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Small Ruminant

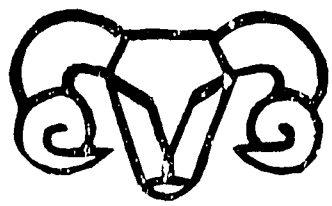
Collaborative Reserch Support Program

Annual Report for

Indonesia

Program Year Eight

1986-1987



Small Ruminant CRSP
University of California
Davis, California 95616

COLLABORATING ORGANIZATIONS

Federal (U.S.):

United States Agency for International Development
Science and Technology Bureau

Board of International Food and Agriculture

Joint Committee on Agricultural Development

Overseas Collaborators:

BRAZIL--Empresa Brasileira de Pesquisa Agropecuaria (EMBRAPA)

INDONESIA--Agency for Agricultural Research and Development (AARD)

KENYA--Ministry of Agriculture and Livestock Development (MALD)

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

PERU--Instituto Nacional de Investigacio y Promocion Agropecuaria (INIPA)

State Subgranted Institutions:

University of California, Davis

Colorado State University, Fort Collins

Montana State University, Bozeman

University of Missouri, Columbia

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

ANNUAL REPORT FOR INDONESIA

1986 - 1987

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If more information is desired, the Principal Investigator of the specific project may be contacted at his U.S. institution or by enquiry from the Management Entity, Small Ruminant Collaborative Research Support Program, University of California, Davis 95616. In addition to this series of annual reports by host country, the Management Entity has compiled a complete roster of trainees and a full listing of over 2000 theses, book chapters, scientific journal articles, abstracts of papers presented at meetings, and written and verbal technical presentations which reflect the activity of the SR-CRSP prior to 1988.

1986-1987 ANNUAL REPORT

INTRODUCTION

Over the last decade there has been a significant increase in interest in the potential contribution that small ruminants (sheep and goats) can make in both traditional and transitional agricultural systems toward sustainable agricultural development. Currently, the levels of consumption of animal protein in Indonesia are quite low particularly in rural areas, due to a multiple of socioeconomic and institutional factors. Although sheep and goats contribute a relatively minor amount to the national protein supply, these animals play a major role in providing employment, food, income, and manure for the direct benefit of many small farmers and landless laborers.

The SR-CRSP is focused on bridging the gap between animal protein availability and minimum dietary requirements by directing research efforts on increasing sheep and goat production. In Indonesia, where there are nearly 20 million small farming households, small ruminants have several advantages over large ruminants such as buffalo and cattle. Sheep and goats are easier to care for and have a ready market. The initial investment required as well as maintenance costs are low. Furthermore, in the typical Indonesian mixed crop-livestock farming system, they are able to utilize marginal land and crop residues. They are also effective as a means to accumulate wealth while concurrently providing manure for fertilizer.

Recent research has illustrated that a significant gap exists between present village sheep and goat productivity and their potential. While a range of technologies exist to bridge this gap, there is inadaquate communication between scientists, extension agents, and farmers. To meet the challenge of focusing relevant research on the variety of constraints of the small farmers and landless laborers, the Farming Systems Research and Development (FSR/D) model has been implemented at the Research Institute for Animal Production at Ciawi near Bogor, West Java.

The FSR/D approach has enjoyed significant expansion in many countries and illustrates on of the most up-to-date methodologies in agricultural research. The SR-CRSP has investigated the small farmers' social and economic objectives, institutional, financial, and environmental constraints and has analyzed this data in terms of national development objectives and improving small ruminant productivity at the farm level. The farming systems methodology for research provides a model for incorporating the diversity that exists among farmers throughout Indonesia into programmed efforts directed toward a variety of constraints in the small farming system. In Indonesia, the emphasis was placed on two major systems, the cut-and-carry system which is dominant in Java, and the integrated rubber-sheep grazing system which has great potential for the Outer Islands, especially Sumatra.

The SR-CRSP has brought about close collaboration of a

multidisciplinary team of Indonesian and expatriate scientists. The Central Research Institute for Animal Sciences (CRIAS) operates as the umbrella organization for emplementing this research. The SR-CRSP involves collaboration of scientists from Research Institute for Animal Production (RIAP), Research Institute for Rubber (North Sumatra), University of California (Davis), North Carolina State University, University of Missouri, and Winrock International. The majority of this research concentrates on improvements in nutrition and breeding management.

During the project year 1986-1987, four major research areas were investigated: Genetic Improvement of Sheep and Goats; Economic Analysis of Small Ruminant Production and Marketing Systems, Nutrition and Feeding Systems for Small Ruminants, and a Sociological Analysis of Small Ruminant Production Systems. This research has provided a significant amount of relevant information for small ruminant production systems as well as identifying a number of critical genetic, nutritional, managerial, and sociological limitations to increasing productivity. The SR-CRSP has continued its effort to improve record collection and mating plans to avoid inbreeding and to record farmers' attitudes toward both sheep and goats. A comprehensive study of blood samples from sheep has been initiated to determine electrophoretic variants among selected geographic areas.

