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External Evaluation Panel

1990 Report

Small Ruminant Collaborative Research Support Program

Collaborating Institutions

United States

Science and Technology Bureau, United States Agency for International Development (USAID)

Board for International Food and Agricultural Development (BIFAD)

Joint Committee on Agricultural Development (JCARD)

Overseas Collaborators

Indonesia	Agency for International Research and Development (AARD)
Kenya	Kenya Agricultural Research Institute (KARI)
Morocco	Institut Agronomique et Veterinaire (IAV), Hassan II University
Peru	Instituto Nacional de Investigacion Agraria y Agroindustrial (INIAA)

Participating Institutions

University of California, Davis
Colorado State University, Ft. Collins
University of Missouri, Columbia
Montana State University, Bozeman
North Carolina State University, Raleigh
Texas A&M University, College Station
Texas Tech University, Lubbock
Utah State University, Logan
Washington State University, Pullman
Winrock International Institute for Agricultural Development, Morrilton, Arkansas

External Evaluation Panel

1990 Report

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S. Gordon Campbell, Chair
Cornelia Butler Flora
Hudson Glimp
Martin Gonzalez

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Cover: Woman herding dual purpose goats in Kenya. Photograph courtesy of Jim Curley.

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Introduction

There was some turnover in the membership of the EEP during 1990. Dr. Cornelia Butler Flora and Dr. Hudson Glimp got into full harness and were extremely useful additions to the Panel. We were pleased to be joined by Dr. Martin Gonzalez, who is a range management scientist. Dr. Gonzalez did not participate in any actual site visits but he helped substantially with the compilation of this report and his expertise in range management is most welcome. We look forward to the addition of an economist in 1991. Since we have a substantial economic component to the work of the Small Ruminant CRSP, the addition of an expert in this area will be most welcome. Dr. Saul Fernandez-Baca retired at the end of his term as a member of the External Evaluation Panel. He will be sorely missed. Not only was he an expert in the field of nutrition and animal health but he was a particularly congenial companion who had a great flair for getting along with people of all nationalities and in all stations of life.

During 1990, Drs. Glimp and Campbell visited Kenya and Morocco together, and Dr. Cornelia Butler Flora made visits to Kenya and Morocco on her own, primarily to look at the sociology components there. On the U.S. scene, members of the Panel visited North Carolina State University which was the only one of the U.S. institutions which had not been visited recently. The Chairman participated in the Technical Committee and Board meetings in San Francisco in May/June, 1990.

One of the major changes made this year was in the format of the EEP report. There had been some concern and criticism of the format of the EEP report from various points of view—the EEP itself, USAID and the Management Entity had all raised some concerns. There was a move afoot to compile all of the reports for the Small Ruminant CRSP, i.e., work plans, annual reports, so that there would be no duplication, and so that they would dovetail reasonably well one into the other. To this end, the Chair of the EEP researched the mandate for the EEP report and after consultation with the Program Manager and the Director of the Management Entity he drafted a new format which is included as an appendix to this report. This format includes both an evaluation of the institutions and projects followed by a series of recommendations which are clearly delineated. It is hoped that this new format, which is used for the first time in this 1990 report, will prove to be useful to all the agencies involved.

On a personal note, the Chairman of the EEP would like to state that he has once again enjoyed tremendous support and cooperation from the Program Manager, Joyce Turk, and from the retiring Director of the Management Entity, Jim Oxley. In addition, the principal investigators and all the personnel involved with the Small Ruminant CRSP projects around the world have been most cooperative in planning and facilitating our evaluation trips.

The running of a project such as the Small Ruminant CRSP, including its evaluation, could be something of a nightmare given the far-flung locations of the various projects. However, because of the great good will and good nature of all the participants, it has been a particularly enjoyable task for this Chair, and he would like due note to be taken of that fact. It is also worth mentioning again that the External Evaluation Panel sets out to be critical, but constructively critical, of the various projects and hopes that it accomplishes this goal. As stated before, much of the salutary effect comes from the actual visitations and from

the exchange which occurs during them. However, it is our charge and a most useful practice to document the concerns and to follow them up from year to year, and we hope that the results of all of these efforts have contributed to the success of the Small Ruminant CRSP.

I would like to publicly thank the members of the Panel who have focused their considerable expertise on these projects and have proved to be congenial travelling companions and prompt report writers.

Domestic Programs

University of California, Davis
Colorado State University
University of Missouri, Columbia
Montana State University
North Carolina State University
Texas A&M University
Texas Tech University
Utah State University
Washington State University
Winrock International — Economics
Winrock International — Production Systems

University of California, Davis

Project Title: Genetic Improvement of Sheep and Goats

Project Goals and Objectives

The overall thrust of the genetic improvement program in sheep has been to increase prolificacy by infusion into the general domestic sheep population germ plasm from highly prolific domestic breeds. In Morocco, this has been accomplished by crossing the Sardi breed, which is the predominant breed in Moroccan range sheep production, with the D'Man breed, which is primarily a stall-fed breed that has been recognized for several years as being very prolific. In Indonesia, research has emphasized delineating the mode of inheritance of prolificacy in the Javanese thin-tail breed, which has been shown by this project to carry a single gene pair that exerts major influences on ovulation rate and thus lambing rate.

To the extent that the primary objective of these programs was to increase prolificacy, they have proven very successful. Litter size in the D'Man breed is almost double that of the Sardi breed, with crosses largely intermediate in litter size. This suggests that, if all other components of the system such as adequate nutrition and animal health are in place, major gains in productivity through increased litter size could be achieved. The prolificacy gene of the Javanese thin-tail sheep appears to be similar in mode of inheritance to the F-gene in the Booroola breed from Australia. Indeed, there is speculation that the Javanese prolificacy gene may be the progenitor of the F-gene in Booroolas.

The hair sheep project is the major thrust in the new five-year plan for Indonesia. The adaptability of external breeds introduced into an alien environment is difficult even under the best of conditions. Problems with the St. Croix breed in Indonesia are a clear example. The future approach appears to emphasize artificial insemination and embryo transfer into native sheep to overcome these problems, and these are clearly the most logical and efficient approaches.

The major concern at this time is the global approach of using increased litter size as the primary means of genetic improvement in sheep. The single most important trait is adaptability to the environment in which an animal is expected to produce—including hardiness, disease or parasite resistance or tolerance, sub-optimal nutrition, etc. It is clear that the general environment for sheep production is less than optimum in Morocco and Indonesia, which will likely preclude widespread use of the genetic results from these prolific sheep studies.

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Based on general observations of the sheep industry in Morocco, for example, the primary production problem is "too many sheep chasing too few feed resources." In other words, until grazing of communal lands can be controlled and the total sheep numbers reduced by 25-40 percent, lack of genetic change may be desirable. The Sardi sheep are to be admired for their ability to survive under the conditions observed. Further, most improved breeds would not survive under these conditions. The project's own data shows that Sardi ewes produce over 1.0 lamb per ewe when bred to Sardi rams and over 1.3 lambs/ewe when bred to crossbred rams. When lambs weaned per ewe in the country ranges from 0.55 to 0.65 by current estimates, it is clear that litter size is not the major limiting factor.

Balance Between Research and Training

This project appears to have done a good job of balancing these two project functions. Training has required major emphasis to provide qualified people to conduct research. It appears that lack of trained research and technical staff has been a major constraint in the past in Indonesia, but that this is being overcome. This is important to the success of the hair sheep project in the next five years. It also appears that many of the institutional constraints have been overcome through training and experience. The University of California, Davis, project team is urged to continue to explore efforts to train U.S. students in its future project activities to enhance further our capabilities to serve developing countries and institutions.

Balance Between Domestic and Overseas Research

Most of the genetics research has been conducted overseas, for example, evaluation of D'Man and Sardi breeds and selection for a new breed from D'Man x Sardi crosses; identification of prolificacy gene in Javanese sheep; evaluation of North Sumatran sheep and introduced St. Croix sheep; initiation of current five-year plan in Indonesia on hair sheep. However, analyses of most data from these studies has been conducted by domestic and overseas students and staff in the United States. The very nature of genetic studies almost dictates that they be conducted in the country to which they are expected to apply. Good examples of U.S. research important to the success of these genetic studies are recent work at UC Davis with artificial insemination and embryo transfer to enhance technical skills for the next phase of hair sheep germ plasm evaluation in Indonesia.

Dissemination of Results

The project has been very active in this area in the past year with over 12 scientific papers published or submitted, a major technical publication titled *Sheep Production and Management in a Mediterranean Climate: The Agropastoral System of Morocco*, participation in several scientific and technical meetings, and co-sponsoring a workshop on Integrated Tree Cropping and Small Ruminant Production Systems. The project leaders, both in the U.S. and host countries, have been diligent in networking efforts. The level of collaboration between U.S. and host country scientists appears to be high.

Effectiveness of Utilization of Results

The project has been effective in contributing new knowledge in the scientific literature, and particularly on characterizing sheep breeds and their crosses in Morocco and Indonesia. There is some question, however, on the extent to which the emphasis on genetic improvement in litter size will be implemented in developing countries with major health, nutritional and management constraints to production. It should also be emphasized that the major constraint may be socio-political, vis-a-vis the communal grazing lands in Morocco.

Evaluate Cost Effectiveness

a. Project management audits were not provided in any reports for evaluation, although there appears to be no basis for concern.

b. Adequacy of funding and/or cooperation by SR-CRSP participants with AID, other universities and institutions appears to have been adequate. Host country AID appears to have been supportive and cooperative in Indonesia, but less so in Morocco.

c. Policies, procedures and management do not appear to have been a major constraint to this project. With respect to the project in Indonesia, there has been repeated concern expressed about the ability of the SR-CRSP to establish linkages with competent scientists and programs in countries such as Malaysia.

Inadequate Performance and Irrelevant or Marginal Activities

a. This EEP review has questioned the wisdom of emphasis on prolificacy and litter size as the primary approach to genetic improvement in developing countries. Once all other components of the production equation are in place (health, nutrition, management), then this may be the logical method of genetic improvement. However, this is clearly not the case in most developing countries.

b. This review is supportive of the hair sheep project associated with tree cropping and other production systems in Indonesia. To the extent possible and feasible, known superior hair breeds from around the world should be included in this study. Artificial insemination and embryo transfer are appropriate and efficient tools for use in implementing this study.

c. This review re-visits the question of why goats were dropped from the SR-CRSP in Indonesia. The Southeast Asia market for goat meat is one of the strongest in the world. The potential for meat goat production would also appear to be high.

Colorado State University

Project Title: An Investigation of Small Ruminant Health Problems in Peru

Introduction

Members of the External Evaluation Panel did not visit Colorado State University in 1990, nor have they visited Peru where Colorado State University scientists collaborate with counterparts in IVITA and San Marcos University because of the difficulty of travel in Peru. However, the animal health project in Colorado State and in Peru has been productive. The work plans have been reviewed as well as the annual report and it is on these two documents that this report is based.

Project Goals and Objectives

There are several subprojects involved in the work at CSU. The projects vary in complexity and timing so the major ones will be considered separately. The first project concerns the major core purification and molecular cloning of the ovine pulmonary carcinoma retrovirus. This research represents the advancing edge of biotechnology in veterinary virology. It is complex and time consuming and overall the research workers at CSU have made very satisfactory advances in this area and some results have already been published. This type of work is particularly useful for training graduate students and in the future will be particularly valuable for the transfer of technology to lesser developed countries. It should be continued for these reasons. In addition, this work portends to be particularly useful for the preparation of diagnostic and immunoprophylactic products for sheep pulmonary adenomatosis, a major disease of sheep in the Andes and many other countries.

The second project involves continuing investigation of enterotoxemia and colibacillosis in alpacas and lambs. While this type of research work is not as complex and difficult as the previous, it is still sophisticated and at the advancing edge of microbiology. The justification for this research is that enterotoxemia and colibacillosis are major causes of death in alpacas and lambs, wherever these species are kept. The research work has progressed satisfactorily. The protection of alpacas by vaccination with *Clostridium perfringens* enterotoxin is both theoretically and experimentally very promising and should be continued. This is the sort of project where large-scale vaccination trials should be conducted and it is very questionable if this can be done in Peru. The identification of antigens on *E. coli* isolated from cases of neonatal alpaca diarrhea is state-of-the-art research and it has proved to be useful for the prevention of disease in other

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species. The present ability to identify about 20% of the pilus types in alpaca suggest that a considerable amount of work will have to be completed before this comes to successful conclusion.

The field studies on sheep respiratory disease control is a good example of experimental studies which have come to a relatively satisfactory conclusion. It would appear that these trials have been successful and the scientists would do well to get as much information on their methodology and results out to the farming community as expeditiously as possible.

Studies on the causes of death in newborn alpacas are of a conventional nature in a species which has long been overlooked. They have made good progress in identifying the causes of death and are continuing with histopathological reviews. This kind of information is elementary when one begins the study of neonatal mortality in any species.

Changes

The scientists responsible for these research projects have made appropriate alterations in their plans as results have evolved. It has to be stressed that certain aspects of this research are highly sophisticated but they are very necessary to overcome some of the difficulties concerning agents like retroviruses. The research workers have done a good job of keeping their overall objectives in focus as well as publishing their results.

The only major element which is disadvantageous to these projects is the tremendous difficulty of working within Peru. This has seriously affected field trials which are now almost impossible. The principal investigator makes the suggestion that some of the administrators have been less than cooperative (page 4) and this suggestion should be pursued and, if it is true, should be dealt with before further projects are undertaken. There is nothing more frustrating than getting to a critical part of a project, e.g., a field trial, to find that samples cannot be taken and therefore the preliminary work is wasted.

Global applicability of the work

While the investigators have focused on the problems of small ruminants in the High Andes, many of the diseases with which they work, e.g., ovine pulmonary carcinoma, sheep respiratory disease and neonatal deaths in young ruminants are very widespread, almost universal in their distribution. Therefore, the work has tremendous applicability. It is of a sophisticated nature and no doubt the results will improve the pool of information on small ruminants and eventually their application to solving practical problems in small ruminants.

It should be stated once more that while many laboratories around the world are working on sheep, there are relatively few that are working on the alpaca, an important animal in the Andes, and also an important animal from the point of view of comparative studies. The CSU workers are to be congratulated on bringing their sophisticated techniques to bear on this desirable species.

Balance between research and training

The overall research activity has been entirely appropriate to the needs of Peru in that it has concentrated on animal production problems in Peru, trained Peruvian personnel and returned them to Peru where they are carrying out an appropriate research function. The research mentioned above is appropriate to

the needs of sheep and alpaca in Peru but also appropriate to the needs of alpaca elsewhere and sheep on a global scale as it addresses major constraints on small ruminant productivity. The training afforded to Peruvian personnel has provided them with modern biotechnological techniques appropriate for research anywhere. Several are spearheading research attempts at San Marcos University, notably in small ruminant diseases, and they are also training Peruvian personnel at a master's degree level. There is no doubt that these trained personnel plus the infusion of operational funds have facilitated a measure of research capability in Peru which would not have otherwise been possible.

With respect to the training of U.S. personnel, it is unfortunate that U.S. personnel cannot now proceed to Peru for training in the field. Lack of training U.S. personnel overseas has been a major criticism of the Small Ruminant CRSP globally and it is presently a deficit in the CSU program. However, as noted by the principal investigator, many faculty members at CSU have benefited from the Small Ruminant CRSP activities both directly and indirectly.

The balance between research and training for the development of institutional research capability, both in Colorado and in Peru, has been considerable. The Small Ruminant CRSP has opened up avenues of funding and opportunity which would not have otherwise existed. These have recently become very restricted in Peru itself. There is excellent evidence that host country personnel trained through the Small Ruminant CRSP have returned to Peru, are presently engaged in research and in networking both in South America and elsewhere.

Balance between domestic and overseas research

There has been a substantial amount of high-quality research conducted at CSU. A remarkable amount of this technology has been transferred to Peru where Peruvian nationals have been working using Small Ruminant CRSP funds. The major constraints, however, have been in getting out into the field in Peru and conducting vaccine studies, serological surveys, etc. This has not been possible and has to be viewed as a major constraint.

Research activity and funding

When one considers the results which have been achieved in terms of published research and enhancement of research capability on both sides, the total budget of $160,000 is a relatively modest one. It would be the assessment of the EEP that the $29,000 which was actually budgeted in Peru for supplies and expenses is absolutely essential to keep the Peru end of the project viable. Without this, it is reasonable to speculate that research on small ruminants in Peru would come to a fairly speedy halt. The level of collaboration between the U.S. and the host country personnel throughout the life span of this project has been excellent and commendable and so has the balance between domestic and overseas research. However, once more the political situation in Peru makes it very difficult to assess the events on the Peruvian end and to carry out real field work in Peru.

The effectiveness and dissemination of results

The results from this project have been widely disseminated through a wide variety of media and these are listed in the annual report. The investigators are to be particularly commended for cooperating in the production of several DVM theses in Lima, Peru, and for the large number of presentations in Spanish. The tangible productivity from this project has been considerable, and some of the papers have been published in internationally recognized and refereed journals. In addition, presentations have been made at the Research Workers meeting in Chicago which is recognized as the national animal disease research meeting in the United States. Therefore, one can rest assured that the presentations have been of a high quality. In addition, presentations have been made abroad, notably in Peru and the United Kingdom, and this also bodes well for the progress of the project.

Linkages between Colorado and Peru have been strong. It is hoped by the investigators that with appropriate funding, the linkages to Peru will be continued in the future (see p. 13 of the Annual Report). However, the scope of this and the level of funding will have to be most carefully considered by the central administration of the Small Ruminant CRSP because of the difficulties of working in Peru compared to other South American countries.

The effectiveness of utilization of results

Many of the results, while extremely useful, for example, in the ovine pulmonary carcinoma and in the diseases of neonates, are only now coming to fruition and it will take some time to make major applications in the field. However, the investigators have spent a considerable amount of effort in their attempts to reduce the prevalence of retrovirus-induced chronic pneumonopathies and have been successful in reducing the prevalence of these conditions in test areas of Peru. The success of this has been described in publications and in presentations in the United Kingdom. Therefore, the methodology of this work is likely to be applied on a more global scale.

Cost effectiveness

In a general way this has been a very cost effective project in that there has been a plethora of published results and the total initial cost has not been extremely high—total budget $160,000. Under the circumstances there has been a very reasonable distribution of funds between Colorado and Peru and the portion spent in Peru ($43,932) is perfectly reasonable under the circumstances. In the United States, the Small Ruminant CRSP budget clearly allows sophisticated research to be conducted at a modest cost and the results made available to Peru and to the rest of the world. It should be remembered that alternative funding for work on small ruminants is unbelievably difficult to acquire in the United States and even more difficult elsewhere. By the same token, it is extremely difficult in developing countries to get monies for supplies and expenses and the $21,000 supplied to the Peruvians has no doubt allowed work to be done which otherwise would never have been undertaken.

Inadequate performance and irrelevant activities

Members of the EEP do not find any irrelevant or marginal activities in this particular project. It is worth recounting that the studies on the alpaca are almost unique in the world.

Recommendations

Recommended changes in program objectives

The most major change which has to be made in this project is the shift to a more hospitable environment. While the project has been scheduled for wind down for some time now, it is still remarkably active and productive in Peru. However, the EEP does not feel that this situation is optimal and recommends that the focus be changed to another country as expeditiously as possible. This is primarily because it is extremely difficult to carry out the full Small Ruminant CRSP mandate given the present political and security situation in Peru. It has been the philosophy of the Small Ruminant CRSP not to drop projects instantaneously but rather to taper them off. Progress should continue to be made in this direction with linkages continued and perhaps even some support to keep a modicum of research alive in Peru and training of persons completed. However, the bulk of the resources should be used in another site.

Additions and modifications of projects or activities

The research is highly appropriate for work in Andean countries. However, it is recommended that the site of overseas research should be carefully surveyed and if alterations in the research planning are then necessary, then this should be undertaken. With respect to training, the same is true. Should the CSU component move to another site, then the experienced investigators at CSU should carefully consider the training of overseas personnel in the United States in appropriate institutions. The principal investigators at CSU have continued to carry out first-class research and collaboration with Peru. This is most commendable, but it must be terminated and the efforts moved to a more congenial site.

The EEP makes no recommendations concerning the improvement of the distribution and utilization of the results. The investigators have made a major effort to make their results widely available and this should be continued into the next five-year plan. The EEP would commend the investigators involved in this program on their excellent planning and annual report. They would make the following suggestions, however: 1) the function of individuals paid by the project should be very clearly delineated as it is not entirely clear what role several of the listed persons played and this is important and 2) in the Annual Report, it is more helpful to list work which has actually been published and leave work under consideration for publication for the following year. It is not entirely clear what is meant by the heading "Journal Articles Refereed (Supporting)," particularly when this incorporates topics which are not clearly related to the major projects reported by SR-CRSP.

Overall rating

Overall rating of this program is highly satisfactory. The program has been most productive, and due to the very difficult circumstances which prevail in Peru, all of the investigators, both in Peru and in Colorado, are to be commended for their remarkable efforts. It is strongly recommended, however, that the site be changed to one more suitable from a political, security and stability point of view.

University of Missouri-Columbia

Rural Sociology

In the 1989-90 plan of work there were 11 projects in three sites. In addition, the writing up of a fourth site in Peru was concluded. Unfortunately, the results reported were not in the form that easily allows for linking with each project.

