SOILS NEWSLETTER

A Publication of the Soil and
Water Management &
Crop Nutrition Sub-Programme
of the Joint FAO/IAEA Division
of Nuclear Techniques in Food and
Agriculture and FAO/IAEA
Agriculture and Biotechnology
Laboratory, Seibersdorf
International Atomic Energy Agency
Vienna, Austria

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A. TO OUR READERS

This end-of-year Newsletter provides the opportunity to reflect on activities carried out in 2002 and highlight planned activities in 2003. Two major activities completed early in 2002 were the evaluation of Projects for the Technical Co-operation (TC) Programme 2003-04 biennium, and formulation of the programme of work and budget (PWB) for the Regular Programme 2004-05 biennium. Reorganised sub-programmes within the Food and Agriculture Programme and multi-disciplinary projects are included in the PWB, although existing disciplinary structures (i.e. Sections) within the Joint FAO/IAEA Division are to be retained. This new programme structure is in line with the Agency-wide approach to matrix management. The new sub-programme within which the Section will operate in 2004 is "Sustainable Intensification of Crop Production Systems", which is consistent with the FAO approach to programme development. Within this new sub-programme, a new multi-disciplinary Project area "Identification and development of crop germplasm with superior resource use efficiency and nutritional value and adapted to harsh environments" will be introduced. We will gradually develop new research initiatives to be implemented under this Project area that will operate from 2004 to 2010. The two existing Project areas will be retained until 2006 when new Project areas will be introduced.

A highlight in 2002 was Symposium 59 "Towards integrated soil, water and nutrient management in cropping systems: the role of nuclear techniques" which was convened by the sub-programme at the 17th World Congress of Soil Science (WCSS), 14 – 21 August 2002, Bangkok, Thailand. A symposium sponsored by the Joint FAO/IAEA Division has been a regular activity at past WCSS, but this time we took full advantage of the offer of a booth to jointly display, distribute and take orders for IAEA and FAO (Land and Water Development Division) publications. Both activities were a marked success, and further details are reported under Past Events in this Newsletter and on the NAFA website http://www.iaea.org/programmes/nafa The next WCSS will be held in 2006 in Philadelphia, USA, and Brisbane, Australia, will host the 19th WCSS in 2010.

As mentioned in the foreword to the last Newsletter, the sub-programme has been very active during 2002 in the area of publications, including (i) IAEA-TECDOC-1266 "Water balance and fertigation in West Asia" (ii) IAEA-TECDOC-1272 "Assessment of soil phosphorus status and management of phosphatic fertilizers to optimise crop production" in hardcopy and CD ROM (iii) IAEA-TECDOC-1317 "Irradiated sewage sludge for application to cropland" in hardcopy and CD ROM (iv) FAO Water Reports 22 "Deficit Irrigation Practices" (v) IAEA C & S Papers Series 11/P "Nuclear techniques in integrated plant nutrient, water and soil management" in hardcopy and CD ROM (vi) IAEA Training Course Series 16 "Neutron and gamma probes: their use in agronomy" (vii) a special issue (Vol. 63, No. 1) of the journal Nutrient Cycling in Agroecosystems edited by Mr. Felipé Zapata "Utilization of phosphate rocks to improve soil P status for sustainable crop production in acid soils". Further information on contents and ordering are given on the sub-programme website at http://www.iaea.org/programmes/nafa/d1 which is currently updated every 3 months. Several additional titles will be published late in 2002 or early in 2003 and will be reported in the next Newsletter.

Four Research Co-ordination Meetings and two Consultants' Meetings will be held in 2003. The final Consultants' Meeting on "Comparison of soil water measuring techniques" will be held in March, and guidelines will then be developed and published in the IAEA

Training Course Series. A Consultants' Meeting is also planned in August 2003 in Brazil to plan for a new Co-ordinated Research Project on "Conservation Agriculture". A sub-programme highlight in 2003 will be the reintroduction of the Interregional Training Course at the Soil Science Unit, Seibersdorf, supported by the Joint Division and TC Projects. The prospectus and application procedures are given in this Newsletter under Future Events. Demand for the 15 available places is expected to be high. It is hoped that an Interregional Training Course covering various areas of the application of nuclear techniques in natural resource management and crop improvement may become an annual activity within the sub-programme.

With my very best wishes for 2003.

Phillip Chalk
Head, Soil and Water Management
& Crop Nutrition Section

B. STAFF

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3. Staff Changes

Dr. Manbir Sachdev left the Soil Science Unit at the end of August to return to the Nuclear Research Laboratory, Indian Agricultural Research Institute, New Delhi, after a 6-month sabbatical at Seibersdorf. Dr. Sachdev participated in fellowship training activities and developed protocols for ^{15}N foliar labelling of wheat on flat and raised beds to quantify belowground root and root-derived biomass. These techniques will be applied in the Rice-wheat Co-ordinated Research Project in which he is a Contract Holder. He also developed the outline for the guidelines (Training Course Series) on Isotopic Methods for Evaluating the Contribution of Organic Nutrient Sources to Plant Nutrition. We thank Mani for his valuable contribution to the work of the sub-programme.

Ms. Rebecca Hood Nowotny, Soil Science Unit, Seibersdorf, returned to duty on December 2, after a 10-month absence on maternity leave.

C. FUTURE EVENTS

RESEARCH CO-ORDINATION MEETINGS (RCMs) OF FAO/IAEA CO-ORDINATED RESEARCH PROJECTS (CRPs)

⇒ **First RCM of CRP on "Assess the Effectiveness of Soil Conservation Measures for Sustainable Watershed Management Using Fallout Radionuclides" (D1-50.08), 19 – 23 May 2003, Vienna and Seibersdorf, Austria**

Twelve research contractors from Argentina, Brazil, China (2), Chile, India, Morocco, Poland, Romania, Russia, Turkey and Viet Nam; three technical contractors from Australia, UK and USA and four agreement holders from Austria, Canada, The Netherlands (ISRIC) and USA are expected to attend the meeting. The objective of this first co-ordination meeting will be to review the experimental plans of the participants in the context of the work plan of the project and to establish collaborative work with the World Overview of Soil and Water Conservation Approaches and Technologies (WOCAT) consortium. Research objectives, approaches, methodologies and protocols will be discussed and agreed upon. This meeting will include a training workshop on both the application of fallout radionuclides in soil erosion research and the use of WOCAT databases and methodologies on soil and water conservation. The overall aim would be to refine/standardise protocols to be used by the network so that the results are comparable and valid conclusions can be drawn for extrapolation to other areas. Mr. F. Zapata is the Project Officer and will serve as the Scientific Secretary.

⇒ **Third RCM of CRP on "The Use of Nuclear Techniques for Developing Integrated Nutrient and Water Management Practices for Agroforestry Systems" (D1-20.07), 2 – 6 June 2003, Colombo, Sri Lanka**

Nine contract holders and five agreement holders are expected to participate. Dr. Sarath Nissanka, Faculty of Agriculture, University of Peradeniya, Sri Lanka, is the local organiser. The purpose of this meeting is to review the progress of the CRP in accordance with the project objectives. To facilitate this process, all participants will be requested to present a report highlighting the major results covering the period from 1999-2003 relevant to the specific objectives of the project. A total of one hour will be allotted for each presentation including 15 minutes for discussion. A copy of the report (abstract, introduction, materials and methods, results and discussion) on a 3.5" diskette should be sent to the Project Officer by 16 May 2003. The presented data will be fully discussed and the plan for future work will be updated in line with the project objectives. Mr. G. Keerthisinghe is the Project Officer and will be the Scientific Secretary.

⇒ **Third RCM of CRP on "Development of Management Practices for Sustainable Crop Production Systems on Tropical Acid Soils Through the Use of Nuclear and Related Techniques" (D1-50.06), 18 – 22 August 2003, Ouagadougou, Burkina Faso**

Eight research contractors from Brazil (2), Benin, Burkina Faso, Cuba, Mexico, Nigeria, Venezuela; one technical contractor from Australia and four agreement holders from Germany, Kenya (TSBF), Nigeria (IITA) and USA (IFDC) are expected to participate. The participants will present their results covering the period 2002-2003. As the project will be completed in October 2004, overall progress made in implementation of the work plan of the project will be reviewed in accordance with the project objectives and plans for completion will be made. Mr. Vincent Boubié Bado, INERA-Farakoba, will be the local organizer. Mr. F. Zapata is the Project Officer and will serve as the Scientific Secretary.

⇒ **Second RCM of CRP on "Integrated Soil, Water and Nutrient Management for Sustainable Rice-Wheat Cropping Systems in Asia" (D1-50.07), 22 – 26 September 2003, Nanjing, China**

Seven contract holders and 3 agreement holders are expected to participate. Prof. Qirong Shen, Nanjing Agricultural University, is the local organiser. The participants will present the major results and conclusions of their research since commencement of the project on 1st October 2001. The data presented will be fully discussed in line with the objectives of the project, and adjustments made where necessary to the agreed work plan and experimental protocols. The role of crop simulation models in the project will also be thoroughly assessed. Mr. P.M. Chalk is the Project Officer and will be Scientific Secretary of the RCM.

