Joint FAO/IAEA Programme
Nuclear Techniques in Food and Agriculture

Soils Newsletter

Vol. 35, No. 1 July 2012

http://www-naweb.iaea.org/nafa/index.html
http://www.fao.org/ag/portal/index_en.html

ISSN 1011-2650

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Managing soils for food production and sustainable agriculture (field trial site on the lower slope of Mt. Chimborazo, Ecuador).

To Our Readers

In less than two months we will host the FAO/IAEA International Symposium on Managing Soils for Food Security and Climate Change Adaptation and Mitigation (23-27 July 2012; Vienna, Austria). The Symposium as shown on the IAEA website (http://www-pub.iaea.org/iaeameetings/41176/International-Conference-on-Managing-Soils-for-Food-Security-and-Climate-Change-Adaptation-and-Mitigation) covers a range of key soil and land management issues that are critical to food productivity, food security and agricultural sustainability. The use of isotopic and nuclear techniques to address these issues will be discussed throughout each of the seven technical sessions. In addition to these sessions, there will be a whole day devoted to the Global Soil Partnership (GSP). The support of FAO colleagues from both the FAO Agriculture and Natural Resource Departments is overwhelming, with contributions to the technical sessions and the final day of the Symposium, which focuses on the GSP. The GSP is an FAO initiative (http://www.fao.org/nr/water/landandwater_gsp_pillars.html). Its mission is to support and facilitate joint efforts towards sustainable management of soil resources for food security and climate change adaptation and mitigation. The FAO/IAEA Symposium therefore promises to be an exciting opportunity whereby collaborative partnerships at global levels will be explored, fostered or strengthened. With over 450 professionals from more than 80 countries participating in this Symposium, the opportunities to exchange and strengthen collaboration are countless.

IAEA
International Atomic Energy Agency

To our readers, who have not yet submitted the registration form, please do so by downloading the form from http://www-pub.iaea.org/MTCD/Meetings/PDFplus/2012/cn191/cn191_FormA.pdf and emailing the filled form to IAEA at: official.mail@iaea.org.

I look forward to welcoming you to Vienna and to exploring with you joint collaborative activities that promote sustainable soil and land use management for food productivity and security. With an expected increase in global population from the current level of 6.7 billion to 9 billion by 2050, there is an urgent need to increase food production by 70%. This acceleration is increasingly challenged by the negative impacts of climate change and variability on land degradation, soil erosion, soil salinization and the reduction of soils' capacity to retain water within the plant rooting zone because of soil degradation. Climate-smart management of land resources plays a critical role in enhancing soil resilience against degradation, improving soil productivity and soil fertility, increasing soil water storage, minimizing soil and water runoff, reducing greenhouse gas (GHG) emissions and promoting the accumulation of soil carbon and soil organic matter. Since nitrous oxide has 310 and 16 times higher global warming potential than that of carbon dioxide and methane respectively over a 100-year period, it is important to improve soil, water and nutrient management practices to reduce nitrous oxide emissions and methane from farmland, while at the same time promoting soil organic matter and soil carbon sequestration. In this Soils Newsletter, you will learn more about our recently initiated (February 2012) coordinated research project (CRP; D1.50.12) relating to mulch-based cropping systems, which aim to promote soil carbon sequestration and land productivity in Sub-Saharan Africa. Another new CRP (D1.50.13) jointly managed by the Plant Breeding and Genetics Section and the SWMCN Section on Approaches to Improvement of Crop Genotypes with High Water and Nutrient use efficiency for Water Scarce Environments was initiated to optimize crop adaptability and productivity using improved crop varieties and best fit soil and water management practices.

For the three following CRPs, which have been initiated for more than 3 years and address key issues relating to managing soils for food security and climate change adaptation and mitigation, up-to-date results will be presented and shared with participants at the forthcoming FAO/IAEA International Symposium:

i. Managing irrigation water to enhance crop productivity under water-limiting conditions: A role for isotopic techniques (D1.20.09).
ii. Strategic placement and area-wide evaluation of water conservation zones in agricultural catchments for biomass production, water quality and food security (D1.20.10).
iii. Integrated isotopic approaches for an area-wide precision conservation to control the impacts of agricultural practices on land degradation and soil erosion (D1.20.11).

Besides providing technical support to ongoing CRPs, the SWMCN team currently conducts a three-month training course in soil and water management to 11 participants from Afghanistan, Kenya, Mali, Oman, Sudan and United Republic of Tanzania. The training course is being held in the SWMCN Laboratory, Seibersdorf. All fellows will have the opportunity to attend the Symposium. The SWMCN Team also provides technical back-up to 55 technical cooperation projects (TCPs) which cover a range of topics relating to the FAO/IAEA Symposium. Scientists and policy makers associated with some of these TC projects will also attnd the FAO/IAEA Symposium. I am therefore very grateful for the funding support from the TC Department to encourage our project counterparts to attend the FAO/IAEA International Symposium and in some cases to actively contribute to the Symposium with oral or poster presentations.

I hope that you are convinced by what I have outlined above and will decide to attend the FAO/IAEA Symposium. I look forward to meeting you and your colleagues in Vienna on 23 July.

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Staff News

Mr Lionel Mabit, Soil Scientist, SWMCN Laboratory, left the Agency on 27 February 2012 after 7 years of service. Lionel received an MSc in Hydrology and a PhD from the University of Paris I Sorbonne. His PhD thesis was on soil erosion assessment by radionuclides (i.e.^{137}Cs) and conventional techniques in two French and Canadian watersheds.

Lionel completed six years of research using nuclear and conventional techniques, and led the soil and water management projects at Laval University, Quebec (Canada), before joining the Soil Science Unit of the FAO/IAEA Agriculture & Biotechnology Laboratories in Seibersdorf, Austria, in February 2005. At Seibersdorf, he contributed to the design and implementation of six national TCPs and one regional project in Africa on the use of fallout radionuclides (FRN) to assess the magnitude and extent of soil degradation and to evaluate the effectiveness of soil conservation strategies. Lionel contributed to several group training activities at the Seibersdorf Laboratories, supervised three consultants and trained one individual fellow and two interns.

During his period with the IAEA, Lionel developed several inter-laboratory collaborations with Member States and published/co-authored 14 journal articles, 3 book chapters, 22 conference proceedings and 3 IAEA-TECDOC contributions supporting two CRP activities on the use of fallout radionuclides to investigate soil degradation. In 2011, he completed an IAEA training manual in the field of FRN techniques involving 20 scientific authors from Member States.

To transfer protocols on nuclear techniques and new findings to IAEA Member States and the scientific community, he presented the activities of the SWMCN Laboratory of the Joint FAO/IAEA Division at international meetings, conferences and seminars. In terms of research and development he tested and refined the ^{137}Cs, ^{210}Pb$_{ex}$ and ^{7}Be methods for soil erosion assessment in various countries in collaboration from field to watershed scales. Lionel developed innovative approaches for assessing soil erosion at area wide scale using spatial tools. He also designed a fine soil increment collector to overcome the limitations of the ^{7}Be technique, and developed protocols to validate soil sampling strategies and background radioactive assessment (FRN and Naturally Occurring Radioisotopes). For his output, dedication and support to the SWMCN Soil-Subprogramme, Lionel received an IAEA Merit Award in 2010. Furthermore, he was part of the three member Food Safety Assessment Team sent to Japan to provide advice and technical support to the Japanese authorities following the Nuclear Power Plant accident at Fuskushima Daiichi. We would like to wish Lionel all the best in his future career.

Mr Sasa Linic, a consultant (May 2009 to April 2012) with the SWMCN Laboratory, Seibersdorf, concluded his assignment and returned to his home country of Serbia. We thank Sasa for his input to the laboratory activities and wish him all the best for the future.

Ms Peggy Macaigne, a consultant (November 2011 to April 2012), left the Section on 13 April after completing her assignment with the SWMCN subprogramme. We thank Peggy for her contribution to the Subprogramme activities and wish her all the best for the future.

Mr Franz Augustin joined the SWMCN laboratory in March 2012 as a temporary Laboratory assistant to help with the preparation, installation and maintenance of field and greenhouse experiments. Franz will also be working on plant harvest and sample preparation for routine analysis. Welcome to Franz.

Mr Sereyvirak Dy (Virak) joined the FAO/IAEA Division of Nuclear Techniques in Food and Agriculture in March 2012, as an intern in the Soil and Water Management and Crop Nutrition (SWMCN) Subprogramme for six months. Virak obtained his BSc in Public Administration at the Royal University of Law and Economics, Cambodia, in August 2011, and he is also a senior student at the Institute of Foreign Language, Cambodia. Because of this great opportunity to work with IAEA as an intern, he has decided to take a break from his studies for one year. Virak has three major objectives for his internship with IAEA. First, he wants to develop skills in project management of issues relating to soil and water management in agricultural production. Secondly, he would like to familiarize himself with IAEA assisted technical cooperation projects and research coordination projects in soil, water and crop management for food security. Thirdly, Virak will assist the sub programme team to organize the International Symposium on Managing Soils for Food Security and Climate Change Adaptation and Mitigation, that will take place in Vienna, from 23 to 27 July 2012.

Ms Lina Shakhashiro joined the Soil and Water Management and Crop Nutrition (SWMCN) Section in May 2012 as an intern. Lina completed her BSc in Business Administration at the Megatrend International University, Vienna, Austria. She has worked as a financial assistant in a wholesale trade company during her studies. She is looking forward to cooperating with the members of SWMCN Subprogramme and gaining new skills in project management. We welcome Lina to the SWMCN Section.

Ms Andra-Rada Iurian joined the Soil and Water Management and Crop Nutrition Laboratory (SWMCNL) on 1 June 2012 as an intern. She is a PhD student at Babes-Bolyai University in Cluj-Napoca, Romania. Ms Iurian will undergo training in the use of fallout radionuclide (FRN)-based techniques for assessing soil erosion and redistribution under the supervision of Mr Minh-Long Nguyen and Mr Joseph Adu-Gyamfi. The training in the SWMCNL will focus on sampling techniques and the assessment of the extreme climatic conditions on the concentration of Beryllium-7 in soil.

Feature Articles

Evaluation of green manures as nitrogen source for maize using ^{15}N labeling technique

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The intensive and inappropriate use of soil for agricultural production aggravates the degradation of soil organic matter (SOM). Maintaining or even improving SOM is vital for sustaining the intensification of crop production in small farmer holdings. Application of green manures promotes changes in the soil chemical, physical and biological characteristics and improves soil fertility and quality. The effectiveness of green manures as a source of nutrients varies among species and cultivars and its integrated use with mineral fertilizer.

Maize is one of the main no-tillage crops in Brazil, which is grown mainly in the savannah areas in rotation and/or succession with soybean and cotton crops. As N is required in large amounts for maize production, it is of great importance to know the capacity of green manures to supply N for its production. Field studies were carried out in Southern Cerrado (savannah), Brazil to evaluate the effectiveness of different nitrogen rates and green manures on maize productivity and to estimate the green manures 'N utilization by maize crop grown under a no-tillage system.

Four green manures labeled with ^{15}N that include sunnhemp (*Crotalaria juncea* L.), pigeon pea (*Cajanus cajan* L.), green velvet bean (*Mucuna prurens*), millet (*Pennisetum glaucum* L.) and spontaneous vegetation (fallow) combined with four N rates (0, 30, 90 and 150 kg ha^{-1}) as urea, were tested for their contribution to N uptake by maize.