Project Title: Model of Biosocial Roles in Crop and Livestock Production

This project has a good outline of the appropriate biosocial groups and the specific areas of focus: decision- making authority, control of technological knowledge, management responsibility, and task implementation. It attempts cross-cultural assessment from Latin America to Africa of gender divisions of labor and responsibility. Primary progress was made in Peru.

Unfortunately, the various countries are not working together to collect comparable data sources. The project, when implemented and combined with other projects, could make important contributions to SR-CRSP goals by identifying the potential users of the developed technologies for better dissemination of the results.

Project Title: Women in Livestock Development

It is not clear if the data search for this project was carried out. Such literature review would be useful in designing field studies. This could be a first step in the development of production technologies.

Project Title: Ethnoveterinary RND: A Global Perspective

This project has proceeded on schedule, identified many ethnoveterinary practices and produced a number of papers. However, this project seems little connected to potential project interventions. While it identifies ethnoveterinary practices in a number of areas, it does little in terms of evaluating them or even suggesting ways in which the identified ethnoveterinary practices could be field tested to determine their efficacy in given situations. If the project could be

linked more fully to the animal health unit and the design of on-farm trials, it could contribute to the SR-CRSP objectives.

Project Title: Sociology of Range Management

This project evaluating USAID Range Management projects was completed as expected. The project contributes towards the goals of the global plan in that it points out and suggests alternative mechanisms of structuring range management interventions that can greatly increase their effectiveness.

U.S. Based Project

Project Title: Synthesis of a Decade of Research Results from SR-CRSP

This project has progressed on schedule and numerous publications are in progress. These contribute to a greater understanding of the role of social sciences in small ruminant research and are widely available.

Kenya Based Projects

Project Title: DPG Production Strategies

Changes in this project during the year improved data gathered on-farm. This data was fed into experiment station research design. This project contributed to the goals of the global plan in that it helped refine which types of farming systems led to the adoption of which of the technologies that were being introduced. Further, it was key in making the production scientists aware of the importance of socioeconomic considerations in designing the technology for DPG production. Each project was carefully linked to ongoing production research and, therefore, extremely effective.

Project Title: DPG Utilization Strategies

This project identified new priorities of DPG production of manure, a valued resource which is used more than the milk. By understanding the hierarchy of values that farmers place on their goats, the project is better able to develop technologies suitable to farmers and focus on the degree to which milk production and other methods of utilizing goats are important to farmers.

Project Title: The Role of Small Ruminants to the Smallholder Farmer in Central Kenya

This project was important because there is much pressure on the Small Ruminant CRSP to expand their work to other areas of the country. This project, however, was only partially carried out, due to limitations in personnel. There was no scientist appointed from the host institution, KARI, to aid in the process.

However, a general assessment comparing the two areas has been made, suggesting that commercial agriculture in central Kenya could use some of the techniques developed in western Kenya. This conclusion was based on historical studies by the SR-CRSP rather than any systematic comparison of the role of goats on the farm level in the two regious.

Indonesia Projects

Project Title: Village Women's Groups Engaged in Small Ruminant Production

This project to date has organized groups and begun to gather data. Once the project is completed, it should begin to document the importance of homogeneous, same sex groups in disseminating technology.

Project Title: Extension Seminar and Methods for Increasing Small Ruminant Production

This project was not implemented.

Project Title: SR-CRSP Socioeconomic Impact Among Farmers in Cirebon

This project was not implemented.

Project Title: The Gender Gap in Small Ruminant Production

This work was begun in part as a component of a master's thesis. It is not clear the degree to which more systematic data at other sites have been gathered. This project does not seem linked at all to the development of technologies that are currently underway. If this project was more linked to the women's groups project and to the technology development of the Small Ruminant CRSP, it could be useful.

Project Title: Dissemination to Non-OPP

This project could very well contribute to an understanding of the potential for disseminating the technologies developed. This seems to have been carried out in this area during the period under evaluation. Apparently, due to the poor quality of the survey data gathered, further analysis, which might link it to other components of the Indonesian effort, will not be evident and no further such surveys will be undertaken.

Balance Between Research and Training

Research

In the U. S., the research does not always seem linked to the in-country efforts. However, the importance of establishing global data bases, into which the specific phenomena examined at each site in each country can be compared, could be extremely useful now that the data base is in place, at least in such things as ethnoveterinary practices. A movement toward understanding how those identified practices could be used in on-farm trials would be extremely helpful. In Kenya, the research in the sociology unit is a good model for integrated social science research that directly impacts the production scientists work because it is designed specifically with those scientists and with their needs in serving farmers in mind. It is done in such a way as to consistently increase the skills of the researchers in Kenya as well as contribute concrete knowledge for the project. In Kenya, the research is thus most likely to reach the goals of the global plan.

Training

Good use was made in Indonesia of choosing in-country workshops to train personnel and continue to upgrade their skills. The Farming Systems Research and Extension workshop is particularly notable along these lines. In Kenya, the training of scientists has stopped, which seems particularly unfortunate, given the fact that no social science counterparts are available within KARI. Continued training of social scientists is extremely important for continuation of the Kenya sociology unit, as there will be high demands for those that are trained.

Further, the promise of training can help attract capable scientists to the project. The sociology projects have done a good job, at least in the case of Peru, of training U.S. scientists to work in those countries as well as training host country nationals. More effort should be spent on training in this segment since social science skills, particularly integrated with production science skills, are lacking in all the countries involved. In Indonesia, the trained scientists are active in host country institutions, although not necessarily the ones that are directly and systematically cooperating with the SR-CRSP. In Kenya, there seems to be a real problem with the trained scientists in that they are then hired by the SR-CRSP and no host country scientist is available to be their counterpart.

Balance Between Domestic and Overseas Research

Activity

The research carried out in the U.S. in all cases attempts to identify the global universe of specific kinds of constraints to increased efficiency in small ruminant production, from the availability of health interventions to systems of range management. These have enormous potential for addressing constraints worldwide, particularly when they can be directly linked to specific experimental interventions which host country scientists could undertake, monitor, and evaluate in their own countries.

Kenya Activity

Research is particularly useful in solving constraints to small ruminant production in Kenya. The close link of the sociologists to the production scientists not only determines how effective their research is, but influences the direction which production research takes. This model of social scientists-production scientists interaction in technology production and diffusion has worldwide implications for reaching the goals of the global plan.

In Indonesia, the research plan, by the very fact that a large portion of it was not undertaken, suggests that part of the research seems irrelevant to meeting host country needs. On the other hand, the extension-oriented research forming and evaluating groups seems extremely effective in solving constraints to technology dissemination, as well as identifying areas of technology where more work is needed. The use of these groups and the mechanisms developed on how to form them and use them effectively has worldwide implications.

The U.S. based activities seemed to be adequately funded. The facilities are good, but personnel seemed to be somewhat a limiting factor. There is great need at the University of Missouri to integrate someone with good quantitative skills into the team to assist the host country scientists in setting up their data sets and in analyzing them using sophisticated quantitative techniques so that the results can be systematized and understood by more than cross-tabular comparisons of single variable. While there was good collaboration with the Peruvian scientists in the U. S.-based activities, there seems to be much less collaboration between the Kenya and Indonesia scientists in developing global activities. In Kenya, the sociologist feels he has good support from the U.S. personnel, although there is clearly a need for more help in analyzing and formatting the data being gathered. In Indonesia, the collaboration seems spotty, in part because some of the Indonesian scientists appear to devote little time to the project.

The balance between domestic and overseas research seems adequate. There should be more direct feedback from the U. S.-based research to the design and analysis of on-farm trials at the overseas sites.

Effectiveness of Dissemination of Results

In the U. S., major results were 1) identification of worldwide ethnoveterinary practices, 2) development of a scheme to analyze biosocial groups in small ruminant production, and 3) determination of the importance of participation to the formulation of range management projects.

In Indonesia, the most important results have been the identification of the importance of women's roles in small ruminant production and the formation of women's groups to aid in dissemination of technology developed.

In Kenya, the most important research results have been to identify which farmers adopt which practices and the differential value of goats and their products in different farming systems.

International publication has been very good, particularly through edited volumes and co-authored articles which have been led by the sociologists in

Missouri. In Kenya, the constant participation in cross-disciplinary seminars and workshops has also meant wide dissemination of the research results and in the case of Kenya, most importantly, the process of the farming systems approach to technology development. In Indonesia, there have been a number of publications in the local languages and participation in regional workshops held within Indonesia. In both Indonesia and Kenya, there have been increasing linkages with non-SR-CRSP related scientists: in Kenya, within KARI, and in Indonesia, with other countries in the area.

Effectiveness of Utilization of Results

In Indonesia, the use of women's groups has increased the use of the recommended technologies. In Kenya, the research results have been used to modify the kinds of technologies being developed and the recommendations viewed as most appropriate. This has, in turn, increased farmers' adoption of forage and feed technologies as well as facilitated the introduction of a variety of technologies that can improve animal health.

Cost Effectiveness

There is a major problem in cost effectiveness in Kenya in that there is little or no participation by KARI in the socioeconomic unit. The host country needs to show more commitment to this very important aspect of the SR-CRSP in Kenya. In Kenya, the current structure of the project is seen as very productive by the sociologists. The projects are decentralized with each scientist relating directly to their PI. As a result, they are able to be much more effective and efficient than scientists who must rely on slow Kenyan bureaucracies in order to mobilize funds for research.

Inadequate Performance, Irrelevant/ Marginal Activities

The ethnoveterinary work is viewed as marginal by many scientists. Unless it develops systematic recommendations for research validation in the specific sites it will remain as an intellectural curiosity. A number of the large surveys contemplated in Indonesia have not been systematically linked to the technology development activities and thus seem irrelevant. The fact that they were not carried out up to this point suggests that perhaps they should not be carried out in the future.

Recommendations

The Missouri portion of the Small Ruminant CRSP has achieved a number of important results in its ten year overview publications. There should be systematic evaluation and greater integration of the U.S. component with host country needs so that the U.S. component can continue to provide a global framework, but with tighter links to site specific implications of the global findings. No changes were recommended for host country objectives in Kenya. However, in Indonesia, it is suggested that the objectives of the socioeconomic unit be more tightly integrated to the technologies that are being developed by the scientists related to the SR-CRSP. The global objectives should include not only the socioeconomic unit contribution to the dissemination of research results, but also the contribution to the design of the technologies to be developed.

Recommended Additions, Modifications, Deletions

It is very important that the existing extensive data sets be properly analyzed. The U.S. universities should set up a systematic method for data analysis and data handling to utilize fully the wide amount of data being gathered. Particularly in Kenya, there must be more systematic and in-depth analysis of the sociology data. There is need for a specific consultancy to get that data ready to be analyzed, requiring specific programming skills. In terms of training, there should be additional advanced degree training in Kenya. In Indonesia and in Kenya, in-country workshops on data analysis that include a consultant who would work systematically with the scientists to put the data into quickly analyzable form and institute the programs necessary to continually do such analysis would be extremely valuable.

The project is to be commended for its use of videos and television. Continuing efforts in this area are recommended. The rating for the project is satisfactory, if modified as suggested.

Montana State University

Project Title: Evaluation and Improvement of Small Ruminants in Extensive Systems

Project Goals and Objectives

The objectives of this project in 1990 were to complete analysis and publication of research results from the terminated Peru project and to facilitate establishment of an Andean Small Ruminant Network.

The results of previous breeding research that have been analyzed emphasize the importance of 1) identifying economically important traits, 2) developing reliable measurements of these traits, and 3) selection for their improvement. The research in Peru evaluated several introduced breeds and native or Criollo sheep. There was little or no advantage to introducing new breeds under extensive management systems. Research in the U.S. indicates that selection for increased reproductive efficiency in the female also increases male reproductive performance.

The establishment of an Andean Small Ruminant Network was largely achieved with principal scientists in several disciplines involved from Peru, Bolivia, Chile, Argentina and Ecuador. A meeting of this group was held in December, 1990.

A major publication titled *Produccion de Ruminantes Menores: Alpaca* was sponsored by the breeding project in 1990, and is currently in press. A bibliography in Spanish of goat production in Peru, titled *Bibliografia Sobre Produccion Caprina en el Peru* was also published in 1990.

Balance Between Research and Training

Since the Peru project has been terminated, both research and training are in their completion phases. The two persons completing their graduate training at Montana State University have assisted in the analysis and publication of results from the research completed in Peru.

The training and institutionalization process must continue through the Andean Small Ruminant Network. Government instability and lack of funding are continuing problems for the research team that was trained and established in Peru by the SR-CRSP.

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Balance Between Domestic and Overseas research

Since conditions remain unstable in Peru, it is apparent that analysis and publication of results will primarily rely on the leadership of the Montana State University PI.

With further research being initiated in Bolivia, it is hoped that support for the Andean Small Ruminant Network can be incorporated into this new project.

Effectiveness of Dissemination of Results

The completion of data analysis and publication of results appears to be progressing and must be given high priority since they will likely become lower in priority and/or irrelevant over time. Summary publications such as the two mentioned above are encouraged.

The Andean Small Ruminant Network should continue to be given priority support by the SR-CRSP.

Effectiveness of Utilization of Results

The utilization of results in the host country is difficult to assess at this time. The research on the alpaca by the SR-CRSP has developed an important data and knowledge base on these animals that was non-existent prior to this project. It is interesting to note that several U.S. scientists working on this project are now viewed as the experts on camelids by producers in this country.

Cost Effectiveness

Budget information was not provided in the annual report, thus this cannot be evaluated in terms of adequacy of support and appropriateness of expenditures. There are no indications in the annual report that funding levels were a major constraint.

Inadequate Performance and Irrelevant, Marginal Activities

None are apparent. It is hoped that more publications will be completed in the near future.

North Carolina State University

Project Title: By-product and Crop Residue Utilization in Intensive Sheep and Goat Production Systems for Limited Resource Farmers

Indonesia

Introduction

Two members of the EEP, Drs. Glimp and Campbell, visited the Department of Animal Science, North Carolina State University on November 5-6, 1990 and were afforded an excellent opportunity to hear presentations by participating scientists and students and to visit the laboratory and animal facilities of the University. Professor Kevin Pond made the arrangements for the visit and Dr. Leonard Bull, Head of Animal Science, met with the members of the Panel to discuss the nutrition programs in Indonesia, Morocco and those based in Raleigh. The appended report is based predominantly on the Raleigh visit. However, both Dr. Glimp and Dr. Campbell had visited Indonesia fairly recently and were in a good position to assess the home and overseas aspects of these projects.

Evaluation

In Indonesia, two of the major objectives of the nutrition component were to define the nutrient requirements of Indonesian sheep and to summarize the chemical composition of locally important feeds for small ruminants. A considerable amount of work has been done and data generated on these subjects. The information would be highly desirable and important both in Indonesia and elsewhere in the humid tropics. In addition, the research workers are planning to publish in the technology packages (techpacks) recommendations for village small holders. This work is ongoing and is being tested on the farm. The primary change that has been effected in the nutritional projects recently has been the transfer of principal investigator status to Dr. Kevin Pond. This has allowed a redefinition of priorities and projects and there is every indication that this has been done. There were no activities that were identified that were disadvantageous to the project's goals. However, the very substantial reliance on expatriate scientists in Indonesia is something which should be rectified by incorporating local scientists in more substantial roles. The nutritional goals in Indonesia are highly practical and very important to the global plan. There's been a limited amount of research that has been carried out on sheep in the humid tropics, particularly grazing under plantation crops. There is no doubt in the minds of the EEP that this is novel and important work, and the successful development of feed composition and nutritional requirements under humid tropical condi-

tions might start a very major increase in this type of husbandry in the future. Therefore, the EEP considers this work to be of considerable significance.

Balance Between Research and Training in Indonesia.

The research being conducted in Indonesia is highly practical and fits very well with the needs of the country. There is considerable feeling amongst members of the EEP, and to some extent the administration at North Carolina State University, that the quality of the research in terms of modern techniques and approaches could be enhanced and that this would be to the advantage of the American investigators involved. In terms of training, the nutritional part of the project in Indonesia is a very fertile ground for Indonesian scientists and many of them have been well-trained. It is also an appropriate arena for American graduate students and this part of the work is to be commended and, hopefully, an increase made in the future. Carefully selected American graduate students working on good research projects in Indonesia and in Raleigh could greatly enhance the productivity of the SR-CRSP.

The balance between research and training in Indonesia has been good and probably could be enhanced by careful incorporation of the Indonesian scientists into every aspect of the work in the future—planning and execution. While the expatriate scientists in situ have done an excellent job, their presence is, to some extent, disadvantageous to the Indonesian scientists fully taking over and contributing to some of the projects. This is particularly important in Sei Putih where improvements have been made to the station accommodation. These changes bode well for the future but should be accompanied by increased responsibilities taken by the Indonesia scientists themselves.

The balance between domestic and overseas research has been quite good. North Carolina has the advantage of having an extremely well-organized and well-conducted phytotron which facilitates work on a wide variety of plants under very carefully controlled conditions. Indonesia has the advantage of excellent cooperation in the field with the Rubber Institute and the availability of the Institute's lands and facilities for research.

It was generally the feeling of the External Evaluation Panel that the unique work at Sei Putih should be given a high priority in the future as should the accompanying outreach work (O.P.P.) dealing with the actual farmers.

With respect to the dissemination of results, the EEP was assured and has seen evidence that considerable progress has been made by the Small Ruminant CRSP in the chemical composition of local foodstuffs and the evaluation of the feed requirements for livestock. However, the EEP felt that these results should be published as soon as possible so that they might be made available to the international community and so that the individual researchers in Indonesia and America could receive full credit for them. Given the amount of funding and the unique opportunities involved in the Small Ruminant CRSP, the EEP felt that the highest quality of scientific research could be expected of the investigators, and the best of the results should be published in journals of high international repute. This is in the best possible interests of all concerned, including the Small Ruminant CRSP.

There is now evidence that a substantial small ruminant network is being inaugurated in the Pacific rim and that the Small Ruminant CRSP has made

considerable contributions to its organization and will continue to make contributions in the future.

With respect to the utilization of the results generated by the Small Ruminant CRSP in Indonesia, there is merit to U.S. scientists in ascertaining the composition of the humid tropical plants. Some of them may well be applicable to parts of the United States. Of course, there is great potential for utilization by the Indonesians once full techpacks are developed and all of the results are applied.

With respect to cost effectiveness, the EEP felt that the North Carolina/Indonesia project had been extremely cost effective but noted that one of the most expensive aspects of the budget is maintaining expatriate scientists in Indonesia. *While this has proved to be an efficient device in many ways, it has to be pointed out that they should be replaced whenever possible by Indonesians.* There were no obvious problems which came to the Panel's attention with respect to budgeting and working in Indonesia. However, it should be noted that Indonesia is a long way away, communications are difficult, and the scientists have done a remarkably good job of maintaining them. Relatively recent improvements in communications between Bogor and Sei Putih have proved to be very useful.

In a general way the EEP felt that all of the component parts of the North Carolina/Indonesia nutrition component very well justified their existence. As we approach the "next life" of the Small Ruminant CRSP, it is felt that the work on the chemical composition of tropical feedstuffs might be downplayed somewhat—there is no limit to the number of potential feedstuffs that one can analyze—and the workers should concentrate on getting the information on foodstuffs into the hands of farmers and working out the fine details for nutrition under plantation conditions.

Recommendations

The primary recommendation for the nutritional program in Indonesia would be to ensure that the results which have been derived from experiments on chemical composition of feeds and nutritional requirements on sheep be published as widely and as quickly as possible for use within Indonesia and the region. It is imperative that Indonesian scientists continue to be fully involved in the work in country. With respect to training, it would be highly desirable if some American graduate students could gain experience in this zone. To this end, every encouragement should be given to the recruitment and deployment of graduate students on appropriate Indonesian projects. The current balance between research and training is reasonable. The principal investigators should continue to stress the production of high-quality research and the involvement of overseas personnel and graduate students in it.

With respect to the distribution of results, there was some feeling that the research in the next several years should focus on very high quality research worthy of publication in international journals. The principal investigator should ensure that this is carefully incorporated into future work plans. The EEP were ambivalent about changing anything to render the project more cost effective. However, it is clear that if expatriate personnel were not used in Indonesia then considerable financial benefit could be derived. On the other

hand, these persons are still very critical to the success of this project. However, over the next five years a transition will have to be made for economic reasons and also for the purposes of continuation.

The overall rating of the North Carolina program with respect to Indonesia is satisfactory. It should be noted that there is a relatively new principal investigator and it is felt that if he continues along the present lines and takes note of some of the suggestions given above, the project will progress very satisfactorily.

Morocco

Evaluation

Any evaluation of the nutrition work carried out in North Carolina in collaboration with Hassan II University in Morocco must be biased by the fact that this work is being terminated and is, therefore, in a wind down mode. There are presently a large number of papers derived from the Small Ruminant CRSP work which are in press. With respect to the relative effectiveness of the balance between research and training, a substantial component of research has been carried out in Morocco and a number of Moroccan graduate students have been trained recently, often carrying out master's degrees on the research topics under study. In recent years, very few American graduate students have been involved in Morocco and this is unfortunate because of the generally high standard of scientific research being carried out there. It appears to the External Evaluation Panel that the Hassan II University has certainly reached the point where it can more than equitably compete on the world scene for funds to carry out research. From that point of view the Small Ruminant CRSP projects have come to full maturity. Indeed, it has always been stated by the Moroccan scientists themselves that they were most interested in the collaborative and intellectual stimulation aspects of the Small Ruminant CRSP. It is also true that the Small Ruminant CRSP has provided a very important source of operating funds for research projects in Morocco. There is adequate evidence that the host country personnel have been well incorporated into the institution and into the scientific life in Morocco at the end of this first decade of SR-CRSP research. This is laudatory. With respect to the balance of home and overseas research, most of the research seems to have been done in Morocco in recent years with minimal backup in North Carolina. It appears to the EEP that overall, while the project has been collaborative, the balance has been very much in favor of the Moroccan side of the equation.

