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Water and nutrient management for rice-based systems- A major issue to address water scarcity through change in a rice growing environment. Photo: Yavinder Singh (Rice-Wheat CRP D1.50.07)

To Our Readers

I would like to thank you all for your support and contribution to the Soil and Water Management & Crop Nutrition (SWMCN) subprogramme during the past six months. As a result of your participation and a team effort from the Soil and Water Management & Crop Nutrition (SWMCN) Section of the Joint FAO/IAEA Division of Nuclear Techniques in Food and Agriculture and the Soil Science Unit (SSU) of the FAO/IAEA Agriculture and Biotechnology Laboratory in Seibersdorf, there have been several developments/achievements which are listed under the Feature Articles and Past Activities Sections of this Newsletter.

Some of the achievements of our coordinated research projects (CRPs) are briefly reported here. The CRP on Integrated Soil, Water and Nutrient Management for Sustainable Rice-Wheat Cropping Systems, which had its final research coordinated meeting (RCM) from 6 to 10 November 2006, has highlighted several emerging research issues on greenhouse gas emissions and nitrogen fertilizer loss from rice-based cropping systems as they move from the traditional flooding environment to a raised bed, non-flooded operation to address increasing worldwide concern about water scarcity. New CRPs are being planned to investigate: (i) sustainable use and management of water in agriculture through soil and irrigation technologies and practices, (ii) integrated soil-plant approaches to increase crop productivity in harsh

environments and (iii) soil and nutrient management and conservation for sustainable agriculture and environment. One of these CRPs on Selection and Evaluation of Food Crop Genotypes Tolerant to Low Nitrogen and Phosphorus Soils Through the Use of Isotopic and Nuclear-related Techniques was launched in October 2006. The aim of this CRP is to develop integrated crop, soil and nutrient management practices to increase crop production in marginal lands by identifying and promoting the development of crop genotypes with the enhanced ability to utilize soil nitrogen (N) and phosphorus (P) without the degradation of soil fertility.

The SWMCN subprogramme involvement with Member States via technical cooperation projects (TCPs) range from soil fertility, land degradation, agricultural impacts on soil and water environments, crop water productivity, and soil and water conservation within the plant rooting zone. Guidelines on soil water and nutrient management and other soil water conservation tools for sustainable agriculture and management of natural resources will increasingly become major features of our SWMCN subprogramme in 2007. The need for dissemination of technical information to Member States is an important aspect of the SWMCN subprogramme. I am therefore pleased to announce that the phosphate rock decision support system (PRDSS), a successful collaboration between the SWMCN subprogramme and the International Fertilizer Development Center (IFDC) has been developed and placed on the IAEA website to provide information on the use of phosphate rocks versus water-soluble phosphate fertilizers as a source of phosphorus for crop growth.

The FAO/IAEA International Workshop on The use of Nuclear Techniques in Addressing Soil-Water-Nutrient Issues for Sustainable Agriculture, which was convened on 9 July 2006 at the 18th World Congress of Soil Science in Philadelphia, USA, was a great success in promoting the use of isotopic and nuclear techniques in soil–water–nutrient research. The contribution of participants was vital to this success and I would like to thank all of you from both developed and developing countries.

I look forward to receiving your continuing support and valuable inputs in 2007. Your commitment and support is essential to the continuing success of the SWMCN subprogramme. I wish you all every success, good health and happiness in 2007.

Long Nguyen

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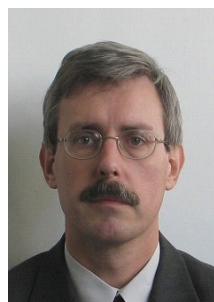
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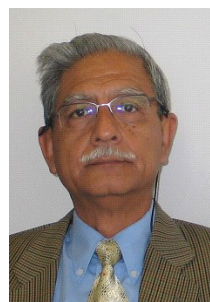
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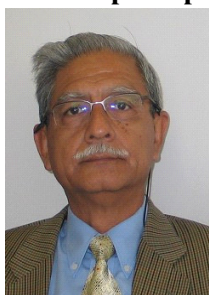
E. Swoboda

Staff News

Ms. Maitane Melero Urzainqui joined the Soil Science Unit on 11 January 2006 for a six-month period as a Temporary Assistant. She assisted the research and training activities on soil erosion Maitane has now joined the staff at the Pamplona University working in the field of soil science. We thank Maitane for excellent contribution to the Soils subprogramme and wish her all the best for the future.



Mr. Felipe Zapata left the Soil and Water Management & Crop Nutrition Section on September 2006 after approximately 9 months of dedicated and excellent inputs in managing both coordinated research and technical cooperation projects of the Soils subprogramme. His dedication and enthusiasm are greatly missed by the Soil and Water Management & Crop Nutrition Section and the Soil Science Unit.



Mr. Phillip Chalk, former Section Head (August 1997 to August 2004), returned to the Section on 1 September 2006 as a Consultant on a 4-month contract. During the previous 18 months he was a visiting scientist at the Agrobiolgy Centre of EMBRAPA in the state of Rio de Janeiro, Brazil. Phil is acting as technical officer for 7 technical cooperation (TC) projects and two coordinated research projects (CRPs) that were formerly managed by Felipe Zapata during the first 8 months of 2006. Phil is also responsible for the technical editing of the Agroforestry TECDOC.



Mr. Pierre Moutonnet, a former staff member, has been back with the IAEA since 4 September 2006 to assist the Soils subprogramme and the Section Head in the preparation of documents relating to water management in agriculture and providing a technical backstop for three TC projects (ALG5020, ALG5021 and HAI5003). Pierre concluded his assignment on 3 December 2006. The Soils subprogramme wishes to thank Pierre for his inputs.



Ms. Maria Heiling is on a one-year maternity leave from the Soil Science Unit. She gave birth to a daughter, Annika Maria, on 28 August 2006. Congratulations Maria from the Soils subprogramme and our very best wishes to you and your family!

Ms. Doris Gludovacz joined the Soil Science Unit on 4 September 2006 as a temporary replacement of Ms. Maria Heiling, who is on maternity leave. She will assist in the implementation of stable isotope analyses in support of the Unit's programme in Soil and Water Management and Crop Nutrition. She completed her Masters degree at the University of Vienna, where her research involved in vitro binding studies with the use of radiolabelled peptides and tumor cell lines. Before joining the Soil Science Unit she worked as an application specialist, providing training on clinical analyses and laboratory equipment (wet chemistry and microbiology). We welcome Ms. Gludovacz to the Soil Science Unit.



Mr. Stefan Borovits joined the Soil Science Unit on 1 July 1970. His main responsibilities have been to implement stable isotope analyses including routine analyses of ^{15}N , ^{13}C and ^{18}O samples from CRPs and TCPs as well as research and training work in the Soil Science Unit. Without his excellent supportive work the Unit would not have been able to complete more than 15 000 measurements each year for the past twenty years. He has always been very eager to understand and improve all analytical protocols used in the Soil Science Unit. Mr. Borovits has also provided general support for the implementation of greenhouse and field experiments. He has always been a very dedicated staff member performing outstanding work for the Unit both in terms of the quality and quantity of the work outputs. It has been a pleasure for the staff of the Soils subprogramme to work with Mr. Borovits, who was greatly appreciated for his open minded and pleasant personality. He retired on 31 October 2006 after more than 35 years of dedicated service to the the Soil Science Unit. Mr. Borovits received a Merit Award in 2006. Colleagues in the Soils subprogramme would like to thank Mr. Borovits for his excellent work and wish him and his family all the very best for the future.



Mr. Arsenio Toloza joined the Soil Science Unit on 1 September 2006 as a Laboratory Technician. He assists and reinforces the research and training activities in soil erosion and sedimentation using fallout radionuclides and is supervised by Mr. Lionel Mabit in support to the Soils subprogramme. Mr. Toloza has a B.Sc. in Biology from the Far Eastern University, Manila (Philippines). Prior to joining the Soil Science Unit, he has been working for ten years at the FAO/IAEA Agriculture and Biotechnology Laboratory in Seibersdorf, initially as a technician in the Plant Breeding Unit (1998 to 2003) gaining experience in banana improvement by in vitro mutagenesis, the rapid detection of aneuploidy in bananas using flow cytometry and developing disease-tolerance in bananas. Later he received five years of technical experience in mass rearing and quality control of the Mediterranean fruit fly in the Entomology Unit. The team welcomes Mr. Toloza into the Soils group.



Mr. Christian Vornberg joined the Soil and Water Management & Crop Nutrition Section on 1 September 2006 as a temporary secretarial assistant during the period of Ms. de Muellner's absence. A Business graduate, Christian has been employed by the IAEA since 20 July 2005. Spending more than 13 months in the IAEA Seibersdorf Laboratories, he performed secretarial and clerical duties for the Agriculture and Biotechnology Laboratory; this was followed by data entry assignments for the Plant Breeding and Animal Production Units. At the Soil and Water Management & Crop Nutrition Section, he is providing administrative and clerical support, assisting Ms. Kopejtko until the end of the year. Half Austrian and half South African, Christian is interested in languages, enjoys reading and writing, photography, playing the keyboard, meeting friends, and is an avid fan of The Simpsons.



