Highlight Note on the Side Event of the UNFSS Science Days

Science, Technology and Innovation for Food Systems Transformation
The role of nuclear and related technologies

The side event of the UNFSS Science Days focusing on the role of nuclear technologies in food systems transformation was held on 5 July 2021. The event was jointly organized by the Joint FAO/IAEA Centre of Nuclear Techniques in Food and Agriculture in cooperation with five national ministries/institutions. Representatives from the Joint Centre and partner institutions provided evidence- and science-based information on how nuclear techniques have been contributing to food systems transformation. Najat Mokhtar, Deputy Director General of IAEA, and Ismahane Elouafi, Chief Scientist of FAO, delivered opening and closing remarks, respectively. Highlights on the five topics of the side event are summarized below.

- **Animal production and health practices to enhance food security**

Nuclear and related tools for sustainable livestock production have been applied in many countries. These include isotopic tracer techniques to evaluate feeding habits, dry matter intake and digestibility, for efficient utilization of local resources as livestock feed to increase productivity and mitigate against climate change; gene-based tools to select superior breeding stock and match animal genotype to production environment; radio-immunoassays improve reproductive efficiency of selected animals for sustainable productivity; isotopic tracers to enable early detection, prevention and control of transboundary animal and zoonotic diseases; and irradiated vaccines to keep animals safe from various diseases and parasites.
Success stories from Bangladesh and Lesotho in improving livestock productivity and animal disease control were demonstrated.

- **Climate-smart agricultural practices for sustaining agricultural production**

To tackle the key challenges that face food and agriculture, farming can only be sustainable and profitable if farmers use climate-smart agricultural practices. A range of climate-smart agricultural practices using nuclear and isotopic techniques have been developed to build the capacity of Member States, covering enhancing crop food production; reducing emissions of greenhouse gases; improving soil fertility; increasing soil resilience to conserve more nutrients and water; minimizing land degradation; and improving ecosystems and livelihoods of farmers.
Greater production of rice, maize and cassava in Lao People's Democratic Republic was presented as a good example of climate-smart agricultural practices.

- **Integrated pest management in agriculture and human health**

The sterile insect technique (SIT), as part of an area-wide integrated pest management (AW-IPM) approach not only contributes to improved crop production as well as improved animal and human health, but also provides benefits to human well-being and the environment through reducing chemical insecticide application. In addition, AW-IPM provides instruments to facilitate trade.
A review of SIT programmes on insect pests of agricultural, veterinary and human health importance was made and two examples presented in detail, including the recent eradication of Mediterranean fruit fly in the Dominican Republic and the ongoing AW-IPM programme on dragon fruit in Viet Nam.

- **Food safety and quality for consumer protection, trade and food security**

Food safety, an important pillar of food security, consumer protection and trade, requires a systems approach, where operational laboratories and surveillance programmes are key components. The contributions of nuclear science to this system were presented, including applications for the control of a wide range of chemical residues and contaminants; food irradiation for post-harvest and industrial purposes; and technology to ensure food authenticity.
Examples of the application of nuclear/isotopic technologies in several Member States were given, and Uganda shared its experience in applying nuclear technology to strengthen food safety.

- **Crop improvement in support of food and nutrition security and biodiversity**

Plant breeding using induced genetic diversity has been used as a tool for improvement of crop varieties with desired agronomic traits such as high yield, nutritional quality, resistance to pests and diseases, tolerance to adverse climatic conditions such as extreme temperatures and drought, in various agricultural crops. These mutant cultivars have been released for planting in numerous countries throughout the world. Moreover, with rapid advances in technology, especially in genomics, plant breeding using induced genetic diversity has been placed in a position to benefit from functional genomics that link gene to the phenotype, which in turn provides information that can be used to support faster and more precise crop improvement.
New rice variety development using mutation building in Bangladesh was presented as a case study.