Small Ruminant

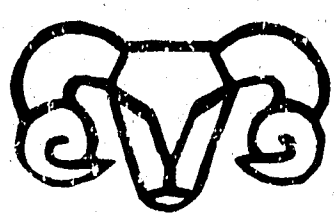
Collaborative Research Support Program

Annual Report for

Indonesia

Program Year Seven

1985-1986



Small Ruminant CRSP
University of California
Davis, CA 95688

THE SMALL RUMINANT
COLLABORATIVE RESEARCH SUPPORT PROGRAM
(SR-CRSP)
ANNUAL REPORT FOR INDONESIA
PROGRAM YEAR SEVEN
1985-1986

Edited and Compiled by the Management Entity

SMALL RUMINANT

COLLABORATIVE RESEARCH SUPPORT PROGRAM

ANNUAL REPORT

INDONESIA 1985-1986*

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*Similar reports for Brazil, Kenya, Morocco and Peru as well as a summary report of the full program are available from the Small Ruminant CRSP Management Entity, University of California, Davis, CA 95616.

SMALL RUMINANT CRSP

IN INDONESIA 1985/86

ANNUAL REPORT

INTRODUCTION

In Indonesia more rural households are involved with sheep and goats than with any other species (except village [scavenger] chickens). One out of every five rural households in Indonesia keeps sheep and goats. On Java, this proportion is 25% or higher.

Annual consumption of meat per capita (1982) in Indonesia was about 4 kg, well below the national nutritional standard. Large ruminants (cattle and buffalo) consitute 48% of the Indonesian meat supply, while poultry contributes 32%. The remaining 20% of the meat supply is about equally divided between small ruminants (sheep and goats) and pigs. Although the relatively minor role of sheep and goats for national protein supply cannot be disputed, it plays a major role in providing employment, food, income, and manure for the direct benefit of many of Indonesia's small farmers and landless laborers.

In order to bridge the gap between animal protein availability and minimum dietary requirements, livestock development efforts in Indonesia have focused on dairy production and commercial poultry. For these sectors, modern technologies have been imported and generally proven satisfactory. However, only about 180,000 rural households are involved in these enterprises -- less than 1% of the 18.5 million rural households in Indonesia. Thus the major development efforts directed to these sectors benefit only a very select group of farmers.

While large ruminants -- because of their high capital value -- are generally kept by medium- or high-income farmers, small ruminants are typically identified with the small farmer. Sheep and goats are easy to raise, prolific, and have a ready market. Their initial and maintenance costs are low and they use marginal land and crop residues. In many instances, they fulfill a number of other functions in the farming system which are often overlooked -- such as a means to accumulate and store capital, and provision of manure. These functions are enhanced by the role of sheep and goats at social and(or) religious ceremonies such as Idul Adha and Idul Fitri.

Other special advantages of small ruminants over large ruminants include higher production efficiency (offtake: live weight produced divided by kg live weight kept as stock), broader adaptability to different environments, easier marketability, and lower risk. In areas where water is in short supply during part of the year, small ruminants are often the only livestock that can be kept.

The two main management systems for sheep and goats in Indonesia are cut-and-carry and grazing. Both systems are labor intensive. For farmers with minimal land holdings, sheep, and goats offer an important employment

opportunity, since labor with low opportunity cost value (young and elderly persons) can be provided productive employment.

The most recent livestock population figures indicate that in 1982, about 12.1 million small ruminants were kept versus 9.2 million large ruminants, 3.6 swine, and 0.7 million horses.

Recent research showed that a large gap exists between village productivity of small ruminants and their potential. For example, the Doe Productivity Index (the ratio of total weight offspring at weaning age per kg doe per year) for Kacang goats under on-station management was 1.16, while semicommercial on goat production specialized farms reached an index of 0.76. Under village management, only an index of 0.51 was achieved. Technologies are available to bridge this gap, but the effective communication between scientist, extension agents, and farmers is lacking.

The SR-CRSP in Indonesia, in close collaboration with the Central Research Institute for Animal Sciences (CRIAS) is developing strategies to improve the transfer of results between researchers and producers. During the project year 1985/86, four major accomplishments in technology transfer can be listed. First, the SR-CRSP sponsored the development of an outstanding videotape on small ruminant research in Indonesia. The 20-minute tape is geared for extension agents, as well as farmers. It gives (a) an overview of the role of small ruminants in Indonesian farming systems, (b) the status of small ruminant research in Indonesia, and (c) approaches used to improve research-extension-producers linkages to increase research efficiency.

Secondly, the Outreach Pilot Project (OPP) was started in the Bogor District. In collaboration with the local livestock service a number of "field laboratories" was established. These consisted of a subsidized loan and the distribution of five females and one male animal per group of farmers. Per female animal, a farmer's group will return the second offspring to the livestock service and the fourth offspring to the research institute. The rest of the offspring is to be distributed among members of the group. Infertile females will be replaced. The distribution of animals took several months. The project has several objectives. Primarily the OPP is aimed at establishing a dialogue with a number of farmers' groups in order to develop appropriate small ruminant management improvements. The "field laboratory" can serve as 1) a testing ground, 2) a demonstration farm, and 3) a muliplication center. By aiming at establishing a dialogue with farmers, the project deviates from the conventional small ruminant development projects where animals are distributed without a preconceived technology package or -- more often -- without any management recommendation at all. Thus, the focus of the OPP is on increasing farmers' management awareness as opposed to increasing animal numbers. Previous research by the nutrition scientist at the Research Institute for Animal Production and by scientists at the Research Institute for Animal Disease had indicated that a limited input of mineral supplement and antiparasite treatment had a significant positive effect on animal growth rate and possibly, also on the reduction of lamb/kid mortality rates. Recent SR-CRSP research confirmed that the first 3-month growth period is the most critical in determining future performance and health of the animal. The OPP is presently one year underway, having expanded from the original 10 to now 17 locations.

The third extension activity was the translation of the Goat Health Handbook into the Indonesian language and its publication. This publication was funded by another AID grant (No. PDC-0182-G-SS-1086-00) whereby the Indonesian SR-CRSP program acted as facilitator for the translation.

Fourthly, under SR-CRSP sponsorship a workshop on Farming Systems Research and Development (FSR/D) was held at Ciawi (Bogor) where specific examples of the application of the broad guidelines of FSR/D to livestock-based system were highlighted. The workshop meant a starting point for the application of new sheep and goat technologies to upland watershed development activities in West and Central Java.

The SR-CRSP has played a pioneering role in demonstrating the need for integrated research activities such as FSR/D. Despite the small resource base of the program in Indonesia, a comprehensive research program could be maintained by the strong collaboration not only between the SR-CRSP subprograms, but also between the SR-CRSP and other research programs (notably the Farming Systems Program) as well as between the SR-CRSP and other institutes (notably the Research Institute for Animal Diseases and a number of Indonesian universities). The SR-CRSP therefore fulfills an essential function in catalyzing collaborative research.

Research of the past five years has generated a substantial amount of basic information. The surveys and the long-term monitoring of small ruminant production systems in West Java have identified a number of critical nutritional and managerial limitations to increasing productivity. Concurrent station research on specific feedstuffs has provided insight and possibilities for maximum utilization of large roughage base, and suggested optimum combinations of readily available by-products of agriculture and industry. Specific nutritional deficiencies in the small ruminant diet have been identified and solutions are being tested. At the Cicadas station, very good data on inheritance of prolificacy have been (and are still being) collected. Village performance data on sheep and goat has indicated the parturition interval as main constraint. Plans are being finalized to ship hair sheep breeding stock to the research substation at Sei Putih, North Sumatra. By 1987, it will be known if the exceptional variability in prolificacy of Javanese sheep is due to segregation of a gene with large effect on ovulation rate. If the preliminary conclusion that this is the case is confirmed, the program will be well into the process of establishing several lines with high and low prolificacy and have started tests of the two kinds of rams in our village programs. The socioeconomic work, which has been partly conducted in collaboration with the Satya Wacana University in Salatiga, has focused on the types of management (traditional versus semi-commercial, herding versus complete confinement); resource allocation (labor, cash); types of labor (husbands, women, children); sociological environment; and market structure. Now that the biological programs have entered the technology design/evaluation phase, the participation of the socioeconomic group in on-farm testing has become more critical.

In the near future, nutrition research will continue to explore the most optimal management systems under rubber by screening pastures and evaluating feed management systems (cut-and-carry, herding, fencing, etc.). Breeding research will focus on the development of a hair sheep strain by crossing St. Croix sheep with local ewes. The evaluation of the hair sheep and their F_1

progeny from local ewes should be well started by 1987. So far the genetic research on goats has been limited. It is expected to develop a more active research effort on goats as they contribute two-thirds of the Indonesian small ruminant population. It will be oriented towards genetic improvement of milk production potential.

The socioeconomic program will increasingly devote its attention to technology testing and transfer. The new production packages will include information on selection and management practices, to increase frequency of parturitions, and to increase growth rates by better nutrition and health practices.

TRAINING SR-CRSP SPONSORED STUDENTS IN DEGREE PROGRAMS IN US.

NAME	DEGREE	PROGRAM	TRAINING DATES	NATIVE COUNTRY
UNIVERSITY OF MISSOURI				
Suradisastra, Kedi[1]	MS Rural Sociology	Missouri	1/81 - 1/83	Indonesia
Suradisastra, Kedi[2]	PhD Agricultural Ed.	Missouri	2/83 - 1/87	Indonesia
NORTH CAROLINA STATE UNIVERSITY				
Haryanto, Budi[2]	MS Animal Nutrtion	North Carolina	1/81 - 5/84	
Haryanto, Budi[2,3]	PhD Animal Nutrition	North Carolina	6/84 - 12/87	Indonesia
Hatch, Patricia[2]	MS Animal Science	North Carolina	8/82 - 12/84	US
Leonard, Ellen	MS Animal Science	North Carolina	9/83 - 12/86	US
Prabowo, Achmed[2]	MS Animal Nutrition	North Carolina	1/84 - 9/86	Indonesia
Reese, Alice[3]	PhD Nutrition	North Carolina	8/83 - 6/87	US
Samsell, Lennie[2]	MS Animal Science	North Carolina	9/83 - 7/86	US
Silitonga, Sorta[4]	MS Animal Nutrition	North Carolina	4/81 - 12/82	Indonesia
Smith, Barbara[2]	MS Animal Science	North Carolina	1/84 - 6/86	US
WINROCK INTERNATIONAL/ECONOMICS				
Mink, Steve[2]	PhD Agr. Economics	Winrock/Economics	6/80 - 12/80	US
Muljadi, Agus[5]	MS Production Economics	Winrock/Economics	5/81 - 7/83	Indonesia
Page, Frank[2]	MS Agr. Economics	Winrock/Economics	7/83 - 9/83	US
Soedjana, Tjeddy[6]	PhD Agricultual Econ.	Winrock/Economics	8/84 - 8/87	Indonesia
Spinhoven, Ginette[2]	MS Agr. Sciences	Winrock/Economics	10/85 - 4/86	Holland
UNIVERSITY OF CALIFORNIA/BREEDING				
Elzo, Mauricio[2]	PhD Genetics	UCD Breeding	9/79 - 6/83	Chile
Garcia, Omar[2]	PhD Genetics	UCD Breeding	9/78 - 8/81	Venezuela
Gonzales, Gonzalo[2]	PhD Genetics	UCD Breeding	7/80 - 9/82	Uruguay
Inounu, Ismeth[7]	MS Animal Science	UCD Breeding	1/85 - 8/86	Indonesia
Schwartz, Maria[2]	MS Int. Agr. Devel	UCD Breeding	9/85 - 9/87	US
Subandriyo[8]	MS Animal Breeding	UCD Genetics	3/82 - 6/84	Indonesia
Tiesnamurti, Bess[9]	MS Animal Science	UCD Breeding	1/85 - 6/87	Indonesia

TRAINING OF OVERSEAS DEGREE CANDIDATES OVERSEAS WITH CRSP SUPPORT

STUDENT	PROGRAM/INSTITUTION	SUPPORT	DATES	NATIVE COUNTRY
NORTH CAROLINA STATE UNIVERSITY				
Hanafiah, Ahmed	B.S. Animal Science Bogor Agricultural Institute	North Carolina	9/84 - 9/87	Indonesia
Priyanto, Dwi	BS Animal Science Bogor Agricultural Institute	North Carolina	9/84 - 9/87	Indonesia
Pulungan, Hamzah[1]	PhD Animal Nutrition Bogor Agricultural Institute	North Carolina	1/85 - 1/88	Indonesia
UNIVERSITY OF MISSOURI				
Mawi, Syahrir	MS Sociology Institut Pertanian, Bogor	Missouri	8/82 - 8/84	Indonesia
UNIVERSITY OF CALIFORNIA/BREEDING				
Setiadi, M.	MS Animal Science IPB University, Bogor	UCD Breeding	4/81 - 3/83	Indonesia
WINROCK INTERNATIONAL/ECONOMICS				
Sabrani, M.[2]	PhD Agricultural Economics Gadja Mada Univ., Jogkarta	Winrock/Economics	6/82 - 12/84	Indonesia
Sugiyanto, Agus	MS Production Economics Institut Pertanian Bogor	Winrock/Economics	8/80 - 12/82	Indonesia

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[1] Support for thesis research only
[2] Partial support
[3] Research conducted in Indonesia
[4] Attended University of Minnesota
[5] Attended Texas A&M University
[6] Attended Oklahoma State University
[7] Attended Oregon State supported by World Bank Fellowship. Will complete degree at IPB Bogor
[8] Attended Montana State
[9] Attended University of California, Davis, support by World Bank fellowship.

