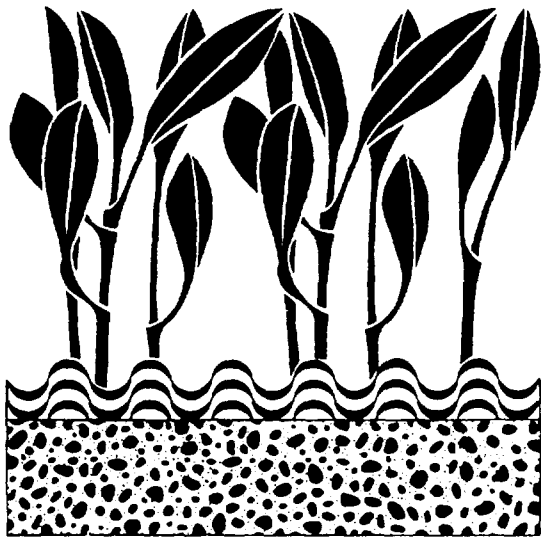




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Soils Newsletter



JOINT FAO/IAEA DIVISION
OF NUCLEAR TECHNIQUES IN FOOD AND AGRICULTURE
AND FAO/IAEA AGRICULTURE AND
BIOTECHNOLOGY LABORATORY, SEIBERSDORF
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Dear Colleague,

We hope that you like the new look of our Newsletter.

The first six months of 1997 saw significant changes in personnel at the Soil and Water Management and Crop Nutrition Section at the Joint FAO/IAEA Division Headquarters and at the Soil Science Unit of the FAO/IAEA Agriculture and Biotechnology Laboratory at Seibersdorf. Dr. G. Hardarson was promoted to Head of the Soil Science Unit having served as Acting Head since Dr. Zapata's transfer to the Joint Division in February 1996. Dr. G. Keerthisinghe, from CSIRO Canberra, Australia, joined the Section in April as a Technical Officer, and, in May, Dr. R.C. Hood, joined the Soil Science Unit at Seibersdorf. Dr. S.H.M. Naqvi, formerly the Director General of the National Institute for Agriculture and Biology, Faisalabad, Pakistan, was with us February-March and returned in June. Dr. K.O. Awonaike and Dr. A. Eaglesham, respectively, returned to the Unit and Section on temporary assignments, while Ms. A. Sessitsch left the Soil Science Unit in March.

The third Research Co-ordination Meeting of the FAO/IAEA CRP on "The Use of Nuclear and Related Techniques for Evaluating the Agronomic Effectiveness of Phosphate Fertilizers, in Particular Rock Phosphates" was held in Vienna, Austria, 17-21 March 1997, with fifteen Contract Holders and four Agreement Holders participating; thanks to generous support from the French Government, five new contracts were awarded in 1996, to scientists in Eastern Europe: Belarus, Hungary, Lithuania, Poland, and the Russian Federation. Research results were presented, revealing significant progress towards realizing the objectives of the CRP, and an action plan was drawn up for the final phase of work.

Two Regional Training Workshops were held: (i) "The Use of Nuclear Techniques for Increasing the Efficiency of Fertilizer N, Biofertilizers and Green Manures in Latin America and the Caribbean Region," Havana, Cuba, 21-25 April 1997, and (ii) under the auspices of the Regional Technical Co-operation Project for West Asia on "Water Balance and Fertigation for Crop Improvement," Nicosia, Cyprus, 5-14 May, 1997. There were nineteen trainees in Havana including twelve from Cuba, and thirteen trainees participated in Nicosia.

A Consultants' Meeting at the Agency HQ discussed "Management of Nutrients and Water in Rainfed Arid and Semi-Arid Areas, for Increasing Crop Production," 26-29 May 1997, with the participation of five external experts, Dr. J. Angus, CSIRO, Canberra, Australia, Dr. A. Bationo, ICRISAT/IFDC, Niamey, Niger, Dr. P. Grace, CIMMYT, Mexico City, Mexico, Dr. F. Maraux, CIRAD, Montpellier, France, and Dr. M. Pala, ICARDA, Aleppo, Syria, plus Dr. M. Smith, FAO/AGL, Rome, Italy. The Joint FAO/IAEA Division is taking a leading role in fostering collaboration with and among International Agricultural Research Centres of the CG System, and similar organizations, in this case to develop strategies for improved nutrient- and water-use efficiency by crops in semi-arid areas. Recommendations and guidelines for a new CRP were elaborated and are described later.

A new Europe Scientific 20-20 isotope-ratio mass spectrometer was commissioned at the Soil Science Unit, to replace the decade-old Micromass SIRA for routine ¹⁵N determinations. For optical emission spectrometry analysis, a FAN NOI-7 was purchased to replace the NOI-6, about thirty of which have been purchased over the past five years by IAEA for Member States.

My retirement as Section Head on June 30 brings to conclusion over 30 years of formal association with the Joint FAO/IAEA Division. My first participation in Agency activities was in 1963, in a Consultants' Meeting, and there then followed various collaborative endeavours in CRPs, from 1964 to 1983. Moreover, on several occasions I acted as a Mission Expert, mainly in West Asia, and particularly in Turkey. And of course, since February 1991 I have had the pleasure of serving as Section Head.

As Head, I have guided the Soil Section from its heavy emphasis on biological nitrogen fixation (BNF) towards a more integrated systems-approach in which BNF is but one component of crop nutrition. Last year, the External Review Board strongly supported this new direction. They recommended that the Section name be changed. And so, when I assumed the reins it was as Head of the Soil Fertility, Irrigation and Crop Production Section, and I take my leave from the Soil and Water Management and Crop Nutrition Section; the change occurred formally on 13 May 1997.

My long association with the Joint Division has been very happy, and personally satisfying on several levels. But as one door closes so another opens, and I look forward to returning home to Romania, and to a continuing involvement in agronomic research, mainly by supervising Ph.D students as a Professor of the Agricultural University, the Academy of Agricultural and Forestry Sciences and Romanian Academy in Bucharest. Also, over the next five years, I will be very much involved in the various world-wide activities of the International Scientific Centre of Fertilizers (CIEC), as its newly elected President.

I thank you, friends and associates, past and present, here in the Joint Division and around the world, for your collegial support and fellowship.

I wish you all the very best.

