, Freebayes)

Activity:

- Discussion on speed, accuracy, and applications.

Session 19: Variant Annotation & Functional Insights

- Annotate variants and predict biological impact.

Activity:

- Annotate datasets and extract functional insights.

Session 20: Genome Type 1 Annotation Databases – Deep Dive

- Explore SNP variation and structural/functional genome annotation platforms.

Activity:

- Retrieve SNPs from Type 1 genome databases.

Session 21: Genome Type 2 Annotation Databases – Deep Dive

- Retrieve genotypic/phenotypic datasets using advanced tools.

Activity:

- Use Ensembl tools to analyze SNPs and genome features.

Session 22: Sequence & Meta-Analysis Research Toolkit™

- Build a complete pipeline from FASTQ → QC → Alignment → Variant Calling → Annotation.

Activity:

- Full end-to-end workflow execution.

Session 23: Genotype - Phenotype Association

- Understand how variants influence plant traits.

Activity:

- Explore trait-linked genomic signatures.

Session 24: Data Visualization & Result Interpretation

- Visualize variants in IGV
- Visualize variant distribution and trait association.

Activity:

- Hands-on plotting using IGV/R/Python.

Session 25: Advanced Applications in Agrigenomics

- Explore about pangenome, RNA-Seq applications in plant stress and long-read sequencing relevance in complex genomes.

Activity:

- Research paper discussion & data interpretation challenge.

Session 26: Opportunities in Genome Led Enterprise & Economy: NutriGenomics

- Explore how genomics drives innovation, value creation and enterprise development across agriculture and nutrition sectors.
- Understand how nutrigenomics emerges from core genomic insights to improve crop nutritional traits and develop health-focused products.
- Learn how genomic data guides decisions in developing nutrient-dense crops.

WEEK 2, 3 & 4: Weekend Sessions dedicated to capstone project work and special guest lectures from International, Industry, Academia & Research experts.

WEEK 2: Major Activity - Team Capstone Project

A guided, collaborative project applying the entire workflow to a real agrigenomic dataset.

- Guest lectures from industry, academia and research experts.
- Capstone Project discussion
- Variant discovery & annotation
- Trait-linked variant interpretation

WEEK 3: Capstone Submission Week

Participants finalize their capstone project and prepare a comprehensive report and review article.

- Final Capstone Project Submission: From Raw Reads to Interpretation Report.
- Review article submission.
- Guest lectures from industry, academia and research experts.
- Project refinement under mentor guidance.

WEEK 4: Grand Finale - Presentation, Evaluation, Workshop Culmination & Ceremon

- Present project results and review of workshop learning.
- Special guest session Lecture from expert.

Activities:

- Workshop culmination & ceremony
- 3 special awards for best presenter.

ENROLL NOW

LIMITED SEATS

FOR REGISTRATION



Scan QR Code for Registration

Register Link: <https://pusakrishi.accubate.app/ext/survey/8524/apply>

Venue: PUSA Krishi, ZTM & BPD Unit ICAR-IARI, Pusa Campus, New Delhi 110012

**FOR MORE
INFORMATION**



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