SR-CRSP SPONSORED SHORTCOURSES

COURSE	NUMBER OF PARTICIPANTS	SPONSORED BY	WHERE HELD	DATES
Sheep Production	23	All Projects	Bogor, Indonesia	6-7/80 (2 weeks)
Socio-Economic Research Techniques for Livestock in Asia	*	IDRC, ADC, Winrock	Bangkok, Thailand	4/13/83 - 5/18/83
SCHEDULED WORKSHOP				
Role of Small Ruminants in the Humid Tropics		IIDRC & ACIAR with SR-CRSP contribution	Indonesia	Oct. 86

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*T. Soedjana from Indonesia attended and Drs. DeBoer and Knipscheer served as lecturers.)

SR-CRSP SPONSORED INFORMAL TRAINING

SUBJECT MATTER	NUMBER OF PARTICIPANTS	TRAINER	PROJECT	LOCATION	DATES
Data Analysis with hand-held calculator	12	Neil Thomas Projects	Indonesian Indonesia	Bogor,	March 82
Sheep Management	Indonesian Staff	D.T. Torell Genetics	UCD Animal Indonesia	Bogor,	6-7/80
Sheep and Goat Mgt. and Record Keeping	3 professionals and other staff	Fremont Bell Genetics	UCD Animal	Western Java	7/82 - 7/83
Economic data design, collection, analysis and write up	4 professionals and other staff co-workers	H. Knipscheer & Indonesia	Winrock Econ. 1984	Bogor,	1981 -
Village Data Gathering	5 professionals from BPT	M. Sabrani & H. Knipscheer	Winrock Econ.	Bogor, Indonesia	Feb-Mar. 1983

Name	Training	Project	Dates
Sri Wening	Conference on Advances in Animal Feeds and Feeding in the Tropics	UCD Breeding	8/2-8/86
Puis Ketaren	Conference on Grazing Small Ruminants under Rubber Trees, Kuala Lumpur, Malaysia	Indonesia Host Country Funds	11/26/85 - 12/2/85
P. Sitorus	Asian Association of Animal Science	UCD Breeding	5/11/85

INDIVIDUAL TRAINING INCLUDING PARTIAL SUPPORT TO ATTEND PROFESSIONAL MEETINGS [*a]

Name	Training	Project	Dates
Subandriyo	Sheep and Goat Management and Record Keeping at UC Davis and UC Hopland Field Station	UCD Animal Genetics	Jan-Feb. 1981
M. Sabrani A. Muljadi	Third International Conference on Goat Production and Disease [*b], Tucson, AR	Winrock Economics	Jan. 1982
M. Sabrani	First Asian-Australian Animal Production Congress, Kuala Lampur	Winrock Economics	Sept. 1980
M. Sabrani	Second Asian-Australian Animal Production Congress, Manilla, Philippines	Winrock Economics	Nov. 1982
M. Sabrani	IDRC Conference on "Livestock in Asia: Issues and Policies," Singapore	Winrock Economics	Feb. 1982
Uka Kusnadi	English Training Course [*c]	Winrock Economics	- - - - -
T. Soedjana	Technical writing in English [*c]	Winrock Economics	Jan. 1983
A. Djajanegara	Nutrition Laboratory Procedures (1 week at Cornell, 2 weeks at NCSU)	NCSU Nutrition	- - - - -
Djoko Sri Wening Subandriyo Ruth Gatenby	Conference on Livestock Production and Diseases in the Tropics	UCD Breeding	8/17-23/86

[*a] See also publication section for papers presented by SR-CRSP participants at meetings.

[*b] other attendees were supported by SR-CRSP projects

[*c] Many other participants have been supported by SR-CRSP for improving their English but not reported as training.

SR-CRSP

ANNUAL REPORT

1985-86

I. **Project Title:** Genetic Improvement of Sheep and Goats

II. **Host Country:** Indonesia

III. **Principal Investigator:** G. Eric Bradford

IV. **Personnel:**

Host Country Co-Workers:
Subandriyo
P. Sitorus
Djoko
Sri Wening
Bambang Setiadi
Bess Tiesnamurti
Ismeth Inounu

U.S. Co-Workers:
Rolf Jensen
Luis Iniguez
T. R. Famula
D. B. Van Liew

Other Co-Workers:
Ruth Gatenby, RMI
Ian Fletcher, CSIRO

V. **Project Goals**

The goals of the Indonesia breeding project are as follows:

A. To characterize the production potential of Indonesian sheep and goats under village and Experiment Station conditions;

B. to determine the mode of inheritance of the exceptional prolificacy noted in some Indonesian sheep;

C. to investigate the performance of imported hair sheep and their crosses with local sheep under Indonesian conditions;

D. to investigate the performance of crosses between improved dairy goat breeds and local goats;

E. and through the above activities and collaboration with other CRSP projects, develop recommendations for practices which will improve projects and the productivity of Indonesian small ruminants under producer conditions.

VI. **Research Accomplishments**

Eighteen hair sheep, eight rams and ten ewes were shipped from California to Bogor, Indonesia in October, 1985. These animals are intended for the research project at the BPT Sub-Balai in Sungei Putah, North Sumatra. Their shipment to North Sumatra was delayed by health problems and quarantine regulations, but 14 were sent there in May, 1986. Matings to produce hair sheep X local sheep crossbreds should be initiated by July, 1986.

Work towards the goal of obtaining further information relating to the hypothesis of a major gene for prolificacy in Javanese sheep proceeded slowly in 1985-86. Ovulation rate data were collected in Fall, 1985 in the Cicadas flock on ewes born in 1983 and 1984. A low plane of nutrition is believed to have contributed to a lower-than-expected mean ovulation rate, and while the data were not inconsistent with the major gene hypothesis, they provided only limited additional evidence for it. Furthermore, nutrition and management problems contributed to high mortality rates among lambs born in 1985 and 1986, resulting in fewer young ewes from test matings than should have been produced. These problems will hopefully be corrected and survival rates should be substantially increased for the the next reproduction period.

The reproduction data from the Cicadas flock for 1980 through 1984 were submitted for publication to the Journal of Animal Science in 1985 and the paper is now in press.

A small number of surplus ewes and rams from the Cicadas flock were placed in villages in the Outreach Pilot Project (OPP) in Fall, 1985, and data on their performance under smallholder flock conditions are being obtained.

The semen from Alpine and Anglo-Nubian dairy goat breeds shipped from Davis to Bogor in July, 1985 was used for successful inseminations of the Kacang and Etawah does at Cilebut, and the first crossbred kids have been born.

The breeding project provided a small amount of support for the environmental physiology work of Dr. Ruth Gatenby of RMI. Studies have been carried out on housing of sheep and goats, on growth rates of village sheep and goats, and on effects of shearing growing lambs on physiological measures and on gains.

Breeding project personnel contributed to production of the SR-CRSP film on small ruminant production in Indonesia.

VII. Significance of Research Findings

The principal research finding from this project to date is the evidence for a major gene affecting prolificacy; while we need additional data to be certain of this conclusion, the evidence is good enough that we are proceeding on the assumption that this is the mode of inheritance. The significance of this finding is that it provides a means of developing strains of Indonesian sheep of much more predictable prolificacy. Currently, the Indonesian sheep producer, who typically has two to four ewes, does not know whether any ewe entering the breeding flock will be a very prolific one, with a high proportion of litters of three and four lambs (high), or one that has only singles and twins (normal). Both kinds occur in many flocks. This makes

development of an adequate but economical feeding program very difficult. A high level of feed and management to ewes of normal prolificacy can result in wasted inputs; inadequate feed and management for highly prolific ewes results in high lamb mortality, failing to utilize their genetic potential. The presence of a gene with large effect should make possible the rapid development of strains with consistently high or consistently normal prolificacy. Given such strains, a farmer could choose the one which best fits his resources, and feed and manage accordingly.

VIII. Future Research Directions

Future work on the project will emphasize:

1. Confirmation (or rejection) of the major gene hypothesis, and if possible, development of "high" and "normal" prolificacy strains;

2. determination of which strain is best-adapted to defined management systems currently existing in Indonesia;

3. development, in collaboration with other SR-CRSP projects (nutrition, economics and sociology), of production systems to utilize the high prolificacy strain;

4. evaluation of the overall productivity of the St. Croix Hair Sheep in Indonesia and of St. Croix X local crossbreds;

5. evaluation of the comparative meat and milk production of dairy X local and local goats.

IX. Funding

Subgrant	$59,635 + $10,304 indirect = $69,939
Matching	$34,976
Host Country Contribution	$30,000

INDONESIA

Breeding - University of California

Books and Chapters in Books

Bradford, G. E. and H. A. Fitzhugh. 1983. Hair Sheep: A General Description. In Hair Sheep of Western Africa and the Americas. (H. A. Fitzhugh and G. E. Bradford, Eds.) Westview Press. pp. 3-22.
UCD-Breeding /Winrock-Prod. Systems

Bradford, G. E. 1983. A Note on Characteristics of Hair Sheep in Senegal. In Hair Sheep of Western Africa and the Americas. (H. A. Fitzhugh and G. E. Bradford, Eds.) Westview Press. pp. 241-243. **UCD-Breeding**

Bradford, G. E. 1983. Selection for Litter Size. In Genetics and Fecundty in Sheep. (R. B. Land and D. W. Robinson, Eds.) Butterworths, London.
UCD-Breeding

Bradford, G. E., A. J. Muschette, V. Lyttle and D. Miller. 1983. A Note on the Performance of Barbados Blackbelly Sheep in Jamaica. In Hair Sheep of Western Africa and the Americas. (H. A. Fitzhugh and G. E. Bradford, Eds.). Westview Press. pp. 177-178. **UCD-Breeding**

Bradford, G. E., H. A. Fitzhugh and A. Dowding. 1983. Reproduction and Birth Weight in Barbados Blackbelly Sheep in the Golden Grove Flocks. In Hair Sheep of Western Africa and the Americas. (H. A. Fitzhugh and G. E. Bradford, Eds.). Westview Press. pp. 163-170.
UCD-Breeding/Winrock-Production Systems

Fitzhugh, H. A. and G. E. Bradford (Eds.). 1983. Hair Sheep of Western Africa and the Americas. In A Genetic Resource for the Tropics. A Winrock Int'l. Study. Westview Press. 320 pp.
Winrock-Production Systems/UCD-Breeding

Fitzhugh, H. A. and G. E. Bradford. 1983. Productivity of Hair Sheep and Opportunities for Improvement. In Hair Sheep of Western Africa and the Americas. (H. A. Fitzhugh and G. E. Bradford, Eds.) Westview Press. pp. 23-52. **Winrock-Production Systems/UCD-Breeding**

Levine, J. M. and G. M. Spurlock. 1983. Barbados Blackbelly Sheep in California. In Hair Sheep of Western Africa and the Americas. (H. A. Fitzhugh and G. E. Bradford, Eds.) Westview Press. pp 305-311.
UCD-Breeding

Pastrano, B., R. Rodrigo, D. Camacho and G. E. Bradford. 1983. African Sheep in Columbia. In Hair Sheep of Western Africa and the Americas. (H. A. Fitzhugh and G. E. Bradford, Eds.) Westview Press. pp 79-84.**UCD-Breeding**

Theses--(SR-CRSP)

M. S.

Subandriyo. 1984. Factors Affecting Survival of Range Sheep in the U.S. and Characterization of Sheep in Indonesia. Montana State University, Bozeman. **UCD-Breeding and Montana Breeding**

Journal Articles, Refereed (Supporting)

Elzo, M. A. and G. E. Bradford. 1985. Multibreed Sire Evaluation Procedures Across Countries. J. An. Sci. 60:953-963. **UCD-Breeding**

