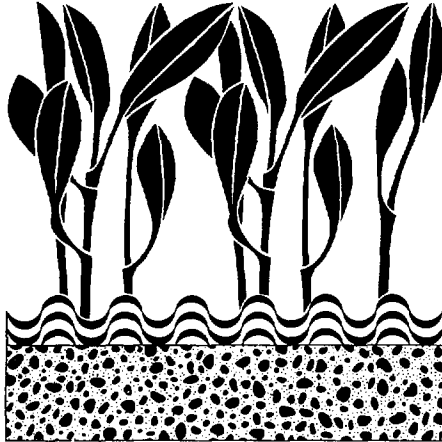




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Soils Newsletter



JOINT FAO/IAEA DIVISION
OF ISOTOPE AND RADIATION APPLICATIONS
OF ATOMIC ENERGY
FOR FOOD AND AGRICULTURAL DEVELOPMENT
INTERNATIONAL ATOMIC ENERGY AGENCY, VIENNA

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TO OUR READERS

This issue is being published without the guidance of Dr. J.B. Bole, former Head of the Soil Fertility, Irrigation and Crop Production Section. Jim, as he is popularly called, left the services of the Joint FAO/IAEA Division on May 19 of this year to rejoin Agriculture Canada, from where he was seconded to the Soil Fertility, Irrigation and Crop Production Section, first as a First Officer, and later as Section Head. Many of our readers have met or corresponded with Jim during his short but distinguished career with the Division. For those who will wish to keep in touch with him, his new address is: Dr. J.B. Bole, Research Scientist, Agriculture Canada, Research Branch, Soil Science Section, Research Station, Lethbridge, Alberta, Canada T1J 5B1.

In the first issue of the 1982 Soils Newsletter, we presented the Agency's plans for implementing Technical Cooperation Projects in 1982 for which the Soils Section has technical responsibility. These projects are progressing satisfactorily, and new ones will soon be added to most of the existing ones. Details on applying for Technical Cooperation have been included in this issue, for those interested in initiating or strengthening nuclear-aided research to prepare such requests. Those to start in 1984 should be submitted by December of this year, or early 1983.

Two relevant FAO/IAEA International training courses were conducted, one at the IAEA Laboratory in Seibersdorf, Austria, and another one at the State University of Ghent at Ghent, in Belgium. These offered excellent training opportunities to the more than thirty participants from developing countries. Reports on these are included in this issue.

As indicated in previous volumes of our Newsletter, we welcome any contributions, comments or suggestions from our readers. We hope you will find the information in this issue interesting to you and your colleagues.

We are still interested in contacting scientists wishing to conduct isotope aided studies in pasture and forage systems. There is still room for a few participants in the Italian Government/FAO/IAEA Coordinated Research Programme on Pasture Management.

CHANGES IN STAFF

We are happy to announce the presence of our new staff member, Klaus Reichart, professor at the University of Sao Paulo, Brazil. Dr. Reichardt replaces Dr. J.B. Bole as Head of the Soils Section. We wish Jim great strides in his research career, and also wish Klaus a successful tenure as Head of the Section.

TECHNICAL COOPERATION PROGRAMME

The Agency funds many projects submitted by developing Member States, or executes projects funded by outside bodies, such as the UNDP. There are at present 70 Member States benefiting from the Agency's Technical Cooperation programme in ten different fields of activity, of which Agriculture is an important one.

Forms of assistance:

Five major programmes can be distinguished:

(a) Regular Technical Cooperation Programme:

A programme comprising expert services and equipment, arranged in the form of individual projects;

- (b) Regular Fellowship programme:
Provides for training of individuals from developing Member States in advanced laboratories.
- (c) Training Course programmes:
A programme for group training.
- (d) Special programme:
These usually consist of large scale projects, identified jointly by donor and recipient Member States and executed by the Agency, utilizing extra budgetary cash and in kind contributions specifically made for this purpose.
- (e) UNDP programme:
These are projects which form part of Country or Regional programmes and executed by the Agency on behalf of UNDP.