At the Cicadas station, ovulation rate data were collected to test the hypothesis of the major gene for prolificacy. The preliminary results have not yet provided conclusive evidence due to low nutrition levels of the flock throughout much of 1986. Evaluation research on contemporary hair sheep (local North Sumatra sheep x hair sheep) was conducted to investigate the survival and growth rate of animals grazed under rubber trees and on measurement of heat load stress. Indications are that the hair sheep crossbreds have excellent viability and illustrate superior growth rates compared to the local sheep.

As the economic analysis of small ruminant production and marketing systems continues, results thus far have been significant. Data gathered from farmers was analyzed to identify crucial problems in the adoption of technology packages. The data collection and analysis procedures have enhanced the training goals of the SR-CRSP professional staff. Data on research impact will be utilized to develop policy guidelines for improving small ruminant productivity and farmer incomes. This research illustrates the farming system/collaborative approach between agricultural institutions and farmers in order to ensure that the new technologies meet farmers needs.

Results from the Bogor research station on tree legumes as a dietary supplement have been encouraging. An analysis of the data indicates that with the addition of a relatively small amount of these legumes for sheep a significant improvement in animal performance occurs. Inexperiments on fiber utilization by mature goats, data analysis suggests that zinc and a nitrogen supplement have positive effects on growth rates on goats fed native grasses. Preliminary research is continuing on sheep and goats fed banana leaves and stems as roughage. The data from this research will be summarized at a later date. In

another research effort, feeding trials were conducted on the effects of sulfus on cyanide detoxification in diets for sheep and goats which contain cassava leaves. Research findings are pending final data analysis.

Research results from the Sungai Putih station on dietary supplementation for sheep have yielded significant results. Examples of this research include studies on the minimum level of energy supplementation for ewes grazed in rubber plantations, and investigations on palm kernel sludge as a supplement for sheep. Supporting research for the SR-CRSP was also conducted at North Carolina State University.

The sociological analysis sector of the project focused primarily on training and testing technology packages. These technology packages were developed through the Outreach Pilot Project (OPP), focusing on increasing farmers' management awareness of sheep and goats and demonstrating the viability of an integrated approach to agricultural research. Through the collaboration among the SR-CRSP subprograms, Indonesian and U.S. institutions, and farmers there is a continuous exchange of information to advance dynamic research process.

In collaboration with the breeding and nutrition programs, the sociology and economic programs are continuing to experiment with innovative ways to involve farmers in small ruminant research. In the past methods have included farmer meetings (RRFH: regular research field hearings), field trips, a video film, and competitions. This aspect of the research program will gain even more importance in the next 3 years as distinct management recommendations are being formulated.

Advanced training continues to be an integral component throughout the SR-CRSP project for degree-oriented study within Indonesia and in the U.S. At this juncture 18 students are pursuing graduate studies directed toward small ruminant research. A number of these are being funded in collaboration with the National Agricultural Research II (NAR-II) project which is funded by the World Bank and managed by Winrock International.

1986-1987 ANNUAL REPORT

Title: Genetic Improvement of Sheep and Goats

Principal Investigator: G.E. Bradford

U.S. Institution: University of California, Davis

Host Country Institution: Balai Penelitian Ternak, Bogor, Indonesia.

Personnel:

Host Country	U.S.
Subandriyo	G. E. Bradford
Bess Tiesnamurti	L. C. Iniguez
Ismeth Inounu	T. R. Famula
Bambang Setiadi	C. M. Finley
Djoko	Y. M. Berger
Sri Wening	
Muryanto	

RESEARCH RESULTS

The Indonesia CRSP Breeding Project is currently involved in work in the following areas:

1. Study of the inheritance of prolificacy and of other traits in Javanese sheep (Cicadas Station, West Java).

2. Comparison of performance of hair sheep, local sheep and crosses grazed under rubber (Sungei Putih Station, North Sumatra).

3. Evaluation of performance of sheep and goats and of farmer acceptance of animals of different genetic potential in villages in West Java (OPP-Outreach Pilot Project).

4. Estimation of genetic differences among populations of sheep and goats in different parts of Indonesia.

5. Studies of dairy goat crosses (Cilebut Station, West Java).

1986-87 Accomplishments in these areas were as follows:

1. Cicadas project.

Ovulation rate data were collected in August/September 1986 by Bess Tiesnamurti for her M.S. thesis research. Because of a low level of nutrition of the flock during much of 1986, mean ovulation rates were lower than obtained previously on ewes of the same ages, and the criterion of one or more ovulations of at least 3 did not identify the expected members of carriers of the postulated major gene for prolificacy. The data have been analyzed with body weight as a covariate, and criteria developed, based on adjusted ovulation rate data, to discriminate between carriers and non-carriers. Segregation ratios and pattern of distribution of ovulation rates were consistent

with the major gene hypothesis, but the results as yet do not provide as conclusive evidence as had been anticipated. Ovulation rate data were collected again in July/August 1987, when the ewes were in better condition. Also, response of pre-puberal ewe lambs to PMSG, which appears to provide a basis for early diagnosis of carriers of the Booroola gene, is currently being measured in 1987 ewe lambs.