With respect to the dissemination of results, as noted above, many of the recent publications are still under consideration for publication. It would also appear that the Moroccan scientists have established and are maintaining excellent international ties in the Mediterranean region. This is commendable and there is every reason to believe that it will continue in the future. With respect to the actual utilization of results, it is hard for the External Evaluation Panel to discern exactly where the results derived by the Small Ruminant CRSP have been applied in Morocco. Indeed, the scientists involved would do very well to scan their most recent results in nutrition and determine which of them might be recommended to and implemented by farmers.

It is difficult to evaluate the cost effectiveness of the nutrition projects at CSU and in Morocco. The total budget has not been very large (about $22,000) and of that a large amount has been expended on supplies. This has no doubt been critical for ongoing expenses such as maintenance of experimental animals, transport and feedstuffs, and it has been a critical element and might be quite difficult for the Moroccan scientists to replace as the Small Ruminant CRSP pulls out. The EEP has fairly consistently bemoaned the lack of interaction between the Moroccan scientists at Hassan II University and other national research agencies. This situation does not seem to have improved very substantially over recent years. In addition, a concern has consistently been expressed about the conditions at the experimental station in Tadla. Again, the situation has not improved very dramatically since the last EEP evaluation and is still a cause for concern.

Recommendations

With respect to changes in this program, the EEP believes that the Small Ruminant CRSP has made a correct decision in deciding to wind down the activities in Morocco because the scientists there are perfectly capable of continuing the research work on their own, and on a global scale the need is much greater for the Small Ruminant CRSP elsewhere. In giving an overall rating to the nutrition component in Morocco, the EEP has frankly felt over the last three years it has not been satisfactory from everyone's point of view and the correct decision has been made to terminate it.

Texas A&M University

Project Title: Breeding a Genetically Improved Dual Purpose Goat for Production in Kenya

Project Goals and Objectives

The primary objective is to develop a dual purpose goat adapted to smallholder farming systems in medium to high potential areas. The breed being developed is a 4-breed synthetic that includes the domestic East African Dwarf and Galla breeds and the introduced Toggenburg and Anglo Nubian breeds.

This must continue to be a high priority objective of the SR-CRSP, and should not be abandoned until the objectives are completed. There is tremendous interest in this project among smallholder farmers in Kenya, research and extension workers in most countries of the world with similar conditions, and by other development agencies and institutions. The DPG, at the human and smallholder farm level, has tremendous potential for rapid contributions to both family nutrition and smallholder economy. The results with F_1 goats in the farming systems project in Western Kenya demonstrate the importance of goats to smallholder income, family nutrition, bio-diversity and fertilizer in farming systems.

The research on genetic resistance to internal parasites as a part of the DPG breed development project also has merit. A recent review of five different research studies with sheep in Australia and New Zealand indicates that real progress is being realized in selection for genetic resistance to internal parasites. This research is viewed as complementary to the primary selection criteria in the breed development process, and involves collaboration with other groups.

The research on gene mapping is largely of academic interest in terms of the primary project objectives, but should be encouraged unless it becomes a serious drain on financial resources.

The major concern is the DPG project goal of having a flock of 600-800 producing DPG does by 1993. This is of concern for the following reasons:

A. This is probably an unrealistic goal when one reviews the current numbers of 2-breed and 4-breed DPG does of producing age.

B. It is probably unrealistic to expect a high success rate with embryo transfer—facilities are primitive, training is limited, and the success rate with goats has not been impressive.

C. This number is probably a minimum critical mass for breed stabilization and genetic improvement through several generations.

The other concerns relate to implementation of the breed development and utilization phases once numbers are adequate. First, at least three to five generations will be required in breed development/genetic selection efforts before a true breed is established that meets the project goals. KARI resources do not appear at this time to be adequate to take over this project from the SR-CRSP within two or three years, yet this is currently the plan. There also appear to be false expectations within the KARI administration in terms of the quality of the DPG breeding herd to be delivered to them in 1993.

Balance Between Research and Training

Research

The research on development of the DPG breed and correlated studies on genetic resistance to internal parasites and gene mapping are of global interest and importance. Once the DPG breed is stabilized in 8-10 years, there will be a world-wide demand for this genetic resource. The host country research capability is marginal at best in terms of its ability to complete the task of DPG breed development once SR-CRSP resources are pulled out. Trained research scientists and technicians are extremely few in number, salaries are inadequate to retain qualified people, and the financial needs for the breed development work post-SR-CRSP are not apparent. The gene mapping portion of this work will very likely be discontinued after SR-CRSP support terminates. These are serious challenges that must be addressed in the very near future.

Training

Qualified people in the host country are very few, with only one Ph.D. Animal Breeder employed by KARI with interests in goats. One other person is being trained, but will not be on the project until it is virtually terminated. The complexity of the future challenges in DPG breed development lead one to the conclusion that qualified research personnel are likely to be a major constraint. Only one Ph.D. candidate and possibly one M.S. candidate are currently being trained. This is further complicated by the large-scale departure of the research team in the farming systems project in Western Kenya. Training of host country personnel has, therefore, been limited and their perception of a limited future within KARI has clearly placed this project in jeopardy.

Balance and Institutionalization

One must conclude that training for the future has been marginal at best in this project, and that support to trained personnel has been inadequate from KARI. There is a strong desire on the part of KARI to institutionalize this project, but they acknowledge up-front that the resources are not available for this purpose.

Assess Balance Between U.S. and Overseas Research

The DPG breed development research has been almost exclusively within the host country. Much of the gene mapping research has been within the U.S.. The U.S. principal investigator and other scientists have provided leadership in developing data bases, selection criteria and procedures, and on-site management systems. To date, much of the data analyses has been done at Texas A & M University. Collaboration among U.S. and host country institutions appears to have increased significantly this past year compared to earlier years.

Examine Effectiveness of Dissemination of Results

Publication of scientific papers has not been as high in this project as in others; however, the long-term nature of a breed development project somewhat precludes large-scale publications. The research team, both domestic and host country, have been more active in participating in local, regional and international meetings and workshops. The high visibility of the DPG project has facilitated networking with other institutions and research teams.

Effectiveness of Utilization of Results

The end-product of this research is the DPG breed, which in reality is not yet available. It is, therefore, premature to assess the utilization of results. The use of F_1 goats from this project in the farming systems project in Western Kenya was the first effort in this regard. Even though the animals were not true DPG's, interest in their performance was tremendously high and they were readily accepted by most smallholder farmers. Pressure is increasing for the project to release more goats, which is premature and inappropriate at this time.

Evaluate Cost Effectiveness

Since project expenditures were not provided in the annual report, this area cannot be realistically evaluated. There does not appear to be major constraints due to SR-CRSP funding levels. The major constraint appears to be in identifying funding support for this project after termination of SR-CRSP in Kenya.

Inadequate Performance and Irrelevant, Marginal Activities

There appear to be no serious problems in this area. In retrospect, use of DPG genetic resources in the farming system project may be part of the current problem of inadequate DPG breed numbers, but this was essential to the overall SR-CRSP effort. The gene mapping research currently in progress is clearly marginal to current breed development efforts, but has the potential of producing valuable scientific information in the long-term.

It can also be concluded in retrospect that efforts to train qualified research scientists in numbers adequate for Kenya to continue this project to its conclusion have been inadequate. This puts the future of this project at risk.

Texas Tech University

Project Title: Breeding a Genetically Improved Dual Purpose Goat Adapted for Production in Kenya

Project Goals and Objectives

The first 11 years of active participation by Texas Tech in the SR-CRSP in Peru have contributed significantly to strengthen the following:

A. The knowledge and the utilization systems of the Antiplano Rangelands and forage resources.

B. The research programs of local institutions like UNA, UNTA, IVITA, UNPG.

C. The formation of a qualified cadre of scientists who can continue with research and rural development programs in the country.

The goals and objectives of the Texas Tech SR-CRSP program were essentially achieved, in spite of the events that forced the phase-out of the program in Peru. However, the foundations for a solid national research program on small ruminant production and range and pasture management were established.

No changes were made in the project's objectives.

No disadvantageous activities occurred, other than the frequent threat to field activities during the years of the project.

The project's contribution to the Global Plan is satisfactory, both in research and training. A great deal of information was generated that is transferable to other Andean countries.

It would have been useful to validate more information at the "farm level" but general field conditions are difficult. Nevertheless, with good support from the Government of Peru and with continued guidance from SR-CRSP, the Peruvian scientists can carry on this task.

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Balance Between Research and Training

Research

The research plans were, in general, adequate for the Peruvian research capabilities. Even when some limitations in equipment and funds occurred, the different institutions and their experiment stations adapted well to the SR-CRSP project.

It is very difficult in developing nations to have all the facilities and materials common in other nations. Nevertheless, the working capacity of the resident scientists (Florez, San Martin, Astorga, Farfan, Gamarra and others) and their close interaction with the principal investigator, Dr. Bryant, overcame many inconveniences that might have occurred.

The "Complementary Grazing and Nutrition" project produced a great deal of information on the grazing habits of llama, alpaca and sheep, supported by several animal nutrition studies. However, it seems that studies on grazing systems and, particularly, on grazing intensities by different species under range conditions (even under herding systems) could have received more attention.

Overgrazing is an ancient problem in almost all of Latin America because of erroneous legislation for allocation and utilization of grazing lands, and research is the only way to develop solutions to correct the situation.

The focus on the use of crop residues as supplemental feed for alpaca and sheep was very important and urgently needed, since very little information existed. Results on the utilization of oats, haba and quinua residues by animals can serve until the adoption of new, integrated grazing forage production systems, which in turn, will reduce the pressure upon overgrazed native ranges.

The other studies involving improved forages showed clearly how kid crop, birth weight, breeding and weight gains can be significantly improved. Overall, SR productivity was much higher when compared with range alone, for all animal species. However, high mortality rates in alpaca are still a problem.

No mention is made on the cost benefit of the establishment and maintenance of cultivated pastures, and of the acceptance by the small farmers (campesinos), and the possibility for them to have land and to pay for the improved pastures (perhaps this information is included in another report).

In summary, a good volume of important information has been generated by Texas/SR-CRSP in Peru that will be very useful to other Andean countries, too.

Training

All developing countries welcome the support from international programs, particularly when they are linked with advanced training of their professionals. In the case of Peru, SR-CRSP has sponsored or supported the following graduates at Texas Tech during the last decade: 7 B.S., 19 M.S. and 6 Ph.D., plus 9 other professionals from the U.S., Africa and Mexico who have received their degrees under the auspices of SR-CRSP/Texas Tech. This training is a very effective way to strengthen national research programs in a host country. Un-

doubtedly, all the Peruvian students that had the opportunity to work on their BS or MS thesis in the country, with the advice and supervision of SR-CRSP scientists, got a very good appreciation of what research is all about. Examples of this are the 6 theses on small ruminants conducted at La Molina (2), Cuzco (2), Huancayo (1) and San Marcos (1).

The training of U.S. personnel should be as much as possible in the host country for them to gain international experience in different environments (ecological, cultural, socioeconomical and political), and get to understand the programs to which they will be assigned.

At least within the SR-CRSP programs, it is reasonable to expect that professionals from host countries have preference for training in the U.S. over students from countries not linked to SR-CRSP.

A national professional who acquires advanced training in the U.S. and goes back to work in his country is, in general, the best person to reinforce institutional research capabilities in that country. In the case of Peru, specifically for the Texas Tech/SR-CRSP programs, it would have been desirable to have opportunities for more Ph.D. candidates.

In connection with the above, the evidence of institutionalization of research personnel in Peru is clear: all of the trainees have returned to their work in national institutions (UNA, UNTA, IVITA, UNPG) and will continue their research there.

On the institutionalization of research results: this is difficult to evaluate due to the problems of implementing those results under a very unstable agragrian situation in the country in recent years.

Balance Between Domestic and Overseas Research

The research conducted in Texas on the "Evaluation of stocking rates and grazing rotation" by Soltero was terminated in 1990. Information from this research is useful to many parts of the U.S. and other countries where similar ecological conditions occur. In the particular case of Peru, some extrapolation will be necessary to make good use of these results.

Research overseas was classified by Texas Tech as follows:

A. Terminated research projects (1989-90). Two studies dealing with "complementary grazing and comparative nutrition of llama, alpaca and sheep," by San Martin, Farfan and Florez (to be published in 1990), and "use of crop residues as supplemental feed for alpacas and llamas" by San Martin (publication date: late 1990) were terminated. Four other research projects have been concluded in 1990; all field work on these projects ceased in 1989. These projects, all authored by Peruvian personnel, are listed in the Workplans and Budget, 1989-90.

B. Partially funded research. Basically, three projects will continue under the responsibility of A. Florez; the results of two projects will be published in 1991 and one in 1993.

C. Major publications. Three major publications are planned, in English and in Spanish. Their condensed titles are: "Complementary use of range, pasture and crop residues" by San Martin, Florez and Bryant; "Recovery of overgrazed rangelands" by Florez, Astorga and Bryant; and "Techniques for rangelands research and range animal nutrition" by San Martin, Florez and Bryant. All these publications are potentially valuable instruments in solving not only Peru's but other Andean countries problems in range small ruminant production.

Adequacy of funding. For the importance and magnitude of the programs on small ruminant production in rangelands and marginal lands, it seems that $150,000 for Subgrant 111-11 to Texas Tech were insufficient. Relatively "poor" countries like Peru or Bolivia are in a very difficult position to provide matching funds to complement the needs of the project. (The situation seems even worse now for Bolivia, with a budget of only $80,000 for 1990-1991.)

Facilities

In general, facilities are always limited in developing nations; however, in Peru this was not a serious limiting factor for field research.

Personnel

No problems; Peru has several very good educational institutions which were the source of resident scientists for the project.

Research activities were in conformance with the annual work plan; nevertheless, some problems and slight adjustments occurred due to the frequent action by guerrillas in some locations.

Collaboration

The most active U.S. scientist collaborating with the host country counterparts was the principal investigator for Texas Tech, Fred Bryant. He is the only Texas Tech scientist to visit Peru since 1982. He has worked closely with the national team and with trainees, both overseas and in the U.S. The collaboration has been excellent. Although other Texas Tech scientists are listed as collaborators, their activities have been in the planning and analysis of data and advising the Peruvian graduate students while in the U.S. The reason for them not going overseas was the limited budget for travel.

The great majority of research was done overseas (as it should). Even L. C. Fierro's Ph.D. dissertation was done in Peru with SR-CRSP support.

Dissemination of Results

Texas Tech has published five volumes in the host country's language (Spanish). These volumes dealing with research on rangelands and pastures in Peru represent a joint effort by American and Peruvian scientists and technicians. They include about 50 technical papers in Spanish and are a very important source of information for scientists, technical people, students, educators and people from other sectors. The five volumes mentioned above—Fierro's dissertation, the Tech Pack for Improving Andean Sheep and Alpaca Production

and the Manual de Pastos y Forrajes by Florez and Bryant, 1989—are some of the most important publications produced during the last two years. The dissemination of all this information has been adequate at the technical media level, however, the problem of disseminating it at the field level is serious due to the unstable rural conditions. Nevertheless, the material exists and one hopes there will be better opportunities when conditions come back to normal in the rural section of Peru.

Linkages

At the national level, linkage SR-CRSP/Texas Tech with Peruvian institutions has been satisfactory. A. Florez and F. San Martin received funds for their sabbatical in 1989-90. Resident scientists advised INIIA with a series of visits to four experiment stations. This proved very useful for INIIA personnel. The most important linkage will be achieved, however, with the Small Ruminant Network, at the national and international levels, establishing interactions with Chile, Bolivia, Argentina, Ecuador and Colombia. Under the coordination of Dr. A. Florez, it is expected that the networking program be extended to other Latin American countries.

Effectiveness of Utilization of Results

In Peru, the dissemination and utilization of results will be the responsibility of the national institutions after the phase-out of the SR-CRSP project. The SR Network program already being organized will prove very useful in helping with the dissemination and utilization of so much information already generated by research.

Cost Effectiveness

According to Dr. Bryant, principal investigator, there were no problems in funding, budgeting or release of funds.

Inadequate Performance and Irrelevant, Marginal Activities

Based on the information provided, no activities were identified as inadequate, irrelevant or marginal in the development of the project.

Recommendations

Recommended changes in program objectives

With the program moving to Bolivia, a detailed assessment of national conditions will have to be made as the basis for adjustments or changes, if necessary. Overall conditions in Bolivia seem less favorable than the conditions found in Peru 12 years ago, in regard to the number of universities, research institutions and experiment stations, and of human resources for the counterpart residents.

Because Bolivia is perhaps the poorest nation in South America, with an urgent need to improve agriculture and livestock production, and the care of its natural renewable resources, the opportunity for SR-CRSP is excellent for a notable contribution in research and, particularly, in training.

Training of personnel should receive the greatest consideration in Bolivia. We have mentioned the benefits of international programs in developing countries. Bolivia needs top rank agricultural and livestock professionals. SR-CRSP has a great opportunity to help alleviate those needs through its training programs.

In general, Latin American countries do not have efficient agricultural extension services; that is why a large percentage of the research information is never transferred and, even less, applied in the field. Perhaps a special effort can be made to help organize or reorganize the extension service in Bolivia.

In regards to the cost effectiveness of the program, the most dramatic aspect is the low priority of the Agropastoral project in Bolivia, with a budget of only $20,000 (plus $60,000 for site development) in 1990-91. Very efficient planning must be done with this limited budget. With the high overhead usually charged by the U.S. institutions, the cost of personnel and international travel, one wonders what the balance would be for real work in the host country for research and training.

In the case of Peru, the phase-out activities are already in progress. One important aspect, however, is not to abandon Peru completely but continue with guidance and support as much as possible for a strong national small ruminant research program.

Overall rating of the program. In Peru, the program is rated satisfactory, all things considered. The Peru experience will be of great value for the implementation (continuation) of the small ruminant program in Bolivia.

Utah State University

Project Title: Range Research for Increasing Small Ruminant Production in Morocco

Evaluation of project goals and objectives

1990 was the final year in a decade of Small Ruminant CRSP range research in Morocco. Major efforts were made to wind down the project, prepare results for publication and leave the Moroccan scientists with every opportunity to continue the work. Considerable effort was made to complete various range projects and, as outlined in their annual report, good progress was made in these. A number of publications, dependent on Moroccan scientists for completion, are in preparation, and it would be most advantageous to the regional and global plan if every effort was made to ensure their publication. It is particularly unfortunate that there was a change in leadership in the Moroccan project some three years ago because that interrupted the flow of materials. However, it is clear that a major effort has been made to draw the project to a conclusion. This is commendable because much of the information is applicable elsewhere, regionally and to some extent globally in arid and semi-arid areas.

Effective balance between research and training

This project has been, to a great extent, a collaborative research project since Morocco had and still does have a substantial number of well-trained scientists in this area. Therefore, much of the productivity in Utah State and Morocco has involved collaborative research.

The research projects which have been undertaken appear to have been very useful for enhancing the host country's research capability. The Utah scientists have laid careful preparations in the form of supplying computers to ensure that the Moroccan scientists are left with equipment capable of helping them in future research endeavors. With respect to the training of host country personnel, the EEP has always felt that the Small Ruminant CRSP's objectives are best served if both the U.S. and the host country have students involved in the research project at the highest possible level, i.e., Ph.D. candidates if at all possible. In the Moroccon situation, two Moroccans are presently finishing off degrees—a Ph.D. and a master's—and this is desirable. No Americans are engaged in graduate studies and one Argentinian is completing a Ph.D. While this makes it defensible in terms of the immediate needs of Morocco and winding down the operations there, it is not the ideal situation for future planning purposes.

The EEP's evaluation is that IAV is an institution which is very capable of carrying out sophisticated range research in the future and being a leader in this field if it can generate operating funds for research projects. The Small Ruminant CRSP can take some credit for helping to sustain this situation over the past decade.

With respect to the institutionalization of personnel and research results in the host country, range projects tend to be long-term and complex and the EEP is satisfied that the Small Ruminant CRSP projects were reasonably well interdigitated into the national research plan and will prove useful for the future.

Balance between domestic and overseas research

It is inherent in the range project that the majority of the research is conducted in Morocco. It would appear that the research projects in that country were appropriate to Morocco and did have applicability elsewhere. It should be noted that this was a wind down year and there was an allocation of funds for equipment, notably computers, to facilitate the host country personnel in their future work and also to ensure their competitiveness. This approach, i.e., tapering off one project and planning for the future, has worked extremely well in other Small Ruminant CRSP countries, notably Peru, and it is highly commendable to see it occurring in Morocco. The members of the Panel feel that the Moroccan counterparts and the Moroccan institution, IAV, are in a very good competitive position to continue work.

