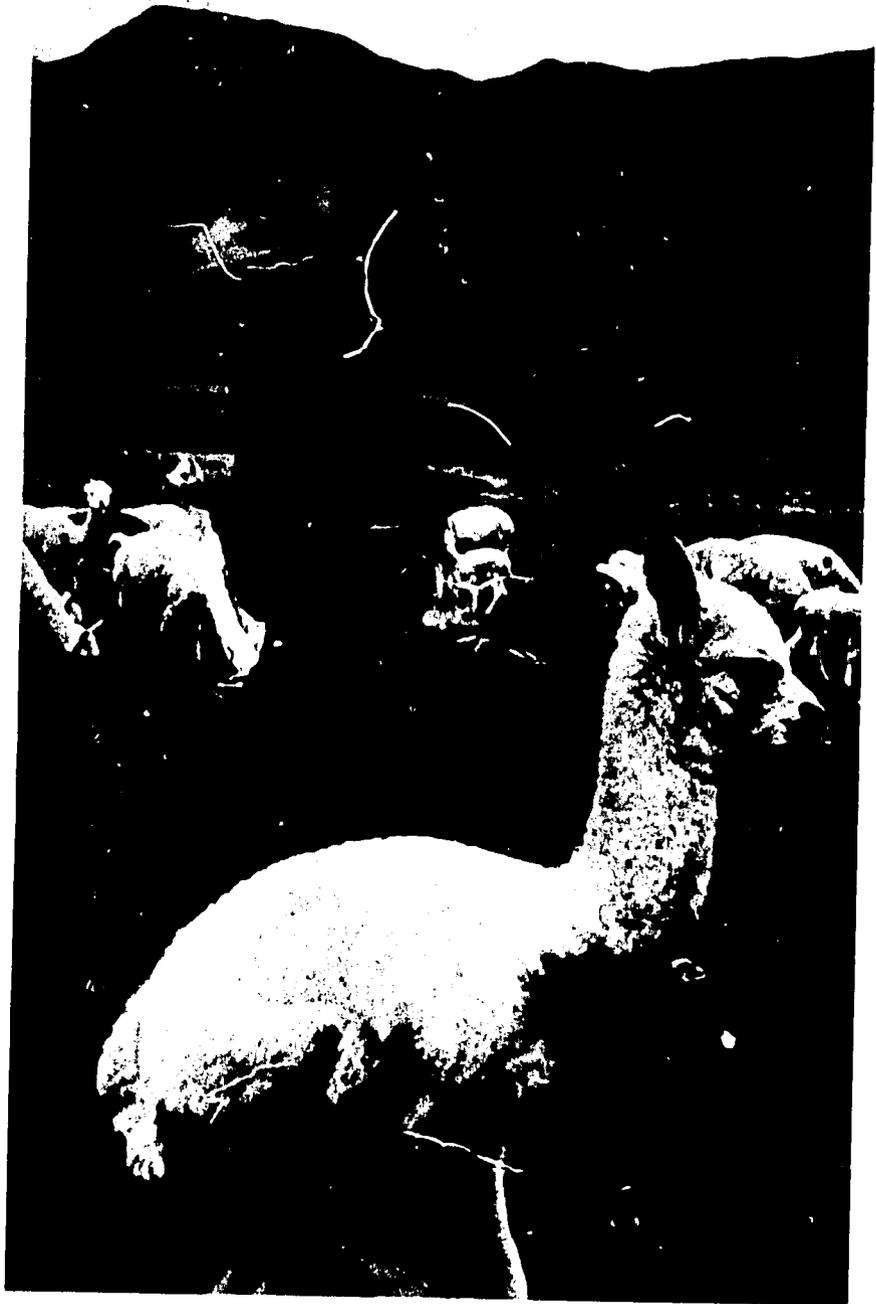


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SMALL RUMINANT Collaborative Research Support Program

**EXTERNAL
EVALUATION
PANEL**

1989 REPORT



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COLLABORATING ORGANIZATIONS

Federal (U.S.)

United States Agency for International Development
Science and Technology Bureau

Board for International Food and Agricultural Development
Joint Committee on Agricultural Development

Overseas Collaborators

INDONESIA: Agency for Agricultural Research and Development
(AARD)

KENYA: Kenya Agricultural Research Institute (KARI)

MOROCCO: Institut Agronomique et Veterinaire--Hassan II
University (IAV)

PERU: Instituto Nacional de Investigacion Agraria y
Agroindustrial (INIAA)

Participating Institutions

University of California, Davis

Colorado State University, Fort 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

***Small Ruminant
Collaborative Research Support Program***

External Evaluation Panel

1989 Report

1989 External Evaluation Panel

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Introduction to the EEP Report - 1989

The External Evaluation Panel of the Small Ruminant CRSP made a substantial number of visits to projects, both in the United States (Colorado, Montana, Washington and Utah) and overseas (Indonesia) in 1989. Some members of the EEP participated in Executive Board and Technical Committee meetings in the United States. The Chair participated in the hearings concerning the five-year extension, Small Ruminant CRSP, before the USAID and BIFAD Board personnel in Washington, D.C. during the summer. The members of the External Evaluation Panel enjoyed all of these interactions tremendously and found them most fruitful.

It should be borne in mind by the reader of this report that a large component of the salutary aspect of any external evaluation is achieved by and inherent in the day-to-day interactions of evaluation panel members with the scientists, technicians and administrators involved with the Small Ruminant programs. In the exchange of questions, ideas, suggestions and experience, members of the External Evaluation Panel see immediate effects of their words and on later visits, changes which had been made as a result of these suggestions. This element of the EEP's work should not be overlooked.

The External Evaluation Panel was strengthened tremendously this year by the addition of Dr. Cornelia Butler Flora, who brought expertise in sociology and economics, a fresh look and a new dimension to the considerations of the External Evaluation Panel. This influence can be clearly discerned in the report. The members of the External Evaluation Panel themselves, although their visits are often brief, enjoy the experience from the point of view of their own education and consistently remark on this fact. We trust that the suggestions made in this report are constructive. They should be viewed as attempts to help direct and redirect the peregrinations of the Small Ruminant CRSP, to enhance the strengths of what is clearly a very successful international collaborative program and to provide the participants with alternatives and another point of view, usually a helpful exercise. The opinions of the External Evaluation Panel should be viewed in the light in which they are given, that is, maintaining a fresh perspective, adding new ideas and providing constructive criticism for the Small Ruminant CRSP.

Program Evaluation: U.S. Institutions

Colorado State University

Introduction

Two members of the EEP (Campbell & Glimp) visited Colorado State University on Wednesday, July 12th, 1989, and reviewed Colorado State University's animal health projects in Peru.

Important Consideration

While it is clear that excellent work both at Colorado State University and in Peru has been carried out in the various aspects of this animal health project, the work is now very seriously impeded by three overriding considerations:

- 1) Because of the political situation in Peru, it is dangerous for U.S. citizens to travel in Peru. This has been the case for at least the last 12 months.
- 2) It would now appear that even for Peruvian nationals it is very difficult, dangerous and undesirable to travel in many parts (estimated 50%) of the countryside in Peru.
- 3) It is expected that U.S. supported projects and personnel will increasingly become the target for hostilities.

These factors are major concerns of the EEP and unfortunately have seriously impeded certain aspects of the animal health projects in Peru.

Progress

The animal health project has stuck with the original intent of the log frame, making modifications where necessary. Many of these modifications have been directed to phase down in Peru. It should be stressed that the quality of the science involved in these projects is high; the research workers at Colorado State are of very high caliber and the work on the alpaca and the pneumonias of sheep is of international caliber. The research work on the alpaca is basic to the welfare of that species and is probably not duplicated anywhere else in the world. Carried out by competent scientists, this work will contribute greatly to the understanding of perinatal mortality in the alpaca wherever that particular species is kept. The research on the pneumonias of sheep is a component of a greater thrust in this area at CSU, where there is funding available from other sources (Fulbright, various governments,

World Bank, USDA and NIH).

The high quality of the research work in Colorado has extended the boundaries of our knowledge of the diseases of sheep as well as providing opportunities for training in the most sophisticated methods of modern molecular virology. All of the health projects that are being carried out have fundamental importance to the health and well being of ruminants kept by small farmers in Peru.

Personnel Training and Facilities

It was clear from this review that the personnel in the home country Peru, some of whom we met, are clearly capable of carrying out a collaborative research project in conjunction with CSU under normal circumstances. They have been well trained in modern scientific methods of animal health investigation and they work well with the scientists at CSU. They would, therefore, be considered suitable for continued linkage, but they themselves are impeded because of lack of access to the countryside in Peru.

Equipment and Facilities

The equipment and facilities at Colorado State University are superb for carrying out any aspect of animal health research. Their animal holding facilities and research laboratories are modern and more than adequate. They are extremely well-equipped and capable of carrying out the most sophisticated aspects of modern research. This is reflected, for example, in their approach and achievements in the area of ovine progressive pneumonia.

Funding

The scientists at CSU enjoy a wide variety of funding for their small ruminant projects. They have, for example, funding from the World Bank, the USDA and the NIH amongst other resources. These all contribute to a large volume of important work on small ruminant diseases.

The change in direction of the SR-CRSP Animal Health and Disease research effort from "Flock Health Management" to more specific disease problems has re-oriented collaborative relations and changed financial needs. The CSU role in Peru has become more critical for basic research, that is, non-site specific and in support of Peru collaborators through training, research planning, analysis, and technical support. Peru is now beginning the long-term process of developing physical facilities and trained staff for independent research. Since much of the research such as the development of diagnostic tests, vaccines, etc. becomes non-site specific, the opportunities and needs for collaboration among countries and institutions may become more important.

The funding has been adequate for this project, although it appears that specific areas such as parasitology and nutrition or management-associated health problems were not adequately funded up to this point.