2. Hair sheep evaluation.

Contemporary hair sheep, F_1 (hair sheep x local) and local North Sumatra sheep have been produced during 1986-87. Evaluation is being based on survival and growth rate of animals grazed under rubber, and on measurement of heat load and physiological response to heat stress. Reproduction will be evaluated as the animals reach breeding age. Reports of performance to date indicate excellent viability and significantly superior growth rate for the F_1 sheep compared to the local breed animals, and there is apparently much interest among farmers of the region in obtaining hair sheep or F_1 animals. This question will be considered during the annual CRSP meeting in Indonesia in October 1987.

3. OPP.

Breeding project personnel have taken a more active role in the OPP project this year, working on record collection, mating plans to avoid inbreeding, and farmer attitudes about both sheep and goats, of different breed types or prolificacy potentials.

4. Genetic relationships among subpopulations.

Blood samples have been collected from subpopulations of sheep in West and in Central Java and in North Sumatra. These will be analyzed for electrophoretic variants, to obtain information on degree of relationship among the strains in different areas. It is planned to extend the sampling to goats and to East Java. Contact has been made with participants in an Australian-sponsored project in Southeast Asia with similar objectives, also just being initiated, with a view to coordination of the two projects.

5. The dairy goat breeding project at Cilebut has been hampered by poor conception to A.I., and the project is currently under review.

PUBLICATIONS

Bradford, G.E., Subandriyo and L.C. Iniguez, 1987. Breeding strategies for small ruminants in integrated crop-livestock production systems. In: Small Ruminant Production Systems in South and Southeast Asia. Ed. C. Devendra, IDRC Publ. 256E:318-331.

TRAINING

Degree-oriented:

1. Bess Tiesnamurti, BPT, Bogor, Indonesia. M.S. Program, Animal Science, University of California, Davis, 1985-87. (World Bank Fellowship; SR-CRSP supported research).

2. Subandriyo, BPT, Bogor, Indonesia. Ph.D., Animal Breeding, University of Missouri, 1987-1990. SR-CRSP support.

1986-1987 ANNUAL REPORT

Title:	Economic Analysis of Small Ruminant Production and Marketing Systems
Principal Investigator:	Hendrik C. Knipscheer
Host Country:	Indonesia
Personnel:	Host Country Co-workers: M. Sabrani (Ph.D. student) Mawi Sjahir U. Kusnadi U.S. Co-workers: T. Soedjana (Ph.D. student) S. Karo-Karo (M.Sc. student) Philippine Co-workers: Pervaiz Amir (Co-Principal Investigator) Agus Muljadi (Ph.D. student)

RESEARCH RESULTS

The general goals are 1) to provide a well-trained group of professional agricultural economists with the analytical skills, research experience, and professional motivation to contribute to the conduct of multidisciplinary research on small ruminants and their producers, 2) provide an improved data base for guiding research and providing policy guidelines for improving small ruminant productivity and farmer incomes, and 3) to direct the focus of research towards a farming system approach in which relevant institutes collaborate in attempting to develop new technology to meet farmers' needs.

Testing of new technologies is the Outreach Pilot Project (OPP). A variety of analytical techniques are being applied to experimental data generated from trials within this project. At least once a year farmers are convened to discuss research results with the scientists. Three types of evaluation studies were completed in the OPP villages. First, a report was completed on the second annual outreach pilot project (OPP) farmers' meeting. After showing the SR-CRSP videotape, discussions centered around problems of inbreeding, reproduction, feed calendar, drenching, vitamin and mineral supplementation, barns, and animal identification. A crucial issue for the farmers was the return of animals. As "gadohan" animal distribution schemes are common in Indonesia, the use of a well-organized re-distribution system has thus been illustrated.

Secondly, a survey was carried out to evaluate the impact of the introduction of gliricidia maculata to small ruminant farmers in the Bogor district in West Java. It appears that gliricidia was a little-known livestock fodder plant among farmers participating in the SR-CRSP Outreach Pilot Project (OPP) as well as among their nonparticipating neighbors. Two years of activity by SR-CRSP, including one OPP farmers'

meeting and monthly monitoring visits, resulted in an increase in the number of adopters among the OPP farmers and those in contact with these farmers. The function of gliricidia in the small ruminant ration is currently as an occasional supplement with levels well below those recommended to be fed. It appears that the adopters have not yet realized the full potential of using gliricidia as an animal fodder. Intensive, direct, and constant extension and development activities involving the introduction of gliricidia to small ruminant farmers is needed, especially by District Livestock Services and other related institutions.

