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Nuclear Techniques in Food and Agriculture

Soils Newsletter

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Water use efficiency - An important feature in sustainable agriculture

To Our Readers

The Soil and Water Management & Crop Nutrition (SWMCN) subprogramme (abbreviated as the Soils subprogramme), implemented by the Soil and Water Management & Crop Nutrition (SWMCN) Section and the Soil Science Unit (SSU) of the FAO/IAEA Agriculture and Biotechnology Laboratory in Seibersdorf, is currently engaged in new initiatives on water management in agriculture through both the regular and technical cooperation programmes of the Agency. The subprogramme continues to receive requests for training in the use of isotopes and nuclear techniques in soil water management. During the past few months, the subprogramme has been planning a Consultants Meeting on *'Assessing the Impact of Irrigation Management Technologies on Water Use Efficiency and Crop Water Productivity Using Isotopic and Nuclear Techniques'*. This CM will be organized in late June (26-29 June 2006) to formulate a coordinated research project to address water management in agriculture. Currently on average, around 75-80% of the worldwide fresh water resources are consumed by irrigated agriculture. This level of consumption cannot be sustained in the future because of increasing competition for water from other sectors and the variation in rainfall patterns and global warming as a result of climate changes.

IAEA International Atomic Energy Agency

Approximately one-third of the population of developing countries live in regions where there are insufficient water supplies to meet the expected needs for agricultural, domestic, industrial and environmental purposes by the year 2025. Thus improving water management in agriculture is crucial for increased global food security and the alleviation of rural poverty. This will require the development and testing of novel water management practices and soil moisture conservation measures at farm and catchment levels, as well as an increase in crop water productivity and water use efficiency.

The IAEA International Workshop on "The Use of Nuclear Techniques in Addressing Soil-Water-Nutrient Issues for Sustainable Agricultural Production", which the Soils subprogramme has planned during the past year, will be organized on 9th July 2006 at the 18th World Congress of Soil Science in Philadelphia, USA. I look forward to meeting scientists from Member States to share information and experience on the use of nuclear techniques in integrated soil-water-nutrient-plant management. The event will provide an excellent opportunity for the Soils subprogramme to promote the activities of the Agency in assisting Member States in the use of nuclear techniques to develop improved soil, nutrient and water management practices for sustainable intensification of production systems, as well as conservation of natural resources.

The Soils subprogramme is still understaffed, (please see p. 4 for staff status and p. 5 for information on staff movement) but I am proud of the fact that all team members plus ex-staff members (Felipe Zapata and Pierre Moutonnet) who have returned to lend their support have worked hard to successfully deliver all outputs. The subprogramme is currently implementing a coordinated research project on "Selection and Evaluation of Food Crop Genotypes Tolerant to low Nitrogen and Phosphorus Soils through the Use of Isotopic and Nuclear–related Techniques". The overall objective of this project is to identify crop genotypes with high N-P resource use recovery from soils, which will help to reduce the demand for fertilizers and prevent the accumulation of soil nutrients which can be lost as runoff or deep drainage into receiving waters.

A major activity during the past few months has been the preparation of the 2004-2005 programme implementation report and the preparation of the programme of work and budget (PWB) for the 2007-2008 biennium. The successful implementation of the Soils subprogramme is a product of dedicated effort, not only from staff members but also from you, our valuable researchers. Some examples of the achievements of the subprogramme include assisting several Member States in Latin America and Africa to identify acid-tolerant and phosphorus-efficient crop genotypes and develop optimum management practices for correcting soil acidity constraints. Also twenty-seven laboratories were involved in both coordinated research (CRP) and regional technical cooperation projects using fallout radionuclides to quantify the beneficial effects of different land management practices such as conservation tillage and crop residue incorporation in reducing soil erosion. Such practices can effectively reduce soil loss by 50%, representing an annual benefit of 100 $US per hectare in terms of maintenance of soil productivity and prevention of pollution in receiving waters. This represents annual savings of 45 billion dollars for Asia and nearly 25 billion dollars for Africa.

Building on these accomplishments, the subprogramme is planning activities in 2008-2009 that will use its expertise to address land-water management issues at a catchment scale to enhance sustainable agricultural production, preserve land-water-soil nutrient resources and protect the environment.

The subprogramme has also been assigned thirty-two new IAEA technical cooperation project concepts for the 2007-2008 biennium, covering a range of areas, including soil erosion, conservation agriculture, land degradation, conservation and efficient utilization of land and water, plant nutrition and integrated soil-water-nutrient-plant management. Such projects when implemented will provide an opportunity for the Soils subprogramme to be directly involved with Member States in addressing key issues in sustainable agricultural systems.

With the range of activities that the subprogramme will be addressing, involving land and water management and evaluation of the impacts of agricultural activities on environmental quality, I continue to look for your valuable inputs to ensure that our activities remain relevant to the needs of Member States. To provide a forum for this communication, I plan to introduce a column entitled "Feature Article from our Readers" in our next newsletter. Please email me at m.nguyen@iaea.org with comments and suggestions. Better still, your contribution of a feature article will be extremely welcome.

I would like to thank you all for your continuing support and send my best wishes to you and your families.

Long Nguyen

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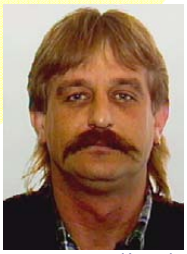
N. Jagoditsch

Mr. Joseph Adu-Gyamfi, joined the Soil Science Unit in Seibersdorf on 15 March 2006 as Soil Scientist/Plant Nutritionist to fill the vacant position by Ms Lee Heng. Joseph, a Ghanaian, has a Ph.D. in Plant Nutrition & Crop Physiology from the University of Hiroshima, Japan.

He has expertise in plant nutrition, soil fertility, nutrient-physiology and soil-water-plant interactions, with major focus on mechanisms of tolerance by crops to nutrient and other abiotic stress factors for increased crop productivity in dryland and rainfed agriculture.

Prior to joining IAEA, he worked with the International Crops Research Institute for the Semi Arid Tropics (ICRISAT) locations in India, Niger and Nigeria as Principal Scientist, Team Leader of Government of Japan/ICRISAT Collaborative Project, ICRISAT Country Representative, and Regional Theme Coordinator for West and Central Africa leading a team of scientists in the Crop Physiology Unit and coordinating the regional research project on integrated natural resources management. Joseph has extensive experience in the use of nuclear techniques to assess mechanisms of nutrient and water uptake and use, translocation of photo-assimilates at low nutrient availability by crops and the mobilization of soil nutrients (especially P) by organic acids from root exudates of crops. Joseph also held several other positions as Senior Research Scientist at the CSIR (Ghana), Visiting Scientist, (Japan), Technical Expert/Advisor (Danida–funded Projects in the United Republic of Tanzania and Malawi), Consultant to FARA (Forum for Agricultural Research in Africa), and more recently as Senior Lecturer at the University of Ghana. We look forward to working with Joseph in the Soil Science Unit (SSU) and to his contribution to the joint FAO/IAEA Programme.