The nature of the animal health and disease component of the SR-CRSP in terms of diagnostic tests and vaccines for specific diseases virtually guarantees the applicability of successful results to a much broader area than the host country. The CSU-Peru work on OPP Lentivirus, for example, is of significance to the U.S. and other developed countries as well as many developing countries. This research is at the stage that it should be supported on much broader terms than the SR-CRSP.

Administration

The administration of the CSU component appears to be very solid. Work plans are well organized, developed collaboratively, and approved through the proper channels. Dr. James DeMartini has done an excellent job as Principal Investigator. He has organized the CSU research team to address the appropriate disease and health problems in Peru with a good mix of basic research, field studies and training.

The research team at CSU, including Dr. Robert Ellis, Dr. Gordon Niswender and several others are involved and committed to this project. Scientists' areas of responsibility are well defined and they have a clear understanding of their role in the team program.

Dr. James Meiman, Associate Vice President and Director of International Programs at CSU met with the evaluation panel and conveyed a clear understanding of their institutional role in the SR-CRSP and a strong commitment to international programs. Dr. Gordon Niswender, in addition to working with the team, is Associate Dean for Research in the College of Veterinary Medicine and a member of the Board of Directors of the SR-CRSP.

Two members of the Peruvian collaborative research team, Dr. Antonio Ramirez and Dr. Raul Rosadio, were present at the meeting. Their commitment to the program, understanding of the SR-CRSP objectives and mission, and desire to continue their work was very clear. They recognize the concerns and constraints caused by the security problems in Peru and hope that these can be overcome.

USAID Mission Involvement

The general consensus of the CSU team was that USAID commitment to and support of their project was good. They have had excellent support from Ms. Joyce Turk, and have generally had good support from the Peru AID mission. However,

some concerns were expressed over excessive time required for clearances or approval for travel, purchase of materials and supplies, transfer of funds, host country salary constraints, etc.

Linkages and Networking

There was some discussion of problems of inadequate linkages and support within the Peruvian system. The faculty members at San Marcos University, for example, felt a need for a strong national support infrastructure for veterinary research and field programs. There were also problems of "turf" or responsibilities with other government agencies in certain field studies that were difficult or impossible to overcome.

There is evidence of regional networking with other South American countries. An international conference on small ruminant health and disease was held this past year and was organized by one of the Peruvian collaborators in the SR-CRSP. From this meeting, it appears that a regional network will be developed involving at least Peru, Colombia, Bolivia, Argentina, and possibly Ecuador. The coordinating responsibilities and specific country roles are still being defined.

Overall CRSP

The work carried out in the health project at CSU is highly appropriate to the overall goals and activities of the Small Ruminant CRSP. It is clear that the project has been successful in training personnel and in the dissemination of information. The list of publications and the successful meeting in Bolivia are testimonies to this. There is some concern about the relative effort distribution between U.S. and Peruvian activities. Some of this is due to the extreme difficulty of working in Peru and the fact that some of the more sophisticated aspects of molecular virology are better carried out in Ft. Collins. Valid questions arise about the availability of sophisticated and even basic equipment at San Marcos. In any future work this aspect should be thoroughly investigated before additional resources are deployed in Peru. There has been good collaboration between Colorado State University and the host country, but this has recently been distorted because of the political activity in Peru. It becomes more difficult as time goes on. The publications have been satisfactory in quality and quantity. Because of the unique nature of the work carried out on the alpaca, every effort should be made to ensure that all aspects of that work are committed to the world literature. The EEP strongly recommends that this be a high priority of the project as it winds down.

The EEP believes that the CSU project in Peru has been a first-class project despite the most difficult conditions in Peru. The EEP, however, does not believe that the project can be continued because of these security considerations.

Summary

The Colorado State University's animal health project in Peru has been an extremely successful one, both in sheep and in alpaca. The research work carried out in both these areas and the personnel trained have been excellent. Due to recent terrorist activity in the country, many aspects of the original Small Ruminant CRSP projects cannot now be carried out, including visits by American scientists and easy exchange of personnel between Peru and Colorado. American personnel and even Peruvian personnel are no longer able to work with any degree of facility in the field. For these reasons the EEP recommends, with great regret, that the work in Peru be phased out as expeditiously as possible causing the minimum of trauma to the Peruvian personnel. This might involve sufficient funding to facilitate strong 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 CSU scientists should be given the most serious consideration for animal health projects in other parts of the world.

Washington State University

Introduction

Drs. Gordon Campbell, Hudson Glimp and Gerald Thomas, accompanied by Dr. Jim Oxley of the ME, visited Washington State University on Monday and Tuesday, October 23rd and 24th, 1989. The EEP had stated beforehand that they wished to cover two main areas during the review. One was the general support by the University for international programs and the other was the progress of the Small Ruminant CRSP work in Pullman and in Kenya. The first day, therefore, they met with senior members of the University administration. These included: Albert C. Yates, Executive Vice President and Provost; James B. Henson, Director, International Program Development Office; Borje K. Gustafsson, Dean, College of Veterinary Medicine; and David J. Prieur, Chair, Department of Veterinary Microbiology and Pathology. The panel was amply reassured that international programs now constitute a very major part of the planning of Washington State University. The University has a program for "Internationalizing the University" and this is summed up by President Samuel H. Smith's statement: "We cannot be insular; we have to be globally involved. It is essential that we in the University be involved in the larger world and be active in learning about other countries, societies, cultures, economies, and how we may interact with them in the most mutually beneficial ways." This major effort to place Washington State University into an international perspective was amply reinforced by James Henson, Director of the International Program Development Office, who has extensive experience in East Africa and by Dean Gustafsson, who has had considerable international experience. The panel was adequately reassured that there is widespread support for international programs in Pullman.

Sixteen departments at WSU are committed to international involvement and 450 faculty have had some exposure overseas.

The SR-CRSP fits well into the research and training programs at WSU. The Veterinary component of SR-CRSP has served to leverage other funds into the University. Certainly WSU has exceeded the matching requirements for the program.

Progress

(a) Adherence to the log-frame and project objectives

The EEP found close adherence to the log frame and project objectives assigned to Dr. Travis McGuire and his team.

(b) The major research achievements are listed under each of the sub-projects:

- (1) Experiment No. 1 was designed to identify and evaluate possible genetic resistance to *Haemonchus contortus*, an internal parasite infecting virtually all goats in Kenya. In the study of 300 kids it was possible to identify goats which were relatively resistant to the parasite. Researchers report that "the basis of this resistance may be genetic." Also, protocols were developed to assess the relative resistance of goats to a defined *H. contortus* challenge. This research is continuing.
- (2) Experiment No. 2 is concerned with the identification of antigens for the diagnosis and prevention of heartwater in goats. Heartwater disease in goats, sheep and cattle is caused by a rickettsia, *Cowdria ruminantium*. Transmission of the disease is by ticks. There is a need for a better method of diagnosis. The WSU/Kenya team of scientists has made progress toward this goal but much remains to be done. An oral presentation of the endothelial cell culture system and the results of the IFAT (indirect fluorescent antibody test) was presented to a 1989 Kenya SR-CRSP workshop. Genes of *C. ruminantium* were cloned and one was selected for evaluation as a DNA probe to detect organisms in infected animals and ticks.
- (3) Experiment No. 3 was designed to evaluate the importance of *Anaplasma ovis* in goats. A DNA probe was developed and used to determine the prevalence of this organism in goats in Kenya. In the areas surveyed about 60 percent were infected.
- (4) The objective of Experiment No. 4 was to immunize goats against Contagious Caprine Pleuropneumonia with expressed F38 surface protein that reacts with neutralizing monoclonal antibody. Researchers report that the CCPP vaccine trial involving 100 goats showed positive results. Testing will continue on this serious problem.

Washington State scientists also point out that their work as a part of the SR-CRSP will contribute to both U.S. and host-country livestock production.

Personnel

Personnel involved in the WSU/Kenya SR-CRSP are as follows:

Principal Investigator: T. McGuire

Collaborating Scientists: S. Chema, D. Jasmer

Resident Scientist: F. Rurangirwa

Host Country Co-workers: S. Kihara, S. Shompole, S. Waghela

In addition, Dr. McGuire has a strong back-up team of veterinarians at WSU who serve as informal consultants to the project.

Training

The training component at WSU is considered in three parts:

(a) Degree oriented training

Students from Kenya for this program are carefully selected and have been very supportive. They complete courses and laboratory work at WSU and conduct their research in Kenya. There are five Kenyans at WSU pursuing advanced degrees in the College of Veterinary Medicine with the following three supported by SR-CRSP:

- (1) Stanley Kihara, B.V.M., completed course work for his master's degree and has returned to Kenya to do his thesis research. He should finish his degree in May 1990.
- (2) Francis Karanu, B.V.M., began his course work for a master's degree in January 1989. He will return to Kenya in April 1990 to begin thesis research and to complete his degree in May 1991.
- (3) Suryakant Waghela, B.V.Sc., M.Sc., is continuing his Ph.D. studies under the auspices of SR-CRSP and another USAID project. He will finish his degree in December 1989.

(b) Non-degree training

Several people associated with this project attended the Eighth National Veterinary Hemoparasite Disease Conference in St. Louis, MO, in April 1989. The most significant SR-CRSP contribution was a paper presented by S. Shompole on his *Anaplasma ovis* findings.

(c) Institutional development

SR-CRSP continues to be an important source of information for veterinary research organizations in Kenya. Dr. S. Chema, Director of Veterinary Research in the Kenya government's Ministry of Livestock Development, visited Washington State University in July 1989 in an effort to strengthen and expand this relationship. Dr. Joseph Katende, a Research Associate at the International Laboratory for Research on Animal Disease in Nairobi, also visited WSU in July. He discussed current issues in veterinary research with the faculty and compiled a list of books to be added to the ILRAD library.

Equipment and Facilities

The equipment and facilities at the College of Veterinary Medicine, Washington State University are outstanding, and more than adequate to accomplish the objectives of the WSU component of the SR-CRSP Workplans.

