

International Hands-on Training on

# CRISPR/Cas-mediated GENOME EDITING

May 06-10, 2024

**Organized by**

National Center for Genome Editing (NCGE),  
Center for Advance Studies in Agriculture and  
Food Security (CAS-AFS),  
D-8 Research Center for Agriculture  
and Food Security (D-8 RCAFS),  
University of Agriculture, Faisalabad

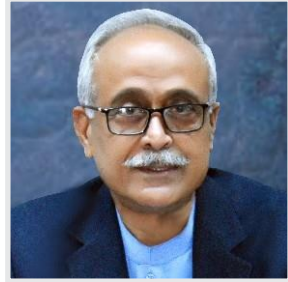


UNIVERSITY OF  
**AGRICULTURE**  
FAISALABAD - PAKISTAN



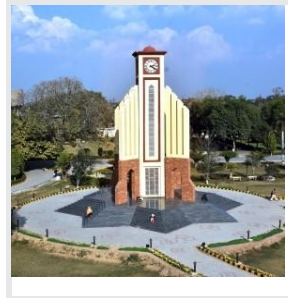
## Message from the Vice Chancellor

The advent of targeted editing of genome presents the global scientific community with a newfound opportunity to address the issues of humanity. Its widespread applications allow for potentially finding cures to fatal and previously untreatable diseases, addressing the containment of COVID-19, and augmenting our food security needs. As Agricultural scientists in a predominantly agrarian economy, there is a great onus of responsibility on us to make Pakistan Food & Nutritionally secure. University of Agriculture Faisalabad stands out as the premier agriculture research and academic body in the country, and proudly takes on the challenge of addressing the aforementioned issues. In order to achieve our goals, a coordinated and pragmatic approach must be established in using CRISPR/Cas-mediated genome editing with the help of the capacity building of young and early career agricultural scientists.



## About UAF

The University of Agriculture, Faisalabad (UAF) is one of the major success stories in Pakistan. Founded in 1961 under USAID patronage, the flagship university of the province of Punjab stands first amongst all agriculture/ veterinary universities and fourth among all degree awarding institutes of Pakistan according to the Higher Education Commission-Pakistan



ranking. Times Higher Education World University Ranking 2023 by Subject declared University of Agriculture, Faisalabad the best university in Pakistan in the subject category of Agriculture and Forestry, and 66th university across the globe in the said category. As a public sector university, UAF prepares the next generation of researchers, managers, and leaders through its academic programs in agriculture and allied sciences. It generates new knowledge through innovative research and transfers to the people to ensure a sustainable and abundant agriculture, livestock, forestry, and fisheries within a healthy environment.

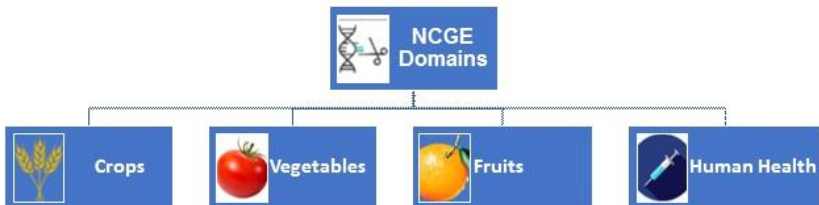
## Center for Advanced Studies in Agriculture and Food Security

Center for Advanced Studies in Agriculture and Food Security (CAS-AFS) at the University of Agriculture, Faisalabad was jointly designed and established by HEC and USAID in December 2014 and upgraded to D-8 Research Center in 2023. The initiative is aimed to build the capacity of academia to find innovative solutions to national and global challenges related to food and nutritional security. The Centre houses state-of-the-art research and teaching laboratories, fully equipped conference/lecture theatre, advanced computer and electronic labs and a dedicated library. In addition to conducting modern teaching and research, we are also convening policy dialogues, conferences, and training workshops for stakeholder consultation and broad dissemination of knowledge and technologies. The building has installed modern equipment (costing >\$2M) to support campus wide research in the areas of agriculture and food security.



## National Center for Genome Editing

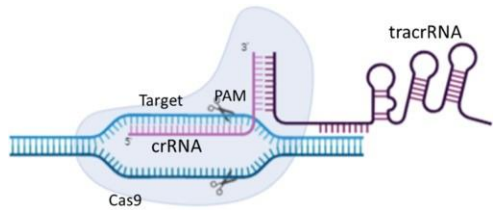
National Center for Genome Editing (NCGE) at CAS-AFS is a collaborative project between UAF and Pakistan Council of Scientific and Industrial Research (PCSIR) sponsored by the Ministry of Science and Technology. The project has been established to fully exploit the potential of genome editing to address emerging challenges to agriculture, food security, and human health. The project aims to mainstream the use of this technology to advance indigenous capacity and unleash related entrepreneurship and services. The project component at UAF is focusing on interventions in four domains i.e., crops, vegetables, fruits, and human health.