Mr. Emil Fulajtar joined the Soil and Water Management & Crop Nutrition Section Section on 7 March, 2006 as Soil Scientist, to fill the post vacated by Claude Bernard. Emil has graduated in geography and has a degree in soil science (M.Sc. from University of Ghent, Belgium, 1993 and Ph.D. from the Commenius University in Bratislava, Slovakia, 2003). His field of expertise is in soil science and particularly in soil erosion. His experience with nuclear techniques began by studying the nitrogen cycle with the use of ^{15}N and later he specialized in soil erosion assessment through the use of FRN techniques (^{137}Cs, ^{7}Be and ^{210}Pb). Emil was involved with the IAEA in the past years through his participation in CRP D1.50.05. Before joining the IAEA, Emil worked as research worker at the Soil Science and Conservation Research Institute in Bratislava (1987-2001) and as Science Officer at the European Commission and European Science Foundation (2001-2005) where he gained experience in management of international research projects with agricultural and environmental objectives (such as soil erosion, denitrification, water pollution, soil-rhizosphere interaction, microbial inoculents in agriculture and environment, soil remediation, agricultural contribution to eutrophication, etc). We welcome Emil to the Section and wish him a successful tenure in the Joint FAO/IAEA Programme.

Ms. Maitane Melero Urzainqui joined the Soil Science Unit of the Agency's Laboratories Seibersdorf on 11 January 2006 as Temporary Assistant. She will assist the research and training activities on soil erosion, in support to the Soils subprogramme. Maitane is an Agronomical Engineer specialized in Soil Science at the Universidad Pública de Navarra (Spain). She completed her Masters degree at the Universität für Bodenkultur Wien (Austria) with a thesis entitled 'Runoff effects on soil erosion from a silt loam'. Before joining the SSU she worked with Universität für Bodenkultur Wien as Laboratory and Field Assistant on soil erosion studies and soil analyses.

Mr. Norbert Jagoditsch joined the Soil Science Unit on 24 April 2006 as a Technical Attendant. Norbert has 15 years of experience at the IAEA Seibersdorf Laboratories, first in the Soil Science Unit (1990-2000) and later in the Entomology Unit (2001-2006), both at the FAO/IAEA Agriculture & Biotechnology Laboratory. Norbert will support the implementation of greenhouse and field experiments for the Soils subprogramme. The team welcomes Norbert back into the SSU.

Mr. Claude Bernard after two years of service with the Soil and Water Management & Crop Nutrition Section Section has returned to his previous employer at a higher position as Research Director. Claude acted as a project officer for two coordinated research projects (CRPs) on 'Assess the Effectiveness of Soil Conservation Techniques for Sustainable Crop Production Systems Using Fallout

Radionuclides' and on 'Integrated Soil, Water and Nutrient Management in Conservation Agriculture'. He also involved as technical officer for a technical cooperation (TC) project. We wish him well in is new position.

Mr. Felipe Zapata, a former staff member has been back with the IAEA since January 2006 to assist the Soils subprogramme with managing coordinated research and technical cooperation projects. These have previously been managed by Mr. Rachid Serraj. Felipe will conclude his assignment in early September 2006. His dedication and excellent inputs will be sorely missed by the Soil and Water Management & Crop Nutrition Section and Soil Science Unit.

FORTHCOMING EVENTS

Research Coordination Meetings (RCMs) of FAO/IAEA Coordinated Research Projects (CRPs)

Second RCM of CRP on Integrated Soil, Water and Nutrient Management for Conservation Agriculture (D1.50.09)

11-15 September 2006, Rabat, Morocco

Scientific Secretary: Emil Fulajtar

The second RCM on the 'Integrated soil, water and nutrient management for conservation agriculture' will be organised by University Moulay Ismail, Meknes, with the collaboration of CNESTEN (National Center of Nuclear Sciences and techniques in Rabat) in Rabat, Morocco from 11-15 September 2006.
The main objective of the second RCM will be to present and evaluate the results obtained since the 1st RCM. The meeting will provide the information for mid-term assessment of CRP and formulate the work plan for 2007-2008.

First RCM of CRP on Selection and Evaluation of Food (Cereal and Legume) Crop Genotypes Tolerant to Low Nitrogen and Phosphorus Soils through the Use of Isotopic and Nuclear-Related Techniques (D1.50.10)

16-20 October 2006, Vienna International Centre, Vienna, Austria

Scientific Secretary: Joseph Adu-Gyamfi

Sixteen participants namely ten research contractors, two technical contractors, and 4 agreement holders are expected to attend the first RCM of this CRP. The main purpose of the meeting will be to review the overall work plan of the project, to examine the experimental plans of the participants and to establish standardised methodologies and protocols to be utilized by the network in accordance with the work plan of the project. To facilitate this process, all participants will be requested to present a report of their ongoing work and the activities planned for the CRP. A workshop session on relevant isotopic and related techniques will be held in the Agency's Laboratories at Seibersdorf.

Consultants Meetings

Consultants Meeting on Assessing the Impact of Irrigation Management Technologies on Water Use Efficiency and Crop Water Productivity Using Isotopic and Nuclear Techniques

26-29 June 2006, International Atomic Energy Agency, Vienna International Centre, Austria.

Scientific Secretary: Long Nguyen

Scope and issues:
Competition among different sectors for scarce water resources and increasing public concern on water quality for human health, livestock performance and industrial activities, including tourism have focussed more attention on water management in agriculture. In many parts of the world, the agricultural sector is the predominant user (75-80%) of freshwater resources. Improving water use efficiency in agriculture will require an increase in crop water productivity through the use of novel irrigation technologies and an improvement in water management practices and soil moisture conservation measures at both farm and catchment levels.

Limited information is available on: (i) crop water productivity and water use efficiency under different irrigation technologies, (ii) the extent and proportion of evapotranspiration (ET) as evaporation and transpiration for different crops under different irrigation and soil-plant management conditions (e.g. planting density and cropping systems), (iii) sources of water from different soil depths taken by plants and (iv) off-site losses of water through subsurface flows or deep drainage below the root zone under different irrigation conditions. This information is urgently needed to ensure sustainable irrigated agricultural systems. Off-site losses of water can result from (a) either inappropriate land management practices to capture a substantial part of the rainfall within an agricultural landscape and retain it in the plant rooting zone or (b) excessive use of irrigation water. Such losses not only lead to water wastage but also potential hazards of soil salinity and water pollution resulting from the transport of nitrate, phosphate, sediments and agro-chemicals to receiving water bodies.

In accordance to the IAEA programme of work and budget 2006-2007, the Soil and Water Management & Crop Nutrition Section plans to develop a coordinated research project (CRP) under the project E.1.08 to use isotopic, nuclear and associated non-nuclear methods to quantify and better identify the pathways and fate of water (and nutrients) within the soil-plant continuum, under different irrigation systems. This CRP will link closely with and complement the project proposal of the Isotope Hydrology Section, which focuses on hydrological pathways and fluxes of water and nutrient transport in deep drainage beyond the plant-rooting zone under different irrigation water management practices at the catchment scale. The outcome will be to improve agricultural water use efficiency and crop water productivity and at the same time minimize water wastage through evaporation; deep drainage and off-site

runoff, thus reducing/mitigating agricultural impacts on the water quality of adjacent/downstream water bodies.

Data obtained from the proposed CRP will be used for refining inputs/parameters and validating/testing of the FAO's crop water productivity model (CWP-Model) under a wide range of situations. This model (brand name AquaCrop) is a timely response by FAO to the increasing need for a dynamic tool to predict crop water productivity in agricultural production systems. It was developed as an addition to the revised publication FAO Irrigation and Drainage, Paper Number 33 to predict crop yield response to water not only under optimal, but also suboptimal (e.g. rain-fed and dry land systems) water supply conditions, where crops are exposed to the risk uncertainties and extreme climatic events, which may provoke a wide range of variations in harvestable product.