Kennedy, B. W., C. M. Finley and G. E. Bradford. 1982. Phenotypic and Genetic Relationships Between Reproduction and Milk Production in Dairy Goats. J. Dairy Sci. 65:2373-2383. **UCD-Breeding**

Kennedy, B. W., C. M. Finley, E. J. Pollak and G. E. Bradford. 1981. Joint Effects of Parity, Age and Season of Kidding on Milk and Fat Yields in Dairy Goats. J. Dairy Sci. 64:1707-1712. **UCD-Breeding**

Manuscripts Submitted or In Press (SR-CRSP)

Bradford, G. E., J. F. Quirke, P. Sitorus, I Inounu, B. Tiesnamurti, F. L. Bell, I. C. Fletcher and D. T. Torell. 1986. Reproduction in Javanese Sheep: Evidence of a Gene with Large Effect on Ovulation Rate and Litter Size. J. Anim. Sci. (In Press). **UCD-Breeding**

Abstracts (SR-CRSP)

Astuti, M. 1983. Production Parameters of Goats and Sheep in Tretep Upland Area, District of Temanggung. Small Ruminants Conf. Ciawi/Bogor, Indonesia. Abst. B-3. **UCD-Breeding**

Bradford, G. E., J. F. Quirke, S. Sitorus, I. Inounu, B. Tiesnamurti, F. L. Bell and D. T. Torell. 1983. Genetic Basis of Prolificacy in Javanese Sheep: A Progress Report. Small Ruminants Conf. Ciawi/Bogor, Indonesia. Abst. B-1. **UCD/-Breeding**

Bradford, G. E., J. F. Quirke, P. Sitorus, I. Inounu, B. Tiesnamurti, F. L. Bell and D. T. Torell. 1984. Ovulation Rate and Litter Size In Janavese Sheep. J. An. Sci. 59, Suppl. 1:154. **UCD-Breeding**

Gatenby, R.M., M. Martawidjaja and S.W. Handayani. 1985. Housing of Sheep and Goats in West Java. Animal Science Congress, Seoul, Korea. **UCD-Breeding**

Gatenby, R.M. 1985. The Design of Houses for Domestic Animals in Hot Countries. Animal Science Congress, Seoul, Korea. **UCD-Breeding**

Inounu, I. and D. P. Sitorus. 1983. Relationship of Wool Cover to Litter Weight and Total Weaning Weight of Javanese Thin-Tailed Sheep. Small Ruminants Conf., Ciawi, Bogor, Indonesia. Abst. B-10. **UCD-Breeding**

Inounu, I., P. Sitorus, B. Tiesnamurti, I.C. Fletcher and G.E. Bradford. 1985. Reproductive Performance of Indonesian Sheep on Different Planes of Nutrition. Animal Science Congress, Seoul, Korea. **UCD-Breeding**

Setiadi, B., P. Sitorus and Subandriyo. 1985. Performance of Etawah Grade and Kacang Goats. Animal Science Congress, Seoul, Korea. **UCD-Breeding**

Sitorus, P., Subandriyo and I. Inounu. 1985. A Study of Some Aspects of Reproduction in Javanese Thin-tailed and Javanese Fat-tailed Sheep. Animal Science Congress, Seoul, Korea. **UCD-Breeding**

Sitorus, P. and Subandriyo. 1982. Javanese Thin-Tail Sheep Characteristics in Highland, Medium and Lowland Areas. Proc. 2nd World Congr. Genetics Appl. to Livestock Prod., Madrid. 8:781-785. **UCD-Breeding**

Sitorus, P., Subandriyo, and E. Triwulanningsih. 1982. Performance Traits of Indonesian Goats. Proc. 3rd Int'l. Conf. on Goat Prod. and Dis., Tucson, AZ. p. 538. **UCD-Breeding**

Subandriyo, P. S., G.E. Bradford and R.L. Blackwell. 1985. Growth Characteristics of Indonesian Sheep. Animal Science Congress, Seoul, Korea. **UCD/Montana-Breeding**

Subandriyo. 1985. Litter Weight of Indonesian Sheep Under Village and Experimental Station Conditions. Animal Science Congress, Seoul, Korea. **UCD-Breeding**

Subandriyo, P. Sitorus, J. M. Levine and G. E. Bradford. 1981. A Preliminary Report on Performance of Javanese Thin-Tailed Sheep under Experiment Station Conditions. Lembaga Penelitian Pengembangen Reports. **UCD-Breeding**

Subandriyo, P. Sitorus, D. Sudarham, J. M. Levine, and G. E. Bradford. 1981. Performance of Javanese Fat-Tailed Ewes and their Crossbred Progeny at the Garalian Multiplication Center. Lembaga Penelitian Pengembangen Reports. **UCD-Breeding**

Tiesnamurti, B., I. Inounu, P. Sitorus and Subandriyo. 1985. Pre-weaning Performance of Javanese Lambs. Animal Science Congress, Seoul, Korea. **UCD-Breeding**

Abstracts (Supporting)

Finley, C. M., G. E. Bradford, B. W. Kennedy and F. D. Murrill. 1982. Use of DHIA Production Records for Dairy Goat Sire Evaluation. Proc. 3rd Int'l. Conf. on Goat Prod. and Dis., Tucson, AZ. p. 303. **UCD-Breeding**

Finley, C. M., E. J. Pollak, B. W. Kennedy and G. E. Bradford. 1980. Influences of Parity and Seasonal Breeding Pattern on Age Adjustment Factors for Dairy Goats. Am. Dairy Sci. Assoc., 75th Ann. Mtg., Blacksburg, VA. J. Dairy Sci. 63(S1):112. **UCD-Breeding**

Kennedy, B. W., C. M. Finley and G. E. Bradford. 1982. Genetic Relationships Between Reproduction and Milk Production in U.S. Dairy Goats. Proc. 3rd Int'l Conf. on Goat Prod. and Dis., Tucson, AZ. p. 302. **UCD-Breeding**

Technical Communications (SR-CRSP)

Astuti, M., M. Bell, P. Sitorus and G. E. Bradford. 1984. The Impact of Altitude on Sheep and Goat Production. SR-CRSP Working Paper No. 30. Indonesia. 32 pp. **UCD-Breeding**

Bell, M. and I. Inounu. 1982. Sheep Reproduction Parameters for Sixteen Farms in Sukawargi Village, District of Garut, West Java. SR-CRSP Working Paper No. 8, Indonesia. **UCD-Breeding**

Bell, M. I. Inounu, B. Tiesnamurti and Subandriyo. 1983. Variability in Reproductive Performance of Sheep Among Twenty-two Farms in Tenionegara and Sindangratu Villages. District of Garut. Working Paper No. 18. SR-CRSp, Bogor, Indonesia. **UCD/BPT-Breeding**

Bell, M., I. Inounu, Subandriyo, B. Setiadi, B. Tiesnamurti, G. E. Bradford and P. Sitorus. 1983. A Monitoring Program for Village Sheep and Goat Farms in Indonesia. I. Breeding/Reproduction. SR-CRSP Working Paper #23, Indonesia. **UCD-Breeding**

Bell, M., I. Inounu, B. Tiesnamurti and Subandriyo. 1983. Variability in Reproductive Performance of Sheep Among Twenty-Two Farms in Tenjonegara and Sindangratu Villages, District of Garut, West Java. SR-CRSP Working Paper #18, Indonesia. **UCD-Breeding**

Bradford, G. E., J. F. Quirke, P. Sitorus, I. Inounu, B. Tiesnamurt, F. L. Bell and D. T. Torell. 1983. Genetic Basis of Prolificacy in Three Breeds of Javanese Sheep: A Progress Report. Proc. Scientific Meeting on Small Ruminant Research, Bogor, Indonesia. pp. 131-135. **UCD-Breeding**

Fletcher, I. C., P. Sitorus, B. Tiesnamurti, I. Inounu and G. E. Bradford. 1985. Reproductive Performance of Indonesian Sheep on Different Planes of Nutrition. Proc. 3rd AAAP An. Sci. Congr. I:414-416. **UCD-Breeding**

Gatenby, R. M. 1985. The Design of Houses for Domestic Animals in Hot Countries. Proc. 3rd AAAP An. Sci. Congr. 11:1171-1173. **UCD-Breeding**

Gatenby, R. M. 1985. A Survey of Goat Husbandry in West Timor and Recommendations for Research at Lili. Working Paper 68. SR-CRSP, Bogor, Indonesia. **UCD/BPT-Breeding**

Gatenby, Ruth M. A Survey of Goat Husbandry in West Timor and Recommendations for Research at Lili. SR-CRSP Working Paper No. 68. Dec. 1985. **UCD-Breeding**

Gatenby, R. M., M. Martawidjaja, S. W. Handayani and M. Waldron. 1985. Housing of Sheep and Goats in West Java. SR-CRSP Working Paper #46, Indonesia. **UCD-Breeding**

Gatenby, R. M., M. Muchji and S. W. Handayani. 1985. Housing of Sheep and Goats in West Java. Proc. 3rd AAAP An. Sci. Congr. II:1168-1170. **UCD-Breeding**

Gatenby, Ruth M., Muchji Martawidjaja and Ginette Spinhoven. 1986. Comparison of the Thermal Budgets of Five Different Roofs of Animal Houses. Working Paper No. 75, May 1986. **UCD/BPT-Breeding**

Handayani, S. E., M. Martawidjaja and R. M. Gatenby. 1986. Effect of Physical Environment on Physiology of Sheep and Goats in West Java. Ilmu dan Peternakan 2:75-78. **UCD/BPT-Breeding**

Inounu, I., P. Sitorus, B. Tiesnamurti and I. C. Fletcher. 1984. Reproductive Performance of Javanese Sheep on Different Planes of Nutrition. 1984. SR-CRSP Working Paper No. 36. **UCD-Breeding**

Inounu, I, P. Sitorus, B. Tiesnamurti, I. A. Fletcher and G. E. Bradford. 1985. Reproductive Performance of Indonesian Sheep on Different Planes of Nutrition. Working Paper 49. SR-CRSP, Bogor, Indonesia. **UCD/BPT-Breeding**

Inounu, I., Subandriyo, N. Thomas, P. Sitorus and M. Bell. 1986. Lambing Characteristics of Javanese Thin-tail ewes at Cicadas Experiment Station and Under Village Conditions. Ilmu dan Peternakan 2:79-82. **UCD/BPT-Breeding**

Inounu, I., N. Thomas, P. Sitorus and M. Bell. 1984. Lambing Characteristics of Javanese Thin-Tail Ewes at Cicadas Experiment Station and Under Village Conditions. Working Paper No. 41. **UCD-Breeding**

Inounu, I., N. Thomas and P. Sitorus. 1982. Lambing Characteristics of Javanese Thin-Tail Sheep. Mimeo, SR CRSP/BPT, Bogor, Indonesia. **UCD-Breeding**

Levine, Joel and M. Sabrani (Editors). 1986. Proceedings of the Workshop on Farming Systems Research and Development. Central Research Institute for Animal Sciences (CRIAS), CIAWI - Bogor. March 21, 1985. **UCD/BPT-Breeding**

Levine, Joel, Agus Muljadi N., Amiruddin, Subiharta and Robert L. Watung. 1986. Baseline Survey Results of the Upland Agriculture and Conservation Project Research Locations in Central Java: How Do the Farmers of Kandangan and Klari Live before the Project?. Working Paper No. 76, June 1986. **UCD/BPT-Breeding**

Martawidjaja, M. 1985. The effect of Season on the Physiology of Sheep in Yogyakarta. Ilmu dan Peternakan 2:15-17. **UCD/BPT-Breeding**

Martawidjaja, M. 1985. The effect of Season and Food Consumption on Growth Rate in Sheep. Ilmu dan Peternakan 2:19-22. **UCD/BPT-Breeding**

Martawidjaja, M., R. M. Gatenby and S. W. Handayani. 1985. The relation between Climatic Environment and Sheep-Goat Productive Characteristics at Different Altitudes. Ilmu dan Peternakan 2:9-13. **UCD/BPT-Breeding**

Setiadi, B and P. Sitorus. 1984. Performance of Etawah Grade and Kacang Goats. Working Paper 37. SR-CRRSP, Bogor, Indonesia. **UCD/BPT-Breeding**

Setiadi, B., P. Sitorus and Subandriyo. 1985. Performance of Etawah Grade and Kacang Goats. 1985. Proc. 3rd AAAP An. Sci. Congr. I:275-277. **UCD-Breeding**

Sitepu, P. 1985. Goat Productivity in the Province of North Sumatra: A. Birth Weight, Sex and Mortality of Kids in Galang Sub-District. Ilmu dan Peternakan 2:1-3. **UCD/BPT-Breeding**

Sitepu, P. 1985. Goat Productivity in North Sumatra: B. Body Measurements and Morphologenetical Characteristics of Local Goats in Galang Sub-District. Ilmu dan Peternakan 2:5-8. **UCD/BPT-Breeding**