Christian Hera
Head, Soil and Water Management
and Crop Nutrition Section

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Secretarial Staff: Muriel WEINREICH

3. Staff Changes

Dr. Angela Sessitsch left the Soil Science Unit in February. She was very productive in her molecular genetics research on rhizobia, and now, with her PhD, a promising future awaits. In June she began postdoctoral studies at the Department of Microbiology, Wageningen Agricultural University, The Netherlands. She has our thanks and very best wishes for the future.

Dr. Gamini Keerthisinghe joined the Section in April, as a Technical Officer, from the Division of Plant Industry, CSIRO, Canberra Australia. His research interests include N and P use efficiency by crop plants, and nutrient turnover in agricultural soils. He has assumed Project Officer responsibilities for the CRPs on N₂-fixing trees and soil organic matter, and twelve TC projects - seven in East Asia and the Pacific, and five in Africa.

Dr. Rebecca C. Hood joined the Professional Staff at the Soil Science Unit in May. During a temporary appointment at the Unit last year, she prepared standard operational procedures for ¹⁵N analyses by mass spectrometry and emission spectrometry. Her current work includes the development of an indirect method for measuring nutrient release from organic residues to soil, especially of N.

Dr. N.H. Mujtaba Naqvi joined the Section on temporary assignment (February-March), as coordinator of the inter-regional TCP on salt-affected soils. Dr. Naqvi is the former Director General of the National Institute for Agriculture and Biology, Faisalabad, Pakistan. Funded by the TC-Department, he returned for a 1-year stay in June.

Dr. K. Olufemi Awonaike, from the Institute of Agricultural Research and Training, Obafemi Awolowo University, Ibadan, Nigeria, returned to the Soil Science Unit as a consultant (March-July, 1997), to work on isotopic methods to assess N availability from organic nutrients and to write a chapter on isotope methods in studies involving N₂-fixing trees.

Dr. Allan Eaglesham rejoined the Section on temporary assignment (February-June, 1997), to assist in day-to-day activities and with TECDOC and Newsletter editing.

Future Events

CO-ORDINATED RESEARCH PROJECTS

- ★ **Final Research Co-ordination Meeting of the FAO/IAEA/OPEC Co-ordinated Research Project on "The Use of Nuclear Techniques in the Management of Nitrogen Fixing Trees for Enhancing Soil Fertility and Soil Conservation," Vienna, Austria, 1-5 September, 1997**

Each participant will present the major results and conclusions of their research component. The presented data will be fully discussed, and the implications for sustaining soil fertility examined. The results will be published as a TECDOC. There are eight Contract Holders in this CRP, C. Ovalle-Molina (Chile), E.Y. Safo (Ghana), H. Shariffuddin (Malaysia), K. Malik (Pakistan), N. Mbaya (Zaire), M. Gueye (Senegal), M. de S. Liyanage (Sri Lanka), and M. Bekunda (Uganda), and three Agreement Holders, J.K. Ladha (Philippines), N. Sanginga (Nigeria), and D. Baker (USA). Project Officer G. Keerthisinghe.

A new CRP on "Use of Nuclear Techniques in Agroforestry" will be a logical continuation of this work on BNF in trees.

- ★ **Third Research Co-ordination Meeting of the FAO/IAEA Co-ordinated Research Project on "The Use of Nuclear Techniques for Optimizing Fertilizer Applications under Irrigated Wheat to Increase the Efficient Use of Fertilizers and Consequently Reduce Environmental Pollution," Vienna, Austria, 29 September - 3 October, 1997**

Sixteen scientists are expected to participate in this RCM which will be held at IAEA Headquarters. Four are Agreement Holders: G. Vachaud (France), I. Ortiz-Monasterio (Mexico), W. Baethgen and J. Schepers (USA), and twelve are Research Contract Holders: I. Khalil (Bangladesh), A.E. Boaretto (Brazil), I. Vidal (Chile), X. Wen (People's Republic of China), M.A.S. Abdel Monem (Egypt), M.S. Sachdev (India), X. Uvalle-Bueno (Mexico), J.M. Sanchez-Yañez (Mexico), M. Bazza (Morocco), G. Cioban (Romania), A. Arslan (Syria), Ç. Kirda (Turkey). Dr. P. Moutonnet is the Project Officer, and will serve as the Scientific Secretary for the meeting.

Fertilizers labelled with ¹⁵N and several technical documents to be used as guidelines have been provided to the contractors. ¹⁵N-enrichment measurements of plant and soil samples have been made at the Seibersdorf Laboratory and in various developing countries. The first results were discussed in detail at the second RCM, which was held in El Batan CIMMYT Research Centre, near Mexico City, 4-8 March 1996. Excerpts from presented papers were published in the July 1996 Soils Newsletter. The third season of experiments is now completed in the northern-hemisphere countries.

The CRP will close by the end of 1998 with a final RCM expected to be held again in Vienna.

TECHNICAL CO-OPERATION PROJECTS AND RELATED ACTIVITIES

- **FAO/IAEA Regional Technical Co-operation Project for Latin America on "Plant Nutrition, Soil and Water Management"**

This Regional TCP is in the first phase of implementation, with Dr. F. Zapata as the Project Officer. The terms and conditions of participation were discussed and agreed to by the project coordinators during the First Co-ordination Meeting in Irapuato, Mexico, September 1996. All participating countries are involved in several activities.

Regional Training Workshop on "The Use of Neutron Moisture Gauges and Balance of Water and Nutrients," Piracicaba, Sao Paulo, Brazil, 20-24 October 1997

The objective of this training workshop is to provide instruction and "hands-on" experience in the calibration and operation of the neutron moisture probe for junior scientists who are involved in soil-water research, from Argentina, Chile, Cuba, Guatemala, Mexico, Uruguay and Venezuela. Dr. Osny Bacchi, CENA, Piracicaba, is the local organizer.

Field-trial Network

The objective of this network is to use nuclear techniques to devise novel strategies in plant-nutrient, soil and water management for sustainable crop production in countries of the region. Replicated field experiments will test current local practices and experimental treatments that are expected to improve water- and nutrient-use efficiency. It is envisaged that these trials will be located on farmers' fields.

Scientists from each participating country defined a relevant topic of research. Experimental plans were prepared by the project co-ordinators and were submitted to the IAEA for approval, and equipment and ¹⁵N-labelled fertilizers have been supplied. The field trials will be set up this year.