Objectives:

- To identify key research areas in irrigation management technologies and soil-water management measures that will enhance effective water management tools for optimum agricultural crop water productivity in Member States.
- To review recent advances in isotopic/nuclear and associated non-isotopic/non-nuclear techniques that will be used to investigate the effects of irrigation technologies and soil management practices on the cycling of water (and nutrients) within the soil-plant continuum, the partition of evapotranspiration into plant transpiration and evaporation, and fluxes of water (and nutrients) through and beyond the rooting zone. Stable isotopes such as ^{18}O, ^{2}H and ^{15}N at natural abundance will be used for tracking and quantifying water and nitrogen movement within and beyond the soil-plant continuum and to identify sources of water transpired by plants.
- To develop a coordinated research project, that seeks to obtain information and develop management tools for improving crop water productivity and water use efficiency with minimum off-site water (nutrient) wastage and potential environmental harzards. This CRP will establish a close link with a proposed CRP from the Isotope Hydrology Section, which focuses on the use of isotopes to understand hydrological pathways and fluxes below the plant rooting zone at the catchment scale.

FAO/IAEA International Workshop on the Use Nuclear Techniques in Addressing Soil-Water-Nutrient Issues for Sustainable Agricultural Production

9 July 2006, Philadelphia, Pennsylvania, USA

Scientific Secretary: Long Nguyen

The Joint FAO/IAEA Division of Nuclear Techniques in Food and Agriculture will host a workshop on 'The Use of Nuclear Techniques in Addressing Soil-Water-Nutrient Issues for Sustainable Agricultural Production' at the 18th World Congress of Soil Science to be held in Philadelphia, Pennsylvania, USA. This workshop on 9 July 2006 will provide an excellent opportunity for participants to exchange information on nuclear techniques in agriculture and to attend the 18th World Congress of Soil Science, which covers a range of research and technical issues highly relevant to the participants.

The following themes will be covered at the FAO/IAEA workshop on 9 July:

- The use of isotopic tracers and soil moisture neutron probes to quantify stocks and flows of carbon, nutrients, water and soil in cropping systems.
- The use of isotopic markers or tracers in germplasm selection or breeding programmes for enhanced tolerance to abiotic stresses.
- Soil carbon sequestration and conservation agriculture in mitigating soil erosion, fertility degradation and desertification.
- Agricultural water management and productivity (crop water productivity and agricultural water resource assessment/measurement).
- Integrated soil-nutrient management in agro-ecosystems (e.g., use of crop residues and fertilizer utilization efficiency and losses to environment).

Further information on the workshop and the 18th World Congress of Soil Science can be reviewed at http://www.18wcss.org

Non-FAO/IAEA Meetings 2006

- 18th World Congress of Soil Science. Frontiers of Soil Science: Technology and the Information Age, Philadelphia, Pennsylvania, USA. 9-15 July 2006. Contact the Organizing Executive Committee at http://www.18wcss.org
- Plant Nutrition meets Plant Breeding. First Conference of the German Society for Plant Nutrition – DCP (Annual Meeting) and the Research Centre Biotechnology & Plant Breeding Uni Hohenheim – FSP (21st Colloquium), 26-28 September 2006. University of Hohenheim, Stuttgart, Germany. For information, please visit http://www.uni-hohenheim.de/DGP-FSP2006/EN/index.html
- 4th Australian Controlled Traffic Farming Conference, Ballarat Victoria Australia, 27-29 September 2006. To receive more information and to express interest in presenting a paper at the conference, please visit www.actfa.net

- International Sediment Initiative Conference. Organized by UNESCO, will be held in Khartoum, Sudan 12-15 November 2006. Contact: P.O. Box 1244, Khartoum 11111, Sudan, Tel:(+249 183) 779599- (+249 183) 786770, Fax:(+249 183) 797758, For information, please visit http://www.unesco.org/water/ihp/events/sudan_isic/brochure.pdf

TECHNICAL COOPERATION PROJECTS

Operational Projects and Technical Officers responsible for implementation

Project Number	Title	Technical Officer
ALG/5/020	Combating Desertification	F. Zapata
ALG/5/021	Optimising Irrigation Systems and Surface Water Management	L.Nguyen
CHI/5/048	Integrated Watershed Management for the Sustainability of Agricultural Lands	L. Mabit
CMR/5/013	Use of Nuclear Techniques in Soil Nutrient and Water Studies	F. Zapata
CPR/5/015	Assessment of Soil Erosion and Effectiveness of Soil Conservation Measures	E. Fulajtar
ECU/5/022	Efficient Use of Nitrogen Fertilizers in Flower Production	F. Zapata
GHA/5/032	Enhancing Production and Use of Cassava	F. Zapata
HAI/5/003	Enhancing Crop Productivity through the Application of Isotope Nuclear Techniques	F. Zapata
IVC/5/029	Improvement in Yield of Plantain and Cassava through the Use of Legume Cover Crops	F. Zapata
JAM/5/009	Developing Soil Fertility Management	F. Zapata
KEN/5/023	Combating Desertification Using Nuclear Technology	F. Zapata
KEN/5/026	Isotope Techniques for Assessment of Water and Nitrogen Use Efficiency in Cowpea and Maize Intercropping Systems	J. Adu-Gyamfi
LIB/5/010	Establishing a Drip Irrigation-fertigation System Using Nuclear Techniques	J. Adu-Gyamfi
MAR/5/014	Management Practices for Increased Efficiency of Fertilizers and Improved Productivity of Saline Soils	F. Zapata
MON/5/014	Application of Isotopes in Soil and Plant Studies	G. Hardarson
NAM/5/008	Increasing Crop Productivity and Resource Use Efficiency in the Northern Communal Areas	F. Zapata
PHI/5/031	Assessment of Erosion and Sedimentation Processes for Effective Formulation of Soil Conservation and Water Quality Protection Measures	E. Fulajtar
RAF/5/048	Combating Desertification in the Sahel	E. Fulajtar
RAS/5/043	Sustainable Land Use and Management Strategies for Controlling Soil Erosion and Improving Soil and Water Quality (RCA)	E. Fulajtar
SEN/5/028	Enhancement of Biological Nitrogen Fixation and Phosphorus Use Efficiency in Cowpea under Drought Conditions	G. Hardarson
SIL/5/008	Contribution of Nitrogen Fixing Legumes to Soil Fertility in Rice-based Cropping Systems	G. Hardarson
SIL/8/002	Improved Water Management Technologies in the Inland Valley Agro-Ecology	J. Adu-Gyamfi
SLO/5/002	Protecting Groundwater and Soil against Pollutants Using Nuclear Techniques	J. Adu-Gyamfi
SRL/5/038	Application of Isotope Techniques for Soil Erosion Studies	E. Fulajtar
TAD/5/002	Assessment of Soil Erosion and Sedimentation for Land Use	E. Fulajtar
TUR/5/024	Improving Crop Productivity through Nuclear and Related	L. Nguyen

Project Number	Title	Technical Officer
	Techniques	
UGA/5/025	Integrated Nutrient Management for Increased and Sustainable Crop Production on Smallholder Farms	L. Nguyen
URU/5/024	Improving Carbon Sequestration in Agricultural Systems	L. Nguyen
YEM/5/002	Drip Irrigation and Fertigation for Improved Agricultural Productivity	J. Adu-Gyamfi
ZIM/5/011	Combating Desertification in Agricultural Drylands	F. Zapata

PAST EVENTS

FAO/IAEA EVENTS

Third RCM of CRP on Assessing the Effectiveness of Soil Conservation Measures for Sustainable Watershed Management Using Fallout Radionuclides (D1.50.08)

27-30 March 2006, Vienna, Austria

Technical Officer: Claude Bernard/Emil Fulajtar

The 3rd RCM was held at IAEA Headquarter in Vienna. The meeting comprised 19 participants including 12 research contractors from Argentina, Brazil, Chile, China (2 contractors), Morocco, Pakistan, Poland, Romania, the Russian Federation, Turkey and Vietnam; 2 technical contractors from Austria and UK; and 5 agreement holders from Australia, Canada, Japan, Switzerland and USA. The participants were welcomed by Dr. Long-Minh Nguyen, the Head of SWMCN Section who presented information on the Section's activities and achievements.