Sitorus, P., Subandriyo and I. Inounu. 1985. A Study of Some Aspects of Reproduction of Javanese Thin-Tailed and Javanese Fat-Tailed Sheep. Proc. 3rd AAAP An. Sci. Congr. I:435-437. **UCD-Breeding**

Sitorus, P., Subandriyo and E. Triwulanningsih. 1982. Performance Traits of Indonesian Goats. Proc. 3rd International Conference on Goat Production and Disease. p. 538. **UCD/BPT-Breeding**

Sitorus, P., B. Tiesnamurti and Subandriyo. 1986. The Effect of Litter Size on Birth Weight, Weaning Weight and some Puberty Traits. Working Paper No. 70, SR-CRSP Bogor. **UCD-Breeding**

Subandriyo. 1984. Genetic and Non-Genetic Factors Associated with Litter Size in Sheep: A Literature Review. SR-CRSP Working Paper No. 35. **UCD-Breeding**

Subandriyo. 1985. Sheep Production in Three Villages in West Java. Working Paper No. 60. SR-CRSP, Bogor, Indonesia. **UCD/BPT-Breeding**

Subandriyo. 1985. Litter Weight of Indonesian Sheep Under Village and Experiment Station conditions. Working Paper No. 45. **UCD-Breeding**

Subandriyo. 1985. Litter Weight of Indonesian Sheep Under Village and Experiment Station Conditions. Proc. 3rd AAAP An. Sci. Congr. I:315-317. **UCD-Breeding**

Subandriyo 1986. Survival Rates of Indonesian Sheep Under Experiment Station Conditions. Working Paper No. 74. May, 1986. **UCD/BPT-Breeding**

Subandriyo, G. Setiadi and P. Sitorus. 1986. Ovulation Rate and Litter Size of Indonesian Goats. Wsorking Paper No. 73. May, 1986. **UCD/BPT-Breeding**

Subandriyo, P. Sitorus, G. E. Bradford and R. L. Blackwell. 1985. Growth Characteristics of Indonesian Sheep. Proc. 3rd AAAP An. Sci. Congr. I:318-320. **UCD-Breeding**

Subandriyo, P. Sitorus, G. E. Bradford and R. L. Blackwell. 1985. Growth Characteristics of Indonesian Sheep. Working Paper No. 44. **UCD-Breeding**

Subandriyo, P. Sitorus, J. M. Levine and G. E. Bradford. 1981. A Preliminary Report on Performance of Javanese Thin-Tail Sheep Under Experiment Station Conditions. Mimeo, SR-CRSP, Lembaga Penelitian Peternakan, Bogor, Indonesia. **UCD-Breeding**

Tiesnamurti, B., I. Inounu, P. Sitorus and Subandriyo. 1985. Pre-weaning Performance of Javanese Lambs. Working Paper No. 42. **UCD-Breeding**

Tiesnamurti, B., I. Inounu, P. Sitorus and Subandriyo. 1985. Pre-weaning Performance of Javanese Lambs. Proc. 3rd AAAP An. Sci. Congr. I:321-323. UCD-Breeding

Waldron, J. C., R. M. Gatenby, P. Sitorus and Subandriyo. 1985. Growth Rates of Lambs in Villages in West Java. Working Paper No. 67. SR-CRSP, Bogor, Indonesia. **UCD/BPT-Breeding**

Technical Communications (Supporting)

Finley, C. M. and G. E. Bradford. 1981. The U.C. Buck Summary. 7th Ann. Calif. Dairy Goat Day, Davis, CA. **UCD-Breeding**

Finley, C., F. D. Murrill, B. Kennedy and E. Bradford. 1981. U.C. Buck Summary. Univ. of Calif. Coop. Ext. Publ. **UCD-Breeding**

Kennedy, B. W. 1980. Seasonal Breeding and Age Adjustment Factors. 6th Ann. California Dairy Goat Day, Davis, CA. **UCD-Breeding**

Verbal Presentations (SR-CRSP)

Subrandriyo, P. Sitorus, J. M. Levine and G. E. Bradford. 1980. A Preliminary Report on Performance of Javanese Thin-Tailed Ewes and their Crossbred Progeny at the Garahan Multiplication Center. Presented at the Indonesian An. Sci. Seminar. **UCD-Breeding**

Verbal Presentations (Supporting)

Bradford, G. E. 1983. The Small Ruminant CRSP. NC-111 Technical Committee Meeting, Ottawa, Canada. **UCD-Breeding**

Bradford, G. E. 1985. CRSP Research on Prolific Sheep in Morocco and Indonesia. Seminar, INRA - Nouzilly, France. **UCD -Breeding**

Bradford, G. E., 1985. Research on Prolific Sheep in the Small Ruminant CRSP. Seminar, Dept. Anim. Sci., NCSU. **UCD-Breeding**

SR-CRSP

ANNUAL REPORT

1985-86

I. **Project Title:** Economic Analysis of Small Ruminant Production and Marketing Systems

II. **Host Country:** Indonesia

III. **Principal Investigator:** Hendrik C. Knipscheer

IV. **Personnel:**

Host Country Co-Workers:
A. Muljadi
U. Kusnadi
S. Karo-Karo
M. Sabrani

U.S. Co-Workers:
A.J. De Boer
T. Soedjana

V. **Project Goals**

1. 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.

3. Strengthen the overall research capacity of selected host country research institutions by providing leadership in conducting interdisciplinary research, conducting training programs and publishing research results.

4. 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.

5. Publication and dissemination of research results representing a wide variety of research and which will contribute to a better understanding within the scientific community of small ruminants and their place in selected rural economies of developing countries.

VI. Objectives

Complete labor allocation studies of small ruminant enterprises in West Java farming systems.

Implement a simplified linear programming (LP) model of rubber plantation in small ruminant systems in North Sumatra.

Conduct profile studies in North Sumatra and Central Java.

Test and evaluate new technologies in the Outreach Pilot Project (OPP) in the Bogor district.

VII. Research Accomplishments

Sheep and goal raising is a family enterprise. Rarely do persons outside the immediate family participate, while within the family, members substitute for each other. Depending on the location, the role of women and children is more or less pronounced. For example, child input in the Garut area is substantial (20%), while women provide 40% of the labor input in Cirebon (and 25% in Ciburuy).

Seasonal effects are substantial. Differences in labor input per head between the dry season compared with the annual average were 21% in Garut 1% in Cirebon, and 29% in Ciburuy. The results differed from earlier figures reported by Mulyadi et al. (1984), who reported that generally lower labor input and little difference of labor use per farm by season. This can partly be explained by the difference in recording, but also by increasing flock sizes. There are indications that flock sizes have been increasing since the beginning of the program. Further analysis of the data relating labor use to animal numbers is presently underway.

A linear programming model was constructed to measure the economic potential of integrating small ruminant livestock in government sponsored rubber plantation schemes. The farm model incorporates typical constraints facing small farmers in the Nuclear Estate Smallholder project. The approach to selection of a representative farm involved in-depth interviews with local officials and extension workers familiar with local conditions. The results of the programming exercise confirm the high potential of small ruminants on rubber plantations. The critical constraint would be labor and well-organized marketing channels. Newly developed small ruminant technologies by the Animal Production Institute at Sei Putih indicate good economic profitability and can be augmented within the existing farming systems. This would require initial government support and effective means of technology transfer.

Secondary village level data on area, population, land use, food and estate crop production, livestock populations, employment, and on-farm gross income components were collected from 15 villages in three kecamatans (subdistricts) of Kabupaten (district) Deli Serdang, North Sumatra, considered to be representative of village based farming systems in the kabupaten. The three kecamatans surveyed were Sibolangit characterized qualitatively as upland, Batak, Christian, with little sawah, much smallholder rubber, coffee, tree fruits, horticultural crops, few cattle, buffalo, many pigs and kampung chickens, few goats, no sheep, and fish ponds, Galang, characterized as

lowland, Javanese/mixed, Moslem, some sawah, much cassava, much large estate rubber and palm oil, tree fruits, some cattle, buffalo, few pigs, many kampung chickens, goats and few sheep, and Perbaungan, characterized as lowland, Javanese/mixed, Moslem, large amount of sawah, some cassava, some large estate rubber and palm oil, many cattle, some buffalo, no pigs, many kampung chickens, some goats, and few sheep. Results for gross on-farm income components (percents per village basis) for the three kecamatans were for Sibolangit, food crops (43%), estate and perennial crops (29%), livestock (17%), fish ponds (11%), for Galang, food crops (67%), estate and perennial crops (27%), livestock (7%), for Perbaungan, food crops (67%), estate and perennial crops (23%), livestock (9%), and fish ponds (1%).

A survey was carried out to assess the performance of new livestock technologies in West Java. The results show that farmers find a marked difference in the health of the test animals compared to their own animals. However, under present market conditions they would find it difficult to continue the recommended practices unless some form of economic incentives were provided. The farmers' willingness to pay the price for the treatments was found to be below the actual cost of the treatment. Farmers reported problems with labor and capital, especially those farmers traveling long distances to collect grass. The reproductive performance of the test ewes was not significantly different than that of the farmers own animals. The analysis of this survey suggest the need to develop economically viable and acceptable mechanisms to disseminate technology.

Co-sponsored by funds from the Host Country Funds, a video-tape (20 minutes) was developed focusing on the role of small ruminants in Indonesia, the SR-CRSP farming systems approach, and the positive results from on-farm research.

INDONESIA

Economics - Winrock International

Books and Chapters in Books

Rangkuti, M., T. D. Soedjana, H. C. Knipscheer, P. Sitorus and A. Setiadi. (Eds.) 1984. Sheep and Goats in Indonesia. Proc. Sci. Mtg. on Small Ruminant Research. Center of Res. Inst. for Ani. Science, Bogor. 315 pp. **Winrock-Economics**

Rangkuti. M, M. Sabrani and Beriajaya. 1984. Goat Production in Indonesia: Current Status and Potential for Research. In: Copland, J. W. (Ed). Goat Production and Research in the Tropics. pp.27-31. Australian Centre for International Agricultural Research. Canberra. **Winrock-Economics**

Bernsten, R. H. 1982. Analytical Approaches to Farming Systems Research with an Emphasis on Animal Production. In Livestock in Asia. (J. C. Fine and R. G. Lattimore, Eds.) Int'l. Dev. Res. Ctr., Ottawa, Canada. pp. 180-185. **Winrock-Economics**

DeBoer, A. J. 1982. Livestock Development: The Asian Experience. In Livestock in Asia. (J. C. Fine and R. G. Lattimore, Eds.) Int'l. Dev. Res. Ctr., Ottawa, Canada. pp. 13-26. **Winrock-Economics**

DeBoer, A. J. 1985. Some Basic Features of Asian Livestock-Production Systems Factors Underlying Productivity-Improvement Programs. Winrock International, Morrilton, Arkansas, pp. 67. **Winrock-Economics**

Journal Articles, Refereed (SR-CRSP)

Knipscheer, H. C., U. Kusnadi and A. J. DeBoer. 1984. Some Efficiency Measures of the Productive Potential of Indonesian Goats. Agri. Systems, 15:1-11. **Winrock-Economics**

Knipscheer, H. C., M. Sabrani, A. J. DeBoer and T. D. Soedjana. 1983. The Economic Role of Sheep and Goats in Indonesia: A Case Study of West Java. Bull. Indonesian Econ. Studies. XIX (3): 74-93. **Winrock/BPT-Economics**

Knipscheer, H. C., T. Soedjana and A. Prabowo. 1983. Small Ruminant Farm Management at Semi-Commercial Level in the Districts of Cicadas and Garut, West Java. Ilmu dan Peternakan, Vol. 1, No. 4. **Winrock/BPT-Economics**

Mawi, S. and M. Sabrani. 1982. Sheep Management Systems in Two Different Food Cropping Patterns. Ilmu Dan Peternakan 1(1). **BPT/Winrock-Economics**

Muljadi, A., M. Sabrani, A. Suparyanto and D. Pramano. 1980. The Effect of Land and Animal Ownership Systems on the Possibility of Sheep and Goat Development in Ciburuy, Bogor. Lembaran LPP. (4):5-15. **Winrock-Economics**

Muljadi, A. N., H. C. Knipscheer and I. W. Mathius. 1984. The Effect of Season on the Participation of Family Laborers in Small Ruminant Farming Systems in West Java, Ilmu dan Peternakan, 1(7):267-273. **Winrock/BPT-Economics**

Sabrani, M. and H. C. Knipscheer. 1982. Small Ruminants for Small Farmers. Indonesia Agri. Res. and Development J. 4(13):86-90. **Winrock-Economics**