Ms. Rosario Leon de Muellner was transferred to the Waste Technology Section of the Division of Nuclear Fuel Cycle and Waste Technology in June 2006 under the Temporary Assignment Programme scheme (TAP) at her requests to enrich her project administrative experience in other areas of the IAEA's activities. The Soils subprogramme misses her inputs and wishes her well in her new activities.



Feature Articles

Green revolution in Africa

Long Nguyen

Improving food security, mitigating soil fertility degradation and addressing water scarcity in agriculture are the major issues confronting Africa. This message was eloquently delivered at the plenary address at the recent 18th World Congress of Soil Science (9 to 15 July 2006, Philadelphia, USA) by Dr. Jeffrey Sachs, a noted economist, Director of the Earth Institute at Columbia University and a Special Advisor to the UN Secretary General Mr. Kofi Annan on the Millennium Development Goals. In his speech, Dr. Sachs highlighted the importance of soil science in combating poverty alleviation and enhancing environmental sustainability. Examples were cited to demonstrate the importance of enhancing soil quality resources to provide comprehensive socio-economic packages and to improve the livelihood of resource-poor farmers and enhance national stability. I am encouraged by the recognition of such a noted economist that hunger in the world today, as well as environmental degradation, cannot be solved without the active contribution of soil science in conjunction with other science disciplines. A professional challenge has been delivered to soil scientists by Dr. Sachs to foster a green revolution in Africa, since this can only be achieved by addressing major soil constraints and factors affecting land degradation. The Joint FAO/IAEA Soil and Water Management & Crop Nutrition Subprogramme can be proud of its contribution to this challenge through coordinated research projects (CRPs) and technical cooperation projects (TCPs) which assist Member States in the application of isotopic and nuclear techniques to develop soil–water–nutrient management tools to enhance food security and environmental sustainability.

Dr. Sach's speech, together with a range of topics presented and discussed at the 18th WCSS including a key Symposium on Global Priorities of Soil Science Research with contributors from North and South America, Europe, Asia, Africa and Australasia, reinforce my belief that the FAO/IAEA Soils subprogramme of the IAEA is moving in the right direction to address a range of important issues in Member States on combating land degradation, improving the sustainable use of natural resources and minimizing impacts of land use activities on the environment. The increasing concern about climate change makes it important for the IAEA to promote the use of isotopes in the quest to identify the extent to which soils act as a sink (sequestration) or a source for greenhouse gases, and the land management factors that control such processes. The variety and scale of land uses can influence not only the sustainability of

natural resources for crop and livestock productivity but also downstream activities such as fisheries, aquaculture, water use and tourism. Thus in the context of catchment management, soil science plays a major role in providing information on soil–water processes at the soil–plant and soil–plant–animal continuum to minimize runoff of agricultural pollutants, mitigate land degradation and enhance soil–water quality. In my view, the Soils subprogramme of the Joint FAO/IAEA Division, together with the IAEA Technical Cooperation (TC) Department, could explore a range of thematic plans for each particular region (e.g. Asia, Africa, Europe and Latin America) to combat land degradation, enhance the green revolution and promote soil carbon sequestration through sustainable land–water management at the catchment scale. The Soil and Water Management & Crop Nutrition Subprogramme should also continue to be involved with other leading international institutions in research/technical activities relating to a multidisciplinary approach to land–water management for sustainable agriculture and environmental protection.

The use of isotopic and nuclear techniques in agriculture

Long Nguyen

A oneday FAO/IAEA workshop on: The Use of Nuclear Techniques in Addressing Soil–Water–Nutrient Issues for Sustainable Agriculture which was successfully convened on 9 July 2006, the first day of the 18th World Congress of Soil Science (WCSS), Philadelphia, USA (please see Past Events Section) highlighted the important role of isotopic and nuclear techniques in (i) identifying processes that influence nutrient and water use efficiency, sources and pathways/movement of applied nutrients and water in soil–plant systems and soil organic matter dynamics, (ii) quantifying soil erosion rates and nutrient and water use efficiency by crops under different cropping systems. The abstract of the opening address delivered by Long Nguyen with Felipe Zapata as a co-author is shown below:

Use of Nuclear Techniques in Addressing Soil–Water–Nutrient Issues for Sustainable Agricultural Production

The Joint FAO/IAEA Division of Nuclear Techniques in Food and Agriculture has on many occasions in the past convened a symposium at the World Congress of Soil Science and provided financial support to Congress participants from developing countries. At this 18th World Congress of Soil Science, a workshop rather than a symposium is organized by the Soil and Water Management & Crop Nutrition (SWMCN) sub-

programme of the Joint FAO/IAEA Division. The aim of this workshop is to provide a forum for presentation and discussion of scientific and technical advances in FAO/IAEA Member States using nuclear and related techniques to develop optimum soil–water–plant–nutrient management practices to increase crop productivity and foster environmental sustainability. In addition, it provides an excellent opportunity for scientific exchange at a global level, since isotopic techniques are continuously refined and new applications are implemented in crop production and natural resource management. Nuclear and isotopic techniques can be used to track the sources and flows of nutrients and water in soil–plant and soil–plant–animal agro–ecosystems. They therefore help to identify management practices that optimize the efficiency with which natural resources and external inputs are used for crop production. In addition, they can be used to quantify the movement of soil and sediments and associated agrochemicals in the landscape and hence identify the effects of different management practices on the loss of carbon, sediments, nutrients, and agrochemicals from agro–ecosystems to receiving water bodies. In line with the major theme of the 18th World Congress of Soil Science on Frontiers of Soil Science: Technology and Information Age, the selected applications of nuclear techniques in soil–water–nutrient management as shown in this workshop demonstrate that nuclear techniques provide invaluable tools which can assist to define best management practices for enhancing sustainable crop production, soil and water conservation and environmental protection. Specifically, 30 papers are presented on the use of isotopic techniques to address:

- Impacts of different land uses on soil organic matter sequestration.
- Soil erosion and distribution at a catchment scale.
- Identification of hydrological pathways and impacts of agricultural activities on the transports of soil organic matter, sediments, nutrients and agrochemicals in agricultural landscapes.
- Water balance and water use efficiency.
- Efficiency of fertilizers and crop residues as sources of nutrients for plant growth.

Water use in agriculture: the role of nuclear and isotopic techniques

Long Nguyen, Pierre Moutonnet, Felipe Zapata and Phillip Chalk

Recently the Soil and Water Management & Crop Nutrition Subprogramme submitted a review on this subject which will be published in the IAEA Nuclear Technology Review 2007. The following information provides only a snap shot of this article and we are

looking forward to receiving feedback from readers worldwide. Agriculture is the predominant user (75–80%) of the available freshwater resources in many parts of the world. Competition among different sectors for scarce water resources and increasing public concern about water quality for human, animal and industrial consumption and recreational activities have focussed more attention on water management in agriculture. As water resources shrink and competition from other sectors grows, agriculture faces a dual challenge: to produce more food with less water and to prevent the deterioration of water quality through contamination with soil runoff, nutrients and agrochemicals.

Improving water use efficiency (WUE) will require an increase in crop water productivity (an increase in marketable crop yield per unit of water removed by the plant) and a reduction in water losses from the plant rooting zone. Nuclear and isotopic techniques can play an important role in improving WUE in agriculture by:

- Improving water management through accurate soil moisture monitoring for optimum irrigation scheduling to minimize water losses. The soil moisture neutron probe generates data used to calculate the soil water balance and estimate the amount of soil water removed by evapotranspiration.
- Optimizing crop water productivity with more yield per amount of water inputs from rainfall or irrigation. Measurement of the natural abundance of the stable isotopes of O, H, C and N in soil, water and plant components can help to identify the sources of water (and nutrients) used by plants and to quantify water (and nutrient) fluxes through and beyond the plant rooting zone.
- Assisting in the selection and evaluation of crop cultivars with tolerance to drought and higher crop water productivity. A plant cultivar, which is resistant to water scarcity, should display less depletion in ^{13}C compared with a susceptible cultivar.

Phosphate Rock Decision Support System (PRDSS website)

Long Nguyen

An exciting new tool has been developed and placed on the IAEA website to provide resource managers, policy makers and farmers with information on the relative agronomic effectiveness of local phosphate rocks, compared to water-soluble phosphate fertilizers as a source of phosphorus for crop growth. This web-based PRDSS integrates all information on soil properties, crop, phosphate rock characteristics and site factors such as annual rainfall that may influence the availability of phosphate from phosphate rocks for crop growth. This web-based PRDSS is the product of joint collaboration

between the Soil and Water Management & Crop Nutrition Subprogramme of the Joint FAO/IAEA Division in Food and Agriculture and the International Fertilizer Development Center, Alabama, USA.

The web-based PRDSS incorporates the IFDC-developed client-based PRDSS into the IAEA Direct Application of Phosphate Rock (DAPR) website system (<http://www-iswam.iaea.org/dapr/srv/en/resources>). The purpose is to improve access to the PRDSS for end-users after incorporating additional results from agronomic trials which have been coordinated by the Joint FAO/IAEA Division in 25 different countries to evaluate PR as a source of P for plant growth during the period 1993 to 1998.

