



Training Workshop on Integrated Nuclear and Complementary Approaches to Understanding the Nexus between Water and Nutrient Use Efficiency, Nutrition Security and Food Safety for Dryland Crops in a Changing Climate

Virtual Event
Via Microsoft Teams

26 November 2024 – 03 December 2024

Ref. No.: EVT2404747

Information Sheet

Introduction

Climate change has profound impacts on dryland crops, including water scarcity, temperature extremes, and yield variability, all intricately linked to resource use efficiency. Recent studies indicate that elevated temperatures together with increasing CO₂ levels not only adversely impact the crop yields posing threat to food security, but also diminish the nutritional quality of the food, necessitating advancements in crop breeding and precision agriculture techniques to optimize resource utilization and preserve the nutrition for both food and feed uses. Concurrently, shifting climate conditions can create environments conducive to mycotoxin-producing fungi and to increased uptake of heavy metals into plants, presenting contamination risks and compromising food and feed safety and nutritional security. IAEA promotes R&D in this space through nuclear science and applications to devise and deploy strategies that make dryland staples maintain their nutrient profiles, resilience to pest and pathogen incursions and deal with the anticipated elevated CO₂, water scarcity and temperature change, in conjunction with nuclear and complementary methods to detect, monitor, and control contaminants, safeguarding public health and ensuring compliance with food and feed safety standards for market access. By integrating these strategies, dryland agriculture can successfully navigate the challenges posed by climate change, ensuring both food security and safety, all while upholding the efficient use of water and nutrients.

This virtual training course will focus on nuclear and complementary technologies that can be applied to better address and mitigate the impact of changing climate conditions on water and nutrient use efficiency, nutrition, and laboratory analysis for food safety in key food and nutritional security crops.

Objectives

The objective of this virtual training course is to raise awareness and enhance capabilities in the use of nuclear and complementary techniques for understanding the nexus between water and nutrient use efficiency, nutrition security and food safety for dryland crops in a changing climate. The course will focus on how advancements in laboratory analysis and field experiments for the assessment of improved genetics, resource use efficiency, nutrition security and food safety can enable Member States to effectively respond to climate change-related challenges in drylands.

Working Language

English.

Expected Outputs

The expected outcome of the course will be well informed, trained personnel in the application of nuclear and complementary technologies for improved genetics, resource use efficiency, nutrition, and food safety laboratory analysis, to better address the challenges posed by climate change.

Demonstrate an understanding of the use of nuclear and complementary technologies for improved crop production, nutrition, and food safety.

Integrate advanced research and development methodologies and strategies to enhance the quality and effectiveness of scientific investigations.

Better understanding of the nexus between water and nutrient use efficiency, nutrition security, and food safety for dryland crops in a changing climate.

Structure

The training programme will comprise four modules: (1) Introduction to the nexus between water and nutrient use efficiency, nutrition security, and food safety for dryland crops in a changing climate, (2) The use of isotopic techniques to develop water and nutrient management strategies for mitigating the impact of climate change on crops, (3) Research and innovation to enhance climate resilience, nutrition and food

security through adaptation and mitigation solutions, and (4) Analytical approaches and considerations for monitoring key climate change-related chemical contaminants in food: mycotoxins and heavy metals.

The training will employ recorded lectures, video presentations of laboratory procedures and 'live' online question and answer sessions. Selected applications will be presented to provide the participants with basic to intermediate knowledge of techniques.

Topics

Module 1. Understanding the Nexus between Water and Nutrient Use Efficiency, Nutrition Security, and Food Safety for Dryland Crops in a Changing Climate.

Module 2. Isotopic techniques to develop water and nutrient management strategies for mitigating the impact of climate change on dryland crops.

- Challenges and solutions in soil and water management to enhance water and nutrient use efficiency in dryland crops under a changing climate
- Nuclear and complementary techniques for evaluating responses of water use efficiency to climate change
- Isotopic techniques to assess nitrogen use efficiency in dryland crops under climate change
- Role of water and nutrient management in mitigating declines in nutritional quality and ensuring food safety in dryland crops
- Specific challenges and opportunities in experimental design in agricultural research on soil and water management

Module 3. Research and innovation to enhance climate resilience, nutrition and food security through adaptation and mitigation solutions.

- Role of eco-physiology, phytohormones, carbohydrate metabolic and antioxidant enzymes in plant adaptation to drought stress
- Impact of elevated CO₂ on crops under progressive soil drying- case study on wheat
- Data analysis and determination of threshold value of progressive soil drying.
- Adaptation and mitigation tools and technologies for pest and disease management in a changing climate
- Next -generation tools and technologies for adaptive agriculture and climate ready crops
- Nutrition inclusive breeding under changing climate

Module 4. Analytical approaches and considerations for monitoring key climate change-related chemical contaminants in food: mycotoxins and heavy metals.