The laboratories and equipment in the College of Veterinary Medicine are "state of the art" for the development of vaccines, gene mapping, DNA probes, and other basic research required in the work plan. Based on the evaluation of the PI and Kenya graduate students, facilities and equipment are more than adequate for collaborative work in Kenya. The Saanen and Pygmy goat herds at Washington State University contained very healthy goats maintained in well-managed facilities.

Progress and future plans appear to be consistent with the work plans as presented in the annual plan.

Funding

In terms of accomplishing research and training objectives, the project funding appears to be adequate, with two exceptions:

1. There has been a reluctance of the host country to accept U.S. graduate students for training as a part of project costs. It appears that this objective will not be met unless USAID obligates these funds "up front" in the projects.
2. The Kenya project health component has to some extent been the victim of its own success. The CCPP vaccine developed by this project has not been widely utilized, due to lack of funding for vaccine production and distribution. It appears that the vaccine may have widespread use if it were available, yet it was not within the scope of this project's funding level to enter into the vaccine production and distribution business. This is a serious problem that needs to be addressed.

One of the most impressive components of the WSU project is the synergism of this project with other projects at WSU and with other international studies. The SR-CRSP project at WSU is collaborative with 6 major NIH-funded projects at the institution, two ARS CRIS projects that are cooperating with the PI and CRSP, and other WSU funded projects. Some of these projects include funds for research and training in Kenya and other host countries.

Administration of Program

The Principal Investigator, Dr. Travis McGuire, is widely respected by the SR-CRSP research team, his colleagues and collaborators within the WSU College of Veterinary

Medicine, and university-wide as evidenced by recent awards and honors received within the WSU system.

Washington State University is to be commended for its strong institutional commitment to international programs. The administration of international programs is coordinated through an International Program Development Office directed by Dr. James B. Henson and is strongly supported by the total University administration. The State of Washington is appropriating funds to the University for international programs, including project seed monies, curriculum development at the University, and administrative support. This commitment is exceptional.

The research project management is excellent and is due to the leadership of the PI, Dr. Travis McGuire. He appears to be strongly supported by Dr. Doug Jasmer, who has some exciting work in progress on *Haemonchus contortus* genetic resistance and vaccine immunization. Dr. Don Knowles, ARS scientist at WSU, is collaborating with Dr. McGuire on *Anaplasma ovis* research studies. Two Kenya graduate students at WSU, Patrick Shompole and Francis Karanu, presented excellent research plans and results.

USAID Mission Involvement

During our visit to Kenya last year, the EEP found that the USAID mission in Kenya had a good understanding of Washington State University's health project in Kenya. Indeed, there is considerable interest in animal health in Kenya and there is a substantial amount of very high-quality research work going on there. During our meetings, USAID mission personnel suggested that they might provide some financial support for the dual-purpose goat project but felt that the work on vaccines might be funded from other sources. They did, however, express great interest in the outcome of the vaccine work. Since that time, the Contagious Caprine Pleuropneumonia vaccine has been more widely tested in Kenya and in the Oman, and the results are still very promising, i.e., good protection afforded by the vaccine. The EEP will visit with USAID when next in Kenya to see what their interest is at that time in light of these findings.

It should be noted that the animal health work, both on a multiple caprine vaccine 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. For this reason, USAID centrally and in all countries where ruminants are kept should maintain a great deal of interest and support for the work which is of high quality and promises to have global application.

Linkages and Networking

Excellent linkages are maintained between Pullman and Kenya and this has been the case for the last decade. However, these were further strengthened this year by the visit to Pullman of Dr. Sam Chema, who was well-received in Pullman and who was provided with the opportunity to visit the appropriate persons and agencies associated with international work. This visit of Dr. Chema can only enhance the networking and linkages and understanding for the future.

It should be noted that, while the work in Pullman is of a very high quality in this animal health project, consisting of the most advanced techniques in biotechnology, a remarkable amount of the technology has already been transferred to Kenya, where very sophisticated biotechnological techniques are being used daily in the SR-CRSP. This speaks very well for the training afforded the Kenyans by the people in Pullman and for their ability to transfer this information back into the working situation in Nairobi. The EEP would recommend that the high quality of the animal health work be continued.

Overall CRSP

The animal health work being conducted by Washington State is of very high quality and has a great deal of significance for the health of small ruminants on a global scale. This is because the concept of a basic vaccine "backbone," to which you could attach various and different important vaccine entities, would have universal application. The work on *Haemonchus contortus* also has universal interest, including a great deal of interest in the continental United States where haemonchosis in ruminants is a national scourge. There is an excellent balance between research, training, and dissemination of technologies. Indeed, the workers at WSU have been extremely successful in transferring technology back to Kenya, with appropriately trained personnel, to conduct basic and applied research using modern techniques and to supervise Kenyan graduate students. There is good balance between domestic and overseas activities with a frequent exchange between the two areas. The one disappointment in this arena, and it is a widespread concern for the Small Ruminant CRSP, is that more American graduate students have not been trained in the Small Ruminant CRSP to work in the host country, in this case Kenya.

There is a high degree of collaboration and cooperation between Pullman and Nairobi. It is not characterized by a large amount of traffic back and forth. The Principal Investigator, Dr. Travis McGuire, has extensive personal experience in Kenya. He is extremely well thought of, both in Africa and in the United States. Under his leadership the cooperation and coordination has flourished. The cost-effectiveness, especially when viewed on a global scale, has been very high. The principal investigator's broad-based interests in infectious and parasitic diseases of small

ruminants has allowed the project to cover a wide area of topics of great significance to small ruminants. By any standards, the animal health work being carried out at Pullman and in Nairobi is world-class research. This is evidenced by the quality of the publications and the international standing of the journals in which they are published, e.g., "The Veterinary Record." It would appear to the External Evaluation Panel that the Small Ruminant CRSP has acquired, in Dr. McGuire and his team, a group of scientists of world-class. They should do everything in their power to continue their contracts through the next five years in the certain knowledge that the products, both scientific and human, will be quite excellent.

Montana State University

Introduction

Three members of the External Evaluation Panel, Drs. Gordon Campbell, Hudson Glimp and Gerald Thomas, spent Tuesday, October 24th and Wednesday, October 25th, 1989 in a review of the Small Ruminant CRSP's project at Montana State University. During the review, they had an opportunity to discuss the project with Dr. William J. Tietz, President; Dr. Art Linton, Department Head, Animal and Range Sciences; Dr. Peter Burfening, Principal Investigator; and Peruvian graduate students involved with the Small Ruminant CRSP. They had an excellent itinerary arranged by the principal investigator and felt they had every opportunity to view the support provided by the University and the progress of the Small Ruminant CRSP. It should be noted that Montana State University does not maintain a very large presence in overseas projects. The Small Ruminant CRSP would appear to be one of their major efforts overseas and it has received good support by the central University administration and by the Department of Animal and Range Sciences. It is noteworthy, however, that there is not a large organization for overseas projects and the success of the Small Ruminant CRSP is, to a very large extent, due to the untiring efforts of the Principal Investigator, Dr. Peter Burfening. He has been more than a champion for the Small Ruminant CRSP, and, in the opinion of the External Evaluation Panel, has provided superior guidance for the Peruvian students who were extremely laudatory about his stewardship over their studies. In addition, he has gone to Peru and helped to organize the wind down of the Small Ruminant CRSP, often at considerable inconvenience and even danger to his own person. The success of the project has been, to a large measure, dependent on his superior efforts.

Progress

(a) Adherence to the log-frame and project objectives

MSU has been a cooperator in the SR-CRSP since its inception, holding the responsibility for the project entitled "Evaluation and Improvement of Small Ruminants in Extensive Management Systems." The review team found close adherence to the log-frame and project objectives by Dr. Peter Burfening and his research associates. The research has been focused on genetic improvement of sheep and alpaca.

(b) Research accomplishments

Virtually all field work on this project in Peru has ceased due to severe social problems and terrorism. Thus, the major thrust of the program in 1989 has been to analyze the field data, prepare publications and help establish a research network.

Part of the data collected at SAIS Tupac Amaru on the crossbreeding study has been analyzed. Junin and Criollo ewes were bred to Junin, Targhee, Finnish Landrace and Criollo rams. The growth rate of the lambs resulting from these crosses was greatest from the Junin ewes mated to Junin, Targhee or Finn sires. Twinning rate has been historically low in Peru but the SR-CRSP studies indicate that, when given the nutrients, ewes with the genetic potential can produce multiple births.

Data from the Chuquibambilla station involving the Corriedale and Criollo flock have been moved to Montana State University for more extensive analysis. These studies have shown that Criollo lambs had approximately 10 percent higher survival rates than did the Corriedale lambs.

A third objective of the MSU project was to investigate reproductive management in the community alpaca flocks. This objective was not pursued due to the dangerous situation in southern Peru. Consequently, time was spent in putting the records of the LaRaya-Puno Alpaca Research Station on the micro-computer. Detailed analysis of these data will continue at MSU.

The community project was designed to validate a Criollo sheep mass selection program on family herds without significant change in the social and cultural values at the community level. This project was discontinued due to the situation in the central Sierra. However, one experiment was continued at the San Juan of Yanamuelo Station from UNA-LaMolina. This experiment focused on the productive response of Criollo sheep to three management and feeding systems.

(c) Future directions

The Montana research team will continue to analyze the data collected on this project. The main thrust in Peru will be to establish a research network which will include other South American countries. The animal focus will be on alpaca and sheep.

Training

Foreign students are getting good training at MSU. They are well accepted both at the University and in the community.