The prototype of the PRDSS model was originally developed in 2000 by IFDC based on results obtained

from its agronomic trials in Latin America, Asia and Sub-Saharan Africa during the past 25 years. The advanced version of this initial prototype, called Client-based PRDSS has a complete set of database variables (climate, soil, PR, crops, etc.), thus improving the accuracy of the prediction for the user in a particular area/location.

Technical Cooperation Projects

Operational Projects and Technical Officers responsible for implementation

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

Project Number	Title	Technical Officer
TUR/5/024	Improving Crop Productivity through Nuclear and Related Techniques	L. Nguyen
UGA/5/025	Integrated Nutrient Management for Increased and Sustainable Crop Production on Smallholder Farms	L. Nguyen
YEM/5/002	Drip Irrigation and Fertigation for Improved Agricultural Productivity	J. Adu-Gyamfi
ZIM/5/011	Combating Desertification in Agricultural Drylands	P. Chalk

Forthcoming Events

Third Research Coordination Meeting (RCM) of the Coordinated Research Project (CRP) on Selection for Greater Agronomic Water-Use Efficiency in Wheat and Rice Using Carbon Isotope Discrimination (D1.20.08)

Date: 2nd quarter of 2007

Location: To be announced

Scientific Secretary: To be announced

Planning is underway for the third RCM to be held during April or May 2007. Expressions of interest to host the meeting have been obtained from contract holders in China, Pakistan, India and the Philippines (IRRI). A final decision will be made soon on the dates and location of the RCM. It is expected that 12 contract holders and one agreement holder will attend the meeting. The main objective of the 3rd RCM will be to present and evaluate the results obtained since the 2nd RCM, and to review workplans and progress towards reaching the overall and specific objectives of the CRP.

A mid-term Coordination Meeting of the FAO/IAEA/RCA Regional Technical Cooperation Project Sustainable Land Use and Management Strategies for Controlling Soil Erosion and Improving Soil and Water Quality RAS/5/043, 22 to 25 January 2007, Beijing, China

Scientific Secretary: Emil Fulajtar

The mid-term Project Coordination Meeting of the regional TC project RAS/5/043 on Sustainable Land Use and Management Strategies for Controlling Soil Erosion and Improving Soil and Water Quality will be held from 22 to 25 January 2007 in Beijing, China under the organization of Prof. Yong Li from the Institute of Agricultural Environment and Sustainable Development, Chinese Academy of Agricultural Sciences. It is anticipated that the representatives of all participating countries involved in the project (Australia, Bangladesh, China, Indonesia, the Republic of Korea, Malaysia, Mongolia, Myanmar, Pakistan, Philippines, Sri Lanka, Thailand and Vietnam) will attend the meeting.

The objective of the meeting will be to assess the progress achieved in the implementation of the TCP, to identify arrangements and mechanisms for enhanced national implementation of regional co-operation and to prepare a work plan for the final phase of the project focussing on the finalisation of experimental activities, summarization of the results, formulating conclusions and recommendations and preparing the information dissemination strategy.

The participants will be requested to present an overview of their results achieved under the project and these

presentations will be critically evaluated in line with the specific objectives of participating countries.

Final Coordination Meeting of FAO/IAEA Regional Technical Cooperation Project Combating Desertification in the Sahel, (RAF/5/048) February 2007, Dakar, Senegal

Technical officer: Emil Fulajtar

The final Coordination Meeting of the regional TC project RAF/5/048 on Combating Desertification in the Sahel will be held in Dakar, Senegal under the organization of Mr. Mamadou Khouma from the Agricultural Research Institute of Senegal. The meeting is planned for February 2007. It is anticipated that the representatives of all participating countries involved in the project (Burkina Faso, Kenya, Mali, Niger, Senegal and the United Republic of Tanzania) will attend the meeting.

The objective of the meeting will be to assess the results achieved under the project, to prepare the final report summarizing the results, formulating conclusions and recommendations and to organize the dissemination activities to increase public awareness of the problems investigated and the solutions developed. Dissemination will be achieved through the publishing of a brochure summarizing the results and practical recommendations for farmers.

The meeting participants will be requested to present an overview of their results achieved under the project and these presentations will be critically evaluated in line with the specific objectives of participating countries.

Consultants Meeting on Use of Nuclear Techniques in Watershed Scale Sediment Budget Studies for Assessing the Environmental Impact of Intensive Agriculture, March to April 2007, Vienna International Centre, Vienna, Austria

Scientific Secretary: To be announced

A consultants meeting (CM) is planned to address the following two issues:

- To review recent advances in the use of both nuclear and conventional techniques to investigate the mobilization, transfer and storage of sediment and sediment-associated organic matter and phosphorus at the watershed scale and to establish watershed sediment budgets.
- To identify key research areas in determining sediment budgets and sediment-associated organic matter and phosphorus at the watershed scale.

Non-FAO/IAEA Meetings 2007

- Symposium on Soil Processes under Extreme Meteorological Conditions, 25 to 27 February 2007, Bayreuth, Germany. See announcement at: <http://www.bayceer.uni-bayreuth.de/SP-2007/>
- First International Soil Moisture Sensing Technology Conference; Current and future research directions in soil moisture sensing. 19 to 21 March 2007, Waikiki, Honolulu. This conference will focus on current and future research directions in soil moisture in-situ sensing technology with special emphasis on sensor reliability and measurement scale dependency. More details about the conference can be found on the webpage of the conference: <http://www.ctahr.hawaii.edu/faresa/Conferences.htm>
- EcoSummit 2007: Ecological Complexity and Sustainability, 22 to 27 May 2007, Beijing, China. <http://www.ecosummit2007.elsevier.com/>
- General Assembly of the European Geosciences Union, 15 to 20 April 2007, Vienna, Austria. <http://meetings.copernicus.org/egu2007/>
- EcoSummit 2007: Ecological Complexity and Sustainability, 22 to 27 May 2007, Beijing, China. <http://www.ecosummit2007.elsevier.com/>
- 10th International Symposium on Soil and Plant Analysis, 11 to 15 June 2007, Budapest, Hungary. <http://www.spcouncil.com/symposium.htm>; <http://www.pedologie.cz/dokumenty/isspa2007.pdf>
- 5th International Congress of the European Society for Soil Conservation, 25 to 30 June 2007, Palermo, Italy. <http://www.esscpalermocongress.it/>
- 9th International Conference on the Biogeochemistry of Trace Elements (9th IOCBTE), 15 to 19 July 2007, Beijing, China. <http://www.conference.ac.cn/icobte.htm>
- 10th International Symposium on River Sedimentation, 1 to 4 August 2007, Moscow, Russian Federation. <http://isrs10.hydro-msu.ru/en/>
- Pedometrics 2007, 27 to 30 August 2007, Tübingen, Germany. <http://www.pedometrics.de>

Past Events

FAO/IAEA Events

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

11 to 15 September 2006, Rabat, Morocco

Technical Officer: Emil Fulajtar

The second RCM on Integrated Soil, Water and Nutrient Management for Conservation Agriculture was organised by the University Moulay Ismail, Meknes, with the collaboration of CNESTEN (National Center for Nuclear Science, Energy and Technology) in Rabat, Morocco from 11 to 15 September 2006.

The meeting comprised 14 participants including 9 research contractors from Argentina, Brazil, Chile, India, Morocco, Pakistan, Turkey, Uganda and Uzbekistan; 1 technical contractor from Australia; 1 agreement holder from Kenya and representatives of the SWMCN Section, SSU and FAO. Participants were welcomed by Prof. Mohammed Zaher Benabdallah, President of Moulay Ismail University and Dean of the Faculty of Science, Dr. Khalid El Mediouri, Director General of the National Centre for Nuclear Science, Energy and Technology (CNESTEN) and Dr. Omar Debbaj, Director of the National School of Mineral Industry, Rabat. Prof. Ismaili Mohammed and Prof. Marah Hamid presented information on the activities of the University Moulay Ismail and CNESTEN.

The main objective of the second RCM was to present and evaluate results obtained since the 1st RCM, especially the progress achieved by the participants in the implementation of their respective work plans and to discuss and agree on the follow-up of experimental work until the third RCM. All participants reported the results of their research covering the period since the 1st RCM. In addition Mr. Joseph Adu-Gyamfi from the SSU, Seibersdorf, made a presentation on Developing methodologies, providing direct analytical services and human capacity building for Coordinated Research and Technical Cooperation Projects: The role of the Soil Science Unit of the FAO/IAEA Agriculture and Biotechnology Laboratory.

Results presented at the RCM demonstrated the advances made in the CRP since the 1st RCM. Quantitative data on the effects of conservation agriculture practices on crop yields and soil properties were gained through the use of nuclear techniques (^{15}N , ^{13}C and neutron probe). The meeting outlined further priorities for the next period of the CRP, provided information for the mid-term review of the CRP and formulated the work plan for the period 2007–2008. The report of the 2nd RCM is available at:

http://www-naweb.iaea.org/nafa/swmn/crp/d1_5001.html. The 3rd RCM will be held in Istanbul, Turkey, in November 2007.