CONSULTANTS' MEETINGS

⇒ **FAO/IAEA Final Consultants' Meeting on "The Comparison of Soil Moisture Neutron Probe with Time-Domain Reflectometry and Capacitance Methods", 24 – 28 March 2003, Vienna, Austria**

The meeting will be held at IAEA Headquarters with the participation of the four contract holders: Drs. C.T. Hignett from Australia; P. Cepuder from Austria; J.P. Laurent from France and S.R. Evett from USA. Complementary field-testing was also performed by Ms. L.K. Heng at the Seibersdorf Laboratory. The project, which is now finishing, was initiated in November 1998. A set of guidelines on the recommendation of soil moisture sensors will be written and published. Preliminary results were collated in IAEA-TECDOC-1137 entitled "Comparison of soil water measurement using the neutron scattering, time domain reflectometry and capacitance methods". This publication is available from: http://www.iaea.org/programmes/nafa/d1_pbl_2_1.pdf

⇒ **FAO/IAEA Consultants' Meeting on "Integrated Soil, Water and Nutrient Management under Conservation Agriculture Practices", 11 – 16 August 2003, Iguaçu Falls, Parana, Brazil**

This Meeting will be held in conjunction with the **2nd World Congress on Conservation Agriculture**, which will be co-sponsored by several Divisions within the Agriculture Department of FAO. The objective of the meeting will be to prepare the project document for a new CRP on Conservation Agriculture as included in the programme of work and budget for the 2004-05 biennium. It is expected that five Consultants will participate in the meeting in addition to FAO professional staff. Mr. P.M. Chalk will be the convenor and Scientific Secretary of the Meeting.

TRAINING COURSE

⇒ **FAO/IAEA Interregional Training Course on "The Use of Nuclear and Related Techniques to Increase Water Use Efficiency in Rainfed and Irrigated Agriculture", 30 June – 25 July 2003, Seibersdorf, Austria**

Venue: Soil Science Unit, FAO/IAEA Agriculture and Biotechnology Laboratory, Seibersdorf Laboratory

Deadline for nominations: 1 April 2003

Organizers:
Food and Agriculture Organization of the United Nations and the International Atomic Energy Agency

Participation:
The training course is open to 15 participants from FAO and IAEA Member States in all geographical regions. Preference will be given to qualified candidates from developing countries.

Purpose of the course:
The objective of the course is to give scientists from developing countries a sound working knowledge of the use of nuclear and related techniques on increasing water use efficiency in rainfed and irrigated cropping systems. The course aims to transfer to participants of Member States existing knowledge on strategies, approaches and nuclear and related techniques to monitor soil water status and improve the use of water resources, particularly in arid and semiarid areas for increased and sustainable agricultural productivity.

Language:
The language of instruction will be English.

Participants' qualifications:
Participants must have at least a first university degree in agronomy/agriculture sciences, and should be specialized in the field of soil physics/water management and/or actively involved

in FAO and/or IAEA projects on water management. As the course will be conducted in English, participants should have no difficulties in following lectures and expressing themselves in this language.

Nature of the course:

Description of the course

This four-week course will cover basic aspects of isotope and nuclear techniques on topics related to crop water requirements in different agro-ecological areas, the efficient and rational use of water resources and the interaction between irrigation water and fertilizers for maximizing crop productivity. The range of activities coming within the scope of the course is potentially very wide. Broad coverage of techniques will, therefore, be given through intensive classroom lectures, laboratory sessions, greenhouse and field experiments.

Syllabus

The following is the outline of the content of the course:

1st week: Introduction to the course. Isotope and radiation techniques in studies of integrated soil, water and nutrient management. Use of isotopes in soil-plant studies: fertilizer recovery, biological nitrogen fixation, nutrient availability from organic sources. Nutrient dynamics in cropping systems. Nuclear physics and instrumentation. Radiation protection and nuclear safety procedures.

2nd week: Physical & hydraulic properties of soils. Methods of measuring soil water status. Use of nuclear and related techniques in soil water studies. Field use of neutron moisture gauges and other soil water measuring devices. Installation of access tubes and calibration of various devices - theory and practical.

3rd week: Soil water measurements under field conditions. Evapotranspiration and soil water balance calculation. Irrigation methods/efficiency. Irrigation scheduling. Fertigation studies using nuclear techniques. Soil water management under rainfed agriculture.

4th week:, Field excursion, Preparation of project proposals. Design of greenhouse or field experiments on water management. Participants will be requested to present a research proposal, which provides the opportunity to apply techniques and concepts learned during the course to practical problems from their own experience. FAO/IAEA activities on water management. Evaluation and review of the course.

Application procedure:

Nominations may be submitted on the standard IAEA application form for training courses (Available from the IAEA or on the IAEA web pages:
http://www-tc.iaea.org/tcweb/participation/astrainee/default.asp).

The completed form must be sent by the Head of nominating institution through the FAO Country Representative, the relevant Regional or sub-Regional Office or the National Atomic Energy Authority or the Office of the United Nations Development Programme to the address given below. They must be received **not later than 1 April 2003**. Nominations received after this date, or applications, which have not been routed through one of the aforementioned channels, cannot be considered.

The nomination, together with the Language Proficiency Certificate, issued by a language school or cultural institution or the British Embassy, should be returned to:
Mr. Gudni Hardarson
Head, Soil Science Unit
FAO/IAEA Agriculture and Biotechnology Laboratory
International Atomic Energy Agency
P.O. Box 100
A-1400 Vienna, Austria
Fax: +43-1-26007; e-mail G.Hardarson@iaea.org

Advanced nominations by facsimile or e-mail are welcomed. The facsimile/e-mail should contain the following basic information about the candidate: name, age, academic qualifications, present position including exact nature of duties carried out, proficiency in English and full working address including telephone/facsimile numbers.

Administrative and financial arrangements:
The four week training will be provided free of charge by FAO and IAEA. The travel costs, living expenses and accommodation of the participants shall be borne by the nominating governments. Limited funds are available to support the participation of scientists from least developed countries; requests to benefit from this support should be made by the respective Government Authority. Nominating Governments will be informed in due course of the names of the candidates who have been selected and will at that time be given full details on the procedures to be followed with regard to administrative and financial matters.
Shipment of course materials to the participants' home countries is not the responsibility of the sponsoring Organizations.

The organizers of the course do not accept liability for the payment of any cost or compensation that may arise from damage to or loss of personal property, or from illness, injury, disability or death of a participant while he/she is travelling to and from or attending the course (except the health and accident insurance which will be borne by the sponsoring Organizations during the participants' stay in Austria in connection with the training course). It is clearly understood that each Government, in nominating participants, undertakes responsibility for such coverage. Governments would be well advised to take out insurance against these risks.

FAO CO-SPONSORED MEETINGS

⇒ FAO Expert Meeting on "Crop Water Productivity Under Deficient Water Supply", 26 – 28 February 2003, Rome, Italy

An expert meeting will be held at FAO Headquarters to discuss the progress and development made since the first meeting in December 2001. The meeting consists of an international global network of experts from FAO, IAEA and international research institutes with specific knowledge on crop water use functions. The purpose is to estimate crop water productivity for food production in rainfed and irrigated conditions under drought and

deficient water supply, and to introduce effective crop water management practices at the farm level to optimise water productivity and food security under deficient water supply.

⇒ **IFA-FAO Agriculture Conference, 26 – 28 March 2003, Rome, Italy**

The International Fertilizer Association (IFA) is organising its 2003 Conference jointly with FAO. It will address the role of fertilizers in sustainable food security with inputs from key stakeholders in plant nutrition, food production, farm management systems and emerging technologies. Gamini Keerthisinghe will make a presentation on "Plant nutrition: challenges and tasks ahead".

⇒ **2nd World Congress on Conservation Agriculture, 11 – 15 August 2003, Iguaçu Falls, Parana, Brazil**

The Brazilian Federation of No Tillage in Crop Residues (FEBRAPDP) is organizing this Congress under the theme of "Producing in Harmony with Nature". More information can be obtained from Mr. José Benites at Jose.Benites@FAO.ORG

NON-FAO/IAEA MEETINGS

⇒ **11th Regional Technical Coordination Committee (RTCC) of the Rice Wheat Consortium (RWC) for Indo-Gangetic Plains (IGP), 4 – 6 March, Kathmandu, Nepal**

Mr. P. Chalk (Project Officer for the Rice/Wheat CRP) participated in the previous annual meeting of the RTCC held in New Delhi, India, 9 – 15 February 2002. Progress on implementing the Asian Development Bank (ADB) funded Project "Study on sustaining the rice-wheat production systems of Asia" will be reviewed at the 11th RTCC.