The objectives of the meeting were to review the progresses achieved by the participants in the implementation of their respective objectives and work plan and to discuss and agree on the follow-up of experimental work until the fourth and final RCM. All participants reported the results of their research covering the period since 2nd RCM. In addition there were several technical presentations. Dr Abdulghani Shakhashiro, of the Chemistry Unit of the Agency's Laboratories in Seibersdorf made a presentation on the first results of a proficiency test which was organized among the participating laboratories to the CRP. Dr Lionel Mabit and Ms Maitane Melero Urzainqui, of the Soil Science Unit of the Agency's Laboratories in Seibersdorf, made a presentation on the use of geostatistics to improve the spatialization of FRN punctual data. Prof Walling, from Exeter University (UK) presented information on the latest developments on new conversion models for the use of FRNs (^{137}Cs, $^{210}Pb_{ex}$ and ^{7}Be) for erosion/sedimentation studies and on the latest version new software that includes these models. A presentation was also made by a representative of the World Overview of Conservation Approaches and Technologies (WOCAT) on the tools available from WOCAT for the dissemination of information on soil and water resource conservation issues.

Results presented at RCM demonstrate the advance achieved by CRP. The major achievements are the quantitative data on soil erosion rates gained through the use of (^{137}Cs and ^{210}Pb) and on the efficiency of soil conserving measures and impact of land use changes gained by ^{7}Be method. The measured values of soil erosion at field scale range from 0.4 to 120 t.ha-1.y-1. The highest rates were measured in Brazil (120 t.ha-1.y-1) and in China (110 t.ha-1.y-1). Erosion rates at watershed scale were measured in China and they reach 2.4 to 20 t.ha-1.y-1. These data provide valuable information on erosion/deposition throughout the World. Most data available worldwide are gained from experimental plots of small size where only sheet and initial stage of rill erosion occur, or as sediment load in rivers which represents long distance transport of sediment coming not only from agricultural land, but partially also from river banks. The data gained from CRP represent different landscape units (agricultural fields and small catchments) and are complementary to results gained by conventional methods.

Efficiency of soil conservation practices and land use changes was tested mainly for no-till practices, but also for some other practices. The no-till practice reduced the erosion rates by 89% (Chile), 90% (UK) and 25 - 37.5% (Morocco), forest strips and terracing by 25-80% (Russian Federation), grass strips by 91-97.8% (Vietnam) and stopping the timber harvesting by 89% (China).

The meeting outlined further priorities for last period of CRP, especially the strategy for summarizing, publishing and dissemination of the results. The 4th and final RCM will be held in October 2007, in Vienna, Austria. The report of the 3rd RCM will be available at: http://www-naweb.iaea.org/nafa/swmn/crp/d1_5001.html

Participants to the 3rd RCM of CRP D1.50.08

NON FAO/IAEA EVENTS

- General Assembly of the European Geosciences Union, 2-7 April 2006, Vienna, Austria.

  Lionel Mabit, Melero Urzainqui Maitane and Claude Bernard

  As in previous year (24-29 April 2005), the Assembly of the EGU in 2006 took place in Vienna and gathered several thousands of researchers from all around the world. Three contributions from the Soils subprogramme were presented under the Dryland Hydrology Section co-organized by the Soil System Sciences Section of the Assembly. L. Mabit (SSU), C. Bernard (SWMCN) M. Melero Urzainqui (SSU) had two contributions entitled *Test of ^{134}Cs as soil erosion tracer under rainfall simulation* and *Impact of the soil sample intensity on soil erosion estimation using ^{137}Cs methodology* and M. Melero Urzainqui had an additional contribution in collaboration with Prof. A. Klik from Boku University entitled *Interrill erosion processes along a hillslope*.

- 14th Conference of the International Soil Conservation Organization (ISCO), 14-19 May 2006, Marrakesh, Morocco. The SWMCN Section was actively involved in this meeting, by organizing a session on 'The Use of Fallout Radio-nuclides for Erosion/Sedimentation Studies'. Some twenty abstracts have been received for this session. For information on the ISCO meeting: Email: isco2006@wanadoo.net.ma; Web site: www.maneskovtravel.com/isco2006

Status of Coordinated Research Projects (CRPs)

Use of Nuclear Techniques for Developing Integrated Nutrient and Water Management Practices for Agroforestry Systems (D1.20.07)

Technical Officer: Felipe Zapata

The final RCM of this CRP was held from 18-22 April 2005, at the Vienna International Centre, Vienna, Austria and the project was closed in December 2005.
The final report of the RCM and CRP is available at:
http://www-naweb.iaea.org/nafa/swmn/crp/d1_2007.html

Fourteen papers were produced by 9 research contractors and 4 research agreement holders as contributions for the publication of an IAEA-TECDOC. Compilation and technical editing are in progress. Active involvement of the contributors is required for a timely production of this output.

Selection for Greater Agronomic Water-Use Efficiency in Wheat and Rice Using Carbon Isotope Discrimination (D1.20.08)

Technical Officer: Felipe Zapata

The overall objective of this project is to contribute to increasing the agronomic water-use efficiency of wheat and rice production, where agronomic water-use efficiency is defined as grain yield/total water use including both transpiration and evaporation. The CRP is also aimed at increasing wheat productivity under drought and rice yield in salt-affected areas.
The first RCM was held from 12-16 November 2001, at the Vienna International Centre, Vienna, Austria. All research and technical contracts were renewed for the second year and new ones included.. Nine research contract holders from Algeria, Bangladesh, China (2), India, Morocco, Pakistan, the Syrian Arab Republic and Yemen; three technical contractors (CSIRO-Australia, CIMMYT, Mexico and IRRI-Philippines) and one agreement holder (USA) attended the second RCM held in Meknes, Morocco, from 21-25 November 2005. Significant progress has already been achieved by the research contractors during the first phase of implementation of this CRP.
Studies on the use of the carbon isotope discrimination (CID) technique in wheat and rice for tolerance to abiotic stress (drought and salinity) were also carried out by the technical contractors (CIMMYT, IRRI and CSIRO).
From experiments simulating different water regimes on wheat carried out in different locations of Mexico (CIMMYT) it was concluded that CID can be used as a selection criterion for yield under a wide range of environmental conditions, in particular under post-anthesis stress that represents the most common drought situation for wheat worldwide.
A comparative assessment of the oxygen isotope composition and the carbon isotope discrimination was made in the frame of an ongoing collaborative project CSIRO-CIMMYT using stomatal aperture related traits (SATs) to assist wheat breeders identify in early generations breeding lines with high agronomic water use efficiency under irrigation. Results from the first year of this study with three populations of wheat recombinant inbred lines indicated strong prospects for using SATs in screening for yield potential. CID in flag leaf and grain, and leaf porosity showed the most promise and these traits had moderate to high heritability and moderate to strong genetic correlations with yield. The results obtained with grain oxygen isotope compostion showed less promise.
Two experiments were conducted at IRRI with rice recombinant inbred lines exposed to normal and salt stress conditions to evaluate the use of the CID as selection criterion to salt tolerance. Results of the first year indicated that reasonable variability in CID exists in rice and salt stress decreased CID and widen the range of variability. Other correlations suggest that selection for high CID may be adaptive in salt-affected areas.
Key issues of the project such as the carbon isotope analyses at natural abundance level and the definition of the environments (soil and climatic conditions, in particular water balances) in the target locations were thoroughly examined and a work plan for further implementation, including milestones for 2006 and 2007 was defined. This ongoing project is back on track.