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

16 to 20 October 2006, Vienna, Austria

Scientific Secretaries: Joseph Adu-Gyamfi and Phillip Chalk

The first RCM of the CRP on Selection and Evaluation of Food Crop Genotypes Tolerant to Low Nitrogen and Phosphorus Soils Through the Use of Isotopic and Nuclear-related Techniques was held at IAEA during 16 to 20 October 2006.

The overall objective of this CRP is to develop integrated crop, soil and nutrient management practices to increase crop production in marginal lands by identifying and promoting the development of food (cereal and legume) crop genotypes with enhanced nutrient (N and P) use efficiency and greater productivity in low fertility soils. Eleven research contract holders from Burkina Faso, Brazil, Cameroon, China, Cuba, Ghana, Malaysia, Mexico, Mozambique and Sierra Leone, four Agreement Holders from Australia (UWA), Benin (WARDA), Kenya (TSBF-CIAT) and Nigeria (IITA) and two Technical Contractors from Germany (University of Hanover) and USA (University of Pennsylvania) attended the meeting. In addition, one observer from Turkey and staff of the SWMCN subprogramme were among the participants. The Project Officers, Mr. J. Adu-Gyamfi, and Mr. P. Chalk, served as the Scientific Secretaries for the RCM. During the opening address, the Head of the SWMCN Section, Mr. L. Nguyen stressed the importance of the current RCM to the Soils subprogramme and the need for effective networking and the generation of quantitative data for the production of 'success stories' at the end of the CRP. In an introductory lecture, the Head of the Plant Breeding and Genetics Section, Mr. P. Lagoda, stressed the need for identifying and phenotyping root traits associated with crop tolerance to nutritional and other abiotic stresses. The Project Officer, Mr J. Adu-Gyamfi, gave an overview of the CRP and the importance of having outputs that are achievable, quantifiable, and indicators of success. All the participants presented reports on the characterization of the environment, experimental design and past experiments on the subject area.

A one-day workshop was organized at the FAO/IAEA Agriculture and Biotechnology Laboratory in Seibersdorf to (i) brief the participants on the laboratory activities related to the use of isotope techniques for nutrient dynamics and nutrient efficiency, (ii) discuss data

analysis and interpretation of data related to isotopic dilution experiments and (iii) examine sample preparation techniques and analyses related to the CRP. During the opening session, a representative of the Director of NAAL, Mr. C. Schmitzer welcomed the participants and presented an overview of the Agency's Laboratories' research mandate and current activities. Presentations at the workshop included: (i) general introduction of isotopes (ii) isotopic techniques in N studies: theory, applications and data interpretation and (iii) isotopic techniques for studying P dynamics and evaluating agronomic effectiveness of P fertilizers: theory, application and problem sets. The participants later visited the analytical laboratory and were briefed on sample preparation and the principles underlying the operation of the mass spectrometer for the analysis of ^{15}N , ^{13}C and ^{18}O in plant, soil and water samples.

The following conclusions were made at the end of the 5- day meeting:

- There was a general consensus to slightly modify the specific objectives to reflect discussions held during the workshop.
- Experimental plans should include the initial collection of at least 200 cereal (maize or upland rice) or grain legume (soybean, cowpea, common bean) genotypes/lines from exotic, landraces and known genotypes, followed by a rapid laboratory screening for root traits (primary root elongation, lateral roots, seminal root branching, root whorls and lateral root branching) conferring P and N acquisition efficiencies. This should be followed by the field evaluation of the same number of genotypes in low N and/or low P soils to compare the results of the laboratory screening with that of the field evaluation. Contrasting genotypes (20–50) could be selected for evaluation using isotopic and nuclear-related techniques.

The RCM was a great success, stimulating significant exchanges between plant physiologists, plant breeders, soil scientists and agronomists and serving as the platform for strong collaboration between the Soils subprogramme and the Plant Breeding and Genetics Section. Expressions of interest were received from the contract holders from Mexico and China to host the second RCM in 2008.



Group picture of RCM participants

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

6 to 10 November 2006, Vienna, Austria

Technical Officer: Long Nguyen

The fourth and final RCM of this CRP was held from 6 to 10 November 2006, with the participation of 5 contract holders from China (2), Bangladesh, Nepal, and India, 2 technical contractors (IRRI and University of New England, Australia) and one agreement holder (CSIRO). In addition, there was one observer, Dr. Pathak from India. Unfortunately Dr. Hussain (Pakistan) was not able to participate in this final RCM because of unforeseen circumstances.

The main purposes of the RCM were to: (i) review research results and achievements of the CRP, (ii) discuss and evaluate the final project reports and (iii) plan the publication of research results in an IAEA-TECDOC.

The results presented at the RCM can be summarised as follows: Rice yields in permanent raised beds and under direct seeding were at least 20% lower than those in a conventional flooded (puddled) system. A similar magnitude of higher N losses from applied N fertilisers was observed in raised beds, compared to the puddled transplanted rice system. The existing rice varieties used for a conventional flooded system were found to respond adversely in beds and zero tillage.

Thus new varieties will need to be developed to cope with aerobic rice culture and the increasing incidence of water scarcity. Under favourable rainfed conditions, as shown in the studies in Jiangsu province (800–1000 mm annual rainfall) and southwest China (950–1200 mm annual rainfall), the existing rice varieties with straw incorporation were almost as good as conventional flooded systems (less than 10% yield reduction). The novel cultivation of rice in aerobic soil could produce comparable yield as the flooded system with a potential water saving of up to 100%. Rice is one of the three most important cereals (rice, wheat and maize) in China and it accounts for 40% of the summer crops, about 40 million hectare per year. Waterlogged cultivation of transplanted rice is the traditional practice with more than 80% of the freshwater used in agriculture going to rice production in China. The savings in water using novel aerobic systems is therefore potentially enormous. Although water savings can be considerable, the reduction in grain yield and the losses of fertiliser N in gaseous forms need to be further investigated under different conditions. The performance of wheat is satisfactory with zero tillage, either on flat land or on raised beds. The efficiency of utilization of fertilizer N is also similar (50–60%) in the conventional and zero-tilled practices, but water saving of about 20% is possible on raised beds.

The final report of the RCM will be available at <http://www-naweb.iaea.org/nafa/swmn/crp/d1>



Group picture of RCM participants

FAO/IAEA International Workshop

Convenor: *Long Nguyen*

A 1-day FAO/IAEA workshop on: The use of nuclear techniques in addressing soil–water–nutrient issues for sustainable agriculture was successfully convened on 9 July 2006, the first day of the 18th World Congress of Soil Science (WCSS), Philadelphia, USA. Both the FAO/IAEA Workshop and the 18th WCSS were held in the Philadelphia Convention Centre.

The WCSS is organized every 4 years by the International Union of Soil Science and in 2006 was attended by over 2000 scientists, with 8 concurrent sessions per day and approximately 2700 posters and oral papers presented over a 6-day period. The major theme of the 18th WCSS was Frontiers of Soil Science: Technology and the Information Age with topics including GIS technologies, land use analyses, environmental soil biology, plant–soil interactions, waste remediation, precision agriculture, global soil science issues and new technologies in soil science.

Approximately 85 scientists from both developing and developed countries, including 12 funded by IAEA, attended the Opening Address given by the Convenor.

The Workshop was organized as Session 1 (15 oral papers) and Session 2 (15 poster papers). The posters were displayed throughout the WCSS period (9 to 16 July), thus allowing extended exposure to WCSS participants. Both oral and poster papers presented research findings on the role of isotopic and nuclear techniques in integrated soil, water and nutrient management.

A CD-ROM, containing 15 oral and 15 poster papers presented at this Workshop was made available to participants. Copies of CD-ROM can be obtained by contacting Eveline Kopejtka at e.kopejtka@iaea.org.

IAEA General Conference

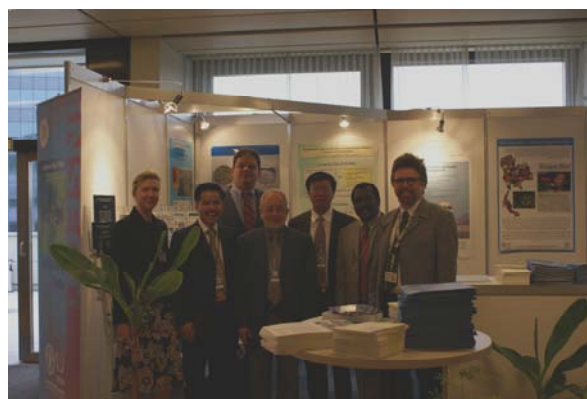
The 50th General Conference of the IAEA was held during the week of 18 to 22 September 2006. Staff of the SWMCN subprogramme manned the Nuclear Application (NA) Department display booth during the week, and on Monday, 18 September (NAFA theme day) they manned the NAFA display booth, which included publications and promotional material (printed and audio-visual) from all NAFA subprogrammes. In addition, a special display was organized by the Soil Science Unit to demonstrate support for the newly launched CRP on the Selection and evaluation of food crop genotypes tolerant to low nitrogen and phosphorus soils through the use of isotopic and nuclear-related techniques, which has identified the need for rapid screening techniques of root traits (primary root elongation, lateral roots, seminal root branching, root whorls and lateral root branching)

conferring P and N acquisition efficiencies. The root system is the organ that is directly exposed to various soil stress conditions and its development is therefore essential for selecting useful management practices to improve crop productivity, especially under water- and nutrient-stressed conditions. The Soil Science Unit mounted a display during the General Conference to demonstrate the influence of different soils with different physico-chemical properties on root system development and the root architecture of legumes and cereals. Root boxes with a glass surface (that allows the roots to be viewed) were filled with different soil types with a range of fertility status (low, medium and high). Common bean, maize and rice were grown in the root boxes with the transparent surface for 30 days. The three crops showed different root architecture and branching in the different soils clearly visible from the transparent portion of the root box. The root box system could be a useful technique for an in-depth study of root traits that may be associated with crops' ability to tolerate low nutrient and moisture availability in soils.

