



Animal Production and Health Newsletter

JOINT FAO/IAEA DIVISION OF NUCLEAR TECHNIQUES IN FOOD AND AGRICULTURE
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CONTENTS

TO THE READER	2
A. PAST EVENTS	4
National Training Course in Indonesia	4
Research Coordination Meeting on Buffalo Production	4
Research Coordination Meeting on Sheep and Goat Production	6
Advisory Group Meeting on Animal Nutrition	8
Research Coordination Meeting on Feeding Strategies for Ruminants ..	13
Research Coordination Meeting on Asian Livestock Production	16
Research Coordination Meeting on Rinderpest Serosurveillance	17
B. STATUS OF EXISTING COORDINATED RESEARCH PROGRAMMES	19
C. NEW COORDINATED RESEARCH PROGRAMME	21
D. DEVELOPMENTS AT THE SECTION'S LABORATORY UNIT, SEIBERSDORF	25
E. PUBLICATIONS	29
F. FORTHCOMING EVENTS - REGIONAL FAO/IAEA SEMINAR FOR AFRICA	30

32 / 10

Dear Colleague,

As forecast in the introduction to the last edition of the Newsletter, it's been a busy last 6 months with 5 Research Coordination Meetings, an Advisory Group Meeting on animal nutrition and a national training course in Indonesia having already been held, and a Regional Seminar for Africa combined with two Research Coordination Meetings due to come up in September. In the course of organising these activities (which by the end of the year will have involved over 200 participants in various aspects of animal production and health supported by the Joint FAO/IAEA Division), it's natural that the technical officers of the Section responsible for running the programmes, have received a lot of feed-back - not only of a technical nature, but also on how we go about organising our activities. We greatly appreciate these inputs even if in some cases they are critical, because they give us a basis for re-thinking the technical direction of our programmes, the nature of the support we should be providing, and ways of improving our administrative procedures. In this edition of the Newsletter, we have reported fairly extensively on the conclusions and recommendations from a number of our recent meetings. If the experiences which we have gained in running these programmes and the advice we have been given by our participants are going to be put to good use in the future to improve our programmes, then clearly there will have to be some changes. And, without going into details (these are spelled out for each activity) we are determined to do our best to see these changes through, difficult as some of them will be to implement.

One point worth making however is our aim in the future to "regionalise" the vast majority of our Coordinated Research Programmes and where possible to link these with Technical Cooperation projects in the individual countries concerned. Apart from its obvious technical merits, this approach will allow us to maintain much greater contact with Research Contract holders through visits by technical officers and outside experts which in turn should improve the level of technical back-stopping we can provide for project activities. Also, with the recent appointment of Regional Experts who will travel frequently and extensively throughout their regions, we will have a direct mechanism for identifying institutes and individual staff worthy of future support. At present, we have Martyn Jeggo, Kees Plaizier and Camille Ooijen doing this job in Africa and Oswin Perera in Asia, and next year we hope to be in a position to appoint a Regional Expert for Latin America. We are certain that these developments will go some way towards improving our programmes, but of course it will take a little time for them to be felt!

Another aspect which should be mentioned is our laboratory support programme from Seibersdorf. We see this purely as an activity to improve the quality of back-stopping available to our projects in developing countries, but we also know we can't go it alone! So, not only do we rely on the expertise of our many FAO/IAEA meetings participants to pass judgement on and help us to define the topics and scope of our programmes, but we also could not operate without the help we get from the outside scientific community with regards to laboratory activities. In trying to develop this laboratory programme, we asked for and received the best possible collaboration from some of the best institutes and scientists in the world in the fields of animal nutrition, reproduction and disease diagnostics. Although the laboratory only became fully operational 3 or 4 years ago, we know already that the services and products it provides are greatly appreciated by the institutes and scientists we are trying to

assist in developing countries. For instance, our various standards and kits for progesterone and rinderpest are already recognised as extremely reliable even under the most difficult conditions. As experience is gained with some of the other products now being developed or coming on line through validation trials in the field, we are confident that our role as "middle-men" for the transfer of appropriate technology from the developed to the developing world through the collaborative programmes we have established between Seibersdorf and national and international laboratories will go a long way towards helping institutes in the developing countries define and solve their problems.

Finally, there has been only one change in the staffing of the Section over the past few months, namely that Dr. Dan Sharp joined us at the beginning of June to help with our programmes in animal reproduction. Dan comes from the Department of Animal Science of the University of Florida, Gainesville, USA with a background of research on the mechanisms regulating seasonal reproduction and the establishment of pregnancy. He will be based at the Agency's Laboratory at Seibersdorf where he will assist with our work on the development and validation of immunoassays for hormones, as well as with training of scientific and technical staff from developing countries. Dan is on sabbatical leave from Florida, and we are grateful to his Government authorities for providing the necessary additional support needed to enable him to come and work with us.

With best wishes,

James Dargie, Francesco Castrignanò, Mark Eisler, Noble Jayasuriya,
Martyn Jeggo, Camille Ooijen, Emyr Owen, Oswin Perera,
Kees Plaizier, Wyn Richards, Dan Sharp, Hermann Unger

(A) PAST EVENTS

(i) UNDP/FAO/IAEA National Training Course on "ELISA for Serodiagnosis of Animal Diseases", Bogor, Indonesia, 6-25 February 1989.

A National Training Course on "ELISA for Serodiagnosis of Animal Diseases" was held at Balitvet, Bogor, Indonesia, 6-25 February 1989, as part of the UNDP/FAO/IAEA Technical Cooperation Project INS/88/013. The local organization of the course involved the National Atomic Energy Commission, BATAN, which is the project counterpart organization, the Directorate General of Livestock Services (DGLS), and the Research Institute for Animal Diseases (BALITVET). Experts from the United States, Australia and Canada lectured on ELISA serodiagnostic methods, immunology and epidemiology, with particular reference to Brucellosis. Other applications of ELISA were also considered.

The course was followed by a one-day seminar entitled "Bovine Brucellosis: A Challenging Disease for Indonesia" which involved course lectures and participants, and personnel from BATAN, DGLS and BALITVET. Following the seminar, discussions were held with DGLS personnel regarding possible IAEA involvement in follow up to the training course, and in assistance with ELISA serodiagnosis in the DGLS Disease Investigation Centres.

Participants of the National Training Course (Indonesia):

Dr. Herlin D. Sumaryani, Dr. Dwi Ambar W., Dr. I. Made Suastawa, Dr. Sri Maniatiningsih, Dr. Shi Pangastoeti, Dr. Achmad, Dr. Alit Eka Putra, Dr. Isep Sulaiman, Dr. Herawati Setyaningsih, Dr. Supriyanto, Dr. Enuh Raharjo Jusa, Dr. Muchson Arifin, Dr. Murnihati Iskandar, Dr. Indrawati Sendow, Dr. Effendi, Dr. Cattleya Pandoe, Dr. Risa Tiuria.

We would like to record our appreciation of the assistance provided in running this Course by Drs. T. Spencer, B. Patten and S. Sutherland (Australia), Dr. L. McClure (Canada) and Dr. R. Jacobson (USA).

(ii) FAO/IAEA Final Research Coordination Meeting on "The Use of Nuclear Techniques to Improve Domestic Buffalo Production in Asia - Phase II, Rockhampton, 20-24 February, 1989

The final RCM of this programme was held at the Tropical Cattle Research Centre, Rockhampton, Australia, in conjunction with a meeting on buffaloes being sponsored by the Australian Council for International Agricultural Research (ACIAR). The meeting was attended by 12 FAO/IAEA Research Contract holders and 5 Research Agreement holders from Malaysia (4), Bangladesh (2), the Philippines (2), Pakistan (1), Thailand (2), Indonesia (2), Japan (1) and Australia (3). After the individual presentations, the group formulated conclusions and drew up recommendations for future research in buffalo production in the Asian region.

We would like to thank all the Contract and Agreement holders who contributed to this programme over the past five years. We would also like in particular to express our sincere thanks and appreciation to Drs. John Vercoe and John Frisch and the staff of the Tropical Cattle Research Centre, Rockhampton, Australia for the outstanding arrangements they made for the meeting. The full text of the papers and of the conclusions and

recommendations arising from this meeting will be published by the Agency as a Panel Proceedings Series in 1990.

