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Animal Production and Health Newsletter

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

No. 2 June 1985

CONTENTS

Dear Colleague,

Since the last Newsletter, the Section has held 3 Research Coordination Meetings, a Regional Seminar for African and Middle East countries, and an Advisory Group Meeting on animal production in harsh environments. Together with 7 outside consultants we have also undertaken an evaluation of animal production and health research in 14 African countries during which we visited about 60 veterinary or animal science institutes to see at first hand what is currently being done by way of research in the fields of nutrition, reproduction and disease, and thereby assess how in the future we may assist in supporting and developing these activities. By the time the next edition of the Newsletter is published, we hope to provide more information on this.

Our Training Manual on animal nutrition has now been published and this will be used during the FAO/IAEA Nutrition Training Course scheduled for 26 August - 20 September 1985 in Seibersdorf, Austria. Our one regret about this course is that the applications from so many people who wished to participate had to be turned down (we had over 90 applications from nearly 50 countries for the 18 places available). On the same theme, we have to say that regrettably there are now virtually no vacancies for further Research Contracts within the framework of our 7 established Coordinated Research programmes which already contain around 90 Contractors and 30 Agreements holders. However, and as indicated in the last Newsletter, we hope to establish a new Coordinated Programme on animal diseases during late 1985/early 1986, and therefore for those of you working on disease diagnostics, there could be openings coming up.

In this issue of the Newsletter, we would also like particularly to bring to your attention the fact that in March 1986, the IAEA and FAO are sponsoring an International Symposium on animal production and health. Full details of the scope of this Symposium, how to go about applying for participation, and copies of the relevant forms are included. If you are interested in participating, please adhere to the deadlines indicated and remember to send the information requested through the official channels. You can't participate if you don't do this!

Finally, we are pleased to announce that Dr. S. Oschmann, formerly of the Technical University of Munich, (FRG), joined the Section at the end of May. Stefan is a veterinarian with particular experience in animal fertility problems and the use of radio- and enzyme immunoassay techniques in studies of such problems. He will be working mainly in our immunoassay laboratory at Seibersdorf as well as serving as a field expert.

With best wishes,

J.D. Dargie
L-E. Edqvist
M.C.N. Jayasuriya
S. P.Oschmann
J. I.Richards

(A) PAST EVENTS

(1) First FAO/IAEA Research Coordination Meeting on "Improving the Productivity of Sheep and Goats with the Aid of Nuclear Techniques", ILRAD, Nairobi, 4-8 March 1985

This meeting was held at the International Laboratory for Research on Animal Diseases (ILRAD), Nairobi, and was attended by 14 Research Contract/Agreement holders. In conjunction with the meeting, a visit was made to the USAID Small Ruminant Collaborative Research Support Program at Ol Magogo. The Agency would like to thank the staff of both ILRAD and USAID for their excellent organisation of this meeting and for providing the participants with the opportunity of seeing at first hand the facilities available and projects being undertaken by them in Kenya. Below is a short summary of the principal recommendations which arose from the meeting.

The objectives of this research programme were specified as follows:

- improvement of cheap and locally available feedstuffs;
- improvement of fertility by manipulation of feeding regimes especially during the postpartum period and by early pregnancy testing;
- increasing the number of offspring per year by strategic weaning, by use of the male effect and by treatment with gonadotrophic hormones;
- optimizing the age at which puberty is reached by hormone measurements and by studying the adverse effects of some infectious diseases.

(a) The participants in this programme strongly recommended as a general rule that the first coordination meeting should be held at the beginning of the programme. This will allow a better exchange of ideas and a more coordinated design of the experiments right at the start of the programme.

(b) Prior to the first Coordination meeting, information about the background of the contract and agreement holders should be circulated, using a format which was decided upon at this meeting.

(c) The participants strongly recommended that a training course in laparoscopy should be organised, preferably in direct connection with the next coordination meeting.

(d) It was further strongly recommended that work plans of contract holders should be evaluated according to a standardized scheme with criteria, including proposed statistical methods for analysis in order to make evaluation more efficient and systematic.