Thirdly, a survey was carried out in October 1986 to study the past, pre-OPP experiences of OPP farmers in raising high prolific sheep and goats as well as their preferences of types of births. The results show that 57% farmers have had 27 triplets and two quadruplets. Thirty-one (34.8%) lambs and kids were reported dead, of which 64% died in 0-3 weeks of age. Seventy percent farmers preferred to have twins to other types of births, but none of them expected to have higher types of births. The survey will serve as benchmark for OPP interventions.

As one of the Southeast Asian countries where on-farm animal research is being conducted, the Indonesian SR-CRSP experience is the basis for the preparation of a manual for the economic analysis of on-farm animal research (OFAR). In collaboration with IDRC and OICD (the Office of International Cooperation and Development), a workshop on "On-Farm Animal Research and Its Economic Analysis" was held at SEARCA, the Philippines. Organizer was Co-Principal Investigator Dr. Pervaiz Amir and the proceedings of this workshop have been distributed. A first draft of a manual for the economic analysis for on-farm animal research has been completed, and a final draft will be published during the next year.

Having been involved for the last 6 years in sheep research in the Garut area, a study was designed to measure the impact of the SR-CRSP presence in the target villages. The first results of the evaluation study in the Garut are encouraging. Results are still being analyzed and written up. Apparently the SR-CRSP presence has had a positive impact on animal management in the target village (Tenjonagara).

As last phase of the market study, a comprehensive review was conducted. During 1986-1987 a comprehensive review of small ruminant marketing studies was completed. Specific focus was on the suitability of the SR market system for input delivery. Sheep and goats in Indonesia are important to the cash economy of the smallholder. During the last decades the local market system for small ruminants has changed little as various types of middlemen are dominating the marketplaces. Generally, these middlemen (village money collectors and various types of brokers) are numerous and provide farmers with various "contracts". They play no role in the supply of farm inputs.

A review of trends in interprovincial trade, prices, and market margins show that the local markets have become integrated in a national market system. As the demand projections for red meat are strong, this integration is expected to continue.

The distribution system for farm inputs for small ruminant production is barely developed. It is unlikely that the overlapping of input and output delivery (e.g., vertical integration) will occur in the near future. This implies a constraint to the introduction of new technologies.

PUBLICATIONS

Knipscheer, H.C. and P. Amir. The Feasibility of Sheep-rubber System in Indonesia: A LP Analysis of Alternative Technologies. Agroforestry Systems (submitted).

Knipscheer, H. C., M. Sabrani, T. D. Soedjana, and A.J. DeBoer. 1987. The Small Ruminant Market System in Indonesia: a Review. Agricultural Systems (in press).

Amir, P. and H. C. Knipscheer. 1987. Application of the Environment-behavior-performance Model in Farming Systems Research - the Case of Small Ruminant Technology Transfer. Agricultural Administration and Extension 25(3):161-176.

Wahyuni, Sri, H.C. Knipscheer, and M. Gaylord. 1987. Women's Decision Making Role in Small Ruminant Production. The Conflicting Views of Husbands and Wives. Agricultural Administration and Extension 24(2):91-98.

Hart, R.D. and H.C. Knipscheer. 1986. Characteristics and Socioeconomic Aspects of Small Ruminant Production Systems: An Analytical Framework. In: C. Devendra (Ed.) Small Ruminant Production Systems in South and Southeast Asia. IDRC-256e pp 10-28.

Amir, P.A. and H. C. Knipscheer. 1986. A Conceptual Framework for the Economic Analysis of On-Farm Trials with Small Ruminants. In: C. Devendra (Ed.) Small Ruminant Production Systems in Soutn and Southeast Asia. IDRC-256E. PP 380-391.

Amir, P. and H.C. Knipscheer (Eds.). 1987. On-Farm Animal Research/Extension and Its Economic Analysis (Proc. Workshop, SEARCA, Philippines). Winrock International Institute for Agricultural Development, Morrilton, Arkansas, U.S.A., 116 pp.

TRAINING

Mr. Agus Muljadi has started his Ph.D. studies at the University of the Philippines, Los Banos (UPLB) with limited support of the Indonesian Host Country Funds.