⇒ **14th International Symposium of the International Scientific Centre of Fertilizers (CIEC), 22 – 25 June 2003, Debrecen, Hungary**

This symposium is being jointly organized by Gaziosmanpasa University and CIEC under the theme "Fertilizers in Context with Resource Management in Agriculture". The official website of the symposium is http://www.date.hu/szervez/mtk/foldmuv/ciec/index.html For more information please contact Dr. Zoltan Kovacs at kovacszo@helios.date.hu

⇒ **2nd International Symposium on Phosphorus Dynamics in the Soil-Plant Continuum, 21 – 26 September 2003, Perth, Australia**

Information about this Symposium, which will be held at the University of Western Australia, can be found at http://www.agric.uwa.edu.au/soils/P_Symposium/index.html

⇒ **XIV International Congress on Nitrogen Fixation, 1 – 6 November 2003, Beijing, China**

Information about this Congress to be held at Peking University under the theme "Towards Sustainable Agriculture and Protection of the Environment" can be found at http://n2fix.pku.edu.cn

TECHNICAL CO-OPERATION PROJECTS (TCPs)

⇒ **FAO/IAEA Regional TCP for Africa " Combating Desertification in the Sahel" (RAF/5/048)**

Implementation of this regional TC project commenced in 2001. The overall objective is to sustainably intensify food production in the rainfed agriculture of Sahelian countries, in order to enhance food security while combating desertification. The specific objective is to develop, pilot-test and promote the adoption of improved and integrated soil, water and nutrient management technologies in cropping systems through the use of nuclear and related techniques. The short-term goal is to improve the productivity of the system, while the long-term goal is to restore and maintain the soil fertility to effectively combat dry-land degradation. The target area is the West African Sahel and includes Burkina Faso, Mali, Niger and Senegal.

The first project co-ordination meeting was held in Ouagadougou, Burkina Faso from 18 – 21 February 2001. The specific focus of the initial phase (2001-2002) has been to strengthen the national capacities and to establish a network of field trials to generate specific technologies for improved and integrated crop, soil, water and nutrient management in millet-based cropping systems. The second phase (2003-2004) of the project has been approved for implementation and the focus will be on the continuation of the field trials and the pilot-testing of promising technologies in farmers' fields.

- **Second Co-ordination Meeting, 17 – 23 February 2003, Niamey, Niger**

The project co-ordinators of the participating countries (Burkina Faso, Mali, Niger and Senegal) will attend the meeting. The main objectives of this meeting are to: a) present the results obtained so far and assess the progress made in implementing the project during the first biennium, b) ensure co-ordination with National Action Plan to Combat Desertification in the countries and other regional initiatives on desertification, c) elaborate a new Action Plan for the continuation of the project during the next biennium in accordance with the overall project objectives, including the logical framework and allocation of IAEA inputs for each country and for the project, and e) compile a full report of the meeting. Preparatory work for the meeting started in November 2002. Local arrangements for the meeting are made by an Organizing Committee composed of representatives of several national organizations involved in desertification and the chairperson is Dr. Amadou Moustapha, Director of Research, Institut National de Recherche Agronomique du Niger (INRAN). Mr. F. Zapata and Mr. Vincent Nkong-Njock are the Technical and Project Officers, respectively.

⇒ **FAO/IAEA Regional TCP for East Asia and the Pacific (RCA) on "Restoration of Soil Fertility and Sustenance of Agricultural Productivity" (Part 2) (RAS/5/039)**

In East Asia and the Pacific region extensive land degradation and the conversion of agricultural land into other uses (urbanisation, infrastructure and industrial development) are factors contributing to reduced agricultural productivity. The principal degradation processes are nutrient depletion, acidification, salinisation, pollution and soil erosion. The effects of human-induced degradation are exacerbated by inappropriate land use, soil and water mismanagement and inadequate cultivation practices. Enhancing sustainable food production will require the combined use of the following strategies: a) agricultural intensification on the best arable land, b) rational utilisation of marginal lands, and c) prevention and restoration of soil degradation. Excessive use of agrochemicals in some areas may affect both water and soil quality over the long term.

The overall objective of this project is to develop improved soil, water, nutrient and crop management practices while counteracting predominant soil degradation processes in order to increase and sustain crop productivity. Two complementary approaches are utilized to achieve this main objective. Part 1 of this project deals with the restoration of soil fertility, and implementation commenced during the 2001-2002 cycle (refer to past events). The specific objective of Part 2 of this project is to measure soil erosion/sedimentation and associated pesticide contamination. For this purpose, the fallout radionuclide ^{137}Cs and related techniques will be utilized to measure erosion/sedimentation rates and to define soil redistribution patterns in the landscape. Pesticides are being extensively used to maintain agricultural production over the long term. It is often found that eroded soil particles are a better carrier for pesticides that may become toxic to aquatic plants and animals. Conventional and radiotracer techniques will be applied to determine pesticide contamination levels in soil, water and crops. This part of the project will start in 2002 and be implemented through 2004.

- **Regional Training Workshop on "Use of Conventional and Radiotracer Techniques in Pesticide Contamination Studies in the Landscape", 3 – 7 March 2003, Hangzhou, China**

This training workshop, which belongs to Part 2 of the project, will be organized by the Institute for Nuclear Agricultural Sciences, Zhejiang University, Hangzhou 310029, China. The local director of the workshop will be Prof. Xu Bujin. The main purpose of this activity will be to provide training on all aspects of the application of conventional and selected radiotracer techniques and approaches and strategies for Pesticide Risk Management studies at the landscape and watershed levels. Candidates from the countries participating in this part of the project (China, Indonesia, Malaysia, Pakistan, Philippines, Sri Lanka, and Viet Nam), who are directly involved in conducting pesticide studies at the landscape level in connection with soil erosion and sedimentation measurements will be selected to attend this training workshop.

D. PAST EVENTS

CO-OPERATION MEETING

⇒ **Symposium 59 "Towards Integrated Soil, Water and Nutrient Management in Cropping Systems: the Role of Nuclear Techniques", 17th World Congress of Soil Science, 14 – 21 August 2002, Bangkok, Thailand**

The IAEA was a co-operating Agency in the Congress, which is held once every 4 years. The organizers reported that more than 100 countries were represented among the 2100 participants. Sessions were organized among 65 symposia, with both oral and poster presentations. The convener of the one-day symposium was Mr. P.M. Chalk, Head, SWMCN Section. Fourteen oral presentations were made and 25 posters were displayed. Six of the oral and poster presentations were authored or co-authored by staff of the SWMCN sub-programme. The oral presentations were well attended with an estimated 75 – 150 participants in the audience at any one time. The best poster selected within Symposium 59 by O. Muñiz et al. (Cuba) was also judged to be one of the best eight within the Congress. All full papers and abstracts submitted within Symposium 59 have been published in the Transactions of the Congress in CD ROM. Participants from nine developing countries (Brazil, China, Cuba, Iran, Kenya, Lebanon, Russia, Sri Lanka and Turkey) were sponsored by the sub-programme. A booth was set up to display recent publications of the SWMCN sub-programme together with publications from the FAO Land and Water Development Division (AGL). An estimated 100 – 200 participants visited the booth each day. Almost 400 orders were taken for the ten IAEA publications on display. There was a similar strong response to then AGL publications with 1300 orders taken. The Symposium and the booth were two very effective ways of advertising our programmes and products to a large gathering of international scientists and end-users.

Phillip Chalk (IAEA), Lionel Gunaratne (Grantee, Sri Lanka) and Hiroshi Hiraoka (FAO-RAP) in FAO/IAEA booth

FAO CO-SPONSORED MEETINGS

⇒ **International Workshop on "Conservation Agriculture for Sustainable Wheat Production in Rotation with Cotton in Limited Water Resource Areas", 14 – 18 October 2002, Tashkent and Samarkand, Uzbekistan**

The workshop was organized by the Ministry of Agriculture and Water Resources (MAWR), Tashkent Institute of Irrigation and Agricultural Mechanization Engineers (TIIAME) in collaboration with FAO and other international agencies. The objectives of the workshop were to: (i) Review and evaluate new, and existing knowledge and experiences of growing wheat in rotation with cotton; (ii) Share experiences and facilitate understanding and implementation of conservation agriculture technologies for farmers; (iii) Identify approaches and strategies to facilitate the adoption of conservation agriculture for profitable and sustainable production of wheat in rotation with cotton; (iv) Develop action plan for promotion of conservation agriculture through well-designed partnerships among stakeholders and donors.

The Joint FAO/IAEA Division provided financial support to the Workshop together with other Agriculture Divisions of FAO. The workshop was organized along the following lines: 1. Plenary Session with keynote presentations 2. Country Reports 3. Thematic Sessions 4. Field Excursions and 5. Conclusions and Recommendations. Mr. P.M. Chalk, Head SWMCN Section, participated in the Workshop; chaired one of the sessions dealing with Country Reports and made an oral powerpoint presentation in Thematic Session 1 (Recent innovations in conservation agriculture for cotton-wheat crop rotation) on " Improved water and nitrogen use efficiency of cotton and wheat in arid and semi-arid areas". A text manuscript (authors Lee Heng and Phillip Chalk) has also been prepared and will be published in the edited Workshop Proceedings.