Degree-oriented students and completion dates are shown below:

Paz, Miguel, Peru, Ph.D., Statistics, MSU, Departments of Animal Science and Mathematical Sciences, 1988-1992

Cardenas, Horacio, Peru, M.S., Animal Science (Reproductive Physiology), MSU, Department of Animal and Range Sciences, 1988-1990

Balbin, R., Peru, M.S., Animal Production, UNA, 1988-1989

Lopez, M., Peru, M.S., Animal Production, UNA, 1988

Alarcon, V., Peru, M.S., Animal Production, UNA, 1988

Olivera, E., Peru, Ing., Animal Production, UNA, 1989

Vilchez, O., Peru, Ing., Animal Production, UNA, 1989

Chavez, R., Peru, Ing., Zootecnia, UNA-P, 1989

Castelo, H., Peru, Ing., Zootecnia, UNA-P, 1989

Huaman, J., Peru, Ing., Zootecnia, UNA-P, 1989

General Observations on Montana State University

The EEP team met with the appropriate department heads, deans and directors, some vice-presidents and President Tietz. We found familiarity and sympathy for the SR-CRSP component at MSU. However, the overall commitment for international programs at MSU is minimal. MSU resigned from the Consortium for International Development several years ago due to lack of funds for membership dues and lack of support from the legislature. As one administrator stated, the program "has to play on mainstreet," and Montana has too many problems at home to be very concerned about other countries. The SR-CRSP component and a small program with ICARDA remain as the only long-term ties with the Third World.

Most of the administrators at MSU stated that the University is now ready to make a larger commitment to international programs. The Montana Legislature has agreed to return a portion of the overhead funds to the University--moving to 100 percent return by 1991. If these funds can be used as an incentive, the University can increase its involvement in the international arena.

In spite of the lack of resources to make a commitment to internationalizing the University, the EEP found strong support for the SR-CRSP program at MSU. Sheep are an important industry in the state, and there should be some technologies developed by SR-CRSP that have applications to Montana. The current project has good leadership from Dr. Peter Burfening and, if the Peru-based network can be established, MSU can play a prominent and continuing role.

Equipment and Facilities

The equipment and facilities component of the Montana State University contribution to the CRSP are difficult to assess. Breeding and management studies with Criollo sheep and introduced genotypes were in progress and well managed in adequate facilities in Peru prior to their cessation due to political unrest. The facilities, equipment, and other resources at Montana State University have been adequate for graduate training of Peruvian students at Montana.

Funding

Funding for this component has basically been adequate to date. The MSU project has provided approximately 70% of total funding for HC activities, which is a very high ratio.

The biggest problem at Montana State University has been the very small portion of overhead that returns to the generating department and scientist. This is a disincentive to scientists and departments.

The Peru and South American component of the SR-CRSP is through necessity entering the networking phase of the project earlier than planned. The ultimate product of the SR-CRSP is to leave in place regional and country small ruminant research and training networks. It is our strong recommendation that this Andean highland or Alti-plano small ruminant network be carefully planned over the next 6 months and adequately funded over the next 3 years. This project could serve as a model for the ultimate end-product of the total SR-CRSP.

Administration of Program

The sheep breeding and management research components of the Peru project within the country are no longer active. The data are being analyzed by PI collaborators and graduate students. All collaborators appear to be dedicated to the completion of publications and other technical packages to the extent possible.

The Montana State University PI, Dr. Peter Burfering, has provided outstanding leadership to the project technical committee and to the Peru project in particular. His dedication and understanding of the mission of the CRSP makes him an excellent candidate to provide leadership to the networking phase of this project during the next 3 years. This clearly indicates a re-direction of the Peru project from current activities. Provisions should be made, however, to provide for completion of programs of the Peruvian graduate students currently in the pipeline.

Due to the state budgetary and political constraints, the commitment to international programs at Montana State University leaves a lot to be desired. The University administration should be encouraged to provide leadership in educating its constituency on the importance of internationalization to the future of the state of Montana and the University. This commitment must be in the political arena to the state constituencies and in the administrative arena through the development of procedures that facilitate and encourage faculty to pursue projects in international programs.

USAID Mission Involvement

The USAID mission in Peru has been deeply involved with the Small Ruminant CRSP at least over the last few years. This is because the political situation in Peru has been unstable and it is difficult and indeed dangerous for foreign nationals to attempt to work there. The USAID mission has been most helpful in tendering advice about travel and facilitating the wind down of the active project and the establishment of a networking system to ensure a transition to the next phase.

The EEP would recommend that the USAID mission involvement continue as maximum help will be required from them if the efforts to continue the project through mini-grants and regional networking are to be successful. The EEP believes that this would be an excellent model for the continuation of Small Ruminant CRSP projects after the active phase and the Peru experience, howbeit under difficult conditions, will be exactly what will be required at the end of the Small Ruminant CRSP projects in other countries. Therefore, it will serve as a very good model for the future and every attention should be paid to it by the principal investigators, the Management Entity, and the USAID mission.

Linkages and Networking

The EEP supports the research network concept. The team recommends that sufficient funds from the SR-CRSP be set aside to do the job right. Dr. Burfening's proposal is for \$120,000 which will cover a few short-term assignments, newsletters, outreach to other countries and some workshops. It is our hope that AID Mission buy-ins will add to this resource base.

The objectives of the Small Ruminant Science Network are as follows:

1. Conduct and sponsor workshops on small ruminant production and provide a forum for development of collaborative proposals to send to funding organizations.

2. Support collaborative research on common small ruminant production problems.
3. Produce a quarterly newsletter of research topics and technology transfer.
4. Inventory and develop a data base of scientists with common interests in small ruminant research and extension in the Andean region.
5. Develop a literature data base for small ruminants in the Andean region.
6. Establish linkages with other Andean networks.

Personnel

Dr. Peter J. Burfening, PI, MSU
Dr. Juan Chavez, Animal Breeder, (Co-PI), UNA
Manual Carpio, Animal Scientist, UNA
Victor Bustinza, Animal Breeder, (Co-PI), UNA-P
Rolandro Alancastre, Animal Breeder, UNA-P
Dr. J. Berardinelli, Assistant Professor of Animal Science, MSU
Dr. D. Kress, Professor of Animal Breeding, MSU
Manuel Lopez, Research Assistant, UNA
Prospero Cabrera, Research Assistant, Community Project
Maria Lencinas, Research Assistant, UNA-P

Host Country Institutions

INIAA
Universidad Nacional Agraria, La Molina (UNA)
Universidad Nacional de Altiplano, Puno (UNA-P)

Overall CRSP

It is unfortunate that political and other considerations have forced termination of specific HC projects prematurely. However, the problem presents the SR-CRSP with the opportunity to develop a model Small Ruminant Research and Training Network over the next 3 years for the Andean countries that could be the prototype for the research and training networks in other world geographic regions. This project should be carefully planned over the next 6-9 months and adequately funded to encourage regional participation. This is viewed as a very critical process for developing the ultimate end-product of the SR-CRSP on a global basis.

Given the circumstances, the effort expended on the Small Ruminant CRSP in Peru has been extremely cost effective. Much of the success and the efficiency has been due to the unstinting effort of the Principal Investigator, Dr. Peter Burfening. He takes more than an active interest in the proceedings, and his personal supervision of the project, both in Montana and in Peru, has done much to ensure its success.

The publications of the Peruvian work have been of good quality. Every opportunity should be given to ensure the publication of the small ruminant work which is, as yet, unpublished. This is particularly true in the case of the camelids, where the world literature is really quite sparse. The extension proposal in Peru involves the continuing of some of the research work and the establishment of a networking system. The EEP would like to make note of the fact that some five years from now all Small Ruminant CRSP projects around the world will find themselves in a similar situation. We, therefore, recommend that Peru be looked on as a model system, that some resources continue to be deployed in Peru so that some projects can be continued and that networking can be established and maintained. We feel that this will be an excellent model for all of the other Small Ruminant CRSPs in five years time.

Utah State University

Progress

- (a) The SR-CRSP program at Utah State University was reviewed by one member of the EEP (Dr. Gerald Thomas) in May of 1989. During this review several members of the Administration were contacted in addition to those directly involved with the projects. There was evidence of strong support for the Small Ruminant program.
- (b) **Research achievements**
- (1) Utah State scientists are following the basic log frame and project objectives as set forth by the SR-CRSP.
 - (2) The range research project in Brazil was closed in 1987 and converted to a "research linkage" approach. However, the limited funding available for these linkages has seriously jeopardized the effectiveness of this objective. The linkage is intended to facilitate ongoing work at the National Goat Research Center (CNPC) and to maintain communication with Brazilian scientists through EMBRAPA.
 - (3) The range research project designed to increase small ruminant production in Morocco has been going well. The collaborating institution in Morocco is the Institute Agronomique et Veterinaire (Hassan II). The institute has a well-qualified group of scientists with a strong interest in range and livestock research.

Progress has been made on all of the objectives. The research team has been able to quantify the ecological potential of the Artemesia-Stipa ecosystem and has studied several grazing systems which have applications for the area. Sub-projects of the Utah State/Morocco SR-CRSP include:

- (1) Definition of an optimal grazing system for the *Stipa tenacissima* (alpha grass) community. *Stipa* has a low palatability for both sheep and goats and the nutritive value declines with maturity. Grazing systems are under study to offset this problem.
- (2) Productivity and dynamics of the *Artemisia herba-alba* plant community as affected by season and grazing. This component of the research is located at the Research Station near Midelt. Data have been collected on this project and preliminary results released.

- (3) **Characterization of farms in the Artemesia-Stipa ecosystem, Ain Beni Mathar region.** This project is designed to gain a perspective on social and economic factors that govern land-use decisions, the types of farms and their products. This information is essential in order to arrive at acceptable interventions.

(c) Subgrant constraints

Ecological research of this nature takes time. Adequate long-term funding has been a problem. Conclusive results cannot be obtained until adequate base-line data are collected, interventions imposed, and trends established. The research team at Utah State and in Morocco are making good progress but more time and funds will be required to complete the research. Several publications have been released which have immediate implications for livestock producers in Northern Africa.

Personnel

Principal Investigator: John C. Malechek, Range Science

Morocco

Co-Principal Investigator: Dr. Hamid Narjisse, IAV

Co-Investigator: Dr. Ahmed el Aich, IAV

Co-Investigator: Dr. Omar Berkat, IAV

U.S.A

Co-Investigator: Dr. Fred Provenza, USU

Dr. Malechek has taken on additional duties at Utah State and the SR-CRSP will now be under the direction of Dr. Brien Norton as Principal Investigator.