However, some of the General Recommendations arising from this CRP are given below:

1. Nutrition

- (a) The programme contributed to a marked improvement in knowledge of buffalo nutrition. Many of the conclusions arising from research trials have been translated into strategies which have been tested under small holder conditions.
- (b) In the last phase of the programme emphasis was placed on field-oriented interdisciplinary research. This was not fully realized in all instances due to lack of adequately trained staff in the different disciplines. It became evident that "team" effort was required for proper planning and execution of field trials. The participants recommended that FAO/IAEA consider a further Coordinated Research Programme on the productivity of large ruminants in Asia with the objective of studying nutrition/reproduction interactions involving research teams incorporating both nutritionists and reproductive physiologists.
- (c) A major hypothesis arising from the meeting is that an improved body condition mediated via feed supplementation, i.e. better balanced nutrient availability, during the postpartum period may considerably shorten the anoestrous period. This should be investigated further.

2. Reproduction

Despite the considerable progress made in the understanding of female reproduction, calving rates of buffaloes under small farming systems continue to be low. Many studies demonstrated that the low fertility of cycling buffaloes is often due to the unavailability of fertile bulls or wrong timing of insemination.

- (a) It was recommended that examinations of buffalo bulls for breeding soundness should be conducted in villages to establish if there are seasonal fluctuations in semen quality.
- (b) Efforts should be made to develop a simple method for confirming oestrus (based on physical and behavioural signs) for animals submitted for artificial insemination. Studies are also needed to establish the optimum time of insemination during oestrus.
- (c) Cheaper methods of oestrus synchronization are needed for greater utilization and effectiveness of artificial insemination.
- (d) Since conception rates are generally lower with artificial insemination, research should be undertaken on semen extenders for freezing buffalo semen and on the survivability of buffalo spermatozoa stored in liquid nitrogen.

- (e) Studies on reproduction/nutrition interactions should be continued under village farming systems and strategic supplementation should be provided for postpartum buffaloes in poor body condition (a body score of <3) to overcome acyclicity.
- (f) Studies should be conducted to determine the role of infectious diseases in male and female infertility.

3. Diseases

- (a) The epidemiology and control of diarrhoeal diseases in buffaloes should be further investigated in Bangladesh, Malaysia and Sri Lanka.
- (b) Trypanosomiasis should be further studied in Indonesia to establish the antigenic types, their diagnosis and economic effects particularly on reproduction.
- (c) The effects on reproduction of viral diseases need to be further studied. This will require a multidisciplinary approach.
- (d) There is a need to develop diagnostic/seromonitoring tests to:
 - enable better definition of the prevalence of particular infections
 - evaluate present vaccination and other control strategies adopted.

(iii) FAO/IAEA Final Research Coordination Meeting on "Improving the Productivity of Sheep and Goats with the Aid of Nuclear Techniques", Perth, Australia, 20-24 February 1989.

This meeting was held at the New Westos Hotel, South Perth. The local organizing committee, composed of staff from the Western Australian Department of Agriculture under the direction of Dr. James Rowe, are to be congratulated on their friendly efficiency; the participants were met at the airport, provided with a meeting programme, an entertainment brochure, maps of the city etc. and briefed about administrative/financial matters well before the commencement of the programmed scientific sessions.

Fifteen participants from 11 countries attended the meeting as well as ten observers from local research institutions. The RCM was officially opened by Mr. N.J. Halse, Director General of the Western Australian Department of Agriculture. In addition to the presentation/discussion of scientific papers, three visits were made to different locations of interest during the course of the week: (i) Western Australian Department of Agriculture, Wongan Hills Research Station some 5 hours bus journey north of Perth. Current research programmes at the Station are designed to improve the productivity of cereals (principally wheat) legumes (mostly clovers and lupins) and sheep (wool production) within a rotational system; at the same time as optimizing productivity, efforts are made to retain organic matter in the soil and to use water, the most limiting resource, efficiently. (ii) Western Australian Department of Agriculture Headquarters, S. Perth. Participants were shown around the laboratory and

given an opportunity to discuss their research interests with Australian scientists. They found the various publications produced by the Department for the farming community on animal husbandry, feeding and disease control of particular interest and relevance to their own needs. (iii) A commercial wool packing shed (the largest of its kind in W. Australia) to witness the grading, sorting, sale, processing and packing of wool.

Comments and recommendations from this Research Coordination Meeting included:

1. General Comments on the Coordinated Research Programme

The research goals for this programme, formulated at the Second RCM in Malaysia in February 1987 can be summarized as follows:

- (a) The projects should attempt to document the characteristics of local sheep and goat genotypes with respect to their reproduction, lactation, growth and fibre production in relation to the nutrition and disease limitations in their respective environments.
- (b) The projects should attempt to improve the productivity of local small ruminants by:
 - (i) Manipulation of feeding regimes
 - (ii) Strategic weaning practices
 - (iii) Use of the "male effect"
 - (iv) Treatment with exogenous hormones
 - (v) Gene substitution (i.e. selection, crossbreeding)
 - (vi) Control of specific diseases.

An examination of the final reports of the contract holders at the meeting confirmed that the above goals were largely achieved. Specific examples of these are as follows:

- New information was obtained on the reproductive characteristics of goat breeds in Africa, Asia and Europe. This included data such as age at puberty, seasonality of reproductive cycles, litter size, kid survival, and growth rate. Hormone measurements documented the steroid patterns during the oestrous cycle, pregnancy and parturition.
- Novel nutritional strategies were evaluated in Malaysia and Europe for feeding waste products (e.g. rice straw, sawdust) to small ruminants.
- Management techniques (e.g. early weaning, use of the ram effect) were shown to improve the annual productivity of goats and sheep in Malaysia and Spain respectively.
- New approaches to monitoring hormonal patterns in domestic ruminants were developed in China by measuring steroids in hair and wool.
- Growth and carcass composition of a local goat breed and its response to nutritional manipulation were documented in Zimbabwe.

These examples provided evidence that the Programme dealt with realistic and achievable objectives. A feature of the programme was the

demonstration that RIA techniques could be used in developing countries to help solve practical problems. The contract holders were able to carry out high quality research as well as contributing significantly to progress in knowledge of animal production in difficult environments of the world.

2. Recommendations for Future Programmes

- (a) Despite the successes described above, the Agreement holders felt obliged also to comment on the shortcomings of the Coordinated Research Programme. Most projects could have been improved if there had been some on-site (i.e. the location of the project holder) assessment by an agreement holder during the programme. Difficulties encountered such as the assay technique, changes in experimental design, etc. could have been avoided if the projects were reviewed on-site, say two years after the start.
- (b) Where possible, contract holders should be chosen from an appropriate stage in their career path. That is, they should be in the 25-35 year age group, with good potential for independent research and development success. The project area should be of their own design where possible, so as to encourage independent skills and to avoid the unnecessary perpetuation of projects established by senior research bureaucrats.

(iv) FAO/IAEA Advisory Group Meeting on "Feeding Strategies for Improving Productivity of Ruminant Livestock", 13-17 March 1989, Vienna, Austria.

This meeting was held in conjunction with the feeding strategies RCM described below. Its purpose was a) to review recent developments in the use of nuclear and related techniques for feeding ruminant livestock in both developed and developing countries, b) to identify developments and techniques that could be of use in ruminant nutrition and production in developing member states and c) to review FAO/IAEA activities in animal nutrition and define the future role of the nutrition unit of the Seibersdorf laboratory in supporting programmes of the Animal Production and Health Section.

Below is a summary of the Conclusions and Recommendations arising from the meeting which was attended by:

Prof. P.J. Buttery (UK); Dr. J. Rowe (Australia); Dr. C. Devendra (Singapore); Prof. Syed Jalaludin Syed Salim (Malaysia); Dr. I Morrison (UK); Prof. W.v.Engelhardt (FRG);
Dr. V. Buvanendran (Zimbabwe); Dr. D.A. Beever (UK).

1. General Recommendations

- (a) The Advisory Group recognized the contribution to animal nutrition research which the Joint FAO/IAEA Division has made by bringing together scientists from developing and more developed countries to exchange ideas and knowledge, and by providing training in a wide-range of techniques in animal nutrition research. These efforts have been directed through Coordinated Research Programmes and Technical Cooperation projects and have done much to promote research and

development activities in developing countries. These activities should continue but recent efforts to change the approach from technique-oriented to problem-oriented work should be supported and strengthened.