Effectiveness and dissemination of results

As noted in the annual report, there has been a paucity of written material during 1990. However, in the decade of its work, the Small Ruminant CRSP has been quite productive in Morocco, and there are presently plans underway to have Moroccan scientists complete several papers. This is most desirable and is a strong reason for continuing some form of support since many countries could profit from the articles. The principal American investigator has suggested that there are plans for the production of a technical package, perhaps linked with an international symposium concerning information about the Mediterrenean area. This, too, would be highly desirable as it would make the information derived from the Moroccan project available to a larger group and highlight the project.

Effectiveness of utilization of results

The utilization of range results is on a much longer time span than are most of the other elements of the Small Ruminant CRSP, so that an immediate "quick fix" is neither expected nor evident.

Cost effectiveness

Range management studies are expensive and the EEP feels that the monies invested in this range project has been well spent. Particularly commendable are the recent efforts to gear up the Moroccan scientists with equipment ready for their more independent future studies. In Morocco as much as anywhere else the Small Ruminant CRSP project has provided vital functioning monies to supplement a relatively strong institution with good scientists. Finding new research funds will be a challenge for the Moroccan scientists (and one

in which they have already been successful), and it has to be said that the Utah State personnel have done everything possible to enhance the Moroccan's opportunity for this.

Inadequate performances

Perhaps the greatest disadvantage that the Utah/Moroccan range project has had over the years has been the major changes in personnel. However, it should be noted that the most recent principal investigator has quickly taken up reins and has done a very good and a most responsible job in preparing the Moroccans for the end of the Small Ruminant CRSP. None of the projects was considered irrelevant by the EEP. However, a tear was shed for the lack of American students recently trained in Morocco.

Recommendations

In general, the EEP endorses the plan to wind down the Small Ruminant CRSP in Morocco and to look elsewhere for the future. The IAV is in a very strong position to compete for funding and the site in Morocco is probably better equipped than any other Small Ruminant CRSP around the world (Indonesia, Kenya, Peru) to continue on its own and compete for national and international funds. It is recommended, therefore, that the major research components be terminated, that the training of Moroccan students be tapered off in a responsible manner (plans are already underway for this to occur), and that the Small Ruminant CRSP give serious consideration to a modest amount of funding for the following purposes:

1. Completion of any outstanding articles for publication in peer- reviewed journals.

2. Compilation and publication of the technical package and its distribution.

3. Most serious consideration to some support for an international symposium as suggested by the P. I. in the annual report.

With respect to an overall rating for the program, the EEP feels that this program has been wound down in a most responsible fashion and would commend the principals, both Moroccan and American, for their efforts towards this end.

Washington State University

Project Title: Kenya Animal Health Research and Training Program

Introduction

Washington State University's effort in the SR-CRSP is in Kenya with the Animal Health Research and Training Program.

The goal of this project is to find solutions to disease problems that are constraints to dual purpose goat production. One objective under this goal is the evaluation of possible genetic resistance to the parasitic worm, *Haemonchus contortus*, by identifying and breeding kids for challenge tests of resistance to the parasite. The goal of resistance is a very long-term one.

The project is engaged in another strategy to develop a minimal intervention health program for dual purpose goats introduced to farms in Western Kenya. Here the project has identified some management strategies, including timing of pasturing of goats and hanging fodder prior to feeding it to the goats which reduces the presence of the parasite eggs on the food consumed by the goats. These practices are popular with the farmers and easy to implement and are said to have a substantial impact on the health of the animals.

The third objective is to identify and evaluate *Cowdria ruminantium* surface proteins, that is to identify antigens for the diagnosis and prevention of heartwater in goats. The researchers have developed a DNA probe for C. ruminantium and detection of individual, infected ticks. This line of research meets the needs of a researcher being trained for a PhD. The project has demonstrated that a monoclonal antibody that causes growth inhibition of F38 recognizes an epitope on the carybohydrate diagnostic antigen providing new possibilities for vaccination. The work plan changed in that the team switched from monoclonal antibody to a polyclonal antibody to identify F38 surface proteins expressed by recombinant bacteria. This project is in the early stages of identifying and developing a vaccine that could fight CCPP, an important goat disease around the world.

The studies on genetic resistance to H. contortus by goats in Kenya are directly applicable to U.S. sheep and goats. The studies on vaccination against that parasite are also directly applicable to small ruminants in many parts of the world. The DNA probe for C. ruminantium organisms can be used to help prevent entry of this disease into the U.S. This preventative measure is important because heartwater occurs on some Caribbean Islands.

Balance Between Research and Training

Most of the research is in fact part of the training process. The more sophisticated DNA related research at Kabete has been undertaken in great part to allow Kenyan researchers to obtain their Ph.D.s. The biotechnology involved is a very basic kind of research but the researchers have systematically linked it to global problems as part of the global plan. In the past year, a Ph.D. in veterinary immunology was completed at Washington State University. Two students are undertaking their theses research in Kenya. One researcher connected with the project had a one week USAID short course on polymerase chain reaction. This training and the in-country research involved in thesis preparation have greatly enhanced the host country's institutional research capability. Little training of U.S. personnel seems to be involved. This project has a good balance between research and training in terms of its potential to contribute to future Kenyan institutional research capability.

There is still the problem that most of the personnel involved in this research, although they are Kenyans, are paid by the SR-CRSP. Few have been hired by KARI, the Kenya counterpart institution. There is also a delay in the host country of fully utilizing the research results. For example, a vaccine has been developed but has yet to be used by the appropriate Kenya institutions.

The Panel found it difficult to differentiate between domestic and overseas research. A part of all four activities are carried out in Kenya at least to some degree. Clearly there are backup and ongoing activities at Washington State University as well. The possible genetic resistance to Haemonchus contortus could have worldwide implications in terms of introducing breeding stock that could increase resistance. However, this has a long-term potential. Major changes in Kenyan goat breeding and management must take place for this breeding strategy of disease resistance to be effective.

The activity of developing a minimal intervention health program for dual purpose goats in Western Kenya, although developed as site specific management practices, in fact, will have some measure of applicability and could be used in other programs around the world, e.g., the substitution of labor—hand removal of ticks and hanging of fodder for such expensive inputs as drenching and dipping—are simple practices which have widespread applicability in labor intensive goat keeping systems.

Identification of antigens for the diagnosis and prevention of heartwater in goats has potential in addressing a major problem of parasitic disease in goats around the world. However, its actual implementation will require an upscaling of the vaccine once it is discovered and an organization in place to do the vaccination.

The same is true for the last objective, to develop a CCPP vaccine through immunizing goats with expressed the surface protein that reacts with neutralizing monoclonal antibody. The development of such a vaccine would be extremely useful and its production would not be enormously expensive, but it would require an infrastructure that is not present in most developing countries. However, it is of use in developed countries and in areas where the social and economic infrastructure for vaccine development and distribution are in place.

Conformance to Annual Work Plans

All four research activities seem to be funded at an adequate level, although there seems to be a need to continue the training portion of this project. The facilities, particularly for the sophisticated lab work, are relatively primitive. It is impressive what the researchers have been able to do in Kenya in extremely modestly equipped labs. The personnel are of the highest quality, showing enormous dedication to their work and also a good understanding of the applied implications of the most basic scientific research being undertaken. However, there is a need for KARI to put in institutional counterparts. There is relatively good conformance to the annual work plans.

Collaboration

Collaboration between the principal investigator, particularly in the case of the laboratory health studies, is very good. This project is to be commended on an excellent balance between domestic and overseas research. There appears to be a push to have the investigators do their Ph.D. research in Kenya with some training in the United States.

Dissemination of results has been somewhat disappointing in the case of the vaccine that has been developed, but has been very good in the case of the management practices to improve goat health in Maseno. In terms of the basic scientific studies, the project has not reached the point where those results can be disseminated. There has been a good flow of scientific publications in terms of the basic research so that others can use it. This is probably of more use to scientists in developing countries and at major research centers than in Kenya, but the constant attempts to make results available to peers is very important.

Within Kenya, particularly at Maneso, the group gives papers locally which stress their interdisciplinary nature and, in the case of the animal health techniques, increases their dissemination at the country level. The scientists participate in KARI sponsored seminars and share their results in this fashion. They are thus linkage to other experiment stations in Kenya as well as to university scientists.

In terms of the CCPP vaccine work, there have been attempts through Washington State University to identify or to isolate F38 from CCPP cases in Sudan, Tanzania, South Yemen, Chad, and Turkey. As a result of this, the researchers believe the serological test specific for F38 is important in identifying the presence of the organism in other countries.

The project resulted in six articles, two proceedings, two papers from the SR-CRSP Kenya workshop, and an unpublished thesis in the last year.

Effectiveness of the Utilization of Results

The practices for inexpensively reducing disease prevalance are being picked up by extension agents and farmers in Kenya.

Cost Effectiveness

Funding seems adequate, although a continued source of funding for training would be extremely helpful. The host country needs to put in more resources in the form of collaborating scientists from KARI. U.S. institutions

might think of involving U.S. graduate students in the research. There appear to be no activities which are inadequate, irrelevant or marginal. However, the activities involving DNA research are very long-term in the potential impact on goat health in Kenya.

Recommendations

A major recommendation is to continue the training component. A second recommendation is to ask KARI to support host country scientists. The overall rating for the program is satisfactory.

Winrock International

Economics

Project Goals and Objectives

The results presented in the Annual Report 1989-90 deal mostly with two of the three studies described in the Work Plan: "Economic Analysis of Outreach Pilot Project Experiments," and "Studies on Market Oriented SR Production Schemes in the Villages of West Java." Emphasis was in on-farm oriented research through the OPP towards most efficient communication between scientists and farmers. The activities included monthly visits and bimonthly discussions to identify and discuss problems of the smallholder sheep and goat farmers in Java and Sumatra, giving special attention to farmer priorities. Monthly monitoring was conducted with the participation of scientists on breeding, nutrition, health, economics and management and of the same farmers. However, the *quantitative* achievements of this monitoring are not clear. Did monitoring confirm the receptivity of the farmers to the innovative production systems and marketing strategies?

Important information was obtained with respect to present farmers production and, particularly, their marketing systems. Parameters measured for marketing were: selling age, body weight, selling price and marketing channels. It was ascertained that only 30% of the OPP farmers sell their animals at the proper age (12-18 months), and that 33% sell directly to the market, while the other 67% depend on intermediaries. In selling, results indicate a direct relationship between age, weight and price. These studies are continuing in order to complete more information on these parameters.

In general, the On-Farm Research Model and the new OPP research approach create incentives for farmers' participation, a fact that is highly desirable in the study of rural systems. The exchange of information is very useful and helps to get an in-depth knowledge of the real situation in the communities, and to have additional and more reliable data for planning research activities. Apparently, the farmers are very interested in finding adequate SR production schemes for sustained and more profitable production. The Annual Report does not comment on the number of farmers and villages participating in the On-Farm Model or in the OPP. (Perhaps this information is part of other publications.) If the OPP had been active for two and a half years, it might have produced more results than the ones reported, particularly on marketing. (There are 17 researchers in the Economics subprogram.)

The other section in the Annual Report is related to research now in progress, basically under the study "Village SR Intensive Production Schemes."

The objective of this study is to demonstrate the possibility of increasing the income of farmers through testing schemes and to determine how applicable these production procedures are to other farmers.

Several parameters will be evaluated for each of the following areas: breeding and reproduction, feeds and feeding, and marketing. The idea is to work on systems that can produce animals for sale every month, on a sustained basis and, consequently, provide a more stable income for the family. No progress report on this project is included in the annual report.

All the information collected related to economics of production and marketing systems of small holder farms in Indonesia is of value for establishing basic references for other research projects.

Balance Between Research and Training

The Annual Report list the names of nine staff members (one Ph.D. student) and eight co-researchers (one M.Sc. student) for the economics subprogram in Indonesia. Although the Work Plan 89-90 did not discuss training programs, the Annual Report lists five national professionals engaged in degree oriented training: three in host country institutions (B.S.), one in the University of Arkansas (M.Sc.), one in the Philippines (Ph.D.), but these persons are also included in the staff list. Masbulan (B.S.) and Moljadi (Ph.D.) obtained their degrees in 1990. The other three are still in training or completed their graduate work before 1989.

In reviewing other documents, Winrock/SR-CRSP has sponsored or supported around 30 graduate students from Indonesia, Peru, Kenya, the U.S. and other countries, just for the Economics subprogram, since 1980. In this group, five students are from Indonesia and five from the United States, but it is not clear if the latter were connected with the Indonesian project. The Indonesian trainees seem to be active in national institutions, mainly RIAP and CRIAS, according to their publications and other SR-CRSP reports. They form a very important component of the national research teams on the institutionalization of research results. It seems that the Production Systems research programs where a great deal of information has been generated, many of the results have been disseminated and institutionalized. In the Economics subprogram a good number of publications have been produced, whose contents might have had some institutionalization.

Balance Between Domestic and Overseas Research

In the Economics area, all the research activities have been conducted in the host country, according to the list of publications included in the 1988-89 Annual Report, and in the 1989-90 Winrock/SR-CRSP Annual Report.

Dissemination of Results

Also in the 1989-90 Annual Report, information is presented on the achievements of the Economics subprogram, which are basically a collection of data on marketing (more than production) parameters. However, the participation of farmers in the Outreach Pilot Project within the on-farm research programs is very important in the dissemination process. The best "disseminator" is

the farmer himself—assuming, of course, that research results are correct and adequate to the farmer's needs.

At the professional level, last year's results are reported in over 20 technical communications, eight seminars and two books, one of them translated into three other languages.

Utilization of Results

There is not sufficient basis to comment on this, but results of research on Economics (statistics, polls, analysis and interpretation of information) are very good sources of information for national institutions or agencies. The degree to which such data have been utilized is not possible to ascertain.

Inadequate Performance and Irrelevant/ Marginal Activities

No activities within the economics subprogram seems inadequate, irrelevant or marginal to the Project's or SR-CRSP objectives. However, with the human resources in the subprogram more research results could have been reported. It may be that there is a policy to condense or select the information to be included in the Annual Report.

Recommendations

1. The extension of the Indonesia Project for five more years will provide a great opportunity to restructure and consolidate all the information from the economics subprogram in close collaboration with the production activities.

2. This interaction should become more refined and effective with the emphasis of the research moving to Northern Sumatra (Sei Putih).

3. It would be desirable to make every possible effort to continue with the training programs. Several B.S. and M.Sc. theses can be supported (as it is done already) without large expenditure.

Peru

Project Goals and Objectives

With the phasing out of SR-CRSP activities in Peru, the Winrock Economics subprogram had modest achievements to report. The only activities reported were on the training of Valdivia and Martinez, who obtained their Ph.D. in the United States. These dissertations deal with important socioeconomic aspects of livestock (SR) production in Peru.

In the Winrock Work Plan, 1989-90, two projects were reported: "Farming systems analysis of agropastoral communities" and "Effect of economic policies of the SR sector of Peru." Both were designed to collect and analyze information

from different agencies and institutions in Peru as a basis for comprehensive assessment of the situation in the country.

Balance Between Research and Training

The only research reported is linked with Valdivia's dissertation in the U.S. (mentioned above), finished in 1990. Research and training of D. Martinez continues in the U.S. He is expected to graduate in early 1991. The results of these two dissertations will be very valuable for planning in Peru.

Other training activities supported were: Flor Robles for her thesis at UNA, and Martinez to attend a Farming System Symposium in Michigan.

Dissemination of Results

Domingues contributed a chapter on Economics to the techpack, *Improving Andean Sheep and Alpaca Production* (research and development). This is a most important dissemination document, published in Spanish and English (1990).

Another very important achievement of the Peru project is the initiation of the Small Ruminant Network, now being coordinated by Dr. A. Florez. Great interaction is expected from professionals in the Andean countries.

Martinez and Barrera's work on family labor in agropastoral communities was published in 1990.

Inadequate Performance and Irrelevant, Marginal Activities

The Annual Report, 1989-90, from Winrock does not provide sufficient information for identifying inadequate, irrelevant or marginal activities with respect to the project or SR-CRSP objectives. Actually, as the Report says, the activities were modest, due to the phase-out of the project.

Recommendations

1. In the new site in Bolivia, we would recommend that the production and economics team interact more closely to avoid any possible fractioning of research results.

2. Consider training for Bolivian professionals and students as a priority activity.

Kenya

Project Goals and Objectives

Research activities by Winrock during 1989-90 concerned the two major projects: "Economic analysis of SR production and marketing systems" and "DPG production systems for small holder agriculturalists in Kenya." For the first project, three subprojects were planned and one subproject for the second project.

Results in the first project deal with economic analysis of feeding practices, the use of sweet potato vines as milk substitute for kids, and the economics of intercropping food forage crops with maize. The results are interesting and show significant improvements in the production of DPG, results that can be communicated to and applied by the farmer. However, more refined experimentation is needed on this same topic, including wider experimental design, more replications, animal units and time. The linear model for small holder farms indicates how DPG systems can be better than traditional farm systems. The next step would be to validate the model under field conditions. Increases from 30 to 80% in family income detected in the model would have a fantastic appeal to farmers! The Kenya techpack was completed in 1990 with the incorporation of the economics section, in addition to sections on breeding, health, nutrition and management. This techpack should be a key instrument for planners and extension personnel for the transfer of information to the farmer. Winrock plans to emphasize the need for credit to farmers and for new marketing structures to handle the increments in milk production once the new technology in DPG is widely accepted and applied. The Winrock project has all the economic evaluations of the new systems in support of the credit programs from the national institutions. On the possible surplus of milk, other alternatives can be adopted like manufacturing cheese or some types of candy (in Northern and Central Mexico candy manufacturing has proved to be more profitable than cheese at the rural family level).

On the DPG Systems Production project, reports on forage wilting, maize plants utilization and toxicity of Leucaena for goats, also show interesting and practical results. Wilting reduces forage moisture and, consequently, the incidence of *Haemonchus* larvae. Less moisture contributes to greater DM intake and fewer larvae means less deworming expense, leaving a better net income for the operation. The utilization of one leaf of every maize plant in 0.5 Ha can produce 300 Kg.DM, enough to feed two does for 90 days, without affecting the grain yield. Both of these practices should be tried on a larger scale, with more animals and replications, defining also the additional labor costs for harvesting the leaves. The information obtained in these two activities is easily adaptable at the farm level. The studies with Leucaena showed that goats in the region are susceptible to Leucaena toxicity, even when fed to kids just after birth. However, it would be interesting to define the toxic level when Leucaena is only a part of the ration, to goats of different age/weight. On-farm information was collected from 150 small farmers to obtain production parameters in goats. These parameters are very low in relation to fertility, kid crop, birth weight, weaning weight, among others, but the most striking data are on mortality, with rates of 65% in kids and 20% in does. On the other hand, these low parameters show the great margin for general goat husbandry improvement, through adoption of new

management, health, nutrition and breeding techniques developed by the Winrock/SR-CRSP projects.

In the Model Farm at Maseno, preliminary results indicate that 0.5 Ha cultivated with traditional crops (beans, maize and sweet potatoes) and using marginal native vegetation, can produce more than enough food for four goats without affecting the crops production, and that these respond favorably to manure produced by the same goats. This response to manure fertilization has been observed in other sites and different rates are being evaluated. The good thing is that the Model Farm is visited frequently by small farmers and provides an opportunity to transmit information about DPG systems from other Winrock/SR-CRSP programs.

The research achievements during 1989-90 are in agreement with the project objectives: work continues on new technologies to generate economical improvements of DPG systems, through sustainable land use, sound practices for efficient utilization of forage resources and better all round goat husbandry practices and no significant changes were detected in the objectives of the two main projects and no disadvantageous activities were identified. Perhaps a relative disadvantage is the absence of training programs for host country personnel, other than the project's resident scientist. No local students or other professionals participated in any of the projects during 1989-90.

It seems that all the information generated by Winrock/SR-CRSP during more than a decade is very important and fits, in general, the goals of the global plan; that includes results transferable and applicable both at the regional and at the global level. In relation to the 1989-90 reports, although details are not mentioned in each partial experiment, the results are very objective, simple and easily transferred to the farmers.

Balance Between Research and Training

During 1989-90, the project did not support any long-term training. No host country or U.S. personnel were included as trainees in any of the projects. Outside of the participation in some workshops and meetings of the project's staff, no specific action was detected to enhance the host country research capability. There seem to be good relations with KARI and several local universities, but it is not clear what the impact is of the Winrock/SR-CRSP in those institutions in the host country.

There is not an adequate balance between research and training, at least during 1989-90, when research received all the attention.

Balance Between Domestic and Overseas Research

In relation to personnel, the Winrock and the resident scientists are top level. However, two years without an economist in an economics project may have delayed other results. On the other hand, more personnel at the "assistant' level could have been useful. These positions could have been filled with national professionals and some U.S. students.

During 1989-90 all the research was conducted in the host country. The annual report does not mention other domestic (U. S.) research activities.

Dissemination of Results

The results of research activities commented in previous paragraphs of the report have been published, presented at meetings, discussed at workshops or transmitted orally. Many of these are communicated to farmers and other technical people at the Maseno Model Farm. At the professional level, resident scientists Onim, Semenye and Biamba have participated in workshops and meetings in Kenya and other countries, as well as in related networks. (The list of publications is pending.)

The techpack, when finished, will be a valuable aid for the dissemination of research results in new DPG technologies and especially in helping extentionists and technicians to transfer information to small farmers. However, other than visits to the Model Farm, no direct procedures for dissemination of results to the farmers are mentioned, nor if KARI and the extension service or other agencies use these results at the field level.