(e) It was recommended that a quality control programme should be started for the purpose of standardization of assay techniques, especially radioimmunoassay. This programme can be very helpful both in validation of assay procedures and in making more comparable the assay results of different laboratories, often located in different countries.

(f) Part of the next coordination meeting should be devoted to a course on experimental design.

(g) It was recommended that IAEA considers providing the contract holders with the following reference volumes on sheep and goat production:

- Reproduction in sheep, Ed. D.R. Lindsay and D.T. Pearce, Austral. Acad. of Science, 1984

- Goat Production in the Tropics. Ed. C. Devendra and M. Burns, Commonwealth Agricultural Bureaux, 1983

- IAEA Training Manuals on Reproduction and Nutrition.

(h) The programme recognises the value of promoting identification of genetic resources of indigenous breeds (small ruminants), and promotion of exchange of these resources.

(2) Second FAO/IAEA Research Coordination Meeting on "Use of Nuclear Techniques in the Study and Control of Parasitic Diseases of Farm Animals, Rabat, Morocco, 22-26 April 1985

This meeting was held at the Institut Agronomique et Vétérinaire Hassan-II, and was attended by 13 of the research contractors/agreement holders in the programme. The Agency would like to record its appreciation of the excellent arrangements made by Dr. A. Dakkak and the staff of the Department of Parasitology, not only for the meeting itself, but also for the visits to the Disease Diagnostics Institute at Casablanca and to the vaccine production unit at Rabat. Below are the conclusions and recommendations from the meeting:

In helminthology, studies should be initiated and/or continued on:

(a) The effect of host nutrition (particularly the protein content of the diet) on the pathogenesis of gastrointestinal infections and the resistance of animals to such infections.

(b) The effect of protein and/or energy infusions on the gross efficiency of use of nutrients in parasitised sheep and on resistance to such infections.

(c) The disturbances in gastrointestinal motility associated with helminth infections and the implications of such disturbances on feed conversion efficiency.

(d) The genetic selection for resistance against gastrointestinal parasites of sheep including the study of selective matings based on the presence of the lymphocyte marker (SYI) associated with high resistance and the continuation of line breeding for estimation of realised heritability; through field studies further confirmation of the relative resistance of selected high and low responders will be sought.

(e) The resistance conferred to sheep against lungworm and H. contortus and to dogs against E. granulosis using irradiated parasites. Also cross-protection in sheep between F. hepatica and S. bovis will be further examined using irradiated parasites.

(f) The epidemiology of gastrointestinal helminth and lungworm infections in sheep and cattle.

In protozoology, work should continue on:

(a) Evaluation of the use of irradiation for production of an attenuated vaccine against B. bigemina for use under field conditions and development of a sensitive radioimmunoassay for seroepidemiology and diagnosis.

(b) Isolation of B. bovis field strain and its attenuation by irradiation for use as a vaccine.

(c) Cloning and expression of the gene for the $15B_1$ B. bovis protective antigen.

(d) Comparative study of the efficacy of irradiation and/or culture for the attenuation of A. marginale.

Additionally:

(a) It was recommended that the work described in the attached work plans be completed during 1986 and that the participants write up the results obtained from these and previous work conducted under the programme in the form of a scientific paper which can be considered for publication by IAEA.

(b) The final RCM of the programme should be held in Vienna during late 1986/early 1987 at which time all potential publications should be reviewed.

(c) The Scientific Secretary should provide guidelines to Contract and Agreement holders on the format for all publications.

(d) In conjunction with the final RCM, a small Consultant's Group Meeting should be convened to provide guidelines for future IAEA programmes in animal parasitology.

(3) Second Research Coordination Meeting on "Optimizing Grazing Animal Productivity in the Mediterranean and North African Regions with the Aid of Nuclear Techniques", Udine, Italy, 6-10 May 1985

This meeting, which was attended by 22 scientists, was held at the Universita degli di Studi di Udine and was very ably organised by Prof. P. Susmel of the Institute for Animal Production. Again the Agency is very grateful to Prof. Susmel for all he did on its behalf to make the meeting so successful.