All these five programmes are intended to introduce or encourage the applications of nuclear techniques to help solve problems which cannot be solved by other conventional methods, or where nuclear tools could be more advantageous. This issue will deal mainly with Technical Cooperation activities in Agriculture, in which the assistance given involves expert, equipment, fellowship and training course components. The Regular Fellowship programme was fully discussed in Soils Newsletter Vol. 4 of 1981

Applying for Assistance:

Since the Agency's resources cannot cope with the numerous requests made every year, only a portion of the proposals submitted receive approval and support. It is therefore important that Technical Cooperation requests should clearly and as fully as possible describe the research to be carried out, for a proper evaluation to be made as to the merits of the project.

Because the level of development and the needs of various developing Member States vary, no fixed set of criteria can be applied uniformly to all project proposals. However, the following general criteria serve as useful guides in the evaluation of project proposals to the Agency for Agricultural research:

- The project must be scientifically and technically feasible with a clearly defined output and contribute to the development of the country, and must involve the safe and effective use of nuclear techniques;
- Adequate local counterpart support must be available, from the point of view of basic local infrastructural set up, manpower and financial resource; where necessary, a training or fellowship component could be included in the project request to back-up or upgrade local manpower.

Applications have to be submitted on special Technical Cooperation Forms which can be obtained from the Technical Cooperation Department of the Agency, or through the applicant's National Atomic Energy Commission, or the Ministry which has jurisdiction over nuclear matters. This local government body would have to endorse the application after satisfying itself that the proposals submitted form part of their national goals and forward them to the IAEA for consideration, listing the various projects according to priorities.

It is necessary to state clearly on this form, the background information, objectives and work plan of the proposed research. The scope of the project and all the assistance needed to conduct the project must be fully described.

A proposal could be made for a small project, such as one requiring only an instrument or a simple research study. Alternatively, proposals could be for a large scale project involving request for expert services,

consultants, equipment, training, etc. Although projects are approved on a yearly basis, possibilities exist for for planning projects, to be executed over more than one year.

Processing of Requests:

The official submission of a project proposal through the designated channel is the first step. After having reached the Agency's Technical Cooperation Department, it will be evaluated by the appropriate Technical Division. Some of the criteria used for evaluation have already been outlined. Where the information provided is not adequate, additional information will be requested. Projects are evaluated early in the year preceding their implementation, thus requests for 1984 must be received late in 1982 or very early in 1983.

Final approval for project funding rests with the Board of Governors. However, usually, there are insufficient funds in the Agency's budget to cope with all approved projects. Some of the approved projects, designated as "Footnote A" projects, are therefore submitted to Member States for voluntary support. One or two donor Member States may offer to provide extra budgetary funding for a "Footnote A" project. In some instances, when a project is found to be of high priority, it may be inserted into a country project and funded in the context of UNDP programme.

SOILS RESEARCH AT THE AGRICULTURE SECTION
OF THE SEIBERSDORF LABORATORY IN 1982,
IN SUPPORT OF THE JOINT FAO/IAEA COORDINATED RESEARCH PROGRAMMES.

- A. The following field experiments were conducted in 1982:
- 1) The application of the N-15 methodology to measure symbiotic nitrogen fixation by forage legumes. Two aspects are being studied: the evaluation of standard crops and the effect of different methods of applying N-15.
 - 2) The use of the N-15 methodology to quantify nitrogen fixation of leguminous trees.
 - 3) The effect of mulching on nitrogen uptake by apple trees.
 - 4) Additional studies on symbiotic nitrogen fixation by grain legume crops using the N-15 methodology, e.g.:
 - Nitrogen fixation by soybean cultivars at two levels of N-fertilizer application.
 - The effect of competition for nitrogen from a cereal on nitrogen fixation by a grain legume crop. The crop combinations being studied are (i) faba bean-barley and (ii) soybean-sorghum, in separate field experiments.
 - 5) Field evaluation of a natural organic fertilizer source (guano) by means of isotope techniques.

Most experiments were harvested and sampled in the Summer and Fall of 1982. Isotope analysis will be carried out during the winter of 82/83.

B. Fellowship Training at Seibersdorf during 1982.

Each year a number of fellowships are awarded to scientists from developing Member States to receive intensive training in Seibersdorf on the use of stable and radioactive isotopes in soil-plant studies. This forms part of the regular fellowship programme of the Department of Technical Co-operation.