## Genome Editing

Technologies like CRISPR/Cas-mediated genome editing offer myriad ways to tweak genomes and help scientists to fulfil what they have been wishing for since the advent of molecular biology. The past decade witnessed an enormous adoption of this

technology in almost all branches of biology from agriculture to medicine and environment. After successfully deploying gene editing to modify simple traits, scientists are now embarking on more ambitious adventures in genomics to combat challenges of food security in the wake of increasing population and climate change adversaries.



## Genome Editing Workshop

To mainstream genome editing in biological research, scientists at NCGE (UAF and PCSIR-Lahore) are offering training programs to the professionals of public and private sectors involving agriculture and human health. Two one-week training courses have been held in February 2022 and May 2022 as comprehensive hands-on training programs for the nominees from public sector universities/Institutes of Pakistan. The programs covered both practical and theoretical aspects of genome editing technology and its applications. Due to the overwhelming response and interest among the scientific community across Pakistan, NCGE has made hands-on workshops as permanent feature of its strategic goals. In pursuance of this, an international hands-on training workshop is being held on May 06-10, 2024 for international audience.

## Workshop Objectives

International Hands-on training on genome editing aims to train young and early career researchers in academia to have a true hands-on experience of practicing basic techniques involved in genome editing experiments. It will:

- provide essential understanding of both theoretical and practical knowledge of genome editing technology.
- acquaint researchers about the potential of genome editing tools in different disciplines.
- walk through the basic gene editing workflow practically with their own hands in lab environment.
- enable participants to design genome editing experiments in their own research.

# Schedule

## DAY 1: INTRODUCTION TO GENOME EDITING

Time	Program
08:30am	Registration
09:00am	Recitation and Naat
09:30am	Address by Vice Chancellor
09:45am	Address by Guest of Honor
10:00am	Address by Chief Guest
10:30am	Tea Break
11:00am	History and development of Genome Editing (Prof. Dr. Holger Puchta, Karlsruhe Institute of Technology, Karlsruhe, Germany)
11:30am	Genome Editing as a precision breeding tool in Plants (Prof. Dr. Daniel Voytas, University of Minnesota, MN, USA)
12:00noon	Advanced applications of Genome Editing in medicine and human health (Dr. Brad Ringeisen, Executive Director, The Innovative Genomics Institute (IGI), University of California, Berkeley, CA, USA)
12:30pm	Q/A session
01:00pm	Lunch Break
02:00pm	Workshop objectives, layout and expected outcomes.
03:00pm	<b>Hands-on I:</b> Genomic Databases- Target Gene Identification and Gene Isolation (Dr Amen Shamim, Dr Zunaira Afzal)



Dr. Holger Puchta



Dr. Daniel Voytas



Dr. Brad Ringeisen

## DAY 2: DESIGNING TOOLS FOR CRISPR/CAS EXPERIMENTS

Time	Program
09:00am	<b>Hands-on II:</b> Bioinformatics tools in Target Site/Spacer Sequence/gRNA Designing (CRISPR-GE, CRISPRdirect, CHOPCHOP) (Dr Aftab Ahamd, Dr Atif)
10:45am	Tea Break
11:00am	<b>Hands-on III:</b> Bioinformatic Tools in Target Site/Spacer Sequence/gRNA Designing (Target site adaptor sequences, Target site confirmation, SnapGene, Primer designing) (Dr Aftab, Dr Iqrar)
01:00pm	Lunch Break
02:00pm	Exp. 1: Media/solutions/ buffers/ antibiotics prep
03:00pm	Exp. 2: Media handling and sterile conditions
03:30pm	Exp. 3: Bacterial culture preparation
04:00pm	Exp. 4: Competent cells preparation
05:00pm	City Tour