(a) Interim Programme Achievements

The programme is now well established and is working satisfactorily. Contract holders have been able to work effectively and those with initiative have made considerable progress. For example, the assay of progesterone has been established by all contract holders present at the meeting and concerned with the study of reproduction. Equally, in the study of water turnover, the use of tritiated water to assess water metabolism in a variety of circumstances and conditions has been effectively established. This is seen to be fundamental to advance the understanding of nutritional requirements in arid environments. In

terms of the assessment of nutrient requirements, contract holders have effectively linked local research to internationally recognised methodology and systems. Some contract holders are now moving effectively to use physiological and endocrine traits in particular to characterize grazing animals in their locality. Others are moving to contribute to international physiological research. The understanding of wider variation is relevant to science; it also serves as a sound basis to establish a group of trained zoo-technicians for the benefit of local animal production.

(b) Recommendations

(i) Contract holders should be encouraged to describe the circumstances and objectives of the research more precisely. The relationship between the research and the national animal production targets should be defined.

(ii) Now that a number of research techniques are well established, contract holders should be encouraged to define specific research objectives in terms of testing clearly formulated hypotheses. These hypotheses might relate either to the use of physiological traits to characterize animals in local conditions or to enhance basic scientific understanding or the adoption of this scientific methodology. This approach would prevent unnecessary measurement of superficial parameters.

(iii) Contract holders have shown an appreciation of the need to acknowledge interactions between the various components of the animal production systems. It is important that they continue to document relevant circumstances but should not complicate experiments unnecessarily. The nutritional status of animals used in the study of reproduction for example should be described carefully and guidelines were drawn up for this purpose.

(iv) The effectiveness of the programme would be enhanced if arrangements could be established for greater continuity of coordination. The Agency could well have a direct role in this. Equally the contract holders should interact among themselves more effectively. The failure of most contract holders to participate in the progesterone quality control programme was seen as a serious deficiency. More contact between agreement and contract holders might also be helpful. Some agreement holders for example could be encouraged to interact with a particular group of contract holders.

(v) It is recommended that the Seibersdorf Laboratory facilities be made available for the measurement of ^{15}N in samples generated by some contract holders investigating the relation between nutrition, water metabolism and urea recycling.

(4) FAO/IAEA Regional Seminar on "Research Using Nuclear Techniques Aimed at Improving Meat, Milk and Wool Production from Ruminant Animals in the Middle East and Africa", Ankara, Turkey, 3-7 June 1985

This Seminar provided a forum to review the various ways by which nuclear methods when combined with conventional techniques can be used to improve animal nutrition, reproduction and disease control under the different ecological conditions prevailing in Africa and the Middle East. During the first few days of the meeting, descriptions were given

by experts in their respective fields of the techniques which are available for work in the above areas, and these descriptions were followed by details of the type of information which can be obtained and the use which can be made of this information. Included in the seminar were sessions on such topics as trace element, protein, energy and water requirements of ruminants, radioimmunoassay techniques to monitor reproductive performance and assess environment-breed interactions, ELISA techniques for disease diagnosis, and the production of radiation-attenuated vaccines. The Seminar was attended by over 60 participants from the Regions concerned.

(5) FAO/IAEA Advisory Group Meeting on "Improving the Productivity of Indigenous Animals in Harsh Environments with the Aid of Nuclear Techniques", Ankara, Turkey, 3-7 June 1985

This meeting was held in conjunction with the Seminar described above. Its aim was to provide FAO and IAEA with an evaluation of current isotope and radiation methodologies used to quantify such functions as adaptation to heat, digestion and utilisation of poor quality feedstuffs, reproductive efficiency and resistance to disease and other forms of stress. It also produced a set of recommendations and guidelines for the sponsoring organisations' future activities in promoting research in these areas in developing countries. We hope to be able to publish the proceedings of this meeting during 1986 and at this stage would like to thank the following for their advice:

Dr. P. Buttery, (U.K.); Dr. J. Crowther (U.K.); Dr. W. v. Engelhardt (FRG); Dr. J.E. Frisch (Australia); Dr. K. Göksoy (Turkey); Dr. P. Holmes (U.K.); Dr. O.F. Idris, (Sudan); Dr. B.M. Kessy (Tanzania); Dr. L.R. McDowell (USA); Dr. M.N. Qureshi (FAO); Dr. D. Robertshaw (USA); Dr. M. Terqui (France); Dr. W. Thatcher (USA).