Fellows, as the trainees are called, usually begin their training as participants in the annual Interregional Training Course on the Use of Isotope and Radiation Techniques in Studies on Soil-Plant Relationship in Seibersdorf. They may then receive training for varying periods of time, determined largely by the scope of training required for each fellow.

Because training and research activities are closely related, on-the-job training is mainly provided in the field of research in which the laboratory is active. However, many fellows are encouraged to carry out recommended projects on their own.

In 1982 eight scientists were selected as Fellows for training at the Seibersdorf Laboratory. Mr. Cocou POTI from Benin received Fellowship training as a participant of the Interregional Training Course.

Mr. B.R.V. IYENGAR from India, was trained in the use of isotope techniques in determining fertilizer use efficiency by tree crops.

Mr. El Hag MOHRLI from Morocco and Mr. J. ARRILLAGA from Uruguay were trained in isotope analytical techniques and the planning of field experiments using isotope techniques.

Mr. Ali T. AYOUB from Sudan is carrying out glasshouse and incubation experiments with N-15 using soils from Seibersdorf and the Sudan Gezira and two leading cotton varieties from the Sudan to study fertilizer use efficiency and to investigate gaseous nitrogen losses.

Mr. K.S. KUMARASINGHE, a plant physiologist from Sri Lanka is performing studies of nitrogen fixation in Psophocarpus tetragonolobus (L) DC (Winged bean) and Phaseolus vulgaris cv. Cipro (climbing bean) in relation to photosynthetic carbon metabolism. This research is being done using N-15 and C-14 isotopes.

Ms. I. NIKOLOVA from Bulgaria is comparing different isotope techniques to evaluate rock phosphate materials under greenhouse conditions.

Ms. R. AFZA from Bangladesh, after completion of her research work is preparing her doctoral thesis to be submitted to the University of Vienna.

C. Laboratory services:

The Soils group of the IAEA Seibersdorf Laboratory offers various services which are not known by many of our readers. Some of this work is described below:

(1) Routine analytical work:

The Analytical Group is requested to render services to co-ordinated research and technical co-operation programmes. These include analyses of the isotopic composition of plant and soil samples. The development of improved routine N-15 analysis techniques by mass-spectrometry in the Laboratory enables the staff to cope with a large number of N-15 analyses. In addition, analytical services such as analysis of protein and amino acids in samples supplied by the Plant Breeding and Genetics Section and those from the Seibersdorf Laboratory's own field experiments are carried out by this group. The analytical output during 1981 is shown below:

Section	Programme	Analysis of N-15		Total N
		Mass-spectrometry	Emission spectrometry	Kjeldahl
	Supporting field experiments	1720	-	1650
	N-Residues	1850	400	-
Soil	N ₂ -Fixation	2600	-	-
Science	Semi-arid areas	400	50	-
	Multiple cropping	400	-	-
	Independent contractors	320	-	-

Plant Breeding and Genetics Section: Lysine analyses: 2160
 % N by Technicon: 2000
 % N by Kjeldhal: 250

- Special analyses: 50 samples

The total analytical output over the years can be summarized as follows:

	1977	1978	1979	1980	1981
Mass-spectrometry	7000	6430	3700*	6150	7290
Emission spectrometry	1000	620	350	370	450
Nitrogen analysis	-	-	200	500	1650

* Low output because of breakdown of the mass-spectrometer and the installation of new equipment.

It should be pointed out that the total number of samples analysed represents the full capacity of this group. Also the distribution of N-15 labelled fertilizers for work done under research contracts or other IAEA-supported projects is made by this group.

2. Development work:

- This Laboratory does not only render routine isotope analytical services to the participants of programmes but also develops methods enabling them to carry out their own isotope analyses. As the result of the development work we can enumerate the following achievements:

- A metal vacuum line which can be used for any kind of sample tube for mass-and emission spectrometry in N-15 assay. The line has been used in the Seibersdorf laboratory and has proved to be very reliable. In the few instances that these lines have been supplied for technical co-operation projects, we have received very satisfactory reports. As a result, it has been decided that in future, vacuum lines to be provided for the Agency's Technical Co-operation Projects will be assembled in Seibersdorf.