(d) General observations

There is a strong commitment from Utah State University for international programs at all levels of administration. The University has had a long and continuing interest in international projects and international student training. The EEP also observed that the Central Administration was aware of, and supportive of the SR-CRSP. This collaborative research program fits well into the mission of Utah State University.

The range component of the SR-CRSP at Utah State University is important since this research relates to the issue of "sustainable production systems" and the maintenance of "biological diversity."

Program Evaluation: Indonesia

Preface

Three members of the EEP, Drs. Campbell, Fernandez-Baca and Flora, visited Indonesia in November 1989. They visited sites in Bogor and Sei Putih, met with American and Indonesian PPs as well as the Director of AARD, Dr. Jan Nari and five members of the USAID mission in Jakarta. They visited the research and administrative facilities in both sites and went to the field to meet with farmers owning sheep flocks serviced by the OPP and the ORP. Every courtesy was extended to the EEP and every opportunity was afforded them to visit sites, meet people involved with the SR-CRSP and facilitate the preparation of this report.

Progress

(a) Adherence to log frame and project objectives

Progress in Indonesia is being made toward each of the three goals in the log frame.

Goal 1: The project is expanding the body of knowledge on small ruminants and, to a degree, knowledge on small holder production systems. They are developing and testing appropriate technologies and practices to improve productivity of target production systems. However, development continues of technologies that are inappropriate for settings where purchased inputs are expensive and difficult to obtain. The fact that all the on-farm demonstrations are carried out using a nonavailable input (for drenching) provides an obstacle in adoption of the proposed technological packages as a whole. However, a number of other appropriate technologies are also being developed.

Goal 2: The level of competence of U.S. and developing country scientists to conduct research is increasing, although differentially depending on the discipline. The multiple demands on the Indonesian personnel have limited in-country competence development. This is particularly true of the apprentice-type development that would be expected in the project. However, the training of Indonesian personnel is progressing.

Goal 3: Improvement of food and fiber production capability seems to be occurring on the small holder level and is anticipated on the national level.

In terms of objectively verifiable indicators, the number of published reports of results of the project has continued at a high pace. Several new forms of publication

and dissemination have developed in the last year. The project published 11 working papers between January 1989 and November 1989. A number of articles were also published in refereed scientific journals in the U.S. Publication in Indonesia has been delayed because one of the major Indonesian journals has temporarily stopped publication due to the retirement of its editor.

Perhaps of greatest importance is the publication in Indonesian of a major handbook on sheep and goat raising that has wide distribution and enthusiastic acceptance by the farmers and the extension service. In addition, the project is publishing a newsletter in Indonesian that builds on monthly meetings with farmer groups answering in print questions posed by farmers. Given the relatively widespread literacy among male farmers in Indonesia, this new set of publications is important in showing mechanisms for the diffusion of existing and new technologies.

Improvement in the competence of U.S. and developing country personnel seems to be occurring, although more slowly because of cutbacks in training in previous years. The problem of lack of training for U.S. students remains.

The major objectively verifiable indicator, the socio-economic evaluation of improved packages for small holder families, unfortunately has not been developed to any extent, although some attempts on the economic level are in the planning stage.

(b) Research achievements during the report period (1987-89)

Animal nutrition. A major publication is currently in press demonstrating the nutritional quality of available forage and those that are most easily integrated into animal diets under farm conditions. The project has now shifted to more experimental work with animals, particularly those involved in the animal breeding program. The project determined in well-designed experimental trials that cassava root peelings can be used without detriment as feed for sheep. Cassava peelings, although not available to the degree used as a maximum in the experiment, are part of the small farmer system. Other experiments were less adapted for small farmers per se, but were presumably undertaken on the assumption that farmers might sell their lambs for fattening to enterprises (thus far nonexistent) that could utilize agricultural byproducts. Thus, the study of the utilization of cotton seed hulls for feeding sheep was carried out, despite the fact that little cotton is currently raised in Indonesia. A series of research projects are underway on supplements which may be inappropriate. In the tropics supplements only make sense when there is a small period of time when otherwise available nutritional elements are not seasonally available. The supplemental experiments planned are for year-round use and, thus, probably not practical for small farming systems. Lack of integration with the socio-economic component has encouraged such research, which is much more suitable to developed countries where there are cheap protein sources readily available. In fact, the

supplement research has been delayed in part because the experiment station cannot afford the supplements. It is doubtful then that the small farmers could, either.

An important aspect of the nutrition research is in a completely different farming system in North Sumatra. This set of research works not only with the Indonesian agricultural experiment station, CRIAS, but also with the Rubber Institute, a better funded and more sophisticated research organization which is part of the parastatal enterprises. This research is carried out at Sungei Putih and has been extremely productive, primarily through the efforts of Dr. Manuel Sanchez. Here, too, the nutrition program works with the breeding program projects, including strategic supplementation of local St. Croix crossbred ewes; continuous molasses supplementation; rubber seed for lactating ewes; timing of palm kernel cake supplementation; supplementation of molasses and broken rice; use of molasses box at Sei Putih; rotational grazing under old rubber trees; drylot feeding of sheep with palm kernel cake; long-term production of Sumatra sheep in an integrated sheep and rubber plantation system; planting methods for legumes; production of forages in new rubber plantation; and shade tolerance of forages under rubber trees. While many of these experiments are more applicable to fattening operations carried out in conjunction with parastatals, there is great potential in these research results for small holder and landless laborers in terms of improving small ruminant production.

Economics. The economic work has had two main thrusts. One is pulling together the existing knowledge on small ruminant production in Indonesia and putting it into the production handbook usable by small farmers. That handbook was picked up by FAO and translated into English to be distributed throughout southeast Asia. Further, it was the basis for a videotape made and distributed by FAO. This is an important contribution, not only to sheep raisers in Java but to the whole area. The continued updating of this book is part of the workplan. The economic project has also done some important work in experimenting with different methods of giving feedback to farmers in terms of improving production practices as an iterative process. This work with the Outreach Pilot Project (OPP) and the Outreach Research Project (ORP) has great potential for the future. Finally, the project has attempted to do some cost benefit analysis of rearing sheep by the on-farm research project farmers. One of the most difficult parts of this research was ascertaining the cost of labor, which is the largest input into the system. A lack of coordination with the sociology part of the project has limited the usefulness of this research, although the other inputs are carefully enumerated for each farmer at each site. Another major problem in cost benefit analysis is the differential market for sheep, particularly rams. One of the recommended animal husbandry techniques is castrating rams. However, castrating rams drastically decreases their value, as unblemished rams are an important source of income for Muslim holidays, where they are ritually sacrificed. These animals can earn up to 6 times the ordinary market value. A series of economic studies showed that few of the sheep were actually sold at the optimum age.

However, this was not articulated with the current market values. It is hard to argue that biological factors should drive the animal husbandry practices of integrating sheep into the market, yet the economic research drew its conclusions based on exactly that assumption. Again, better articulation with the sociology research would strengthen the economic work underway. Systematic baseline data have been gathered for the outreach research project on the island of Sumatra. Good descriptive data are included. The outreach research project on Sumatra is integrated as part of the economics component and will be integrated with the breeding program and the nutrition program.

Unfortunately, there is little sociological input in this aspect of the project. The project found that when one included labor using the going market wage, it was not economic to raise sheep. One then wonders 1) how the farmers value the labor and 2) if sheep production would be continued once the project with its considerable donation of inputs ends. Once again, the sociology component would be extremely helpful.

On the island of Java, research also included analysis of factors affecting the success of the outreach private project farmers. That research examined OPP farmers with low acceptance compared to those with high acceptance of the recommendation practices. The major difference between the two groups was amount of labor available. Neither education nor land ownership explained much of the differences. Labor availability was particularly highly related to feeding management and to housing management. Labor availability in turn was related, one could argue, to stage in the family life cycle given the drastically reduced fertility among Indonesian families in the last few years. Again, a sociological component would help understand if sheep raising is to be a strategy used during certain times in a farmer's life cycle or is to be a continuing part of the farming system. Given the huge importance of labor, more sociological work in conjunction with those involved in the economics and animal husbandry aspects of this study would be extremely appropriate.

Breeding. Breeding activities are by their very nature long term. There are three major projects that include the development of high prolificacy and lower prolificacy lines of sheep in order to isolate the prolificacy gene that could allow farmers to maximize manageable litters of sheep. This is now being attempted at two sites on both Sumatra and Java. Those sheep are indigenous. Hair sheep have been introduced and are being bred with local sheep in the grazing under rubber system. Further, these breeding crosses are now being evaluated by farmers as part of the ORP and OPP.

The sociology work depends heavily on the resident scientists connected with the outreach pilot programs and suffers from lack of Indonesian counterparts in the field. A number of studies that are extremely interesting have been carried out by the

sociology unit, including the report on women's involvement in the improvement of small ruminant production in the OPP village looking at their time and motivation. Unfortunately, little of the sociology work is integrated with that of the production scientists, making it difficult to allow the sociology component to have the expected iterative impact on the choice of research problems in the field.

(c) Research objectives in terms of expected achievements for the next 12 months are by and large a continuation of the research that is currently underway. The economic analysis of the Outreach Pilot Project interventions examines small ruminant profitability before and after each of the experimental interventions, as well as various combinations of interventions. Basically, this research is based less on systematic economic analysis--which may be inappropriate in any event--and more on regular farmer feedback, using their standards for evaluating the project. This method of interacting with farmers on their criteria has great promise for yielding useful results in the time period.