The Workshop provided a forum for up-to-date information exchange on the role of conservation agriculture in sustainable intensification of cotton-wheat production systems, and initiated discussion and debate on research and extension priorities. It reinforced the strategic importance of the new FAO/IAEA CRP on Conservation Agriculture that will be implemented in the 2004 – 05 biennium. The overall objective of this CRP is to increase nutrient and water use efficiencies through the adoption of conservation agriculture practices (zero tillage on permanent beds, cover crops, green manures, mulches). Several speakers emphasized the importance of obtaining experimental data on nutrient and water dynamics, carbon sequestration and soil physical properties in order to identify key processes that enhance soil fertility under conservation farming practices. The full set of recommendations and conclusions of the workshop are being finalized by the organizing committee, and will be distributed to participants and other stakeholders in due course. Follow-up activities will include participation in the 2nd World Congress on Conservation Agriculture, Iguaçu Falls, Parana, Brazil, August 11 – 16, 2003, and the convening of a Consultants' Meeting during the Congress to formulate the new CRP on Conservation Agriculture.

⇒ **7th International Workshop of the Consortium on "World Overview of Soil and Water Conservation Approaches and Technologies (WOCAT)", 28 October – 1 November 2002, Grottaferrata, Italy**

In connection with the CRP on soil conservation which is in the initial stage of planning, Mr. F. Zapata participated in the WOCAT Workshop organized by the Centre for Development and Environment (CDE), University of Berne, and hosted by the Food and Agriculture Organization of the United Nations (FAO) in collaboration with other international and regional agencies. The workshop was a good forum to get acquainted with the latest developments on approaches and technologies to control soil degradation and to advertise past and present FAO/IAEA projects in the field of soil erosion and sedimentation.

WOCAT is organized as a consortium of national, regional and international institutions and operates in a decentralized manner through development and implementation of national and regional plans with backstopping from experienced members of the consortium. WOCAT has developed tools to document, monitor and evaluate SWC know-how that can be applied to control soil degradation and enhance productivity in the field, and to disseminate information world-wide in order to facilitate exchange of experiences in local, national and global programmes.

Since 1996, WOCAT has organized International Annual Workshops and Steering Committee Meetings. FAO is an active collaborating institution supporting in general the WOCAT field activities and in particular the database development. The objectives of this annual workshop were to: a) Bring together the main collaborating and funding institutions and the core collaborators; b) Assess the progress made in the work plan and exchange experiences; c) Further develop the programme, and d) Plan for the future.

The programme of the workshop was organized along the following topics: 1) General Introduction, 2) Progress reports, 3) Quality assurance, improvement and enhancement of data collection, 4) CD-ROM version 3 (prototype) and digital products, 5) World Map and Questionnaire Maps, 6) UNEP overview book and guidelines, 7) Field trip to Mosciano Experimental Station of the University of Teramo (Conservation Agriculture in the EU and Italy), 8) Future plans including budget requirements.

Forty resource persons from the main collaborating and funding institutions attended the workshop. In addition to Mr. Zapata representing the Joint FAO/IAEA Division of Nuclear Techniques in Food and Agriculture (AGE, Vienna), six FAO staff members participated in the workshop (Mr. W. Prante, Mr. R. Gallacher, Mr. F. Nachtergaele, Mr. J. Benites, Ms. C. Vella Tomlin, AGLL, Rome and Mr. R. Pavlovic, FAO-SNE, Tunis).

In the frame of global activities, the workshop provided a forum to publicize the activities of the Joint FAO/IAEA Division of Nuclear Techniques in Food and Agriculture. Mr. Zapata made an oral power point presentation on "Soil erosion and sedimentation studies using fallout radionuclides" reporting on CRPs and TCPs related to the topic. A summary and the power point presentation were delivered to the Organizing Committee for inclusion in the proceedings of the workshop. Printed material was distributed to the participants and a number of requests for publications on the topic were also received.

As WOCAT's mission is to provide a standardised framework of methods, tools and outputs that allow SWC specialists to share their knowledge in soil and water management that assists them in their search for appropriate SWC technologies and approaches, and in making decisions in the field and at the planning level to control land degradation and enhance soil productivity. There is therefore wide scope for the adoption and utilization of WOCAT to document and disseminate technologies generated in CRPs and TCPs implemented by the Soil and Water Management & Crop Nutrition sub-programme, in particular those with focus on use efficiency and conservation of the resource base. This will also contribute to support the FAO initiative on Conservation Agriculture.

It is recommended that the Joint FAO/IAEA Division become a collaborating institution of the WOCAT consortium and that WOCAT tools be utilised in support of the implementation of the CRP on "Assess effectiveness of soil conservation measures for sustainable watershed management and crop production using fallout radionuclides".

NON-FAO/IAEA MEETINGS

⇒ International Workshop on "Biological Nitrogen Fixation for Increased Crop Productivity, Enhanced Human Health and Sustained Soil Fertility", 10 – 14 June 2002, Montpellier, France

The Meeting was organised by ICRISAT in collaboration with other CG centers (Consultative Group on International Agricultural Research, CGIAR) and ENSA-INRA, Montpellier. Approximately 40 participants from all regions attended the meeting as well as local scientists. The main goal of the workshop was to define research strategies for a Challenge Programme on Biological Nitrogen Fixation and to develop a pre-proposal based on a concept note submitted to the Science Council of CGIAR. The concept note has now been selected by the SC and given the approval for the development of a pre-proposal. This required the holding of the above-mentioned international workshop and a meeting of the main partners and stakeholders. Mr. Gudni Hardarson attended the Workshop on behalf of the FAO/IAEA and gave a presentation entitled *Enhancement of Symbiotic Nitrogen Fixation in Grain Legumes.* Further information on the programme may be obtained at http://www.icrisat.org/

⇒ 9th International Symposium on Nitrogen Fixation with Non-Legumes, 1 – 5 September 2002, Leuven, Belgium

The Symposium was organised by the Centre of Microbial and Plant Genetics, University of Leuven. Approximately 150 participants as well as local scientists attended the conference. The main goal of the Symposium was to highlight past and present research in the field of endophytic nitrogen fixation in non-legumes. The presentations were held in seven sessions on: Soil factors and microbes; Root development, root physiology and plant growth factors; Biochemistry and genetics; Physiology and regulation; Genomics and proteomics; Agronomy and Microbial ecology. Mr. Gudni Hardarson attended the Symposium on behalf of the FAO/IAEA and gave a presentation entitled *International FAO/IAEA Programmes on*

Biological Nitrogen Fixation. Further information can be obtained at the website www.cmpg.be

⇒ **International Symposium on "The Impact of GMOs: Soil Microbiology and Nutrient Dynamics", 3 – 6 November 2002, Vienna, Austria**

The Symposium was held at the University of Agricultural Sciences, Vienna and the ARC Seibersdorf Research. Approximately 90 participants attended the Meeting. The Symposium was organised in six sessions on: i) Transgenic Plants and Microorganisms; ii) Effect of Transgenic Organisms on Natural Microbial Communities; iii) Stability and Binding of DNA and Transgenic Products in Soil; iv) Horizontal Gene Transfer; v) Soil Nutrient Dynamics and vi) Conclusion and Closing Remarks. Mr. Gudni Hardarson attended the Symposium on behalf of the FAO/IAEA and prepared a report on the Meeting for FAO.

TECHNICAL CO-OPERATION PROJECTS (TCPs)

⇒ **FAO/IAEA Regional TCP for East Asia and the Pacific (RCA) on "Restoration of Soil Fertility and Sustenance of Agricultural Productivity" (RAS/5/039) (Part 2)**

- **Regional Training Workshop on "Use of ^{137}Cs Techniques for Establishing Soil Redistribution and its Relationship to Soil Quality Parameters", 3 – 9 June 2002, Yan'an and Beijing, China**

This training workshop that belongs to Part 2 of the project was successfully organized by the Institute for Application of Atomic Energy, Chinese Academy of Agricultural Sciences (IAAE, CAAS) at two locations: Yan'an and Beijing. Fifteen scientists attended the workshop: nine representatives from eight countries in the region (China, Indonesia, Korea, Malaysia, Pakistan, Philippines, Sri Lanka, and Viet Nam), three local lecturers, the course director (Prof. Yong Li) and one invited lecturer from Australia (Prof. R. Loughran).

As the use of the ^{137}Cs technique to measure soil erosion and sedimentation is the core activity of part 2 of the regional project, the main purpose of this training workshop was to provide a comprehensive review of all aspects of the application of the ^{137}Cs technique to the local staff directly involved in the implementation of the activity. Field activities such as the reconnaissance survey of the study area, field sampling design and sample collection methods were conducted at Yan'an in the Yangjuangou reservoir catchment, where the local staff are implementing project activities. Laboratory work including sample measurements and data acquisition, use of conversion models and data interpretation were carried out at the host institute in Beijing. Participants presented their activities in their countries and exchanged experiences. The final evaluation indicated that the participants were satisfied with the content and quality of the lectures. Several requested more coverage on specific topics reflecting the need for more training. It is hoped that the new knowledge and skills will be put into good use for implementing the project activities.