Technical Manuals

Two manuals in Spanish will be prepared this year. One will be on neutron-probe use for water-balance studies co-authored by Drs. Klaus Reichardt and Osny Bacchi (both of Brazil), and the other will be on phosphate fertilizers by Dr. Eduardo Casanova (Venezuela).

■ **FAO/IAEA Regional Seminar for Latin America on "Nuclear Techniques for Optimizing the Use of Nutrients and Water for Maximizing Plant Productivity and Environmental Preservation," Piracicaba, Sao Paulo, Brazil, 27-31 October, 1997**

This seminar will provide a forum for scientists in the Latin American region to review recent progress in the use of nuclear and related techniques in studies of nutrient and water management and environmental problems associated with crop production and sustainable agriculture. Scientific Secretary: Dr. F. Zapata.

■ **IAEA/FAO Regional Training Course for West Asia on the Use of Nuclear Techniques in "Water and Nutrient Management Practices," 13 April-8 May, 1998**

- Deadline for applications:** 15 January, 1998
- Participation:** The course is open to twenty agronomists and soil scientists of the West Asia region. Mr. P. Moutonnet will serve as the Technical Officer to whom enquiries should be sent.
- Language:** English

Background of the course: The course is aimed at scientists in countries with extensive areas of marginal soils, whose research or extension interests lie in improving agricultural productivity in such areas.

Purpose: The objective is to give scientists a working knowledge of the use of nuclear techniques in soil-water monitoring and soil-nutrient (N, P, and K) management practices, including fertigation. The course aims at transferring nuclear technologies, to improve efficiency of use of water resources and soil nutrients in arid and semi-arid areas, for increased and sustainable food production.

Suggested venue: Damascus, Syria.

Qualifications: Candidates must have a Bachelor's degree or the equivalent in agronomy, or soil science, and be actively involved in agricultural research and/or extension activities.

Nature of the course: The course will cover topics related to water use efficiency and fertilizer recovery, using nuclear techniques. National and international experts will provide lectures, supervise practical classes and lead discussion sessions on these topics.

■ **IAEA/FAO Inter-regional Training Course on "The Use of Nuclear Techniques in Integrated Water and Plant Nutrition Management," Seibersdorf, Austria, 18 May-26 June, 1998**

Deadline for applications: 15 February, 1998

Participation: The course is open to twenty-two agronomists and soil scientists of all geographical regions. Mr. F. Zapata will serve as the Technical Officer to whom enquiries should be sent.

Language: English

Background of the course: The course is aimed at scientists whose research or extension interests lie in improving agricultural productivity.

Purpose: To train senior soil scientists on the use of relevant nuclear techniques.

Qualifications: Candidates must have a Bachelor's degree or the equivalent in agronomy, or soil science, and be actively involved in research and/or extension activities.

Nature of the course: The six-week course will be held at the FAO/IAEA Agriculture and Biotechnology Laboratory, Seibersdorf. In line with the Section's mandate and recommendations from the external review of the Soils sub-programme, the course will cover topics related to integrated water and plant-nutrient management in cropping systems. Dr. G. Hardarson is the Course Director.

Past Events

CO-ORDINATED RESEARCH PROJECTS AND RELATED ACTIVITIES

- **First Research Co-ordination Meeting of the FAO/IAEA Co-ordinated Research Project on "The Assessment of Soil Erosion Through the Use of Cesium-137 and Related Techniques as a Basis for Soil Conservation, Sustainable Production, and Environmental Protection," Vienna, Austria, 11-15 November, 1996**

This first RCM, with Dr. F. Zapata as the Project Officer, and that of the CRP on "Sedimentation Assessment Studies by Environmental Radionuclides and their Application to Soil Conservation Measures" were held together at the IAEA Headquarters. The latter CRP is implemented by the Isotope Hydrology Section of the Division of Physical and Chemical Sciences, with Dr. E. García-Agudo as the Project Officer.

The meeting was officially opened by Dr. S. Machi, Deputy Director General and Head, Department of Research and Isotopes, with opening remarks from Dr. J. Dargie, Director of the Joint FAO/IAEA Division of Nuclear Techniques in Food and Agriculture, and Dr. C. Hera, Head of the Soil and Water Management and Crop Nutrition Section.

There were twelve participants - eight Contract Holders: O. Bacchi (Brazil), P. Schuller (Chile), X. Zhang (People's Republic of China), L. Hua (People's Republic of China), I. Ionita (Romania), V. Golosov (Russian Federation), E. Fulajtar (Slovak Republic), and L. Mukurumbira (Zimbabwe) and four Agreement Holders: P. Wallbrink (Australia), D. Pennock (Canada), Q. He (UK), and J.C. Ritchie (USA). Eight IAEA staff members were also in attendance.

Presentations were made by the participants. There was a workshop on the ^{137}Cs technique, with discussion sessions for the preparation of standardized protocols for its application in soil erosion/sedimentation research.

Conclusions and Recommendations

During this initial phase of implementation, the focus will be on methodological aspects of the measurement of fallout ^{137}Cs and other radionuclides, with special attention given to quality control and quality assurance, for documenting soil erosion and deposition. Profile descriptions and measurements of quality indicators for each horizon will be carried out at representative points for reference and eroded soils.

A full report of the meeting is available upon request from the Scientific Secretary, Dr. F. Zapata.

- **Third Research Co-ordination Meeting of the FAO/IAEA Co-ordinated Research Project on "The Use of Nuclear and Related Techniques for Evaluating the Agronomic Effectiveness of Phosphate Fertilizers, in Particular Rock Phosphates," Vienna, Austria, 17-21 March, 1997**

The meeting was held at IAEA's Headquarters at the Vienna International Centre, and was attended by fifteen Contract Holders: J. Bogdevitch (Republic of Belarus), T. Muraoka (Brazil), I. Pino (Chile), G. Feng (People's Republic of China), J.A. Herrera Altuve (Cuba), T. Németh (Hungary), E.L. Sisworo (Indonesia), N. Karanja (Kenya), G. Šidlauskas (Lithuania), Z.A. Rahman (Malaysia), M.

Fotyma (Poland), Z. Borlan (Romania), R. Alexakhan (Russian Federation), J. Mahisarakul (Thailand), and E. Casanova (Venezuela), and four Agreement Holders: J.-C. Fardeau (France), D. Montage (France), J.-M. Barea (Spain), and S.H. Chien (USA). There were eight observers (including six IAEA fellows) and eight IAEA staff members from Headquarters and the Soils Unit. The official opening was by Dr. C. Hera, Head of the Soil and Water Management and Crop Nutrition Section, with remarks from Dr. F. Zapata, Scientific Secretary.