They are going to translate the economic analysis how-to manual, "Conducting On-Farm Animal Research Procedures and Economic Analysis," by Amin and Knipscheer, into Indonesian. The aim of this is to increase the scale of small ruminant production by providing management information to facilitate decision making in order to raise small ruminant production to a commercial scale. This means an orientation toward larger farmers with higher degrees of capital/labor availability. It is an attempt to move sheep production from the traditional function of savings that protect the farmer from the vagaries of other market conditions into major market relationships.

Nutritional experiments in Sei Putih have responded to last year's experimental results by attempting to carry out new projects that focus more on inputs that may be available to the small holder producers. For example, they have dropped the work with molasses because of its unavailability. The work plan for Bogor hopes to put into usable packages the nutrient requirements for maintenance and production of Indonesian sheep and goats. This will require working closely with the outreach people in order to put these requirements in terms usable in small farm production systems. Tech packs are developed relating local nutrient requirements with the chemical composition of locally important feedstuffs. In the course of putting together these packages, gaps in the research are being identified. The existence of the gaps will hopefully then feed into the research project in the following year and be filled. These technologies will then be tested with on-farm evaluations, although the methodology for conducting such evaluations is still incomplete.

The work plan for Sungei Putih is a continuation of the supplementation of the local North Sumatra and F1 sheep grazing native pasture under rubber trees, the introduction of forage species and their establishment in the rubber plantations, grazing management studies of sheep under rubber trees, the effects of shading on

growth of forages, molasses blocks with and without minerals, and free choice molasses for grazing ewes. There is a possibility that the two projects with molasses will be dropped and modified. Molasses is not readily available to small farmers in the area.

The socio-economic unit has found that women do not participate in or pay much attention to the technology being disseminated in mixed sex meetings. Thus, there will be a new effort working with already established women's groups in the villages to provide new outreach strategies for women producers.

They plan to have a series of seminars with extension workers to bring about closer research-extension-farmer linkages. The project sees this as a continuum, not a dichotomy or trichotomy, and the important work being proposed to make these linkages through a seminar should further help this process.

A study of the socio-economic impact among farmers in Cirbon is proposed. They presumably would do this through survey research. This project, in particular, does not seem workable. There is already a great deal of survey data that is unanalyzed or underanalyzed. Further, the lack of integration with the other parts of the project make this a less than optimum use of project resources. The validity of the survey at this point in time to evaluate impact is highly questionable. The ability of this particular sociology project to achieve the stated goals is low.

Another proposed sociology project, the gender gap and small ruminant production, again relies heavily on survey research to determine something that might be better approached through multidisciplinary activities involved with the on-farm trials. In fact, if this project were integrated with the work with women's groups, better results might be obtained. Once again, a heavy reliance on surveys, particularly given the large amount of survey data already underanalyzed, makes this project extremely questionable.

The other project in the socio-economic area is dissemination of information to non-OPP producers. This is a project that will be undertaken through a series of meetings and informal discussions, a methodology appropriate to the project being undertaken.

Proposed breeding research will continue work on the prolific Javanese sheep, evaluate the performance of hair sheep and their crosses with local sheep in the management systems, involving grazing under rubber and work with the Outreach Pilot Project teams. It will utilize data from that project with the development of improved breeding and management plans. This contributes to the on-going development of tech packs and is an important research-extension-farmer link. The breeding project also intends to assess genetic variation among sheep and goat

populations reared in different regions in Indonesia using electrophoretic variants.

Summary Recommendations

The research in Indonesia has matured greatly in the 10-year course of the project. A number of important research results are in hand and on-going research in large part is based on results of previous research. There are good links with small farmers, who are a major group of potential users of the research in both areas in which research is underway.

There are some problems of integration of the sociological component of the project with the other aspects of the research. It would be useful to provide in Indonesia systematic training in farming systems research methodology, particularly that involved with on-farm trials utilizing materials that stress measurement and awareness of the human factors of the system. This training might include such materials as those developed by Poats, Feldstein and Flora. In addition, short-term consultancies aiding the analysis of existing survey data to help the production scientists understand the sociological context of their research would also be extremely helpful.

Opportunities for U.S. students to do thesis or dissertation research in Indonesia needs to be developed.

Recommendations of the project scientists, including the experiments they run, need to be evaluated even before they are taken to the field as to their relevancy for small holders conditions. It is all right to do forward-looking, relatively high-input experiments, but their limitations and applicability need to be recognized from the onset.

More sociological work, not of the survey variety, needs to be done to determine how farmers value labor of each family member and the relation of these opportunities costs for various types of family labor for sheep production. In addition, the trajectory of future plans of different kinds of farm families in terms of sheep raising should be evaluated by the sociology unit. This would help proposed research in terms of whether or not to encourage farmers to think of long-term expansion versus short-term maintenance of various sizes of sheep producing units.

There needs to be more sociological interdisciplinary work in conjunction with those involved in the economics of animal husbandry aspects of the on-farm projects.

Efforts should be made to get an Indonesian counterpart for the sociological aspects of the study. The sociological work should coordinate more with the on-going field work involved with dissemination of the project research results rather than

unrelated surveys. There should be a moratorium on survey research until the utility of the existing surveys has been demonstrated in terms on its impact on the work of the nutritionists and breeders.

(d) Conformance of research to annual work plans

The research undertaken over the past years seems, to a large degree, to follow the annual work plans. However, in the case of sociology, in particular, there has been more emphasis on data gathering than on data analysis. Perhaps as a result of lack of articulation with the rest of the scientists, that area has shown less ability to actually conform to the annual work plan.

(e) Changes made in research plans as a result of research findings

The nutrition component has been most responsive by adjusting their research plan to research findings. This has been particularly important in the forage research, which has quickly responded to unsuitable forage developments and in the supplemental studies, where the lack of results or the use of inappropriate materials have led to altering the research plan to projects that would be more adaptable to farmers' conditions.

The breeding program is becoming more aware of the problems of raising triplets, particularly under experiment station conditions, and has focused on developing a moderately prolific sheep.

The economic outreach part of the project, having observed the lack of participation of farm women in traditional outreach methods, formulated a project for women farmers using established village women's groups.

(f) Subgrant constraints

Funding, particularly from the Indonesian government has, at times, been a constraint in the research process, particularly in terms of the purchase of inputs. However, this constraint is also an advantage because it forces the researchers to deal with the farmers' conditions rather than using expensive high inputs.

Facilities have not been a constraint recently. While not overly elegant, they seem to be suitable for the research to be carried out.

Personnel, particularly in the socio-economic component, has been a major constraint for the research, in part because several of the key Indonesians are still being trained. In addition, sociology is traditionally not part of the agricultural component in Indonesian agricultural research and extension systems. Further, the

few sociologists that have been trained have attempted to do too many projects and have seemed unwilling to integrate with the production scientists.

(g) Technology packages: relevance, context and schedules

The technology packages are still being developed. Information to make up different technology packages is coordinated by the extension media specialist. His work is extremely important as he pulls together the files for each particular technology, indicating the gaps in the research base and what must be found out before these technological packages can be delivered on a widespread scale. As a result of the close work of tech pack products with the outreach projects, the relevance of the projects will be much greater. Further, they appear to be fitted to a context of the small farming systems for both sheep under rubber and the traditional "cut and carry" system of Java. The schedule of when the research gaps will be filled in order for the packages to be released is not yet clear.

(h) Appropriateness of research and training to small farmer needs

This is always an enormous problem and made even more difficult in animal farming systems. Motivations for raising animals as well as the constrained conditions under which they are raised, particularly in the high density areas of Java, leave little room for sophisticated improvements, particularly for the kinds of high energy or high cost inputs that would be routinely used in research in the United States. It is difficult for the training and research that is done for the kinds of small ruminant production prevalent in Australia, Europe, and the United States to be relevant for the more constrained production conditions of Indonesia. Given this, and the tendency of scientists to replicate their dissertation research, which tended to be based on that of their major professor, which tended to be based on the kinds of problems emergent in developed countries, there is an increasing appropriateness of the research undertaken to the actual conditions of Indonesian small holders. However, that relevance stems less from the training received than from the "apprentice" work being done in the field. In particular, the outreach projects, which bring scientists face to face with farmers, are perhaps the most important mechanism through which research becomes more attuned to farmers' needs. These outreach projects need to be encouraged, regularized, and brought into more farming systems.

(i) Response to the 1988-89 recommendations: ME and participating institutions

Despite the recommendation by Dr. Raun and the EEP in the 1987-88 report, a forage person has not yet been added to the team, although there are forage scientists involved. The EEP recommended a sharp curtailment of the number of projects in nutrition. There still seems to be a large number of projects underway. The degree of focus could still be sharpened.

The EEP in 1987 and 1988 expressed concern about the lack of a health component, despite the potential of linking with Balivet of AARD and the Australian advisors from Cook College. This component is still lacking and will be a particularly important component in the sheep under rubber studies.

The EEP expressed concern about the low visibility of the SR-CRSP in Indonesia. The publication of the technical book in Indonesian and its adoption by FAO has greatly increased the visibility of the project. Further, the networking activity under the leadership of Indonesian project participants has also greatly increased the visibility of the project in Indonesia.

The EEP recommended that the manual on the economic analysis of sheep systems proceed. This has occurred, with the troubling problem about how to evaluate labor. Given the problems of market-labor interactions and the cyclical nature of each, the relevance of an economic analysis manual for small holder systems should lead to caution in urging it on farmers. It will be very useful for purely commercial operations.

The EEP suggested more integration of the research projects. That has certainly occurred, particularly through the mechanism of the Outreach Pilot Project and the Outreach Research Project. However, the sociology component remains outside that nexus to a very large degree, in part, because of the methodological obsession with surveys.

(j) EEP recommendations.