The results from this field study showed that legume green manures (green velvet been and pigeon pea) provided more N to maize crop grown in sequence, compared to millet residues (Fig.1A and 1B), in spite of larger amount of N in the millet residues, suggesting that residues of these two green manures favored soil conditions for N uptake. This may be due to its low C/N ratio leading to faster and regular release of N and other nutrients that are mineralized concomitantly to N. Millet, with high C/N ratio causing temporary immobilization of N, leads to a to lower contribution to maize N uptake. Studies have shown that N uptake and accumulation by maize plant is directly influenced by the growth stage of maize (Varvel *et al*., 1997, Silva *et al*., 2006).

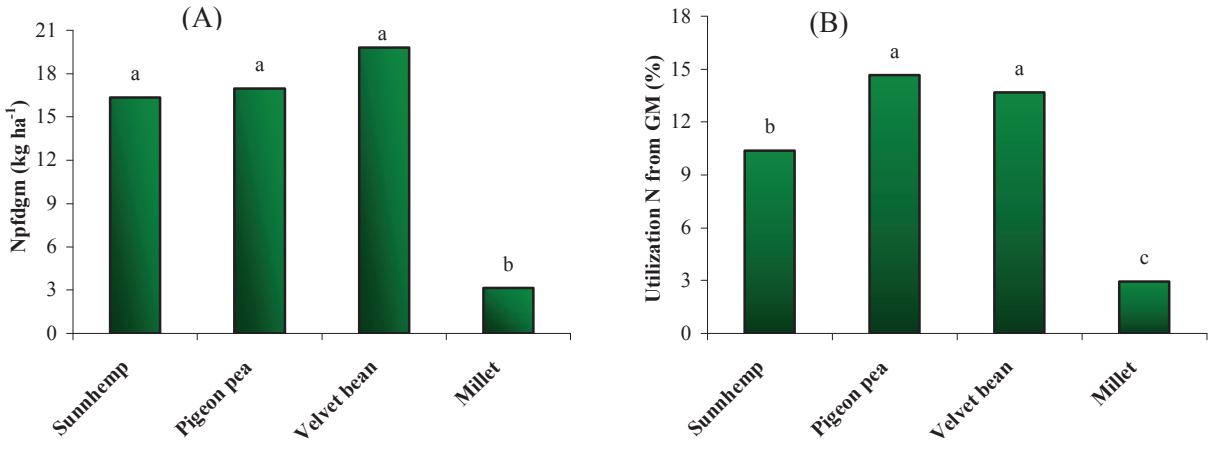

Fig. 1. Maize N (straw + grain) derived from green manures (Npfdgreen manures) (A) and the fraction of the maize N derived from green manures (B) Values followed by same letters, on columns, do not differ ($p < 0.05$) amongst themselves by the Tukey test.

The contribution of N from green manures to total N in maize plants did not differ significantly among the green manures (Fig 1A). However, when the N recovery is considered, which is relative to the amount of N applied in the form of residues, there were differences even among the legume green manures, such that velvet bean (13.7%) and pigeon pea (14.7%), better than sunnhemp (10.4%). Millet (3.0%) was significantly less efficient than the three legumes (Fig. 1B). The results of this study are similar to those obtained by Acosta *et al*. (2011), in which the hairy vetch N utilization by maize was on average 12.3%.

On average, more than 85% of the green manures N was not utilized by maize grown in succession. Studies have shown that the majority of N from green manures accumulates in the soil predominantly in the form of organic N (Silva *et al*., 2006; Acosta *et al*., 2011). Of the N accumulated in the soil less than 50% is transformed into inorganic N by mineralization and the remaining is found with the soil microbial biomass (Mengel, 1996). Regardless of N rate and green manures species used, the soil was the main source of N for maize.

The highest grain yields in treatments without mineral N application were observed in treatments where legume green manures were grown previously and the lowest yields observed in treatments with millet or where fallow soil was previously practiced (Fig. 2).

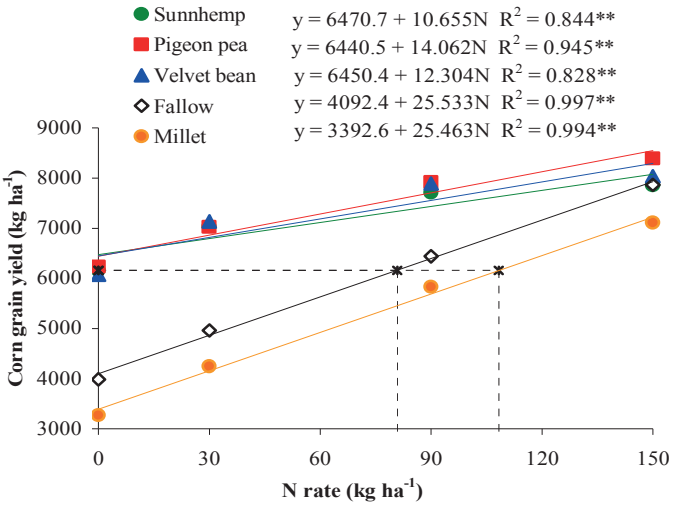

Fig. 2. Maize grain yield as affected by N rates and green manures.

Based on grain yield in legume green manures treatments without mineral N application, the response in grain yield would be equivalent to applying 80 kg N ha^{-1} for maize grown in the fallow soil, and 108 kg N ha^{-1} for the maize in succession to millet (Fig. 2). Thus, this slower N release from decomposition of green manure residues may represent increased efficiency and/or farm income, while reducing losses of N. In general, the greatest grain yield response to N was obtained by applying 30 kg ha^{-1} applied at sowing, suggesting the importance of applying N at sowing. Although there was a linear response for grain yield with increasing N rates with the use of legumes, the application of only 30 kg ha^{-1} at sowing generated grain yields above 7 t ha^{-1}. The difference in yield between the treatments receiving 90 or 150 kg N ha^{-1} is not economical, considering the cost of N fertilizer application. It is concluded that N fertilizer must be applied to maize crop at sowing, even when using legumes, with N applied as topdressing when proceeding millet or fallow ground. The results indicate that there is an opportunity to both reduce N fertilizer inputs and increase maize yields by growing in succession with a legume green manures. This is important for Brazil where resources are limited and there is a need to improve agricultural productivity.

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Evaluating the contribution of different land uses to catchment sediment yield using compound-specific stable isotope techniques

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A new stable isotope technique, using the compound-specific stable isotope (CSSI) signatures of organic markers in the soil, can identify hot-spots of land degradation to complement the information on soil erosion rates provided by fallout radionuclides. Knowing where to focus erosion management efforts ensures cost effective soil conservation strategies to reduce soil loss and improve the sustainability of arable land.

The technique is based on the concept of land use being defined by the plant community growing on the land. These plant communities label the soil where they grow by exudating organic materials that act as markers (e.g. fatty acids). Although all plants produce organic materials, the stable isotopic signature in these materials is different for each plant species.

This study explored the potential for using compound-specific stable isotope (CSSI) techniques to inform precision conservation of soil resources in the United Kingdom. In this example, particular attention was given to the contribution that different land management practices make to overall sediment yield in a small agricultural catchment (Blake et al., 2012). The work was undertaken within the framework of the IAEA funded Coordinated Research Project (CRP) entitled Integrated Isotopic Approaches for an Area-wide Precision Conservation to Control the Impacts of Agricultural Practices on Land Degradation and Soil Erosion (2009-2013). The study drew upon the application of CSSI techniques (Gibbs, 2010) in combination with conventional geochemical sediment fingerprinting methods (Walling, 2005) to identify critical source areas within a small (145 ha) agricultural catchment in the southwest UK (Figure 1).

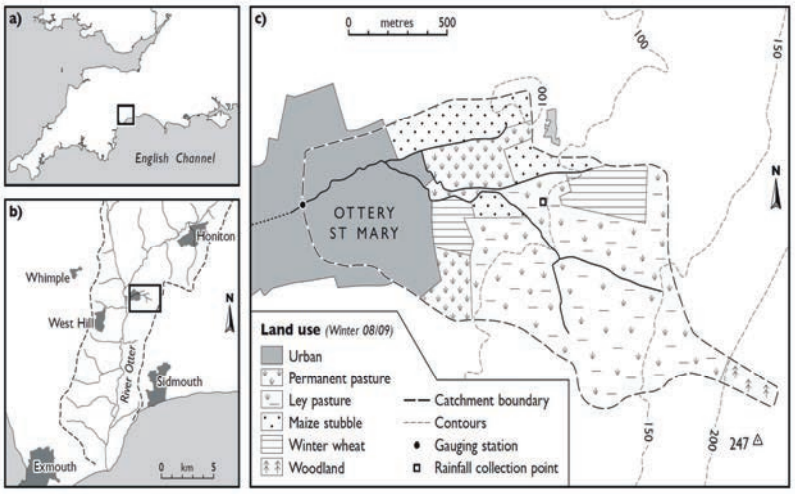

Figure 1: Location of the study catchment (a and b), in southwest UK; (c) land cover in the catchment during the study period

Crop cover in the catchment at the time of this study was maize stubble (24 ha), permanent pasture (17 ha), ley pasture (69 ha), winter wheat (16 ha), woodland (5 ha) (Figure 1 c). Soil from fields of each crop type was sampled and analysed for carbon CSSIs (Gibbs, 2010) and major and minor element geochemistry. The CSSIs were used to characterise sediment sources according to crop type whereas geochemical properties characterised the sources according to surface and subsurface materials (where cultivated land represented a mixture of the two). Suspended sediment samples were collected from the catchment outlet during a major storm event for comparison with source materials. CSSI suspended sediment signatures were unmixed using the isosource model following Gibbs (2008). Geochemistry data were unmixed using methods described by Walden et al. (1997), Collins and Walling (2002) and Rowan et al. (2000).

The carbon (C) CSSI signatures showed differences between crop types so sediment eroded from each land cover could be tracked downstream. CSSI signatures did appear, however, to be influenced to some degree by previous crop cover since many fields in this system were in crop rotation. Signatures were less distinct than expected from literature values. Crop rotation is an important consideration in application of CSSI tracers.

High resolution sediment sampling during the storm event and analysis for CSSI and geochemical fingerprints elucidated temporal patterns of sediment mobilisation under different crop regimes and the specific contribution that each crop type makes to downstream sediment load. Pasture sources (65% of the catchment area) dominated the sediment load (Figure 2, left) but areal yield (0.13 ± 0.02 t ha^{-1}) was considerably less than that for winter wheat (0.44 ± 0.15 t ha^{-1}). While temporal patterns in crop response matched runoff and erosion response predictions based on plot-scale rainfall simulation experiments, comparison of biomarker and geochemical fingerprinting data (Figure 2, right) indicated that the latter overestimated cultivated land inputs to catchment sediment yield due to inability to discriminate ley pasture (pasture fields in rotation i.e. previously cultivated) from cultivated land. This discrepancy, however, presented an opportunity, since combination of the two datasets revealed the extremely localised nature of erosion from damaged permanent pasture fields in this system (estimated at up to 0.5 t ha^{-1}). Permanent pasture was identified as an erosion hotspot.