Following presentations from the Contractors and Agreement Holders, progress was reviewed towards achieving the work-plan objectives and in ancillary supporting activities [related to the IAEA-IMPHOS (World Phosphate Institute) Agreement]. Discussions were held to define experimental plans for the final phase of the CRP and on arrangements for publishing results. Meetings were held with each contractor to discuss issues specific to individual projects.

Significant progress has been made by the contractors towards achieving the objectives of the CRP, as reflected in their presentations and the individual meetings. Some participants have already published results in national and international journals. With the active participation of Mr. A. Benjelloun, representative of IMPHOS, details of the standard characterization of soils and phosphate rock (PR) as well as of reactive IMPHOS rock phosphates, were discussed.

Conclusions and Recommendations

Activities during Phase 3 will focus on completion of the CRP objectives. Most of the contractors will conduct field trials to determine P-fertilizer recommendations. Minimum data sets will be collected, on sheets provided by Dr. S.H. Chien, IFDC, for validation of the P sub-model of the DSSAT computer-simulation model.

The standard characterization of PRs utilized in the network will be continued. In addition, IMPHOS will supply reactive PRs for inclusion. Final reports on the standard characterization of soils and PRs utilized for the network will be prepared during 1997 and 1998, respectively.

The contractors were encouraged to publish their research results in national and international scientific journals, with due acknowledgement for IAEA's support. The results of the CRP will be made available to the scientific community as an unpriced IAEA publication.

A full report of the meeting is available upon request from the Scientific Secretary. The final meeting of the CRP will be held during the last quarter of 1998.

■ FAO/IAEA Consultants' Meeting on "Management of Nutrients and Water in Rainfed Arid and Semi-arid Areas, for Increasing Crop Production," Vienna, Austria, 26-29 May, 1997

Research has shown that arid and semi-arid areas are capable of supporting only sub-optimal levels of agricultural production because of moisture limitations. In accordance with UNCED's Agenda 21, FAO is implementing a Special Action Programme on Rural Use of Water Resources for Sustainable Agricultural Development (SAP-WASAD). The integrated rural water management programme aims at improving water-use efficiency, conserving water resources and protecting water quality. The development of improved cultural practices, new crop varieties and farming systems requires better understanding of the many interacting soil, plant and atmospheric components. Multidisciplinary teams, aided by field data generated using nuclear and related techniques and computer-simulation models in agricultural hydrology, will lead to the development of strategies for improved water-use efficiency.

The Joint FAO/IAEA Division is taking a leading role by fostering collaboration with and between International Agricultural Research Centres (ICARDA, ICRISAT, and CIMMYT) and other organizations (IFDC, CSIRO, and CIRAD).

This Consultants' Meeting, held at IAEA headquarters, Vienna, Austria, involved five external experts, J. Angus, CSIRO, Canberra, Australia, A. Bationo, ICRISAT/IFDC, Niamey, Niger, P. Grace, CIMMYT, Mexico City, Mexico, F. Maraux, CIRAD, Montpellier, France, and M. Pala, ICARDA, Aleppo, Syria, plus a representative of FAO/AGL, M. Smith, Rome, Italy. The aim of the meeting was to draw up recommendations and guidelines for FAO/IAEA-sponsoring organizations for a new Co-ordinated Research Project (see below). The Project objectives and the programme of work were defined using, as a basis for discussion, a broad workplan previously prepared by the Scientific Secretary Dr. P. Moutonnet. Rainfed zones and cropping systems for study were selected, with methodologies for interdisciplinary research. International contacts were listed for possible future collaboration. Full details about this CRP are given below.

TECHNICAL CO-OPERATION PROJECTS AND RELATED ACTIVITIES

■ Annual Co-ordination Meeting of the FAO/IAEA Regional Technical Co-operation Project for West Asia on "Water Balance and Fertigation for Crop Improvement," Amman, Jordan, 10-13 November, 1996

Initiated in 1995 for a two-year period, the objective of this regional project is to improve the efficiency of use of irrigation water and N-fertilizer in the arid and semi-arid conditions that exist in most countries of the Middle East. Fertigation is recognized as an effective way to save water and nutrients, and to increase crop production on marginal calcareous soils. It has been emphasized that fertigation is particularly important in the Middle East, since irrigated agriculture is expanding rapidly and modern irrigation technology is being broadly adopted. However, fertigation is practiced often without any technical background and/or control. Nuclear techniques, the soil-moisture neutron probe and ¹⁵N-labelled fertilizers, are powerful research tools to illustrate the substantial benefits of fertigation when properly applied.

The host institution was the Ministry of Energy and Mineral Resources of Jordan. Dr. P. Moutonnet, Technical Officer for the project, was the Scientific Secretary. Mr. S. Chaudhri, Head of IAEA/TCPM West Asia Section attended, with scientists from six countries of the region: I. Papadopoulos (Cyprus), D. Amawi, A.M. Battikhi, S. Khattari, M.H.A. Omari, W.A. Al-Qawasmi, and S. Al-Zuraiqi (Jordan), T. Attalah and T. Darwish (Lebanon), A.A. Aijalaoud (Kingdom of Saudi Arabia), M. Janat, A. Razzouk and M. Shaheen (Syrian Arab Republic), and M.B. Halitligil and A. Ozturk (Turkey). Unfortunately, the counterparts from Iran and United Arab Emirates were unable to participate. The following progress reports are available upon request:

Cyprus: Trials undertaken with tomato and cucumber crops under fertigation in 1995 and 1996 (Agricultural Research Institute, Nicosia).

Jordan: Effect of fertigation scheduling on vegetable crops in the Jordan Valley (University of Jordan, Amman) - Nitrogen for potato through trickle irrigation (Jordan University of Science and Technology, Irbid; National Center Agricultural Research and Technology).

Lebanon: Fertigation in greenhouses: water and N balances [Lebanese University of Beirut; National Council for Scientific Research (NCSR)] - Nitrogen fertigated potatoes with ^{15}N under semi-arid conditions in the Beqaa Valley (American University of Beirut; NCSR).

Syria: Comparative study of N fertilizer use efficiency of cotton under conventional and fertigation practices using ^{15}N (Syrian Atomic Energy Commission; Ministry of Agriculture).