(B) STATUS OF COORDINATED RESEARCH PROGRAMMES

(1) Isotope-aided Studies on Non-Protein Nitrogen and Agro-Industrial By-Products Utilization in Ruminant Nutrition with Particular Reference to Developing Countries.

This programme will be terminated early in March 1986 when it is intended to hold the final research coordination meeting in conjunction with an FAO/IAEA Symposium (see later).

(2) Use of Nuclear Techniques in the Study and Control of Parasitic Diseases.

This programme has a full complement of Contract and Agreement holders and therefore no further awards can be considered. We are planning to hold the final RCM at the beginning of 1987.

(3) Application of Radioimmunoassay to Improving the Reproductive Efficiency and Productivity of Large Ruminants.

This programme is also full and therefore no further awards can be considered. Arrangements are being made to hold the 2nd RCM in Vienna at the time of the Symposium described later (17-21 March 1986).

(4) Improving the Productivity of Sheep and Goats with the Aid of Nuclear Techniques.

No further awards can be considered for this programme which is also full. The 2nd RCM will probably be held in 1987.

(5) Optimizing Grazing Animal Productivity in the Mediterranean and North African Regions with the Aid of Nuclear Techniques.

This programme is also full; we intend to hold the final RCM either late in 1986 or early in 1987.

(6) Regional Network for Improving the Reproductive Management of Meat and Milk-producing Livestock in Latin America with the Aid of Radioimmunoassay Techniques.

This programme currently has 16 Contractors and 4 Agreement holders, and therefore we are not seeking further proposals. The 2nd RCM will probably be held in 1987.

(7) Use of Nuclear Techniques to Improve Domestic Buffalo Production in Asia - Phase II

In this programme 14 Contracts and 6 Agreements have been awarded. We are not seeking any further proposals for work on buffalo nutrition or reproduction, but it may be possible to award further Contracts for studies on disease. Applications should be sent to the Agency as soon as possible, since it is hoped to hold the first RCM under the programme in Indonesia early in 1986.

(8) Improving the Diagnosis and Control of Infectious and Parasitic Diseases of Livestock in Developing Countries with the Aid of Radioimmunoassay and Related Techniques

This programme was first announced in the last edition of the Newsletter and already we have received a large number of applications. However, due to financial restrictions it has not yet been possible to award any contracts, and this, combined with the fact that we would like all contracts under the programme to be initiated at around the same time, means that there is still time to consider further proposals. As usual, proposals should be sent to Mr. P.M. Cate of the Contracts Administration Section of the IAEA - preferably as soon as possible, but certainly not later than 31 October 1985. In view of the large number of new readers, a brief description of the scope and goals of this programme is given below:

(a) Scientific Background:

Livestock diseases adversely affect food production in all parts of the world. The enormous wastage resulting from disease can be guaged from the fact that more than 50 million cattle and buffaloes and 100 million sheep and goats die each year, the productivity and reproductive efficiency of many millions more are seriously reduced, and vast quantities of animal products are condemned at slaughter. In addition, some diseases have a pronounced effect on the establishment and development of viable animal industries, inhibit international trade in animals and animal products, and have severe effects upon crop production in those areas where livestock provide draught power (especially at the small-farm level).

The major diseases of food-producing animals are caused by viruses (e.g. foot-and-mouth, rinderpest, African swine fever); bacteria (e.g. brucellosis, leptospirosis) and by protozoal parasites (e.g. babesiosis and trypanosomiasis); also, a number of helminth infections (e,g. hydatids and trichinella) have considerable public health importance. Although some of these conditions continue to pose serious potential threats to all countries, it is in the economically developing countries of Asia, Latin America and Africa that their most devastating effects are felt. Disease control is therefore a high priority requirement for the veterinary services of these countries.