## DAY-3: CLONING OF CRISPR/CAS VECTORS

Time	Program
09:00am	<b>Hands-on IV:</b> In Silico Cloning- Gene of interest in CRISPR/Cas 9vector via Snapgene (Dr Aftab)
10:30am	Tea Break
11:00am	Exp. 1: Plasmid Isolation
11:45pm	Exp. 2: Restriction Digestion, and Gel electrophoresis
12:30pm	Exp. 3: Gel elution (Fragment isolation)
01:00pm	Lunch Break
02:00pm	Exp. 4: Insert preparation (Rampdown PCR: Annealing of oligos)
02:30pm	Exp. 5: Vector ligation (Backbone + Insert)
03:00pm	Exp. 6: Transformation in E. coli competent cells
03:30pm	Exp. 7: Culture Spreading + colony PCR
04:00pm	Exp. 8: Confirmation by Restriction Digestion
04:30pm	Exp. 9: Transformation in Agro-competent cells
04:50pm	Exp. 10: Primary culture

## DAY 4: TRANSFORMATION OF CRISPR CONSTRUCTS

Time	Program
09:00am	Developing Genome Edited Plants (Dr Iqrar Rana)
10:00am	Plant tissue culture
10:30am	Tea Break
11:00am	Exp. 01: Explant preparation and Agrobacterium mediated transformation.
12:30pm	Exp. 02: Particle bombardment
01:00pm	Lunch Break
02:00pm	Exp. 03: Transgene analysis
03:00pm	Exp. 04: qRT-PCR analysis
07:00pm	Conference Dinner

## DAY 5: CRISPR/CAS APPLICATIONS IN HUMAN HEALTH

Time	Program
09:00am	National and International regulations for GMOs and gene edited products. Social Issues in Gene Editing and Public Acceptance (Dr. Shaukat Ali Bhatti)
09:30am	Sherlock and LAMP based Diagnostics for Infectious Diseases (Dr Imran, Dr Ayesha)
10:30am	Tea Break
11:00am	Bacteriophages and Gene Editing; Therapeutics for Drug Resistant Pathogens (Dr Aamir , Dr Imran)
01:00pm	Lunch Break
02:00pm	Assessment of Learning
02:30pm	Closing Remarks by Vice Chancellor
03:00pm	Remarks by Chief Guest
03:30pm	Certificate Distribution
03:45pm	Group Photo

### Contact

**Dr. Iqrar Ahmad Rana**

Associate Professor

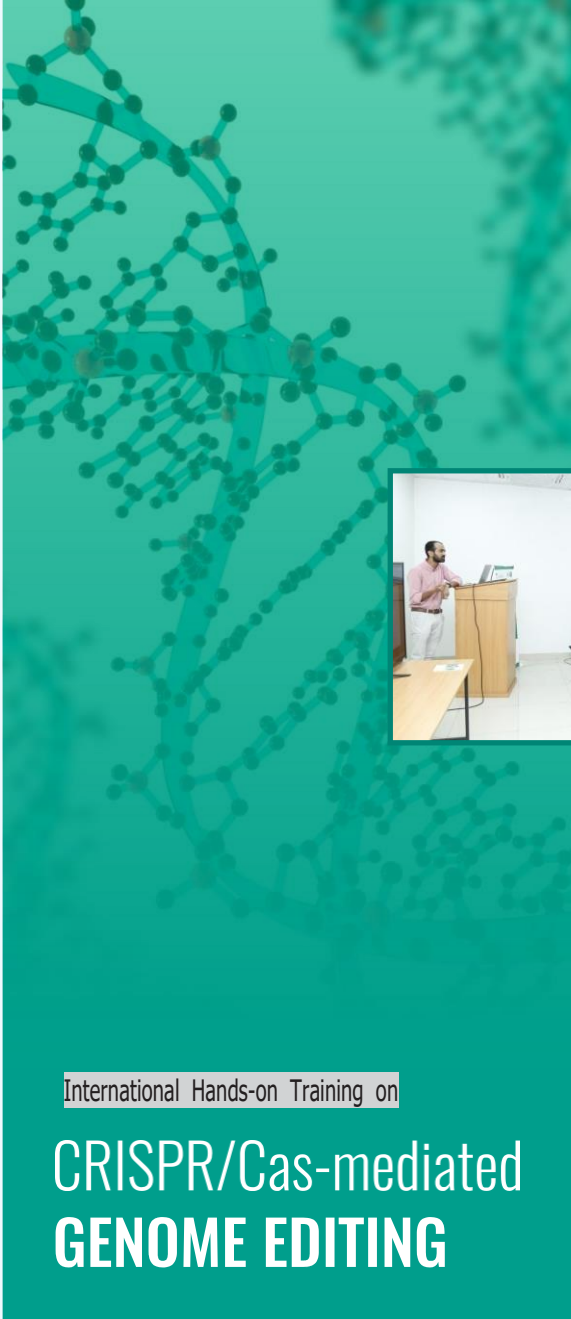
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**Dr. Sultan Habibullah Khan |Director|**

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