The reports of the first two RCMs are available at:
http://www-naweb.iaea.org/nafa/swmn/crp/d1_2008.html

The Third RCM is scheduled to be held the second quarter of 2007.

Integrated Soil, Water and Nutrient Management for Sustainable Rice-Wheat Cropping Systems in Asia (D1.50.07)

Technical Officer: Long Nguyen

This CRP is in its final year of implementation. The main objectives are:

- to improve the productivity and sustainability of rice-wheat cropping systems through increased efficiency of water and nutrient use,
- to modify existing water and nutrient management systems and improve soil management in both traditional and emerging (e.g. raised beds and non puddled soil) tillage systems for sustainable intensification of rice-wheat production and

- to simulate water-nitrogen interactions in rice-wheat cropping systems.

A total of six contract holders from Bangladesh, China (2), India, Nepal and Pakistan, two technical contractors from Australia and the Philippines (IRRI) and two agreement holders from Australia (CSIRO) and India (CIMMYT) are currently participating in this CRP.

The fourth and final RCM will be held in Vienna, Austria from 6-10 November 2006. This meeting is important for each participant to present the project results and achievements, to prepare final project reports and to plan a publication of results in an IAEA-TECDOC and/or international journals.

Assess the Effectiveness of Soil Conservation Measures for Sustainable Watershed Management Using Fallout Radionuclides (D1.50.08)

Technical Officer: Emil Fulajtar

The overall objective of this CRP initiated in 2003 is to develop diagnostic tools for assessing soil erosion and sedimentation processes and effective soil conservation measures for sustainable watershed management. More specific research objectives are related to: a) further develop fallout radionuclide (FRN) methodologies, with particular emphasis on the combined use of ^{137}Cs, ^{210}Pbex and ^{7}Be for measuring soil erosion over several spatial and time scales, b) establish standardized protocols for the combined application of the above techniques, and c) utilize these techniques to assess the impact of short-term changes in land use practices and the effectiveness of specific soil conservation measures. A total of nineteen researchers form Argentina, Australia, Austria, Brazil, Canada, Chile, China, Japan, Morocco, Pakistan, Poland, Romania, the Russian Federation, Switzerland, Turkey, UK, USA, and Vietnam are currently participating in the project. The individual studies cover a wide range of conditions (land use, environment, and spatial scales) that should allow a robust testing of the potential of the FRNs to assess the efficiency of soil conservation practices. The first RCM was held in Vienna and Seibersdorf, Austria, 18-22 May 2003. The second RCM took place in Istanbul, Turkey, from 4-8 October 2004. The third RCM was held in Vienna, 27-30 March 2006. The RCM is entering its final stage. The results of third RCM showed the advance of the research carried out under the CRP. The major achievements are the quantitative data documenting erosion rates in variable geographical conditions throughout the World and the data on efficiency of soil conservation measures. The outlines for finalizing the project were drawn. The publishing and disseminating strategy was agreed. The final meeting should be in October 2007 in Vienna. Reports from the RCMs are available at:
http://www-naweb.iaea.org/nafa/swmn/crp/d1_5001.html

Integrated Soil, Water and Nutrient Management in Conservation Agriculture (D1.50.09)

Technical Officer: Emil Fulajtar

The overall objective of this new CRP (2005 to 2010) is to enhance the productivity and sustainability of farming systems through a better understanding of the principles and practice of conservation agriculture. More specifically, the individual and interactive effects of conservation tillage practices, residue management, crop rotations, nutrient and water inputs on soil organic matter stocks, resource use efficiency, agricultural productivity and environmental quality will be investigated.

Eleven researchers from Argentina, Australia, Brazil, Chile, India, Kenya, Morocco, Pakistan, Turkey, Uganda and Uzbekistan are participating in the CRP. The first RCM was held in Vienna, Austria, from 13-17 June 2005.

The major outcomes of the meeting are several. The particular objectives of participating research teams and their links to overall objectives of the CRP were discussed and the state of art at the CRP's research field in participating countries was evaluated. Three topics of particular interest should be followed with higher attention: a) fractionation of soil organic matter; b) monitoring of soil moisture; c) requirements for ^{15}N field work. The methodological aspects were discussed and the question of analytical standardisation and representativeness of results was addressed. The set of minimal analytical requirements should be followed. The methodological advice will be provided by the Soil Science Laboratory in Seibersdorf. There will also be need for analytical support from Seibersdorf, since some CRP participants will require specific analytical services.

The second RCM will be held in Rabat, Morocco, from 11-15 September 2006.

The report of the first RCM is available at http://www.iaea.org/programmes/nafa/d1/crp/d1-crp.html

Laboratory Activities

Research

Sediment production using 137Cs and GIS in an agricultural watershed

L. Mabit (SSU), C. Bernard (SWMCN) and M.R. Laverdière[1]

[1] Institut de Recherche et de Développement en Agroenvironnement (IRDA) Sainte-Foy (Québec), Canada

The selected area for the present study, the Boyer River watershed in Quebec, covers 217 km2 (Figure 1) and a part of it is under intensive agriculture. The spawning of Rainbow Smelt (*Osmerus mordax*) in the last two km of the river gradually declined and completely disappeared at the beginning of the 1980's. Eutrophication linked to increasing concentrations of nutrients and transport of fine sediments from the basin, is directly associated with this disappearance. Runoff, and then water erosion, is the principal vector of non-point source pollution and constitute the main way of conveying sediments and agricultural nutrients towards hydrosystems, leading to water quality degradation.

The study's objectives were to quantify and map the magnitude of erosion risks in the Boyer River watershed, using an approach based on 137Cs measurements. It was also planned to estimate the origin and magnitude of sediment production in the river system, so that appropriate conservation practices could be targeted.

Using a Geographical Information System, the Boyer River watershed was divided into isosectors according to topography and soil texture, based on topographic and pedological maps and compilation of background information and field reconnaissance. Three soil texture classes were found in the watershed: loam, sandy loam and sandy clay loam. Two slope classes were defined. Six different isosectors were thus defined (Figure 2), i.e. five sectors with a soil-slope combination and forest cover. Forests were considered as an isosector since they cover 44% of the watershed area and the fact that their sedimentary budget was considered as: ±0 t ha-1 yr-1. The respective area of each isosector was calculated for each sub-basin with the GIS. Twenty-four agricultural fields were sampled to evaluate the soil movement magnitude as well as 14 undisturbed forest sites, to evaluate the initial fallout of radiocaesium (Figure 2). A total of 412 points were sampled for ^{137}Cs analysis in the 24 cultivated fields that were investigated, for a total of 1236 cores. Soil movements were estimated with the Simplified Mass Balance Model (SMBM).