Paramount to the control of animal diseases is rapid and accurate diagnosis. Not only does this enable identification and treatment of cases and carriers and/or removal of reservoirs of infection, it also increases the effectiveness of vaccination strategies. In many instances, diagnosis is based solely on clinical observations, but since the clinical signs of some diseases vary or cannot be differentiated from others, such observations should be supported by isolation and identification of the organism concerned. However, some organisms cannot be easily isolated or grown in culture, the procedures are often time-consuming, and the results are obtained too late to institute effective therapy or other control measures. Serological immunoassay tests are therefore also widely employed as tools for diagnosis. These assays are based on the fact that infectious agents can be identified by a specific antigen-antibody reaction, and the tests themselves either involve the detection of organism-specific antigens or detection of an altered antibody status.

Until recently, diagnostic immunoassays have involved tests such as classical neutralisation, complement fixation, immunofluorescence or gel diffusion. Although producing a result within one to a few days, these tests are often cumbersome and inferior in terms of sensitivity, precision and through-put to the more modern radio- and enzyme immunoassays (RIA and EIA) which now cover about 90% of the routinely reported tests in the research and diagnostic fields. Although there are a number of RIA and EIA systems available, the form which has attained most widespread usage for diagnosis is the solid-phase assay in which antigens or antibodies are passively adsorbed onto microtitre polystyrene or polyvinylchloride plates or tubes and reacted with the test material. Subsequently, a radio- or enzyme-labelled antibody is added, followed in the case of EIA by an enzyme substrate which changes colour on degradation. The amount of radioactivity or colour measured is a function of the amount of antigen or antibody in the test material and the end result can be assessed objectively in simple manual counters or colorimeters. For large-scale testing, multi-well manual gamma-counters or microtitre plate colorimeters may be employed.

In June 1983, the Joint FAO/IAEA Division convened a Consultants Meeting in Vienna to review the applications of nuclear and related techniques in the study, diagnosis and control of livestock diseases in developing countries (see Section on publications ii. of this Newsletter). The consultants recognised the expertise and experience of the Animal Production and Health Section of this Division in promoting the widespread development and application of RIA and related techniques to the study and improvement of reproductive efficiency of animals kept at the small-farm level. They further noted the similar technical basis of RIA and non-isotopic assays such as EIA, and recommended that the Division should embark on supporting programmes of research and development involving the use of both techniques.

(b) Scientific Scope and Proposed Programme Goals:

The programme will be directed towards:

(i) improving the diagnosis of infectious and parasitic diseases of ruminant livestock and pigs using radioimmunoassay and/or enzyme immunoassay techniques;

and

(ii) employing these tests to obtain a better understanding of the factors affecting the epidemiology of such infections and their impact on productivity.

The following topics are recommended as priorities for attention:

- Assessment of the suitability of RIA and/or EIA techniques for the diagnosis of important viral, bacterial or parasitic diseases in tropical and subtropical countries. This would require comparative studies between these modern immunoassays and and longer-established techniques in order to determine the most suitable approach to specific disease problems.

- Evaluation of the use of RIA and/or EIA in epidemiological surveys of viral, bacterial or parasitic disease.

- Evaluation of the use of RIA and/or EIA for assessing the success of vaccination or other disease control campaigns.

- Application of RIA and/or EIA techniques to determine the role of infectious or parasitic disease on reproductive efficiency and/or growth rate.

- Examination of the relationship between such factors as nutrition and genotype on the resistance of livestock to viral or bacterial infections.