Turkey: Nitrogen use efficiencies on drip-irrigated tomatoes, pepper, and cucumber as affected by soil application and fertigation (Sutcu Iman University, Kahramanmaras; Horticultural Research Institute, Antalya; Nuclear Research Center, Ankara).

Following this Co-ordination Meeting, the Agency extended funding for two years. The third co-ordination meeting will be held in Lebanon, possibly in November 1997. A Regional Training Workshop was held in Cyprus from 5-14 May, 1997, as described above.

■ **Regional Training Workshop on "Strengthening Analytical Laboratories in the Latin American Region," Santiago, Chile, 11-15 November, 1996**

This workshop was the first organized within the framework of the FAO/IAEA Regional Technical Co-operation Project "Plant Nutrition, Soil and Water Management," for which Dr. F. Zapata is the Technical Officer. It was held in the laboratories of the Chilean Nuclear Energy Commission with Ms. Inés Pino acting as the local organizer and Mr. Raul Goyenola as invited lecturer. It was attended by twelve participants, eight from the region and four local.

There were two main objectives: i) to introduce elements of a quality-control system in the laboratories of the region, and ii) to train local staff in standardized operating procedures (SOPs), achieved through lectures, practical sessions, and bibliographic searches on ^{15}N and radioassay techniques. Conclusions and recommendations were included in the final report.

It was noted that laboratories in the region have certain limitations in common: i) quality-control systems are not applied systematically, ii) there is a lack of reference materials, iii) there is limited supply of spare parts, in particular for the NOI-6 PC optical emission spectrometer, and iv) electronic expertise is not available for instrument adjustment and repair.

As a result of the workshop, a Regional Network of Isotope Analytical Laboratories in Soil/Plant Studies was created, and protocols for three analytical procedures were prepared for use in those laboratories. A regional database on the laboratories was initiated and an Action Plan drawn up for implementation of the Network. The quality of the data produced by the participating laboratories will be evaluated in the second regional workshop, which will take place in Uruguay in June 1998.

■ **National Training Course, "Use of Nuclear Techniques to Determine Nutrient- and Water-use Efficiency in Cropping Systems," Havana, Cuba, 25 November - 6 December, 1996**

The first in this series of courses, within the framework of the FAO/IAEA Regional Technical Co-operation Project for Latin America on "Plant Nutrition, Soil and Water Management," had eighteen participants, with instruction provided by Dr. S. Urquiaga, EMBRAPA, Brazil, and from Cuba, Ing. A. Nuviola (Course Co-ordinator), Lic. G. Dueñas, Lic. A. García, Dr. O. Muñiz, Lic. F. Alvarez, Lic. J. Sosa, Dr. E. Zamora, Ing. T. López, and Dr. R. Rivera.

- **Regional Training Workshop on "The Use of Nuclear Techniques for Increasing the Efficiency of Fertilizer N, Biofertilizers and Green Manures in Latin America and the Caribbean region." Havana, Cuba, 21-25 April, 1997**

This workshop, organized within the framework of the FAO/IAEA Regional Technical Co-operation Project for Latin America on "**Plant Nutrition, Soil and Water Management**," was attended by seven representatives from ARCAL Member States, two invited lecturers and twelve local participants. The local organizer was Dr. Olegario Muñiz from the Institute of Soils, and the Technical Officer was Dr. F. Zapata

There were over twenty presentations of work conducted in the region using nuclear techniques, including contributions from the participants, with instructional talks given by Dr. F. Zapata (Project Officer) and the invited lecturers: Dr. J.J. Peña-Cabriales of Mexico and Dr. S. Urquiaga of Brazil.

Discussion sessions were held on selected topics from the workshop. Participants combined their efforts in working groups and, at the end of the workshop, conclusions and recommendations resulted from a round-table discussion session.

Dr. Peña-Cabriales and Dr. Urquiaga also assembled and edited manuscripts that will be published next year as Technical Manuals on Biofertilizers and on Fertilizer N, respectively.

- **Training Workshop under the FAO/IAEA Regional Technical Co-operation Project for West Asia on "Water Balance and Fertigation for Crop Improvement," Nicosia, Cyprus, 5-14 May, 1997**

The workshop, on utilization of nuclear techniques in fertigation studies was held at the Agricultural Research Institute (ARI) in Nicosia. Participants were scientists and engineers from West Asia who are actively involved in fertigation work in their home countries; they received training on the use of isotopes and nuclear techniques in studies of soil-water-plant relationships, nuclear physics and instrumentation, and the safe handling of radioisotopes. Training was also provided on the use of the soil moisture neutron probe in association with a set of tensiometers/tensionics. Other topics included drip irrigation; fertigation studies involving the utilization of labelled fertilizers (^{15}N and ^{32}P); crop water requirements; soil and irrigation water management; irrigation scheduling; field implementation of fertigation studies; and daily monitoring of irrigation water and labelled fertilizer through drip irrigation.

In addition to lectures, the participants took part in field isotope-aided fertigation studies and made visits to agricultural research stations and farmers' facilities. There were thirteen trainees from six countries: Cyprus (2), Iran (2), Jordan (3), Lebanon (2), Saudi Arabia (1), and Syria (3). Dr. I. Papadopoulos (ARI) was the Course Director and Dr. P. Moutonnet the Technical Officer.

- **Regional Working Group on "The Use of Nuclear and Related Techniques for Evaluating the Agronomic Effectiveness of Phosphate Fertilizers," Buenos Aires, Argentina, 23-27 June, 1997**

This working group was the first organized within the framework of the FAO/IAEA Regional Technical Co-operation Project for Latin America on "**Plant Nutrition, Soil and Water Management**" for which Dr. F. Zapata is the Project Officer. Scientists from Brazil, Chile, Cuba, Uruguay and Venezuela discussed the results of their research on phosphorus nutrition using ^{32}P and related techniques. The local organizer was Dr. N. Barbaro, CEA Ezeiza.

Status of Co-ordinated Research Projects

◆ **Use of Nuclear Techniques in the Management of Nitrogen Fixing Trees for Enhancing Soil Fertility and Soil Conservation**

Project Officer: G. Keerthisinghe

The project has seven Research Contract Holders: C. Ovalle-Molina (Chile), E.Y. Safo (Ghana), Z. Abdul Rahman (Malaysia), K. Malik (Pakistan), M. Gueye (Senegal) M. Bekunda (Uganda), N. Mbaya (Zaire), and four Research Agreement Holders: N. Sanginga (IITA-Nigeria), J.K. Ladha (IRRI-Philippines), C. van Kessel (USA), D. Baker (USA). The final RCM will be held in Vienna, 1-5 September, 1997.