- The staff of the Soils Laboratory in close co-operation with the Entomology Section of the Seibersdorf Laboratory have developed a technique for the labelling and detection of N-15 in the Brown Planthopper (BPH), Nilparvata lugens, Stal., which is a serious pest of rice in tropical Asia. Marking insects for subsequent recognition in ecological studies is known to be an effective technique. The technique and results were reported in a short communication submitted to *Entomologia Experimentalis et Applicata*.

- A new emission spectrometer, NOI-6, is being developed by scientists in the Institute for Isotopes and Radiation Research in Leipzig, GDR. This instrument eliminates the need for high vacuum in sample preparation, thus cutting down on costs and time in the determination of $^{14}\text{N}/^{15}\text{N}$ ratios. For these reasons, the Seibersdorf staff has taken keen interest in the development of this instrument. Some of the Seibersdorf Staff held meetings in Leipzig with the GDR staff involved, and have offered useful suggestions on modifications needed to be made on the instrument, so that the equipment could be used by researchers participating in FAO and IAEA coordinated research programmes, as well as technical cooperation programmes in developing countries. As a result of the discussions held, a joint project proposal for the development of the NOI-6 emission spectrometer has been prepared and submitted through the Government of the GDR to the Agency for support.

Report on the FAO/IAEA/SIDA
International Training Course on the Use of Isotope
and Radiation Techniques in Studies on Soil/Plant Relationships

Seibersdorf, Austria.

29 March -21 May, 1982.

This year's course, which was held from 29 March to 21 May 1982, was the fifth hosted by the Seibersdorf Laboratory in five consecutive years.

There were 20 participants from 18 developing Member States. The teaching staff consisted of IAEA Staff Members from the Seibersdorf Laboratory and the Joint FAO/IAEA Division. In addition, Dr. H. Faust from the German Democratic Republic and Dr. K. Reichardt from Brazil (now with the Joint FAO/IAEA Division) were guest lecturers in areas of their specific expertise.

From 29 March to 23 April, the participants familiarized themselves with the theoretical and practical aspects of safe handling of radioisotopes, preparation of samples for isotope analysis and isotopes detection by means of Geiger Muller, liquid scintillation and spectrometry techniques. During that time the participants had the opportunity to prepare plant samples for N-15 analysis and to determine $^{15}\text{N}/^{14}\text{N}$ ratio by means of emission spectrometry.

During the second part of the course from 23 April to 21 May the participants devoted their time to isotope techniques used in the laboratory, greenhouse and field. Practical training was given on

studies of the efficient use of different fertilizer sources and the use of isotopes for determining symbiotic nitrogen fixation by legume crops.

Field determination of soil water storage was conducted, using the neutron moisture density probes. Participants were taught how to calibrate the instrument, and a demonstration on the determination of the "effective" cluter of the probes was carried out.

Tree crop studies involving a determination of their active root distribution patterns were conducted. The double labelling technique, employing both ^{32}P and ^{33}P was used in these investigations.

The course on the whole placed strong emphasis on the planning and execution of field and greenhouse experiments, and included calculations and interpretation of the isotope-derived data. The course also offered each participant the opportunity to inform other colleagues of present and future agricultural programmes in his country, and areas where isotope studies could be used or their use strengthened were identified and discussed. They also made contacts with various staff members of the Joint FAO/IAEA Division and IAEA with a view of developing cooperative Programmes in the future.

TECHNICAL COOPERATION ADVISORY MISSIONS

Dr. J.B. Bole, then Head of the Soil Fertility, Irrigation and Crop Production Section undertook a programming mission entitled "Nuclear planning and programming in Bolivia" from 3 to 7 May, 1982. Dr. Bole's mission consisted of programming future activities and possible IAEA assistance in soil fertility studies in Bolivia. In addition, he reviewed work being carried out under project BOL/5/004, Radioisotopes in Agriculture.

SCIENTIFIC TRAVEL RELATED TO ISOTOPE USE IN AGRICULTURAL RESEARCH

Dr. K. Kalinin of the Soils Section participated in the Steering Committee Meeting of the FAO/IAEA/GSF Coordinated Research Programme on the Role of Isotopes in Studies on Agricultural Residues, held in Neuherberg, Federal Republic of Germany, on 2 July, 1982.