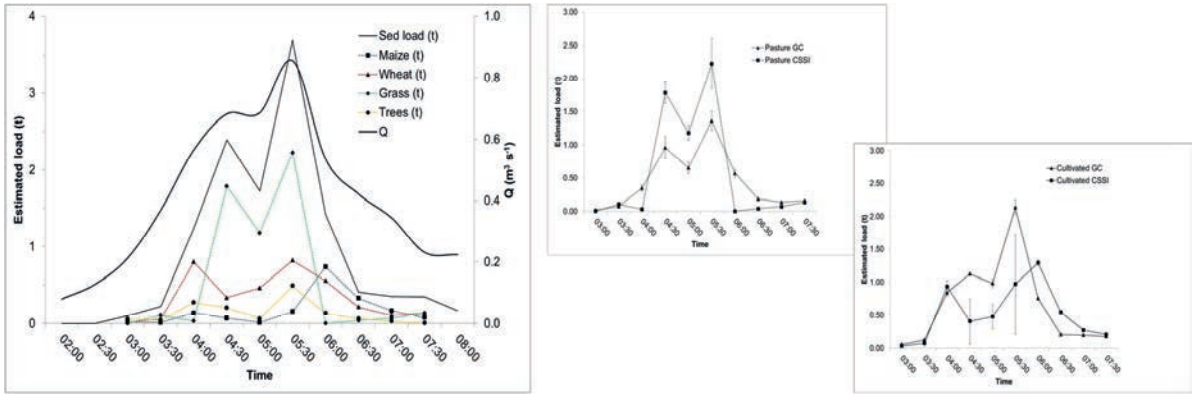

Figure 2: CSSI biomarker derived sediment yields for key crops (left) and comparison of CSSI estimates to geochemical fingerprint estimates (right)

The combined use of CSSI and geochemical tracers elucidated important details about sediment source dynamics that could not have been derived from each method alone. Information provided by the CSSI sediment tracing approach appears to have the potential to provide important support for soil resource management policies and inform sediment risk assessment for the protection of aquatic habitats and water resources.

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Technical Cooperation Projects

Project Number	Title	Technical Officer(s)
ALG5026	Increasing the Genetic Variability for the Improvement of Strategic Crops (Wheat, Barley, Chickpeas and Dates) for Enhanced Tolerance to Biotic and Abiotic Stresses and the Development of Biotechnology Capacities	Adu-Gyamfi, Joseph in collaboration with Plant Breeding and Genetics Section
ALG5028	Preserving Arid and Semi-Arid Agro-Ecosystems and Combating Desertification by Using Advanced Isotopic Techniques, Developing Decision-Making Tools and Supporting Sensitisation of the Local Population on the Needs of Desertification Control	Dercon, Gerd
ANG5011	Monitoring Soil Fertility in Pasture Areas for Their Improvement and Maintenance	Heng, Lee
BGD5028	Assessing Crop Mutant Varieties in Saline and Drought Prone Areas Using Nuclear Techniques	Sakadevan, Karuppan in collaboration with Plant Breeding and Genetics Section
BKF5009	Improving Voandzou and Sesame Based Cropping Systems Through the Use of Integrated Isotopic and Nuclear Techniques for Food Security and Poverty Alleviation	Sakadevan, Karuppan in collaboration with Plant Breeding and Genetics Section
BKF5010	Enhancing Crop Productivity through Small-Scale Irrigation Technologies for Peri-Urban Agriculture to Improve the Income and Livelihood of Farmers	Heng, Lee
BOT5007	Using Isotopic, Nuclear and Other Conventional Techniques to Support the Development of Improved Soil and Water Management Techniques to Increase Crop Production	Sakadevan, Karuppan; Nguyen, Minh-Long
CAF5006	Improving Cassava Production through High-Yielding Varieties and Sustainable Soil Fertility Management by Using Isotopic and Nuclear Techniques to Ensure Sustainable Farming	Dercon, Gerd in collaboration with Plant Breeding and Genetics Section
COS5029	Strengthening of Good Agricultural Practices (GAP) for Food Safety and Security and Environmental Protection	Dercon, Gerd in collaboration with Food and Environmental Protection Section
ECU5026	Improving the Efficiency of Irrigation in the Rio Chota Sub-Basin	Sakadevan, Karuppan
GUA5018	Evaluating the Impact of Anthropogenic Contamination on Aquatic Ecosystems	Sakadevan, Karuppan in collaboration with Isotope Hydrology Section
HAI5003	Enhancing Crop Productivity through the Application of Isotope Nuclear Techniques	Sakadevan, Karuppan
HON5007	Evaluating Nutrient Pollution and Heavy Metals in Lake Yojoa to Determine the Impact on the Environment and Human Health	Sakadevan, Karuppan in collaboration with Isotope Hydrology Section
INS5039	Enhancing Food Crop Production Using Induced Mutation, Improved Soil and Water Management and Climate Change Adaptation	Sakadevan, Karuppan in collaboration with Plant Breeding and Genetics Section
IRQ5018	Using Fallout Radionuclides and Stable Isotope Techniques to Assess Soil Quality and Dust Production for Enhanced Agricultural Land Productivity	Dercon, Gerd
IVC5033	Contributing to Food Security and Combating Poverty by Improving the Productivity of the Coconut Palm, Plaintain and Leafy Vegetables by Means of Studying the Effects of Organic and Mineral Fertilisers	Nguyen, Minh-Long
KAM5001	Improving Soil Fertility and Crop Management Strategies in Diversified Rice-Based Farming Systems	Nguyen, Minh-Long

KAZ5003	Increasing Micronutrient Content and Bioavailability in Wheat Germplasm by Means of an Integrated Approach	Sakadevan, Karuppan in collaboration with Plant Breeding and Genetics Section
KEN5030	Assessing Nutrient and Moisture Use in Major Cropping Systems	Heng, Lee
KEN5031	Improving Agricultural Productivity in Mixed Cropping Systems through Application of Knowledge-Based Technologies Generated with the Aid of Nuclear Techniques	Heng, Lee and Sakadevan, Karuppan
MAG5019	Improving the Use of Agricultural Resources and Combating Soil Erosion by Optimising Conservation Agriculture and Developing Strategies for Its Dissemination	Nguyen, Minh-Long; Dercon, Gerd
MLI7003	Assessing Erosion, Sedimentation and Water Resources in River Basins by Using Isotope Techniques	Dercon, Gerd
MOZ5003	Sustaining the Management of Soil Fertility	Dercon, Gerd
MOZ5004	Improving Nitrogen and Water Use Efficiency of Maize Varieties in Conservation Agriculture under Smallholder Farming Systems	Dercon, Gerd
MYA5020	Strengthening Food Security through Yield Improvement of Local Rice Varieties with Induced Mutation (Phase II)	Dercon, Gerd in collaboration with Plant Breeding and Genetics Section
MLI5024	Enhancing Sustainable Intensification and Diversification of Sorghum Production Systems in the Southern Zone by an Integrated and Participatory Approach, Phase 2	Heng, Lee
NEP5001	Improving Nepalese Cardamom Using Nuclear and Molecular Techniques	Sakadevan, Karuppan in collaboration with Plant Breeding and Genetics Section
NER5015	Improving Productivity of the Millet-Cowpea Cropping System through Development and Dissemination of Improved Varieties and New Water and Fertiliser Management Techniques	Sakadevan, Karuppan in collaboration with Plant Breeding and Genetics Section
NIC8012	Applying Nuclear Techniques for the Development of a Management Plan for the Watershed of the Great Lakes	Dercon, Gerd
OMA5001	Producing Forage Crops Tolerant to Salinity and Drought	Adu-Gyamfi, Joseph
QAT5003	Improving Agricultural Productivity in Saline Land/Areas	Sakadevan, Karuppan
RAF5058	Enhancing the Productivity of High Value Crops and Income Generation with Small-Scale Irrigation Technologies	Heng, Lee
RAF5063	Supporting Innovative Conservation Agriculture Practices to Combat Land Degradation and Enhance Soil Productivity for Improved Food Security	Dercon, Gerd
RAS5055	Improving Soil Fertility, Land Productivity and Land Degradation Mitigation	Nguyen, Minh-Long
RAS5056	Supporting Mutation Breeding Approaches to Develop New Crop Varieties Adaptable to Climate Change	Sakadevan, Karuppan in collaboration with Plant Breeding and Genetics Section
RAS5064	Enhancing Productivity of Locally-underused Crops through Dissemination of Mutated Germplasm and Evaluation of Soil, Nutrient and Water Management Practices	Sakadevan, Karuppan in collaboration with Plant Breeding and Genetics Section
RAS5065	Climate-Proofing Rice Production Systems (CRiPS) based on Nuclear Applications	Heng, Lee in collaboration with Plant Breeding and Genetics Section
RLA5051	Using Environmental Radionuclides as Indicators of Land Degradation in Latin American, Caribbean and Antarctic Ecosystems (ARCAL C)	Dercon, Gerd
RLA5052	Improving Soil Fertility and Crop Management for Sustainable Food Security and Enhanced Income of Resource-Poor Farmers (ARCAL CI)	Sakadevan, Karuppan

RLA5053	Implementing a Diagnosis System to Assess the Impact of Pesticide Contamination in Food and Environmental Compartments at a Catchment Scale in the Latin American and Caribbean (LAC) Region (ARCAL CII)	Dercon, Gerd in collaboration with Food and Environmental Protection Section
RLA5062	Applying Stable Isotopes to Assess the Impacts of Natural Zeolite to Increase Nitrogenous Fertilizer Use Efficiency, to Improve Soil Fertility and to Reduce Soil Degradation (ARCAL CXXV)	Nguyen, Minh-Long
SEN5034	Using an Integrated Approach to Develop Sustainable Agriculture in a Context of Degrading Soil Fertility, Climate Change and Crop Diversification	Dercon, Gerd in collaboration with Plant Breeding and Genetics Section
SEY5006	Implementing Nutrient and Water Management Practices Using Nuclear and Related Techniques to Enhance National Vegetable Production through Sustainable Agricultural Management	Heng, Lee
SLO5003	Developing the Optimum Combination of Soil Quality and Nutrient Management for Sustainable Food Production and Pollution Prevention	Sakadevan, Karuppan
SUD5033	Enhancing Productivity of Major Food Crops (Sorghum, Wheat, Groundnut and Tomato) under Stress Environment Using Nuclear Techniques and Related Biotechnologies to Ensure Sustainable Food Security and Well-Being of Farmers	Adu-Gyamfi, Joseph in collaboration with Plant Breeding and Genetics Section
TAD5005	Developing Soil Conservation Strategies for Improved Soil Health	Dercon, Gerd
URT5027	Improving Livestock Production and Productivity through Sustainable Application of Nuclear and Related Techniques	Heng, Lee
URT5028	Improving Crop Production and Productivity through the Use of Nuclear and Nuclear-Related Techniques	Heng, Lee
VEN7004	Use of agro-environmental radioactive soil tracers (i.e. 137Cs and 2010Pb) for assessing and managing sedimentation processes impacting reservoirs	Nguyen, Minh-Long
ZAI5020	Assessing and Improving the Assimilability of Natural Phosphates Composted with Organic Matter in Marginal Soils through the Use of Isotope and Nuclear Techniques for Improved Crop Nutrition	Dercon, Gerd
ZAM5026	Improving Crop Varieties Through Use of Nuclear Techniques	Heng, Lee
ZAM5027	Developing Maize Genotypes for Drought and Low Soil Fertility Tolerance	Heng, Lee
ZIM5015	Developing Drought Tolerant and Disease/Pest Resistant Grain Legume Varieties with Enhanced Nutritional Content Using Mutation Breeding and Novel Techniques, Phase II	Heng, Lee
ZIM5018	Optimising Water Use and Soil Productivity for Increased Food Security in Drylands through Farmer Participation in Sustainable Technologies	Heng, Lee

Forthcoming Events

FAO/IAEA Events

FAO/IAEA International Symposium on Managing Soils for Food Security and Climate Change Adaptation and Mitigation, 23-27 July 2012, Vienna, Austria

The symposium will be held in cooperation with the following organizations/bodies:

1. Soil Science Society of America
2. Soil Science Society of China
3. International Union of Soil Sciences
4. East and Southeast Asia Federation of Soil Science Societies
5. International Centre for Advanced Mediterranean Agronomic Studies
6. European Confederation of Soil Science Societies

Approximately 450 professionals have been registered to attend the symposium, representing 10 international organizations and 81 Member States. The Symposium committee also received more than 240 extended synopses and all of them have been assessed for their technical merits and authors have been informed of the committee's decisions on the synopses. The committee has accepted a total of 234 extended synopses for oral and poster presentations. Of these eighty will be presented as oral and the remaining 154 will be presented as posters.