1986-1987 ANNUAL REPORT

Title:	Nutrition and Feeding Systems for Small Ruminants in Indonesia
Principal Investigator:	W. L. Johnson
Reporting Institution:	North Carolina State University
Host Institution:	Balai Penelitian Ternak (Animal Production Research Institute), Bogor Sub-station of BPT, Sungia Putih, North Sumatra
Other Collaborating Institutions:	Research Institute for Rubber Plantations, Sungai Putih Bogor Agricultural Institute
Personnel:	<u>Balai Penelitian Ternak, Bogor</u> Marwan Rangkuti (Co-Principal Investigator) Dr. Andi Djajanegara (Co-Principal Investigator) Sorta Silitonga Budi Haryanto Augustinus Wilson Muchji Martawidjaja Bambang Sudaryanto Dwi Yulstiani Dr. Budi Tangendjaja Darwinsya Lubis <u>On study leave:</u> Budi Haryanto (Ph.D. at North Carolina State Univ.; conducting research in Bogor) H. Pulungan (Ph.D., Bogor Agricultural Institute) A. Djajanegara (Completed Ph.D., Australia, December 1986) A. Prabowo (Completed M.Sc., NCSU, August 1986; Ph.D., Univ. of Florida) I. W. Mathius (M.Sc., Oregon State Univ.) D. Lubis (Completed M.Sc., Univ. of Florida) T. Chaniago (Ph.D., Bogor Agric. Institute) M. Winugrohu (Completed Ph.D., Bogor Agric. Institute) Prapti Mayudin (Ph.D., Australia) Bambang Sudaryanto (M.Sc., Bogor Agric. Institute) <u>Bogor Agricultural Institute</u> Thesis advisors for BPT trainees: Dr. Toha Sutardi

Dr. Aminuddin Parakkasi
Dr. Soewando Djojosoebagio
Dr. L. Amalia

Student collaborator:
R. Pinontoan

BPT Sub-station at Sungai Putih, North Sumatra
Simon Ginting
Pius Ketaran
Marsal Boer
Sri Weniny Handayani

On study leave:
Leo Batubara (M.S., Bogor Agricultural Institute)

Research Institute for Rubber Plantations, Sungai Putih
Dr. Abdul Madjid, Director
Dr. Nong Alwi (Biometrics)
Wisma Sinulingga (Agronomy)

North Carolina State University, Raleigh (USA)
Dr. J.E.J. van Eys (resigned October 1986)
Alice Reese (Ph.D. candidate)
Budi Haryanto (Ph.D. candidate)
Dr. Manuel D. Sanchez (assigned to Sungai Putih; arrived in Indonesia July 1987)
Dr. J. W. Spears
Dr. K. R. Pond
Ms. D. Mann
Dr. W. L. Johnson (Principal Investigator)

RESEARCH RESULTS FROM BOGOR

1. Leucaena as a supplement to rice straw/napier grass diets for growing male lambs in West Java. S. Sitorus-Silitonga, H. Pulungan, J.E. van Eys.

The promising use of tree legumes as a high quality forage supplement has been demonstrated in several previous experiments at Bogor. The present experiment was completed in 1985, but has not been included in previous annual reports. Whereas the lower-quality for age base in previously reported experiments was tropical grasses, either cultivated (usually napier grass) or native, the present experiment was unique in that the daily basal forage intake was about half rice straw (73% cell-wall fiber) and half napier grass (67% cell-wall fiber). Leucaena forage (56% cell-wall fiber and 25% crude protein) was consumed at the rate of 0, 42, 84 and 126 g of dry matter per day in four treatment groups of male Javanese thin-tail lambs (about 17 kg initial weight).

Total daily dry matter intake increased only with the highest level of leucaena. Rice straw (which was offered ad libitum) declined in amount consumed, by about one-fourth, in the three treatments with leucaena compared with the zero level. Average daily gains were 9, 6, 24 and 25 g/day for the four treatments. Digestibility of diet dry matter, nitrogen, and fiber increased slightly as leucaena level increased.

The pattern that is emerging from all of the various experiments with tree legumes is that a relatively small amount added to the diet each day will cause a significant improvement in animal performance. In the case of growing lambs, rate of gain on a diet of tropical grasses and rice straw is close to zero, but with the addition of leucaena (or other tree legumes) a far more respectable rate of gain can be attained.

2. Fiber utilization by native goats fed mixed native grasses and supplemented with zinc and nitrogen. B. Haryanto, J.E. van Eys, W.L. Johnson.

Mr. Haryanto has completed three experiments in Bogor which will comprise his Ph.D. dissertation. Publication of the results will come after defense of the thesis (scheduled for November 1987). However, preliminary examination of the data suggests that both zinc and a nitrogen supplement have positive effects on the growth performance of native "Kacang" goats fed native grasses. Data will be presented on animal growth, intake and digestibility of dietary fractions, rumen ammonia and volatile fatty acids, passage rates and retention times for the particulate and liquid fractions of the digesta, and rumen microbial production rates.

3. Banana leaves and stems as roughages for sheep and goats. Andi Djajanegara, R. Pinontoan, L. Amalia.

In trial 1, four sheep were fed banana leaves and mineral supplement as the sole diet. Ad libitum intake was 28 g of dry matter per kg body weight; average daily gain was 58 g, over four weeks. In trial 2, chopped green banana stem was fed ad libitum to 3 goats and 3 sheep with no problems of palatability. Three supplements were tested in a latin square design: gliricidia leaves, banana leaves, and rice bran, fed on an isonitrogenous basis. Data have not yet been summarized.