The 137Cs activity of the fourteen forested sites ranged from 1622 to 3697 Bq m-2. The average value reached 2780 ± 300 Bq m-2, (mean ± 95% confidence interval) with a coefficient of variation of 21 %. Soil movements ranged from – 39 t ha-1 yr-1 to + 21 t ha-1 yr-1. It appears that under short rotations, erosion situations are more frequent and with higher loss rates. Long rotations also involve losses, which are however compensated by higher frequencies and rates of material deposition. This translates into an average loss of 5.4 t ha-1 yr-1for short rotations. For long rotations, the average loss is 40% lower, with a rate of 3.3 t ha-1 yr-1.

Loam soils with slope higher than 2% generate the highest sediment rate (6.9 t ha-1 yr-1) and nearly 40% of the global sediment production. Sandy loams with slopes lower than 2% exhibit a sediment production rate of 5 t ha-1 yr-1 and the second largest sediment contribution, with 36.6% of the total. Sandy loams with slopes higher than 2% show a similar rate of sediment production. However, the small area they cover translate into a low contribution to the overall sediment production (9%). The sediment production could also be calculated on a sub-basin basis, by calculating, with the GIS, the area of the five isosectors included in each of the four sub-basins. The average sediment production rate of each isosector was multiplied by the area of this isosector in each sub-basin. For each sub-basin, the sediment production was summed over the five isosectors to generate a total sediment production by sub-basin. This value was divided by the area of the sub-basin, to produce an average sediment production rate for the whole sub-basin. The results are presented in Table 1. The Boyer sub-basin has the highest rate, with 3.6 t ha-1 yr-1. The Portage sub-basin has the lowest, with less than 1 t ha-1 yr-1.

A total sediment assessment was established by taking into account the various isosectors, including forest surfaces. The net sediment production for the Boyer River is estimated at 2.8 t ha-1 yr-1. This represents an annual export of 60 771 t of material from the watershed towards the St. Lawrence River. Globally, 28% of the cultivated lands of the Boyer River watershed experienced erosion rates higher than 6 t ha-1 yr-1, the suggested soil loss tolerance level for most Canadian soils. Another 45% of the cultivated area is near this limit. The isosectors loams with slopes higher than 2% and sandy loams with slopes lower or higher than 2% are the most vulnerable ones. The erosion rates and net sediment output, as estimated in this study using a GIS and 137Cs data, are similar to the results estimated using the USLE (3 t ha-1 yr-1).

Using a 'fingerprinting' technique based on sediment and sources material properties measurements, it was then estimated that 75% of the bottom sediments would originate from the cultivated fields and that the banks would produce the other 25%. Therefore, it seems that the sediments come essentially from the cultivated areas, so it is important to control soil erosion at the field level to reduce sediment losses and eutrophication problems at the watershed level.

Data obtained at the field and watershed level are useful in determining the appropriate management technologies of land and water resources at different scales. For the Boyer River basin, soil erosion control, in combination with limitations of the phosphorus inputs on crops, must ensure the durability of soil and water resources. Reduced disturbances of aquatic systems, through prevention of nonpoint pollution upstream, will support the sustainability of soil and water resources. In the case of the Boyer River, water quality improvement is certainly a first step towards the rehabilitation of the Rainbow Smelt habitat in the Boyer River.

Reference

Mabit, L., Bernard, C. and Laverdière, M.R. (2006). Assessment of erosion in the Boyer River watershed (Canada) using a GIS oriented sampling strategy and ^{137}Cs measurements. (Accepted in CATENA).

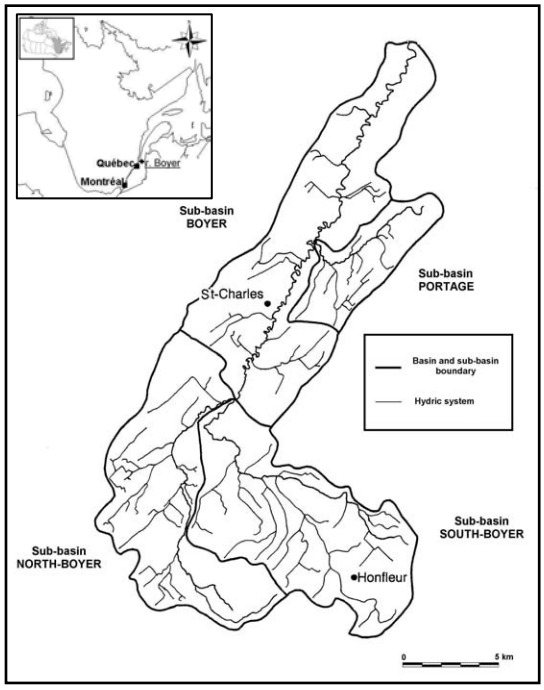

Figure 1. Location of the Boyer River

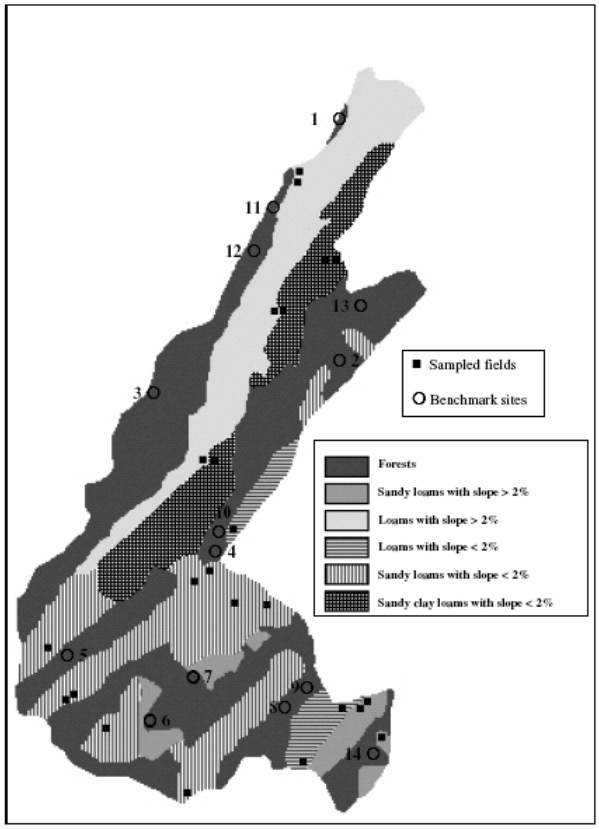

Figure 2. Fields and reference sampled sites according to the isosectors

Table 1. Net sub-basins sediment production

	Sub-basins			
	Boyer	Portage	Northern Boyer	Southern Boyer
Forest (ha)	2490	1680	2660	2610
Sandy loam, Slope >2% (ha)	0	0	180	890
Sandy loam, Slope <2% (ha)	0	250	1990	2370
Loam, Slope >2% (ha)	3060	0	250	0
Loam, Slope <2% (ha)	210	0	0	490
Sandy clay loams, Slope <2% (ha)	1640	170	430	340
Net sediment production ($t\ ha^{-1}\ yr^{-1}$)	3.6	0.8	2.3	2.2

Optical emission spectrometry (OES) can be used to determine inorganic nitrogen-15 in soil samples

M. Heiling, J. Arrillaga, R. Hood-Nowotny

To measure biological nitrogen transformations in the soil-plant-atmosphere continuum, such as gross N mineralization or nitrification, the tracer 15N is essential. However routine analysis of these most fundamental processes has been restricted due to the limited access to isotope ratio mass spectrometry and the time consuming nature of the sample preparation methods, such as steam distillation, for 15N analysis. A faster and simpler way to determine the inorganic nitrogen fraction is a combination of the micro diffusion technique and the use of optical emission spectrometry (OES). The principle of the micro diffusion technique is that ammonia is liberated from the KCl soil extract by increasing the pH of the solution by the addition of magnesium oxide, which is then collected on an acidified quartz or glass fibre filter disc enclosed in a PTFE (polytetrafluoroethylene) envelope. The trapped ammonium sulphate is then washed off the disc to be analysed by OES. Nitrate is sequentially analysed from the same sample; by reduction to ammonium on addition of Devarda's alloy and using the same acid trapping procedure.