- (b) In order to make the work which the Joint FAO/IAEA Division supports more relevant, it is essential that future project activities are evaluated not only for their scientific interest but also for their practical importance within the agricultural system to which the work will eventually apply. In order to do this some economic assessment of the likely impact of the proposed technology on the production system should be attempted prior to support being provided for any project. The Advisory Group emphasised the importance of clearly defining the objectives together with a sound economic evaluation to ensure the relevance of the results.
- (c) Ruminant production systems vary according to the agro-ecological environment and land use. Within each system the interactions between individual animal species and plants need to be more thoroughly studied using a 'systems' approach. The important elements of a system include genotype, climate, nutrition, disease, sociology/management and economics. The ecological and ethical aspects of the production system must also be taken into account. It is essential that systems be defined in such a way that they can be evaluated, and their limiting factors identified. More information is required on grazing ruminants and herbivores, rangeland management and ecology. In identifying systems, it is important to list the targets towards which the production system is geared.
- (d) Research programmes should attempt to be more interdisciplinary in approach. Interactions between animal nutritionists and scientists in other disciplines should be encouraged, both in the conduct of research and in the development of practical systems. For example, the interface between nutrition and reproduction has not been addressed adequately and should be given more attention in the future.
- (e) Among the existing production systems, those involving the integration of animals and tree crops are currently underestimated, and represent a considerable potential for study and development in the future.
- (f) In promoting a closer link between research and development work, closer collaboration and cooperation between FAO projects and the Joint FAO/IAEA Division's programmes is to be encouraged.
- (g) The Advisory Group endorses the Joint Division's previous concentration of efforts on ruminants, especially indigenous species. In future programmes, however, emphasis should be broadened to include other herbivores (e.g. camelids and equids) where these are important components of a system.

2. Specific Recommendations:

- (a) The focus on feed resources needs to quantify amounts available and should include feeds other than grasses and

cereal straws. There is some justification in considering non-conventional feed resources, which are currently underutilized e.g. poultry litter, root crop by-products and tree fodder and legumes.

- (b) Efforts should be made to identify the important and relevant measurements to be undertaken on feedstuffs. Contract holders should avoid making chemical analyses which may not be relevant (e.g. there are doubts about the usefulness of fibre analysis as a measure of nutritional value). Inadequate information exists on deleterious compounds/anti-nutritional factors and toxic substances in a number of tropical feeds. More documentation is necessary on their occurrence and effects on animals.
- (c) In many developing countries there has been an overwhelming research interest (perhaps overemphasized) in the treatment of cereal straws with one or more alkalis. The results of most of these studies are of doubtful economic and practical relevance. The application of these results on-farm, especially treatment by the urea-ammonia method, far outweighs the need for further research on treatment methods. Therefore, future studies should concentrate on applying existing knowledge. These should include an assessment of alternative options for treating roughages e.g. type and cost of alkali, cost of other inputs, feasibility of small-scale centralized schemes, acceptance by farmers, aspects of safety etc.
- (d) Options for improving the nutrition of ruminants are manifold and some of them are listed below. The adoption of one or more of these will depend on local conditions, including social considerations.
 - i). Treatment of cereal straws and other roughages and identifying varieties of superior digestibility.
 - ii) Supplementation with other feedstuffs or possibly feed additives which influence digestion in the gastrointestinal tract.
 - iii) Introduction of new crops with high protein content. (e.g. tree legumes).
 - iv) Alternative methods for feed conservation.
 - v) Manipulation of the animal's metabolism.
 - vi) Strategic use of accumulated animal-tissue reserves during times of shortages.
 - vii) Alternative use of fertilizers as 'feed improvers'.
- (e) Strategic supplementation with protein, carbohydrate and mineral/vitamins etc. needs to be given more emphasis in the future. Supplements should be designed in relation to season and physiological state of the animal within different production systems. Research should aim to identify strategic points in the production chain in relation to climate/season and to develop appropriate supplementation strategies. This

may be especially important where more than one animal species is involved in the production system, and where each species has a different biological strategy.

- (f) More sophisticated approaches, such as the biodegradation of lignocellulosic material by microorganisms and/or enzymes, rumen defaunation and genetic engineering of rumen-microorganisms are areas that have not yet been sufficiently investigated. These will require much more research before they can be proposed for technological development and on-farm application. In this context the Advisory Group was made aware of a new programme originating in the Joint FAO/IAEA Division entitled "Bioconversion of lignocellulosic agricultural residues to animal feed components". The activities of this programme should be linked, wherever possible, to activities within the existing programme.
- (g) The Advisory Group noted with some concern that many of the techniques used in experiments conducted under FAO/IAEA CRPs were varied and sometimes unrealistic. More thought needs to be given to the objectives of experiments and especially to the techniques that need to be used with respect to relevance, practicality and predictability. Associated with this is the need for adequate understanding of the basic principles governing the work.
- (h) The following measurements may be relevant in defining the quality of feedstuffs and physiological changes in the animal.

Feedstuffs:

- It is recommended that feeds be characterized through a limited amount of chemical analysis such as dry matter (DM), organic matter (OM) and crude protein (CP). The dacron bag technique is widely used and when applied and interpreted correctly, provides a useful estimate of feed degradability in the rumen. However, caution is required when using this technique to evaluate chemically modified roughages or novel/unusual feedstuffs. The standardization of the procedure can be improved by providing a uniform bag to all counterpart institutes supported by the Joint FAO/IAEA Division.
- For screening purposes in vitro methods may be appropriate for estimating dry matter degradation. The Joint Division could assist counterparts by providing roughage standards for these techniques.

Animals:

- The Group recognized the importance of understanding the nutritional status and metabolic responses of animals under conditions of fluctuating feed availability. It is clear that no simple measurement exists to assess the nutritional status of an animal at any given time. Change in liveweight, when considered together with the condition score and the genotype, provides the most practical means of assessing a change in nutritional status. Recent improvements in the design of electronic scales make it

possible to measure liveweight of all classes of animals accurately under field conditions. In addition to liveweight, milk and wool production are also easily measured and are sensitive indicators of changing nutrition.

- Assessing nutritional status by measurement of blood or urine metabolites can present problems because of difficulties in the assay procedures and the lack of understanding of the appropriate metabolite to measure. With considerable caution, the Group suggests plasma beta-hydroxy butyrate, free fatty acids, glucose and urea-N may be worth measuring. Indices of muscle protein breakdown such as the ratio of urinary methyl histidine to creatinine needs to be explored but only in those laboratories where appropriate analytical facilities are already available. This technique will not work in all species. The possibility of using urine allantoin as an index of microbial protein synthesis in the rumen under field conditions is worth exploring. There may be problems with this technique in animals with low levels of feed intake.
- (i) The Group felt that the FAO/IAEA laboratory in Seibersdorf should play an active role in developing, testing and validating standardized methods for measuring some of the above metabolites. The potential of this laboratory in supporting animal production research programmes by providing more sophisticated analyses (e.g. ¹⁵N and other stable isotopes) should also be explored.
- (j) Increased contact, both formal and informal, between contract and agreement holders is to be encouraged to ensure the effectiveness and success of FAO/IAEA programmes. The means whereby this contact can be increased should be investigated by the Agency. Possible ways of increasing contact include some, or all of the following:
 - i) Agreement holders acting as "advisers" on occasions and also making on-site visits.
 - ii) As part of technical cooperation projects, contract holders might visit agreement holder's laboratories for short periods (e.g. 3 weeks) for technical training, and advice.
 - iii) On-site involvement of technical staff from agreement holder laboratories with contract holders.
 - iv) Circulation of progress and annual reports from contract holders to agreement holders for comments and criticism.
 - v) Establishment of joint or linked agreement holder and contract holder research programmes. Where feasible, agreement holders and contract holders should interact in a way which may lead to joint programme activities. The latter should be greatly encouraged.
- (k) An important activity for the future will be to identify, and if necessary assist in creating a suitable journal for the publication of development work which may not always be

suitable for existing scientific journals. While this applies both to developing and more developed countries this need is more pressing for workers in developing countries.

- (1) The FAO and IAEA should continue to provide effective training programmes designed to meet the needs of different groups from developing countries. The possibility of running these courses in different regions close to on-going projects should be explored.

- (v) First FAO/IAEA Research Coordination Meeting on "Development of Feeding Strategies for Improving Ruminant Productivity in Areas of Fluctuating Nutrient Supply through the Use of Nuclear and Related Techniques", V.I.C., Vienna 13-17 March 1989.

This meeting was held in conjunction with the Advisory Group meeting on "Feeding Strategies for Improving Productivity of Ruminant Livestock".

Fourteen Research Contract and five Research Agreement holders from Australia, Bangladesh, Brazil, Cyprus, Iceland, Korea, Malaysia, Mexico, Morocco, New Zealand, Portugal, Sri Lanka, Thailand, Tunisia, Turkey, UK Venezuela, Zambia, and attended the meeting. After the scientific presentations, which focussed on the achievements of the individual contract and agreement holders over the past 15-18 months, the participants prepared work plans and research strategies for the coming 15-18 months. Each Research Contract holder was allocated a "responsible Research Agreement holder" so that the contract holders could directly communicate and interact with Agreement holders to discuss the progress of their research.