Linkages exist between project staff members and professionals at KARI and the universities in Kenya, and also with international research centers like ILCA, ILRAD and ICRAF as well as with other networks. However, the extent and achievements as the result of these interactions are not mentioned in the annual report for 1989-90.

Utilization of Results

The utilization of results is mainly by professionals and/or students. On the other hand, there are 121 farmers from six villages where 350 goats were distributed for on-farm research and demonstrations. This activity is very important; however, no evaluation is mentioned about the "receptivity" of the farmers to the new technologies and up to what point they apply the innovations.

Inadequate Performance and Irrelevant, Marginal Activities

There are no inadequate, irrelevant or marginal activities to the project or the SR-CRSP objectives. In each project, the justification and the statement of the problem to investigate were well explained.

Recommendations

1. Changes in program objectives. The objectives are clear and valid for the host country, for the U.S. and globaly. However, in 1989-90 emphasis in training declined. Training, particularly for host country personnel, should continue to be an objective as important as research. The proper balance between these two components is the key to strengthening national research programs, and this is one of the global objectives.

2. Modifications. In research, perhaps a better balance should exist between the biological and the economic components. Some of the experiments reflect very limited statistical design.

Every effort should be made to include host country trainees. These are the most important elements in the strengthening of national research programs, and for the dissemination and utilization of results. This is the only way to provide the foundation for a long term, successful, research program in the country.

3. Improving distribution and utilization of results.

   a. Work closely with national institutions such as KARI and, through them, have an efficient transfer of results to the farmers.

   b. If the Maseno Model Farm has been successful and it appears so, create at least one more site (if funds are available) to multiply the dissemination activities. These farms should serve also as good sites for the on-field training of students and extension personnel.

   c. Coordinate with local institutions the creation of more adequate channels of communication to reach the farmers, the final users of research results.

5. Overall rating of program. Satisfactory, if adequate training programs are included.

Indonesia

Component Projects

Hair Sheep Production Systems
Prolific Sheep

Objectives

The primary objective is to develop and adapt sheep production systems to the needs of small farmers in the humid and semi-humid regions. These systems will be closely integrated with cropping systems, particularly tree plantation grazing systems, and will be based on local vegetation and feed by-products. Farming systems and on-farm research and development efforts are emphasized, with the end-product including technology packages and dissemination strategies for production systems that are economically and socially viable.

Evaluation of Whether Project Goals are Being Maintained and Accomplished

Breeding

The comparison of Javanese thin-tail prolific sheep with imported Finnsheep and Dorset crosses has been completed, and the mode of inheritance of prolificacy in the Javanese sheep has been delineated. Ovulation rate, and thus litter size, is largely controlled by a single gene pair. The hair sheep project currently includes native sheep and the imported St. Croix breed. Plans include

incorporating the Barbados Blackbelly breed via artificial insemination and embryo transfer.

Nutrition

Extensive evaluation of native and introduced grasses and legumes has identified several that are adapted to sheep grazing and plant survival in tree plantations with heavy canopy. Rhizoma peanuts are to be further evaluated in 1991. Research on the nutrient needs of the smaller hair breeds has been completed and summarized. The reviewers are particularly encouraged by the addition of forage agronomists to the research team. This adds a much needed component to the development of viable land use systems.

Sociology

The workshop on farming systems approaches for social and biological sciences in 1990 was an important step in initiating small ruminant farming systems. Further, the studies on gender gap and peasant household production are basic to the development of appropriate farming systems.

Economics

The economics subcomponent has focused on economic constraints to increasing sheep and goat productivity and production. On-farm research models have been used for these research studies. The on-farm research model emphasizes producer collaboration at all levels.

General Comments

The individual project subcomponents appear at this time to be developing appropriate information and technology for integration into the total farming system and technology packages. There is no clear evidence, from submitted annual reports, that a total team effort is in progress to develop and evaluate the final technology package and it is also not clear who is providing leadership for this effort.

In terms of adequacies or inadequacies of the research effort, there clearly is a major deficiency in the lack of an animal health input. It is not clear at this time whether a research effort is required or whether these deficiencies could be overcome via animal health expertise in management and/or consultancies.

Based on annual reports, the sociology team appears to need to place increased effort on *completing* its research, with emphasis on analysis of data and publication of results. Participating in meetings and workshops is not full completion of research.

Effective Balance Between Research and Training

Research

The funded components in the Indonesia project are (1) sheep production systems and (2) prolific sheep. The hair sheep production system research effort appears to be focused in the right direction, with management and research

locations more clearly identified and operational. The total team effort of all subcomponents needs emphasis.

The prolific sheep component is less clear for the future. The relative merit of high and low prolificacy selection lines is less clear in terms of future applications. Is the project to be a germ plasm source for Javanese sheep homozygous for the prolificacy gene? Is this needed? What are its merits? If these questions are not addressed, then this project is of academic rather than practical interest.

Training

Based on annual reports, all of the project subcomponents appear to have two or more Indonesian students in graduate training, except for Nutrition (N. C. State University). Most institutions indicate active participation of U.S. and other graduate students in data summary, analysis and publication. However, there is no evidence of U.S. students conducting research in Indonesia.

General Comments

It appears that students trained in previous years have been incorporated into host country institutions to enhance institutional research capabilities. Some of these have completed their degree requirements and returned to Indonesia as SR-CRSP project collaborators.

Balance Between Domestic and Overseas Research

The breeding (UC-Davis) and Nutrition (NCSU) subcomponents both report an appropriate balance of research activities. Emphasis is on host country research on appropriate animal populations and farm locations. However, correlated research on genetic selection at UC Davis and on evaluation of accessions of Rhizoma peanut at NCSU are examples of domestic research that can be transferred to the host country.

The economics and sociology 1990 annual reports for Indonesia did not discuss any related domestic research activities, thus, this can not be evaluated on these subcomponents.

Effectiveness of Dissemination of Results

The breeding (UC Davis) and economics (Winrock) subcomponents have aggressively and effectively published the results of their research efforts in referred journals and at technical meetings. Both are to be commended for their efforts. The nutrition (NCSU) subcomponent is improving in its efforts in this regard and is encouraged to continue emphasis in this area. No publications were listed in sociology (UM-Columbia); thus, it is concluded that none were completed.

Upon discussion with PI's, there is a general consensus that there are significant opportunities for linkages with scientists in other more advanced Southeast Asian countries such as Malaysia, yet this is often discouraged within USAID.

Effectiveness of Utilization of Results

Other than the contribution of scientific and technical publications to literature, it is difficult at this time to evaluate utilization of results from the projects in Indonesia. The projects are just now beginning to reach the "application phase" in their maturity, thus evaluating effectiveness of utilization must await the test of time.

Cost Effectiveness

None of the domestic institutions submitted budgets with their annual reports that were reviewed by the EEP. It is not possible, therefore, to evaluate the various components of cost effectiveness.

Kenya

Preface

Two members of the EEP, Drs. Glimp and Campbell, spent the week of March 17-24, 1990 in Kenya. In addition to the routine visit, they had been asked to evaluate Kenya as a site for the continuation of the animal health component (Washington State and Colorado State Universities) of the SR-CRSP. During the week they met with officials of USAID, KARI, ILCA and the University of Nairobi (Veterinary College) and visited sites at Kabete, Ol'Magogo and Maseno station in western Kenya. Their itinerary was greatly facilitated by Dr. Julius Mungai and every facility was afforded the panel to evaluate the project from all persons involved with the SR-CRSP in Kenya.

From September 1-8, 1990, Dr. Cornelia Butler Flora visited Kenya and was ably hosted by her rural sociologist colleague Dr. Mkonge Mbabu, a resident scientist in Productions Systems Sociology in Maseno. Dr. Butler Flora met with many Kenyan colleagues and felt that she received an excellent overview of the many facets of the Kenyan projects and the fine scientists working there.

Project Goals and Objectives

The project in Kenya appears to be making good progress toward the goals in the log frame and each of the project objectives.

General Goals

The project is expanding the body of knowledge on small ruminants, and farming systems involving small ruminants, in Africa. This ranges from the development at Kabete of a multivalent vaccine using the most modern techniques in biotechnology to the development of appropriate technology for smallholder agriculture at Maseno. The level of competence of Kenya scientists is excellent, with the project approaching a full complement of Kenya scientists on site. The Kenya scientists appear to have good working relationships with the American PI's who are among the best in their respective disciplines. There has been some turnover of U.S. PI's, but this appears to have been orderly. The EEP emphasizes the high level of competence observed among Kenya scientists trained by the SR-CRSP. This has clearly been a major accomplishment of the

project and should be continued in selected areas, notably animal breeding.

Project Objectives

The multivalent vaccine development project is highly ambitious, and perhaps optimistic, but the level of competence in the team is high and up to the challenge.

The development of the dual purpose goat is progressing in an organized fashion but, in the opinion of the EEP, it is not likely to reach project goals or Kenyan expectations in the next 3 years. This prospect needs serious review and careful future planning.

The Maseno research team has progressed very well in developing and testing the on-farm technology for utilizing the DPG, even while under the constraint of not having DPG's as a part of the package to test. The combination of research at the Maseno station in the basic disciplines and the incorporation of specific components of the research into the Model Farm program for on-farm research testing has been highly innovative, based on sound scientific principles, and has a high likelihood of success and application beyond the SR-CRSP's lifespan in Kenya.

Changes have been made in the overall plan of work; however, these have been normal and expected changes that would occur in the evaluation of research progress. The Model Farm approach is an example.

The only exception, which requires review in the opinion of the EEP, is the apparant attempt to incorporate ethno-veterinary medicine into the research protocols.

Research Achievements

Animal Health

The research achievements in animal health over the past year have been impressive. At a strategic level the animal health team has successfully brought a modern, working biotechnology lab to Kabete with the minimum of cost and now have it up and running with host country personnel at the helm. This is a tribute to their training and to the ability of SR-CRSP to transfer the technology from Washington State University to Nairobi. The significance of this achievement cannot be overstated since many animal health labs in North America and Europe are still struggling with this technology.

At a tactical level considerable advances have been made both in Heartwater and Anaplasmosis where members of the team have developed suitable DNA probes for the identification of the causal agents. In the case of Heartwater, the breakthrough was due to the enhanced ability of the team to grow the agent (*C. ovis*) in tissue culture through technology learned in Zimbabwe, a fine tribute to African networking!

A start has been made to identify key "protective" antigens on the surface of *Mycoplasma ovis*. While this has not yet been done successfully, the work shows promise and should lead to the identification and isolation of one of the

important elements for the polyvalent small ruminant vaccine—a goal of the five-year extension.

The animal health group at Kabete also provides veterinary support for the DPG breeding unit at Ol'Magogo. In addition to advice on preventive medicine for the Ol'Magogo herd, the two groups have pursued a project for the past two years to identify and breed goats resistant to the endoparasitic worm *Haemonchus contortus*. Initially, goats with low fecal worm egg counts were selected for breeding and their kids subjected to challenge doses of infective larvae. This work continues to show some promise and is of significance because of the importance of *H. contortus* in Kenya and in many other parts of the world. However, the selection of any ruminant for resistance to parasites is a very long-range project and the true validity of these preliminary findings will take several years to confirm.

While not directly related to the animal health project, the SR-CRSP projects at the Maseno station have been enhanced by the addition two years ago of a veterinarian, Dr. Siamba. During his tenure he has defined the causes of death and the diseases of goats prevalent in western Kenya, and provided on-going veterinary advice to the farmers in the clusters. This information will be most valuable for the health and well being of the DPG when it is distributed in western Kenya.

Dual Purpose Goat Development, Ol'Magogo

The development of the dual purpose goat (DPG) is proceeding on the basis of sound genetic principles and selection criteria. Unfortunately, delays due to management and other problems in the early years of the project are going to prevent completion of this component within the next three years. Current numbers include only a small sample of the four-breed composite does (108 total, 76 of breeding age in 1990) and an even smaller sample of F_2 selected does (19 total, one of breeding age). Further, the number of two-breed cross does for the production of four-breed composites (approximately 320) is limited, especially if the goal is to have up to 1000 of the DPG does by the end of the project. This can only be accomplished by use of superovulation, A.I. and embryo transfer technology. Since does are not mated until two years of age, the goal of 1000 head is not likely to be reached until 1995 - even with the use of embryo transfer technology. True DPG's will not be available until the breed is selected and stabilized for at least three or four generations (i.e., F_4's), and this is not likely until close to the year 2000.

The development of a dual purpose goat is clearly an important and worthwhile project. There is a high level of interest in Kenya and other countries in it. Provisions must be made by SR-CRSP, KARI, AID and others to see this project through to its completion. In the interim, the SR-CRSP team should exercise caution and attempt to curb the expectations of those anticipating the true DPG to be available for distribution in the near future.

As the number of lactating does increases, this project will clearly need increases in labor and facilities. Milk production records will be essential for the selection program, and hand-milking up to 1000 does will be a very labor intensive operation. Other requirements will include some facilities modification and equipment for embryo transfer (laparoscopes, incubator, cradles, generator, etc.).

Experience suggests this cost will be from $15,000 to $25,000, which is apparently not budgeted at the present time.

Maseno On-Farm Research Program

The Nutrition and Management and Feed Resources components of this project have made significant progress in recent years. The identification of factors limiting productivity, such as adequate nutrient intake from fresh forages and certain health constraints, and the development of solutions to these problems have been significant accomplishments. The training of field assistants and smallholder farmers, and the subsequent data obtained from the on-farm research in the clusters will contribute significantly to the knowledge base on smallholder agriculture. The Sesbania collection at the Maseno research farm is among the best in the world. It is of great importance to the project. The evaluation of the team approach into the Model Farm concept recognizes the fact that the holistic approach is essential in evaluating any new technology such as the DPG for smallholder farming systems.

The economics component of the project is fortunate to have Dr. Fanny Nyaribo on site. The linear program developed by Dr. Nyaribo in her dissertation contributed insights into the relationships of smallholder farm size, capital resources, levels of productivity, alternative enterprises (i.e., goats vs. cattle) and other factors to the economic output of smallholder farms. The model also includes consideration of factors such as human nutrition optimization vs. income maximization. It is clear from farm visits that both nutrition and income are important components of goat production in the view of the smallholders. Adding the economic component to the planning and research programs in the future will definitely strengthen this project.

Sociology Component

The sociology component is integrated into the other research components and is seen as very important by other members of the production systems team. Unfortunately, the sociologist is about to take a two-year leave of absence to work with ISNAR and KARI to help develop agricultural research administration. Although this will be a problem for the sociology component of the production systems team, particularly since there is no collaborating scientist on the ground being trained, it should be an advantage for KARI and for ISNAR to have someone with that experience there.

The sociologist is leaving because of funding cutbacks. At the last PAC meeting, the SR-CRSP and the PIs urged all the scientists to find funding elsewhere. The initial application for this new position, which is funded by the Rockefeller Foundation, was in the hopes that the individual could be seconded to Winrock and continue as sociologist on the SR-CRSP. However, Rockefeller Foundation feels that their project is only useful if they give the individual new experiences and thus are requiring the move to ISNAR. Other considerations aside, it may prove an exceedingly useful move in terms of institutionalization of the SR-CRSP.

The sociology work plan involves collecting sociological data related to the other projects. Some of the work cannot continue without an on-site sociologist, but other work requires it.

DPG Production Strategies

Farmer Management of Recommended Forage Packages. Monthly data has already been collected and now needs to be aggregated on a yearly basis. With some help this can be carried to fruition.

DPG Production Strategies—Breeding

Data collection is underway but will need more qualitative research and extensive interviews that will need an on-site sociologist.

DPG Production Strategies—Health Conditions and Treatment Patterns

DPG Production Strategies—Health Conditions and Treatment Patterns will also need an on-site sociologist to begin specifying the instrument and working through its application. Health conditions and treatment patterns are particularly important, because several of the collaborating scientists find that there is little unanimity among peasant collaborators about the kind of treatments they use and which are effective, particularly for internal health problems in goats.

DPG Utilization Strategies

Manure use is well underway and the sociological data concerning its use is being gathered. This project should be carried out without any problems.

Milk use will need further qualitative research in systematic in-depth conversations with various members of the extended farm households in order to distinguishs different strategies among different types of households. Here, the ethnic variable may prove important.

Factors in Farmer Withdrawal from the SR-CRSP is one project that unfortunately will also require a resident sociologist, but which will be extremely important. In discussions of this part of the project with the Production Systems team, it became clear that collaborating farmer withdrawals does not necessarily mean project failure. It is absolutely crucial that a systematic follow-up of the dropouts be carried out.

The project Overview of Past Experiences in Vaccine Production and Distribution in Kenya has been begun but will not be able to be carried out without a resident sociologist.

It is very important to note that every single one of the sociology projects is highly related to one of the other components of the Small Ruminant CRSP and has been developed in coordination with the appropriate component scientist and the Production Systems team as a whole. In this way, and perhaps in this way alone, can a sociology component really be effective in working with such commodity-specific, yet systems-based research approaches.

Need for More Sophisticated Data Analysis

The results of the sociology research to date have been impressive and generated shifts in research strategies of the entire Production Systems team. However, there is a need for more intensive multivariate analysis that has been carried out to date. So far, there are only single cross tabulations of the data.

The data is gathered by farmer by month. Programming help is needed to combine the monthly data into a workable yearly record. That data needs to be systematically analyzed using muiltivariate analysis, as does the data from the initial survey of 104 farmers. The analysis should go beyond the simple cross tabulations, although they have been used very effectively thus far. For example, we need to know if the same farmers are using fertilizers and pesticides, and if the farmers who hire labor also use pesticides and use fertilizers.

Programming help, possibly from the PI or from another collaborating institution, would be appropriate for sociology at this point. This is particularly necessary because of the highly sophisticated modeling that is going on in ag-economics, which is greeted with much more skepticism by the rest of the Production Systems team than the simple yet persuasive cross tabulations that are presented by the sociology unit. However, sophisticated multivariate analysis and linear programming models, as well as very clear, descriptive comparisons are useful in farming systems research and need to be encouraged for whatever scientist will be active in the sociology role in the future.

Appropriateness of Research and Training to Small Farm Needs

Kabete

It is generally recognized that one of the major constraints to animal production in East Africa is the presence of major infectious diseases, some of which do not occur elsewhere. The work at Kabete is addressing this problem by identifying the major antigenic components necessary for protection and their incorporation into a polyvalent vaccine. This approach should permit the production of an affordable vaccine for small ruminant farmers in Kenya, and the further customizing of these polyvalent vaccines has considerable potential for other parts of the world.

The health component on the selection of goats resistant to H. contortus also has potential significance for small ruminant all over the world. In view of the long-range and time consuming implications of the Haemonchus work, it is important that the animal health group remain goal oriented and pursue with unmitigated zeal their primary goal of a polyvalent vaccine—this in itself will be a major achievement for the next five years.

Ol'Magogo DPG Breeding Project

The DPG has been viewed for the last 20 years by many persons working in developing countries with a high density of smallholder agriculturalists as a much needed project. The DPG has great potential for improving smallholder family nutrition and income. There is a urgent need for additional Kenya scientists to be trained in Animal Breeding.

Maseno On-Farm Research

The assembling of a research team involving both animal and agronomic research scientists along with socio-economic scientists is almost a "first" for this type of intensive and complex program. The output of the research is a reflection of the caliber of the team. The process used in developing this team and the execution of the research should become a model for similar projects.

Personnel

It was very gratifying to the EEP to see so many Kenyan scientists now working in-country. In Kabete a small group is carrying out sophisticated biotechnological research with appropriate, but minimal, visitations by U.S. counterparts. The same is true at Ol'Magogo although the EEP identified a real need for at least one more Kenyan to be trained in animal breeding. At Maseno there is a perceptible increase in activity and esprit de corps with the recent addition of a sociologist and an economist to the team. Serious considerations should be given to providing them with some support personnel (secretarial/ assistants).

Assimilation of SR-CRSP Personnel into KARI

The SR-CRSP DPG breeding and on-farm research projects are scheduled to end in three years. The potential and quality of these two projects underscores the need for their continuity through assimilation by a Kenyan organization. It was clear to the EEP that KARI is now prepared to assimilate these two elements (it was unclear in 1988 what their future would be). In order to accomplish this, KARI must make provisions in their budget; since such budgeting needs a two to three year lead, the ME and the PIs need to start work this year and fully inform the KARI administration of their budgets and projected spending so that the assimilation and continuity of the work can be assured after 1993.

Facilities and Equipment

Excellent use has been made of the slightly expanded animal health facilities at Kabete. This group has done well to accumulate sufficient equipment to carry out sophisticated biotechnology but they are in dire need of a high speed refrigerated centrifuge for their vaccine work. Funds for this have not been forthcoming from any of the sources tapped but centrifuges and a large filtration piece of apparatus will have to be found for the vaccine work to continue apace.

At Ol'Magogo the facilities are fine for the present breeding program. However, there is no electricity, no refrigeration and no equipment for the embryo transfer work which is presently contemplated to speed up the DPG work. Should embryo transfer be pursued, a very cost effective plan will have to be made or the cost in facilities and equipment could be very high.

The members of the EEP noted several improvements and excellent use of the facilities at the Maseno station but report with regret and from personal experience that some of the motor vehicles used by the SR-CRSP in Kenya are moribund, i.e., past their useful life, and fast approaching death.