4. The effect of sulfur on cyanide detoxication in diets for sheep which contain cassava leaves. B. Sudaryanto, T. Sutardi.

Two trials were conducted; data will be published as the M.S. thesis of Mr. Sudaryanto. In trial 1, diets with 0, 20 and 30% cassava leaves resulted in no differences in average daily gain of sheep (3 per treatment) or dry matter digestibility of the diet. In trial 2, with five sheep per treatment sulfur was added at two ratios to thyocyanate and compared to a control diet with 30% cassava leaves. There were no differences in average daily gain, or diet dry matter intake. T3 and T4 blood levels were reduced by thyocyanate.

1
Other projects in progress:

Cottonseed meal as a supplement to napier grass for sheep, with or without additional calcium. D. Yulistiani, M. Rangkuti, D. Lubis.

In situ degradation of tropical forages and industrial byproducts. H. Pulungan, A. Parakkasi, B. Tangendjaja, S. Djojosoebagio, W.L. Johnson.

Kapok seed oilcake as a protein supplement for sheep fed napier grass. M. Marawidjaja, M. Rangkuti.

Pilot feeding studies with village farmers in the OPP program. D. Yulistiani, M. Rangkuti, M. Marawidjaja.

RESEARCH RESULTS FROM SUNGAI PUTIH

1. Effect of energy supplementation on growth, reproduction and lifetime performance of North Sumatran ewes grazing in rubber plantations. A. Reese, S. Ginting, P. Ketaren, S. Handayani and W. L. Johnson.

Ewe-lambs (n=152), average weight 9.1 kg, were purchased locally, then assigned to one of four replicate grazing areas under rubber trees (canopy closed), and sub-allocated to one of four supplement regimes: no supplementation, and supplement at .6, 1.0, or 1.4% of body weight. By April 1987 all retained ewes (the total number was reduced to 80 after first lambing) in the three supplemented treatments had lambed three times, whereas only half of the unsupplemented group had reached 3rd lambing. Twinning rate was higher for the highest supplement level in the first lambing, but tended to be equal across all treatments by third lambing. Lamb birth weight and pre-weaning growth was lower for the unsupplemented ewes than for any of the supplemented groups, especially for the female lambs. Pre-weaning lamb mortality was 45, 29 and 50% for the unsupplemented group in the 1st, 2nd and 3rd lambings. All levels of supplementation greatly reduced lamb mortality; for example, the lowest level of supplementation resulted in 12, 0 and 26% mortality for the 1st, 2nd and 3rd lambings. Growth rates of twin lambs were no different when their dams were supplemented, compared with no supplement; however, single lambs gained at rates of 64, 75, 96 and 96 g/day for the four treatments.

An economic study of the results for first lambing only, showed a positive return to supplementation only for the highest level (with then prevalent local prices). However, this analysis needs to be repeated with lifetime data before a long-term recommendation can be made. Based on the results summarized to date, it seems that at least the minimum level of supplementation will significantly improve biological performance of native North Sumatran ewes and their lambs, when grazed on a native (volunteer) pasture under rubber trees.

Data from the first two years of this project will comprise the Ph.D. dissertation of Ms. Alice Reese. Her defense is scheduled for October 1987; one or more journal manuscripts will follow. Data from the third

year, and a lifetime summary, is being analyzed by Mr. Ginting and Ms. Handayani, with the help of Dr. Sanchez.
Five preliminary publications from this work are included in the list that follows.

2. Palm kernel sludge as a supplement for sheep fed native grass. S. Handayani, S. Ginting, P. Keteren.

The limitations of tropical grasses for small ruminants have been demonstrated in previous experiments. The main problem is the relatively high concentration of cell-wall fiber, which requires a long rumen residence time for even moderate digestibility, thus severely limiting intake of total and digestible dry matter. In humid tropical areas of Southeast Asia, palm kernel sludge is a cheap, readily available byproduct that has potential as a low-protein, medium energy supplement. The present trial was designed to test varying levels of palm kernel sludge (84% dry matter, 7% crude protein, 40% cell-wall fiber) as a supplement to native grasses. Native male lambs (initial weight 17 kg) which consumed 113 to 139 g of palm kernel sludge per day in addition to native grasses ad libitum, had an average daily gain of 30 to 50 g. Further tests will be necessary to work out optimum levels of this byproduct in supplemental diets for small ruminants.