First, the sociology component is clearly a major weakness at this time, not as a result of lack of effort by the University of Missouri but because of the institutional structure of Indonesia, which like most countries, including the United States, does not consider the human element important beyond the economic aspects. An alternative to urging lone sociologists on the project would be to help train all the scientists involved to use sociological insights in planning their research. A mechanism for doing this would be through further training in farming systems methodology. This will also be important to give more systematic evaluation of the on-farm part of the project. Right now, these are indeed outreach projects and not on-farm trials. Bringing external teams to train the teams of researchers in on-farm methodology to evaluate on-farm trials, which would include designing those trials, would be extremely important. In particular, the project on gender analysis developed by Susan Poats and Hillery Feldstein supported by the Ford Foundation, and the manuals produced by IDRC would be helpful here. Not only are women important parts of the small ruminant production system, but the training materials that have evolved for gender analysis are really a mechanism for including the human factor in setting up

agricultural research and extension projects. Thus, a major recommendation is to institute this training for all the scientists in Indonesia in the two sites involved.

Secondly, there needs to be some order put on the vast amount of survey data that has been gathered. Right now that data tends to be proprietary and not used in a mechanism that helps any of the other scientists involved in the project. The data ownership problem must be dealt with. One mechanism would be a short-term consultancy on data analysis that would first work with the sociologists and economists to put the data in a usable form, to work with them in learning the appropriate software packages and, finally, to hold a series of seminars with the production scientists showing the interactions of the socio-economic data with the nutrition and breeding results.

The health component must be included. The on-farm work should include a greater concern with the health component, in particular that involving grazing animals. Whereas the Indonesians showed great willingness to undertake this, there must be persistent followup to make sure this occurs.

The breeding programs need to deal with the potential of distribution of the breeding stock. The links that have been made with the distribution service need to be continued and built upon. This massification of the project means that dependence on imported sheep may give a very limited genetic pool for improvement. Further breeding work should use the hair sheep already available in Indonesia as alternative breeding stock.

The nutritional work should focus on foodstuffs and supplements readily available and affordable by small farmers in both of the systems under study.

Personnel

(a) Host country

The number and qualifications of research scientists in Bogor appears to be adequate in three of the four main work disciplines in which SR-CRSP is involved: Feed Resources, Animal Breeding and Economics. Many of the scientists have returned after the completion of their graduate training and are now actively engaged in small ruminant research.

Research staff at Bogor tend to be more stable in their work because of the location of the station and the attractive working environment as well as other living facilities available at this location.

The situation in Sungei Putih, North Sumatra, appears to be somewhat different. There are a total of 14 researchers assigned to this station; seven of them are assigned

to the Small Ruminant Program but only 4 of those 7 are at the station at the present time since 3 are on study leave. These 4 scientists must share their time between their own Small Ruminant Program and SR-CRSP activities.

Working facilities at Sei Putih are limited because of insufficient electricity and water supply. In addition, because of the location of the station, about 50 miles from Medan with a rather difficult road, researchers must live at the station, a situation not always compatible with family needs such as schooling. All these factors contribute to making the work at Sei Putih less attractive than at other research stations.

National authorities are well aware of this situation and have expressed the firm intention to make every effort in order to attract qualified scientists for staffing the Sei Putih station. Their immediate plans include the recruitment of more scientific staff, the granting of scholarships for graduate training, and the improvement of working facilities at the station. The ultimate goal is to make the station self-sufficient.

In the recruitment of personnel, preference will be given to people from the local area, since, according to past experience, they may be more readily adaptable and more stable in their work. The EEP feels strongly that if the work at Sei Putih is to be expanded to develop sustainable sheep production systems under tree plantations, proper staffing should be considered as one of the highest priorities.

The Rubber Research Institute, as an indication of their high interest in the development of this type of research, is participating at the present time with the involvement of three of their scientists: an agronomist, a sociologist and a weed scientist.

One area that needs immediate attention is animal health as has already been pointed out by the EEP in a previous report. This component will become increasingly important as sheep production under rubber trees is expanded. The control of internal and external parasites will be one of the most important concerns in such a production system.

(b) Expatriates

There are three expatriate scientists working with the SR-CRSP in Indonesia: one PLO/Animal Breeding specialist (Dr. L. Iniguez), one Nutrition specialist (Dr. M. Sanchez), and one Communication specialist (Dr. P. Ludgate). Their role in the administrative coordination of the program as well as in the development of scientific and outreach activities has been outstanding.

Should the work at Sei Putih be expanded and intensified the participation of more expatriates may be necessary, particularly in the form of short-term consultancies

in specific research areas. It would also be highly desirable to encourage the involvement in the program of more U.S. graduate students, who may take advantage of the research opportunities for their dissertations.

(c) Collaboration between U.S. and HC personnel

Collaboration appears to be adequate, especially in Bogor. The fruits of this collaborative work are the numerous publications in the form of working papers, bulletins and scientific papers. The preparation of the Technical Information Files (TIF's) and the implementation of the outreach programs, because of their multidisciplinary nature, are also contributing to a closer collaboration among disciplines and among U.S. and HC personnel. It is expected that the degree of collaboration will also increase and become more effective in Sei Putih.

(d) EEP recommendations

The EEP feels strongly that the successful development and continuity of a research program on sheep production systems under rubber tree plantations will depend to a great extent on the number and quality of the national research scientists. Therefore, it is strongly recommended that this matter of recruitment and training of research staff be given high priority by the local authorities. In fact, this should be one of the essential prerequisites for the continuation of SR-CRSP support during the second phase of the program in Sei Putih. The provision of the proper working environment as well as the basic physical facilities and services are essential elements for productive work.

As mentioned earlier, the distant location of the station from the nearest city, Medan, may discourage the possibility of the staff members and their families living in Medan. This suggests the need to provide living quarters at the station for most scientists which, in turn, generates other problems such as schooling for their children, etc. These and other relevant aspects need to be analyzed in depth if a strong and long-lasting research program is to be developed in Sei Putih.

In addition to the scientific staff, a competent team of auxiliary personnel is required for both field and laboratory work. It is recommended that due attention be given to the proper selection and training of these personnel.

Training

Without a doubt, training of national scientists has been one of the most outstanding contributions of SR-CRSP in Indonesia. A total of 23 scientists have been trained at different levels. From this total, 10 have received their training at U.S. universities and the remaining 13 in other educational institutions within the home

country and abroad.

At the time of the EEP visit, there were still 7 national scientists doing graduate work under the sponsorship of SR-CRSP: 3 in the U.S.; 1 in Los Banos, Philippines; and 3 in Bogor, Indonesia.

Future training plans with SR-CRSP support will depend on the decision to be taken regarding the continuation of the program in Indonesia. In any event, high priority will be given to the training of scientific staff for Sei Putih, as mentioned above.

Equipment and Facilities

Facilities and equipment in Bogor appear to be adequate. The station in general has adequate facilities for housing animals and well-equipped laboratories, especially at Ciawi station. Animals of the prolific sheep project, near Bogor, are well housed and, contrary to what was observed in a previous visit of the EEP, proper provision has been made to ensure an adequate supply of good quality forage out of the grasses and legume trees that have been planted there.

In Sei Putih, even though the facilities for housing and managing the experimental animals appear adequate, the lack of a continuous supply of electricity and water prevents the proper utilization of the laboratory facilities.

Funding

SR-CRSP funds allocated to administrative operations and the specific research projects have been properly managed as there are no indications on the contrary. The proportion of the subgrants spent in the host country as compared to that spent in the U.S. varies widely among projects.

No other financial collaborators are envisaged at the present time apart from the Rubber Research Institute. This institute, in addition to the participation of the 3 staff members, provides the living quarters for the SR-CRSP resident scientist stationed in Sei Putih and access to land and rubber plantations. The extent to which the institute may provide additional financial resources for research in sheep production was not clear to the EEP. Other financial resources may become available in the future as the research on sheep production under rubber trees gains more strength. This production model is likely to have broad application in different tropical areas of the world, not only in combination with rubber trees but also with other plantation crops such as coconuts, citrus trees, etc.

The EEP has not been informed of any audit performed in the host country.

Administration of the Program

In a general way, the administration of the SR-CRSP follows the same pattern as other sites. After 10 years, the roles of the PI's, the TC, the ME and BD are well integrated with their counterparts in Indonesia, and they are working well together despite the considerable distances involved. The introduction of the FAX has greatly aided communications for the SR-CRSP in Indonesia.

The presence of three expatriate scientists (Dr. Iniguez, Dr. Ludgate and Dr. Sanchez) on site in Bogor and Sei Putih has greatly facilitated communications, continuity and coordination of the work in Indonesia. They are indispensable for the continued success of the project.

The host government is now fully aware of the work of the SR-CRSP and supportive of it. The government does have several priorities for ruminants, notably the widespread distribution of Bali cattle and some apprehensions were expressed about mixing cattle, water buffalo and sheep because of the potential danger of malignant catarrhal fever. Nonetheless, the government officials understand the important role that small ruminants play in the lives of Indonesian farmers and they are very interested in the future of sheep at transmigration sites and their potential productivity grazing under plantation trees.

While budget reductions in previous years did have an effect on the projects, they were accommodated by careful planning and budgeting such that this year there was a balanced administrative budget. It must be emphasized that while scientists and facilities are available in Indonesia, it is the availability of research and operating monies which make the work on small ruminants possible.

EEP Recommendations

Should the SR-CRSP continue for a further five years in Indonesia, the EEP has the following suggestions for its administration:

- 1) The expatriate project officers on both sites should be strongly supported in every way possible.
- 2) Every effort should be made to enhance communications between the two sites in Bogor and Sei Putih (travel, radio, FAX, etc.).
- 3) As increased resources for research and extension flow to Sei Putih, corresponding administrative resources will be required and an appropriate balance maintained between them corresponding to the changing nature of the project.
- 4) The ME should continue its practice of providing a special infusion of funds for high priority projects, e.g., the production of an extension handbook, veterinary services, a visiting consultant, etc.

USAID Mission Involvement

The EEP had a two-hour conference with five members of the USAID mission in Jakarta. It was clear that the USAID members had a much better understanding and knowledge of the SR-CRSP on this occasion than they had in 1987. This was in part due to the increased passage of time and the visibility of several SR-CRSP publications but mostly to the considerable effort made by AID officers to visit SR-CRSP sites, including Sei Putih and see the work for themselves.