Experiments were carried out at Seibersdorf and in Chile to assess the feasibility and accuracy of these preparation procedures compared to traditional steam distillation and mass spectrometric methods. The micro-diffusion OES combination proved to be a suitable method for process studies of this kind. Potentially saving considerable costs and time and opening up the possibility of studying these essential processes in developing countries around the world.

Further details are shown in *Preparation of ammonium-15N and nitrate-15N samples by micro-diffusion for isotope-ratio analysis by optical emission spectrometry* in Communications in Soil Science and Plant Analysis, 37: 1–10, 2006 by M. Heiling, J. Arrillaga, R. Hood-Nowotny and X. Videla

Resumption of P-32 Radioisotope Studies and Training at Seibersdorf

J. Adu-Gyamfi

The Agency's Laboratories in Seibersdorf have in the past developed and implemented laboratory and field research in support of CRPs on the use of radioisotopes (P-32) for quantifying plant available soil phosphorus (P) pool, characterizing P dynamics in soil-plant systems and identifying factors that affect the agronomic effectiveness of phosphate rocks as a source of P for plant growth. A lot of training in the use of radioisotope P-32 for P studies was conducted, and scientific publication (journal articles, TECDOC) has been produced.

With the scientific advancement in the use of Mass Spectrometry to analyze the small change in isotopic ratios, emphasis is now being shifted to the use of stable isotopes (C-13, O-18, Cl-35). For an important nutrient like P where there is currently no stable isotope, the use of radioisotopes (P-32, P-33) will continue to play a critical role in determining P fixation, uptake and use efficiencies by crops. In most of the developing countries where P bio-availability is low, the use of P-32 and P-33 is crucial to understanding P dynamics in soil, and to quantify P pools that can be mobilized by crop genotypes with superior nutrient resource recovery.

Fellowship training in the use of P-32 and P33 radio-isotopes for soil P dynamics and P nutrition experiments, its safety precautions, sample preparation, measurements using liquid scintillation counter, and calculations, will now be conducted at the Soil Science Unit in Seibersdorf.

Supportive Services

Training

The Soil Science Unit conducted a Training Session for 13 IAEA fellows during April-May 2006. The following fellows are participating in the session:

Mr Opio, Julius (UGA/06001),
Ms Baast, Bayarsaikhan (MON/05009),
Mr Irekti, Hocine, (ALG/06001),
Ms Bongosuren, Delgermaa (MON/06007),
Ms Tseeren, Odontungalag (MON/06006),
Mr Duvivier, Predner (HAI/06001),
Mr Sumah, Foday (SIL/05010)
Mr Kislal, Hakan (TUR/06001),
Mr Ergul, Faki (TUR/06005),
Mr Nam, Murat (TUR/06002),
Mr Onaran, Huseyin (TUR/06003),
Ms Kale, Sema (TUR/06004),
Mr Sirin, Hamsa (TUR/06006).

A detailed report of the Training Session will be presented in the next Newsletter.

Analytical services 2005

The following Tables summarise the isotope analytical work of the Soil Science Unit during 2005.

Samples received:

From CRPs	3016	62.6%
From TCs	347	7.2%
Seibersdorf research	1453	30.2%
Total	4816	100.0%

Requested analysis:

^{15}N enriched level	2878	45.1%
^{15}N nat. ab.	180	2.8%
^{13}C nat. ab.	2364	37.1%
^{18}O nat. ab.	958	15.0%
Total	6380	100.0%

Measurements carried out:

^{15}N enriched level	7134	41.1%
^{15}N nat. ab.	1077	6.2%
^{13}C nat. ab.	5267	30.3%
^{18}O nat. ab.	3881	22.4%
Total	17 359	100.0%

The Soil Science Unit carries out more than 17 000 measurements during the year. During middle of May to end of July 2005 the mass spectrometer room was renovated, newly furnished and all electrical and gas installations were renewed. The details were reported in the January 2006 Newsletter.

Proficiency Test 'EQA2005' on ^{15}N and total N as well as ^{13}C and total C in plant materials

Martina Aigner

The new round of the annual proficiency test (PT) has been completed in December 2005. An individual evaluation report as well as certificates of the (successful) participation have been sent to the participants. A comprehensive final report (IAEA/AL/165[1]) on the PT has been issued and distributed to the participants. A copy is available upon request.

In order to increase information on analytical institutions able to perform stable isotope analysis on natural matrix materials the participants that provided data meeting the quality requirements set by the Soil Science Unit from now on will be advertised regularly in the Soils Newsletter. This provides an opportunity to the readers to get into contact with these laboratories and possibly exchange experiences or seek help on analytical problems and even ask for the provision of analytical services.

[1] Ref.: *Final Report on the annual Proficiency Test 'EQA2005' for the measurement of ^{15}N- and ^{13}C isotopic abundance and total nitrogen- and carbon concentration in plant materials* by M. Aigner, A. Shakhashiro, A.Trinkl, IAEA Laboratories, Seibersdorf, IAEA/AL/165, 2005

Table 1. Stable isotope laboratories that participated successfully in 'EQA2005' listed per region:

AFRICA

Laboratory	Contact	Type of analysis successfully performed
MAURITIUS SUGAR INDUSTRY RESEARCH INSTITUTE REDUIT **MAURITIUS**	MR. GUNSHIAM UMRIT Phone: +230 454 1061 Fax: +230 454 1971 E-mail: gumrit@msiri.intnet.mu	^{13}C / total C

ASIA

Laboratory	Contact	Type of analysis successfully performed
BANGLADESH INSTITUTE OF NUCLEAR AGRICULTURE P.O. BOX 4 MYMENSINGH, 2200 **BANGLADESH**	DR. M.A. SATTAR Phone: +880 91 544012 303 Fax: +880 91 54091 Email: dgbina11@bttb.net.bd Satt_54@yahoo.com.uk	^{15}N / total N