The programme booklet for the Symposium and the Book of Extended Synopses to be given to each participant at registration are currently being finalized. A provisional programme for the Keynote Speakers and Oral and Poster Presentations, together with the Supplementary Announcement and the revised Flyer, have been placed on the website:
http://www-pub.iaea.org/iaeameetings/41176/International-Conference-on-Managing-Soils-for-Food-Security-and-Climate-Change-Adaptation-and-Mitigation

In addition to the Plenary session, the first 4 days of the symposium are divided into the following seven technical sessions:

Session 1	Managing soils for crop production and ecosystem services
Session 2	Preserving and protecting soil resources
Session 3	Soil and water conservation zones for pollution control
Session 4	Managing soils for climate change adaptation and mitigation
Session 5	Managing agricultural water for climate change adaptation
Session 6	Recent advances in nuclear techniques and instrumentation
Session **7**	General discussion, summary and conclusions

As a result of consultations between the Joint FAO/IAEA Division of Nuclear Techniques in Food and Agriculture in Vienna and the FAO's Land and Water Division in Rome, it was decided to extend the four-day International Symposium originally scheduled from Monday, 23 July, to Thursday, 26 July 2012, to include Friday, 27 July 2012. The programme for this additional day is intended to focus on the **FAO Global Soil Partnership** highlighting, in particular, linkages between research and policy development in the soil agenda in order to meet the challenges of improving food security in the context of climate change. The FAO Committee on Agriculture at its 23rd session on 24 May 2012 endorsed the establishment of the Global Soil Partnership.

The programme structure for day 5 includes:

- Presentation of the Global Soil Partnership (GSP) — vision and mission, objectives, governance, pillars of action and implementation framework;
- Statements/Discussion on the GSP with regard to GSP components and collaboration with related international processes;
- Discussion on linking scientific and technical conclusions from the Symposium (Days 1-4) with 2 key GSP pillars of action: i) promoting sustainable soil management and ii) targeted soil research;
- Discussion in working groups on priority areas for action and concrete proposals for partnership and report back
- Becoming a partner of the GSP (e.g. NARSs, CGIAR participants, etc.)- Interactive process for the development of collaborative actions with partners;
- Plenary conclusions and recommendations regarding the implementation of the GSP.

There is no deadline for registration and there is no registration fee to attend the symposium

IAEA
International Atomic Energy Agency
Atoms for Peace

50th Anniversary of the Agency's Nuclear Sciences and Applications Laboratories in Seibersdorf

Believe it or not: the Agency's Nuclear Sciences and Applications (NA) Laboratories in Seibersdorf have just completed half a century of dedicated support to Member States in their efforts to optimally exploit 'atoms for peace'. It seems to be an appropriate time to celebrate the completion of these five decades in a fitting manner.

Throughout these many years, the activities of the NA Laboratories in Seibersdorf have continuously evolved, also through their partnership with FAO, in response to the ever changing landscape of nuclear technologies and applications, and to the multitude of expectations of national and international organizations for cooperation in nuclear research and technology transfer. In this process, the Laboratories have consistently remained at the forefront of assisting Member States in fostering the use of nuclear science and technology wherever these offer unique opportunities or provide added value.

The Laboratories have indeed come a long way. Starting with a mere 1736 m^2 of combined laboratory, office and corridor space in 1962, the original U-shaped building housed 14 professional and 24 general service staff. Today, it covers an area of more than 13 000 m^2 and is a dynamic hub for nearly one hundred scientists, technicians, fellows, visitors, interns and students from all over the world that are engaged in a wide range of activities dedicated to supporting global development and cooperation. These dedicated and concerted efforts have led to a myriad of success stories in the many areas of work in the Laboratories, which is both satisfying and enthusing.

Many of you have, at some stage in your career, interacted with the NA Laboratories in Seibersdorf and contributed to these successful projects and programmes, which are glowing examples of success stories that fully justify the mandate of these Laboratories. We are very grateful to all of you for seamlessly working with us, as we realize that it is only through the dedication, the enthusiasm and the numerous ideas of our many internal and external stakeholders, that it has been possible for the Laboratories to consistently remain at the forefront in our numerous and very diverse endeavours.

Nonetheless, this is not the time to lay back in satisfaction but a time to look forward to further enhance the performance of the Laboratories and to improve our outreach. While the NA Laboratories in Seibersdorf have served the Member States well over the last half century, they need to be modernized and upgraded to cater to growing demands and to keep pace with increasingly rapid technological developments. The planned 50 year anniversary celebration of the Laboratories is an apt time to look back and feel proud of the numerous achievements, as well as to plan the future road map that will enable the Laboratories to retain the high level and quality of service that Member States have come to expect.

So, when we celebrate the 50th anniversary of the NA Laboratories in Seibersdorf, it is really you we are celebrating. We sincerely hope to see as many of you as possible during this year of celebration or maybe even at the actual event in late November 2012 at the Laboratories.

Daud Mohamad

Deputy Director General
Department of Nuclear Sciences and Applications

Regional Training Course for TC project RLA5052 on Improving Soil Fertility and Crop Management for Sustainable Food Security and Enhanced Income of Resource-Poor Farmers 23 July – 3 August 2012, Vienna, Austria.

Technical Officer: Karuppan Sakadevan

The objective of this workshop on soil, water, crop and nutrient management to improve soil fertility and crop productivity in small holder farms is to improve the skills, knowledge and technical competency of scientific and extension specialists from Latin America for managing soil, water, crop and nutrient management in agriculture. The knowledge will then be disseminated to local agricultural officers and farmers in order to improve soil fertility, quality and crop productivity.
It is expected that the training course will involve: (1) a general introduction to soil, water, crop and nutrient management, (2) factors affecting nutrient and water use efficiencies in agriculture (3) soil and plant testing to determine nutrient requirements by crops and (4) farming practices that improve soil fertility and reduce nutrient losses.
The proposed training will help to provide an understanding of important farm management practices that improve soil fertility, quality and crop productivity and reduce nutrient losses from agricultural soils. The trainees from 12 Memebr States in Latin America (Argentina, Bolivia, Brazil, Chile, Cuba, the Dominican Republic, El Salvador, Haiti, Mexico, Nicaragua, Paraguay and Venezuela) will then disseminate this knowledge to farmers and local agricultural officers in Member States.

The following three RCMs will be held from 23-27 July 2012, in Vienna, Austria, along with the International Symposium on Managing Soils for Food Security and Climate Change Adaptation and Mitigation.

(1) The fourth and final RCM of the CRP D1.20.09 on Managing Irrigation Water to Enhance Crop Productivity under Water-Limiting Conditions: a Role for Isotopic Techniques (*Technical Officers: Lee Heng and Minh-Long Nguyen)*
(2) The third RCM of the CRP D1.20.10 on Strategic Placement and Area-Wide Evaluation of Water Conservation Zones in Agricultural Catchments for Biomass Production, Water Quality and Food Security (*Technical Officers: Karuppan Sakadevan and Lee Heng*).
(3) The third RCM of the CRP D1.20.11 on Integrated Isotopic Approaches for an Area-wide Precision Conservation to Control the Impacts of Agricultural Practices on Land Degradation and Soil Erosion (*Technical Officers: Minh-Long Nguygen and Gerd Dercon)*

Regional Training Course for TC project RLA5051 on Using Environmental Radionuclides as Indicators of Land Degradation in Latin American, Caribbean and Antarctic Ecosystems, 12 - 23 November 2012, Irapuato Guanajuato, Mexico

Technical Officer: Gerd Dercon

The purpose of the training course is to provide basic knowledge and skills on how to disseminate and promote the work and research carried out under the regional project RLA5051, entitled Using Environmental Radionuclides as Indicators of Land Degradation in Latin American, Caribbean and Antarctic Ecosystems, through the use of innovative internet-based advanced geospatial information visualization and dissemination platforms (Google Earth, MapBox, among others). By disseminating this information, our RLA5051 network and partners can reach target audiences and have impacts on policy and programming in the region. These internet-based tools can serve as an invaluable aid in this effort to exchange and communicate information on soil erosion and conservation to a wide audience. Approximately 28 participants from across Latin America and the Caribbean (Argentina, Bolivia, Brazil, Chile, Cuba, Dominican Republic, El Salvador, Haiti, Jamaica, Mexico, Nicaragua, Peru, Uruguay and Venezuela) will attend this training course.

Final regional coordination meeting for the technical cooperation project RLA5052 on Improving Soil Fertility and Crop Management for Sustainable Food Security and Enhanced Income of Resource-Poor Farmers, 10-14 December 2012, Buenos Aires, Argentina.

Technical Officer: Karuppan Sakadevan

The purpose of the final regional coordination meeting is to discuss and review activities and outputs for individual countries. Counterparts from Argentina, Bolivia, Brazil, Chile, Cuba, Dominican Republic, El Salvador, Haiti, Mexico, Nicaragua, Paraguay and Venezuela are expected to attend the meeting. During this meeting the participants will discuss the results obtained from field work on soil, crop and nutrient management practices on nutrient use efficiency and soil fertility and quality improvements. They will also discuss the publications and development of possible success stories and a final report for the project.

Non-FAO/IAEA Events

- The 4th International Congress of ECSSS – Soil Science for the benefit of mankind and environment.
  Dates: 2-6 July 2012
  Place: Bari, Italy
  Website: http://www.eurosoil2012.eu/

- The 5th Joint SSA and NZSSS Soil Science Conference – Soil solutions for diverse landscapes.
  Dates: 2-7 December 2012
  Place: Hobart, Tasmania, Australia
  Website: http://www.soilscience2012.com/

- The 4th International EcoSummit - EcoSummit 2012 - Ecological Sustainability: Restoring the Planet's Ecosystem Services
  Dates: 30 September -5 October 2012
  Place: Columbus, Ohio, USA
  Website: http://www.ecosummit2012.org/

- The 19th ISTRO Conference
  Dates: 24-28 September
  Place: Montevideo, Uruguay
  Website: http://www.congresos-rohr.com/istro2012/webs/htm/invitation.html

- The 9th European Conference on Precision Agriculture – Facing new challenges, providing new solutions
  Dates : 7-11 July, 2013
  Place: Lleida, Catalonia, Spain
  Website : http://www.ecpa2013.udl.cat/first_call.html

- The 20th World Congress of Soil Science – Soils embrace life and universe
  Dates: 8-13 June, 2014
  Place: Jeju, Korea
  Website : http://www.20wcss.org/

- 6th International Nitrogen Conference (N2013), 18-22 November 2013
  Place: Kampala, Uganda.
  Website: www.N2013.org

Past Events

Duty Travel

Chile and Antarctica for Regional TC project RLA/5/051 on Using Environmental Radionuclides as Indicators of Land Degradation in Latin American, Caribbean and Antarctic Ecosystems, 29 November – 15 December 2011

Technical Officer: Gerd Dercon

Gerd Dercon travelled to King George Island (referred to as May 25 Island by Argentina, Isla Rey George by Chile, and Vaterloo by Russia), the largest of Antarctica's South Shetland Islands and 120 kilometres off the coast of Antarctica, from 29 November – 15 December 2011.