Staff of the SWMCN also attended the various meetings organized by the TC Department with representatives of Member States to review technical issues associated with on-going and planned TC projects in the 2007–2008 biennium.



Display at the 50th General Conference



Some SWMCN subprogramme staff members with Mr. Liang Qu (Director of NAFA Division. Third from the right) at the NAFA display booth

NON FAO/IAEA Events

14th Conference of the International Soil Conservation Organisation (ISCO) – Water Management and Soil Conservation in Semi-Arid Environments, Marrakech, Morocco, 14 to 19 May 2006

Lionel Mabit

Under the auspices of the High Commissioner for Water, Forestry and Desertification Control, the Moroccan Network of Soil and Water Conservation, the Moroccan Association of Soil Sciences and the Moroccan Association of Geomorphology, the 14th Conference of ISCO on Water Management and Soil Conservation in Semi-Arid Environments was organized in Morocco. The meeting was held in the Palais des Congrès de Marrakech from 14 to 19 May 2006. Presentations were made in 38 sessions with around 400 oral and poster presentations and more than 600 participants. A total of 240 oral presentations were made on different agro-environmental topics related to soil and water resource management.

The IAEA special session (19 May) entitled Use of fallout radionuclides for erosion/sedimentation studies was chaired by Lionel Mabit. This session included seven scientists, who made presentations on studies in six different countries (Austria, Canada, Chile, Morocco, Russian Federation and USA). A poster session was also organized for additional contribution.

It became clear that one of the major gaps in soil degradation knowledge is the lack of use of spatialisation tools and methodologies to map erosion/sedimentation to target conservation action at the watershed scale. For more information on this meeting and the proceedings of previous ISCO meetings please visit: <http://www.tucson.ars.ag.gov/isco/>

The Soil and Water Management & Crop Nutrition programmes in the field of soil and water conservation were also publicized during this meeting. Lionel Mabit gave an oral presentation entitled Spatial variability of erosion as evidenced from ¹³⁷Cs and organic matter content measurements and some soil parameters at the field scale. A second presentation was made in collaboration with Dr. Claude Bernard and Prof. Marc Laverdière from IRDA Québec/Canada on Assessment of soil erosion and sediment production at the watershed scale using fallout radionuclide ¹³⁷Cs.



Soil degradation 60 km from Marrakech close to the Atlas Mountains, Ourika Valley

18th World Congress of Soil Science, Philadelphia, Pennsylvania, USA, 9–15 July 2006

Long Nguyen and Gudni Hardarson

Long Nguyen and Gudni Hardarson attended the 18th World Congress of Soil Science, which was held in Philadelphia, Pennsylvania, USA during 9 to 15 July 2006.

The International Union of Soil Sciences (IUSS), which organised the 18th World Congress of Soil Science, is the global union of soil scientists. The objectives of the IUSS are to foster all branches of the soil sciences and their applications, and to give support to soil scientists in the pursuit of their activities. Previous meetings were held in Bangkok, Thailand (2002), Montpellier, France (1998) and Acapulco, Mexico (1994), all of which were attended by FAO/IAEA staff. Future Meetings will be held in Australia (2010) and the Republic of Korea (2014).

1. A presentation was made of the Soil and Water Management & Crop Nutrition subprogramme of the Joint FAO/IAEA activities entitled An Overview of Recent Soil-Water-Plant Research and Technical Activities of the FAO/IAEA Programme by G. Hardarson, L. Heng, L. Mabit, R. Serraj, C. Bernard and L. Nguyen as part of SESSION 172, Soil Science and International Organizations. Promotion of Joint FAO/IAEA Division research and technical cooperation activities in soil–water–nutrient management was also accomplished through the display and distribution of approximately 200 copies of a range of the Subprogramme's publications to participants.

International Symposium on Soil Physics and Rural Water Management (SOPHYWA) - Progress, Needs and Challenges, 28 to 29 September 2006, Vienna, Austria

Lionel Mabit

The International Symposium (SOPHYWA) in honour of the retirement of Prof. Ferdinand Kastanek was held at the University of Natural Resources and Applied Life Sciences, Vienna, Austria, 28 to 29 September 2006. This symposium focused on the past, present and future of basic and applied research in rural water management including: field measurement and monitoring, laboratory and field experiments, modelling and simulation as well as case studies in the areas of irrigation and drainage, soil and water conservation, water and solute transport, regional water balance in rural areas, land use and climate change, diffuse and point sources of contamination, impact assessment and mitigation measures and development co-operation in rural water management. More than 25 oral presentations were made and a poster session with 20 posters including a short oral presentation was organized. Lionel Mabit presented a contribution entitled: The application of geostatistics concept in agri-environmental sciences through a case study addressing soil and organic matter redistribution by erosion processes to assess soil fertility and establish sediment budget. The full proceedings of this meeting are now available on the internet. For more information please visit: <http://ihlw-sophywa.boku.ac.at/>



Participants of the SOPHYWA meeting (Photo: K. Ruppert)

International Sediment Initiative Conference, Khartoum, Sudan 12 to 15 November 2006

Emil Fulajtar

This conference was organized by UNESCO.

The conference addressed sediment management in the context of sustainable water resources development at a global scale. A total of 64 oral presentations were made.

Emil Fulajtar presented a paper on Assessing Erosion-Sedimentation Processes and Efficiency of Soil Conservation Practices Using Radio-Isotope Techniques with Lionel Mabit and Claude Bernard as co-authors. It provided an overview of fallout radionuclide (FRN) techniques used for investigation of soil erosion and sedimentation processes, and on research and technical cooperation activities coordinated by the SWMCN section and research activities carried out at the SSU. Three case studies were provided as examples of FRN use for different research objectives. The contribution will be published in the conference proceedings, which are in preparation.

Status of Coordinated Research Projects (CRPs)

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

Technical Officer: Phillip Chalk

The Technical Officer is presently engaged in the technical editing of the publication (IAEA-TECDOC) which contains manuscripts submitted by the participants.

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

Technical Officer: Phillip Chalk

The overall objective of this project is to contribute to increasing the agronomic water-use efficiency of wheat and rice production, where agronomic water-use efficiency is defined as grain yield/total water use including both transpiration and evaporation. The CRP is also aimed at increasing wheat productivity under drought, and rice yields in salt-affected areas.

The first RCM was held from 12 to 16 November 2001, at IAEA Headquarters, Vienna, Austria, and the second RCM held in Meknes, Morocco, from 21 to 25 November 2005. The reports of the first two RCMs are available at http://www-naweb.iaea.org/nafa/swmn/crp/d1_2008.html

Nine research contract holders from Algeria, Bangladesh, China (2), India, Morocco, Pakistan, the Syrian Arab Republic and Yemen, two technical contractors (CSIRO-Australia and IRRI-Philippines) and two agreement holders (USA and CIMMYT, Mexico) are participating in the CRP. Progress reports and requests for contract renewal for 2007 have been evaluated, and the mid-term review report of the CRP was prepared and approved. The third RCM is scheduled to be held in April 2007.

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

Technical Officer: Long Nguyen

The final RCM of this CRP was held at the Vienna International Centre, Vienna, Austria from 6 to 10 November (see 'Past Events' Section). All participants presented their final reports summarizing major results and achievements.

Reports from the RCM will be available at: http://www-naweb.iaea.org/nafa/swmn/crp/d1_5001.html

Conservation Measures for Sustainable Watershed Management Using Fallout Radionuclides (D1.50.08)

Technical Officer: Emil Fulajtar

The overall objective of this CRP is to enhance the productivity and sustainability of farming systems through a better understanding of the principles and practice of conservation agriculture. This should be achieved through the specific objective, which is to quantify the individual and interactive effects of conservation tillage practices, residue management, crop rotations, nutrient and water inputs to increase soil organic matter, resource use efficiency, agricultural productivity and environmental quality.