⇒ **FAO/IAEA TCP on "Optimization of Water and Fertilizer Use for Major Crops" (UZB/5/002)**

The objective of the project, which commenced in 1999 were to optimise the use of water and fertilizer for cotton and winter wheat in Uzbekistan under different soil conditions. The project is in the final phase of implementation. The Uzbek National Cotton Growing Research Institute (UNCGRI) is the chief counterpart and Lee Heng is the Technical Officer.

- **Final Project Review, 28 July – 3 August 2002, Tashkent, Uzbekistan**

Previous experiments established that cotton/winter wheat and sugar beet sequences were viable crop rotation options in Uzbekistan. Assessment of soil water consumption of crops by the soil water balance method was carried out for the first time in Uzbekistan at five research stations, using the soil moisture neutron probe, allowing the dynamics of soil water and irrigation scheduling to be studied. High productivity of winter wheat and sugar beet can be obtained when irrigated to between 60 - 75% of field capacity. More irrigation did not result in additional yield. Optimal scheduling of irrigation decreased the water requirement of winter wheat per unit crop yield up to 25% while yield increases of 18 - 50% were recorded.

⇒ **Programming FAO/IAEA TC Activities in North Africa**

The IAEA Technical Co-operation Programme has as one of its priorities the development of Country Programme Frameworks (CPFs) with Member States to ensure that IAEA technical co-operation is in line with national development objectives and priorities. The CPF is a planning tool and a frame of reference for programming in the medium term. The objective is to reach an agreement, which focuses the limited resources of the IAEA's TC Programme on a few areas of development, which are of high priority to the Government, and where nuclear-based technology can make a significant contribution. Identification of these selected areas provides opportunities for establishing projects, which meet the IAEA central criterion.

- **CPF Mission, 8 – 12 July 2002, Tunis, Tunisia**

The mission team consisted of Mr. Felipe Zapata, representing the Food and Agriculture Programme, and Agency staff from TCPA, NAHU and NAPC. Several working sessions of the team and meetings with various senior officers from the Ministries of Economic Planning and International Cooperation, Health, Agriculture, Industry and Higher Education were held. Within the near-term core programme in the area of food and agriculture, the following priority fields were identified: (i) increasing livestock productivity through improved nutrition and disease control (ii) improving crop production (iii) combating desertification and (iv) enhancement of date production. The final CPF document was accepted during the IAEA General Conference.

- **CPF Mission, 24 – 30 August 2002, Tripoli, Libyan Arab Jamahiriya**

The mission team consisted of Ms. Lee Heng, representing the Food and Agriculture Programme, and Agency staff from TCPA and NAHU, plus experts representing Isotope Hydrology and Human Health. A series of meetings was held with officials in charge of the

sectors of human health, water, food and agriculture including livestock, industry, and higher education and scientific research. Meetings were also held with International Organisations (UNPD and WHO) and the Ministry of Agriculture. In the food and agriculture sector, the following priority areas in the near-term core programme were identified: (i) increasing water and fertilizer use efficiency through improved drip and fertigation systems (ii) improved animal health and livestock production (iii) eradication of pests by means of the Sterile Insect Technique (SIT). The CPF is in the final stage of negotiation.

⇒ **FAO/IAEA TCP on "Irradiated Sewage Sludge for Increased Crop Production" (EGY/8/014)**

The objectives of this interdisciplinary project are to assist national counterparts to undertake on-farm demonstrations of the value of irradiated sewage sludge and wastewater applications for increased crop production, and to conduct a feasibility study for an industrial-scale irradiation plant for waste treatment. Equipment has been purchased, fellows have been trained and expert missions/scientific visits have been fielded. The project is in the final stage of implementation. The Technical Officer is Mr. P.M. Chalk.

- **Technical Meeting on "Irradiated Sewage Sludge for Increased Crop Production and Environmental Protection", 2 – 4 November 2002, Cairo, Egypt**

The objectives of the meeting were (i) To review water resources, wastewater treatment and disposal of effluents/sludges in Egypt (local presenters) (ii) To review latest developments/application of radiation technology in wastewater and sludge treatment (Invited lecturer, Dr. T. Waite, USA) (iii) To review the use of sewage sludge in agriculture (Invited lecturer, Dr. A. Chaudri, UK) (iv) To review achievements of EGY/8/014 (Dr. R. El-Motaium, CSI) (v) To formulate Conclusions and Recommendations. The meeting was opened by the Chairman of the Egypt Atomic Energy Authority, and Mr. P.M. Chalk, Technical Officer, who gave an overview Agency support to Egypt in the area of wastewater treatment and sludge utilization. In addition to the invited experts, representatives of the Cairo Sewage Authority, Ministry of Environment, Cairo University and AEA professional staff participated in the Meeting. A set of Conclusions and Recommendations was formulated, based on the major achievements of the Project, perceived needs and opportunities for further support from International donors.

⇒ **FAO/IAEA Regional TCP for Europe on "Fertigation for Improved Crop Production and Environmental Protection" (RER/5/011)**

Nine countries are participating in this regional project: Bulgaria, Cyprus, Greece, Hungary, FYR Macedonia, Romania, Slovenia, Turkey and Yugoslavia. The first Co-ordination Meeting was held in Vienna in February 2001. Lee Heng is the Technical Officer.

- **Annual Co-ordination Meeting, 4 – 8 November 2002, Kalamata, Greece**

Seventeen participants attended the Meeting, which consisted of presentations of results from all nine countries, a lecture on "Quality criteria for selcting drip, mini-sprinkler and low-capacity sprinkler irrigation systems" by Dr. Eliades from Cyprus. Field excursions to fertigation trials and green houses in the west coast of Greece and a visit to an "organic" olive tree plantation of the local institute in Kalamata were also included in the programme. Summaries and outputs from the last two years were presented and work plans for 2003 were formulated. Preliminary findings show that fertigation improves both yield and quality, increases water and fertilizer use efficiencies while reducing the risk of nitrate leaching.

⇒ **FAO/IAEA Regional TCP for East Asia and the Pacific (RCA) on "Restoration of Soil Fertility and Sustenance of Agricultural Productivity" (Part I) (RAS/5/039)**

- **Mid-Term Review Meeting, 11 – 15 November 2002, Bangkok, Thailand**

This meeting was organized by the Agency with support from the Applied Radiation and Isotopes Department, Faculty of Science, Kasetsart University, Bangkok. Fourteen participants from 10 countries (Bangladesh, China, India, Indonesia, Malaysia, Pakistan, Philippines, Sri Lanka, Thailand and Viet Nam) attended the Meeting. The local organizers were Asst. Profs. Panee Pakkong and Patana Anurapongsatorn (Kasetsart University). The Technical Officer, Mr. Gamini Keerthisinghe, reviewed the progress of the project activities with the support of Dr. Roland Buresh (International Rice Research Institute, The Philippines). All project counterparts presented major achievements of the project and all presentations were critically evaluated in accordance with the project objectives. Necessary amendments were proposed to on-going activities, and work plans for future activities were established for each participating country. Agency inputs in terms of experts, equipment and fellowships were discussed and the necessary recommendations were made to the Agency. The project activities are progressing well in line with the specific objectives.

⇒ **FAO/IAEA TCP on "Determination of Fertilizer Mix to Increase Crop Production" (UGA/5/020)**

The objectives of this project are to assist national counterparts to undertake on-farm and on-station experiments to determine a suitable combination of organic/mineral fertilizers including crop residues, legumes and local rock phosphate to increase crop production. Equipment has been purchased, fellows have been trained and expert missions/scientific visits have been fielded. The project is in the final stage of implementation. The Technical Officer is Mr. P.M. Chalk.

- **Project Review, Finalization of Country Programme Framework (CPF) and Formulation of Work Plan for UGA/5/025 "Integrated Nutrient Management for Increased and Sustainable Crop Production on Smallholder Farms", 18 – 22 November, Kampala, Uganda**

The Technical Officer met with project counterparts at Kawanda Agricultural Research Institute (KARI) and reviewed the implementation and major outputs and

accomplishments of UGA/5/020. A draft completion report was prepared. A detailed workplan for UGA/5/025 was formulated in a step-wise manner, building on results obtained in UGA/5/020. Four main on-station and on-farm activities are envisaged (i) integrated nutrient management (nitrogen and phosphorus) (ii) nitrogen economy of legume/cereal rotations (iii) water balance and conservation (iv) ^{32}P studies. The relevant Sections on "Crop Improvement" for the CPF for Uganda were drafted, including (i) National Development Priorities and Activities Relevant to the TC Programme (ii) The Projected Programme Outline (Near-term and Medium-term Core Programmes).