Under the umbrella of the RLA/5/051 project, this mission aimed to assess the impact of climate change on soil quality and soil degradation in polar ecosystems using natural tracers such as stable and radioisotopes. This mission, in cooperation with INACH, the Chilean Antarctica Institute was the first of its kind, and part of an on-going Regional Technical Cooperation Programme to enhance soil conservation and environmental protection in Latin America, the Caribbean and Antarctica. INACH provided vital logistical support to the team, which was made up of two Chilean scientists from the Universidad Austral de Chile, Professor Paulina Schuller and Ms Alejandra Castillo, and the Technical Officer from the Joint FAO/IAEA Division.

Three days of briefings and trip preparation at INACH in the Chilean city of Punta Arenas preceded the team's departure for Western Antarctica. The following thirteen days were spent collecting soils, sediments, plants, lichen, moss, grass (new to the landscape) and penguin excrement. Moving between Chile's Professor Julio Escudero scientific base and the Uruguayan scientific research station of Artigas, the team was able to access a range of sites, not only around the bases, but also on the smaller Ardley Island off the southern coast of King George Island. While Zodiac boats were used to travel the short distance to Ardley Island and tracked snow vehicles and quads transported the team between the bases, much of the day was spent walking to sites accessible only by foot, crossing small streams of meltwater. This proved a challenge in layers of protective clothing and heavy boots and with a combined weight of up to 30 kilograms of soil sampling equipment and the samples themselves.

Every effort was made to minimize any impact on the fragile ecosystem. Around 150 samples, each weighing between 50 g and 400 g, were taken, sieved, separated, dried and packed. In addition, 27 cylinders of undisturbed soil were also taken. In order to investigate what changes occur in soil quality at higher temperatures, changes for example in the soil organic carbon content, these have since been buried at sites in Patagonia and Valdivia in South Central Chile and reburied on King George Island, Antarctica. The reburial in Western Antarctica creates a baseline for the simulation study, while those samples buried in Chile will provide scientists with a window into the future as higher soil temperatures simulate an accelerated scenario of global warming.

Nowhere are the effects of climate change more visible than in polar and high mountainous regions where increasing temperatures are leading to glacial melting. In Western Antarctica, where climate change is progressing at a rate several times the global average, research carried out in the soils at the foot of retreating glaciers may provide vital clues as to what the future holds for farmers in high mountainous regions, such as the Andes, Himalayas or Caucasus.

In addition to the invaluable fieldwork undertaken, the teams' presence in Antarctica provided an excellent opportunity to network with scientists from other countries. More than twenty Chinese, German and Russian scientists attended a seminar given by Mr. Dercon at Russia's Bellingshausen base and the lively discussion that ensued went on late into the night. Other informal meetings as well as communication since the team's departure from Antarctica indicates not only a high level of interest but also the possibility of future collaboration.

Soil sampling for land degradation monitoring through the use of fallout radionuclides in Antarctica.

Dominican Republic: To organize the second coordination meeting for the regional technical cooperation project RLA5052 on Improving Soil Fertility and Crop Management for Sustainable Food Security and Enhanced Income of Resource-Poor Farmers, Santo Domingo, Dominican Republic, 12-16 December 2011.

Technical Officer: Karuppan Sakadevan

The purpose of the second regional coordination meeting was to review and discuss project progress during the period from January 2010 to November 2011 and to plan the work programme for 2012. The meeting was attended by national counterparts from Bolivia, Brazil, Haiti, Cuba, the Dominican Republic, Chile, El Salvador, Mexico, Paraguay and Venezuela and the PMO, International Atomic Energy Agency (IAEA). The first two days focused on discussing the progress made in each country. The discussion included presentations by counterparts on field work carried out in each of the countries and outputs from field studies. On day three, a round table discussion was organized in which the technical officer presented an overview of integrated soil, water and nutrient management for improving soil fertility, quality and crop productivity. As part of this presentation, the roles of conservation agriculture practices, including tillage, crop residue retention, mulching, addition of organic amendments, cover crops and crop rotation for improving soil fertility and crop productivity, were discussed. Brazil, Cuba, the Dominican Republic, Paraguay and Mexico are using conservation agricultural practices as part of the project.

A one day field visit was organized on the fourth day. The importance of rice residue management to improve soil fertility and quality was reiterated in a farmer field experimental site. The final day focused on developing the detailed work plan and strategies for project implementation for 2012, including field studies, fellowship training, scientific visits, expert mission requirements and training workshops. All ten countries participating in the mid-term coordination meeting have agreed to establish additional field experiments on different farms to study nitrogen use efficiency in soil-crop systems. N-15 labelled urea fertilizer will be used in all field experiments.

Philippines: As a resource person, requested by the Philippines Nuclear Research Institute (PNRI) to discuss the use of nuclear and isotopic techniques in soil and water management studies, 20-24 February 2012

Technical Officer: Lee Heng

Lee Heng travelled to the Philippines Nuclear Research Institute (PNRI) in Manila as a resource person to discuss with staff the use of nuclear and isotopic techniques in soil and water management studies. The trip came about after the 2011 IAEA General Conference and the Scientific Forum on 'Water Matters: Making a Difference with Nuclear Techniques', where the use of nuclear and isotopic techniques in soil and water management was demonstrated. Lee gave two PowerPoint presentations on Quantifying and partitioning of evaporation and crop transpiration by oxygen-18 and deuterium and other simple methods and The use of soil moisture equipment to measure and improve water use efficiency. Besides visiting PNRI, Lee visited (1) the Bureau of Soil and Water Management (BSWM), where she gave a presentation on The use of N-15 in fertigation and nitrogen use efficiency studies, (2). the PhilRice at Muñoz, Nueva Ecija, where she presented IAEA's work on The use of carbon-13 for rice and wheat selection, and (3) the Philippine Council for Agriculture, Aquatic and Natural Resources Research and Development (PCAARRD) and the University of Philippines Los Banos Engineering Department, where she gave a presentation on AquaCrop model for improving water use efficiency in maize and wheat crops.

France: To attend the 6th World Water Forum from 13-16 March 2012 in Marseille, France

Technical Officers: Lee Heng and Karuppan Sakadevan

The sixth World Water Forum was held in Marseille, France from 12 to 17 March 2012 with the aim of advocating a strategic approach to solving key water problems by finding solutions to tackle the challenges relating to global water issues and to ensure that these issues are high on all political agendas.

The main purpose of Lee Heng and Karuppan Sakadevan's attendance at the Forum was to introduce IAEA's work in agricultural water management and to show how nuclear and isotope techniques can contribute towards finding water solutions. They also supervised the IAEA exhibition booth together with colleagues from Isotope Hydrology, Nuclear Energy, Technical Cooperation and the Environmental Laboratory in Monaco. Lee Heng and Karuppan Sakadevan also attended some of the high level events and thematic sessions of the Forum, including The Way Towards Rio+20, Water and Adaptation to Climate Change – The Way Forward, Future of World's Water Beyond 2025, Water and Food Security, in the fight against desertification and sustainable financing for water security. The thematic sessions focused mainly on issues and options relating to agricultural water management. Technical presentation was kept to a minimum. The forum generated many excellent discussions, knowledge sharing and partnership building opportunities.

The IAEA exhibition on water management of the 6th World Water Forum provided very good public visibility for the IAEA's development programmes on agricultural water management. The thematic programmes highlighted current issues in water management, including water sharing, improving water use efficiency and the programme of actions by some representative countries to tackle water management issues. Attendance at the exhibition and at the thematic sessions provided an opportunity to better understand water-related issues in Member States by IAEA and development programmes to address these issues.

IAEA Water exhibition booth at the 6 WWF.

Benin: National TC project BEN 5007 on Soil, Crop and Livestock Integration for Sustainable Agriculture Development through the Establishment of a National Laboratory Network, 18-23 March 2012

Technical Officer: Joseph Adu-Gyamfi

Joseph Adu-Gyamfi travelled to Cotonou, Benin to review and evaluate the achievement of the past project BEN5005 on Improving maize and yam-based cropping systems and soil fertility and to discuss with national counterparts to develop the work plan and implementation strategies for the new project BEN5007. This is an interdisciplinary project, which aims at sustainable intensification of peri-urban agricultural production through the integration of cropping and livestock systems.

Adu-Gyamfi reviewed the progress of project BEN5005 implementation by assessing existing laboratory facilities in Cotonou and assisted the counterparts to identify two pilot sites for field studies in northern (Ina, 640 km from Cotonou) and southern (Sekou, 30 km from Cotonou) Research Centers.

The equipment, consumables, human resource capacity building, and legumes selected for their high biomass and nitrogen fixing ability under BEN5005 provided benefits to the new project. It was agreed to install three weather stations in the Southern, Middle and the Northern Belt to collect weather related data.

It was agreed to use an initial baseline survey on current livestock feeding practices, farmer household information, land tenure systems, soil types, chemical characteristics of soil and manure currently used, number of ruminants, types of feed, land use, and income from crops and livestock.

Support for field experiments on soil fertility and feed resources and cereal (sorghum, millet) rotation with

legumes (soybean, cowpea/groundnuts or pigeonpea) will be established to assess nutrient use efficiency and biological N fixation by crops.

Field studies at the Southern Research Center, Sekou, will be linked with the on-going CRP D1.50.12 on Soil Quality and Nutrient Management for Sustainable Food Production in Mulch-based Cropping Systems in Sub-Saharan Africa.

Indonesia: For Technical Cooperation project INS5039 on "Enhancing Food Crop Production Using Induced Mutation, Improved Soil and Water Management and Climate Change Adaptation Makassar, Indonesia, 26-28 March 2012.

Technical Officer: Karuppan Sakadevan

Karuppan Sakadevan visited Hasanuddin University, Makassar, which is one of the main counterparts of the technical cooperation project INS5039. The purpose of the visit was to discuss and develop a work plan to implement the project for the period 2012-2015. The Indonesian Nuclear Agency (BATAN) is the second counterpart for the project. The project aims to improve the productivity of rice and sorghum by using improved crop varieties tolerant to abiotic stresses and better soil, water and nutrients management practices in different agro-climatic environments, particularly in South Sulawesi.

Mr Sakadevan met with the project counterparts from both Hasanuddin University (crop, soil and water scientists) and BATAN (plant breeders). The counterparts from Hasanuddin University informed the meeting that in South Sulawesi, two important rice varieties tolerant to water stress and suitable for upland rainfed conditions have been developed with yields of up to 3 tonnes/ha/year. However, with improved soil, water and nutrient management practices the yield can be increased up to 5 tonnes/ha/year. The demand for these rice varieties is very high due to the aroma and taste and they are mainly destined for consumption in the Java region. After the discussion with the counterparts it was decided to develop field studies in the uplands at Wajo Regency, one of the central areas for agriculture production in south Sulawesi by introducing technology packages in soil, water, crop and nutrient management.

Mr Sakadevan visited Wajo Regency and met with the chief agricultural officer and farmers to discuss and identify potential sites for field studies. Less than 4000 ha of land out of 36 000 ha in the uplands are currently used for agriculture. The major limitation for production is the lack of availability of improved soil, water and nutrient management practices. The farmers agreed to participate and provide sites for the field work.

In addition to field studies in the Wajo Regency, the counterparts from BATAN will establish additional field studies using improved sorghum varieties with soil, water and nutrient management practices to increase the productivity of sorghum in soils with acid conditions in the Java region.