Dr. K. Reichardt of the Soils Section, was in Ghent, Belgium from 23 - 24 September, 1982, in connection with the FAO/IAEA Interregional Training Course on the Use of Isotope and Radiation Techniques in Soil Physics Studies.

Report on the FAO/IAEA/ Interregional Training Course on the Use of Isotope and Radiation Techniques in Soil Physics Studies

Ghent, Belgium
6 - 24 September, 1982

The training course was held at the Department of Soil Physics, State University of Ghent and was attended by 16 participants from 16 developing Member States. These were: Brazil, Bulgaria, Chile, Ecuador, Egypt, Jordan, Kenya, Republic of Korea, Malaysia, Mauritius, Sierra Leone, Sri-Lanka, Sudan, Tanzania, Thailand and Turkey.

The course director was Dr. M. De Boodt from the University of Ghent. The teaching staff was composed of Belgian lecturers, Drs. L. Baert, M. De Boodt, W. De Breuck, W. Diericks, J. Feyen, D. Gabriels, R. Hartmann, I. Impens, P. Jacobs, C. Sys, O. van Cleemput, and non-Belgian scientists, P. Moutonet and G. Vachaud from France, and Dr. D.R. Nielsen from U.S.A., who delivered lectures related to their specific expertise.

Participants were exposed to lectures and experimental work on the application of nuclear and isotope techniques used to measure and trace soil-water. These included neutron moderation, gamma-ray attenuation, neutronography, D₂O gamma detection and the use of tracers. These methodologies were related to practical aspects of soil characterization, soil water balance, crop water requirement, irrigation and spatial variability of field measured soil water properties.

The IAEA and FAO, through their Joint Division express their gratitude to the Belgian Government/State Department of Development Cooperation for the provision of participants fellowships, including travel costs, and for hosting the course, the Research station of Ornamental Plant Growing for the facilities offered to conduct field experiment, the University of Ghent/Department of Soil Physics for the overall organization and running of the training course and the lecturers from abroad and from Belgium.

PUBLICATIONS

The following cost-free technical documents are in press, and should be available for distribution to interested scientists very soon:

1. The Use of Nuclear Techniques in Improving Fertilizer and Water Management Practices for Tree Crops (Proceedings of a Consultants Meeting).
2. Nuclear Techniques in Improving Pasture Management (Proceedings of an Advisory Group Meeting).

OTHER ITEMS

Visits to the Soils Section:

Dr. Thomas Rosswall, from the Swedish Agricultural University, Uppsala, visited and had discussions with staff of the Soil Science Section of the IAEA Seibersdorf Laboratory and the Soils Section of the Joint FAO/IAEA Division from 19 to 20 April, 1982.

Dr. E.J. Da Silva, from the Division of Scientific Research and Higher Education, UNESCO, visited the Joint FAO/IAEA Division on 20 April 1982, and had discussions with staff of the Soils Section, especially on areas of future cooperation between the Division and UNESCO.

Dr. D.F.R. Bommer, Assistant Director General, Head of the Agriculture Department, FAO, Rome had discussions with staff members of the Soils Section on 10 August, 1982.

FAO/IAEA Consultants Meeting on the Role of Isotopes in Studies of Nitrogen Fixation and Nitrogen Cycling by Blue-Green Algae and their Associations

A small group of internationally reputed scientists was invited to review the role of the blue-green algae and Azolla as sources of fixed N₂ from the atmosphere, and how the fixed N₂ becomes available to associated or succeeding crops. The invited scientists were: Dr. J.H.

Becking, The Netherlands; Dr. P.A. Roger, Philippines; Dr. P.A. Reyenaud, Senegal; Dr. S.A. Kulasooriya, Sri Lanka; Mr. K. Jones and Dr. W.D.P. Stewart, United Kingdom. Dr. E. Dujardin (Mrs.), Belgium attended the meeting at her own expense. Dr. C.S. Ofori, participated as a representative of AGL, FAO, Rome. Together with staff members of the Joint FAO/IAEA Division and the IAEA Seibersdorf Laboratory they reviewed in particular, the extent to which isotopes have been employed to answer some of the questions related to the usefulness of these cyanobacteria and their associations in the N turnover of soils and plants. The group agreed that valid data on quantities of N_2 fixed in the field, by these organisms was lacking. The use of ^{15}N to assess N_2 fixed and to measure N turnover was strongly recommended. The Meeting was held from 11 - 15 October, 1982, in the Vienna International Center, Vienna.