The 3rd RCM was held in Vienna, 27 to 30 March 2006 and the CRP is now entering its final stage. The results of the 3rd RCM showed that the research carried out is advancing according to the workplan. All participants reported the results of their research covering the period since the 2nd RCM. In addition there were several technical presentations. Dr Abdulghani Shakhshiro, of the Chemistry Unit of the IAEA Seibersdorf Laboratories made a presentation on the first results of a proficiency test, which was organized among the laboratories participating in the CRP. Mr. Lionel Mabit and Ms. Maitane Melero Urzainqui of the Soil Science Unit made a presentation on the use of geostatistics to improve the spatialization of FRN punctual data. Prof Walling from Exeter University (UK) presented information on the latest developments on new conversion models for the use of FRNs (¹³⁷Cs, ²¹⁰Pbex and ⁷Be) for erosion/sedimentation studies and on the latest version of new software that includes these models. A presentation was also made by a representative of the World Overview of Conservation Approaches and Technologies (WOCAT) on the tools available from WOCAT for the dissemination of information on soil and water resource conservation issues. The major outputs of the CRP are the measured erosion rates under a range of geographical and agorecological conditions, and data on the efficiency of soil conservation measures and the impact of land use changes. The measured values of soil erosion at the field scale ranged from 0.4 to 120 t ha⁻¹ y⁻¹. The highest rates were measured in Brazil (120 t ha⁻¹ y⁻¹) and in China (110 t ha⁻¹ y⁻¹). Erosion rates at the watershed scale measured in China reached 2.4 to 20 t ha⁻¹ y⁻¹. No-till reduced erosion rates by 89% (Chile), 90% (UK) and 25–37.5% (Morocco), forest strips and terracing by 25–80% (Russian Federation), grass strips by 91–97.8%

(Vietnam) and regulation of timber harvesting by 89% (China). Strategies for finalizing the project and for publishing and disseminating the results of the CRP were formulated.

The RCM report, including the contributions of participants, new software versions of models for conversion of ^{137}Cs data to soil erosion and deposition rates and other documents, was incorporated onto a CD-ROM and distributed among the CRP participants. The final RCM is scheduled to be held in October 2007 in Vienna. Reports from the RCMs are available at: http://www-naweb.iaea.org/nafa/swmn/crp/d1_5001.html

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

Technical Officer: Emil Fulajtar

The CRP is approaching the mid-point of its predicted 5-year duration, and will be subject to review in 2007. The second RCM was held in Rabat, Morocco, from 11 to 15 September 2006. At this meeting the progress of experimental work in the participating countries during the first two years of the CRP was presented, discussed and evaluated. The sites at which the research was carried out were classified using the agroecological classification method of FAO. The discussion at the meeting resulted in a proposal to introduce specific approaches for soil conservation under different agroecological and agrotechnical conditions. The participating countries were divided into 4 working groups (WG1. Small scale farming in dry areas, WG2. Small scale farming in moist areas, WG3. Large scale farming in dry areas and WG4. Large scale farming in moist areas) and issues specific to particular areas were discussed within the working groups. The major output of the CRP is the collection of a large amount of quantitative data on the impact of conservation agriculture on soil fertility, plant nutrition and crop yields. The results indicate that no tillage management has a very positive impact. Important improvements in cropping systems can also be achieved through improved crop residue management and by increasing the proportion of legumes in crop rotations. Important progress has been made towards the standardization of experimental protocols, terminology and units. The RCM reports are available at <http://www.iaea.org/programmes/nafa/d1/crp/d1-crp.html>

Selection and Evaluation of Food (Cereal and Legume) Crop Genotypes Tolerant to Low Nitrogen and Phosphorus Soils Through the Use of Isotopic and Nuclear-related Techniques (D1.50.10)

Technical Officers: Joseph Adu-Gyamfi and Phillip Chalk

Information on the objectives of this CRP can be seen in the 'Past Events' Section. The participants in the CRP include ten Research Contract holders from Burkina Faso, Brazil, Cameroon, China, Cuba, Ghana, Malaysia, Mexico, Mozambique and Sierra Leone, five Agreement Holders from Australia (UWA), Benin (WARDA), France (ENSA), Kenya (TSBF-CIAT), Nigeria (IITA) and two Technical Contractors from Germany (University of Hanover) and USA (University of Pennsylvania).

The 1st RCM was held at IAEA Headquarters and Seibersdorf during the week of 16 to 20 October 2006. The report of the 1st RCM is in preparation. The second RCM is planned for the first quarter of 2008.

Laboratory Activities

Research

The use of geostatistics in environmental sciences to spatialise fallout radionuclides to assess soil erosion/sedimentation (Part 1–Geostatistics concepts)

Lionel Mabit

^{137}Cs and other fallout radionuclide (FRN) methodologies have been used all over the world for more than 40 years. Some aspects of the methodology (e.g: data modeling, the transformation of ^{137}Cs activity into soil movement and the sampling strategy) should be improved, and still require additional research and development (IAEA, 2006). Radiocesium is highly variable in space, and knowledge of that variability is important for understanding and predicting processes like erosion and deposition. Geostatistics can help researchers to evaluate and interpret the ^{137}Cs data, in particular to map activities over a whole field or the landscape where only a limited number of samples has been taken. Therefore the author would like to propose that more emphasis is placed on the use of geostatistics in erosion studies.

At the Soil Science Unit we have recently developed expertise on the use of geostatistics. This has been presented during the Third FAO/IAEA Research Coordination Meeting on the Assessment of the Effectiveness of Soil Conservation Techniques for Sustainable Watershed Management Using Fallout Radionuclides held in Vienna, Austria, 27 to 30 March 2006. A presentation was made during this RCM on the use of geostatistics to improve the spatialization of FRN punctual data for the production of improved maps of FRN redistribution, which can be translated into maps of soil movement. The introduction of these techniques in FRN-based studies could also help to improve soil sampling strategies and the accuracy of soil movement budgets established from FRN spatial redistribution. To edit and produce a map we need sufficient numbers of samples and a validated sampling strategy to ensure a good interpolation in the unsampled area (Mabit et al., 2002). Only geostatistics in conjunction with variography will make it possible to study and use information regarding the spatial dependence of the data, i.e. to give values to a whole area based on the limited number of samples taken. Traditional statistical methods cannot be used to address this aspect.

In order to familiarise our readers with some of the specific vocabulary and the geostatistics concept including data interpolation, some technical information is provided in the following contribution.

Geostatistics and variography concepts

Soil parameters are not distributed in the landscape randomly; there is a spatial correlation that can explain the spatial distribution of their magnitudes. To represent this spatial correlation of variables, called the structure, geostatistic analyses have to be used through one specific tool, the variogram. Geostatistical methods provide a set of statistical tools for incorporating spatial and temporal coordinates of observations in data processing.

Geostatistics are largely based on the concept of random function, and soil properties are regarded as a set of spatially dependent random variables. Geostatistics is a technology for estimating the values of properties (at unsampled places) that vary in space from more or less sparse sample data. It is particularly useful to quantify an unknown value when producing a map and when validating and improving sampling strategies. It became a scientific discipline in the 1960s, and was used in the mining industry and later extended to many other fields such as geomorphology, geology, hydrology and geography. Geostatistical analysis has been used in large areas covering several kilometers for mapping soils, soil properties, nutrient variation and for producing fertilizer recommendations. In the field of resource assessment, geostatistics is mainly used to characterize the spatial behaviour of a variable under study and to use this information to predict the value of this variable between sample points, while minimizing the error of estimation and also improving and validating a sampling survey.

The variogram is a mathematical description of the relationship (structure) between the variance of pairs of observations (data points) and the distance separating these observations (h).

Data interpolation

Using two-dimensional space, the spatial structure of a variable can be visualized by maps. In order to produce maps, we need to interpolate the values at unsampled locations. In geostatistics, if there is a spatial correlation between the data, this prediction method is called 'Kriging'. Kriging is a method of interpolation named after a South African mining engineer D.G. Krige, who developed the technique in an attempt to predict gold mining reserves in the early 1960s. Over the past several decades Kriging has become a fundamental tool in the field of geostatistics. Kriging is based on the assumption that the parameter being interpolated can be treated as a localized variable, the 'regionalised variable theory'. Kriging interpolation provides an optimal interpolation estimate for a given coordinate location and obtains interpolations from observed values and their spatial relationships, as inferred from the variography. Kriging uses nearby points weighted by distance from the interpolate location and the degree of autocorrelation or

spatial structure for those distances, and calculates optimum weights at each sampling.

Ordinary Kriging (OK) is the most popular type of Kriging. The OK is an estimation technique known as the Best Linear Unbiased Estimator (BLUE), which has the great advantage of using the semivariogram information. The difference between IDW and OK is used to calculate the weighting factor. In Kriging, weights are based on the spatial structure of the data, and not only on the distance between the measured points. Structural analysis involves describing and modeling the estimated variogram. The variogram model is used to define the weights of the Kriging function.

Some applications of geostatistics have de-emphasized the mapping application of Kriging. Recent soil science publications show that Kriging is being used effectively to build models of uncertainty and conditional probabilities that depend on the data configuration.

A case study related to the spatialisation of fallout radionuclides to evaluate a sediment budget will be presented in the next Soils Newsletter.