Central African Republic for TC Project CAF5006 on Improving Cassava Production through High-Yielding Varieties and Sustainable Soil Fertility Management by Using Isotopic and Nuclear Techniques to Ensure Sustainable Farming, 12–17 April 2012

Technical Officer: Gerd Dercon

Gerd Dercon visited the Faculty of Science, University of Bangui, Bangui, the main counterpart of the project that aims to increase cassava production through crop improvement and integrated soil fertility management for ensuring sustainable farming in the Central African Republic. Mr Dercon discussed with counterparts to identify current capacity in soil fertility management (SFM) research and assisted in the development of a work plan linked to the national strategies for improving SFM (in particular in cassava-based cropping systems).

Mr Dercon gave seminars on the use of isotopic and related tools to enhance soil fertility management under cassava based cropping systems. Several protocols were designed for determining the response of cassava to organic and inorganic fertilizers. Further, he visited the experimental farm of the counterpart in Kapou, which will be used in the TC project. The field visit provided an opportunity to learn how the lack of soil fertility management reduces the quality and productivity of soil, increases the pressure on natural resources, such as the rainforest, and affects the livelihoods of rural population. Mr Dercon also established contacts with personnel from the Central African Institute for Agricultural Research, who showed interest in the practices being tested under CAF/5/006 for improving soil fertility in the Central African Republic.

Opening the rainforest for agriculture.

Bangladesh: For Technical Cooperation Project BGD5028 on Assessing Crop Mutant Varieties in Saline and Drought Prone Areas Using Nuclear Techniques Mymensingh, Bangladesh, 23-25 April 2012.

Technical Officer; Karuppan Sakadevan

In Bangladesh, about 2.8 million ha of coastal lands are currently affected by varying degrees of salinity (2 to 16 dS/m) and this is a major threat to the national food security. Of this about 1 million hectares of land can be used for crop production with improved soil, water, crop and nutrient management. In this context, Karuppan Sakadevan visited the Bangladesh Institute of Nuclear Agriculture (BINA) and met the national counterpart to discuss and develop a detailed work plan and implementation strategies for the project. The meeting was also attended by the Director General and Director (Research) of BINA.

The discussion included establishing field experiments on soil, water and nutrient management for enhancing water and nutrient use efficiencies of improved varieties of rice, mung bean and ground nut and human resource capacity development requirements. During the meeting it was discussed that BINA has developed two rice varieties (Binadhan 8 and PBRC37) tolerant to salinity of up to 6 dS/m that provide a yield of more than 6 tonnes/ha/harvest. These two new varieties will be tested in coastal saline lands for improved soil, water and nutrient management practices for enhancing yield, water and nutrient use efficiencies.

Mr Sakadevan visited the coastal areas with Dr Mirza Islam, the project counterpart from BINA to identify potential sites for evaluating soil, water and nutrient management practices for increasing yield, water and nutrient use efficiencies of the two rice varieties. Potential sites in the Khulna and Sathkira regions were identified for field studies. An area of 15 ha can be used for rice production during the dry season starting in November 2012. At present, Bangladesh produces approximately 35 million tonnes of rice per year. The project outcomes will provide opportunities to increase rice production by an additional 7 million tonnes/year.

On the final day, Mr Skadevan also visited the Bangladesh Atomic Energy Commission and discussed the importance of project BGD5028 for Bangladesh food security with the national Liaison Officer.

Binadhan 8 rice is being tested in the field.

Italy: FAO, on the publication of Irrigation and Drainage (I&D) Paper No. 66 on 'Crop yield response to water', AquaCrop model update and attending FAO's Land and Water Days, 3-10 May 2012

Technical Officer: Lee Heng

Lee Heng travelled to Rome, Italy as part of the AquaCrop core group to discuss the soon to be published FAO I&D Paper 33 on 'Crop Yield Response to Water', which was an update of the 1979 FAO publication (No. 33 on Yield Response to Water) to better assess and enhance crop yield response to water. The new publication also contains a chapter on the use of the AquaCrop model and on the yield response to water of fruit trees and vines, that were not available in the I&D Paper 33.

Lee also attended the FAO Land and Water Days from 7-10 May. The workshop aimed to improve land and water management quality and impact in the field in terms of technologies, approaches and modalities for sustainable improvements. The workshop, which was attended by over 200 participants, helped to strengthen the network of practitioners within FAO, across Rome-based agencies (IFAD and WFP) and beyond to improved land and water management interventions on the ground and enhanced collaboration between disciplines, between regions and between field operations and knowledge management, taking advantage of existing networks like the FAO Water Platform, IFAD Water and Food Network, the Global Soil Partnership and WOCAT. Tools and methodologies to support better investments in land and water management were also highlighted.

Ecuador for the first coordination meeting of the regional technical cooperation project (RLA5062) on Applying Stable Isotopes to Assess the Impacts of Natural Zeolite to Increase Nitrogenous Fertilizer Use Efficiency, to Improve Soil Fertility and to Reduce Soil Degradation (ARCAL CXXV); Riobamba, Ecuador, 10-14 May, 2012

Technical Officer: Long Nguyen

The purpose of this first coordination meeting was to review experimental designs and to plan the work programme for 2012-2013 with project counterparts from eight countries in Latin America (Bolivia, Colombia, Costa Rica, Cuba, Ecuador, Guatemala, Honduras and Panama). The meeting also involved active participation and inputs from the Project Management Officer (Ms Eva Ciurana Casademont) of the IAEA Technical Cooperation Programme, representatives from the Ecuadorian Ministry of Agriculture, a representative from FAO and from the Ecuadorian zeolite industry (ZEONATEC).

The project aims to quantify the beneficial effects of natural zeolites, which are aluminosilicate minerals, present in abundance in both Cuba and Ecuador. They are known to adsorb and absorb cations (positively charged ions) such as ammonium (NH4+) and potassium (K+). However, the extent of adsorption-absorption of these cations depends on soil types, the availability of soil nutrients, the form of nitrogen (N) fertilisers used and the amount of zeolites added. In order to quantify the efficient use of N fertilisers, 15N-labelled urea fertiliser will be used in all the studies conducted in each of the eight participating countries. Beside the potential capacity of zeolites to enhance N (and K) fertilizer use efficiency, zeolites with their high capacity to retain water (normally 30% higher than soils can hold) can also be used to enhance water use efficiency and crop water productivity.

In partnership with local counterparts, field experiments are being planned to investigate the effects of zeolites as soil amendments to enhance soil quality and nitrogen fertilizer use efficiency (Chimborazo, Ecuador).

Visitors

- Dr Marnik Vanclooster from the Université Catholique de Louvain, Louvain-la-Neuve, Belgium (April 23). Dr Vanclooster has extended expertise in agricultural water management in developing countries.

- Dr William Blake from the University of Plymouth, Plymouth, UK (April 26). Since 2009, Dr Blake has been collaborating with the Soil and Water Management & Crop Nutrition Subprogramme through CRP D1.20.11, entitled Integrated Isotopic Approaches for an Area-wide Precision Conservation to Control the Impacts of Agricultural Practices on Land Degradation and Soil Erosion, in the field of soil erosion monitoring through the use of fallout radionuclides.

- Dr Veerle Vanacker from the Université Catholique de Louvain, Louvain-la-Neuve, Belgium (April 26). Dr Vanacker focusses on the relationship between land degradation and human-induced land use changes in tropical and subtropical regions.

- Dr Matthias Zeeman of Karlsruhe Institute of Technology (KIT), Atmospheric Environmental Research Institute of Meteorology and Climate Research (IMK-IFU) visited the SWMCN on 25-27 April 2012 to work with Lee Heng and Dr Peter Cepuder, University of Natural Resources and Life Sciences and visiting scientist Dr Tom Denmead on a field study at BOKU Experimental Station on the determination of evapotranspiration (ET) using the eddy covariance of KIT and the Keeling plot isotopic method.

- Dr Tom Denmead, from CSIRO Land and Water, Principal Fellow with the University of Melbourne, Australia, visited the SWMCN from 18-27 April to help set up a field study with Lee Heng, Leo Mayr, Jose Arrillaga, Matthias Zeeman and Peter Cepuder to compare the eddy covariance and isotopic methods of determining ET and to use Inverse Lagrangian dispersion analysis to determine the sources of soil evaporation and plant transpiration.

Coordinated Research Projects (CRPs)

Strategic Placement and Area-Wide Evaluation of Water Conservation Zones in Agricultural Catchments for Biomass Production, Water Quality and Food Security (D1.20.10)

Technical Officers: Karuppan Sakadevan and Lee Heng

This project is in its fourth year and will be continued until the end of 2013. Eight research contract holders from China, Estonia, Islamic Republic of Iran, Lesotho, Nigeria, Romania, Tunisia and Uganda, two technical contractors from the UK (University of Birmingham) and the USA (University of Florida) and agreement holders from the USA (University of Rhode Island) and France (Institut de recherche pour le developement) are involved in the project. The technical contractors have now been converted into agreement holders. The objective of this CRP is to assess and enhance services provided by water conservation zones (farm ponds, wetlands and riparian buffer zones) to optimize water and nutrient storage, biomass production and food security within agricultural catchments. The specific objectives of the project are: (1) to optimize water storage in water conservation zones for downstream irrigation and biomass production, (2) to regulate nutrient cycling in water conservation zones to improve biomass production and improving downstream water quality and (3) to optimize the use of water conservation zones for biomass production.

The first RCM was held from 15-19 December 2008 and the second RCM from 10-14 May 2010. All research contract holders have continuously collected field data on ^{15}N, ^{18}O and ^{2}H from water and plants in wetlands, farm ponds and riparian buffer zones to identify sources of water and N use efficiency in the biomass. The mid-term review was approved in October 2011. Project progress for 2011 was reviewed for all eight research contractors and the contracts have been renewed for 2012.

The third RCM will be held in Vienna in July 2012 to coincide with the FAO/IAEA International Symposium on Managing Soils for Food Security and Climate Change Adaptation and Mitigation. All participants in this CRP will be presenting either an oral or poster paper at the Symposium.

Integrated Isotopic Approaches for an Area-wide Precision Conservation to Control the Impacts of Agricultural Practices on Land Degradation and Soil Erosion (D1.20.11)

Technical Officers: Gerd Dercon and Long Nguyen

The overall objective is to develop integrated isotopic approaches to identify hot spots or critical areas of land degradation in agricultural catchments for effective soil conservation measures (precision conservation). Specific research objectives are to: (i) develop the combined use of fallout radionuclide (FRN) and conventional techniques with spatial analysis to establish soil redistribution patterns and rates over several temporal scales on an area-wide (catchment) basis, (ii) develop and validate protocols for the application of compound specific stable isotope (CSSI) techniques to identify and apportion the amount of source soils (land degraded areas) from main land uses/management (cropland, grassland and forestland) in the catchment, (iii) integrate nuclear based approaches with other non-nuclear techniques through modelling and other tools to establish comprehensive soil redistribution studies on an area-wide basis, and (iv) create a basis for developing decision support tools to implement precision conservation and contribute to sustainable land management.

This CRP, which was formulated on the basis of the recommendation from a Consultants Meeting held at IAEA Headquarters, Vienna, 5-7 November 2007, is in its third year. The first RCM was held at IAEA headquarters in Vienna from 8 to 12 June 2009. The second RCM was held at the National Centre for Atomic Energy, Nuclear Sciences and Applications (Centre National de l'Energie, des Sciences et des Techniques Nucléaires (CNESTEN)) in Rabat, Morocco, from 27 September to 1 October 2010. A Mid-Term Review of the CRP was successfully carried out in November 2011.