Funding and the Administration of the Program in Kenya

With the start of the second phase of the SR-CRSP come several changes in personnel, PIs and ME. It will be very important that all the principals, including PIs, ME, KARI and USAID personnel, plan and work most carefully together to ensure efficient continuation of the research work, production of the target numbers of DPG (1,000) and a smooth transition to KARI to ensure that the work done in Kenya is continued and not lost at the termination of the SR-CRSP. It is not too early for all parties to start this strategic planning.

Technology Package, Publications and Networking

At the time of the EEP visit (March '90) the research information was available, a coordinator (P.P. Semenye) had been named, and the following schedule made for the preparation of the Kenya tech pak.

Coordinator:	P.P. Semenye	
Preparation timetable:	March '90	Submit revised versions
	April '90	Compile document
	May/June '90	Regional testing of techpacks
	July '90	Update and revise techpacks
	August '90	Submit draft to Winrock for editing and printing
	November '90	Translate English version to Kiswahili
	January '91	Production of Kiswahili version

If the plans come to fruition in time, the English and Kiswahili versions should both be available and distributed by early 1991. This will represent the culmination of a decade of work and will be well in advance of the true dual purpose composite goat on farms in Kenya. Every effort must be made to ensure that the techpacks are produced on time and made widely available to eductional institutions in Kenya and the state extension service.

The level of publication of scientific research has been good and the quality high. The research team has integrated well with peer networks and appears to be well respected by the scientific community in the region.

The Kenya scientists at all locations within the SR-CRSP feel that they are a part of the East African scientific community. They are frequently invited to participate in workshops and present papers at scientific meetings. Based on visits with scientists from other institutions (eg. ILCA), the SR-CRSP research team is respected and frequently called upon to share their expertise. The Maseno team, for example, has been invited to Zimbabwe to assist in planning a similar project in that country. To the extent that it can be achieved without detracting from the SR-CRSP mission, this type of activity should be strongly encouraged.

USAID Mission Involvement

The EEP found—as it had in 1988—that the AID Mission in Nairoibi had an excellent, up-to-date and on-site knowledge of the SR-CRSP in Kenya. In

addition the Mission had provided over the past two years tangible and constructive support for the SR-CRSP. Considerable concern was expressed by AID personnel concerning the following:

i. Applicability of the Animal Health plans to the grass roots needs of Kenya.

The EEP would convey this concern to the scientists involved but feels that the production of a polyvalent vaccine suitable for SRs in East Africa or with appropriate antigenic modification to other parts of the world and investigations into resistance to H. contortus are pertinent and important to Kenyan livestock.

ii. The transmission of the information derived from the SR-CRSP to the small farmers of Kenya—not just the production of a techpack but the transmission of that information to the farmers.

The EEP would endorse, commend and support every effort which can be made to ensure that this happens, including the production of the techpack in two languages, field days at Maseno station, the education and use of Kenyan extension agents whose job it is to disseminate such information and get it out into thefield.

iii. Lack of continuity or despair about the SR-CRSP after 1995.

While some of this concern clearly comes from AID's global posture and hopes that with careful planning (see above) a very real legacy will be left in nutrition, dual purpose goats, farming systems, and animal health in East Africa. Additionally, the SR-CRSP approach has been distinctive, if not unique, with cooperative research training and overseas experience seen as integral parts of the integrated program.

Training

With a three to five year extension it is now possible for the SR-CRSP to continue the training programs recently tapered off at the end of the first decade of funding. Serious consideration and planning should be given to the following:

1. Postgraduate training of Kenyans at the Ph.D. and M.S. levels in the U.S. or elsewhere. The EEP identified a need for more animal breeding specialists and an increase in the small group in animal health which could be accomplished by graduate trainees.

2. Postgraduate training for Americans in various aspects of "international agriculture" and animal health. Kenya, with its critical masses of qualified scientists at Kabete and Maseno stations, would be an excellent site for this, and the EEP reiterates its appeal for this component to be increased (mandated) during the next iterations of the SR-CRSP.

3. Ol'Magogo DPG Breeding Project: The time frame, costs, and other factors affecting the development of the true DPG must be carefully reviewed. If KARI is to be expected to assume this responsibility in three years, they must be involved in this process. Realistic estimates of costs,

number of goats, and when these goats will be available for distribution need to be developed in the very near future. There is currently only one Ph.D. in Animal Breeding in SR-CRSP *and* KARI, which places both DPG and other KARI projects such as the Sahiwal stud at risk. Additional people should be trained in this area.

4. The Maseno On-Farm Research Project: The total Kenya research team is complete and on-site for the first time, which should yield significant results. The Model Farm approach, which includes the holistic approach to incorporating the DPG into smallholder farming systems, is strongly endorsed by the EEP.

5. The University of Missouri sociologist that was on-site during the EEP visit was promoting the incorporation of "ethno-veterinary medicine" into the project plan of work. The EEP is not aware of this being an objective of the research at Maseno, and thus considers it as potentially counterproductive to the mission of the project.

The EEP had several points of caution, relating to the sociology component.

1. The absence of a sociologist on the sites must be rectified as soon as possible.

2. Preliminary data obtained by the sociologist in a short-term on-farm survey were being misinterpreted due to a lack of understanding of production factors. This suggests that the sociologist must carefully review results or observations with the total production and economics team.

3. The University of Missouri sociologist that was on-site during the EEP visit was promoting the incorporation of "ethno-veterinary medicine" into the project plan of work. The EEP is not aware of this being an objective of the research at Maseno, and thus considers it as potentially counterproductive to the mission of the project.

4. The sociology research team is encouraged to review its preliminary research results with the total production team.

Overseas Programs

Morocco

Peru

Morocco

Preface

In March, 1990, two members of the EEP, Drs. Campbell and Glimp, spent one week in Morocco. During the same week, a SR-CRSP site evaluation team, led by Dr. J. Oxley and several PIs, was also present, so joint visitations for both groups were planned. This allowed the EEP an excellent overview of the projects at various sites in Morocco, with somewhat restricted opportunities for close examination and questioning of all aspects of the Moroccan projects. This report will, therefore, reflect that situation, being more of a strategic overview than an analytical report of the details of the Moroccan component of the SR-CRSP. It should be noted that the Moroccan scientists presented excellent reviews of their projects and organized two extensive tours during this week. It should also be noted that this report was written before any strategic decisions had been made about the global future of the SR-CRSP during the next five years. In late summer Dr. Cornelia Flora visited Morocco and evaluted the socioeconomic aspects of the SR-CRSP projects there.

Evaluation

The project continues to develop increased understanding of the constraints to land and livestock productivity and is developing new knowledge to address several of the constraints. The evaluation of improved genetic resources and nutrient supplementation programs are examples of new knowledge generated. However, the total economic, production and training package to integrate these two components into practical on-farm situations appears to be lacking. The range management team is probably having the greatest success in getting its program implemented at the community or grass roots level. The interaction of the political-social-technical components, for example, in the range management project on the perimeter of the Middle Atlas region at Timahdit is encouraging. However, the magnitude of the problem in the arid pastoral regions is extremely discouraging and the apparent successes are few.

The level of competence, and confidence, of the Moroccan scientist team continues to improve. The interaction of scientists from several departments within the IAV is ecouraging. However, the interaction with scientists from other groups (i.e., INRA, the MIAC-INRA Project at Settet, etc.) does not appear to be occurring adequately. The Ministry of Agriculture indicated that plans were in progress to formalize the research and development planning process, with strong emphasis on coordination and prioritization of efforts.

There has been substantial turnover of U.S. scientists/P.I.s collaborating with Moroccan scientists on the SR-CRSP. However, these turnovers may well be positive.

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Improvement of food, fiber and potential milk production from sheep and goats as a national goal will be extremely difficult to achieve with current production systems. The major constraints are the deterioration and degradation of national rangelands, the result of too many animals chasing too few range feed resources. Supplementation and genetic improvement will not solve these problems and may even aggravate them. Economic constraints related to pricing policies for red meat, regional disparities in animal prices, inconsistencies in feedstuffs pricing, etc., must all be addressed.

The number of published scientific papers and reports continues to increase. Although this is a major and important function of the SR-CRSP project in Morocco, caution must be exercised to assure that limited funds are not diverted from training and on-farm implementation programs for this purpose. The most significant achievement this year is the techpack publication entitled *Sheep Production and Management in a Mediterranean Environment.*

Research Achievements of Past Year

Genetics and Reproduction

Research emphasis has been on the development of a synthetic breed that includes 1/2 D'Man x 1/2 Sardi, with selection emphasis in the development process on prolificacy and growth. Field work includes the dissemination of F1 ewes and rams to producers. Five ewes and one ram were given to 12 producers in one area, with management recommendations and schedules included. Performance of the F1 appears to be superior to either of the parent breeds in overall productivity. Other studies have included the evaluation and documentation of causes of ram reproductive failure in cooperator flocks, determining optimal scrotal circumference in rams, and evaluating the "ram effect" on ewes late in the breeding season with emphasis on comparing sexually more agressive D'Man rams with less agressive Sardi rams. Research data indicate that Sardi sheep have lower water needs and higher nitrogen retention than the D'Man breed. D'Man sheep appear to be more susceptible to heat stress than the Sardi. Relative growth rate and food intake are higher in F1's.

Nutrition

The nutrition research program has four primary objectives:

a. Strategic supplementation during cereal stubble grazing.
b. Improved late gestation-early lactation nutrition.
c. Improved postweaning lamb nutrition.
d. Use of agricultural/industrial by-products.

The following research was conducted in the past year to address these objectives:

Effects of Type and Duration of Supplementation on Ewes and Lambs from Early Gestation through Early Lactation. Chronic undernutrition during gestation, particularly late gestation, can have serious consequences on lambing performance and lamb liability (i.e., lamb losses in 1984-85 were 18%, and in 1985-86 were 31%). Over 50% of lamb mortality occurs in the first three days postpartum, with weak lambs and poor milk production the primary causes.

Ewes were grazed at 16 ewes/hectare on barley stubble, with both Sardi and D'Man x Sardi F1 ewes used in the study, and were assigned to the following three treatments after the mating season:

1. No supplement to 16 weeks, then barley and cottonseed meal (CSM) thereafter.
2. CSM started at 5 weeks + barley at 16 weeks.
3. CSM started at 5 weeks + barley at 9 weeks.

Ewe weight responses during the first 16 weeks were: (1) -6.1 kg; (2) +3.9 kg; (3) +5.1 kg. Lamb birth weights increased as supplement levels increased. Lamb death losses were highest on treatment (1). The data were incomplete as presented. Earlier studies had shown energy to be the first limiting factor on cereal stubble grazing, with protein supplementation response best when energy is adequate. With this previous knowledge, the logic for the three treatments (i.e., protein supplement first, followed by energy supplementation in treatments 2 and 3) is not at all clear.

Use of By-Products in Lamb Fattening Rations. By-products available could potentially include carob pulp, citrus pulp, beet pulp, sunflower meal and molasses. A study this year indicated that satisfactory gains (200 gm/day) were achieved with 30% carob pulp in the diet. It was not clear how this compares with conventional fattening diets, or with other by-product supplements.

The nutrition research at North Carolina State University, in support of the project, related to evaluating the Australian controlled release chromic oxide bolus as a method of estimating fecal output. The bolus appeared to be reliable for predicting fecal output in pen-fed animals. Its performance in grazing animals was apparently not studied (at least not reported), which is really the only applicable use under Moroccan conditions. Experience at DuBois indicates that there are serious problems on low-quality forage diets when using the bolus as a predictor of fecal output in grazing animals. The above results would, therefore, be misleading.

The major deficiency in the Morocco nutrition studies is that economic data were not presented. In other words, what were the costs related to the performance improvements and were the benefits (improved performance) profitable?

Intensive Sheep Management in Imlil Valley of the High Atlas

During the past 15 months a pilot experiment has been conducted with small groups of Sardi sheep kept intensively by farmers in the High Atlas. Twelve selected farmers were given five F1 Sardi ewes and a ram with specific instructions about nutritional and reproduction management procedures to be used. These sheep are monitored each month—weighed, vaccinated, etc.—and modifications made as necessary. They are kept intensively, being mostly inside and fed a mixture of straw and various concentrates and cereal as available. It should be noted that the farmers also have flocks of sheep kept in a traditional fashion of grazing and moving to the high range in summer and the plains in winter. These farmers also produce crops (cereals, nuts and fruits) on irrigated, terraced fields. It is intended to make a comparison of the production of the introduced Sardi sheep kept intensively versus the local Berber sheep kept

extensively in the traditional fashion. The Sardi were supplied free and after two years the farmers will be expected to share 50% of the offspring with the SR-CRSP who will in turn supply new farmers, then the original group of Sardi sheep will be owned by the farmers.

This outreach project has provided a grass roots outlet for the reproductive and nutrition studies of the SR-CRSP and promises to provide a means of improving the lot of the small diversified farmers of the High Atlas. To date it has been monitored and supervised each month and has been successful in that very few animals have been lost and careful records haved been kept. It is still too early to analyze the results. There is a good deal of farmer satisfaction with the plan, some of which is due to the availability of excellent Sardi sheep at no cost, with good follow-up support. This outreach program in the Imlil Valley is most commendable, and it will be interesting to follow its long-range viability and economic feasability in three or four year's time.

Range Management Research

The range management research program was well presented in the 1989 Annual Report, and by Dr. Narjisse and others on the range management team in the meetings and field trips. The range management research team includes range scientists, animal scientists and agronomists. The team appears to be very aware of the socio-political aspects of range management and works closely with the sociology team in field implementation and training studies.

Specific research results presented, as stated earlier, can be reviewed in the 1989 Annual Report, pp. 39-44. New knowledge includes increased understanding of the *Stipa* and *Artemesia* rangelands ecosystems, characterization of range animal production systems, plant/animal interactions within these ecosystems, and the use of strategic supplementation to meet animal needs during periods of range plant nutritional inadequacy.

The range research team has developed a comprehensive training program, with different levels of training for: 1) continuing education for range scientists, policy makers and range managers on an international level; 2) training for field technicians or extension workers that includes a high level of "hands on" training; and 3) technical support of technicians in the field through result demonstration work and advice to farmers and regional and local leaders.

The range management research program should be encouraged to include more animals in its studies, now that the range characterization work appears to be largely completed. More innovative approaches, in cooperation with the sociology team, should be developed and evaluated as it relates to rangelands management and utilization.

Sociology Program

The Moroccan Institute collaborative research effort is different than the SR-CRSP effort in other countries. This is the only country in which the collaborating institution follows the land grant model: a teaching institution with research and extension responsibilities. This made the scientists less dependent on the SR-CRSP for support, which had advantages and disadvantages. Within

the Institute, there seems to be a strong feeling that social aspects are important and the people can talk about them.

The Institute is particularly strong in the French tradition of understanding the social context of agricultural innovation. They are much less strong in ability to bring more micro approaches to bear. However, this macro awareness has been important for the development projects they have undertaken regarding pastoral systems, particularly with the World Bank, where they basically negotiated with different sub-tribal groups in the middle and high Atlas to change their grazing systems to be more environmentally sound. There is a lot that can be learned about range management and the sociopolitical as well as the socioeconomic aspects of them.

However, there is still a lack of coordination between the actual production research and the sociological effort. For example, the techpack was put out before it was tested on farmers' fields. Even to this date, it has not been tested on farmers fields under farmers conditions. There has been no evaluation of the techpack to see if it is either socially compatible or economically profitable for the small farmer. However, the level of science is very high and the broad interest of the scientists to continue with the SR-CRSP, at least with a linkage mode, seems high in certain areas.

It is clear that the sociologist was one of the more difficult scientists to work with. A brilliant scientist, he has become an intellectual entrepreneur, spending part of his time in the U.S. and part of the time in Morocco. Further, he prefers to negotiate his own contracts, which currently will occupy him more than full time.

Recommendations

There are a number of concrete things that can be done under the linkage mode to strengthen the socioeconomic component of the other research. Given the existing protocol that is strictly followed at the Institute, these actions must be initiated by the official SR-CRSP sociologist
in order to involve more people within the socioeconomic department.

-The sociologist could submit a proposal that would include:

1. An analysis of the survey that he undertook in the high Atlas;
2. Further analysis different kinds of pastoral systems present there;
3. A follow-up evalution of the introduction of the Sardi sheep breed to the High Atlas area to see the impact on the present farming systems. Since this is the only place that the new technology will be particularly useful.

In addition, the sociologist could arrange for colleagues in economics to do some economic benefit analysis of the techpack technologies from the animal nutrition and breeding components of the SR-CRSP.

As a follow-up to the Moroccan participation in the SR-CRSP would be to facilitate visits by the Moroccans to Kenya and of the Kenyans to Morocco. It would be particularly helpful if the Moroccans could see some of the on-farm trials in Kenya and if the Kenyans could see some of the institutionalized procedures in Morocco. Although the different team members have met at SR-CRSP meetings in developed countries, they have yet to see each other's sites.

The SR-CRSP should continue to relate to colleagues in sociology, not just the officially named sociologist, whose interests are perhaps a bit more exotic than some of the other sociologists at the Institute doing exciting work relating to small ruminants.

Personnel

The host country (Moroccan) personnel have been relatively stable over the past three years of the SR-CRSP. Many of them are of international renown and are sought-after speakers in other countries. Their support staff is stable and well organized.

While there are no American expatriates working permanently in Morocco, the presence of the "Minnesota Project", under the leadership of Dr. D. Johnson, has been invaluable to host country and American personnel alike. All members of the "Minnesota Project" and, in particular, Dr. Johnson, are to be highly commended for the very real cooperation and help they have afforded the SR-CRSP since its inception.

The cadre of American P.I.s involved in the SR-CRSP has changed substantially over the past two years. This is particularly so in Nutrition and Range Management where new American P.I.s have been designated (Nutrition, Dr. K. Pond; Range, Dr. B. Norton). Our Moroccan counterparts have consistently stressed the importance to them of collaboration with "outside institutions" and "outside scientists" as one of the most important and vital aspects of the SR-CRSP. They expressed concern that they were not always aware of the "home-based" research projects of their American counterparts and felt that they could profit considerably from a bilateral exchange of information, perhaps through discussions or seminars.

Training

With the end of the first 10-year phase of the SR-CRSP in sight, there has been a considerable reduction in the training phase of the SR-CRSP. There are now a large number of well-trained scientists at I.A.V. fully capable of future collaborative research and training of American graduate students with Moroccan-based projects. Should SR-CRSP continue in Morocco in a second phase, full advantage should be made of their availability, expertise and experience.

Equipment, Facilities and Funding

The facilities at IAV are relatively new and well appointed. The SR-CRSP provides a fairly small but important part of their funding and co-mingled with other funding, both external and internal, facilitates the conduct of a significant body of research. The SR-CRSP funds, though modest, are still significant for travel, training and day-to-day operating costs.

The members of the EEP heard several complaints about the Tedlah experimental station. These were concerns about the availability of funds for such basics as feed and the fact that any profits "disappear centrally" and are not available for purchasing needed supplies. There were also concerns about the coordination and administration of animal experimentation at Tedlah with scientists making demands for animals regardless of the needs of others. Finally, members of the EEP were concerned about the welfare and the general manage-

ment of the animals at Tedlah when they observed large litters of newborn lambs being left to perish for want of an appropriate system of artificial rearing or grafting (a system described as "natural selection"), many animals with overgrown hooves and an adult sheep whose joints were ankylosed at birth hobbling round on its knees with the rest of the flock—this latter being explained on the basis that "all animals had to be accounted for and no animal, however incapacitated, could be euthanised." It was clear that the high (impeccable) standards necessary for the maintenance of suitable experimental animals do not presently exist at Tedlah.

Administration of Program

The SR-CRSP is well integrated into the research and training programs of IAV. However, the EEP heard several expressions of concern from the AID Mission, the Ministry of Agriculture and (the research division) personnel that the programs of IAV, including the SR-CRSP, were not necessarily well-integrated with other national efforts in small ruminant research. The EEP is not in a position to verify these concerns, having only the briefest of exposure to other agencies' research efforts in Morocco, but, given the expertise at IAV and the limited resources available in Morocco, it behooves the SR-CRSP to ensure that cooperative efforts are encouraged and duplication of work avoided in future SR-CRSP work in Morocco.

USAID Mission Involvement

USAID appears to have been heavily committed to the agronomic programs in Morocco, and the development of technical competence in these areas. This is evidenced by its financing of the "Minnesota Project" on graduate training, which is coming to a close. The support of the MIAC-INRA project at Settat, which has funding commitments through 1994, is a major part of the USAID commitment in Morocco.

The USAID and the Ministry of Agriculture view the Settat program as a "hands on" project, with an animal/forage component. Visits with Settat administration and research scientists did not produce significant evidence of an agro-pastoral component, nor a strong interest in developing one. To date, animals have only been used in "put and take" grazing studies to measure forage production.

When one views crop production in Morocco, cereal grain production is totally linked to agro-pastoral production, especially sheep production. This is evidenced by: 1) intensive grazing of barley and wheat during the vegetative phase prior to jointing; 2) heavy utilization of straw by livestock; 3) the marketing of surplus grain through livestock; and 4) "graze out" of cereal grain crops during poor rainfall years. On the average, the primary source of income from cereal grains is through livestock.

The Ministry of Agriculture, and especially the USAID through its funding support, should be encouraged to force multi-disciplinary programs in the agro-pastoral area. The lack of cooperation and/or coordination of the INRA project at Settat and the SR-CRSP project at IAV is unfortunate. Cooperation will only happen when funding sources force it to happen.

