IAEA: Contributing to evidence base for improved diet quality and nutrition security through isotopic and nuclear techniques. Victor Owino and Kofi Bimpong

1. Nutrition security is a function of many factors within a complex and dynamic food systems influenced by several external forces like climate change, dietary transition, etc.
2. Diet has two important dimensions
   i) Adequacy – enough quantity to meet recommended nutrient levels to sustain the human system beyond daily maintenance
   ii) Quality – balance and bioavailability of nutrients for use by the human body
3. Largely plant-based diets in Asia and other LMICs associated with nutrient deficiencies and later risk of NCDs
4. More evidence needed on nutrient absorption from diets and link to health and nutrition outcomes (such as body composition, gut health, etc). to design policy frameworks and interventions to guarantee optimal diet quality.
5. Measuring diet quality is not easy as it has many dimensions
   i) Digestibility of the food – influenced by food matrix (dietary fibre), processing or preparation method
   ii) Bioavailability of key nutrients – influenced by nutrient composition and presence of anti-nutrients
   iii) Digestion capacity of the human gut – influenced by disease/environment and in turn influences nutrient absorption
6. IAEA supports Member States, via either coordinated research projects or Technical Cooperation projects, to use nuclear techniques including stable isotopes to accurately assess different dimensions of diet quality
   i. - Stable isotopes of iron and zinc have been used to assess absorption of these micronutrients and to evaluate the efficacy of various programmes – fortification, biofortification, for example a study in India showed that pearl millet biofortified with iron and zinc covered the daily requirements for children.
      - Stable isotope labelled vitamin A can be used to measure changes in vitamin A
      body stores as a result of interventions addressing vitamin A deficiency and to make sure the right amounts are being consumed – example from Indonesia, assessing impact of edible oil fortification with vitamin A (ongoing)
7. An isotope-based sucrose breath test helps with assessing sucrose digestion as an indicator of gut health; in use in the Philippines to assess gut health in light of high stunting rates
   - A new stable isotope technique has been used in India, Thailand and other regions to assess protein digestibility in legumes commonly consumed in those countries and will be applied in a new IAEA supported Asian regional project to assess how protein quality links to human health outcomes.
8. Ability to measure multiple dimensions of diet quality in population surveys is important; stable isotope techniques may be used to validate biochemical markers and other techniques before wider application; multi-disciplinary/sectoral partnerships needed.

9. Specific breeding for nutrition has been limited, as food security remains predominant driver (yield enhancement/stability and biotic/ abiotic stresses)
10. Mutation, which is a heritable change in the genetic material of a living organism can lead to development of new germplasms which can be subsequently selected for better traits i.e. Nutritional quality, and preferred end-user characters
11. Nutrition enhancement projects at IAEA – very few in TCPs (cassava, rice, maize)

12. New proposed CRP aim to use nuclear techniques to generate diversity in underutilized crops for productivity enhancement for selection and release to farmer fields
13. Develop capacity in participating Member States