E. STATUS OF CO-ORDINATED RESEARCH PROJECTS

⇒ **Selection for Greater Agronomic Water-use Efficiency in Wheat and Rice Using Carbon Isotope Discrimination**
Project Officer: G. Keerthisinghe

This CRP was approved in March 2002 and implementation will start in 2003 with an anticipated duration of 5 years. The project was advertised in the June 2002 issue of the Soils Newsletter with a call for applications for research contracts and agreements (deadline 31 March 2003). The overall objective is to contribute to increasing the agronomic water-use efficiency (AWUE) of wheat and rice production where AWUE is defined as grain yield/total water use including both transpiration and evaporation. The specific objectives are: (a) to evaluate different strategies for using carbon isotope discrimination as a selection tool for identifying higher yielding genotypes of (i) wheat in water-limited rain-fed stored soil moisture cropping systems, (ii) wheat in irrigated cropping systems and (iii) rice in irrigated cropping systems, (b) within (a) to develop sets of elite isomorphic lines varying in carbon isotope discrimination for use in (c), (c) Using a set of these isomorphic breeding lines evaluated in contrasting cropping environments, assist national program scientists to determine the most effective breeding strategies for application of carbon isotope discrimination in their environments. The first RCM will be held in the first quarter of 2004, in Vienna.

⇒ **Use of Isotope Techniques in Studies on the Management of Organic Matter and Nutrient Turnover for Increased, Sustainable Agricultural Production and Environmental Preservation**
Project Officer: G. Keerthisinghe

The implementation of this CRP was completed in 2001. All contract holders have submitted manuscripts for inclusion in an IAEA-TECDOC. The project officer has collated the manuscripts that are now being edited for the TECDOC, which will include the major achievements and conclusions of the project. Some contract holders have already published their results in scientific journals.

⇒ **The Use of Nuclear and Related Techniques in the Management of Nutrients and Water in Rainfed Arid and Semi-arid Areas for Increasing Crop Production**
Project Officers: G. Keerthisinghe and L. Heng

The third and the final RCM of this CRP was held in Vienna, 24 - 28 September 2001, at which the overall progress and significant achievements of the project were reviewed and discussed. All contract holders were requested to present their final reports before the end of June 2002. All data submitted will be evaluated using crop simulation models such as APSIM and Ms. Lee Heng is co-ordinating this activity. The deadline for the submission of manuscripts for inclusion in an IAEA TECDOC is 31 December 2002. The project officers will collate the manuscripts and prepare the TECDOC, which will include the major achievements and conclusions of the project. Participants are also encouraged to prepare manuscripts for publications in scientific journals.

⇒ **Use of Nuclear Techniques for Developing Integrated Nutrient and Water Management Practices for Agroforestry Systems**
Project Officer: G. Keerthisinghe

Participating in this CRP are nine contract holders: K. Aihou (Benin), B. Zhang (China), C. Ovalle Molina (Chile), C. Cervantes (Costa Rica), J.M. Ndufa (Kenya), Z. Rahman (Malaysia), S. Nissanka (Sri Lanka), P. Ebanyat (Uganda) and R. Chintu (Zambia); and five agreement holders: M. Adams (Australia), S. Recous (France), L. Verchot (ICRAF-Kenya), N. Sanginga (IITA-Nigeria) and M. Smith (UK). All contract holders have on-station and on-farm experiments under way and the results presented at the second RCM showed that the experimental work is progressing according to the work plan and experimental guidelines established at the first RCM. The project has maintained the flexibility necessary to address location specific needs and tree species well-adapted to local conditions have been selected for the experiments and have been integrated into existing cropping systems. Isotope techniques are being used to quantify nutrient and water dynamics in agroforestry systems in order to modify management practices for better resource utilization. Linkages with CG centres and other agroforestry projects have been established for effective implementation of project activities. The third RCM of the project will be held in June 2003.

⇒ **Assessment of Soil Erosion Through the Use of Caesium-137 and Related Techniques as a Basis for Soil Conservation, Sustainable Production and Environmental Protection**
Project Officer: F. Zapata

Implementation of this project was completed in 2001. The final report of the CRP is available upon request from the Project Officer. Several follow-up activities are being completed to achieve the outputs targeted for this project.

The production of the handbook "Soil erosion and sedimentation research using environmental radionuclides" is in its final stage. Final editing and the preparation of the "camera ready" document were successfully completed and submitted to Kluwer Academic Publishers for printing. It is anticipated that the handbook will appear before the end of this year.

Significant progress has also been made in the production of the special issue in the journal Soil and Tillage Research. Prof. Kutilek, Chief Editor of the journal visited Vienna for a joint review of the progress made. Peer review process of the manuscripts has been completed. Fifteen manuscripts were submitted by the participants, thirteen have been approved and two were rejected. The final version of the approved manuscripts has been already submitted to the journal. It is anticipated that this special issue will be published in the first quarter of 2003.

⇒ **Use of Nuclear and Related Techniques for Evaluating the Agronomic Effectiveness of P Fertilizers, in Particular Rock Phosphates**
Project Officer: F. Zapata

This FAO/IAEA co-ordinated research project (1993-98) has generated a valuable data set consisting of results from laboratory, glasshouse and field experiments on the agronomic effectiveness of phosphate rock products covering a range of cropping systems and agro-ecological zones. In addition to the publication of the **IAEA-TECDOC-1272** "Assessment of soil phosphorus status and management of phosphatic fertilizers to optimise crop production" as hard copy and CD versions in February/March 2002, respectively, final steps were taken to produce the special issue containing 11 refereed manuscripts in the journal Nutrient Cycling in Agro-ecosystems. The **special issue** entitled "Utilisation of phosphate rocks to improve soil P status for sustainable crop production in acid soils" was published this year as volume 63 (1). For details see Publications.

Other outcomes of this project include several initiatives to promote the direct application of phosphate rocks (PRs) as sources of phosphorus in tropical and sub-tropical acid soils in developing countries in Asia, Africa and Latin America. One activity is as a joint undertaking by two FAO Divisions (AGE and AGL) to produce a **FAO Land and Water Technical Bulletin** on "Use of local phosphate rocks in sustainable agriculture". The Bulletin is in an advanced stage of preparation and is expected to be published in the first quarter of 2003.

Another initiative is a collaborative project between the Joint FAO/IAEA Division and IFDC to develop a **Decision Support System for direct application of phosphate rocks (PR-DSS)** during the 2002-2003 biennium. The PR-DSS will be a useful research and extension tool for scientists, extension workers, progressive farmers, planners and agribusiness dealers, thus contributing to promote the use of phosphate rock resources in tropical and sub-tropical FAO and IAEA Member States. The IAEA has awarded a technical contract to IFDC to develop a customized database on phosphate rocks. IFDC has recruited a Junior Professional Officer based at Muscle Shoals, USA to serve as an assistant on this project. Provisions have been made in the IAEA programme of work and budget 2004-2005 for the continuation of this work and the field validation of the PR-DSS.

The Joint FAO/IAEA Division is implementing an Information Technology (IT) pilot project, i.e. **an interactive web-based resource on Direct Application of Phosphate Rocks (DAPR).** The purpose is to provide scientific and technical services to Member States and to better advise resource managers including policy makers and farmers, predominantly those in the developing world (i.e. Africa, Asia & Latin America) on the agronomic effectiveness of PRs, i.e. how different PRs perform over the short and long term under different environments

for different crops, with the ultimate goal of promoting sustainable food security in the developing world.

Mr. Ian Ferris, Ms. Lee Heng and Mr. F. Zapata are involved in this activity with the assistance of external consultants. Currently the mainframe has been designed and constructed with appropriate links to WAICENT. When completed the system will have features including: Database of PR, a web-based Decision Support System for estimating the effectiveness of PR for direct application, Learning, Slide Show, Glossary of Soil Science Terms, References, Help Function, etc. This will allow instant online generation of simulated results, retrieval and uploading of data and information relating to direct application of PR.

⇒ **Development of Management Practices for Sustainable Crop Production Systems on Tropical Acid Soils through the Use of Nuclear and Related Techniques**
Project Officer: F. Zapata

This CRP started implementation at the end of 1999 and the first RCM was held in Vienna in June 2000. Eight research contract holders: P. Houngnandan (Benin), S. Urquiaga (Brazil), T. Muraoka (Brazil), V. Bado (Burkina Faso), A. García (Cuba), J.J. Peña-Cabriales (Mexico), E. Iwuafor (Nigeria), and M. Lopez (Venezuela); one technical contract holder: P. Randall (Australia), and four agreement holders: W. Horst (Germany), S.H. Chien (IFDC-USA), B. Vanlauwe (TSBF-Kenya), and J. Diels (IITA, Nigeria) are currently participating in the project. The second RCM was held in Brasilia, Brazil, 11 – 15 March 2002. Overall the progress made in the implementation of the activities of the project is satisfactory. Revised guidelines and research protocols have been produced. They reflect the progress made in the project through a better understanding of the constraints to agricultural productivity and the prioritisation of the studies to be undertaken for further implementing the project. Participants have started to publish their results in scientific journals. The mid-term review of the project was carried out and the project extension until completion in 2004 approved.