The USAID Mission stated that a proposed range management project for Morocco was turned down by headquarters. They stated that they were instructed to emphasize watershed management, rainfed cropping agriculture, and other concerns affecting the environment such as reforestation and extensive or low potential agro-pastoral agriculture. The Mission is urged to try again for a range management project since it is highly relevant to all of the above priorities, especially with emphasis on the fact that rainfed cropping and range management are both inextricably linked to animal production systems, and this linkage is relevant to environmental concerns such as erosion, watershed management, water quality, rangelands degradation, etc.

The SR-CRSP research team is encouraged to become more proactive in informing USAID Mission staff of SR-CRSP projects and activities. There seemed to be a lack of understanding of project objectives on the part of the mission staff. This is viewed by the EEP as the SR-CRSP research team's responsibility.

The USAID Mission in Rabat has consistently taken a more critical position on the SR-CRSP efforts in Morocco compared with other sites (Indonesia, Kenya) visited by the EEP. The basis of the concern seems to be the Mission's conviction that the efforts of the SR-CRSP are *not* well integrated with other efforts, notably those of the Ministry of Agriculture, MIAC and INRA, in Morocco. While it is true that repetition of research can be an important means of vertification of results, it is also true that resources for research are very limited in Morocco and every effort should be made to avoid duplication of work and to utilize the considerable resources and expertise at IAV to the maximum.

Linkages and Networking

The major advance in networking during this year was the publication in French of *L'elevage Du Mouton Dans Un Pays A Climat Mediterraneen*, a sheep production handbook for extension use in Morocco. It is anticipated that the handbook will have more extensive application in the mediterranean area and will enhance the reputation of Morocco as a center of regional expertise in small ruminants. The production of this handbook represents a major landmark in the progress of the SR-CRSP in Morocco. The EEP recommends that this handbook be widely distributed at modest cost to the purchaser and that the ME consider the production of additional copies for dissemination of this information in the mediterranean basin—an excellent and productive form of networking.

Constraints to Production

Several people representing different agencies listed the constraints to improving sheep production and/or research priorities to address production constraints. There was lack of unanimity in terms of recognition of constraints and priorities to address these constraints. The EEP would suggest the following priority list, some of which are not being addressed by the SR-CRSP or other programs:

1. Chronic undernutrition caused by overstocking.

A. Sheep were overstocked in *all* areas visited. This is so serious that some of the rangelands degradation is probably irreversible. This is a socio-political problem that must receive the highest priority.

B. Traditional herding practices are further aggravating the problem. It was not uncommon, for example, to observe up to five herds of 40-100 sheep and goats in one small grazing area. Managing these herds as one common unit on the communal lands would at least provide some opportunities for rest-rotation grazing.

C. Supplementation is viewed as a high priority by many, but it is feared that this is viewed as a substitute for reducing stocking rates. Strategic supplementation during critical periods is a valid approach, but does not imply the ability of lands to support higher stocking rates through supplementation.

Animal health

The SR-CRSP is not addressing animal health in its research projects. The animal health problems observed can, to a large extent, be accounted for due to two management practices: severe overgrazing, resulting in chronic undernutrition, and the practice of night penning in overcrowded, poorly ventilated barns and lots. The health problems are manifested as internal and external parasites, pneumonia, reproductive diseases of the ram and ewe, etc. The treatment of these diseases will meet with little success until the underlying management problems and/or practices are resolved.

Marketing and production economics

Marketing and production economics are not being addressed by the SR-CRSP, nor do they appear to be addressed by any other project that was reported on to the EEP. Although meat prices are somewhat regulated, there appear to be huge disparities from region to region and city to city. Although grains have an "official" market price, there appears to be little relationship between the "official" price and grain market dynamics. Structural problems related to slaughter, transportation of live animals and meat, buyer competition and marketing options all appear to be serious constraints. Further, major changes in production practices are being evaluated by the SR-CRSP (prolific breeds, alternative feeds, alternative production systems, etc.) without adequate consideration of costs and returns.

Breeding

The Ministry gives highest priority to evaluating imported breeds and the D'Man breed. The SR-CRSP has emphasized the development of a highly productive breed—the D'Man x Sardi cross. The EEP suggests that emphasis should be placed on genetic improvement of adapted local breeds. It is apparent that, due to poor management, these breeds are producing below potential and must be very hardy to survive under the conditions observed. This hardiness and apparent tolerance to mismanagement should not be disregarded.

Agropastoral production systems

Increased understanding of appropriate agropastoral production systems has been discussed at several points throughout the EEP report and requires multi-disciplinary team approaches and the elimination of institutional "turf" problems.

Technology transfer

The magnitude of this problem is underscored by the reported 90% illiteracy rate in rural areas. This presents huge challanges that require innovative approaches to technology transfer. This problem is not being adequately addressed.

Recommendations by Program

Genetics Program

A. Evaluation of the 1/2 D'Man x 1/2 Sardi sheep. Care should be taken to insure that the F_1 crosses are evaluated under realistic farm conditions, rather than artificial or confined conditions.

B. Definition of long-term goals. Is the goal to develop a breed? For what management situations? What are the breed development plans, what is required in terms of years and resources? How will this breed be used?

C. Improvement of the Sardi breed. This should not be overlooked. It appears that the breed is adapted to a wide range of harsh environments. It also appears that genetic potential, in terms of pounds of lamb produced per ewe, of the Sardi breed is three or four times greater than the current national production level. The EEP believes it is essential that current genetic resources (i.e., Sardi ewes) should be approaching their genetic potential in actual productivity before increased productivity from higher potential genetic resources (i.e., D'Man x Sardi) is encouraged. It is also apparent that the vast majority of the rangelands are not likely to support sheep of this high productivity in the near future, thus emphasizing further the need for selection within an adapted breed such as the Sardi.

Nutrition Program

The nutrition program must emphasize the economic aspects of its supplementation and alternative or by-product feed resource research. A carefully defined set of studies needs to be conducted, both in the ewe and and in the postweaning lamb, that defines the biological response to supplementation at different levels upon feeding specific feedstuffs, their substitution value relative to a baseline diet, and the economic costs (and ultimately returns) of these decisions.

The nutritionists and range managers are especially cautioned to avoid the thinking that supplementation is a substitute for making tough range management decisions (i.e., reduced stocking rates). This mentality was apparent, for example, in the technical and political leadership in the Missour region.

Range Management Program

The range management research team is encouraged to emphasize range management and utilization under field conditions in its future studies. This team could contribute significantly to the baseline information required for understanding of agro-pastoral production systems. Continued emphasis on the team approach in field implementation projects is encouraged.

The Outreach Program in the High Atlas

The EEP commends the outreach program in the High Atlas and recommends that careful record keeping of the sheep be continued. The EEP suggests that any unfit sheep (old, chronically lame, coughing or thin, etc.) in the original group be replaced with healthy ones for the two-year period of study. The EEP recommends that at the end of two years, the data be analyzed, that the economics of the system be carefully evaluated and that farmer satisfaction and continuation of the system be determined. This broad-based analysis will only be possible if a multidisciplinary approach be taken early in this program, and the EEP recommends that this be done as soon as possible.

Sociology Program

There are a number of concrete things that can be done under the linkage mode to strengthen the socioeconomic component of the other research. Given the existing protocol that is strictly followed at the Institute, these actions must be initiated by the official SR-CRSP sociologist in order to involve more people within the socioeconomic department.

- The sociologist could submit a proposal that would include:

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The SR-CRSP should continue to relate to colleagues in sociology, not just the officially named sociologist, whose interests are perhaps a bit more exotic than some of the other sociologists at the Institute doing exciting work relating to small ruminants.

EEP Recommendations – General

1. The EEP recommends that every effort (administrative, financial, management) be made to ensure that the experimental animals kept at the Tedlah station be maintained under optimal conditions.

2. The SR-CRSP efforts in Morocco should be integrated with and complementary to the national efforts in small ruminant research and production.

3. The EEP recommends that all parties who do research on small ruminants in Morocco, including sponsors, national ministries and research institutes, meet at reasonable intervals—at least once per year—to discuss results, visit research

sites and explain future plans in order to avoid duplication, foster cooperation and complement each other's efforts.

4. Every effort must be made, including increased printing if necessary, to ensure that the sheep production handbook is made available throughout the mediterranean region and in Morocco. Since many of the shepherds in Morocco (and elsewhere) cannot read, key parts might be illustrated as "cartoons" or diagrams for use in the field.

5. The outreach project in the Imtil Valley, with Sardi sheep kept intensively, should continue to be carefully monitored and particular attention paid to the fitness of the sheep used, the economics of the system and farmer acceptability. Its overall effect should be carefully evaluated after two years of operation and comparisons made with the traditional form of management with mature sheep.

6. Every attempt should be made to ensure that the American P.I.s interact in a bilaterally symmetrical fashion (seminars, consultations, students, visits, etc.) with their Moroccan counterparts.

7. Increased and renewed efforts should be made to ensure that the operation of the Tedlah experimental station is improved. This will require integration, a better economic base and the strictest level of health management.

8. A method must be found to ensure that the SR-CRSP research and extension efforts are compatible and integrated with the other international and national programs in the small ruminant and range management field.

9. USAID should recognize and commend the considerable and constructive help offered to the SR-CRSP by personnel involved in the "Minnesota Project."

Peru

It has been several years since any members of the EEP were in Peru. This report was compiled from the annual reports of the American PIs, published reports from the Peruvian project and the excellent monthly reports provided by Dr. Arturo Florez, site coordinator in Peru. It should be noted that the Small Ruminant CRSP officially closed down in Peru on September 30th, 1990 and the year of this report was one of terminating as efficiently as possible the activities of the Small Ruminant CRSP in that country in accordance with stated policy. In a general way this wind down was conducted in a most orderly and successful fashion. This is particularly noteworthy given the very difficult circumstances in Peru where communications, personal safety and on several occasions lack of electrical power made work extremely difficult. The following is a very brief evaluation of the Small Ruminant CRSP events in Peru and some minor recommendations for the future.

Evaluation

Members of the EEP agreed that the objectives for the Peru projects had been satisfactorily achieved and that many of the results achieved by the Small Ruminant CRSP in Peru over the decade were brought to fruition through published results and workshops. It is worthy of comment that the Small Ruminant CRSP has contributed very substantially to the knowledge about small ruminants in the High Andes and some of this information is unique and will be useful to Peru and other Andean nations in the future. The EEP has consistently remarked that the work on the alpaca is almost unique and has been a major contribution of the Small Ruminant CRSP to the global scene. There has been a considerable amount of small project research carried out in Peru throughout the last year and most of this is dealt with in the American institutions report. However, it should be noted that some of the operations, notably the small grants, the networking activities, the publications and, finally, the workshop on the future acquisition of research funds will all serve Peruvian scientists very well in the future. One can only hope that the results of the research in Peru and the training of its personnel will all be exploited when the Small Ruminant CRSP moves to Bolivia. Much of the research work that was carried out in Peru can be transferred to Bolivia and continued in the appropriate American institutions. The EEP hopes that this can be carried out as efficiently and as expeditiously as possible without any major loss in research impetus.

The collaboration between the American PIs and the Peruvians has been most commendable. This is particularly so given the difficult circumstances but it is very clear to the members of the EEP that the American PIs were deeply concerned about the future of their Peruvian counterparts and performed many tasks beyond the call of duty to facilitate the publication of results, the continuation of research and the initiation of a networking system for the Andean region. The Peruvian counterparts clearly cooperated magnificently in these efforts and both parties are to be commended on the results achieved to date.

With respect to the dissemination of results, a remarkable number of publications have been forth coming from the Small Ruminant CRSP work in Peru and it is particularly commendable that many of these are in Spanish as well as English. It is equally commendable that the techpack was completed both in English and in Spanish and it is now available. No doubt it will be widely used in the future.

The members of the EEP, having perused the budget for this year, believe that the investment made in Peru was modest and money extremely well spent. It is also noteworthy that AID personnel in Peru and in Washington appear to have been extremely helpful in this wind down phase and also in the attempts to move the Small Ruminant CRSP elsewhere in South America. The arrangements for the disposition of the equipment purchased by the Small Ruminant CRSP seemed to have been quite satisfactory. It is particularly ironic that the EEP at this stage of closure of the Small Ruminant CRSP finds itself in a position of commending very highly the activities of this last year and it is with the deepest of regret that the members of the EEP see the unfortunate but inevitable termination of these fine projects.

Recommendations

In view of the fact that this project is now terminated, recommendations for the future might appear to be spurious. However, members of the EEP would like to make the following observations and recommendations to the Small Ruminant CRSP in the hope that they will be useful for the future.

1. From all appearances, the administrative research networking and interpersonal arrangements which are made to wind down the Small Ruminant CRSP in Peru appear to have been excellent and should serve as a model for the termination of other Small Ruminant and indeed other foreign aid projects. Every attempt should be made to maintain relationships with the Peruvian counterparts and incorporate them and their knowledge wherever possible in the Bolivian enterprise. With a decade of experience behind them they are in a position to be most helpful in the next phase of the Small Ruminant CRSP in the Andean region. It is recommended by the EEP that serious consideration should be given to funding any bridging enterprises which might occur between the terminated project in Peru and the work in Bolivia.

It was noted (Dr. Florez' monthly report, September, 1990) that three publications in the area of animal health had not yet been published and distributed. They are "Mortality in alpaca cria," "Aspects in alpaca and sheep in communities of the department," and "Medical and toxic plants for cattle in communities of the Peruvian central sierra." It is always unfortunate when manuscripts cannot be distributed for budetary reasons and any publication on camelids is extremely useful. Therefore, serious efforts should be made to complete their publication. The members of the EEP would recommend that these manuscripts be scrutinized by appropriate experts and every effort made to publish and distribute them.

2. With respect to an overall rating of the program in Peru, the members of the EEP were agreed that during the wind down year of 1990 the performance of all members of the program was highly satisfactory and their efforts were highly commendable.

Management Entity and General Administration of the Small Ruminant CRSP

With ten years of experience under its belt there is a general feeling amongst members of the EEP that the Small Ruminant CRSP is operating very successfully. However, the EEP had very major concerns about certain fundamental administrative matters and would like to bring these to the fore as extremely important matters requiring careful and in some cases urgent attention.

The Directorship of the Management Entity

The directorship has been vacant for almost a year at this point and it is imperative that the position be filled as expeditiously as possible. This position is pivotal for the overall management of the Small Ruminant CRSP. It is absolutely essential to have an excellent person in position to maintain appropriate day-to-day oversight and management of the affairs. The EEP would urge that all parties concerned with the appointment of a new director deal with the matter as expeditiously as possible. If it is not resolved with a suitable candidate by July (the Board of Directors meeting), then a radical new approach must be examined to resolve this important issue.

Bidding on Small Ruminant CRSP projects

With the opening up of the new site in Bolivia, the EEP would once more urge in the strongest possible terms that the projects and the contracts be made public and the bidding for them be made nationally competitive. This, we feel, is the optimum way to do business and the best way to maintain excellence in the Small Ruminant CRSP.

Technical Committee - Board interactions

Members of the EEP would urge in the strongest possible terms that the Board of Directors exercise their authority and obligation to scrutinize with great care the recommendations of the Technical Committee and add their expertise to these. For a wide variety of reasons, not all of which are negative, there is a tendency after a successful operation has been in progress for a decade for the principal investigators to become so expert that their recommendations, budgets, etc., are easily endorsed. However, there are disadvantages to this process, not the least of which is that the Small Ruminant CRSP would not profit from the experience and objectivity of the Board, and this tendency and any tendency to rubber stamp the Technical Committee's recommendations without giving them the most serious of consideration is to be avoided.

A Summary of the Observations and Recommendations of the External Evaluation Panel

1. The members of the EEP would reconfirm the importance of the small ruminant as an important source of food, clothing, income and security for the developing world. The SR-CRSP projects have been an extremely cost and results effective form of foreign aid with very substantial benefits for the United States.

2. One of our most serious concerns 10-12 years ago, as scientists working with small ruminants in the U.S., was the lack of young scientists committed to small ruminant research. The development of such scientists in the SR-CRSP has been a major benefit of the SR-CRSP. We now have a small ruminant research network in the U.S. and many of the members are young scientists identified through this project. This network is well integrated with the world regions where the SR-CRSP has been working for the past decade.

3. Technical Committee—Board interactions. Members of the EEP would urge in the strongest possible terms that the Board of Directors exercise their authority and obligation to scrutinize with great care the recommendations of the Technical Committee and add their expertise to these. For a wide variety of reasons, not all of which are negative, there is a tendency after a successful operation has been in progress for a decade for the principal investigators to become so expert that their recommendations, budgets, etc., are easily endorsed. However, there are disadvantages to this process, not the least of which is that the Small Ruminant CRSP would not profit from the experience and objectivity of the Board and this tendency and any tendency to rubber stamp the Technical Committee's recommendations without giving them the most serious of consideration must be avoided.

4. Bidding on Small Ruminant CRSP projects. With the opening up of the new site in Bolivia, the EEP would once more urge in the strongest possible terms that the projects and the contracts be made public and the bidding for them be made nationally competitive. This, we feel, is the optimum way to do business and the best way to maintain excellence in the Small Ruminant CRSP.

5. The success of the SR-CRSP to date is strong and persuasive testimony to the commitments host countries, institutions and individuals have made to this project in the past decade. This panel recognizes that personnel turnover and changes are inevitable and healthy. The SR-CRSP appears to have had substantial PI turnover at this time and we suggest that each institution review its commitment to the SR-CRSP when assigning staff and resources with emphasis on the following four points:

Previous Page Blank

A. Commitment of the institution to international programs.

B. Fitness of the SR-CRSP to the institution's objectives.

C. Fitness of the Principal Investigator to the institution's commitments to the SR-CRSP.

D. Awareness of the PIs about the basic objectives of the SR-CRSP.

6. The External Evaluation Panel recommends that guidelines be established to assure increased support for training U.S. graduate students within the host countries. This was one of the original stated objectives of SR-CRSP and it has not received adequate support in recent years. Host countries, and to a lesser extent PIs, have been reluctant to support U.S. students due to cost and other factors. We believe that it is an important function of this SR-CRSP to train future U.S. scientists for development assistance and other international work. It is possible that a "formula funding" mechanism will be required for acceptance (3% of project dollars, or a ratio of U.S. to foreign students, or equal amounts expended on U.S. and foreign students). If the decision is left to the host country, very few countries will want to expend the extra cost to involve U.S. students or young faculty members. Guidelines must be developed by the SR-CRSP Board to obtain a balance for Host Country and U.S. students.

7. There are a few fundamentals in the philosophy and planning of the SR-CRSP which are not incorporated as strongly as they might be in the research planning process. These include:

A. Sustainability – from the point of view of long-range ecological soundness, sustainability must be a critical component in the research and training process. For example, concern is expressed in this report about the use of high fertility breeds of sheep on nutritional supplementation where overstocking is the real problem.

B. Longevity – It is important that all persons involved in the SR-CRSP over the next five years make careful plans and adequate preparation for the continuation of the programs started by the SR-CRSP, so that the traditional "post aid vacuum" will be supplanted by a post SR-CRSP legacy.

C. Geographical areas of importance – At the present time, the arid desert ecosystem (represented by sub-saharan Africa) is not represented in the SR-CRSP and this ecosystem on a world-wide basis includes a major portion of the small ruminants in developing countries. Terminating the Peru projects leaves a void in the high altitude ecosystem and in the study of the alpaca.

D. Breadth of applicability – The grazing of small ruminants under plantation trees is of novel and significant interest.

E. Benefits to U.S. – There are clearly many benefits to U.S. institutions, research scientists and agriculture from the SR-CRSP. The participants should identify and emphasize these benefits at every opportunity.

8. The EEP would recommend strongly that the Indonesian sites be continued for the next five years. To that end, the panel has made recommendations about expatriate scientists, communications, consultants, veterinary services, planning and future site development, etc., for these sites.

The EEP recommends that the SR-CRSP maintain and enhance the present good relations and understanding that exist with the USAID mission in Jakarta. This should be done by frequent briefings, copies of publications and, best of all, USAID visits to SR-CRSP sites. As work progresses over the next five years all parties should continue to investigate the possibility of mission buy-in, particularly in the waning years of the SR-CRSP, so that selected initiatives started by the SR-CRSP, for example, grazing under plantation trees, can be continued and enhanced with USAID mission funds.

9. The EEP strongly recommends that the SR-CRSP continue to support the work which has been done on national and international networking in Asia. During the next five years a very strong network could be set up in Asia which would substantially increase the efficiency of the work by preventing duplication and making information on small ruminants widely available throughout the region.

10. Members of the EEP have some concerns about the use of increased litter size as the primary means of genetic improvement in sheep. This is the goal both in Morocco and Indonesia where other traits might be more important to production, e.g., hardiness, disease resistance, heat tolerance, sub-optimal, nutrition, etc.

11. The publications from the SR-CRSP have increased in recent years as the projects mature and get results. The publications have been prolific, of good quality and some, e.g., "Penelitian Ternak Kambing Den Domba Di Pedesaan," have been adopted by other international agencies (FAO) for wider distribution.