1. General Conclusions and Recommendations

- (a) Contract holders accepted the view that there was a need to define the whole farm system and, within the system, to identify the major limitations or constraints to production. These constraints would need to be placed in order of priority so that the relatively restricted resources available locally for research could be used to best effect in improving production for livestock owners. The aim therefore is to place proposed research activities into the context of a whole farm production system. Clearly, it cannot deal with all components of the whole farm system - this would be unrealistic. However, the research should be concentrated on the priority constraints to production within that system. It may or may not involve on-farm research but the research should be done with the knowledge of the constraints to production on the farm.
- (b) Contract holders accepted the need to assess how the work plan could be implemented in order to make sure that the plan was relevant and achievable within the limited resources available in the area. The work plans of the individual contract holders were prepared at the meeting in conjunction with agreement holders. However, it was considered necessary for agreement and contract holders to maintain contact through the exchange of information throughout the programme of research. This can be facilitated by the circulation of annual progress

reports to agreement holders as they become available to technical officers in the Joint FAO/IAEA Division.

- (c) It was felt that in some instances more technical expertise would be needed for the successful completion of the programme. One way in which the IAEA might be able to provide assistance would be through training courses held in Vienna. Another possibility would be the funding of visits of technicians or technical staff from the developing country laboratories to more established laboratories in developed countries. These might be laboratories of the agreement holders or alternatively other more appropriate laboratories in the region. It was suggested that it might be possible to obtain assistance through Technical Cooperation projects if a sufficiently strong case could be made.
- (d) The supply of items such as nylon bags and analytical standards and the printing and distribution of laboratory methodologies through the Seibersdorf laboratory was considered very useful. It was also suggested that the IAEA might investigate ways of providing assistance for convening local regional technical seminars in different regions.
- (e) Maintaining contacts between agreement holders and contract holders should be encouraged in all possible ways. Contacts might be facilitated by visits to counterpart laboratories by agreement holders or else by contract holders visiting the laboratories of agreement holders. The possibility of collaborative projects was also encouraged as a way of increasing the dialogue between agreement and contract holders. The possibility of joint publications would also provide a strong incentive for maintaining contact and exchange of information. However, there was concern as to how a collaborative project might be budgeted.
- (f) The IAEA has played and can continue to play a major role in assisting Research Contract holders in ordering and purchasing equipment. However on the question of maintenance of equipment it was recognized that the IAEA can only assist in purchasing spare parts, provided that an adequate description of the part and the equipment for which it is required is provided to the IAEA; however, actual installation would be the responsibility of the Contract holder.
- (g) To increase information flow and awareness of the assistance offered by the Agency a Current Awareness Bulletin Animal Science is now available incorporating the contents page of 30 selected animal science journals. Reprints of articles found in this bulletin can be obtained by contacting the VIC library. This initiative was enthusiastically received by the participants. The group also strongly recommended the purchase of four text books: a) Matching Ruminant Production Systems with Available Resources in the Tropics and Sub-Tropics - by T.R. Preston and R.A. Leng (available from Penamble Books, Armidale, Australia), b) The Feeding of Ruminants - Principles and Practice - by Dr. E.R.Orskov (available from Chelcombe Publications, U.K.), c) An Introduction to Rumen Studies - by J.W. Czerkawski, Pergamon Press, U.K.) and d) Better Utilization of Crop Residues and By-Products in Animal Feeding:

Research Guidelines. 2. A Practical Manual for Research Workers - by T.R. Preston (this will be supplied by FAO, Rome).

2. Specific Conclusions and Recommendations

(a) Nutritive value of forages and crop residues

The nutritive value of locally available roughages and other feedstuffs is still inadequately known. Work should therefore continue to focus on:

- (i) the determination of the rate and extent of degradation of locally available feeds and by-products together with crude protein and possibly mineral content.
- (ii) the development of new methods for evaluating nutritive value of fibrous feeds and roughages (eg. Orskov method).
- (iii) the investigation of the extent to which other by-products vary in nutritive value and the causes of such variation e.g. differences in leaf: stem ratio.

(b) Research into management options available to farmers should include:

- (i) the manipulation of body reserves and level of nutrition by supplementation as a means for achieving production targets.
- (ii) the strategic supplementation of basal diets firstly to supply nutrients to optimize rumen fermentation (e.g. rumen soluble N and S, protein, carbohydrates, lipid, macro and trace minerals), and secondly to provide nutrients which escape fermentation in the rumen (e.g. by-pass protein and energy) and which can be limiting to animal tissues.

(c) The RCM participants endorsed the views of the Advisory Group and their recommendations on feed and animal measurements that would be useful in future research studies. For example feeds should be characterized through a limited number of chemical analyses such as DM, OM and crude protein. The dacron bag technique would be useful for estimating the feed degradability in the rumen while in vitro techniques (e.g. Tilley and Terry method) may be appropriate for screening large numbers of samples for their potential digestibility. In relation to animal measurements which the group recognized as important in understanding the nutritional status of livestock under fluctuating feed availability, they endorsed the view of the Advisory Group that no simple measurement exists at present to assess the nutritional status of an animal at any given point of time. In addition to body weight change and condition score, milk and wool production would be useful parameters for indicating changes in the nutrient status of livestock.

(d) This group also stressed the need for continued basic research in order to better understand metabolic responses of animals to fluctuating nutrient supply and to develop measurements or indices that could be used under field situations to assess the nutrient status of livestock.

- (vi) FAO/TAEA First Research Coordination Meetings on "Strengthening Animal Reproduction Research in Asia through the Application of Immunoassay Techniques" and "Strengthening Animal Disease Diagnosis in Asia through the Application of Immunoassay Techniques", Kuala Lumpur, Malaysia, 22-31 May 1989.

The First Research Coordination Meeting (RCM) and Training Workshop of the above programmes were held jointly, at the Universiti Pertanian Malaysia. They were attended by 18 research contract holders and 5 research agreement holders, representing 10 countries in the Asian-Australasian region. In addition, two Australian scientists funded by ACIAR projects, the Regional Animal Production and Health Officer of FAO in Bangkok, and several observers from Malaysia participated. We would like to thank all those who helped with the local arrangements for the meeting and particularly Prof. M.R. Jainudeen and his organising committee. Thanks are also due to ACIAR for supporting the attendance of Drs. T. Spencer and L. Gleeson, and for the contribution of these scientists to the meeting.

The primary aim of the programmes is to obtain scientific knowledge and technical information, which can subsequently be used to institute low-cost management changes, to improve the productivity of indigenous ruminant livestock maintained on typical smallholder farms in Asia. Particular emphasis is being placed on the application of immunoassay techniques using radioisotopes and enzymes as markers, coupled with conventional methods, to monitor the reproductive efficiency and disease status of livestock.

In the reproduction component, radioimmunoassay (RIA) for progesterone measurement in blood or milk will be used as an adjunct to conventional clinical and physiological methods to monitor the reproductive status, to obtain information on factors which contribute to low fertility, and to test low-cost and practical methods of improvement which can be applied at the small farm level. In the disease component, enzyme-linked immunosorbent assay (ELISA) and DNA probe techniques will be applied, together with clinical methods and other tests, to the diagnosis of important diseases which limit productivity. Emphasis will be placed on studies dealing with epidemiology of these diseases, with the aim of developing and improving measures for control and prevention.

The RCM was followed by a four day training workshop. This included lectures on experimental design, statistics, sampling of blood and milk, processing and storage of samples, validation and applications of immunoassays (RIA and ELISA), and guidelines for writing scientific reports and for giving oral presentations. The practical training included hands-on experience in the performance of RIA for measuring progesterone in blood plasma and milk (for the reproduction group) and the ELISA for detecting antibodies to Brucella abortus (for the disease group).

Some of the General Recommendations arising from this RCM are given below:

- (a) It was noted that the two CRP's, on animal reproduction and disease diagnosis, have specific areas of research which are quite distinct. There is merit in having a combined RCM, but parallel (concurrent) specialist sessions should be held for presentations of contract holders' results, with combined plenary lectures to both groups by the agreement holders.
- (b) The 4-day Training Workshop following the RCM was very beneficial to the contract holders. This should be considered in the planning

of first RCMs under all new CRPs initiated by the Joint FAO/IAEA Division.

