

# **Joint FAO/IAEA Division of Nuclear Techniques in Food and Agriculture Sub-programme on Soil and Water Management & Crop Nutrition Section**

## **Project areas of the SWMCN sub-programme (IAEA PWB 2004-2005)**

Under the operational IAEA Programme of Work and Budget (PWB) 2004-2005, the SWMCN sub-programme is involved in the following project areas:

### **E.1.01. Development of integrated plant nutrient and water management practices for increasing soil fertility and crop yields**

Rationale: Isotope methods and neutron probes provide precise and specific data enabling estimation of sources, movements and balances of water and nutrients in cropping systems as well as interactions between them. They therefore help to identify practices that optimise the efficiency with which natural resources and external inputs are used for crop production. Support and co-ordination of research by NARS will be provided by the Agency to assess the usefulness of more recently developed methods based on natural variations in the abundance of stable isotopes and to conduct comparative assessments between nuclear and non-nuclear techniques for soil water measurement so that appropriate guidelines can be provided on methods and strategies to ameliorate major agronomic and environmental constraints to increased production in developing countries. The Agency will also provide technical direction and support for the adoption of established techniques, methods and guidelines by NARS to improve soil, water and nutrient management practices on farmers' fields through the formulation and implementation of technical co-operation projects and related human capacity building.

Objective: To improve crop production systems in a sustainable manner by using nuclear methods to identify and promote appropriate soil, nutrient and water management practices

### **E.1.02. Development of soil management and conservation practices for sustainable crop production and environmental protection**

Rationale: Soil erosion, acidification and reduced organic matter content adversely affect soil fertility and therefore are major constraints to crop production in many developing countries. Isotope techniques provide precise and specific means for assessing soil erosion and sedimentation, and for gaining a better understanding and evaluation of carbon sequestration, nutrient and water dynamics in conservation agricultural practices. Support and co-ordination of research by NARS is required to assess promising management practices in a wide range of environments so that appropriate guidelines can be developed. Technical direction and support for the adoption of established techniques and guidelines by national crop production institutes is required to improve soil management and conservation practices on farmers' fields through the formulation and implementation of technical co-operation projects and related human capacity building.

Objective: To improve soil conservation, sustainable crop production and environmental protection by identifying and promoting appropriate practices using isotope techniques.

#### **E.1.05. Identification and development of crop germplasm with superior resource use efficiency and nutritional value and adapted to harsh environments**

Rationale: Most countries in the tropics and subtropics have weather patterns and soil characteristics that constrain crop production over large tracts of land. Thus, a major challenge for making better use of these marginal lands is to select, improve and develop crop genotypes that can produce under conditions of high temperatures and low rainfall or where soils suffer from salinity or acidity or have been “mined” of nutrients. Significant opportunities now exist for meeting this challenge by harnessing nuclear techniques in conjunction with newly emerging techniques in cellular and molecular biology. In this project, radiation will be used to generate crop plants with increased variation in response to salinity and drought, following selection in both laboratory and field conditions including the use of natural variation of  $^{13}\text{C}$ . This work will be complemented by the application of molecular marker techniques to characterize and identify mutated genes controlling stress responses, and by the use of  $^{54}\text{Mn}$  for determining the mechanism of Mn tolerance of plants under acidic conditions. Moreover, since isotope and related nuclear techniques also provide unique quantitative information for the evaluation of improved crop genotypes under varying stress conditions and identifying appropriate agronomic practices that need to be integrated to mitigate stresses, support and co-ordination of research will be provided to develop and test these technologies for improving crop production by farmers in harsh environments.

Objective: To enhance Member States’ capacity to identify and develop crop germplasm adapted to harsh environments using induced mutations and molecular and isotope screening techniques.

In continuation the various ongoing projects of the SWNM Sub-programme under the IAEA Research Contract and the Technical Co-operation Programmes are presented. These main Agency’s Programmes are also briefly described. In Table 1, the CRP projects are grouped according to the project areas (IAEA PWB 2004-2005) mentioned above while the TC projects are listed in Table 2 by geographical areas.