ATOMIC ENERGY ORGANIZATION OF IRAN KARAJ NUCLEAR RESEARCH CENTER AGRICULTURE AND MEDICINE P.O. BOX 31485-498 KARAJ **ISLAMIC REPUBLIC OF IRAN**	DR. G. RAISALI Phone: -- Fax: +98 261 4411106 E-mail: --	^{15}N / total N
MALAYSIAN INSTITUTE FOR NUCLEAR TECHNOLOGY RESEARCH BANGI 43000, KAIANG , SELANGOR **MALAYSIA**	DR. ASIAH AHMAD Phone: +60 3 89250510 Fax: +60 3 89282956 E-mail: asiah@mint.gov.my	^{15}N / total N
RAFTER STABLE ISOTOPE LABORATORY GEOLOGICAL AND NUCLEAR SCIENCES 30 GRACEFIELD ROAD PO BOX 31-312 LOWER HUTT **NEW ZEALAND**	DR. KARYNE ROGERS Phone: +64 4 5704636 Fax: +64 4 5704657 E-mail:Isotopelab@gns.cri.nz E-mail: k.rogers@gns.cri.nz	^{13}C / total C
PAKISTAN INSTITUTE OF NUCLEAR SCIENCE & TECHNOLOGY P.O. NILORE ISLAMABAD **PAKISTAN**	DR. RIFFAT MAHMOOD QURESHI Phone: +92 51 2207721 Fax: +92 51 9290275 E-mail: riffat@pinstech.org.pk	^{15}N / total N
ATOMIC ENERGY COMMISSION OF SYRIA DIVISION NITROGEN / PLANT NUTRITION 17 NISSAN P.O.BOX 6091 DAMASCUS **SYRIAN ARAB REPUBLIC**	MR. MOHAMED ALCHAMMAA Phone:+963 11 213 2580 Fax: +963 11 611 2289 E-mail: ATOMIC@net.sy	^{15}N / total N
RESEARCH AND DEVELOPMENT OF AGRICULTURE DIVISION: NUCLEAR RESEARCH IN AGRICULTURE SUB-GROUP PANTHONYOTHIN ROAD 10900, BANGKOK, 10900 **THAILAND**	MS. JARIYA PRASATSRISUPAB Phone: +66 2 579 4114 Fax: +66 2 579 7158 E-mail: jprasatsrisupab@yahoo.com	^{15}N / total N
CENTER FOR NUCLEAR TECHNIQUES DIVISION OF RADIOBIOLOGY 217 NGUYENTRAI,Q1 HOCHIMINH CITY **VIETNAM**	MS. LUONG THU TRA Phone: +84 8 8361967 Fax: +84 8 8367361 E-mail: thutraluong@yahoo.com	^{15}N / total N
BANGLADESH INSTITUTE OF NUCLEAR AGRICULTURE P.O. BOX 4 MYMENSINGH, 2200 **BANGLADESH**	DR. M.A. SATTAR Phone: +880 91 544012 303 Fax: +880 91 54091 Email: dgbina11@bttb.net.bd Satt_54@yahoo.com.uk	^{15}N / total N
ATOMIC ENERGY ORGANIZATION OF IRAN KARAJ NUCLEAR RESEARCH CENTER AGRICULTURE AND MEDICINE P.O. BOX 31485-498	DR. G. RAISALI Phone: -- Fax: +98 261 4411106 E-mail: --	^{15}N / total N

KARAJ **ISLAMIC REPUBLIC OF IRAN**		
MALAYSIAN INSTITUTE FOR NUCLEAR TECHNOLOGY RESEARCH BANGI 43000, KAIANG , SELANGOR **MALAYSIA**	DR. ASIAH AHMAD Phone: +60 3 89250510 Fax: +60 3 89282956 E-mail: asiah@mint.gov.my	^{15}N / total N

EUROPE

Laboratory	Contact	Type of analysis successfully performed
UNIVERSITY OF GHENT FACULTY OF AGRICULTURAL AND APPLIED BIOLOGICAL SCIENCES DEPARTMENT OF APPLIED ANALYTICAL AND PHYSICAL CHEMISTRY COUPURE 653 B-9000, GHENT **BELGIUM**	PROF. DR. PASCAL BOECKX Phone: +32 9 264 6000 Fax: +32 9 264 6230 Email: pascal.boeckx@ugent.be	^{15}N / total N ^{13}C / total C
INSTITUTE OF SOIL SCIENCE AND PLANT CULTIVATION UL. CZARTORYSKICH 8 24 100, PULAWY **POLAND**	DR. AGNIESZKA RUTKOWSKA Phone: +48 81 887 3421 231 Fax: +48 81 886 4547 E-mail: agrut@iung.pulawy.pl	^{15}N / total N
TURKISH ATOMIC ENERGY AUTHORITY SARAYKOY NUCLEAR RESEARCH AND TRAINING CENTER ISTAMBUL YOLU 30 KM; KAZAN-SARAY ANKARA **TURKEY**	DOC. DR. BASRI HALITLIGIL Phone: +90 312 815 4308 Fax: +90 312 815 4307 E-mail: basri.halitligil@taek.gov.tr	^{15}N / total N

LATIN AMERICA

Laboratory	Contact	Type of analysis successfully performed
COMISIóN CHILENA DE ENERGIA NUCLEAR SECCIóN TECHNICAS NUCLEARES EN AGRICULTURA AMUNATEGUI NO.95 , CASILLA 188-D SANTIAGO **CHILE**	MS. XIMENA VIDELA Phone: +56 2 364 6279 Fax: +56 2 364 6277 E-mail: xvidela@cchen.cl	^{15}N / total N
FACULTAD DE AGRONOMíA., UNIVERSIDAD DE LA REPúBLICA GARZóN GARZON 780 12900, MONTEVIDEO **URUGUAY**	DR. CARLOS H. PERDOMO Phone: +598 2 3598272 Fax: +598 2 3590436 E-mail: catnas@fagro.edu.uy	^{13}C / total C

Publications

Recent Publications of the Sub-programme

A list of articles from Soils subprogramme staff published in scientific journals and Conference Proceedings are available on our SWMN Section website at the URL http://www.iaea.org/programmes/nafa/d1/public/d1_pbl_1.html

Recent Titles

Aigner M., Shakhashiro A. and Trinkl A. (2006) *Final Report on the Annual Proficiency Test 'EQA 2005' for Measurement of 15N and 13C Isotopic Abundance and Total Nitrogen- and Carbon Concentration in Plant Materials,* IAEA, 105 pages.

Klik, A. and **Melero Urzainqui M.** (2006). *Interrill erosion processes along a hillslope*. In: Geophysical Research Abstracts (CD-Rom), Volume 8, European Geosciences Union - General Assembly 2006, ISSN: 1029-7006. Abstract EGU06-J-06877. pdf, 1 page.

Mabit L., Bernard C. and Laverdière M.R. (2006). *Assessment of erosion in the Boyer River watershed (Canada) using a GIS oriented sampling strategy and ^{137}Cs measurements*. (Accepted in CATENA).

Mabit. L., Bernard. C. and **Melero Urzainqui M**. (2006). *Test of ^{134}Cs as soil erosion tracer under rainfall simulation*. In: Geophysical Research Abstracts (CD-Rom), Volume 8, European Geosciences Union - General Assembly 2006, ISSN: 1029-7006. Abstract EGU06-J-01245. pdf, 2 pages.

Mabit. L., Bernard. C. and **Melero Urzainqui M**. (2006*). Impact of the soil sample intensity on soil erosion estimation using ^{137}Cs methodology*. In: Geophysical Research Abstracts (CD-Rom), Volume 8, European Geosciences Union - General Assembly 2006, ISSN: 1029-7006. Abstract EGU06-J-01246. pdf, 2 pages.

Heiling M., Arrillaga J., Hood-NowotnyR. and Videla X. (2006) *Preparation of ammonium -^{15}N and nitrate-^{15}N samples by micro-diffusion for isotope-ratio analysis by optical emission spectrometry* in Communications in Soil Science and Plant Analysis, 37: 1–10.

Websites

- Soil and Water Management and Crop Nutrition Section: http://www-naweb.iaea.org/nafa/swmn/index.html
- Joint FAO/IAEA Division of Nuclear Techniques in Food and Agriculture: http://www-naweb.iaea.org/nafa/index.html
- FAO website: http://www.fao.org
- FAO/AGL (Land and Water Development Division) http://www.fao.org/ag/agl/default.stm

IAEA
International Atomic Energy Agency

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