SUPPORTING RESEARCH IN RALEIGH

1. Dietary iron and silica effects on mineral utilization of forage-based diets in lambs. A. Prabowo, J. W. Spears.

This work has been published as Mr. Prabowo's M.S. thesis, and one manuscript has been submitted for journal publication. Suffolk and Dorset wether lambs were fed a basal diet of coastal bermudagrass pellets (90%) and ground corn (10%). In trial 1, supplemental iron was given at varying levels, with no resultant effect on rate of gain, feed intake or feed efficiency. In trial 2, silicic acid was added to the above basal diet at 0, 0.5 and 1.5% of the diet, with a resultant increase in fecal excretion of manganese and calcium, and a tendency for decreased plasma concentrations of calcium and increased plasma magnesium. The implications of these studies for Indonesian conditions are (1) that the levels of iron consumed in present study do not present toxicities for lambs on a high forage diet, and (2) the very high silica levels in rice byproducts could interfere with the absorption of other essential minerals and thus merit further study.

2. Effect of type and level of protein supplementation on the utilization of low quality forages by goats and sheep. J.E. van Eys, H.R. Gaskins, O. Odewumi, W.L. Johnson.

Several experiments in Indonesia have indicated that the quality of protein used to supplement low quality forages may be important. Protein sources which provide mainly rumen-soluble nitrogen may impact diet utilization differently from proteins which escape rumen degradation but are utilized in the small intestine. Two experiments were conducted in Raleigh with wether lambs (Barbados x Dorset) and kids (grade Angora), fed low quality coastal bermudagrass hay (chopped) as

the basal forage. In trial 1, cottonseed meal or alfalfa hay were the protein supplements; each was included at two levels, to provide 20 or 40% of total dietary nitrogen. Weight gains for lambs and kids without supplement were 26 and 13 g/day, respectively; alfalfa at 12% of dietary dry matter increased gains to 44 and 20 g/day, while cottonseed meal at 8% increased gains to 49 and 26 g/day. With the higher supplement levels, gains increased further but not proportionally. Both supplements increased total dry matter intake, but alfalfa, which has some indigestible fiber, replaced part of the basal forage whereas cottonseed meal did not. Digestibility of the total diet increased slightly with supplementation in lambs but did not increase, and in fact decreased at the highest supplement level, in goats. These effects were more than offset by the higher intakes of nitrogen and digestible energy.

3. Forage utilization by tropical and temperate breeds of sheep. D.L. Mann, L. Goode, K.R. Pond.

Coastal bermudagrass pellets (74% cell-wall fiber or NDF) were fed ad libitum to Barbados, Dorset, and Barbados x Dorset ram lambs during a 63-day summer period. Voluntary intake, rate of gain, and apparent digestibility of the diet were the same for all genotypes. In a second trial with the same animals, chopped orchardgrass/alfalfa hay (63% NDF) was fed. Weight gain was not measured, but voluntary intakes were higher in the Barbados than the Dorsets, the crossbred lambs being intermediate. Digestibility was not different in the three genotypes. These studies show that the tropical hair sheep type is as good or better in its ability to utilize low quality forages in hot weather, compared to the Dorset. Further studies are planned to elucidate possible differences in selectivity by these breed types.

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Verbal Presentations

Reese, A.A. Research on Grazing Sheep in Rubber Tree Plantations in North Sumatra. Anim. Sci. Dept. Seminar, NCSU.

TRAINING

Four scientists of BPT received partial support for graduate thesis research during the past year: Budi Haryanto, Hamzah Pulungan, Achmad Prabowo, and Bambang Sudaryanto. Each has followed a different model for the graduate coursework, but all have conducted at least part of their research in Indonesia. Mr. Pulungan is pursuing his Ph.D. at Bogor Agricultural Institute (IPB); his research is being conducted at a sub-station of BPT in East Java. Mr. Haryanto, a Ph.D. candidate at NCSU, conducted his thesis research at BPT/Bogor. Mr. Prabowo completed his M.S. at NCSU in the summer of 1986 and is continuing studies for a Ph.D. at the University of Florida. He has already made a trip back to Indonesia to collect samples for a mapping study of part of Sulawesi, to detect possible areas with mineral problems. Mr. Sudaryanto is an M.S. candidate at IPB; his research was conducted at BPT.

Alice Reese, Ph.D. candiate at NCSU, returned to the U.S. in August 1986 after a two year residence at the BPT sub station at Sungai Putih, North Sumatra, where she conducted her thesis research.

One attitional IPB student, Mr. R. Pinontoan, was given assistance to conduct his S1 degree research at BPT.

"Short-term" training was extended to Simon Ginting, BPT-Sungai Putih collaborator, in the form of travel to Malaysia to attend an International Conference on Advances in Animal Feeds and Feeding, where he presented four papers reporting work from Sungai Putih.

The citizenship of all of the above trainees is Indonesian, except for Mrs. Reese, who is American.