◆ **Use of Nuclear Techniques for Optimizing Fertilizer Applications under Irrigated Wheat to Increase the Efficient Use of Fertilizers and Consequently Reduce Environmental Pollution**

Project Officer: P. Moutonnet

This project has sixteen participants, of which five are Agreement Holders: P. Cepuder (Austria), G. Vachaud (France), I. Ortiz-Monasterio (CIMMYT-Mexico), W. Baethgen (USA), J. Schepers (USA), and twelve are Research Contract Holders: I. Khalil (Bangladesh), A.E. Boaretto (Brazil), I.V. Parra (Chile), X. Wen (China), A. Monem (Egypt), M. S. Sachdev (India), X. Uvalle-Bueno (Mexico), J. M. Sanchez-Yañez (Mexico), M. Bazza (Morocco), G. Cioban (Romania), A. Arslan (Syrian Arab Republic), C. Kirda (Turkey). The third season of experiments was recently completed and the second RCM will be held in Vienna, Austria, 29 September - 3 October, 1997.

◆ **Use of Nuclear and Related Techniques for Evaluating the Agronomic Effectiveness of Phosphate Fertilizers, in Particular Rock Phosphates**

Project Officer: F. Zapata

The third RCM was held in Vienna, 17-21 March, 1997, and the CRP is now in its final phase. There are sixteen Contract Holders: (Regular Budget) T. Muraoka (Brazil), L.M. Xiong (China), C. Herrera-Altuve (Cuba), I. Pino (Chile), E. Owusu-Bennoah (Ghana), E. Sisworo (Indonesia), N. Karanja (Kenya), Z. Rahman (Malaysia), J. Mahisarakul (Thailand), E. Casanova (Venezuela); (French funded) I. Bogdevitch (Republic of Belarus), T. Németh (Hungary), G. Šidlauskas (Lithuania), M. Fotyma (Poland), Z. Borlan (Romania), R. Alexakhin (Russian Federation); and five Agreement Holders: M.J. McLaughlin (Australia), T. Binh (France), J.-C. Fardeau (France), J.M. Barea (Spain), S.H. Chien (USA). The final RCM will be held in the last quarter of 1998.

◆ **Use of Irradiated Sewage Sludge to Increase Soil Fertility and Crop Yields and to Preserve the Environment**

Project Officer: F. Zapata

Participating in this CRP are twelve Contract Holders, C. Magnavacca (Argentina), S. Ahmed (Bangladesh), T. Jiang (China), R. El-Motaium (Egypt), V.V. Athalye (India), M. Mitrosuhardjo (Indonesia), F. Ishak (Malaysia), J.F. Esparza-garcia (Mexico), F. Azam (Pakistan), E.M. Ferreira (Portugal), M. Dumitru (Romania), P. Chaiwanakupt (Thailand), and five Agreement Holders, F. Kock (Austria), H. Harms (Germany), K. Kumazawa (Japan), A.C. Chang (USA), and S. McGrath (UK). The third RCM will be convened in March 1998 in Lisbon, Portugal.

◆ **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

This CRP is in the first phase of operations, with twelve Contractors, S.M. Rahman (Bangladesh), K. Reichardt (Brazil), E. Zagal (Chile), J. Y. Wang (China), S.K.A. Danso (Ghana), M.S.A. Safwat (Egypt), R. Abu Bakar (Malaysia), M. Ismaili (Morocco), J. Z. Castellanos (Mexico), D. Amara (Sierra Leone), R. Sangakkara (Sri Lanka), N. Nguyen (Viet Nam), and five Agreement Holders: D.F. Herridge (Australia), R. Merckx (Belgium), O.P. Rupela (India), C. van Kessel (USA), and D.S. Powlson (UK). The second RCM is scheduled for spring 1998 in Vienna.

◆ **Assessment of Soil Erosion Through the Use of Cesium-137 and Related Techniques as a Basis for Soil Conservation, Sustainable Production, and Environmental Protection**

Project Officer: F. Zapata

This CRP is also in the first phase. Participating are nine Research Contract Holders, O. Bacchi (Brazil), A. Ellies (Chile), X. Zhang (China), L. Hua (China), I. Ionita (Romania), V. Golosov (Russian Federation), E. Fulajtar (Slovak Republic), and L. Mukurumbira (Zimbabwe), one Technical Contractor and four Agreement Holders, P. Wallbrink (Australia), D. Pennock (Canada), D.E. Walling (UK), J.C. Ritchie (USA). The second RCM will be held in Barcelona, Spain, May-June, 1998.

New Co-ordinated Research Projects

✧ **"Use of Nuclear Techniques in the Development of Integrated Nutrient and Water Management Practices for Agroforestry System."**

It is anticipated that a new CRP in this area will be initiated in 1998. Further details will be given in the next Newsletter.

✧ **"Use of Nuclear Techniques for Developing Management Practices for Increasing Crop Production on Acid Soils."**

The initiation of a CRP in this subject is expected late in 1998 or at the beginning of 1999. Details will be provided in the next issue of the Newsletter.

✧ **"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"**

Background Water is the most important agricultural yield-constraint in arid and semi-arid areas. Furthermore, the soils of these areas are generally of low fertility, with *per capita* production in decline. Nevertheless, there is evidence that crop yields can be profitably increased, and yield fluctuations decreased by a combination of careful management and low inputs of nutrients. The development of improved farm-management practices requires better understanding of the complex interactions that occur between soil nutrients and soil moisture. Field data generated using nuclear and related techniques, and computer-simulation models in agricultural hydrology, will aid the development of strategies for improved water- and nutrient-use efficiency.

Objectives

1. To define management strategies that optimize and sustain the productivity of rain-fed farming systems by increasing the efficiency of water and nutrient utilization.
2. To define appropriate technologies to enhance crop water use and nutrient uptake, and to ensure their applicability at the farm level.
3. To test crop responses to water and nutrient in relation to crop sequence and surface management in field experiments using nuclear techniques.
4. To promote the collection of minimum sets of data from all experiments for storing in a common data-base, for testing and applying simulation models, and for training national staff in model use.