FAO/IAEA Research Coordination Meeting
on the Use of Nuclear Techniques in Development of Fertilizer
and Water Management Practices for Multiple Cropping Systems

Vienna, Austria
8 - 12 November, 1982

The second meeting of the group will be held in Vienna in November. Reports on isotope aided research designed to identify the optimum placement of N and P fertilizer for an intercropped cereal and grain legume will be presented. Additional studies performed by some participants used ^{15}N to determine the effect of P placement on dinitrogen fixed by the legume component of intercropped plants.

COMING EVENTS

Announcement of the FAO/IAEA Seibersdorf Training Course
on the Use of Isotopes in Studies on Soil/Plant Relationships
16 May to 2 July, 1983

The 6th FAO/IAEA Interregional Training Course on the Use of Isotope and Radiation Techniques in Studies on Soil/Plant Relationships will be held at the Seibersdorf Laboratory from 16 May to 2 July, 1983. About 20 participants from developing Members States will be selected for training. Applications are now welcome for individuals actively engaged in research involving the use of isotopes, or who intend to use isotopes for future studies.

The course will provide basic training including the safe handling and detection of isotopes. Practical training will include the use of nuclear techniques for evaluating fertilizer sources, form of placement and time of application; isotope-aided studies on biological processes, such as biological nitrogen fixation and photosynthesis; nuclear techniques for monitoring soil moisture, etc. Emphasis will be placed on the planning and execution of field experiments, and ample time will be spent on the calculation and interpretation of data.

Interested candidates from developing FAO/IAEA Member States should please apply immediately for Application Forms and further information from the Head, Training Course Section, IAEA, Wagramerstrasse 5, P.O.Box 100, A-1400 Vienna, Austria. Completed application forms must be submitted through the appropriate Government Agency of the individual's country responsible for Atomic Energy matters.

Announcement of the
Interregional FAO/IAEA Training Course on the Use
of ^{15}N in Soil Science and Plant Nutrition

The next FAO/IAEA Interregional Training Course on the Use of ^{15}N in Soil Science and Plant Nutrition will be held from 25 May to 17 June at the Zentralinstitut für Isotopen und Strahlenforschung, Leipzig, German Democratic Republic.

The Course aims at training scientists from developing Member States of the Agency and FAO in several aspects of the use of ^{15}N -enriched, and ^{15}N -depleted fertilizers in soil and plant nutrition studies. Participants will also be trained in the use and servicing of the emission spectrometer for ^{15}N determination.

Interested participants from developing Member States may apply for application forms now from the Head, Training Course Section, IAEA, Wagramerstrasse 5, P.O.Box 100, A-1400 Vienna, Austria.

FAO/IAEA International Symposium
ON ISOTOPES AND RADIATION TECHNIQUES IN SOIL PHYSICS
AND IRRIGATION STUDIES

18 - 22 April 1983
 Aix-en-Provence, France

This symposium will be hosted by the Government of France, in Aix-en-Provence, 18 - 22 April, 1983. It will provide an opportunity for exchange of information on recent advances in the use of isotope and radiation techniques in soil physics research, with special emphasis on studies of soil-water-plant relationships.

List of topics:

- improvements in and new techniques using nuclear equipment in agricultural research.
- the interrelationships between management factors and soil physical properties and their effect on root growth, crop water use and productivity.
- the effect of management factors on soil water conservation and nutrient dynamics in soil.
- water and solute transmission and retention as affected by the chemical and physical properties of the soil.
- management of saline soils and waters.
- soil and water conservation practices.
- hydrodynamic characterization of experimental sites.

Potential participants should send a completed form which outlines the paper to be presented at the symposium through their official channels, to the Secretariat at IAEA, not later than 15 November 1982, together with six copies of an extended synopsis (maximum 800 words).

Soils Newsletter

Joint FAO/IAEA Division
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