- Introduction on key climate change-related chemical contaminants in food
- Mycotoxins
 - Chemistry, formation, occurrence, and toxicity of mycotoxins
 - Regulatory provisions and standards (CODEX, EU-legislation, etc.)
 - Sampling requirements (lot sample, laboratory sample)
 - Sample preparation techniques

- Principles of liquid chromatography and mass spectrometry
- Multi-analyte mycotoxins determination in food with liquid chromatography–tandem mass spectrometry (LC-MS/MS) with isotope dilution
 - Rapid screening of mycotoxins in food, i.e., with portable electrochemical immunosensors
- Heavy metals
 - Occurrence and toxicity of heavy metals
 - Sampling and sample preparation considerations
 - Elemental profiling in food with Energy Dispersive X-ray Fluorescence Spectroscopy (ED-XRF)
 - Multi-element determination in food with Inductively coupled plasma mass spectrometry (ICP-MS)

Participation and Registration

This training course will be open for remote access from **26 – 29 November and 02 – 03 December 2024** using the virtual platform Microsoft Teams. All persons wishing to participate in the event must be designated by an IAEA Member State or should be members of organizations that have been invited to participate.

Each country is entitled to nominate up to **three (3) candidates** in line with the requirements described in the Participants Qualification and Experience.

Participants' Qualifications and Experience: Countries are invited to nominate candidates in the fields of expertise below for the consideration of the Joint FAO/IAEA Centre's selection committee. (Please note: A total of maximum three candidates per country can be nominated, with only one candidate per field of expertise).

Field of Expertise 1 – Soil and Water Management and Resource Use Efficiency

Eligible candidates are scientists and technicians with a background in soil science, agricultural water management or any related discipline and experience in mitigation of climate change impacts on dryland crops.

Field of Expertise 2 – Plant breeding and associated biotechnologies

Researchers working on genetic innovations including plant breeding and protection, genomics, and allied disciplines for nutritional sensitive agriculture.

Field of Expertise 3 - Food Safety Laboratory Analysis

Eligible candidates are representatives of analytical laboratories (laboratory managers/analysts) in charge of national food safety monitoring plans, or from research laboratories in the field of testing for food safety.

Registration through the InTouch+ platform:

In order to be designated by an IAEA Member State or invited organization, participants are requested to submit their application via the InTouch+ platform (<https://intouchplus.iaea.org>) to the competent national authority (Ministry of Foreign Affairs, Permanent Mission to the IAEA or National Atomic Energy Authority) or organization for onward transmission to the IAEA by **30 September 2024**, following the registration procedure in InTouch+:

1. Access the InTouch+ platform (<https://intouchplus.iaea.org>):
 - Persons with an existing NUCLEUS account can [sign in here](#) with their username and password;

- Persons without an existing NUCLEUS account can [register here](#).

2. Once signed in, prospective participants can use the InTouch+ platform to:

- Complete or update their personal details under ‘Basic Profile’ and upload supporting documents;
- Search for the relevant event (EVT2404747) under the ‘My Eligible Events’ tab;
- Select the Member State or invited organization they want to represent from the drop-down menu entitled ‘Designating Authority’ (if an invited organization is not listed, please contact InTouchPlus.Contact-Point@iaea.org);
- Based on the data input, the InTouch+ platform will automatically generate Participation Form (Form A).
- Submit their application.

Once submitted through the InTouch+ platform, the application, together with the auto-generated Form A, will be transmitted automatically to the required authority for approval. If approved, the application, together with the Form A, will automatically be sent to the IAEA through the online platform.

For additional information on how to apply for an event, please refer to the [InTouch+ Help](#) page. Any other issues or queries related to InTouch+ can be sent to InTouchPlus.Contact-Point@iaea.org.

Selected participants will be informed in due course on the procedures to be followed to access the course.

Candidates who successfully complete the virtual training course will receive a certificate.

No registration fee is charged to participants.

Participants are hereby informed that the personal data they submit will be processed in line with the [Agency’s Personal Data and Privacy Policy](#) and is collected solely for the purpose(s) of reviewing and assessing the application and to complete logistical arrangements where required. The IAEA may also use the contact details of Applicants to inform them of the IAEA’s scientific and technical publications, or the latest employment opportunities and current open vacancies at the IAEA. These secondary purposes are consistent with the IAEA’s mandate.

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Subsequent correspondence on scientific matters should be sent to the Scientific Secretaries and correspondence on other matters related to the event to the Administrative Secretary.