The present mission officers are well aware of the work of the SR-CRSP and supportive of it. They do not provide any financial support from mission funds and were somewhat reserved when approached about the possibility of a future buy-in to SR-CRSP. They expressed greatest interest in work in areas which would improve the national economic picture in Indonesia as opposed to increasing the incomes of small farmers and transmigrants, so the work on "sheep under rubber" with its considerable potential for economic growth was of greatest interest to the Mission.

EEP Recommendations

The EEP recommends that the SR-CRSP maintain and enhance the present good relations and understanding that exists with the USAID mission in Jakarta. This should be done by frequent visits and briefings, copies of publications and, best of all, USAID visits to SR-CRSP sites. As work progresses over the next five years both 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, exploited and enhanced with USAID mission funds.

Linkages and Networking

Major progress has been made in national and international networking since the 1987 EEP visit. On the national level, a booklet entitled "Indonesia, Small Ruminants, Directory of Institutions and Personnel, 1989" has been published and distributed. This lists all of the institutions and scientists engaged in small ruminant research in Indonesia. In addition to this, a list of references on work on small ruminants has been compiled and is now available in Bogor.

On the international level, plans are now well underway for a small ruminant network in Asia. A steering/planning committee has been formed. Dr. Andi Djajanegara is a member and the committee will soon meet to further define the nature of the Asian network and decide upon the headquarter country.

EEP Recommendations

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 increase the efficiency of the work immeasurably by preventing duplication and making information on small ruminants widely available throughout the region.

Overall CRSP

The work done by SR-CRSP with small farmers in Indonesia is very much in line with the goals of the Global Plan. The original work with farmers keeping sheep in traditional small barns (kandang) for a "cut and carry" operation has been supplemented by work in Sumatra on sheep grazing under plantation trees. This latter form of husbandry is available to large rubber estates but is also available to small farmers, who produce 80% of the nation's rubber in small enterprises. It is also available to rubber estate workers and transmigrants who presently live a very borderline existence. Any amelioration of their lot in life would be in line with the Global Plan.

With the possibility of termination of the SR-CRSP at the end of 10 years, the balance between research, training and dissemination of information had been adjusted over the past two years so that training was reduced somewhat and publication and dissemination of information were increased. This is appropriate. With a renewed start to the 5-year plan, it is expected that fresh research will be started, selected persons will be trained, and the flow of information will continue through the national network established during the last two years and the fast evolving international (Asian) network.

There would appear to be a good balance between the domestic (U.S.) activities and those in Indonesia. The expatriates permanently in Indonesia ensure that a substantial amount of work, research and publication is done there. On the training side, there are some indications that the University of Missouri plays a disproportionately large role in training of graduate students (locally known as the Missouri Mafia!). While this is understandable and in some ways very commendable, indicating a real sense of responsibility on the part of the University of Missouri personnel, the EEP members wondered if the well beaten track to Missouri was always in the best interests of the trainees in some disciplines and would recommend that a wide net be cast in the next five years to match trainees with the best possible institutions in the United States and elsewhere for Indonesian students.

Over the past decade the interaction and cooperation between U.S. and HC personnel in Indonesia has been excellent. Particularly gratifying is the cooperation

between U.S. PI's and returning Indonesian trainees. As the SR-CRSP matures, it is particularly important that the HC counterpart scientists be heavily involved with the planning of the work and day-to-day running of experiments. There were instances where the EEP felt that the HC personnel had not been involved sufficiently in planning and instances where they were not entirely sure of why they were doing a particular task and some instances, notably in Sei Putih, where some HC scientists were not much involved with the day-to-day small ruminant work on the station. These situations must be carefully addressed and rectified in the upcoming five years if there is to be a "life after the SR-CRSP" in Indonesia.

By any standards, the SR-CRSP has been unbelievably cost effective in Indonesia. The simplest of comparisons with the Australian and USAID projects, costs, and results will verify this.

The publications from the SR-CRSP in Indonesia have been very prolific. The recent publication of the extension book, "Penelitian Ternak Kambing Dan Domba Di Pedesaan," is now in its second edition and is a model of its type. It is in Indonesian, well illustrated and well used by the farmers--it was produced by the first farmer we visited. We understand it will be reproduced, unaltered, for distribution by the FAO. The SR-CRSP in Indonesia has relied heavily on the production of working papers for the documentation of information. This system is commendable in that it gets the information committed to paper but the dissemination of the information is limited. The EEP would recommend that during the next five years increased emphasis be placed on publication of scientific results in national and international journals. This is likely to improve their quality and enhance their distribution and the availability of the information derived from the SR-CRSP.

The EEP would rate the SR-CRSP work in Indonesia as excellent and would strongly recommend continuation in that country. As the following summary implies, "nothing in this world is perfect," but given the great distance, the substantial differences, the limited resources and the short time span, much of a highly commendable nature has been achieved by the SR-CRSP personnel--Indonesian, American and expatriate--in Indonesia.

EEP Recommendations Concerning SR-CRSP in Indonesia after 1990

During the site visit to Indonesia in November, 1989 by an EEP team consisting of Drs. Campbell, Flora and Fernandez-Baca, at the request of the M.E., paid particular attention to the possibility of continuing the SR-CRSP after 1990. After visiting the sites at Bogor and Sei Putih and meeting with many of the scientists as well as Dr. Soetatwo and Dr. Jan Nari as well as 5 staff members from USAID, the EEP would recommend strongly that the Indonesian site be continued for the following reasons and with some qualifying clauses.

In a general way, tremendous progress has been made by all elements of the SR-CRSP in Indonesia over the past decade. Many fine young Indonesian scientists have been trained; collaborative work has taken place between American and host country scientists; a major extension and networking effort has been successfully established; awareness has been raised about the importance of small ruminants to farmers. In addition, hair sheep have been introduced, and evaluated and an excellent start has been made to grazing sheep under plantation crops, notably rubber. This latter promises to enhance the income of small farmers and plantation workers in Indonesia. If its full potential could be realized, the general practice of grazing sheep in this way has major implications for food production in Indonesia as well as many other countries in the humid tropics where large plantations (rubber, palm, etc.) already exist. In the opinion of the EEP, a change in venue is not justified and would set the SR-CRSP work in the humid tropics back 1-2 years.

The EEP would make the following suggestions for the 5-year extension:

- 1) There should be some decrease in the SR-CRSP effort in Bogor with a concomitant increase in the effort in Sei Putih. The increased effort in Sei Putih should parallel the host country's anticipated increased deployment of resources at Sei Putih.
- 2) More sociological work of a nonsurvey type needs to be done in Indonesia and great attention paid to its integration into the other projects.
- 3) Expatriate scientists should remain at both sites with an increase in Sei Putih.
- 4) The SR-CRSP should continue and perhaps even increase the consultants visiting both sites, but particularly Sei Putih for short periods (1-3 months), to work with the resident scientists.

- 5) Arrangements should be made to provide veterinary services to monitor, diagnose and prevent the diseases of sheep grazing in the humid tropics where small ruminants kept in a nontraditional fashion (grazing under rubber trees) are potentially at high risk.
- 6) The host country scientists resident in Sei Putih should be actively incorporated in the planning, the day-to-day supervision and the publication of the results of the work done at Sei Putih, so that continuity of the work will be assured at the end of the SR-CRSP's tenure in Indonesia.
- 7) The SR-CRSP, with assistance from other agencies, should help to provide facilities and equipment to make the Sei Putih site a more desirable, convenient and efficient place to work.
- 8) The EEP feels that remarkable progress has been made at Sei Putih in the past two years. With careful deployment of increased resources, both by the SR-CRSP and the host country, accompanied by careful monitoring and evaluation, the EEP feels that this work should be continued because of its large potential for the expansion of the sheep industry and the improvement in the lives of small farmers and plantation workers in the humid tropics.

A Summary of the Observations and Recommendations of the External Evaluation Panel Small Ruminant CRSP

1. The members of the EEP would reconfirm the continued 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. 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 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 4 points:
 - 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 PI about the basic objectives of the SR-CRSP.
3. 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 the 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 should be developed by the SR-CRSP Board to obtain a balance for Host Country and U.S. students.
4. 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.

5. 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.
6. There are a few fundamentals in the philosophy and planning of the 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. We believe U.S. institutions and agriculture can learn valuable lessons in the developing countries on ecological sustainability. (These may be both positive and negative experiences.)
 - 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.
7. 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.

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 CRSP, for example, grazing under plantation trees can be continued, exploited and enhanced with USAID mission funds.

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.

9. 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.
10. 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.

COUNTRY	SR-CRSP DISCIPLINE	PRINCIPAL INVESTIGATOR	COLLABORATING SCIENTIST
Indonesia	Animal Nutrition	K. Pond	B. Haryanto
	Economics	H. Knipscheer	T. Soadjana
	Breeding	E. Bradford	B. Gunawan
	Sociology	M. Nolan J. Gilles	K. Suradisastra
Kenya	Breeding/ Systems Analysis	J. Taylor	C. Ahuya B. Mwandotto
	Animal Health	T. McGuire	S. Waghela
	Economics	H. Knipscheer	F. Nyaribo
	Production Systems Feed Resources Nutrition Management	H. Fitzhugh	M. Mathuva K. Otieno M. Simba
	Sociology	M. Nolan J. Gilles	A.N. Mbabu
Morocco	Genetics	E. Bradford	A. Lahlou-Kassi
	Nutrition	K. Pond	F. Guessous
	Range	B. Norton	H. Narjisse
	Sociology	M. Nolan J. Gilles	A. Hammoudi
Peru	Animal Health	J. DeMartini	E. Ameghino
	Breeding	P. Burfening	J. Chavez V. Bustinza
	Economics	H. Knipscheer	D. Martinez
	Range Management	F. Bryant	A. Florez
	Sociology	M. Nolan C. McCorkle	M. Abuhadba M. Estafonero M. Fernandez

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