(C) PUBLICATION

(1) The FAO/IAEA Laboratory Training Manual on "Use of Nuclear Techniques in Animal Nutrition" will be available in August. It can be obtained from the Division of Publications, IAEA; approximate price: Austrian Shillings 680,-- or equivalent paid in your local currency or UNESCO coupons. The contents of this manual include descriptions of the potential of isotopic techniques in animal nutrition; properties of radionuclides and radiation; and radiation detection and protection. These are followed by descriptions and exercises on the measurement of radioactivity and tracer methodology; the preparation of animals with fistula in the digestive tract; determination of ^{15}N; measurement of flows and volumes in the alimentary tract of ruminants and non-ruminants; and measurement of such parameters as microbial protein synthesis, VFA production, glucose turnover, urea synthesis, Ca absorption and endogenous excretion, body composition, etc. All in all, there are some 60 exercises in the Manual dealing with various aspects of animal nutrition.

(D) DEVELOPMENTS AT THE SECTION'S LABORATORY, SEIBERSDORF

The first ruminant nutrition training course to be held in the Section's laboratory at Seibersdorf will take place from 26 August to 20 September 1985. We have received 93 applications from 48 countries. The selected candidates will be provided in due course with further details on the training course.

During the past few months, 'The Fibrous Residue Bank' received 22 residue samples from 11 countries for evaluation using the rumen simulation technique. Six samples have already been analysed for their rumen fermentation characteristics and the data is being processed before transmission to the respective contract holders. We hope that this information will be of value to the research workers as a supplement to their own data. We wish to urge those contract holders who have not yet sent us samples to do so as early as possible.

Subsequent to testing the viability of progesterone antibodies from Sweden and Canada with three ^{125}I progesterone conjugates, the immunoassay laboratory has developed two liquid-phase progesterone RIA systems for distribution to Research Contractors and Technical Cooperation Project counterparts. At present, the laboratory is developing a coated tube RIA employing a purified antibody and an ^{125}I progesterone conjugate. Over the next few months, liquid and solid RIAs for testosterone and 17beta-oestradiol and an enzyme immunoassay system for progesterone in bovine blood will be developed. Quality control criteria for all steroid assays will be established concurrently.

In addition to the availability of antisera for progesterone, oestradiol, testosterone and LH (Newsletter No. 1, January 1985), the laboratory can now supply lyophilised milk and serum standards for progesterone.

Finally, the laboratory is pleased to have had the company of Mr. Costas Photiou from Cyprus as its first training fellow in RIA procedures. Whereas most of his training was in RIA techniques for measuring steroid hormones in milk and blood using ^{125}I, one month of the 6 month training period was spent at the Biochemistry Department, Vienna Veterinary School where he familiarised himself with progesterone RIA using tritium. We are indebted to Prof. E. Bamberg and his colleagues at the Veterinary School for their valued collaboration with our training programme.

(E) FORTHCOMING EVENTS

(1) FAO/IAEA Training Course on Ruminant Nutrition - Animal Production and Health Section Laboratory, Seibersdorf, Austria, 26 August - 20 September 1985.

(2) Final Research Coordination Meeting on "Isotope-aided Studies on Non-Protein Nitrogen and Agro-Industrial By-Products Utilization in Ruminant Nutrition with Particular Reference to Developing Countries, Vienna International Centre, Vienna, Austria, 17-21 March 1986.

(3) Second Research Coordination Meeting on "Application of Radioimmunoassay to Improving the Reproductive Efficiency and Productivity of Large Ruminants", Vienna International Centre, Vienna, Austria, 17-21 March 1986.

(4) First Research Coordination Meeting on "The Use of Nuclear Techniques to Improve Domestic Buffalo Production in Asia - Phase II, Indonesia, early 1986.

(5) FAO/IAEA International Symposium on the Use of Nuclear Techniques in Studies of Animal Production and Health in Different Environments", V.I.C., Vienna, 17-21 March 1986.

The information given below concerns the scope and how to apply for participation in the Symposium. This information and a circular letter inviting Governments to designate interested scientists to participate have already been distributed to the official authorities (Ministry of Foreign Affairs, Ministry of Agriculture, National Atomic Energy Authority or National FAO Committee) of Member States of FAO and IAEA.