Research work on the best adapted genotypes is considered strategic and it will be continued by selected participants and the support of a technical contract to evaluate the effect of the inclusion of the P-efficient genotypes into the overall P-efficiency of the studied cropping systems. Similarly, field studies on cereal-based crop rotations (maize, sorghum and millet), including N inputs from nitrogen fixation (grain legume or cover crops) and nitrogen recycling from crop residues incorporation will continue but with a more integrated approach to SWNM in selected agro-ecological zones of the savannas of Africa and Latin America.

⇒ **Integrated Soil, Water and Nutrient Management for Sustainable Rice-Wheat Cropping Systems in Asia**
Project Officer: P. Chalk

This CRP commenced on 1st October 2001 with an anticipated duration of 5 years. The overall objective is to improve the productivity and sustainability of rice-wheat cropping systems through increased efficiency of water and nutrient use. The specific research objective is to modify existing water and nutrient management systems, and improve soil management in both traditional and emerging (raised beds, non-puddled soil, direct seeding) tillage systems, for sustainable intensification of cereal production. Seven research contracts were awarded: Md. Murshedul Alam (Bangladesh), Qirong Shen (China), Jiarong Pan

(China), Yadvinder Singh (India), Manbir Sachdev (India), Raj Shrestha (Nepal) and Fayyaz Hussain (Pakistan). There are presently three agreement holders: Elizabeth Humphreys (CSIRO-Australia), J.K. Ladha (IRRI-Philippines) and Raj Gupta (CIMMYT-India). The first RCM and training workshop was held 4 – 8 March 2002, in Vienna and Seibersdorf, Austria. The second RCM is planned for 22 – 26 September 2003, in Nanjing, China, with Prof. Q. Shen, Nanjing Agricultural University, as the local organizer.

⇒ **Assess the Effectiveness of Soil Conservation Techniques for Sustainable Watershed Management Using Fallout Radionuclides**
Project Officer: F. Zapata

This CRP was approved by the IAEA in March 2002 and will start implementation in 2003 with an anticipated duration of 5 years. This project will be implemented in co-ordination with the Isotope Hydrology Section. The overall objective is to develop improved land use and management strategies for sustainable watershed management through effective soil erosion control practices. The specific research objectives are: i) to further develop fallout radionuclide methodologies, with particular emphasis on the combined use of ^{137}Cs, ^{210}Pb and ^{7}Be for measuring soil erosion over several spatial and time scales, ii) to establish standardized protocols for the combined application of the above techniques, and iii) to utilise these techniques to assess the impact of short-term changes in land use practices and the effectiveness of specific soil conservation measures.

The participants have been selected from some 30 applications received by the deadline (30 August 2002). Successful candidates are representing multi-disciplinary and inter-institutional teams involved in soil erosion/sedimentation research. Twelve research contracts were awarded: Xianbao Zhang (China), Manjaiah Kanchikerimath (India), Valentin Golosov (Russian Federation), Popa Nelu (Romania), Li Yong (China), Hacivakupoglu Sevilay (Turkey), Moncef Benmansour (Morocco), Alfonso Bujan (Argentina), Rosa Eugenia Trumper Margulis (Chile), Osny Oliveira Bacchi (Brazil), Son Hai Phan (Viet Nam), Wojciech Froehlich (Poland), Manzoor A. Choudhry (Pakistan). The agreement holders are: David Lobb (Canada), Godert Van Lynden (The Netherlands), Andreas Klik (Austria), Jerry C. Ritchie (USA), Chih Ted Yang (USA), Peter Wallbrink (Australia). The first RCM and training workshop will be held in Vienna and Seibersdorf, Austria, 18 – 22 May 2003 (see future events).

F. LABORATORY ACTIVITIES

RESEARCH:

⇒ **Below ground nitrogen (BGN) in leguminous crops**
Martina Aigner, Maria Heiling and Gudni Hardarson

In most experiments applying the ^{15}N isotope dilution method to quantify biological nitrogen fixation only the above-ground material has been used. Some measurements have been done on the roots, which have shown similar enrichments in stems and roots and therefore it was concluded that the calculated % N derived from air would not be altered by including the roots. However, the amount of N fixed can only be accurately estimated if all N both above and below-ground is accurately quantified. Several scientists have recently published data on BGN measurements using ^{15}N foliar labelling methodologies. These papers have revealed large proportions of legume N or legume-derived N below-ground in roots and adjacent soil.

The stem labelling methodology was tested at the Soil Science Unit to measure BGN in soybean and common bean. Several preliminary experiments were conducted during 2001 and 2002. The legumes were grown under greenhouse conditions in pots with 1 kg of soil. Stem labelling was performed 25 days after sowing by inserting a thread connected to a vial through the stem. The vials contained 2 ml of 0.075M urea solution having 40 atom % ^{15}N excess. Parallel experiments were conducted to quantify biological nitrogen fixation by the legume crop using the ^{15}N isotope dilution method.

1.74 mg ^{15}N was applied to soybean and common bean and the recovery measured in shoots, roots and soil (Table 1). The amount of ^{15}N attached to the roots was estimated by comparing washed and unwashed roots. The washed root treatments gave a more accurate measurement of the ^{15}N in roots with the disadvantage that some ^{15}N was lost in the water used to wash the roots. The unwashed roots should have given better estimates of total ^{15}N below ground with a slightly overestimated root ^{15}N and underestimated soil ^{15}N. We concluded that the unwashed treatment would be more relevant for use in future experiments or that water used to wash the roots (including ^{15}N in soil attached to roots) would have to be analysed.

Table 1. ^{15}N applied to soybean and common bean and the recovery measured in shoots roots and soil.

Treatments	**^{15}N applied (mg)**	**^{15}N found (mg)**				**Recovery (%)**
		Shoots	**Roots**	**Soil**	*Total*	
Soybean, washed roots	1.74	1.23	0.32	0.24	1.79	103
Soybean, unwashed roots	1.74	1.19	0.40*	0.19	1.78	102
Common bean, washed roots	1.74	0.85	0.33	0.37	1.55	89
Common bean, unwashed roots	1.74	0.89	0.36*	0.36	1.60	92

* Including ^{15}N in attached soil

The recovery (in the unwashed treatments) was very good in this experiment with 92 to 102 % of the ^{15}N being recovered. We had some doubts about our ability to recover the N

particularly from the soil. In this experiment we finely ground the whole soil used and took sub-samples for analyses. This approach appears to have worked well.

Figure 1. Proportion of ^{15}N in shoots and roots of soybean and common bean as well as ^{15}N in the soil derived from the legumes.

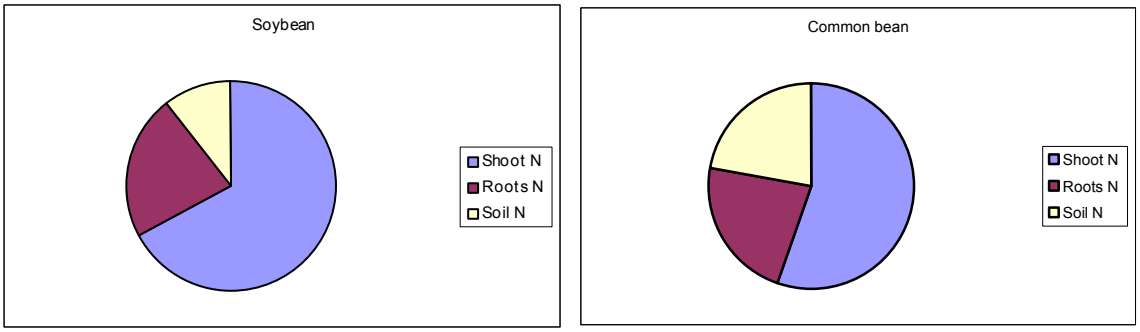

Figure 1 shows the proportion of ^{15}N in shoots of soybean and common bean as well as below ground including roots and soil. In soybean 67% of the ^{15}N was found in the shoot and the remaining 33% below ground. In the common bean 56% was above and 44% below ground with equal amounts in the roots and soil.

%N derived from atmosphere was 58% and 29% for soybean and common bean, respectively. The soybean plants grew well under greenhouse conditions whereas the common bean had relatively low fixation and growth was less than optimal. This might have slightly affected N partitioning in that crop. More experiments will be needed to investigate BGN under optimum conditions.

This preliminary study indicates that a large proportion of the N of soybean and common bean can be found below ground either in the recoverable roots or in the soil. An interesting observation is the large proportion of ^{15}N in soil, i.e. 11% for soybean and 22% for common bean. This N has been largely ignored in most balance studies and therefore the N contribution of leguminous crops to the N economies of cropping systems has been largely underestimated.

Further experiments will be needed to investigate BGN in more detail and in other cropping systems.

⇒ **Does the Pi strip method allow assessment of the available soil P?: Comparison against the reference isotope method**
Martina Aigner

Experiments have been carried out in acid soils developed under tropical climates with and without phosphate rock (PR) addition to assess the ability of the Pi-strip method to extract available soil P compared with the Isotopic Exchange Kinetics method (IEK). In the Pi-strip method strips of filter paper, previously impregnated with iron hydroxide acting as a sink for phosphate ions from soil components, are added to an aqueous soil suspension. The extracted phosphate ions are eluted in diluted sulphuric acid and quantified by a colorimetric method.