Research Contracts

On the basis of technically sound proposals from scientists, Research Contracts will be awarded for an initial period of 1 year. **The deadline for such proposals is 1 October, 1997.** Contracts are renewable every year for up to 5 years, subject to yearly satisfactory progress. Research Contracts provide financial support (US\$6,000-8,000 per year, with some input for equipment). The contracts follow an agreed work-plan, and are awarded on a cost-sharing basis, i.e. the scientist's home institution is expected to provide support to achieve project objectives.

It is anticipated that twelve to fourteen Research Contracts will be awarded under the proposed scheme. It is envisaged that countries will integrate their requirements for equipment through application to relevant National and Regional projects supported through IAEA or FAO. The project proposed under each Contract should adhere to the following guidelines:

- Within semi-arid and arid tropical, sub-tropical, and temperate regions, focus should be on cropping systems for which cash inputs such as fertilizers are marginal, but not so risky that technology may not have impact.
- Experiments will test crop responses to water and nutrient sources in relation to innovative systems of crop sequence and soil-surface management, using nuclear techniques to elucidate the efficiency of water and nutrient use.
- The project should realistically reflect the farming system that it aims to improve, by including parallel experiments on research stations and on nearby farmer fields. Innovative farming practices and possible treatments should be selected through appropriate local information, consultation with small farmholders, or even through a survey methodology that will form the basis of on-going extension. This interaction should be in collaboration with existing development projects involving NARS, CG Centres, and NGOs. Nuclear techniques must be included at one location, under conditions that ensure strict quality-control as agreed with the Joint FAO/IAEA Division.

Research Agreements

Scientists of international repute in crop-nutrient- and water-management in arid and/or semi-arid environments will be invited to participate as Research Agreement Holders. No financial remuneration will be involved, except for invitations to participate, expenses paid, in Research Co-ordination Meetings.

Research Co-ordination Meetings

The first Research Co-ordination Meeting will be held as soon as possible, approximately February 1998, in Vienna, and every 18 months thereafter.

GENERAL INFORMATION APPLICABLE TO CO-ORDINATED RESEARCH PROJECTS

Submission of Proposals

Research Contract Proposal forms can be obtained from IAEA, and from national Atomic Energy Commissions and UNDP offices. They must be countersigned by the Head of the Institution and submitted to IAEA; routing through other official channels is not necessary.

Complementary FAO/IAEA Support

IAEA has a programme of support through national IAEA Technical Co-operation Projects (TCPs). These are concerned with aspects of soil and water management and crop nutrition. Through TCPs, additional support may be obtained for activities planned under individual Research Contracts - for equipment, specialized training through IAEA training fellowships and the provision of technical backstopping through visits by IAEA experts for periods of up to 1 month. Request forms for assistance under the IAEA Regular Programme of Technical Cooperation can be obtained from IAEA. Such support is available to IAEA Member States.

Laboratory Activities

Quality Assurance Programme

Within the framework of the IAEA Technical Co-operation programme, emission spectrometers for measuring N-isotope ratios have been provided to several Member States for the establishment of laboratory facilities for ^{15}N analysis. It is necessary to ensure that results generated in these laboratories are precise and accurate and thus of international standard. This can be achieved by intercomparison laboratory exercises. Participants thus gain confidence in their work and, through feedback, may identify possible sources of error and ways of correcting them.

As part of an Inter-Regional Project on "Quality Assurance for ^{15}N analysis by Optical Emission Spectrometry," sets of reference material and test samples for ^{15}N and total-N determination were dispatched to twenty-five laboratories in Member States. Data from the test samples were received from sixteen of these institutions. Fifteen produced data, of which five complied with the analytical criteria, six generated results of questionable reliability, and data from four labs were outside the control limit; technical advice was provided, with help in procuring spare parts and supplies to improve the analytical facilities in these countries. This first exercise illustrates the importance of the programme.

This process is being repeated in 1997 with the objective of identifying laboratories in each geographical region where ^{15}N analytical support may be made available to scientists in neighbouring national laboratories. A detailed report on this programme is available from the Soil Science Unit.

Use of tracer techniques to evaluate nutrient availability from crop residues

Methodologies are well established for using isotopes to study legume N₂ fixation and nutrient contribution from fertilizers to crops, whereas isotope use for measuring nutrient contributions from crop residues is still at the exploratory stage.

Experiments are in progress to measure indirectly the N contribution from organic amendments to plants to support the "Soil Organic Matter" Co-ordinated Research Project.

Measurement of N₂ fixation in trees and management of agroforestry systems

Research and development activities at the Unit currently support the "N₂-fixing Trees" Co-ordinated Research Project, in which the effects of organic amendments, as leaf litter or prunings, on the growth of accompanying or subsequent non-N₂-fixing crops, are being investigated. We are developing methods of determining the extent to which the nutrients (especially N) in tree residues meet the needs of associated crops.

Increasing the effective use of scarce water resources to maximize plant productivity

In arid and semi-arid environments, poor management results in inefficient use of precious fertilizer and irrigation resources. Therefore, experiments are being conducted at Seibersdorf to study the fate and the interactions of water and nutrients, especially N, to improve fertilizer use efficiency.

Group Fellowship Training

A Group Fellowship Training on ¹⁵N analyses by emission spectrometer will be held during 29 September to 28 November, at the Soil Science Unit, FAO/IAEA Biotechnology Laboratory, Seibersdorf, Austria. Four candidates have been selected.

Internet Support Services

Web Sites

- <http://www.iaea.or.at/>

WorldAtom[®] and TecAtom[®] are public information services of the IAEA. Items are presented for informational purposes only, not as official records. On the home-page you will find the following topics - About the IAEA - On-line products - Programmes - Job openings - Meetings - IAEA books - What's new? - Site index - Feedback - Search - and an image-gallery database.

- <http://www.fao.org/>

The Food and Agriculture Organization of the United Nations is also on the web, in English, French, Spanish, and Arabic configurations. Among the subjects available are - What is FAO? - Statistical databases - Agriculture [the Joint FAO/IAEA Division web site will appear here soon] - Economics - Fisheries - Forestry - Nutrition - Sustainable development - Partnership programmes - Technical cooperation - Employment opportunities - Publications - Documentation services - Events calendar - What's new? - Search our site - and much other diverse information.

FAO Data Bases are also at this Website, including AQUASTAT (water in agriculture and rural development, CROPWAT (irrigation planning and management) and ECOCROP (crop information). A digital global map and database on soils are available on CD-ROM.