IAEA. 2006. Report of the third Research Co-ordination Meeting of the Coordinated Research Project Assess the effectiveness of soil conservation techniques for sustainable watershed management using fallout radionuclides Vienna, Austria. 134 pages.

*Mabit, L., Bernard, C., Laverdière, M.R. 2002. Influence of the sampling strategy on soil loss assessments from ^{137}Cs measurements. p. 2083–2090 (2). In J.L Rubio, R.P.C. Morgan, S. Asins and V. Andreu (ed.) *Man and Soil at the third Millennium. Geofoma Ediciones, Logroño, Spain.**

^{13}C isotope discrimination in maize and rice under water and salt stress at varying nitrogen and phosphorus availability

Joseph Adu-Gyamfi

The use of ^{13}C isotope discrimination (Δ) as a research tool to evaluate the impact of water stress on rice and maize and to estimate water use efficiency (WUE) is well understood. However, its application in the field to assess water stress in semi-arid environments may be hampered by factors other than water and salt stress such as low nutrient (N and P) availability in soils. Pot experiments were carried out in a glasshouse at Seibersdorf to assess the Δ in maize and rice under water and salt stress regimes, and varying nitrogen (N) and phosphorus (P) levels. In the first experiment, maize was planted under two water regimes (field capacity W0 and water stress W1), two N (0 and 100 kg ha⁻¹ N) and four P (0, 20, 40 and 60 kg ha⁻¹ P). The maize plants showed severe P deficiency at the 0 P treatment and the increased application of P increased N availability in soils to plants.

The second experiment with rice had two salt treatments (0 and 10 dSm⁻¹), N (0, 50 and 100 kg ha⁻¹ N) and P (0, 20, 40 and 60 kg ha⁻¹ P). Maize plants were sampled 50 days after planting (DAP), dried, weighed, ground and are being analyzed for %C, %N, ^{13}C content using an Isoprime IRMS (GV Instruments GB).

Above-ground production in maize showed clearly the water, N and P effects with values ranging from 1.8 g pot⁻¹ in 0 N and 0 P to 15.3 g pot⁻¹ for 100 N and 60 P treatments. Shoot production was reduced by half in the water limiting treatment when adequate N was supplied, but the reduction under 0 N application was minimal. The experiment with rice is on-going. Variations of Δ in shoots and roots in maize and rice under water and salt stress at varying N and P availability would help improve our understanding on the use of Δ as an indicator for estimating WUE in N and P limiting semi-arid environments.

Partitioning of ^{13}C -labelled photo-assimilates by common bean and soybean at varying nitrogen and phosphorus availability

Joseph Adu-Gyamfi

Optimizing photosynthesis and the partitioning of a large part of the photosynthates into grain is vital for increasing productivity and resource use efficiency in legumes. Soybean and common bean were grown in pots at three P levels (0, 10 and 30 kg ha⁻¹ P). At 35 days after planting (DAP), plants were divided into 2 groups. The first group of plants was used for whole plant labeling and the second group for leaf labeling. For the whole plant labeling, plants were allowed to assimilate ^{13}C generated from NaH $^{13}\text{CO}_3$ and lactic acid in an airtight chamber for 90 min under natural light conditions. In the second group, leaves below the fully expanded flag leaves were fed with ^{13}C for 90 min. Half of the plants in the first group were sampled immediately after feeding and the rest were allowed to grow to physiological maturity. Plants were separated into labeled leaves, leaves above and below labeled leaves, stems above and below labeled leaves, and pods above and below labeled leaves. For the whole plant labeling, plants were separated into flag leaves, other leaves, stems, pods, and roots, chopped into small pieces and ground.

Analysis of the ^{13}C content in the various plant parts would help understanding the mechanisms of carbon translocation and re-distribution under varying P levels and provide an insight into the mechanisms of tolerance of common bean and soybean to low available P soils.



Glasshouse experiment on whole plant labeling of soybean and common bean with C-13



Fellows participating in Group Training Session on Crop Nutrition and Water Management with DIR- NAFA, Head, Soil Section and Head, Soil Science Unit.

Supportive Services

Training

The Soil Science Unit (SSU), in conjunction with the staff of the SWMCN Section, has provided training to 20 IAEA fellows during 2006. This is the highest number of fellows trained during past years. The training was organised in two group training sessions and individual fellowships.

Group training:

Crop nutrition and water management

The Soil Science Unit conducted a Training Session for 14 IAEA fellows during April-May 2006. The training was offered to the following 14 fellows from 7 countries: **Mr. Opio Julius** (UGA/06001), **Ms Baast**, Bayarsaikhan (MON/05009), **Mr. Irekti**, Hocine, (ALG/06001), **Ms. Bongosuren**, Delgermaa (MON/06007), **Ms. Tseeren**, Odontungalag (MON/06006), **Mr. Duvivier**, Predner (HAI/06001), **Mr. Sumah**, Foday (SIL/05010), **Mr. Kislal**, Hakan (TUR/06001), **Mr. Ergul**, Faki (TUR/06005), **Mr. Nam**, Murat (TUR/06002), **Mr. Onaran**, Huseyin (TUR/06003), **Ms. Kale**, Sema (TUR/06004), **Mr. Sirin**, Hamsa (TUR/06006) and **Mr. A. Alkhader** (JOR/05011).

The training session covered crop nutrition and water management. Lectures and practical demonstrations were given by NAAL and NAFA staff with two external lecturers assisting with the implementation, i.e. Dr. Pierre Moutonnet, who gave lectures and practical exercises on the use of nuclear techniques in irrigation and water management and Dr. Felipe Zapata, who covered the field of fertilizer use efficiency and crop nutrition.

Isotope analyses

The Soil Science Unit will be conducting a Training Session for six IAEA fellows during November to December 2006 on isotope analyses. A detailed report of this Training Session will be presented in the next Newsletter.

Individual fellowship training:

Mr. Mohsen Makhoulf (SYR/03044) from the Atomic Energy Commission of Syria, Department of Agriculture, Division of Soil and Plant Nutrition, was trained for three months (July to September 2006) on erosion/sedimentation process assessment using fallout radionuclides under the supervision of Lionel Mabit. His training, which was related to the IAEA technical co-operation project RAS/0/042 (Human Resource Development and Nuclear Technology Support), covered the following areas: erosion/sedimentation processes, use of fallout radionuclide isotopes to estimate erosion/sedimentation, field training for soil sampling, soil sample pre-treatment for gamma analysis, transformation of fallout radionuclides areal activity into soil movement through conversion models, software training for spatialisation and mapping, introduction to geostatistical analysis, interpretation of data and sediment budget assessment. During this training, he was involved as co-author for one contribution presented at the international symposium SOPHYWA in Vienna and in recognition of his valuable contribution he was also involved in the preparation of a paper on the spatial variability of erosion and organic matter content as investigated from ^{137}Cs measurements and geostatistics. He was also chosen by the Director of the IAEA Seibersdorf Laboratories to represent Seibersdorf fellows in a special session celebrating the 50th General Conference of the International Atomic Energy Agency: The Nuclear technologies for the Environment: Protecting Air, Earth and Oceans, 19 to 22 September

2006, Austria Center, Vienna, Austria. The training will provide him with the expertise to analyse the data that he has collected with Dr. Fares Asfary and Mr. Abdle Aziz Aba, and to evaluate erosion rates and the sediment budget in the Khanasser Valley in the Syrian Arab Republic.



Moshen Makhoulf and Lionel Mabit (SSU) during the special exhibit celebrating the 50th General conference of the IAEA



Runoff and erosion events in the Khanasser Valley in the Syrian Arab Republic

(Photo: Dr. Fares and M. Makhoulf)

Mr. F. Sumah (SIL/05010) was trained for four months on ^{13}C isotope discrimination in maize and rice under water and salt stress at varying N and P availability and the partitioning, and translocation of ^{13}C -labeled photo-assimilates by soybean and common bean at low P levels under the supervision of Mr. Joseph Adu-Gyamfi and with the assistance of Mr. Jose Luis Arrillaga.

Mr. H. Kislal (TUR/06001) received training for three months on Crop production practices and changes in physio-chemical and isotopic composition of groundwater at Seibersdorf (in collaboration with ARC-Mr. P. Hacker). A field experiment involving the

installation of access tubes for moisture measurements using the neutron probe and tensiometers to monitor the composition of ^{18}O and ^{15}N in soil water was supervised by Joseph Adu-Gyamfi and Long Nguyen.

Mr. A. A. Alkhader (JOR05011) was trained for two weeks on isotope techniques for studying P dynamics and evaluating the effectiveness of P fertilizers. Mr. Alkhader was supervised by Joseph Adu-Gyamfi.

Ms Baast, Bayarsaikhan (MON/05009), **Ms Bongosuren**, Delgermaa (MON/06007), **Ms Tseeren**, Odontungalag (MON/06006), **Mr Irekti**, Hocine, (ALG/06001) and **Mr Opio Julius** (UGA/06001) each received a three-month training in the use of the ^{15}N isotope dilution technique for the quantification of biological nitrogen fixation in grain legumes under the supervision of Mr Gudni Hardarson.