Sabrani, M. and A. Muljadi. 1981. Prospects for Small Ruminant Development with Reference to Land Holdings in Ciburuy Village, Bogor. Lembaran LPP. (1):1-4. **Winrock-Economics**

Sabrani, M., P. Sitorus and A. P. Siregar. 1982. Peranan Ternak Ruminansia Kecil Sebagai Sumber Protein Hewani di Pedesaan. J. Litbang Pertanian. 1(2):68-72. **BPT/Winrock-Economics**

Soedjana, T. D. and H. C. Knipscheer. 1983. Economic Productivity Aspects of Sheep Enterprise in Sukawargi Village, Cisurupan, Distrist of Garut. Ilmu dan Peternakan, Vol. I, No. 3. **BPT/Winrock-Economics**

Soedjana, T. D., H. C. Knipscheer and A. J. DeBoer. 1983. The Impact of Expanding Flocksize on Farm Income of Small Ruminant Enterprises in West Java. Ilmu dan Peternakan. Vol. I, No. 4. **BPT/Winrock-Economics**

Soedjana, T. D. 1983. Pemasaran Ternak Domba Pada Periode Hari Raya Kurban Di Kota Madya Bandung. (Sheep Marketing During the Islamic Holiday "Idul Kurban" in Kotamadya Bandung.) Ilmu dan Peternakan Vol. I No. 2. **BPT/Winrock-Economics**

Manuscripts Submitted or In Press (SR-CRSP)

Knipscheer, H. C., U. Kusnadi and A. J. DeBoer. 1984. Some Efficiency Measures for Analysis of the Productive Potential of Indonesian Goats. Agricultural Systems. In Press. **Winrock/BPT-Economics**

Knipscheer, H. C., T. D. Soedjana and A. J. DeBoer. 1983. New Small Ruminant Technology for Small Farms in Indonesia: The Impact of Flock Size. Am. Ag. Econ. Mtg., Purdue Univ. Submitted. **Winrock/BPT-Economics**

Rangkuti, M., T. D. Soedjana, H. C. Knipscheer and Ambar R. (Eds.) 1984. Proceedings of Workshop on Small Ruminant Sharing Systems. In Press. **Winrock-Economics**

Sabrani, M. and H. C. Knipscheer. 1984. Small Ruminants for Small Farmers. Indonesian Ag. Res. and Dev. J. In Press. **Winrock-Economics**

Soedjana, T.D., A. J. DeBoer and H. C. Knipscheer. 1984. Potential Uses of Commercial Technologies for Sheep and Goat Smallholders in Indonesia. Tropical Animal Production. In Press. **Winrock-Economics**

Soedjana, T. D., A. J. DeBoer and H. C. Knipscheer. 1985. The Potential of Commercial Technologies of Sheep and Goat Smallholders in Indonesia. Tropical Ani. Production. In Press. **Winrock-Economics**

Abstracts (SR-CRSP)

DeBoer, A. J., M. Sabrani and A. Muljadi. 1982. Small Ruminant Production on Small Farms in West Java, Indonesia: An Analysis of Comparative Resource Use. Proc. 3rd Int'l. Conf. on Goat Prod. and Dis., Tucson, AZ. p. 552. **Winrock-Economics**

DeBoer, J., M. Sabrani and A. Muljadi. 1982. Small Ruminant Production on Small Farms in West Java, Indonesia: An Analysis of Comparative Resource Use. Proc. Third International Conference on Goat Production and Disease. p.552. **Winrock-Economics**

Knipscheer, H. C., J. DeBoer, M. Sabrani and T. Soedjana. 1983. The Economic Role of Sheep and Goats in Indonesia: A Case Study of West Java. Bulleltin of Indonesian Economic Studies. Australia 19:74-93. **Winrock-Economics**

Knipscheer, H. C., U. Kusnadi and A. J. DeBoer. 1984. Some Efficiency Measures for Analysis of the Productive Potential of Indonesian Goats. Agricultural Systems 15:125-35. **Winrock-Economics**

Kusnadi, Uka, 1983. Management Skill of Sheep-Goat Farmers in Central Java. Small Ruminants Conf., Ciawi/Bogor, Indonesia. Abst. S-3. **BPT/Winrock-Economics**

Muljadi, N. A., H. C. Knipscheer and I. W. Mathius. 1983. Characteristics of Small Ruminant Farming Systems in West Java: Labor Aspect. Small Ruminants Conf. Ciawi, Bogor, Indonesia. Abst. S-6. **BPT/Winrock-Economics**

Soedjana, T.D. and H. C. Knipscheer. 1983. Share Raising Systems and the Productivity of Traditional Sheep Enterprises in Wanaraja, Garut District. Small Ruminants Conf., Ciawi, Bogor, Indonesia. Abst. S-4. **BPT/WI-Economics**

Soedjana, T. D. and H. C. Knipscheer. 1983. The Sheep Enterprise in Upland Farming Systems in West Java, Indonesia. V World Conf. on Animal Prod., Tokyo. **BPT/Winrock-Economics**

Soedjana, T.D., H. C. Knipscheer and Sugiyanto. 1983. Small Ruminant Marketing in East Java. Small Ruminants Conf., Ciawi/Bogor, Indonesia. Abst. S-2. **BPT/U. Mo.-Sociology**

Technical Communications (SR-CRSP)

Amir, P., H. Knipscheer and J. DeBoer. 1985. Economic Analysis of On-farm Livestock Trials. Working Paper No. 63. SR-CRSP, Bogor, Indonesia. **Winrock-Economics**

Amir, P., T. D. Soedjana, and H. C. Knipscheer. 1985. Labor use for Small Ruminants in Three Indonesian Villages. Working Paper No. 62. SR-CRSP, Bogor, Indonesia. **Winrock-Economics**

Damanik, K. I., and M. K. Salangka. 1983. The Role of the Village Collector (blantik) in the Production and Marketing Systems of Small Ruminants in Central Java. Working Paper No. 28. SR-CRSP, Bogor, Indonesia. **Winrock-Economics**

DeBoer, A. J. 1983. Design of Alternative Crop-Livestock Systems for Asian Farmers. SR-CRSP Working Paper #21, Indonesia. **Winrock-Economics**

Kedi, S. and H. C. Knipscheer. 1984. Regular Research Field Hearings (RRFH): A Discussion of the Contribution of Farmers' Opinions to Farming Systems Research. Working Paper No. 38. SR-CRSP, Bogor, Indonesia. **Winrock-Economics**

Knipscheer, H. C., A. J. DeBoer, M. Sabrani and T. Soedjana. 1983. The Economic Role of Sheep and Goats in Indonesia: A Case Study of West Java. In: Bulletin of Indonesian Economic Studies, XIX (3), Australian National University, Canberra. **Winrock/BPT-Economics**

Knipscheer, H. C. and U. Kusnadi. 1983. The Productivity of Goats in Indonesia. Asia-Pacific Workshop on Goat Management, SEARCA, Los Banos, Philippines. **Winrock-Economics**

Knipscheer, H. C. and U. Kusnadi. 1983. The Present and Potential Productivity of Indonesian Goats. Working Paper 29. SR-CRSP, Bogor, Indonesia. **Winrock Economics**

Knipscheer, H. C. and J. Levine. 1984. The Status of Ruminants in Indonesia With Special Reference to Research Needs. Res. Institute for Ani. Production/USAID, Bogor/Jakarta. 37 p. **Winrock-Economics**

Knipscheer, H. C. and M. Sabrani. 1982. The Contribution of Goat and Sheep Enterprises to West Javanese Farming Systems at Different Income Levels. Int'l. Conf. Agr. Economists, Jakarta. **Winrock/BPT-Economics**

Knipscheer, H. C. and T. D. Soedjana. 1982. The Productivity of Small Ruminants in West Javanese Farming Systems. SR-CRSP Working Paper #4, Indonesia. SR-CRSP Tech. Rpt. #13. 33 pp. NTIS #PB8-4-187178. **Winrock-Economics**

Knipscheer, H. C., T. D. Soedjana and A. Prabowo. 1983. A Survey of Six Specialized Small Ruminant Farms in West Java. SR-CRSP Working Paper #9, Indonesia. **Winrock-Economics**

Knipscheer, H. C, T. D. Soedjana and A. Prabowo. 1983. Tatalaksana Usaha Ternak Ruminansia Kecil Semi Komersil di Daerah Cirebon dan Garut. Jawa Barat. (Small Ruminant Farm Management at Semi-commercial Level in the Districts of Cirebon and Garut, West Java). Ilmu dan Peternakan 1:135-139.

Knipscheer, H. C. and K. Suridisastra. 1984. Livestock Farming Systems Research: The Small Ruminant Experience. Workshop on Farming Systems Res. in Indonesia, Sukamandi. August 13-16. **Winrock-Economics**

Knipscheer, H. C. and D. S. Tjeppy. 1982. The Productivity of Small Ruminants in West Javanese Farming Systems. Working Paper No. 4. SR-CRSP, Bogor, Indonesia.

Knipscheer, H. C., D. S. Tjeppy and A. Prabowo. 1983. A Survey of Six Specialised Ruminant Farms in West Java. Working Paper No. 9. SR-CRSP, Bogor, Indonesia.

Levine, J and S. Karo-Karo. 1985. Secondary Village Level Data for Fifteen Villages of Kecamatans Sibolangit, Galang and Perbaugnan. Kabupaten Deli Serdang, North Sumatra. Working Paper No. 48. SR-CRSP, Bogor, Indonesia.

Levin, J. and S. Karo-Karo. 1985. Secondary Village Level Data for Fifteen Villages of Kecamatans Sibolangit, Galang, and Perbaungan, Kabupaten Deli Serdang, North Sumatra. SR-CRSP Working Paper #48, Indonesia. **Winrock-Economics**

Levine, J., S. Karo-Karo and M. Gaylord. 1985. Livestock Marketing Survey for Kecamatans, Sibolangit, Galang and Perbaungan of Kabupaten Deli Serdang, North Sumatra. Working Paper No. 61. SR-CRSP, Bogor, Indonesia.

Mawi, S and M. Sabrani. 1982. Shep Management Systems in Two Different Food Cropping Patterns. Ilmu dan Peternakan 1:10-13.

Mink, S. 1980. Prospects for Small Farm Goat Production in a Transmigration Area of Indonesia: Results of a Survey. Winrock Int'l. LPP and Woodrow Wilson School of Public and Int'l. Affairs, Princeton Univ. 44 pp. Revised February 1982. SR-CRSP Working Paper #2, Indonesia. SR-CRSP Tech. Rpt. #10. NTIS #PB8-4-187160. **Winrock-Economics**

Mink, S. 1982. Prospects for Small Farm Goat Production in a Transmigration Area of Indonesia: Results of a Survey. Working Paper No. 2. SR-CRSP, Bogor, Indonesia.

Muljadi, N. A. 1984. Economic Role of Small Ruminant Production in Two Areas of West Java, Indonesia. SR-CRSP Working Paper No. 31, Indonesia. **Winrock-Economics**

Muljadi, A. N., H. C. Knipscheer and I. W. Mathius. 1984. Seasonality in Labor Use for Small Ruminant Production at Three Locations in West Java. SR-CRSP Working Paper No. 35. **Winrock-Economics**

Mulyadi, A., H. C. Knipscheer and I. W. Mathius. 1984. The effect of Season on the Participation of Family Laborers on Small Ruminant Farming Systems in West Java. Ilmu dan Peternakan 1:267-273.

Muljadi, A. and M. Sabrani. 1981. Land Tenure and Livestock Ownership Patterns in Ciburuy Village, West Java. Animal Husb. Res. Sem., Bogor, Indonesia. **Winrock-Economics**

Obst, J. M. 1985. Small Ruminant Research Program BPT Ciawi. Report of Visit November December 1985. Research Institute for Animal Production. Bogor, Indonesia.

Page, F. C., A. N. Muljadi, H. C. Knipscheer and J. Levine. 1985. Three Surveys on Livestock in Indonesia: Aceh, South Kalimantan and East Java (Madura). Res. Institute for Ani. Production/USAID(PDP), Bogor/Jakarta, 87 pp. **Winrock-Economics**

Rangkuti, M., T. D. Soedjana, H. C. Knipscheer, P. Sitorus, A. Setiadi. 1984. Proceedings: Pertemuan Ilmiah Penelitian Ruminansia Kecil (Scientific Meeting on Small Ruminant Research), Bogor, Indonesia, November 22-23, 1983. **Winrock-Economics**

Sabrani, M. 1980. Analysis of Regional Demand for Red Meat in Java. Asian-Australian Congr. on Anim. Prod., Kuala Lumpur. **BPT/Winrock-Economics**

Sabrani, M. and H. C. Knipscheer. 1982. Sheep and Goat Markets in Central Java: A Profile. Working Paper No. 5. SR-CRSP, Bogor, Indonesia.