- (c) The first RCM should be held prior to the commencement of the research projects wherever possible. The contract holders should carry out a comprehensive literature search of background data and published work from their own country as well as similar countries in the region. This background data should be taken into consideration when designing work plans.
 - (d) Guidance on the writing and presentation of work plans should be given to the contract holders as soon as possible. This may be in the form of written guidelines distributed to the contract holders, as well as lectures given in the early stages of the first RCM. Guidance on the preparation of reports and scientific papers should also be presented, as was done during the present RCM.
 - (e) The second RCM of the two Asian CRPs should be held in February 1991, in Jakarta, Indonesia or in Manila, Philippines. The format should be as outlined above (i.e. concurrent specialist sessions and common plenary lectures).
 - (f) The contract holders should send a draft of the paper they intend presenting at the second RCM (with results and future work plan) to their assigned agreement holder by November 1990.
 - (g) Where a project requires statistical advice the contract holders should liaise with their respective agreement holder. Discussions might include the experimental design, design of data collection records, design of databases as well as the analytical procedures.
 - (i) At the second RCM contract holders should (a) review the objectives and work plan developed at the first RCM, (b) present results obtained up to that time and (c) present a clear idea of their proposed work plan for the next phase, including time schedules.
- (vii) FAO/IAEA/SIDA/PARC Second Research Coordination Meeting on "Serosurveillance of Rinderpest in Africa Using Immunoassay Techniques", Nairobi, Kenya 12 - 16 June, 1989.

The second meeting of the programme was held at the Pan African Rinderpest Campaign headquarters in Nairobi in conjunction with an FAO-funded Training Course. The meeting was attended by 18 Research Contract holders and 3 Agreement holders from Burkina-Faso, Burundi, Cameroon, Central African Republic, Chad, Ethiopia, France, Gambia, Ghana, Kenya, Mali, Niger, Nigeria (3), Rwanda, Senegal, Sudan, Sweden, Tanzania, Uganda (2) and UK, a computer consultant, Dr. N. Knowles (UK) and a number of FAO, EEC and PARC officials.

During the first three days training was given on the use of computers for data management and the participants were introduced to two software packages specifically written for use within this research programme. The first of these software programmes is concerned with interfacing an ELISA multiscan reader with a computer to provide a further standardisation of the testing procedure and to speed up the rate at which sera can be assayed. The second programme is primarily a spread sheet enabling the storing of details relating to each sampling and full epidemiological evaluation of this data.

During the remaining two days participants gave details of the rinderpest control programme in their individual countries and detailed their serosurveillance work. In nearly all countries the FAO/IAEA rinderpest ELISA for use in the sero-monitoring of rinderpest vaccination has been introduced and a system for routine use established. Many of the countries have completed pre-vaccination surveys and details of these were presented.

Several modifications to the FAO/IAEA rinderpest ELISA kit were introduced at this meeting including a revised protocol, the supply of sterile water for reconstitution of the conjugate and the removal of trichloroacetic acid as a stopper. A quality control system was developed involving the titration of the kit positive and negative control sera.

The following general conclusions and recommendations were arrived at:

- (a) All the contract holders in this programme have been sufficiently trained in the use of the rinderpest FAO/IAEA ELISA kit to enable them to conduct sero-monitoring.
- (b) The majority of the laboratories involved in the rinderpest serosurveillance network are now able to routinely test sera for rinderpest antibodies and have sufficient reagents and trained personnel to conduct a national survey.
- (c) These laboratories will be subject to an external quality control procedure during the next twelve months.
- (d) These laboratories should all have completed at least one national sero-monitoring survey during the next twelve months. This will involve not only the collection of the sera in the prescribed manner, but the testing of this sera and the presentation of the results to their respective national rinderpest co-ordinators.
- (e) Four laboratories (in Mali, Ethiopia, Uganda and Nigeria) will receive the two computer software packages within the next month. After using these for six months they will provide a critical report on their use. The programmes will then be updated and by the start of 1990, will have been supplied to all those laboratories in the network with suitable computers i.e. at present Mali, Ethiopia, Uganda, Nigeria, Kenya, Ghana, Niger, Senegal, Tanzania and Cameroon.
- (f) The remaining laboratories (in Burundi, Rwanda, Central African Republic, Somalia and Gambia) will need to introduce the ELISA system. Contract holders in these laboratories will concentrate on this aspect during the next 12 months following a similar approach to that adopted in the other laboratories.
- (g) Two months prior to the final RCM, individual contract holders will submit a full report of all work conducted under the programme. This will adopt the form used in scientific publications and will if at all possible be provided on a computer disc.
- (h) The final RCM of this programme should take place in November 1990 in Côte d'Ivoire

(B) STATUS OF EXISTING COORDINATED RESEARCH PROGRAMMES

(i) Regional Network for Latin America on the Use of Immunoassay and Labelled DNA Probe Methods for the Diagnosis of Livestock Diseases.

This SIDA-funded programme currently has 12 Research Contract and 3 Research Agreement holders and we are not seeking further participants. We hope to be able to hold the final RCM under the programme in Costa Rica during late 1990 or early 1991.

(ii) Improving the Productivity of Indigenous African Livestock using Radioimmunoassay and Related Techniques.

This programme is funded by the Ministry of Foreign Affairs of the Government of the Netherlands. The programme has 16 Research Contracts and 2 Research Agreements. No further participants can be accepted. The second RCM of this programme will be held during the Regional FAO/IAEA Seminar on "Improving Health and Reproductive Efficiency of Livestock through Radioimmunoassay and Related Techniques", in Harare, Zimbabwe, from 4-9 September 1989 (for details see later).

(iii) Improving the Diagnosis and Control of Trypanosomiasis and other Vector-borne Diseases of African Livestock using Immunoassay Methods.

This programme, also funded by the Government of the Netherlands, has 13 Research Contract and 2 Research Agreement holders; we are not seeking further proposals. Arrangements have been made to hold the second RCM of the programme in Harare, Zimbabwe, from 4-9 September 1989. This RCM will also be held in conjunction with an FAO/IAEA Regional Seminar for Africa on "Improving Health and Reproductive Efficiency of Livestock through Radioimmunoassay and Related Techniques".

(iv) Strengthening Animal Reproduction Research in Asia through the Application of Immunoassay Techniques

This programme now has a full complement of 10 contracts and 3 agreements. The list of participants was included in the Newsletter of January 1989.

(v) Strengthening Animal Disease Diagnosis in Asia through the Application of Immunoassay Techniques

This programme has 9 contracts and 2 agreements. In addition to those listed in the Newsletter of January 1989, the following have been included in the programme:

<u>Contract Holder</u>	<u>Title of Research Project</u>
1. Dr.(Ms) J.G. Garcia Laboratory Services Division Bureau of Animal Industry Diliman, Quezon City PHILIPPINES	Epidemiological studies on brucellosis in Philippine livestock using ELISA techniques.

Agreement Holders

1. Dr. A.J. Della-Porta
CSIRO, Australian Animal
Health Laboratory
Geelong, Victoria 3220
AUSTRALIA
ELISA for antigen detection and
epidemiology for virus diseases of
veterinary importance.
2. Dr. G.W. Burgess
Graduate School of Tropical
Veterinary Science
James Cook University
Townsville, Q 4811
AUSTRALIA
Application of ELISA to the
diagnosis of animal diseases.

(vi) Development of Feeding Strategies for Improving Ruminant Productivity
in Areas of Fluctuating Nutrient Supply through the Use of Nuclear
and Related Techniques

This programme has 14 Research Contracts and 5 Research Agreements and no further awards can be considered. The 2nd RCM of the programme should take place towards the end of 1990, and we are presently making plans to hold it in Asia.

(vii) Regional Network for Serosurveillance of Rinderpest in Africa

This programme has 21 contract holders and three agreement holders and no further awards can be considered. The final RCM under this programme is being planned for November 1990 in Côte d'Ivoire.

(C) NEW COORDINATED RESEARCH PROGRAMME

Details of a new CRP on the "Development of Feed Supplementation Strategies for Improving Ruminant Productivity on Small-holder Farms in Latin America through the Use of Immunoassay Techniques" due to be implemented in January 1990 were given in the January 1989 Newsletter. Numerous applications for participation in this programme have been received. However, in order to ensure that details of this new programme are circulated to as wide an audience as possible, these are repeated in this Newsletter. Submission of completed proposals should be to Ms. T. Benson, Head, IAEA Contracts Administration Section. The deadline is 18 September 1989, when we will be making our technical recommendations for funding.

Proposals should be countersigned by the Head of the institution and sent directly to the IAEA; they need not normally go through other official channels.

Title of Programme:

"Development of Feed Supplementation Strategies for Improving Ruminant Productivity on Small-holder Farms in Latin America through the Use of Immunoassay Techniques".