The third RCM will be held in Vienna from 23-27 July 2012 at the same time as the FAO/IAEA International Symposium on Managing Soils for Food Security and Climate Change Adaptation and Mitigation. Eight research contract holders from Chile, China, Morocco, Poland, the Russian Federation, Syrian Arab Republic and Vietnam, four technical contract holders from Belgium (University of Ghent), China (Chinese Academy of Agricultural Sciences) and Germany (University of Hohenheim) and, and five agreement holders from Australia (CSIRO), Canada (University of Manitoba), New Zealand (National Institute of Water & Atmospheric Research) and the United Kingdom (University of Exeter

and University of Plymouth) will attend the third RCM. By linking up the RCM and the Symposium, the results of this successful CRP will be disseminated across the wide scientific community.

In 2012, the protocol for the application of CSSI techniques to identify critical areas of land degradation at the catchment scale is being validated under different agro-ecological conditions and land use systems (i.e. Chile, China, Morocco, Poland, the Russian Federation, Syrian Arab Republic and Vietnam).

Approaches to Improvement of Crop Genotypes with High Water and Nutrient Use Efficiency for Water Scarce Environments (D1.50.13)

Technical Officers: Karuppan Sakadevan and Pierre Lagoda

This CRP aims to increase crop productivity and resource use efficiency in harsh environments by using best fit soil and water management practices and improved crop varieties through demonstration in small farmers' fields. The overall objective of this CRP is to increase crop productivity and food security by developing and extending rapidly to farmers the improved crop varieties and soil, water, nutrient and crop management technologies that make cropping systems resilient to environmental stresses. The specific objectives are (1) to increase the productivity of improved mutant varieties of crops tolerant to environmental stresses under existing soil and climatic conditions, and (2) to enhance nitrogen and water use efficiencies of crops tolerant to environmental stresses through best practice soil, water, crop and fertilizer management.

This CRP has a total of 13 participants from Bangladesh, China, Indonesia, Kenya, Malaysia (two contracts), Mexico, Pakistan, Peru (two contracts), South Africa, Uganda and Vietnam. The first RCM of the CRP was held from 12-16 December 2011 in Vienna, Austria and eleven participants attended the meeting. China and South Africa didn't attend the meeting due to delays in the processing of research agreements. During the first RCM revised country work plans were developed for all research contract holders.

There was general consensus that the work plan needs to be revised to reflect the importance of soil and water management. The participants agreed that soil characterization (physical and chemical properties) and a baseline survey of soil and water management practices, crop management and fertilizer application rates need to be carried out at the beginning of the experiment. Common experimental protocols and techniques will be carried out for all participating countries. It was proposed to have the second RCM in Malaysia in April 2013.

Participants at the first RCM of the CRP D1.50.13

Soil Quality and Nutrient Management for Sustainable Food Production in Mulch-based Cropping Systems in Sub-Saharan Africa (D1.50.12)

Technical Officers: Gerd Dercon and Long Nguyen

The objective of this new CRP is to improve the livelihoods of low socio-economic farmers and rural communities in a region that is dominated by a savannah ecosystem in its natural state.

The CRP seeks to resolve four key issues relating to soil quality and nutrient management for sustainable food production in mulch based cropping systems in sub-Saharan Africa in order to:

- Improve soil fertility and soil health by promoting carbon sequestration through the replacement of exported nutrients (especially N, but also P and S to a lesser extent) and by applying the principles of conservation agriculture;
- Increase productivity in integrated crop-livestock systems across different spatial scales in the moist and dry savannahs of sub-Saharan Africa;
- Increase on-farm and area wide ecosystem service efficiency (e.g. nutrient, water, labour and energy use efficiency);
- Assess economic feasibility and conduct socio-economic and environmental impact assessment of mulch-based farming systems in sub-Saharan Africa.

In mulch based farming systems, it is critical to adopt soil management practices that could potentially increase soil organic matter content (carbon sequestration) and maximize the efficiency of utilization of soil nutrients (synthetic and organic fertilizers) and water storage for crop growth. Soil organic matter improves soil fertility, stabilizes soil aggregates, increases soil water holding capacity to provide more water for crop growth and, very importantly, provides carbon as an energy source for the

soil fauna and flora, which in turn enhances the soil's chemical and physical properties.

The use of the stable isotopic techniques (C-13 and N-15), with either enriched or natural abundance levels, will facilitate in-depth analyses and understanding of the basic soil bio-physical processes, including soil carbon and nutrient cycling in mulch based systems. The CRP will provide a platform for the extrapolation of the recommended soil management practices to many agro-ecological regions of sub-Saharan Africa because of the selection of benchmark sites in diverse and representative environmental conditions.

This CRP was formulated on the basis of the recommendations of a consultants meeting held at IAEA headquarters, Vienna during 5-8 July 2010. The first Research Coordination Meeting was held in Vienna, Austria from 30 January–3 February 2012. Fifteen participants, with seven research contract holders from Benin, Kenya, Madagascar, Mauritius, Mozambique, Pakistan and Zimbabwe, three technical contract holders from China, the Czech Republic and the United Kingdom and five agreement holders from Austria, Belgium, Kenya, New Zealand and the USA attended the first RCM. The expected duration of the CRP is five years (2012- 2016).

Research protocols have been developed and sent to the CRP participants for implementation. In addition, the SWMCN laboratory team has started a series of research activities to support this CRP. More information on these activities can be found under the Section Activities of the Soil and Water Management and Crop Nutrition Laboratory, Seibersdorf of this the newsletter.

Managing Irrigation Water to Enhance Crop Productivity under Water-Limiting Conditions: a Role for Isotopic Techniques (D1.20.09)

Technical Officers: Lee Heng and Long Nguyen

The CRP will be having the fourth and final research coordination meeting (RCM) from 23-27 July 2012 during the week of the FAO/IAEA International Symposium on Managing Soils for Food Security and Climate Change Adaptation and Mitigation. The objectives of the meeting are to: (1) present and discuss the results obtained for the whole duration of the CRP, (2) evaluate achievements in accordance with project objectives and expected outputs, and (3) review manuscripts prepared for publication in the IAEA-TECDOC series. All participants of the CRP will be presenting their work and results obtained in the project. They will also attend the FAO/IAEA International Symposium.

Some outputs of the CRP include: (1) the separation of soil evaporation (E) and plant transpiration (T) using a combination of isotopic techniques and soil water balance methods. Evaporation losses under maize, winter wheat, pepper, coffee and orange tree mainly occurred during the periods immediately after irrigation or rainfall events, early seedling and at senescence stages. Coffee yield increased by 20% with a 25% improvement in WUE under a 12-year old coffee plantation through drip watering together with mulching compared to traditional furrow irrigation practice, (2) while the Keeling plots allow E and T to be separated, the sources and sinks of water vapour in the plant canopy have been identified using the Inverse Lagrangian (IL) analysis. The IL approach provided independent estimates of E and T components as well as the contributions to transpiration of the different layers in the plant canopy, (3) a simple, fast, affordable and portable vacuum distillation technique for the extraction of water from plant and soil samples for isotopic analysis that reduced extraction time to just one hour instead of overnight extraction with other techniques, and (4) FAO's AquaCrop model was validated using the data generated in the CRP for improving water productivity.

The overall objective of this CRP is to improve the water productivity of crops (production per unit of water input) under water-limiting conditions, and the specific objectives are (i) to quantify and develop a means to manage soil evaporative losses to maximise the beneficial use of water through improving the transpiration component of evapotranspiration; (ii) to quantify and develop a means of improving the amount of biomass produced per unit of transpiration; and (iii) to devise irrigation and related management techniques to enhance the yield component of biomass production (harvest index). This CRP has a total of 12 participants comprising seven research contractors from China (2 participants), Morocco, Pakistan, Turkey, Vietnam and Zambia six agreement holders from Australia, Austria, Spain, USA (2 participants) and Kenya. The participant from Australia contributed to modelling evaporation and transpiration from plant canopy.

Activities of the Soil and Water Management and Crop Nutrition Laboratory, Seibersdorf

Assessment of soil organic carbon accumulation and storage under mulch-based cropping systems by using isotopic techniques

G. Dercon, M. Heiling, M. Aigner, C. Resch, L. Mayr, J. Arrillaga, F. Augustin, N. Jagoditsch, A. Toloza, J. Adu-Gyamfi, M.L. Nguyen.

In support of CRP D1.50.12 on Soil Quality and Nutrient Management for Sustainable Food Production in Mulch-based Cropping Systems in Sub-Saharan Africa, the SWMCN subprogramme implemented four major activities to develop or adapt isotopic techniques that can assist Member States in the rapid assessment of the effectiveness of mulch-based cropping systems in enhancing soil organic carbon (SOC) accumulation and storage, and the quantification of stability of stored SOC.

1. Testing of analytical and modelling techniques for assessing stability of stored SOC

This technique, which is based on the use of nitrogen-15 natural abundance and carbon/nitrogen ratio analysis of soil organic matter pools, has been tested in an arable soil with <1% SOC (*Dystric Cambisol*) and was shown to have good reproducibility. Further testing on soils >2.5% SOC is currently under way.

2. Developing techniques for assessing long term contribution from crops to soil organic carbon sequestration under complex crop rotation systems

A long term field experiment focusing on conservation agriculture established at the research station of the Vienna University of Natural Resources and Life Sciences (BOKU) in Gross-Enzersdorf, Austria has been used. The experiment was implemented 16 years ago on a fertile Chernozem soil rich in SOC. Soil organic carbon content and bulk carbon-13 isotope data are now available for three contrasting land management practices, i.e. conventional tillage, zero tillage and permanent grassland (alleys), at different soil depths to one meter. Higher carbon stocks were observed under zero tillage, as compared to conventional deep tillage. Significant SOC amounts were found up to one meter in depth, suggesting the importance of deep soil sampling for calculating carbon stocks and assessing carbon distribution under different land management practices. Bulk soil carbon-13 isotope signatures of the sources of SOC indicated that wheat cropping may be a major contributor to SOC. Further testing will be carried out to assess whether the use of carbon-13 signature of specific organic compounds, such as fatty acids, can assist in determining long term contribution from crops to soil organic carbon sequestration.

3. Assessing short term SOC accumulation and storage in soils low in SOC under simple crop rotation systems

While the focus at BOKU is on long term carbon sequestration in soils rich in SOC under mulch-based multiple cropping systems, an additional field experiment has been implemented to test isotope techniques to assess short term SOC accumulation and storage in poor soils in simple crop rotation systems. Therefore an experiment has been started in March 2012 at the AGES (Austrian Agency for Health and Food Safety) research station of Grabenegg, 116 km West of Vienna. Soil samples have been taken and are now being analyzed, and the first crops have been planted (Figure 1).

4. Testing isotope based techniques under tropical cropping systems and conditions

In the Seibersdorf Laboratories, a glasshouse mesocosm experiment has been prepared for testing the above mentioned isotope based techniques under simulated tropical conditions. In 2011, pre-trial tests were carried out to optimize the conditions for this mesocosm experiment by analysing the optimal configurations of the columns used and the best ways to carry out soil and plant sampling and carbon-13 and nitrogen-15 isotope analyses. The experiment is expected to start in the summer of 2012, after a soil stabilization period of six months, which was started in March 2012. Soils with >2.5% and <1% organic carbon contents will be tested in this study.

Fig 1: Soil sampling for assessing soil organic carbon accumulation and storage in Grabenegg (AGES Research Station).

Interactive Maps

Lee Heng and Sasa Linic

To improve awareness, and as a measure towards improving agricultural water management, two interactive maps at country level on (1) percentage of total agricultural land that is irrigated, and (2) the percentage of total fresh water withdrawals allocated to agriculture were created using the StatPlanet browser-based interactive data visualization and mapping tool. The maps allow instantaneous display of the differences in fresh water withdrawal and the percentage of irrigated land between countries with just a mouseclick. These maps can be accessed at the SWMCN Agricultural Water Management webpage http://www-naweb.iaea.org/nafa/soils-water.html.