Available soil P, defined as the amount of phosphate ions that can move from the soil particles to soil solution, is described by three factors: an intensity factor, a quantity factor and a capacity factor. These three factors were determined by the IEK-method.

Following the addition of carrier-free $^{32}PO_4$-ions to soil, the ability of the Pi-strip to extract available soil P was assessed: (i) by comparing the quantity of instantaneously exchangeable P (E_1) to the quantity extracted with the Pi-strip; (ii) by determining the fraction of ^{32}P extracted with the Pi-strip, and (iii) by comparing the specific activity (SA) of P present as phosphate ions extracted by the Pi-strip to the specific activity of P in the soil solution.

It was observed that (i) E_1 and the amount extracted with the Pi strip are highly correlated, (ii) the recovery of ^{32}P extracted by the Pi-strip varies between 17 and 66%, and (iii) the specific activity of P extracted by the Pi-strip is of the same order of magnitude as that of P in the soil solution. In acid soils low in available P, part of the P in aqueous KCl-extracts is presumably not only present as free phosphate ions but also occluded in the form of a soluble complex, whose isotopic exchangeability is significantly lower than that of phosphate ions transferred to the Pi-strip.

It is concluded from the results that the Pi-strip method can be recommended in routine analysis for the determination of the quantity factor. However, this method cannot provide intensity or capacity factors and therefore needs to be complemented by the IEK-method for full characterization of the available soil P status.

⇒ **Crop water productivity**
Lee Heng

The Land and Water Development Division of FAO (AGL) and the Joint FAO/IAEA Division (AGE) are collaborating in a project to develop appropriate strategies to optimise crop production and economic benefits, under conditions of limited or varying water supply. This includes an assessment of the impact of water stress on production, yield and quality at the experimental level as well as at the farm level, and to integrate new knowledge with traditional farmers' knowledge through participatory research and extension.

The project will build upon FAO methodologies on yield response to water, presented in the Irrigation & Drainage Paper No. 33, which have found wide application since its publication in 1979. Collaborative research studies on soil-water-plant relationships that have been conducted by the Joint FAO/IAEA Division and other research institutes over the past two decades provide a wealth of relevant data to allow refinement and update of the yield response factors for various crops and varieties.

The crop water productivity project is establishing a network of researchers who will collaborate closely to review appropriate procedures to assess crop water productivity. These procedures will be adapted to process available research data and farm water use practices in terms of crop water productivity. Synthesis of the crop water production functions and development of crop-specific guidelines for crop water management and productivity under rainfed and irrigated conditions will be made. The group will also assess the performance indicators for water use productivity under various socio-economic and water supply conditions in irrigated and rainfed agriculture; review field results and synthesis of

experiences leading to the development of practical guidelines in rainfed and irrigated agriculture for farmers, advisory services and scheme managers.

The output of the project will be important for applications to assess the impact of water scarcity on food production and will contribute to the formulation of national strategies and action plans to promote effective water use for water and food security and environmental protection.

TRAINING

⇒ **Fellowships, July – December 2002**

Mr. M. Al-Chammaa (SYR/01024R) was trained on ^{15}N analyses by mass spectrometry for the period of one month under the supervision of Mr. Leo Mayr.

Ms. E. W. Temu (URT/01057R) was trained on the use of ^{15}N methodology to quantify biological nitrogen fixation in grain legumes for a six-month period under the supervision of Mr. Gudni Hardarson, Maria Heiling and Martina Aigner.

Ms. N. Mikhailouskaya (BYE/01009P) received one month theoretical training on nuclear techniques used in biological nitrogen fixation studies under the supervision of Mr. Gudni Hardarson.

Mr. M.A. Atawoo (MAR/01003P) received three-month training on the use of nuclear techniques in crop nutrition under the supervision of Mr. M.S. Sachdev.

Mr. C. Ratnayake (SRL/02004P) received a four-month training on the use of soil moisture sensors under the supervision of Ms. Lee Heng. He conducted a field experiment of spring wheat comparing the performance of soil moisture neutron probe with time domain reflectometry and various capacitance sensors (Diviner 2000 and EnviroSCAN).

Mr. A. Gueable (IVC/01006P), **Mr. A Djawanas** (INS/02006P), **Ms. M. Soumaila** (NER/02016R) and **Ms. F. Gueye** (SEN/02014R) received two-month isotope analytical training under the overall supervision of Mr. Leo Mayr.

SUPPORTIVE SERVICES

⇒ **Analytical services**
Co-ordination: Leopold Mayr

The following analyses were performed during the period January – October 2002

Number of samples received:

CRP	4,997	83.9%
TC	211	3.5%
Seibersdorf	746	12.5%
Total	5,954	100.0%

Number of measurements carried out:

	^{15}N	^{13}C	^{18}O	Sum
Reported results	5,242	2,809	0	8,051
Analysis overhead (calibration, blank, QA-std, reps, test)	5,002	2,556	0	7,558
Total	10,244	5,365	0	15,609

⇒ **External Quality Assurance. Annual Proficiency Testing Exercises on total N and ^{15}N abundance in plant materials**
Co-ordination: Martina Aigner

The Soil Science Unit conducted the sixth interregional proficiency testing exercise on total N and ^{15}N analysis of plant materials during the period January to October 2002. Each laboratory received a test panel consisting of three dry powdered ^{15}N-labeled plant materials to be analysed for both total N content and ^{15}N abundance. The choice of analytical instruments and methods was up to the participant.

Twenty-eight ^{15}N analytical laboratories from Member States in all regions expressed their interest to participate and received the test panel. Twenty laboratories submitted a full set of results in time. Table 1 shows the classification of results provided.

Very good results were reported by 12 institutes, namely in Argentina (LANAIS), Belgium, Brazil, Chile, Cote d'Ivoire, Hungary, Malaysia, Mauritius, Syria, Thailand, Turkey and Uzbekistan. These labs were given a certificate valid for the period covered by the project "EQA2002", i.e. January to December 2002. Satisfactory results were received from 3 institutes in Argentina (CNEA), Indonesia and Uganda. Eight laboratories did not submit

results. The other laboratories provided data not fully complying with the control limits established by the Soil Science Unit, but it should be stressed that the participation and submission of results is highly appreciated although the analytical performance was not yet satisfactory. This gives us the possibility to support these laboratories in correcting their deficiencies.

Laboratories in Argentina (CNEA), Belgium (University of Ghent), Brazil (EMBRAPA), Chile (CCHEN), Cote d'Ivoire (CNRA), Malaysia (MINT), Syria (AECS), Thailand (Department of Agric.) and Turkey (ANRC*)* have produced rather good and stable analytical results over the past 3-4 years.

Table 1.: Summary of response:

Region	Number of participating laboratories	Number of laboratories producing very good or satisfactory results (class I-II)	Number of laboratories producing results outside control limits (class III)	Number of laboratories not submitting results
Africa	9	3	0	6
Latin America	6	4	1	1
East Asia & Pacific	6	3	2	1
West Asia	3	2	1	0
Europe	4	3	1	0
Total	**28**	**15**	**5**	**8**

Some comments received from EQA participants:

" It is very nice ..... that from this year on certification will be given for the successful participation. We will try to be successful in the coming years. We are starting the formalities for the process of accreditation of our N-15 Lab. by TÜRKAK (The Accreditation Agency in Turkey) this month according to ISO/IEC 17025; and I am in the process of preparing the Quality Manual of our Lab...." Doc. Dr. Basri Halitligil, Ankara Nuclear Agriculture and Animal Research Center, Ankara,Turkey, [e-mail, 17. Oct. 2002]

" I have received the QA result yesterday,..... My %N is good this time because of the moisture calculation. I am so happy. My %N-15 is a little bit high. I will try to find the reason and try to correct it. Thank you for your certificate. During this week 18 – 22 November, I am an organizer in IAEA/RCA mid-term project review meeting ... and all the participants will come to visit my N-15 laboratory, so I would like to show them my QA result. ...". Ms. Jariya Prasatsrisupab, Nuclear Research in Agriculture Section, Department of Agriculture, Bangkok, Thailand [e-mail, 22.Nov. 2002]

" Thank you very much for the certificate. ... We are happy that our results of N-total and N-15 are within the control limits. I hope that our collaboration on the issue will be continued." Dr. Nazirbay Ibragimov, Cotton Research Institute, Tashkent, Uzbekistan [e-mail, 16.Oct. 2002]

"Thank you very much for taking into account our modest contribution to the international laboratory proficiency test. We think we should improve both the personal training of our technicians and the laboratory equipment". Ms. M. Aurora. Lazzari, Laboratorio Nacional de Investigaciones y Servicios de Nitrogeno-15, Bahia Blanca, Argentina [letter, 4.Sept. 2002]

G. PUBLICATIONS

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