(i) Scientific and Technical Basis of Programme

(a) The human population of the Latin American region is reportedly a little over 400 million and increasing at the rate of 2.5% per year (1985 FAO Handbook). Despite rapid urbanization and industrialization over the last 20 years, one-third of the population are rural dwellers dependent on agriculture for food and income; a high proportion of this population lives in extreme poverty and suffers the consequences of malnutrition and disease. Livestock products are the major components of the food consumed by Latin Americans; they also account for a significant proportion of the regions' exports. However, as a result of the increasing domestic consumption related to the increased population over the last 15 years there has been a reduction in net exports and if this trend continues the region could become a net importer of livestock products in the very near future.

Latin America is a region with vast and varied animal resources which consist not only of the more conventional domesticated species (e.g., cattle, sheep and goats), but also of such indigenous species like the llama, alpaca and vicuña. The production of meat, milk, wool and/or hides from these animals is important to all countries of the region, providing nutrition and clothing for the human population, valuable export earnings, and perhaps most important of all - employment and income for a high proportion of the poorer people living in the rural and highland areas.

The types of ecosystems under which domesticated animals are reared in Latin America also vary greatly - from tropical and temperate grasslands through to semi-arid and desert scrubland, and often interspersed by areas of high fertility farming dependent upon irrigation water from mountain rivers. In most instances, however, animals are reared in areas where the climate is harsh and consequently they are subjected to a combination of stresses, e.g., extremes of heat, cold and high humidity; pastures of low nutritive value; and insufficient water supplies. Consequently, it is hardly surprising that the efficiency of livestock production in the region is invariably low. An analysis of livestock production and productivity in the region shows that there is a wide gap between actual and potential

achievements; thus, of total world livestock numbers, the percentage of beef cattle, dairy cattle and sheep in the Latin American region are 27%, 16% and 10% respectively; however, the production of meat, milk and mutton from these animals only represents 17.4%, 7.4% and 4.8% respectively (FAO Regional Report 1985). One may conclude from these figures that there is the potential for at least a doubling of productivity.

Nutritional limitations in livestock production, especially in the case of ruminant production in the Latin American region, are the most important factors preventing indigenous stock from achieving their potential. Pasture is the basic resource which sustains the Latin American region's ruminant population. Consequently development depends largely on the possibility of increasing its quality, quantity and year-long availability through modifications to existing pasture management and/or the provision of supplements to the animals in an attempt to balance the inadequacies of the pasture.

Improvement of grazing management and the utilisation of better-adapted grasses and legumes as well as conservation of fodder have not been successfully adopted by small farmers within the region. This has been partly due to the technical limitations of the message but mainly because economic factors have worked against the farmer's propensity to assume the investment risks involved in introducing technical change. It should be remembered that most technological advances in animal nutrition and feeding originate from developed countries and their adoption tends to be governed by a very different relative set of labour, land, input and capital goods costs than those prevailing in the Latin American region. Thus, the use of biotechnology at basic and adaptive research levels to improve forage crop performance has been rather poor; however, this technology may be a way to improve productivity at the animal level.

Mineral deficiencies or imbalances in soils and forages (and ultimately in animals) have long been held responsible for low production and for reproductive problems among grazing animals in the tropics. In the Latin American region, grazing cattle commonly suffer deficiencies of phosphorus, cobalt, copper and iodine and a toxicity of selenium; indeed, in severe cases, livestock production is even more limited by these elements than by either energy or protein. Research from tropical regions has shown that mineral supplementation can increase calving percentages by 20% and growth rates by up to 25% and can reduce mortality significantly. However, much work needs to be done to better define the problem areas in Latin America to assess the influence of deficiency/toxicity on production and on the economics of livestock enterprises and to develop practical and economic prophylactic measures.

Crop residues and by-products and animal waste contribute important yet underutilised sources of animal feed. One way to correct the seasonal deficiency of animal fodder would be to incorporate these residues in the diet and thereby improve the digestibility, intake and protein content of the ration as a whole. For instance, an improvement in the digestive efficiency of crop residues and high fibre diets can be effected by manipulating the rumen micro-flora and micro-fauna through feeding urea-molasses blocks as a source of ammonia and extra energy (and minerals). This technique has worked well under grazing conditions in the dry season in the tropical zone of the Latin American region although the productive, reproductive and economic responses of such supplementation have not been evaluated.

(ii) Scientific Scope and Proposed Programme Goals

The primary aim of the programme is to improve the productivity of indigenous ruminant livestock species maintained on typical small holder farms in Latin America through the identification of nutritional and management constraints which affect their reproductive and productive efficiency, and subsequently to devise and test suitable corrective measures which are within the practical and economic capabilities of the farmer.

This will be achieved by the provision of technical support and back-stopping to research institutions already conducting problem orientated investigational work in livestock production in the region. Monitoring the effect of nutrition on reproductive efficiency will be conducted through measurement of the blood or milk levels of metabolic, gonadotrophic and steroid hormones using radioimmunoassay (RIA) and enzymeimmunoassay (EIA) procedures. These will complement conventional chemical, clinical, behavioural, productive and economic values.

In order to achieve the above-mentioned general objectives, the programme will attempt to identify those nutritional and management constraints in indigenous livestock enterprises which the small-scale farmer is in a situation to rectify without undue demand on technical expertise and financial investment. Consequently, the attention will be given to:

- assessing the importance of mineral deficiencies/toxicities as determinants of existing levels of production through diagnostic procedures and through production responses to feed supplements;
- manipulation of the diet so as to provide livestock with an optimum diet for production during the wet-season as well as generating sufficient body reserves (internal fat stores) for meeting production requirements during times of nutritional inadequacy (dry-season);
- in concert with the above, the provision of locally available alternative feed resources such as urea/molasses/mineral blocks/poultry manure/fish meal and other protein sources to complement poor quality roughage during the dry season.

The effectiveness of supplementary feeding strategies will be monitored through already established reproductive monitoring techniques utilising radioimmunoassay and related procedures in concert with conventional reproductive measures (behavioural and calving/lambing indices) and production parameters (milk production, live-weight gain, wool production).

Subsequent to characterising the reproductive parameters of the livestock enterprises (e.g. post-partum intervals, open-periods, age of onset of sexual maturity, calving interval), the influence of nutrient supplementation and management changes (e.g. partial calf-removal) on these parameters will be assessed.

Also addressed will be nutrient supplementation needs for alleviating sub-clinical and clinical disease problems arising from such conditions as:

iodine related goitrogenic conditions
phosphorus related infertility problems
cobalt related growth retardation

(iii) Programme Management

On the basis of technically-sound proposals from institutions within the existing Regional Network and others, each collaborating national institute will be awarded a Research Contract for an initial period of 1 year. This Contract will be renewable for a total period of 5 years subject to satisfactory progress being made during each contract period. Research Contracts provide modest financial support (up to US\$ 5,000/year) to follow an agreed work plan, and are awarded on a cost-sharing basis, i.e. the institutes concerned also provide support to achieve the project's objectives. In addition to Research Contracts (which are only awarded to developing country institutes), Research Agreements will be awarded to research institutes with special expertise in nutrition/reproduction relationships and the employment of RIA/EIA assays for metabolic/reproductive hormones. Research Agreements do not provide financial support but holders participate in exchange of information and will be invited to attend Research Coordination Meetings to assist Contract holders in preparing work plans, solving methodological problems, analysing data, etc.

This Project will provide about 20 institutes with Research Contracts and 4 institutes with Research Agreements. The selection of all participants will be made by staff of the Joint FAO/IAEA Division's Animal Production and Health Section upon receipt of completed Contract and Agreement proposal forms. It is anticipated that Research Agreements will be awarded to two institutes within the region and two outside.

Research Coordination Meetings will be held at the beginning of the programme and thereafter at intervals of approximately 15-18 months. Such meetings have the effect of encouraging close contact and information exchange between the scientists and institutes involved, as well as a uniform approach both to the development and the practical utilisation of RIA/EIA techniques for the measurement of metabolic and reproductive hormones.

To support the programme, standardised reagents and tests and a quality control service involving reagent testing and distribution will be operated by the Animal Production and Health Unit at the IAEA Agricultural Laboratory, Seibersdorf, Austria.

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

(i) Nutrition

In the last Newsletter we reported that one of our major activities in the nutrition unit during the latter part of 1988 was the evaluation of the rumen simulation technique (Rusitec) as a source of rumen liquor for Tilley and Terry digestion studies. We now have the evidence to show that the effluent from Rusitec, collected over a 24 h period into a flask maintained at 39°C, can be used directly (without adding McDougall's buffer) to inoculate feed samples. Statistical analysis showed that DM and OM digestibilities of forage and fibrous feeds, determined using Rusitec effluent were highly correlated ($r=0.98$) with determinations made using fresh cow liquor.