- <http://www.cvision.com.au>

This site makes available over 300 items of software, on groundwater, air pollution, bioremediation, geophysics, surface-water, and the environment. Their 135-page catalogue is available free of charge at the URL, or via e-mail at <swagman@cvision.com.au>.

- <http://atlas.usu.edu>

The International Irrigation Management Institute (IIMI), a research center based in Colombo, Sri Lanka, has established a database - the World Water and Climate Atlas for Agriculture - in collaboration with Utah State University: "The atlas integrates the available agricultural data into one computer program and represents the most comprehensive, quality-controlled climatic data-set in existence," as reported on the e-mail "Irrigation-List". It will soon be possible to download the atlas from the URL; the first segment, covering Asia, should be available by June 1997, and the entire database by the end of the year. The project, which researchers estimate will cost less than US\$1 million, is being financed by the Japanese government.

- http://fserve.wiz.uni-kassel.de/kww/projekte/irrig/irrig_i.html

The WWW Virtual Library IRRIGATION and related topics, run by Thomas-M. Stein (stein@wiz.uni-kassel.de) provides information and links to servers and sites on irrigation and hydrology - irrigation news - discussion lists - irrigation and water experts - on-line scientific journals/articles on irrigation - irrigation systems (localized, trickle/drip, sprinkler, surface) - irrigation statistics - hydraulic engineering - irrigation standards, management, modelling - drainage and salinity - irrigation and soil-water relationships.

- <http://www.greenhat.com>

Several software programs are available directly from this web site. Demonstration copies may be downloaded for modeling water flow through soil profiles with varying irrigation regimes and soil properties (sales@greenhat.com). WaterMod is a program exploring the dynamics of soil water in agricultural and environmental systems. It incorporates rainfall and irrigation inputs, runoff, transpiration, evaporation (from the soil and the canopy), infiltration and drainage. The focus is primarily on agricultural soils, although the principles apply to other systems.

E-mail Discussion Groups

Subscription to these e-mail addresses will provide information on the indicated topic, questions from the members of the group, with opportunities to contribute to discussions and to ask questions. Some have past correspondences available on archive.

Moderator	e-mail discussion list name	e-mail address for subscription	Message to be sent
rmead@cybergate.com or http://www.cybergate.com/~rmead	trickle-L	listserv@unl.edu	subscribe trickle-L name e.g. subscribe trickle-L Jane Smith
Thomas-M. Stein stein@wiz.uni-kassel.de	irrigation-L	listserv@ listserv.gmd.de	subscribe irrigation-L name e.g. subscribe trickle-L Jane Smith
USDA-ARS-Manag. Res. Lab. Fresno, CA.	salinity-L	listserv@unl.ed	subscribe salinity-L name e.g. subscribe trickle-L Jane Smith
gardos@rial1.iaea.or.at	TC Instrumentation mailing list	majordomo@ listserv.iaea.org	subscribe tcinstr your e-mail address
mathieu.bousquet@ fao.org	Land-and-Water- L	mailserv@ mailserv.fao.org	subscribe land-and-water- L
bruce.metelerkamp@ pobox.com	SOWACS (soil water content)	majordomo@ aqua.cwvr.ac.za	subscribe sowacs

Computer-Simulation Modeling

DSSAT

The Decision Support System for Agrotechnology Transfer (DSSAT, version 3.0) is the product of a multiple-institute, multidisciplinary research and development project that was funded by the United States Agency for International Development (USAID) from 1983 to 1993. Based at the University of Hawaii, the IBSNAT project consisted of a network of model developers, testers, and users in the US and elsewhere. The DSSAT v3.0 software is a set of computer programs accessible under a shell designed to (i) enter, store, and manipulate weather, soil, and crop data, (ii) run crop-simulation models, and (iii) analyze crop-model outputs. There are ten crop models in v3.0: maize, wheat, rice, barley, sorghum, millet, soybean, peanut, *Phaseolus* bean, and cassava. Potato, taro and taniar, sugar cane, and tomato will be added in the near future. All crop models operate on a daily time step and are based on understanding of biological processes.

The crop-models can be run in a number of ways:

Validation mode to compare simulation output with real-world field trial results to assess model performance in an environment.

Sensitivity analysis mode to answer "what if..." questions; for example, what happens to yield response if I grow a specific variety of wheat or apply more fertilizer?

Strategy analysis mode where replicated seasonal or rotation experiments can be simulated and weather and economic risks assessed.

International training programmes in the application of DSSAT are organized periodically; the last was at IFDC, Muscle Shoals, Alabama, USA, 12-23 May, 1997. It is available for purchase, for about US\$500, from Dr. Gordon Y. Tsuji, Department of Agronomy and Soil Science, Krauss Hall 22, 2550 Dole Street, University of Hawaii, Honolulu, HI 96822, USA, fax: 808 956-3421, e-mail: <gordont@uhunix.hawaii.edu > .

The DSSAT software is being used as part of:

- the "Irrigated Wheat" CRP, to check crop responses to N fertilizers (under "Mega-Environment 1" conditions as defined by CIMMYT). Dr. Walter Baethgen of IFDC, an Agreement Holder, trained the Contract Holders in the utilization of the CERES-Wheat model, with the objective of validating the sub-model "N fertilization" using experimental data generated with ¹⁵N-aided field studies.
- the "Phosphate" CRP. During the final phase of field experimentation, Contract Holders will generate data to validate the P sub-model, following IBSNAT minimum data-set guidelines.

Development of Calibration Models for Soil Erosion

Dr. D.E. Walling, University of Exeter, UK, has provided a technical manual and software that he and Dr. Q. He produced: "Models for Converting ¹³⁷Cs Measurements to Estimates of Soil Redistribution Rates on Cultivated and Uncultivated Soils (Including Software for Model Implementation)." It is envisaged that this model will be tested using data sets produced by Contract Holders in the "Soil Erosion" CRP.

In Memoriam

The completion of this issue of the Newsletter coincides with the one-year anniversary of the sudden death of our friend and treasured colleague Dr. Saliya Kumarasinghe. All who knew Saliya, held him in the highest esteem, personally and professionally - he is still greatly missed, and expressions of shock and dismay continue to be received at the Agency. At this time of sad remembrance, our thoughts are with the Kumarasinghe family.

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IAEA

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