Sabrani, M. and H. C. Knipscheer. 1982. Small Ruminants for Small Farmers. Indonesian Agricultural Raesearach and Development Journal 4:86-90.

Sabrani, M., S. Mawi, D. S. Tjeppy and H. C. Knipscheer. 1982. A Profile of Sheep and Goat Markets in West Java, Indonesia. Working Paper No. 3. SR-CRSP, Bogor, Indonesia.

Sabrani, M., A. Muljadi and J. DeBoer. 1982. Small Ruminant Production on Small Farms in West Java, Indonesia: Preliminary Results of a Baseline Survey of Upland and Lowland Farming Systems. Working Paper No. 1. SR-CRSP, Bogor, Indonesia.

Sabrani, M., and A. P. Siregar. 1981. The Role of Small Ruminants in Traditional Indonesian Farming Systems. Ind. Agric. Res. Dev. J. Vol. 3 (4). **BPT/Winrock-Economics**

Sabrani, M., M. Panjaitan and A. Muljadi. 1981. Prospek Peng Ngan Kambing dan Domba Bagi Petani Kecil dan Perlunya Pendekatan Keilmuan ter Padu. Sem. on Small Ruminant Prod., BPT, Bogor. **BPT-Economics**

Sabrani, M., A. P. Siregar, R. J. Petheram and H. C. Knipscheer. 1983. Livestock Farming Systems Research for Rural Development in Indonesia. SR-CRSP Working Paper #20, Indonesia. **Winrock-Economics**

Sabrani, M., P. Sitorus, M. Rangkuti, Subandriyo, I. W. Mathius, T. D. Soedjana, and A. Setiadi. 1982. Laporan Survey Baseline Ternak Kambing dan Domba. BPT Bogor. pp. 88. **Winrock/BPT-Economics**

Sabrani, M., T. D. Soedjana, S. Mawi and H. C. Knipscheer. 1982. Profil Pemasaran Ternak Ruminansia Kecil. (Mimeo.) SR-CRSP/BPT Draft Report, Bogor. 47 pp. **BPT/Winrock-Economics**

Siregar, A. P., M. Sabrani, R. J. Petheram and H. C. Knipscheer. 1983. The Role of Livestock in Farming Systems Research for Rural Development in Indonesia. Proc. Crop-Livestock Res. Workshop, pp. 210-230. Int'l. Rice Res. Institute, Los Banos, Philippines. **Winrock-Economics**

Soedjana, T. D. 1982. Sheep and Goat Markets during the Islamic Holiday "Idul Adha" in Bandung, Indonesia. SR-CRSP Working Paper #7, Indonesia. **Winrock-Economics**

Soedjana, T. D. and H. C. Knipscheer. 1984. The National Goat Program for Rural Smallholders in Indonesia. ASPAC Ext. Bull. No. 211, Food and Fertilizer Tech. Center, Taipei, Taiwan, p. 13-19. **Winrock/BPT-Economics**

Soedjana, T. D. and H. C. Knipscheer. 1982. Productivity of Sheep under Upland Farming Conditions in Sukawargi Village, District of Garut, West Java. SR-CRSP Working Paper #6, Indonesia. **Winrock-Economics**

Soedjana, T. D. and H. C. Knipscheer. 1983. The Sheep Enterprise in Upland Farming Systems in West Java, Indonesia. 5th World Conf. on Ani. Prod., Tokyo. **Winrock-Economics**

Soedjana, T. D., H. C. Knipscheer and Sugiyanto. 1983. Small Ruminant Marketing in East Java. SR-CRSP Working Paper #17, Indonesia. **Winrock-Economics**

Soedjana, T. D., H. C. Knipscheer and A. J. DeBoer. 1983. The Impact of Expanding Flock Size on Farm Income of Small Ruminant Enterprise in West Java. Ilmu dan Peternakan 1:147-150. **Winrock/BPT-Economics**

Soewardi, B., H. C. Knipscheer and M. Sabrani. 1983. The Role of Livestock in Watershed Projects in Java. Working Paper 22. SR-CRSP. Bogor, Indonesia. **Winrock/BPT-Economics**

Sugiyanto. 1983. A Production Function for Sheep and Goat Enterprises in West Javanese Farming Systems. Working Paper No. 15. SR-CRSP. Bogor, Indonesia. **Winrock/BPT-Economics**

Thomas, N. and M. Rangkuti. 1983. Small Ruminant Production in the Small-farm Perspective. Working Paper No. 10. Sr-CRSP, Bogor, Indonesia. **Winrock/BPT-Economics**

Thomas, N., M. Rangkuti, W. L. Johnson and G. E. Bradford. 1983. A Small-Farm Sheep and Goat Production Model for Indonesian Conditions. Working Paper No. 27. SR-CRSP, Bogor, Indonesia. **Winrock/BPT-Economics**

Tjeppy, D. S. 1982. Sheep and Goat Markets During the Islamic Holiday "Idul Adha" in Bandung, West Java. Working Paper No. 7. SR-CRSP Bogor, Indonesia. **Winrock/BPT-Economics**

Tjeppy, D. S. and H. C. Knipscheer. 1982. Productivity of Sheep Under Upland Farming Conditions in Sukawardi Village, District of Garut, West Java. Working Paper No. 6. SR-CRSP, Bogor, Indonesia **Winrock/BPT-Economics**

Tjeppy, D. S., K. C. Knipscheer and Sugiyanto. 1983. Small Ruminant Marketing in East Java. Working Paper No. 17. SR-CRSP,Bogor, Indonesia. **Winrock/BPT-Economics**

Wahyuni, S., H. C. Knipscheer and M. F. Nolan. 1983. Family Division of Labor in Small Ruminant Production: A Comparison of the Views of Husbands and Wives. SR-CRSP Working Paper no. 34. In Press.
Winrock-Economics/U. Mo.-Sociology

Technical Communications (Supporting)

DeBoer, A. J. 1983. Policy Issues Affecting Small-Scale Livestock Producers: Can They be Resolved Systematically. FAO Expert Consultation on Improving the Efficiency of Small-Scale Livestock Production: A Systems Approach. FAO. Bangkok, Thailand. **Winrock-Economics**

Verbal Presentations

Muljadi, A., M. Sabrani, A. Suparyanto and D. Pramono. 1980. The Effect of Land and Animal Ownership Systems on the Possibility of Sheep and Goat Development in Ciburuy, Bogor. Seminar, Anim. Res. Inst., Bogor.
Winrock-Economics

Sabrani, M. and A. Muljadi. 1980. Prospects for Small Ruminant Development with Reference to Land Holdings in Ciburuy Village, Bogor. Seminar, Anim. Res. Inst., Bogor. **Winrock-Economics**

Soedjara, T. D. and H. C. Knipscheer. 1982. Economic Benefit from the Sheep and Goat Enterprise in West Javanese Villages. Seminar on Livestock Technology for Village Development. Univ. Brawijaya, Malang, Indonesia.
Winrock-Economics

Soedjana, T. D. and H. C. Knipscheer. 1983. The Sharing Systems and the Productivity of the Traditional Sheep Enterprise in Wanaraja, Garut. SR-CRSP

SR-CRSP

ANNUAL REPORT

1985-86

I. **Project Title:** Nutrition and Feeding Systems for Small Ruminants in Indonesian Villages

II. **Host Country:** Indonesia

III. **Principal Investigator:** William L. Johnson

IV. **Personnel:**

Host Country Co-Workers:
M. Rangkuti
S. Silitonga
B. Haryanto
P. Pongsapan
A. Wilson
H. Pulungan
M. Sitorus
A. Djajanegara
M. Winogrohu
S. Ginting
P. Ketaran

U.S. Co-Workers:
J. Van Eys
A. Reese
A. Prabowo
I. Mathius
D. Lubis

V. Objectives

Survey and monitoring data have shown that sheep and goats in Indonesian villages have average growth and reproductive performances lower than their genetic capacity, as demonstrated under the best production or experimental conditions. Detailed examination of village feeding practices has shown that dietary constraints exist, which if overcome would allow improvements in small ruminant performance. The objective of our collaborative research in small ruminant nutrition and feeding systems are as follows:

1. To determine animal responses to improved diets of known composition which incorporate feed ingredients actually or potentially available to small ruminant producers.

2. To evaluate new feeds for nutritive value.

3. To investigate the potential of small ruminant production in association with plantation crops.

4. To demonstrate and introduce improved feeding strategies at the village level.

VI. Research Accomplishments

The period of 1985-1986 was characterized by lower levels of activity than in previous years. The two main factors responsible for this are study leave for a large number of the BPT nutritionists (see list of collaborators) and reductions in research funds of both BPT (55 percent) and the SR-CRSP. Nevertheless, much was accomplished, thanks to the diligent efforts of all.

1. Projects Completed, 1985-1986

a. Studies on sugar cane by-products as feed for small ruminants. M. Rangkuti, H. Pulungan, S. S. Sitorus, P. Pongsapan and A. Musofie.

A series of studies were conducted to evaluate sugar cane top wafers as a feed for sheep and goats. There were no differences between sheep and goats in the utilization of sugar cane top diets. Feeding of the diets alone resulted in average dry-matter intake of 2.4 percent of liveweight. Supplementation with gliri- cidia increased dry-matter intake and animal performance. Supple- mentation of sugar cane wafers with 550g fresh gliricidia increased dry-matter intake by 15 percent and liveweight gain from 10 to 26 g/d. Supplementation with wilted cassava leaves resulted in similar increases of dry-matter intake and weight gain. Supplementing the sugar cane tops with a mixtures of corn, ricebran and coconut meal at 300 g/d increased weight of young goats from maintenance to 44 g/d.

b. Urea, soysauce waste and cassava leaf as supplements for lambs given rice straw ad libitum. S.S. Sitorus, P. Pongsapan, J. E. van Eys and T. Manurung.

Weight gain of lambs fed soysauce waste averaged 47/ g/d and was higher ($P<.05$). Rice straw intake was not affected by supple- mentation but total dry-matter intake increased ($P<.01$) by 33 percent on the cassava meal diet and 15 percent on the soysauce supplemented diet. Apparent digestibility of dry matter, crude protein and neutral detergent fiber were not affected.

c. Mineral supplementation of sheep and goats in village farms. H. Pulungan, A. Wilson and M. Rangkuti.

Mineral blocks were provided to all participating farmers (19); comparisons were made between performance before and after mineral supplementation. For this year only, the farmers' opinions of the effectiveness of mineral supplementation were evaluated. Results of one year of mineral supplementation indicate that farmers in general considered mineral supplementation important to increase weight gain and reduce mortality of young lambs and kids. Weight gain changes and reproductive performance were measured but will not be analyzed until one more year of data is available.

d. Growth potential of local lambs and goats fed a basal diet of native grasses collected from rubber plantations. A.A. Reese and P. Ketaran.

A 20-week growth trial was conducted with 12 lambs and 12 kids approximately five months in age. The forage was fed ad libitum to all animals and concentrate feed, consisting of cassava meal, corn meal, molasses, coconut meal and minerals were fed ad libitum choice to half of the sheep and

half the goats. Concentrate feeding increased weight gain of lambs from 37 to 93 g/d; weight gain of kids increased from 19 to 78 g/d.

e. Protein and zinc supplementation of native grass diets for growing goats. B. Haryanto.

A mixture of fresh, chopped native grasses was fed ad libitum to growing local goats. Four treatments were evaluated: a) control [minerals without Zn]; b) mineral supplementation with Zn; c) urea and leucaena supplementation without Zn; and d) urea plus leucaena with Zn. Total dry-matter intake was higher on the nitrogen supplemented diets; and Zn increased average dry-matter intake of the diets without an N supplement. Dry-matter digestibility was increased on the N supplemented diets. Weight gain for the four diets was 17, 5, 24 and 35 g/d, respectively. This trial was a preliminary study in the Ph.D. research work of Mr. Haryanto. A detailed follow-up has started.

2. Projects in Progress; April, 1986

a. Reproductive performance and growth of ewe lambs under rubber (Sungei Putih). Alice Reese.

The effect of age of rubber plantation and energy supplementation of reproductive performance of ewe lambs and lamb growth is being studied for two consecutive lambings. In this study, 150 ewe lambs have been used. Age of rubber plantation (less than five years and more than 20 years) is reflected by differences in forage composition. Four levels of supplements are being studied. Supplements are composed of locally available feeds, iso-nitrogenous but varying in energy concentration. Variables being measured include: age at puberty; litter size and weight; lambing interval; weaning weight, post-weaning performance; and breed characteristics. The effect of sheep grazing on latex and forage production is being measured at the same time. The forage grown under the rubber plantation is being evaluated by measuring intake and digestibility in metabolism crates. The dacron bag technique is being applied to study protein quality and kinetics of fiber digestion. Markers have been used to estimate forage intake and rate of digesta passage by grazing ewes.

b. Growth, intake, digestibility and rate of digesta passage in goats fed native grasses supplemented by zinc and nitrogen. Budi Haryanto.