During the past six months we have also carried out a number of laboratory experiments to ascertain the usefulness of the Tilley and Terry technique for assessing the rate of degradation of forage samples. The results are encouraging. This suggests that laboratories carrying out routine in vitro digestibility determinations could use the facility to estimate DM disappearance rates without having to use nylon bags in fistulated animals. Results from both these studies are now being prepared for publication and the experimental protocols will be available from the section in the near future.

We have also developed two 'friendly' computer programmes one for calculating in vitro digestibilities (DMD, OMD and D value) by the Tilley and Terry technique and the other for calculating Forage Fibre Analysis by Van Soest method. These programmes, which can be used in all IBM compatible systems are available free of charge from the Section. In addition, some useful analytical techniques for feed characterization are being compiled in the form of a laboratory manual and this too will be available from the Section in the near future.

As a follow-up to the Advisory Group Meeting recommendations described earlier the nutrition unit of the Seibersdorf laboratory plans to undertake preliminary investigations on the measurement of certain blood and urine metabolites in an effort to develop 'indices' for assessing the nutritional status of ruminant livestock in environments of fluctuating nutrient supply.

The research carried out by Dr. Dusan Jalc, (a fellowship trainee from Czechoslovakia) on the "Fermentation characteristics of diets containing acid-treated beech sawdust in an artificial rumen", will be published in Biological Wastes towards the latter part of this year.

As far as training is concerned, Mr. Manuel Tiagno from the Philippines and Mr. Ephrahim Sithole from Zimbabwe completed their training in feed evaluation techniques and have returned to their respective countries.

(ii) Reproduction

The first External Quality Control Service exercise on the FAO/IAEA Progesterone kits has now been completed and individual reports have been provided to all those who participated. In this exercise three External Quality Control (EQC) samples were provided to all users of these kits and they were asked to report on the assay characteristics and the progesterone

concentrations measured in these samples. The results of the EQCS were extremely good, only four of the 29 laboratories that responded had outlying values. It thus seems that the vast majority of recipient laboratories can continue their analytical procedures with confidence and in the knowledge that their progesterone results are internationally acceptable. A second EQCS exercise began in April 1989; we sincerely hope that the response to this second EQCS exercise will be greater than the first, especially from the Latin American region.

In the tissue culture laboratory, hybridoma lines producing monoclonal antibodies against progesterone have been provided by Dr. B. Murphy of the University of Saskatchewan, Canada, and by Dr. P. Booman of the Research Institute for Animal Production "Schoonoord" in the Netherlands. All the hybridoma lines have been cultured and ascitic tumours induced in mice. The ascitic fluids obtained from the tumours have a high concentration of antibodies and these are being used in the development of new "self coating" RIA kits for progesterone. Although the results of the self-coating system with monoclonal antibodies are very encouraging, attempts are presently being focussed on means of improving assay characteristics (i.e. lowering intra-assay variability and increasing sensitivity). In the last few months polyclonal antibodies against two progesterone-BSA antigens, (11 alpha hydroxy-progesterone hemisuccinate-BSA and progesterone 3-(o-carboxymethyl) (oxine-BSA) have also been produced. Twelve rabbits have been immunized and some of them show good antibody titres and assay characteristics. It is also programmed to test out these polyclonals in a self-coating RIA.

The field validation of the FAO/IAEA EIA kit for progesterone measurement in milk is still in progress. This validation involves collaboration with 11 selected laboratories from developed and developing countries. The first results of the validation show that the EIA performs well although some more development work to reduce intraassay variation will be necessary. The validation of the plasma EIA kit for progesterone measurement at the unit's laboratory has been completed; a field validation is to follow shortly. The monoclonal antibodies mentioned above will also be validated in an EIA system shortly.

We are now also validating some commercially available RIA kits for thyroid hormones for use in economically important species, and in addition, will soon begin work on the development of a total oestrogen RIA for eventual distribution to Joint FAO/IAEA counterpart laboratories.

Four trainees, Mr. A.A. Farah (Sudan), Mr. B. Erdenebaataar (Mongolia), Mrs. C. Goze (Phillipines) and Mr. Hailu Getu (Ethiopia) received training in the RIA laboratory over the last 6 months. Their training focussed on solid phase RIA and EIA for progesterone measurement, sample collection and processing, as well as the development and validation of new immunoassay techniques for reproductive hormones.

(iii) Disease Diagnosis

In the past few months we have been concentrating on improving our present ELISA test for Brucella abortus. Developments have taken place in three main areas:

- (a) The test protocol has been modified. Most importantly there is now a new substrate, ABTS, which is performing better than the original (OPD); in particular this has reduced the background reaction seen with some negative sera.

- (b) The kit manual has been extensively updated, and the explanations in it simplified. It also contains a section on the collection and storage of appropriate serum samples.
- (c) The validation of the kit is underway; the results obtained so far indicate that it is performing very well. The ELISA is being compared with older serological tests, e.g. the CFT, and even more importantly sera from cattle either confirmed as infected by bacteriological culture, or from Brucella free-herds are being tested. Sera obtained in successful brucellosis eradication campaigns in the UK and Australia have been obtained for this purpose.

The FAO/IAEA Brucella ELISA kit is also central to a collaborative project in seven EEC countries, under the co-ordination of the Central Veterinary Laboratory, Weybridge, UK. This project will assess the suitability of the ELISA as a standard import/export test for brucellosis in the EEC.

The new Brucella kit has been distributed to counterparts in Africa, Asia and Latin America, and has been used in a National Training Course in Indonesia, and a Regional Training Workshop in Malaysia. Excellent results have been obtained throughout.

For all this work, we are extremely grateful for the help we have received from Dr. P. Wright (Agriculture Canada), Dr. A. MacMillan (CVL, Weybridge, UK) and Dr. S. Sutherland (W.A. Dept. of Agriculture, Australia).

In addition, we have been developing or validating kits for the following:

(a) Coronavirus and Rotavirus

Two new ELISA test kits are being developed, in collaboration with the Moredun Research Institute in Edinburgh, for the diagnosis of coronavirus and rotavirus in calf diarrhoea. These diseases are recognised as important causes of morbidity and mortality in developed countries, but have been overshadowed by more "exotic" diseases such as rinderpest in developing countries. As such exotic diseases are brought under control, the importance of losses due to less dramatic diseases such as neonatal diarrhoea are beginning to be appreciated. The new tests have already been successfully used in Venezuela, and kits will soon be available for general distribution. These kits will be the first FAO/IAEA immunoassays to detect the disease agent itself in the faeces, rather than evidence of infection in serum. Dr. Iris Campbell of Moredun visited the laboratory for one week in May to assist in this work, and we are very grateful to her and to Dr. D. Snodgrass for their co-operation.

(b) Babesia bovis

A new batch of antigen from the CSIRO Longpocket Laboratory, Australia, has been tested at the IAEA Seibersdorf laboratory and kits are now ready for distribution. The test protocol has been modified to include skimmed milk powder as a blocking agent, and a change has been made in the type of microtitre ELISA plate recommended (NUNC 2-69620 instead of NUNC Immuno-I). The kit manual has been updated, and the guidelines for interpretation of results extensively revised. Dr. David Waltisbuhl of CSIRO visited the laboratory for one week in May to assist with this work, and we appreciate greatly his advice and that of Dr. I. Wright in the development of this test.

The long-term aim for the Babesia bovis ELISA is to incorporate a recombinant DNA product developed at CSIRO. This will offer advantages of improved stability, and thus greater shelf life in the field, and virtual freedom from non-specific background reactions.

(c) Trypanosomiasis

The ELISA kits for the diagnosis of trypanosomiasis in cattle and camels, developed in close collaboration with the International Laboratory for Research on Animal Disease (ILRAD), Kenya, and the Centre for Tropical Veterinary Medicine (CTVM), UK, respectively, are presently being validated at 12 institutes in Africa. The help which Drs. V. Nantulya and A.T. Luckins have given with these tests and this programme is also much appreciated.

(d) DNA Probes

Work on DNA probes is continuing. To evaluate possible ways of introducing this technique into laboratories in the developing world a model for a disease diagnostic DNA probe based on Aujeszky's disease is currently being tested in collaboration with the Biomedicum Centre, Uppsala, Sweden and with the help of Dr. J. Moreno Lopez to whom we are very grateful.

As far as training is concerned, Dr. Peter Olubunmi of Nigeria completed five months training on the use of immunoassays for animal disease diagnosis at Seibersdorf. He will return home after a 1-month fellowship at the Central Veterinary Laboratory, UK.

Dr. Indrawati Sendow of Indonesia visited the laboratory in May, on her way back from a two-month IAEA fellowship at the AFRC Pirbright Laboratory, where she had been working on Orbiviruses, particularly Bluetongue.