External Quality Assurance.

Martina Aigner.

In March 2012, twenty stable isotope laboratories were invited to participate in the recurrent WEPAL IPE programme (http://www.wepal.nl/website/about_wepal/Scope.htm) and to perform analysis offered in the WEPAL IPE scheme, including ^{15}N (enriched and/or natural abundance level), total N (N-elementary), Kjeldahl-N, ^{13}C and total C (C-elementary). The proficiency test (PT) participants were provided with the WEPAL test sample set IPE 2012.2 consisting of four test samples of 20 g plant material each. The deadline for reporting is 30 June 2012.

The SWMCN Laboratory is participating in this round of PT with the ***lab code 915*** and participants can compare their results with the IAEAdata. The participation fee for one round of Proficiency Test (PT) in 2012 (round IPE 2012.2) is covered by the IAEA. The quarterly report 2012.2 will be issued by WEPAL and sent to all participating laboratories in July 2012.

Training Activities

One of the pillars of SWMCNL is training activities to support technology transfer under various technical cooperation projects (TCPs). The laboratory received 11 fellows who are currently undergoing training for 3 months (14 May to 13 August 2012). Six of the fellows are from Afghanistan and one each from Kenya, Mali, Oman, Sudan and the United Republic of Tanzania. The training is to give the fellows a sound working knowledge of the use of isotopic techniques in soil water management and crop nutrition with emphasis on the application of stable isotopes of carbon, hydrogen, oxygen, and nitrogen to estimate water and nutrient use efficiency.

The fellows will first undergo a one-month group training consisting of lectures, practical and discussions on (i) soil water measurements using different soil water monitoring equipment, irrigation scheduling, and carbon isotope discrimination (CID) related to drought tolerance (ii) crop nutrition and nutrient management, the use of N-15 for soil fertility assessment and biological nitrogen fixation, isolation of rhizobia, and carbon fractions in mulch-based cropping systems, and (iii) monitoring soil and water salinity and soil-plant-water interactions, and the CID technique to assess the tolerance of crop varieties to salinity.

The second part of the training will be a two-month practical class in the field, greenhouse and laboratory experiments, sample preparation, mass spectrometry, cavity ring-down spectrometry, data analysis and interpretation.

Fellows receiving training on the field installation of access tubes for soil water measurements.

Regional Training Course for TC project RAS5064 on Enhancing Productivity of Locally-underused Crops through Dissemination of Mutated Germplasm and Evaluation of Soil, Nutrient and Water Management Practices (RCA), 23 July – 17 August 2012, Seibersdorf, Austria.

Technical Officer: Long Nguyen and Karuppan Sakadevan

The objective of this course is to train the trainees in agricultural soil and water management is to improve the skills, knowledge and technical competency of scientific and technical personnel from Asia and the Pacific for managing soil, water, crop and nutrient in agriculture, which will subsequently be disseminated to local agricultural officers and farmers in order to improve water use efficiency, crop productivity and environmental quality. The specific objectives of the training are:

1. Practical experience in the use of a range of soil water sensors including soil moisture neutron probes to determine soil water status and establish optimal irrigation schedules.
2. Informed knowledge on the use of isotopic techniques for on-farm assessment of management factors that affect soil water removal through crop transpiration and soil evaporation and ultimately provide valuable information for farm management practices which influence the water use efficiency by crops.
3. First-hand experience and familiarity with the use of the AquaCrop model to compare the efficiency of different irrigation systems (e.g. drip, flood, sprinkler or furrow irrigation); to optimize irrigation scheduling and to improve agricultural irrigation management practices.
4. Water quality, managing salt affected soils and saline waters for crop production.
5. To learn isotopic techniques for quantifying water and nutrient use efficiency and evaluating crops tolerant to drought and salinity.

The training programme will focus on: (1) direct measurements of soil water content using neutron probes, time domain reflectometry (TDR), Diviner 2000 and tensiometers, and soil water balance calculation; (2) evapotranspiration, crop water use and irrigation planning and management, including the use of the AquaCrop model for yield response to water; (3) isotopic techniques for quantifying water and nutrient use efficiencies and evaluating crops tolerant to drought and salinity; (4) soil and water sampling for isotopic analysis; and (5) salinization of soil and water theory and practices.

Twenty participants from Afghanistan, Bangladesh, Cambodia, China, the Islamic Republic of Iran, People's Democratic Republic of Lao, Malaysia, Myanmar, Nepal, Oman, Pakistan, Palau, Sri Lanka, the Syrian Arab Republic, Vietnam and Yemen will be attending the training.

Analytical services conducted by the SWMCN Laboratory in 2012 (January to June)

Samples measured:

	15N enriched	15N nat. ab.	13C nat. ab.	18O,D nat. ab.	Total
CRP	65	3	93	112	273
TC	29	7	24	-	60
Seibersdorf	65	307	443	149	964
Total	159	317	560	261	1297

Measurements carried out:
(including standards, blanks, test samples, replicates)

	15N enriched	15N nat. ab.	13C nat. ab.	18O,D nat. ab.	Total
CRP	129	8	172	159	468
TC	58	15	39	-	112
Seibersdorf	202	742	1044	360	2348
Total	389	765	1255	519	2928

Fellows and Scientific Visitors at the SWMCN Laboratory in 2012

Fellows

- Mr S. Hazrat, AFG/12004 (Afghanistan). Use of nuclear techniques in studies of abiotic stress and crop water use efficiency, 15 May to 14 August 2012.
- Mr M.S. Salim, AFG/12005 (Afghanistan). Use of nuclear techniques in studies of abiotic stress and crop water use efficiency, 15 May to 14 August 2012.
- Mr S.A. Sadat , AFG/12007 (Afghanistan). Use of nuclear techniques in studies of abiotic stress and crop water use efficiency, 15 May to 14 August 2012
- Mr R. Haidiri, AFG/12008 (Afghanistan). Use of nuclear techniques in studies of abiotic stress and crop water use efficiency, 15 May to 14 August 2012
- Mr B. Sofezadh, AFG/12009 (Afghanistan). Use of nuclear techniques in studies of abiotic stress and crop water use efficiency, 15 May to 14 August 2012
- Mr S. Rohani, AFG/12010 (Afghanistan). Use of nuclear techniques in studies of abiotic stress and crop water use efficiency, 15 May to 14 August 2012
- Mr B Mohammad, URT/12004 (United Republic of Tanzania). Use of isotopic techniques to evaluate crop tolerance to soil and water salinity, 15 May to 14 August 2012.
- Mr S Suliman. SUD/12012 (Sudan), Use of isotopic techniques in soil and water and water management, 15 May to 13 August 2012
- Ms E.N. Njiru. KEN/12031 (Kenya), Use of isotopic techniques in soil and water and water management, 15 May to 13 August 2012
- Ms A. Doucoure MLI/12012 (Mali). Use of tracer techniques to quantify biological nitrogen fixation, 15 May to 14 July 2012
- Mr H.S. Al-Busaidi, OMA/12005 (Oman). Use of isotopic techniques to evaluate crop tolerance to soil and water salinity, 15 May to 14 August 2012

Scientific visitor

- Mr R. Vencatasamy, MAR/12012V (Mauritius), Use of soil water monitoring equipment (Diviner 2000) to estimate crop water use, 31 May 8 June 2012.

Publications

Aulakh, M., Manchanda, J.S., Garg, A., Kumar, S., Dercon, G., Nguyen, M.L. (2012). Crop Production and Nutrient Use Efficiency of Conservation Agriculture for Soybean-Wheat Rotation in the Indo-Gangetic Plains of Northwestern India. Soil and Tillage Research, 120, 50-60.

Bado, S., Adu-Gyamfi, J., Padilla-Alvarez, R., Forster, B. P., Laimer, M. (2012). Ion accumulation in rice genotypes varying in salt tolerance: Development of a simple screen. Plant Abiotic Stress Tolerance II, International Conference, Vienna, Austria, February 22-25, 2012.

Dercon, G., Mabit, L., Hancock, G., Nguyen, M.L., Dornhofer, P., Bacchi, O.O.S., Benmansour, M., Bernard, C., Froehlich, W., Golosov, V.N., Haciyakupoglu, S. Hai, P.S., Klik, A., Li, Y., Lobb, D.A., Onda, Y., Popa, N., Rafiq, M., Ritchie, J.C., Schuller, P., Shakhashiro, A., Wallbrink, P., Walling, D.E., Zapata, F., Zhang, X. (2012). Fallout radionuclide based techniques for assessing the impact of soil conservation measures on erosion control and soil quality: An overview of the main lessons learnt under an FAO/IAEA Coordinated Research Project. Journal of Environmental Radioactivity, 107, 78-85.

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Laso, J.C., Marohn, C., Dercon, G., Dewi, S., Piepho, H.P., Joshi, L., van Noordwijk, M., Cadisch, G. (2012). Coastal vegetation and its influence on the 2004 tsunami event. In: Geophysical Research Abstracts, Volume 14, European Geosciences Union, General Assembly 2012, Vienna, Austria, 22-27 April 202, Abstract. http://meetingorganizer.copernicus.org/EGU2012/EGU2012-12834.pdf

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Silva, E. C., Muraoka, T., Silva, A., Buzetti, S., Souza, C. S., Orf, O. N., Sakadevan, K. (2011). Cover crops and nitrogen fertilization for maize crop grown in Cerrado oxisols. Proceedings of the 5th World Congress on Conservation Agriculture, 25-29 September 2011, Brisbane, Australia, pp 433-434.

Zaman, M. and Nguyen, M. L. (2012). How application timings of urease and nitrification inhibitors affect N losses from urine patches in pastoral system. Agriculture, Ecosystems and Environment, 156: 37–48.

Recently Published

Greater Agronomic Water Use Efficiency in Wheat and Rice Using Carbon Isotope Discrimination

IAEA-TECDOC-1671 Subject Classification: 0205-Soil fertility and irrigation IAEA-TECDOC-1671 (ISBN:978-92-0-123910-5) 18.00 Euro;
Language: English
Date Published: 2012
Responsible Officer/Officers: Ms Lee Kheng Heng, NAFA

Water scarcity, drought and salinity are among the most important environmental constraints challenging crop productivity in the arid and semi-arid regions of the world, especially rain-fed production systems. This publication presents the outcome of an IAEA coordinated research project which is aimed at increasing agronomic water-use efficiency of wheat and rice production. The studies show that the carbon isotope discrimination (CID) which is the ratio of the variation of carbon-13 versus carbon -12 in plant samples (leaf and grain) , is a good selection tool for identifying high yielding genotypes of wheat under drought stress environments for both pre-anthesis and post-anthesis stages. The CID of flag leaf can also potentially be used to select rice genotypes for salinity tolerance and for selecting parental lines for breeding. The experience gained through these studies will be highly relevant to the needs of developing Member States in Africa, Asia and Latin America.

http://www-pub.iaea.org/books/IAEABooks/8559/Greater-Agronomic-Water-Use-Efficiency-in-Wheat-and-Rice-Using-Carbon-Isotope-Discrimination

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/about/en/
- FAO/AGL (Land and Water Development Division): http://www.fao.org/nr/water/landandwater_what.html

Impressum

Soils Newsletter Vol. 35, No.1

The Soils Newsletter is prepared by the Soil and Water management & Crop nutrition Section, Joint FAO/IAEA Division of Nuclear Techniques in Food and Agriculture and FAO/IAEA Agriculture and Biotechnology Laboratory, Seibersdorf

International Atomic Energy Agency
Vienna International Centre, PO Box 100, 1400 Vienna, Austria
Printed by the IAEA in Austria, August 2012

12-48311