Following the preliminary study (see above), the effect of nitrogen and zinc supplementation on utilization of tropical grasses by goats will be studied in further detail. Sixty-four goats (initial weight approximately 10 kg) will be assigned to eight treatment combinations. The eight treatments consist of feeding native grasses ad libitum and supplementation with eight combinations of Zn, Leucaena foliage, and urea, in a factorial design. The experiment will consist of a 16-week growth trial and a seven-day digestibility trial. Rate of digesta passage, using Cr-mordanted fiber, will be carried out at the end of the digestibility trial. Measurements will include feed intake, weight gain, digestibility of nutrients, mineral content in blood samples and rumen fluid composition (VFA's, NH_{3-N}).

c. Nutritional characterization of fiber and protein fractions from tropical feedstuffs. H. Pulungan.

Dacron bag studies are being carried out to determine in situ degradation characteristics of tropical forages and agro-industrial by-products. Duplicate bags are incubated for 0, 2, 4, 8, 12 and 24 h to determine protein solubility and for 0, 2, 4, 8, 12, 24, 48, and 96 h for the determination of cell wall degradation. Incubation of each feedstuff will be replicated three times. Lag phase, rate of disappearance and potential availability will be determined. The information collected from this study will be used to calculate and test mixed diets of local feeds.

d. Mineral supplementation and legume tree feeding of village flocks. A. Wilson and M. Rangkuti.

As a follow-up to the first year of this study, molasses-mineral blocks are being provided to 19 farmers on a regular basis. Additionally, young legume trees are distributed to the same farmers. Animal performance, growth and reproduction is measured. Farmers' acceptance of these nutritional interventions and willingness for other farmers in the same community to adopt these practices are being studied.

e. Supplementation of napier grass-gliricidia diets for sheep and goats with onggok (a cassava meal by-product). M. Rangkuti.

Twenty young male goats and 20 young male sheep (initial weight 10-14 kg) have been randomly assigned to five treatments (four animals of each species to each treatment). The four treatments consist of A) control, napier grass only; B) napier grass plus 500 g fresh gliricidia; C) treatment B plus 50 g onggok; D) treatment B plus 100 g onggok; and E) treatment B plus 150 g onggok. The napier grass will be fed ad libitum (offered at 150 percent of dry-matter intake). A 12-week growth trial will be followed by a seven-day digestibility trial. Rumen fluid will be collected by stomach tube and analyzed for VFAs and ammonia-N. Measurements include weight gain, intake and apparent digesti- bility.

f. Intake and digestibility of chocolate pods by sheep fed napier grass as a basal diet. H. Pulungan.

A growth and feeding trial has been carried out to determine the value of ground chocolate pods (CHP) as a supplement to grass diets for growing sheep and goats. Three levels of CHP (50, 100 and 150 g DM/d) were fed to animals receiving napier grass ad libitum. A ten-week trial was followed by a seven-day digestibility trial. Samples are currectly being analyzed.

g. The effect of grazing management and anthelmintic treatment on lamb performance. S. Ginting and Sri Wening.

Sixty lambs have been randomly assigned to six treatments in a 2 x 3 factorial experiment. Half the animals are treated with an anthelmintic and the other half are not treated. The grazing treatments consist of full confinement or grazed for three or six hours daily. Animals in full confinement are offered the same forage as grazing animals. Weight changes will be determined for all animals. Intake and digestibility will be measured

on the animals in full confinement. Cr-mordanted fiber will be used to estimate intake.

VII. Significance of Findings

The continuation of studies of small ruminants in confinement has added further information to the understanding of the nutritional factors which limit growth of lambs and kids on low quality diets. For example, in the past year, it has been shown that sugar cane tops in wafer form can be used as the basal roughage with results equivalent to native grasses. However, in agreement with previous results, the limitations related to high fiber levels in small ruminant diets was clearly shown. To maintain optimum growth performance of lambs and kids when high fiber forages and by-products form the basal diet, energy and protein supplementation is necessary. Tree legumes make especially valuable supplements. Even low levels of supplementation can cause a significant improvement in weight gain.

The limitations of cassava leaves as supplements to high fiber forages or by-products was again demonstrated. The protein quality of cassava leaves is low. From dacron bag studies and feeding trials, it seems clear that the crude protein of cassava leaves consists mainly of non-protein nitrogen. Also, the relatively high level of cyanogenic compounds is another potentially limiting factor.

The potential of soy by-products as supplements to roughage diets was confirmed. Soybean curd sludge and soysauce waste have both proven to be excellent sources of protein. Soybean curd sludge is also an excellent energy supplement.

Mineral supplementation in village small ruminant diets continues to be promising. In on-farm trials, positive effects of minerals on growth and survival continue to be noted.

Finally, the studies of sheep production under rubber trees showed the feasibility of this integrated approach. Rubber yields were not affected by grazing sheep. Energy supplementation, at controlled levels, seems to be an economical practice in terms of improving sheep performance when grazing native grasses under rubber trees.

VIII. Future Directions

The following projects have been planned for the coming year. Indicated also is the leader of each project.

1. Microbial protein production in goats fed native grasses supplemented with zinc, urea and leucaena. B. Haryanto.

2. *In situ* fiber degradation of native grasses. B. Haryanto.

3. Reproductive performance of sheep under rubber plantations (Sungei Putih) - a continuation of the project started by Ms. A. Reese. S. Ginting and Sri Wening.

4. Utilization of grass and legume cover crops in rubber plantations (Sungei Putih). S. Ginting.

5. Mineral supplementation and tree legume introduction on village farms. A. Wilson.

6. Evaluation of diets based on *in situ* digestion characteristics of its components. H. Pulungan.

7. The evaluation of rubber seed meal as supplement to grass diets for small ruminants. S. S. Silitonga.

8. Evaluation of palm kernal waste as a supplement for small ruminants fed a basal diet of native grasses (Sungei Putih). S. Ginting.

IX. Funding

Sub-grant for 1984-85:	$57,850
Sub-grant for 1985-86:	55,780
Matching by NCSU, 1984-85:	21,865
Matching by NCSU, 1985-86:	21,840
Estimated matching by BPT, 1984-85:	40,000
Estimated matching by BPT, 1985-86:	24,000

(Estimates are for 12-month program years, and are net of institutional overhead charges.)

INDONESIA

Nutrition - North Carolina State University

Books and Chapters in Books

Thomas, N., W. Mathius, and M. Sabrani. 1982. Small Ruminant Production in West Java: Methodology and Initial Results. In Livestock in Asia. (J. C. Fine and R. G. Lattimore, Eds.), Int'l. Dev. Res. Ctr., Ottawa, Canada. pp. 161-166. **NCSU-Nutrition**

van Eys, J. E. 1985. On-Farm Trial Design. In: Thomas L. Nordblom, A. Hamid and Gordon R. Potts, editors. Research Methodology for Livestock On-Farm Trials. ICARDA-IDRC. p.153.

van Eys, J. E., S. Silitonga, I. W. Mathius and W. L. Johnson. 1985. On-Farm Trials of Mineral Supplementation for Small Ruminants in West Java, Indonesia. In T. Nordblom, K. Kealey-Valliere, G. Potts and E. Thompson (Eds.), Research Methodology for Livestock On-Farm Trials. IDRC, ICARDA pp.153-172. **NCSU-Nutrition**

Theses--(SR-CRSP)

M. S.

Haryanto, B. 1983. Digestibility and Retention Time of Forage Fiber as Affected by Level of Intake in Sheep and Goats. North Carolina State University, Raleigh. **NCSU-Nutrition**

Sitorus, M. 1982. Kebutuhan Kambing Lokal Akan Energi Dan Protein. (Energy and Protein Requirements for Local Goats.) Bogor Agricultural Institute. **NCSU-Nutrition**

Theses-(Supporting)

Sitorus-Silitonga, S. S. 1983. Evaluating Forages. Digestibility Studies of Alfalfa and Brome Hay Using Sheep. University of Minnesota, St. Paul. **NCSU-Nutrition**

Journal Articles, Refereed (SR-CRSP)

Djajanegara, A., and M. Rangkuti. 1983. The Palatability of Leucaena Leaf Meal for Sheep and Goats. Bulletin Lembaga Penelitian Peternakan No. 32. **NCSU/BPT-Nutrition**

Johnson, W. L., J. E. Van Eys and H. A. Fitzhugh. 1986. Sheep and Goats in Tropical and Subtropical Agricultural Systems. J. Anim. Sci. 63:1587-1599. **NCSU/Winrock-Nutrition**

Mathius, I. W., A. Djajanegara, L. P. Batubara and M. Rangkuti. 1983. Supplementation of Grass Rations With Coconut Oil Cake for Growing Lambs. Bulletin Lembaga Penelitian Peternakan No. 32 **NCSU/BPT-Nutrition**

Mathius, I. W., M. Rangkuti and L. P. Batubara. 1983. Groundnut Straw as a Feedstuff for Sheep. Bulletin Lembaga Penelitian Peternakan No. 32. **NCSU/BPT-Nutrition**

Mathius, I. W. and A. Semali. 1984. Pengaruh Pengaruh Penambahan Daun Turi Terhadap Konsumsi Bahan Kering dan Daya Cerna Ransum Pada Domba (Intake and Digestibility of Sesbania Grandiflora Foliage by Sheep). Ilmu dan Peternakan 1(5):173-176. **NCSU/BPT-Nutrition**

Mathius, W., A. Djajanegara, L. Batubara and M. Rangkuti. 1983. Pengaruh Tingkat Suatu Bahan Makanan Dalam Ransum Domba Yang Sedang Tumbuh. III. Bungkil Kelapa. (The Effect of Level of Feeding a Feedstuff in Rations for Growing Lambs. III. Coconut Oil Cake). Ilmu dan Peternakan. 1(2):49. **NCSU-Nutrition**

Mathius, I. W., J. E. van Eys, H. Pulungan and M. Rangkuti. 1985. Evaluation of Wilted Cassava Leaves as Protein Supplement to Napier Grass Diets for Growing Lambs. Proc. 3rd Congr., Asian-Australasian Assn. Anim. Prod. Seoul, Korea 2:826-828. **NCSU-Nutrition**

Pulungan, H., J. E. van Eys and M. Rangkuti. 1985. Penggunaan Ampas Tahu b ebagai Makanan Tambahan Pada Domba Lepas Sapih Yang Memperoleh Rumput Lapangan (Utilization of Soybean Curd Sludge as a Supplement for Confined Sheep Fed Low Quality Forage). Ilmu dan Peternakan 1(8):331. **NCSU/BPT-Nutrition**

Pulungan, H., J. E. vanEys and M. Rangkuti. 1985. Utilization of Ampas Tahu, a Soybean By-Product, by Growing Goats. Proc. 3rd Congr., Asian-Australasian Assn, Anim. Prod., Seoul, Korea 2:763. **NCSU-Nutrition**

Pulungan, H., J. E. van Eys and M. Rnagkuti. 1985. Utilization of Cassava Root Meal in the Rations of Young Male Lambs. Ilmu dan Peternakan. 1(9):420. **NCSU-Nutrition**

Rangkuti, M., I. W. Mathius, H. Pulungan and J. E. van Eys. 1985. Evaluation of Cassava Leaves as a Protein Supplement to Napier Grass Diets for Goats. Ilmu dan Peternakan. 1(10):489. **NCSU-Nutrition**

Rangkuti, M. and A. Djajanegara. 1983. Palatabilitas Tepung Daun Lamtoro (Leucaena Leucosephala) pada Domba dan Kembing (The Palatability of Leucaena Leaf Meal by Sheep and Goats). Ilmu dan Peternakan. 1(3):81 **NCSU-Nutrition**

Rangkuti, M., H. Pulungan and J. E. van Eys. 1985. Effects of Intermittent Feeding of Gliricidia maculata on the Utilization of Napier Grass by Growing Sheep and Goats. Proc. 3rd. Congr., Asian-Australasian Assn. Anim. Prod., Seoul, Korea 2:778. **NCSU-Nutrition**

Silitonga, S., S. Ginting, J. E. van Eys and I. Inounu. 1985. Effects of Level of Feeding and Litter Size on Milk Yield and Composition From Javanese Ewes. In: Efficient Animal Production for Asian Welfare. Proc. 3rd. Congr., Asian-Australasian Assn. of Anim. Prod.,Seoul, Korea 2:784. **NCSU-Nutrition**