(E) PUBLICATIONS

(i) FAO/IAEA Diagnostic Kit Manuals

Updated bench manuals for use with the following FAO/IAEA disease diagnostic kits have been prepared: Rinderpest; Brucellosis; Babesia bovis; Bovine coronavirus; Bovine rotavirus; Aujeszky's disease. These manuals, available in a hardbacked ring binder, are only available to IAEA and FAO project counterparts and are automatically supplied with all FAO/IAEA disease diagnostic kits sent to counterpart institutes.

Also available to project counterparts are two recently commissioned software programmes for the computerisation of rinderpest data: (i) an ELISA reader programme, and (ii) a data handling programme. Computer software for handling ELISA reader and field data for other diseases is planned for the future.

New manuals have also been compiled for enzyme immunoassay (EIA) kits for milk and plasma progesterone currently undergoing field trials. These kits and manuals have been developed in collaboration with the Research Institute for Animal Production, 'Schoonoord', the Netherlands.

(F) FORTHCOMING EVENTS

- (i) Regional Seminar for Africa on "Improving Health and Reproductive Efficiency of Livestock through Radioimmunoassay and Related Techniques", University of Zimbabwe, Harare, 4-8 September 1989.

Background information relating to this Seminar which will be held in conjunction with the 2nd RCMS of our Regional African Coordinated Research Programmes on animal reproduction and diagnosis of vector-borne diseases was given in the January 1989 Newsletter. The response to the announcement has been overwhelming; over 100 scientists have applied to attend the Seminar. Unfortunately, due to the limited space available at the University of Zimbabwe, we have been obliged to restrict participation to 60 people. Scientists from 22 African Member States, five countries outside the region and six international organizations have now been invited to attend. The tentative timetable of the week's activities is as follows:

Provisional Timetable

Venue: Faculty of Veterinary Science
University of Zimbabwe
Mount Pleasant
Harare, ZIMBABWE

Monday, 4 September 1989

08:00	Registration
09:00	Opening of Seminar by His Excellency, the Minister of Energy, Water Resources and Development
	Welcome address by FAO Resident Representative, Mr. C.R. MacCulloch
10.00	Coffee
10:30 - 12:30	SESSION I - Disease-Reproduction interactions
	Dr. M. Thibler (France), Need for knowledge on the reproductive potential of trypanotolerant livestock
	Dr. P. Chicoteau (France), The potential use of trypanotolerant livestock in tsetse infested regions in Africa
	Dr. C. Meyer (Cote d'Ivoire), Reproductive performance of trypanotolerant livestock in West Africa
	Dr. A. Bassinga (Burkina Faso), Seasonal variations of cyclicity in Baoule cattle in Burkina Faso
12:30 - 14:00	Lunch
14:00 - 17:30	Presentations by FAO Trypanotolerant network Dr. C. Hoste and 5 other participants

Tuesday, 5 September 1989

08:30 - 12:30 SESSION II - Disease-reproduction interactions

Dr. P. Yesso (Cote d'Ivoire), Studies on the cyclicity of Ndama and Baoule cattle and Djallonke sheep

Dr. S. Osei (Ghana), Seasonal effects of the reproductive performance of indigenous breeds of cattle in the forest and savanna zones of Ghana

Dr. P. Gyawu (Ghana), Use of radioimmunoassay to monitor reproductive performance of indigenous cattle in the mild forest zone of Ghana

Dr. S. Fofana (Guinea), Production and Health of Ndama cattle in Guinea

Dr. M. Coulibaly (Mali), Reproductive performance of the Sahelien Zebu

Dr. K. Djabakou (Togo), Uterine involution and resumption of cyclicity post-partum of Baoule and Ndama cows

Dr. M. Mbaye (Senegal), An analysis of the reproductive characteristics of the domesticated ruminants of Senegal

12:30 - 14:00 Lunch

14:00 - 17:30 SESSION III - Reproduction

Dr. A. Willemse (The Netherlands), Effects of retained placenta on fertility in cattle

Dr. A. Lahlou-Kassi (Morocco), Improvement of the reproductive efficiency of cattle kept under an extensive management system

Dr. A.M. Homeida (Sudan), Resumption of post-partum ovarian activity in the indigenous cattle of Sudan

Dr. M. Ismail (Egypt), Immunoassay techniques for improving the reproductive efficiency of the buffalo in Upper Egypt

Dr. M. T. Benyoucef (Algeria), Perspectives for the use of nuclear and related techniques in animal production in Algeria

Dr. D. van de Wiel (The Netherlands), Practical use of EIA progesterone measurements in developing countries

Dr. Tesfu Kassa (Ethiopia), Postpartum reproductive activity of the indigenous cows of Ethiopia

Wednesday, 6 September 1989

08:30 -12:30 SESSION IV - Trypanosomiasis

Dr. T. Luckins (U.K.), A preliminary investigation of enzyme immunoassays in the diagnosis of trypanosomiasis in the camel

Dr. J. Faye (The Gambia), Development and use of an ELISA in comparative studies of trypanosomal infections in N'dama and Zebu cattle

Dr. O. Diall (Mali), Use of the ELISA test in the diagnosis of animal trypanosomiasis

Dr. M.M. Mwape (Zambia), A diagnostic survey of trypanosomiasis in the tsetse belt of Zambia, comparing ELISA, blood smear and clinical findings

Dr. C. Munatswa (Zimbabwe), The validation of an enzyme linked immunosorbent assay system to detect circulating trypanosomal antigen in naturally infected cattle

Dr. H.A. Mbwambo (Tanzania), The enzyme linked immunoassay technique (ELISA) as an aid to quick and accurate diagnosis of animal trypanosomiasis in Tanzania

Dr. S.A. Michael (Egypt), Serological diagnosis of camel trypanosomiasis. Introduction of Elisa technique for diagnosis and epidemiological studies in Egypt

Dr. V. Nantulya (ILRAD, Kenya), Monoclonal antibodies that distinguish T. congolense, T. vivax and T. brucei

12:30 -14:00 Lunch

14:00 -17:30 Field trip

Thursday, 7 September 1989

08:00 - 12:30 SESSION V - Reproduction

Dr. J. Rowe (Australia), An example of on farm research in animal production in Africa

Dr. N. Kanuya (Tanzania), A study of the reproductive performance of the Mwapwa breed on small holder farms around Morogoro

Dr. L. Kamwanja (Malawi), Studies on the reproductive performance of the indigenous cattle of Malawi

Dr. L. Eduvie (Nigeria), Studies on the factors affecting the reproductive performance of Bunaji cattle under different pastoral management systems in the Guinea savanna zone of Nigeria

Dr. Khaldi Gley (Tunisia), Improvement of the productivity of sheep flocks in Tunisia

Dr. J. Epelu-Opio (Uganda), Application of radioimmunoassay to improve the reproductive efficiency of indigenous goats in Uganda

Dr. J. Lungu (Zambia), Studies to improve reproductive performance of Zambian cattle and goats

Dr. L. Ndlovu (Zimbabwe), Improving the productivity of indigenous goats in Zimbabwe

Dr. A. Yenikoye (Niger), Study of year-round activity of peulh sheep kept under traditional management in Niger

12:30 - 14:00 Lunch

14:00 - 17:30 SESSION VI - Disease

Dr. T. Dolan (ILRAD), The effectiveness and use of control measures against East Coast Fever

Dr. M. Kachani (Morocco), Development of the ELISA technique for the diagnosis of Theileria annulata

Dr. W. Olaho-Mukani (Kenya), Development and application of ELISA for the diagnosis of animal trypanosomiasis

Dr. R.Z. Omweru-Walufa (Uganda), Studies on animal trypanosomiasis in areas infested with tsetse flies, using ELISA

Dr. M. Ali Farah (Somalia), The use of ELISA in bovine trypanosomiasis surveys in Somalia

Dr. E.A. Elamin (Sudan), T. Evansi infection in camels and goats. Serodiagnosis by Elisa and impact on reproductive performance

Dr. T. Obi (Nigeria), The significance of rinderpest on livestock production in Africa

Friday, 8 September 1989

08:30 - 12:30 SESSION VII

Dr. G. King (Canada), Use of nuclear and related techniques in animal reproduction studies

Dr. H. Robertson (Canada), The small-farmer dairy cooperative: a model system for developing countries

Dr. J. Chesworth (Oman), Nutritional limitations to livestock productivity in Africa

ILCA Representative

Dr. J. Wallace, (Australia), Options for experimental design for small holder research/development in Africa

12:30 -14:00 Lunch

14:00 - 17:30 Workshop groups

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