1986-1987 ANNUAL REPORT

Title:	Sociological Analysis of Small Ruminant Production Systems
Principal Investigator:	Michael F. Nolan
U.S. Institution:	University of Missouri-Columbia
Host Country Institution:	Balai Penelitian Ternak (BPT)
Personnel:	Resident Scientists: Paula Bilinsky Mark Gaylord Collaborating Scientists: Kedi Suradisastra Sri Wahyuni Atien Priyanti

RESEARCH RESULTS

During the reporting period July 1, 1986 - June 30, 1987, Sociology Project activities in Indonesia focused primarily on training and testing technology packages. The major vehicle for the accomplishment of this work was through the Outreach Pilot Project (OPP). Initiated in 1984, the Sociology Project took the lead role in 1986 to provide technical support for this endeavor.

The purpose of the OPP is to improve farmer management of sheep and goats by introducing and testing, at the village level, technical packages that have been developed on research stations in Indonesia. To this end, approximately 17 villages were identified in West Java to participate in this study. Farmer groups within the villages were formed and provided with 1) cash grants of approximately 50 U.S. dollars to subsidize the building of barns; and 2) five female and five male sheep and goats to undertake the technology testing.

The major technologies introduced to the farmer groups included:

1. drenching
2. leguminous trees
3. alternative fodders (e.g. Gliricidia maculata)
4. mineral blocks to improve small ruminant nutrition

At present, approximately 15 farmer groups in Bogor district are actively participating in the OPP. Each serves three primary functions:

1. as a testing ground for the new technologies;
2. as a demonstration farm to spread knowledge to neighboring villages;
3. as multiplication centers for breeding genetically superior animals.

Perhaps one of the most significant accomplishments of this effort is the dialogue and communication that has developed between farmers,

extension workers and BPT staff. Not only are farmers visited on a monthly basis, but annual meetings are also held to provide a forum for airing problems and sharing information. As a result, a constant flow of information is maintained between all parties and activities are modified/reshaped to best meet the needs of farmers and staff alike.

In addition to the efforts presently underway in Bogor district, similar work is in progress in Northern Sumatra. However at this site, activity is limited to four villages.

While the efforts of the Sociology Project have been primarily devoted to the OPP, additional survey work was undertaken in 1986/87. Specifically, over 100 Garut farmers participating in a 1980 SR-CRSP study were surveyed to evaluate how their animal management techniques had changed as a result of program input. Three primary groups were interviewed: cooperating farmers inside the village; non-cooperating farmers in the village; and non-cooperating farmers outside the village. Analysis of the results is in progress.

TRAINING

Kedi Suradisastra, Ph.D., Agricultural Education. University of Missouri-Columbia. August 1984 - December 1987. (Partial Support).

Sri Wahyuni, MS, Rural Sociology. Institut Pertanian Bogor (IPB). September 1985 - August 1987.

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COUNTRY	SR-CRSP DISCIPLINE	PRINCIPAL INVESTIGATOR	PRINCIPAL COUNTERPART
Brazil:	Animal Breeding & Management	M. Shelton	E.Figueiredo
	Animal Health	H. Olander	F.S. Alves
	Animal Nutrition	W.L. Johnson	N.N. Barros
	Economics	H. Knipscheer	J. Souza-Neto
	Range Management	J. Malechek	E. Oliveira
	Sociology	M. Nolan	M.C. Neumaier
Indonesia:	Animal Nutrition	W.L. Johnson	M. Rangkuti
	Economics	H. Knipscheer	A. Muljadi
	Genetic Improvement	E. Bradford	Subandriyo
	Sociology	M. Nolan	K. Suradisastra
Kenya:	Animal Breeding Systems Analysis	T. Cartwright	F. Ruvuna S. Tallum
	Animal Health	T. McGuire	F. Rurangirwa
	Economics	H. Knipscheer	F. Nyaribo
	Production Systems Feed Resources Nutrition/Management	H. Fitzhugh	 M. Onim P. Semenye
	Sociology	M. Nolan	A.N. Mbabu
Morocco:	Genetic Improvement	G.E. Bradford	A. Lahlou-Kassi
	Nutrition	W.L. Johnson	F. Guessous
	Range	J. Malechek	H. Narjisse
	Sociology	M. Nolan	A. Hammoudi
Peru:	Animal Health	J. DeMartini	E. Ameghino
	Breeding & Management	P. Burfening	M. Carpio
	Economics	H. Knipscheer	D. Martinez
	Range Management Sociology	F. Bryant M. Nolan	A. Florez M. Fernandez

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Saul Fernandez-Baca	Santo Domingo
William Flinn	Ohio State University
Gerald Thomas, Chair	New Mexico State University

MANAGEMENT ENTITY STAFF

David Robertshaw	Program Director until 9/30/87
William C. Weir	Program Director after 9/30/87
James Scott	Assistant Program Director
Lindy Watts	Administrative Assistant
Marcella Pieratt	Accounting Assistant until 10/1/87

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