12. The development of a dual purpose goat is clearly an important and worthwhile project. There is a high level of interest in Kenya and other countries in it. Provisions must be made by SR-CRSP, KARI, AID and others to see this project through to its completion. In the interim, the SR-CRSP team should exercise caution and attempt to curb the expectations of those anticipating the true DPG to be available for distribution in the near future.

13. There is an urgent need for additional scientists to be trained in animal breeding for Kenya.

14. The animal health work, both on a multiple component vaccine for goats and on the intestinal worm, Haemonchus contortus, has global significance and application in ovine, caprine and, to a lesser extent, bovine health. Any breakthroughs in the control of haemonchosis and the production of a "backbone vaccine," to which selected antigenic determinants can be added, will have major significance around the world.

15. The "Model Farm" concept and reality used in western Kenya is strongly endorsed and recommended by the EEP.

16. The EEP endorses the plan to wind down the Small Ruminant CRSP in Morocco. The IAV is probably better equipped than any other Small Ruminant

CRSP around the world to continue on its own and compete for national and international funds. It is recommended, therefore, that the major research components be terminated and the training of Moroccan students be tapered off in a responsible manner. The Small Ruminant CRSP should give serious consideration to a modest amount of funding for the following purposes:

1. Completion of any outstanding articles for publication in peer-reviewed journals.

2. Compilation and publication of the technical package and its distribution.

3. Some support for an international symposium as suggested in the annual report.

Support for any other projects should be contemplated only after the most extensive planning, critical examination and investigation of alternatives by all parties involved.

17. The EEP recommends, with great regret, that the work in Peru be phased out as expeditiously as possible with the minimum of trauma to the Peruvian personnel. This might involve sufficient funding to facilitate continued linkages and the pursuit of small projects which might be based, not at distant sites in the country, but in Lima. Because of the excellence of the work and its relevance to small ruminants, the scientists involved should be given serious consideration for projects in other parts of the world.

18. The EEP recommends in the strongest possible terms that the new site(s) in Bolivia become active as expeditiously as possible.

19. The EEP did not specifically review the M.E. during this year. However, the individual members and the chair reiterate that they have received a continued high level of cooperation and help on all occasions from all members of the M.E. and from the USAID project officer, SR-CRSP.

Appendix A

Response of the Management Entity to the External Evaluation Panel's 1989 EEP Report

Page 12, paragraph 6

CCPP Vaccine

The SR-CRSP in collaboration with KARI researchers developed a safe, easily stored, and highly efficacious vaccine for CCPP.

Evaluation of yearly reports of CCPP outbreaks in Kenya indicates that approximately 82 outbreaks occur each year. These outbreaks occur in herds with an average size of 500 and result in an estimated exposure of another 270,000 goats. Death losses exceed $500,000 yearly and do not include estimates of economic losses from weight loss, infertility, and decreased milk production in animals that survive infection.

Demand for the vaccine by Kenyan farmers is high. In 1987, the first year a production protocol for the CCPP vaccine was available, KARI made 165,000 doses. These vaccine doses were distributed by the government veterinary services. In 1988, demand continued and 35,000 doses were made before a high-speed centrifuge necessary for vaccine production broke and could not be repaired. Since that time only small lots of vaccine have been made and the demand has not been supplied.

Subsequently, the Government of Kenya supported a plan to vaccinate all goats and included equipment money in its budget. Unfortunately, these funds have not yet become available. More recently a government-sponsored organization was created to make and market vaccines in Kenya. CCPP comes under the jurisdiction of this new organization.

We have tried to document that F38 *Mycoplasma* causes CCPP in other countries, such as Mali. If the vaccine can be shown to be effective in other countries, perhaps those countries can produce the vaccine. As a last resort, we have a proposal to buy the equipment and to help produce a few million doses of the vaccine. If all other possibilities fail, this plan will be implemented in 1991.

Page 21, paragraph 3

Help from USAID Mission with Networking and Mini-grants

The USAID/Peru Mission has been kept informed on the development of the Small Ruminant Andean Network (SRAN) and linkage activities. Dr. Arturo Florez, former site coordinator and now the network coordinator, has excellent rapport with the Mission in Peru. He meets frequently with the

SR-CRSP contact officer in the Mission to answer questions and keep the Mission apprised of SR-CRSP activities. The Mission has been supportive (morally, not financially) of the SR-CRSP/INIAA sponsored workshops in Peru. Bolivia and Ecuador, both participants in the SRAN, have hosted SR-CRSP workshops in the past and are anxious to cooperate in furthering network activities. Whether the USAID missions in those countries will give more than lip service to the network remains to be determined. With Bolivia becoming a major participant in the SR-CRSP, the USAID Mission there can give direct support to the networks, perhaps even to the extent of providing some local currency support. The Mission encouraged the December 3-7, 1990, regional workshop on Proposal Development and Marketing which was held in Lima, Peru. The Mission's support for this workshop, especially in light of the difficulties involved in getting security clearances for U.S. and other foreign national attending the meetings, is encouraging and indicates their interest in and tacit support of the SR-CRSP continuing its activities in Peru.

The ME concurs with this recommendation and will endeavor to encourage the USAID Mission in Peru to actively support networking and the linkage activities.

Page 35, paragraph 4

Nutrition Projects

The nutrition component of the SR-CRSP has undergone several changes in the last three years. The research is now more focused with fewer experiments. Utilizing information obtained during the tenure of the SR-CRSP, NCSU is now putting management systems together. In Morocco and Indonesia in collaboration with the breeding component, the nutrition component is developing nutritional management systems for prolific sheep. The work in North Sumatra, Indonesia, will continue with a combination of long term (1-2 years) and short term (less than one year) experiments. The goal is to obtain the baseline nutritional and agronomic information to develop a management system for sheep grazing under plantation crops. During the 1990-91 program year, a forage agronomist will be added to the resident scientist team in Sei Putih. This appointment will give much needed expertise in an area that has been notably weak.

Page 36, paragraph 1

Lack of Animal Health Component in Indonesia

In response to the concern about the lack of an animal health component in the Indonesian program, some progress was made during the 1989-90 program year. The ME provided from contingency about $5,000 to the Cook College veterinary group in Bogor to assess the status of internal parasites in the flock at Sei Putih. Using conventional parasitology techniques, Dr. Carmichael and colleagues established three studies to evaluate the incidence of parasites over a 12 month period. Preliminary results after six months of monitoring the sheep revealed parasitic infections of varying degrees. Suggestions were made to improve the management of the herd to reduce infection and plans call for continued monitoring and treatment as

necessary during the next six months. Dr. John Glenn, a UC Davis parasitologist, was planning to visit Indonesia while on sabbatical in Australia during the 1990 academic year to assess further the situation and recommend future action, including training and treatment requirements. Unfortunately, Dr. Glenn had to cancel his planned visit. A substantial amount of 1990-91 funds were placed in the contingency line item for animal health activities in North Sumatra. Their release will depend on the rescheduling of Dr. Glenn's visit and the outcome of the Carmichael studies.

Page 36, paragraph 3

Manual on Economic Analysis of Sheep Systems

The economics manual was published in 1989 in collaboration with IDRC and is titled *Conducting On-Farm Animal Research: Procedures and Economic Analysis*. It is presently being translated into Indonesian by Dr. Tjeppy Soedjana.

The issue of labor value remains difficult. The economics program tried to attack this issue while modeling small scale mixed crop-sheep-rubber farms in North Sumatra. The methodology is described in SR-CRSP Working Paper #86 by Amir, Knipscheer Karo-Kari, Reese, and De Boer, "The potential of small ruminant livestock on rubber plantation schemes: A linear programming analysis."

Two types of labor are specified in this working paper. The hard chores such as ploughing fields, weeding, transplanting rice, etc., are defined as "hard labor," while chores which can be performed in leisure time or do not require much physical input are defined as "leisure labor." These two categories are incorporated in an LP model in such a way that the labor in one category can be transferred to the other. For example, it was assumed that a farmer generally would work 5 to 6 hours on hard chores. Therefore, it was assumed that after hard work, one hour of leisure working would be equivalent to only .33 hours of hard time. However, if the farmer would work fewer hours of "hard," he would be able to extend his leisurely-type work, or make that time more productive. Therefore, it was assumed that the farmer has the option to gain two hours of leisure time for each hour of "hard time."

The distinction between two types of labor requirements and input is based on the notion that various households and farming tasks require different levels of labor quality. This is especially relevant for livestock enterprise, e.g., small ruminant keeping. Livestock management activities consists of herding and/or grass cutting, grass transport, and feeding. These are all light activities often performed by children, women, and/or older members of the family. This type of labor has a low opportunity cost. Of course, there is a large difference between type of labor required for one hour of land cultivation and that for one hour of sheep herding.

In labor analysis, the issue of difference in labor quality has been discussed only on the supply side, e.g., allocation weight (mostly less than one) to the

contribution of women and children time to total household labor availability. The working papers argued that a distinction of quality in labor requirements (labor demand side) should also be made.

The visibility of the Indonesian program has dramatically improved with the publication "Partners in Productivity"—a publication largely produced by the Economics component.

Page 36, paragraph 5

Weakness in Sociology Component and Training and Need to Put Some Order to Gathered Survey Data

Dr. Nolan indicates that he believes the sociology project has made a significant effort to respond to the recommendations in their 1989 report. He further believes the sociology problem in Indonesia cannot be adequately addressed until resources were available to place a capable, experienced, full-time resident scientist on-site for a two to three year assignment.

In the meantime, he states, they have sought to address the suggestions to address the problem of farming systems training for all Indonesian scientists. The sociology project contracted Thomas Conelly and Mariam Chaiken to conduct a farming systems methodology workshop in Bogor in July-August, 1990. The three-week long workshop covered material similar to that of an advanced social science methods course. Examples were tailored to needs of farming systems program using the experiences of the Kenya SR-CRSP. The workshop was attended by 15 full participants and an additional six or eight observers. Under date of April 15, 1990, Dr. Nolan wrote the members of the EEP with a further explanation regarding the EEP's comments regarding sharing responsibilities between sociology and economics for work in Indonesia.

The EEP expressed concern about vast amounts of survey data that are not being used to help other scientists in the project. Dr. Nolan is reluctant to invest major resources to improve this situation because of his lack of confidence of the quality of the data. If he can recruit a scientist with quantitative skills in Indonesia, he will consider revisiting these data sets to see what can be extended.

Page 39, paragraph 3

Concern Over the Recruitment and Training of Research Staff, Especially at Sei Putih

The need to recruit and train research staff at Sei Putih is a high priority matter for the Indonesians. During the 1990-91 program year, the placement of three expatriate scientists in Sei Putih, all to live on or near the station, will greatly enhance the training potential and facilitate identification of candidates for advanced training. There are some Indonesians in training now and will be returning to the station in the next two or three years. The Bogor administration plans to assign more scientists to Sei Putih and when funding permits, upgrade that station to the status of the one in Bogor. Already, electric power facilities are being upgraded. This will

provide a dependable source of water and make the laboratories functional.

Page 41, paragraph 5

Continuation of a Further Five Years in Indonesia—Four Recommendations

With the MOU in place for the next five years in Indonesia, plans call for a gradual phasing down of activities in Bogor and a rapid buildup of the program in North Sumatra with concomitant appropriations of resources. A forage agronomist, an economist, and an animal scientist have been hired. Ruth Gatenby, the animal scientist, arrived in September and participated in the workshop and PAC meetings. Plans call for housing the expatriates on or near the Rubber Institute.

Substantial SR-CRSP resources from the 1989-90 fiscal year, combined with some funds from the Rubber Institute, were diverted to the installation of a radio telephone at the Rubber Institute. A fax machine was contributed by the installation company, so communications between Sei Putih, Bogor, and the U.S. have been greatly enhanced in recent months.

At the last PAC meeting in September, the PIs and the Director discussed the requirements for an orderly transmission of responsibilities and resources from Bogor to Sei Putih. Next year's budget reflects a substantial increase of fund deployment to Sei Putih and a concomitant reduction of resources and program activities in Bogor. There will be some reduction in personnel and administrative responsibilities in Bogor and a gradual increase of the same in Sei Putih during the 1990-91 program year. It is anticipated that the PLO's administrative responsibilities will demand from 20-50% of his time, including liaison with CRIAS, AARD, and the USAID Mission in Jakarta. There will be a gradual shift of other administrative activities to a to-be-designated deputy PLO in Sei Putih, once the expatriate team is in place.

As resources permit, the ME is pledged to provide a special infusion of funds for high priority projects within any of the program components. However, such support cannot be expected until a contingency fund is restored during the next five-year period of the grant. No carryover funds were permitted by AID from the previous grant which terminated on September 30, 1990, and there was no provision for establishment of a contingency budget item for year 1990-91 because of need to allocate the new grant funds to program activities.

There were some funds identified for animal health activities, consultant services, and the completion of the techpack within the Indonesia country funds and the PIs' subgrants.

Page 47, paragraph 3

Guidelines for Training U.S. Students in Host Countries

Dr. Albin, with help from Fred Bryant, suggested some guidelines to assure increased support for training U.S. students. The director was uneasy over

how such guidelines could be implemented and so he has asked Dr. Albin about sharing the suggested guidelines with other PIs before any effort to implement them

Page 49, paragraph 2

Continuation in Indonesia for Five More Years

The ME is pleased to report that the USAID Mission in Jakarta continues to express a supporting interest in the SR-CRSP. For the past two years, the project back-up officer, Mr. Scarborough, has attended the PAC meeting and travelled with the PIs during their visits to Sei Putih. The Project Liaison Officer keeps in regular communication with the Mission and ensures their receipt of SR-CRSP publications. Several of the PIs and the Director have met with the agricultural staff, including the ADO, of the Mission the past three years. There appears to be a high degree of interest in the accomplishments of the program; however, when asked if the Mission would consider a buy-in through a Basic Ordering Agreement, there was definitely a negative feeling. The answer is always there is no money for such an arrangement. Also, the Mission is more interested in private sector development than in research per se. PL 480 funds for the SR-CRSP have not been forthcoming, partly because of the bureaucracy involved and partly because the Mission has had difficulty with these types of accounts on the part of the GOI. Nevertheless, the SR-CRSP should continue to request Mission support in terms of a buy-in, PL 480 funds for operations, or including a facet of the program in the Mission's portfolio. One example might be to assist AARD with private sector development of the prolific-sheep component, once the research is completed by the Institute in Bogor.

Page 49, paragraph 3

EEP Recommendations to Maintain and Enhance Relations with the USAID Mission in Jakarta

To indicate its continued support of networking and its compliance with the global plan, the SR-CRSP budgeted $5,000 for support of the Indonesia network and $4,000 toward co-support with IDRC of the South-East Asia Small Ruminant Network. The headquarters for the latter network may be located in Bogor.

Page 49, paragraph 5

EEP Recommendation to Phase-Out Work in Peru

Per phase-out plans, the Peruvian program was terminated September 30, 1990, with all accounts closed and inventorial items transferred to the UNA, INVITA, and INIAA. Officer personnel were terminated and most of the publications were completed while funds were available. The site coordinator's time was reduced and he was reassigned as network coordinator. INIAA agreed to provide office space for the coordinator. The Peruvian scientists are participating in the competitive linkage grant program established under the five year grant extension. Tentative plans call for enlisting the scientists as needed for involvement in the Agropastoral program in Bolivia. Participation in the Small Ruminant Andean Network is another way to use their talents and maintain interest and research activities.

Appendix B

Scope of Work for the External Evaluation Panel of the Small Ruminant CRSP

With direct reference to the responsibilities legislated for the EEP, the following Scope of Work if applied to each project (and in some defined areas to each activity) at each site, each year will best serve the evaluation of the SR-CRSP and make constructive recommendations possible.

Evaluations

1. Evaluate whether the project goals and objectives are being maintained and accomplished.

Procedures:

1a. Evaluate results achieved which contributed to, or accomplished project objectives.

1b. Identify changes made and their expected/ accomplished effects on the project's objectives.

1c. Identify activities, disadvantageous to the project's objectives.

1d. Comment upon the project's contribution to the goals of the Global Plan "for research on problems and constraints, global in nature, whose results are applicable and transferable regionally and globally (worldwide)".

2. Consider effective balance between research and training (for development of institutional research capability).

Procedures:

2a. Research. Comment upon the overall research activity with respect to its appropriateness to
the host country research capability
the objectives of the global plan.

2b. Training. Comment upon the status of the training program in the host country and the U. S. with respect to
- the training of host country personnel
- the enhancement of host country institutional research capability
- the training of U. S. personnel.

2c. Comment upon the balance between research and training for development of institutional research capability.

2d. Evidence of institutionalization of host country trained personnel and research results.

3. Assess balance between domestic and overseas research (for effectiveness in solving constraints in developing countries).

Procedures:

3a. Comment upon
- each domestic research activity

or if in the host country
- each overseas research activity with respect to its effectiveness in solving constraints in host country worldwide.

3b. Comment upon each research activity with respect to adequacy of
- funding
- facilities
- personnel
- conformance to annual work plans.

3c. Collaboration. Comment upon level of collaboration between U. S. and host country personnel.

3d. Comment upon the balance between domestic and overseas research.

4. Examine effectiveness of dissemination of results.

Procedures:

4a. List the major results of the project
during the past year
during the entire life span of the project and
comment about their dissemination
in the host country or the U. S.
globally.

4b. Indicate any domestic or international linkages, collaboration/cooperation resulting from the research results.

5. Examine effectiveness of utilization of results.

5a. List examples of the effective utilization of results of the SR-CRSP
in the host country and/or U. S.
globally.

6. Evaluate cost effectiveness (versus alternatives).

Procedures:

6a. Audit/project management reviews.
Date, by whom, findings and follow-up.
If no audit, has one been requested?

6b. Adequacy of funding and/or cooperation by CRSP participants with
AID
host country—comments/actions
U. S. university—comments/actions
other institutions or agencies
other CRSPs.

6c. Problems regarding funding, budgeting, release of funds, procurement of supplies and equipment in U.S. and host country.

6d. Adequacy of current policies and procedures on use of funds.

6e. Adequacy of current administration by the following:
PI
host government
U. S. institution
AID (Washington, DC or HC Mission).

7. Identify inadequate performance and irrelevant, marginal activities (to the project and to CRSP objectives).

Procedures:

1. From the list of activities identify any which are
inadequate
irrelevant
marginal
to the overall project and to CRSP objectives. State specific reasons for these judgements.

Recommendations:

Having done the above assessment, the EEP is expected to make recommendations as follows:

1. Recommend changes in program objectives with respect to

a) host country objectives.

b) U.S. objectives.

c) global objectives.

2. Recommend additions, modifications, deletions of projects or activities.

a) Research recommendations with brief justification: additions to existing activities.
modifications of activities.
deletions of activities.

b) Training recommendations with brief justification: additions (host country, U. S., elsewhere). terminations (host country, U. S., elsewhere).

c) Comment upon current balance between Research and Training.

3. Recommendations for the improvement of the distribution and utilization of the results (locally and globally).

4. Recommendations for increasing the cost-effectiveness of the program.

5. Overall rating of the program using the following rating system:

a) Highly satisfactory.

b) Satisfactory as is.

c) Satisfactory if modified, with suggested modifications.

d) Unsatisfactory, SR-CRSP should consider radical changes or orderly phase out.

Country	Discipline	Principal Investigator	Collaborating Scientist
Indonesia	Animal Nutrition	K. Pond	B. Haryanto
	Breeding	E. Bradford	I. Inounu
	Economics	H. Knipscheer	T. Soadjana
	Sociology	J. Gilles	K. Suradisastra
Kenya	Animal Health	T. McGuire	S. Waghela
		J. DeMartini	
	Breeding	J. Taylor	C. Ahyua
	Economics	E. Ospina	F. Nyaribo
	Production Systems	W. Getz	J. M. Onim
			P. Semenye
Morocco	Genetics	E. Bradford	A. Lahlou-Kassi
	Nutrition	K. Pond	F. Guessous
	Range	B. Norton	H. Narjisse
Peru	Animal Health	J. DeMartini	E. Ameghino
	Breeding	P. Burfening	J. Chavez
	Economics	H. Knipscheer	D. Martinez
	Range Management	F. Bryant	A. Florez
	Sociology	M. Nolan	M. Fernandez

Technical Committee
1991

Eric Bradford	University of California, Davis
Fred Bryant	Texas Tech University
Pete Burfening	Montana State University
Jim DeMartini	Colorado State University
Will Getz	Winrock International
Fouad Guessous	IAV, Hassan II, Morocco
Travis McGuire	Washington State University
Mike Nolan	University of Missouri-Columbia
Ben Norton	Utah State University
Enrique Ospina	Winrock International
Kevin Pond, Chairman	North Carolina State University
Marwan Rangkuti	CRIAS, Indonesia
Jerry Taylor	Texas A&M University
Open	KARI, Kenya

Administrative Council
1991

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Leonard Bull	North Carolina State University
Larbi Firdawcy	IAV, Hassan II, Morocco
James Henson	Washington State University
Donald Mathre	Montana State University
Carl Menzies	Texas A&M University
Cyrus Ndiritu	KARI, Kenya
Gordon Niswender	Colorado State University
Paul Rasmussen	Utah State University
Ned Raun	Winrock International
Kenneth Schneeberger	University of Missouri-Columbia
P. Sitorus	CRIAS, Indonesia
Barbara Webster	University of California, Davis

External Evaluation Panel
1991

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Hudson Glimp	University of Nevada, Reno
Martin Gonzalez	Mexico
Glen Vollmar	University of Nebraska, Lincoln

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