(a) Background

The efficiency with which animals are reared for the production of meat, milk, wool and other products is substantially lower in the tropical regions of the world than in the temperate zones. There are a variety of reasons for this state of affairs but essentially the lower productivity associated with tropical areas arises from high environmental temperatures and humidities; from seasonal variations in the availability and quality of feed; from a restricted water supply; and from a high prevalence and incidence of infectious and other diseases. Not all animals, however, suffer to the same extent under such conditions - in fact, some indigenous species and strains of cattle and sheep not only survive and reproduce successfully, but actually produce substantial amounts of protein and by-products.

The key to producing animals in an efficient manner under tropical conditions is to have a thorough understanding of the relationship between the animals and their environment and in particular to determine for each set of conditions (e.g. for the wet and dry tropics) the optimal combination of environmental adaptation and productivity. For many years, nuclear and other advanced techniques have played an important role in defining parameters of adaptation and productivity under temperate zone conditions. Moreover, such techniques are now being frequently used in tropical zone countries where the requirement as well as the potential for increased animal productivity are fully recognized.

For more than two decades the Joint FAO/IAEA Division of Isotope and Radiation Applications of Atomic Energy for Food and Agricultural Development has actively supported research to quantify such functions as animal adaptation, digestion and utilization of poor quality feedstuffs, reproductive efficiency and resistance to disease and other forms of stress. This Symposium will provide a forum at which scientists from various disciplines will review the various ways by which nuclear and other methods can be used to evaluate and improve animal nutrition, reproduction and disease control under the different environmental conditions prevailing in the developing world.

(b) Programme and list of topics

The focus of the Symposium will be the presentation and discussion of scientific results on the topics listed below, in the form of paper and poster presentations. In addition, sufficient time will be available for participants to exchange information during poster sessions.

(c) List of topics

(i) Animal Nutrition/Environmental Adaptation

- Role of tracer techniques in animal nutrition studies.
- Nutritional strategies for the better utilization of crop residues and non-conventional feedstuffs in the developing tropics.
- Manipulation of rumen fermentation to enhance animal productivity.
- Feeding standards. Do we really need them?
- Effect of environment on animal productivity.
- Trace elements in animal nutrition.

(ii) Animal Reproduction

- Immunoassay techniques: current status and future trends in studies on reproductive efficiency of livestock.
- Hormone determinations as a tool to improve reproductive efficiency.
- Effects of environmental constraints (e.g. temperature, nutrition, disease) on reproductive efficiency.
- Genotype x environment interactions with particular reference to reproductive performance.

(iii) Animal Diseases

- Disease diagnosis by radio- and enzyme immunoassay techniques.
- Mechanisms of immunity to viral, bacterial and parasitic infections.
- Vaccination against parasites.
- Recombinant DNA technology in diagnosis and vaccination.
- Genetic resistance to disease-causing organisms.
- Mechanisms of disease caused by viruses, bacteria and helminth/protozoal parasites.
- Interactions between disease, nutrition and/or reproductive efficiency.

(d) Participation

All persons wishing to participate in the meeting have to complete a Participation Form (Form "A" at the end of the Newsletter), and send it as soon as possible to the competent official authority for subsequent transmission to the IAEA. A participant will be accepted only if the Participation Form is transmitted through the Government of a Member State of the Food and Agriculture Organization of the United

Nations or the International Atomic Energy Agency or by an organization invited to participate. Participants whose designations have been received by the Secretariat will be notified directly two to three months before the meeting.

(e) Expenditures

As a general rule, the sponsoring organizations do not pay the cost of attendance, i.e. travel and living expenses, of participants. However, limited funds are available to help meet the cost of attendance of participants selected from those designated by Governments of developing countries with low economic resources. Scientists from such countries should, when applying to attend the Symposium, ensure that their Government requests a travel grant from the Director General of IAEA at the time of submission of the participation form to Vienna (see form "C" at the end of this Newsletter).

(f) Papers

- The submission of a paper implies that the author intends to participate in the meeting if it is accepted. It is therefore necessary that the Participation Form (Form "A" at the end of the Newsletter) is also completed by authors.