Sedimentation study in field condition during the April-May 2006 training course

Scientific Visits

Mr. **Assami**, T (ALG/06004V), 6 to 16 June

Ms. **Mefti**, H (ALG/06005V), 6 to 16 June

Mr. **Gebrehiwot**, K A (ERI/06001V), 2 to 6 October

Mr. **Gonfo**, O J (ERI/06004V), 2 to 6 October

Mr. **Baggie**, I (SIL/05001V) 2 to 13 October

Visitors

Ms. Delphine Dutertre, Assistant to the Counsellor for Nuclear Affairs at the Permanent Mission of France visited the SSU on 25 April.

Dr. Maria Luisa Izaguirre Lessmann, Head, Laboratorio de Biotecnología y Virología Vegetal. Instituto Venezolano de Investigaciones Científicas, Caracas, Venezuela visited the SSU on 4 August.

Mr. Taieb Jerbi, National Liaison Officer for Tunisia visited the SSU on 4 September.

Drs. D. and S. Kalembasa, Head of Soil Science and Plant Nutrition Department, Poland visited the SSU on 12 October.

Mr. David A. Harcharik, FAO Deputy Director-General (ODG) visited the SSU on 6 June.

Approximately 50 delegates from the General Conference visited the SSU on 20 September.

30 UN Disarmaments Fellows visited the SSU on 13 September.

Isotope analyses

The following Tables summarise the isotope analytical work of the Soil Science Unit during 2006 (Jan-Nov).

Leo Mayr

Samples received:

	Number of samples	Requested analyses			
		¹⁵ N enriched	¹⁵ N nat.ab.	¹³ C nat.ab.	¹⁸ O nat.ab.
CRP	3245	1368	276	2153	0
TC	0	0	0	0	0
Seib	1845	647	12	1510	60
Total	5090	2015	288	3663	60

Measurements carried out:

¹⁵ N enriched level	4959	43.0%
¹⁵ N nat. ab.	61	0.5%
¹³ C nat. ab.	5464	47.4%
¹⁸ O nat. ab.	1045	9.1%
Total	11529	100.0%

Annual Proficiency Test (PT) on ¹⁵N and total N as well as ¹³C and total C in plant materials

Martina Aigner

A comprehensive final report on the annual PT EQA2005 performed in 2005 was issued in March 2006 and distributed to the participants: Final Report on the annual Proficiency Test EQA2005 for the measurement of ¹⁵N- and ¹³C isotopic abundance and total nitrogen- and carbon concentration in plant materials by M. Aigner, A. Shakhshiro, A. Trinkl, IAEA Laboratories, Seibersdorf, IAEA/AL/165, 2006. 105p. A copy is available upon request.

In the year 2006 a new name was introduced to the annual Proficiency Test in order to further harmonize activities with other PT-providers in Seibersdorf. The new round of PT is named **IAEA-SSU-2006-01** and started in March 2006. Twenty-two applicants received the test samples in July and the deadline for reporting was end of October 2006.

After the evaluation, a detailed final report will be issued and provided to the participants and other interested laboratories.

Publications

Recent Publications of the Subprogramme

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

Recent Titles

Publication\Proceedings of Symposia and Seminars:

FAO/IAEA Workshop: Use of Nuclear Techniques in Addressing Soil-Water-Nutrient Issues for Sustainable Agricultural Production; at 18th World Congress of Soil Science, July 9–15, 2006 – Philadelphia, Pennsylvania, USA; Convenor: Long NGUYEN. CD-ROM available upon request.

Myaka, F A, Sakala W D, **Adu-Gyamfi, J J** Kamalongo D, Ngwira A, Odgaard, R, Nielsen N E and Jensen H H, **2006** Yields and accumulations of N and P in farmer-managed intercrops of maize-pigeonpea in semi-arid Africa. *Plant and Soil* 285:207–220.

Aigner, M, A. Shakhshiro and A.Trinkl. (2006). ‘*Final Report on the annual Proficiency Test ‘EQA2005’ for the measurement of ¹⁵N- and ¹³C isotopic abundance and total nitrogen- and carbon concentration in plant materials*’, IAEA Laboratories, Seibersdorf, IAEA/AL/165, 105 pages.

Aye, T.M., **Nguyen, M.L**, Bolan, N.S, Hedley, M. J. (2006). *Phosphorus in soils of riparian and non-riparian wetland and buffer strips in the Waikato area, New Zealand*. *New Zealand Journal of Agricultural Research*. 29 (3): 349–358.

Bernard, C., **Mabit, L**. and Laverdière, M.R. (2006). *Assessment of soil erosion and sediment production at the watershed scale using fallout radionuclide ¹³⁷Cs*. In: The 14th Conference of International Soil Conservation Organization – Water Management and Soil Conservation in Semi-Arid Environments. Final Program and Book of Abstracts. Edition INRA 2006. ISBN: 9954-0-6653-5. Page 247 & CD-ROM of the proceedings in .pdf format, extended summary of 4 pages.

Dang, T. H., Cai, G. X., Guo, S. L., Hao, M. D. and **Heng, L. K.** (2006). *Effect of nitrogen management on yield and water use efficiency of rainfed wheat and maize in Northwest China*. *Pedosphere*, 16: 495–504.

Fulajtar, E., Mabit, L. and Bernard, C. (2006). *Assessing Erosion-Sedimentation Processes and Efficiency of Soil Conservation Practices Using Radio-Isotope Techniques*. International Sediment Initiative Conference (ISIC). November 12–15, 2006. UNESCO Chair in Water Resources, Khartoum, Sudan. Proceedings of the meeting. (In press).

Hardarson, G., Heng, L. K. Mabit, L., Serraj, R., Bernard, C. and Nguyen, M.L. (2006). *An Overview of the Recent Soil-Water-Plant Research and Technical Activities of the FAO/IAEA Programme*. 18th World Congress of Soil Science, Frontiers of Soil Science: Technology and the Information Age. 9–15 July 2006, Philadelphia, Pennsylvania, USA. In: Abstracts (CD-ROM) 18th World Congress of Soil Science, SESSION 172 (172-1,2301b), Soil Science and International Organizations, D:/techprogram/P11476.htm, 1 page.

Heng, L.K., Asseng, S., Mejahed, K. and Rusan, M. (2006). *Optimizing wheat productivity in two rain-fed environments of the West Asia - North Africa region using a simulation model*. *European J. Agronomy* (Accepted).

Mabit, L. and Bernard, C. (2006). *Spatial variability of erosion as evidenced from ¹³⁷Cs and organic matter content measurements and some soil parameters at the field scale in the Boyer River watershed (Canada)*. In: The 14th Conference of the International Soil Conservation Organization – Water Management and Soil Conservation in Semi-Arid Environments. Final Program and Book of Abstracts. Edition INRA 2006. ISBN: 9954-0-6653-5. Page 241 & CD-ROM of the proceedings in .pdf format, extended summary of 4 pages.

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

Mabit, L., Bernard, C., Melero Urzainqui M. and Makhoulouf, M. (2006). *Application of geostatistics concept in agri-environmental sciences: A case study addressing soil and organic matter redistribution by erosion processes to assess soil fertility and establish sediment budget*. p. 183–186. In: G. Kammerer and F. Kastanek (eds.). *Soil Physics and Rural Water Management-Progress, Needs and Challenges*. Proceedings of the International Symposium SOPHYWA. 28–29 September 2006. Vienna, Austria. ISBN-13: 978-3-900962-65-4.

Misra, S.C., Randive, R., Rao, V.S., Sheshshayee, M.S., **Serraj, R.**, Monneveux, P. (2006). *Relationship between carbon isotope discrimination, ash content and grain yield in wheat in the peninsular zone of India*. *Journal of Agronomy and Crop Science*, 192: 352–362.

Myaka, F.A, Sakala W.D, **Adu-Gyamfi, J.J.**, Kamalongo D, Ngwira A, Odgaard, R, Nielsen N.E and Jensen H.H. (2006). *Yields and accumulations of N and P in farmer-managed intercropped maize-pigeonpea in semi-arid Africa*. *Plant and Soil*, 285: 207–220.

Nguyen, M. L. and Zapata, F. (2006). *Use of nuclear techniques in addressing soil-water-nutrient issues for sustainable agricultural production*. In: CD-ROM Abstracts -Session No.1-1, 18th World Congress of Soil Science Philadelphia, USA, 9–15 July 2006.

Shakhashiro, A., Gondin Da Foseca Azeredo, A. M., Sansone, U., Kim, C. K., Kis-Benedek, G., Trinkl, A., Benesch, T., Schorn, R. (2006). *Report on the IAEA-CU-2006-02 proficiency test on the determination of ¹³⁷Cs and ²¹⁰Pb in spiked soil* Within the frame of CRP DI.50.08 'Assess the effectiveness of soil conservation measures for sustainable watershed management using fallout radionuclides' by IAEA Laboratories, Seibersdorf, IAEA/AL/166, 51 pages.

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/waicent/FAOINFO/AGRICULT/Default.htm>
- FAO/AGL (Land and Water Development Division)
<http://www.fao.org/ag/agl/default.stm>



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