- All papers (apart from invited reviews), must present original work; they should not have been published elsewhere.

- It should be noted that, in order to provide ample time for discussions, the number of papers that can be accepted for presentation at one of the regular sessions of the meeting and for subsequent publication in the proceedings will be limited. If the number of relevant and high quality papers submitted for selection considerably exceeds the number that can be accepted for the regular sessions, poster sessions may be arranged.

- A completed Form for Submission of a Paper (Form "B" at the end of the Newsletter) must be sent to the competent official authority for transmission to the Secretariat in time to reach it by 16 September 1985 (see section h below), together with six copies of an extended synopsis of a maximum of 800 words (i.e. two A4 sides of close-spaced typing or the equivalent, including any tables or diagrams and a few pertinent references). This synopsis should give detailed information on the contents of the proposed paper, in order to enable the paper selection committee to give it proper evaluation. Introductory and general matters should not be included. The synopsis - if accepted - will be reproduced (reduced to about 70% of its original size) in unedited form in the Book of Extended Synopses; therefore the original must be submitted as a camera-ready copy.

- Authors will be informed whether their papers have been accepted for presentation at a regular session. If so, six copies of the full text of the paper, preceded by an abstract of 300 words maximum (including the master copy), must be sent direct to the Secretariat by 10 February 1986 as these are required by the Editor of the proceedings to be published.

- Authors whose papers have been accepted for "poster presentation" will in due course receive instructions for the preparation of the poster. The extended synopses of their posters will be included

in the Book of Extended Synopses which will be distributed at the beginning of the meeting, and an abstract of 300 words maximum will be published in the proceedings.

(g) Working languages

Working languages of the meeting will be English, French, Russian and Spanish. All communications, synopses, abstracts and papers must be sent to the Secretariat in one of these languages.

Simultaneous interpretation may be provided between all the working languages if six weeks before the meeting it is seen from the Participation Forms received that these are required.

(h) Proceedings

The proceedings of the meeting will be published by the International Atomic Energy Agency as soon as possible after the meeting. They will include all papers presented, printed in full in the language of submission, together with abstracts in the original language and in English. In addition they will include abstracts of poster presentations. With a view to speeding up publication of the proceedings and reducing its costs, the length of the papers will be strictly limited.

(i) Secretariat

The address of the Secretariat is: International Atomic Energy Agency, IAEA-SM-292, Vienna International Centre, P.O.Box 100, A-1400 Vienna, Austria. Telephone No.:(0222) 2360 plus extension; Telex No.: 1-12645; Cable address: INATOM VIENNA

The Scientific Secretary of the Symposium is Dr. J.D. Dargie; the Administrative Secretary is Mr. H. Bakhoum.

FORM A

FOOD AND AGRICULTURE ORGANIZATION OF THE UNITED NATIONS

IAEA-SM-292

INTERNATIONAL ATOMIC ENERGY AGENCY

International Symposium on the Use of Nuclear Techniques
in Studies of Animal Production and Health
in Different Environments

Vienna, Austria

17 - 21 March 1986

To be sent to the competent official authority (Ministry of Foreign Affairs, Ministry of Agriculture, National FAO Committee or national atomic energy authority) for transmission to the Secretariat, P.O. Box 100, Vienna International Centre, A-1400 Vienna, Austria.

PARTICIPATION FORM

Family name:	All initials of given names:	Mr. Ms.
Institution	Full address: Cable address: Telex No.:	
Nationality:	Designating government or organization:	
Mailing address (if different from address of institution):		
Date of departure from mailing address:		

Indicate below in which of the meeting languages you are able to follow the proceedings of the meeting and in which language(s) you can express yourself:

Language	English	French	Russian	Spanish
Speaking				
Understanding				

Do you intend to present a paper?	YES ☐	NO ☐

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International Symposium on the Use of Nuclear Techniques in Studies of Animal Production and Health in Different Environments

IAEA-SM-292

Vienna, Austria

17 - 21 March 1986

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