Silitonga, S. S., J. E. van Eys and H. Pulungan. 1985. Leucaena Supplementation to Rice Straw Based Diets for Growing Sheep. In: Efficient Animal Production for Asian Welfare. Proc. 3rd. Congr., Asian-Australasian Assn. Anim. Prod., Seoul, Korea 2:839. **NCSU-Nutrition**

Manuscripts Submitted or In Press (SR-CRSP)

van Eys, J. E., S. Ginting, M. Rangkuti and W. L. Johnson. 1985. Sulfur Fertilization of Five Tropical Forages. I. Dry Matter Production and Chemical Composition. Proc. XV Int'l Grassl. Cong. In Press. **NCSU/BPT-Nutrition**

van Eys, J. E., S. Ginting, H. Pulungan and W. L. Johnson. 1985. Sulfur Fertilization of Five tropical Forages. II Digestibility of Dry Matter and Cell Wall Constituents. Proc. XV Int'l Grassl. Cong. In Press. **NCSU/BPT-Nutrition**

van Eys, J. E., I. W. Mathius, P. Pongsapan and W. L. Johnson. 1986. Foliage of the Tree Legumes Gliricidia, Leucaena and Sesbania as Supplements to Napier Grass Diets for Growing Goats. J. Agric. Sci. (Camb.) Submitted **NCSU-Nutrition**

van Eys, J. E., I. W. Mathius, M. Rangkuti and W. L. Johnson. 1986. Gliricidia, Leucaena and Sesbania Supplementation of Chopped Napier Grass Diets for Growing Lambs. Trop. An. Prod. In Press. **NCSU/BPTH-Nutrition**

Abstracts (SR-CRSP)

Djajanegara, A. and I. W. Mathius. 1983. The Utilization of Cassava Leaves by Sheep and Goats. Proc. Seminar Pemanfaatan Limbah Pangan dan Limbah Pertanian untuk Makanan Ternak, Yogyakarta. **BPT/NCSU-Nutrition**

Djajanegara, A., N. Thomas and W. L. Johnson. 1982. Patterns in Goat and Sheep Production in West Java. Proc. 3rd Int'l. Conf. on Goat Prod. and Dis., Tucson, AZ. p. 518. **BPT/NCSU-Nutrition**

Haryanto, B. and W. L. Johnson. 1983. Digestibility and Retention Time of Alfalfa and Coastal Bermuda Grass Hays by Sheep and Goats as Influenced by Level of Intake. J. Animal Sci. 57(S1):435, Abst. 737. **NCSU-Nutrition**

Haryanto, B. and W. L. Johnson. 1982. Rumen Innoculum from Sheep or Goats on Two Intake Levels of Alfalfa or Coastal Bermudagrass for In Vitro Digestibility. Joint ASAS-CSAS Ann. Mtg., Guelph, Ontario. Abst. 757. **NCSU-Nutrition**

Haryanto, B., W. L. Johnson and N. Thomas. 1982. Intake Preferences for Cassava, Sweet Potato, Banana and Napier Grass Forages by Indonesian Sheep and Goats. Proc. 3rd Int'l. Conf. on Goat Prod. and Dis., Tucson, AZ. p. 279. **NCSU-Nutrition**

Henniawati, P. Sitepu, J. E. van Eys and D. A. Little. 1983. Carcass Characteristics and Adipose Tissue Distribution in Indonesian and Crossbred Male Sheep. Small Ruminants Conf., Ciawi/Bogor, Indonesia. Abst. M-5. **NCSU-Nutrition**

Mathius, W., J. E. van Eys, A. Djajanegara and M. Rangkuti. 1983. Effects of Cassava Leaf Supplementation on the Utilization of Napier Grass by Sheep and Goats. 5th World Conf. An. Prod., Tokyo.2:401. **NCSU/BPT-Nutrition**

Mathius I. W., J. E. van Eys and M. Pulungan 1985. Gliricidia Foliage as a Supplement to Napier Grass-Cassava Leaf Diets for Small Ruminants. SR-CRSP Working Paper 64. **NCSU/BPT-Nutrition**

Mathius, I. W., J. E. van Eys and M. Rangkuti. 1983. Utilization of Napier Grass-Cassava Leaf Mixtures Supplemented With Corn Meal or Rice Bran by Growing Sheep and Goats. Small Ruminants Conf., Ciawi, Bogor, Indonesia. p. 72-76. **BPT/NCSU-Nutrition**

Mathius, I. W., J. E. van Eys, M. Rangkuti, N. Thomas and W. L. Johnson. 1983. Characteristics of the Small Ruminant Production System in West Java; Nutritional Aspects. Small Ruminants Conf., Ciawi, Bogor, Indonesia. Abst. p. 37-41. **BPT/NCSU-Nutrition**

Murdiati, T. B., H. Hamid, J. E. van Eys and A. J. Wilson. 1983. Preliminary Examination of Brachiaria Sp. Toxicity. Small Ruminants Conf., Ciawi, Bogor, Indonesia. p. 237-240 **NCSU-Nutrition**

Prabowo, A., I. W. Mathius, M. Rangkuti and J. E. van Eys. 1983. Intake and Digestibility of Napier Grass by Sheep Supplemented With Different Levels of Minerals. Small Ruminants Conf. Ciawi, Bogor, Indonesia. Abst. N-14. **BPT/NCSU-Nutrition**

Prabowo, A., I. W. Mathius, J. E. van Eys, M. Rangkuti and W. L. Johnson. 1983. Mineral Composition of Grasses Fed to Sheep and Goats in Ciburuy, Bogor. Small Ruminants Conf., Ciawi, Bogor, Indonesia. p. 55-58. **NCSU-Nutrition**

Prabowa, A., J. W. Spears and L. Goode. 1985. Influence of Dietary Iron on Growth, Copper and Zinc Utilization in Lambs Fed a Roughage Based Diets. J. Anim. Sci. 61 (Supl. 1):505. **NCSU/BPT-Nutrition**

Prabowo, A., J. E. van Eys, W. Mathius and Soekanto Lebdosoikojo. 1983. Trace Mineral Status and Effect of Mineral Supplementation in Javanese Thin-Tail Sheep. 5th World Conf. on Ani. Prod., Tokyo. p. 389-390. **NCSU/BPT-Nutrition**

Pulungan, H., I. W. Mathius and A. Prabowo. 1983. The Effect of Fresh Cassava Root as a Supplement for Napier Grass Diets for Growing Lambs. Small Ruminants Conf., Ciawi, Bogor, Indonesia. p. 63-66. **BPT/NCSU-Nutrition**

Rangkuti, M., I. W. Mathius and J. E. van Eys. 1983. Utilization of Gliricidia Maculata by Small Ruminants: Intake, Digestibility and Performance. Small Ruminants Conf., Ciawi, Bogor, Indonesia. p.3-7. **BPT/NCSU-Nutrition**

Semali, A. and I. W. Mathius. 1983. Effects of Leucaena Leucocephala Supplementation in Sheep Ration on Feed Intake and Digestion. Small Ruminants Conf., Ciawi, Bogor, Indonesia. p. 8-11. **BPT/NCSU-Nutrition**

Setiadi, B. and P. Sitorus. 1983. Reproduction and Production Performance of Etawah Grade Goats. Small Ruminants Conf., Ciawi, Bogor, Indonesia. Abst. B-4. **BPT/NCSU-Nutrition**

Sitepu, P., Henniawati, J. E. van Eys and D. A. Little. 1983. Carcass Characteristics and Adipose Tissue Distribution in Indonesian and Crossbred Male Sheep. Small Ruminants Conf., Ciawi, Bogor, Indonesia. p.286-290. **BPT/NCSU-Nutrition**

Sitorus, M. and T. Sutardi. 1983. Energy and Protein Requirements of Local Goats. Small Ruminants Conf. Ciawi, Bogor, Indonesia. p. 77-80. **BPT/NCSU-Nutrition**

Sitorus, S. S. 1983. The Determination of Digestibility of Alfalfa and Brome Hay by Using Total Collection or Lignin and AIA as Indicator. Small Ruminants Conf., Ciawi, Bogor, Indonesia. p. 88-91. **BPT/NCSU-Nutrition**

Sudaryanto, B., I. W. Mathius and M. Rangkuti. 1983. Utilization of Cassava Leaf Meal in Sheep Diet. Small Ruminants Conf. Ciawi, Bogor, Indonesia. p. 67-70. **BPT/NCSU-Nutrition**

Triwulaningsih, E., B. Setiadi and D. P. Sitorus. 1983. Effect of Concentrate Feeding of Lactating Does on Pre-Weaning Growth Rate. Small Ruminants Conf., Ciawi, Bogor, Indonesia. Abst. N-23. **NCSU-Nutrition**

van Eys, J. E., I. W. Mathius, P. Pongsapan and W. L. Johnson 1985. Foliage of Tropical Legume Trees as Low Level Supplement to Napier Grass Diets for Growing Goats. J. Anim, Sci. 61 (Supl. 1):331. **NCSU/BPT-Nutrition**

van Eys, J. E., I. W. Mathius, H. Pulungan and W. L. Johnson. 1983. Utilization of Fresh and Ensiled Pennisetum Purpureum, Panicum Maximum, and Brachiaria Brizantha by Growing Sheep. Small Ruminants Conf., Ciawi, Bogor, Indonesia. p. 50-54. **NCSU-Nutrition**

van Eys, J. E., I. W. Mathius, N. Thomas, M. Rangkuti and W. L. Johnson. 1983. Forage Composition of Hand-Fed Sheep and Goat Diets in West Java. Small Ruminants Conf., Ciawi, Bogor, Indonesia. p.42-46. and Working Paper No. 24. **BPT/NCSU-Nutrition**

Zahari, P., D. R. Stoltz, A. J. Wilson, T. B. Murdiati and J. E. van Eys. 1983. Preliminary Observations of Pithomyces Chartarum on Brachiaria Toxicity. Small Ruminants Conf., Ciawi, Bogor, Indonesia. p. 241-244. **NCSU-Nutrition**

Abstracts (Supporting)

Johnson, W. L., E. Oliveira, T. W. Robb, J. E. J. van Eys and M. Rangkuti. 1983. Comparisons Between Sheep and Goats in Utilization of High Fiber Diets. Proc. XVII Conference on Rumen Function. Chicago. **NCSU-Nutrition**

Reese, A. A., G. R. Reese, P. Ketaren and W. L. Johnson. 1986. Estimating the growth potential of Indonesian Sheep and goats Using the Gompertz Growth Model. J. Anim. Sci. 63 (Suppl.1):187.

Silitonga, S. and J.D. Donker. 1983. Effect of Mixing Alfalfa and Brome Hays on Intake and Digestibility by Sheep. J. Animal Sci. 57 (Suppl. 1), Abstr. #403. **NCSU-Nutrition**

Thomas, Neil. 1982. Constraints to Improving Small Ruminant Production on Multi-Enterprise Small Holdings in the Humid Tropics. Proc. 3rd Int'l. Conf. on Goat Prod. and Dis., Tucson, AZ. p. 292. **NCSU-Nutrition**

Technical Communications (SR-CRSP)

Djajanegara, A. and I. W. Mathius. 1983. The Utilization of Cassava Leaves by Sheep and Goats. Proc. Seminar Pemanfaatan Limbah Pangan dan Limbah Pertanian untuk Makanan Ternak. Yogyakarta, Indonesia. **BPT/NCSU-Nutrition**

Mathius, W., H. Pulangan and N. Thomas. 1983. A Preliminary Analysis of Results from the Nutrition Village Monitoring Program. SR-CRSP Working Paper No. 11, Indonesia. **NCSU/BPT-Nutrition**

Mathius, I. W., M. Rangkuti and L. P. Batubara. 1983. The Use of Peanut Straw in Sheep Rations. Proc. Seminar Pemanfaatan Limbah Pangan dan Limbah Pertanian Untuk Makanan Ternak. Yogyakarta, Indonesia.**BPT/NCSU-Nutrition**

Mathius, I. W., and J. E. van Eys. 1983. Feeds and Feeding of Sheep in Sukawargi Village, West Java: A Profile Study. SR-CRSP Working Paper #12, Indonesia. **NCSU-Nutrition**

Mathius, I. W., and J. E. J. van Eys. 1983. Utilization of Napier Grass With and Without Sesbania grandiflora by Growing Sheep. SR-CRSP Working Paper #19, Indonesia. **NCSU-Nutrition**

Mathius, I. W., J. E. van Eys and H. Pulungan. 1985. Gliricidia Foliage as a Supplement to Napier Grass-Cassava Leaf Diets for Small Ruminants. SR-CRSP Working Paper No. 64. BPT (Bogor) and North Carolina State University.

Mathius, I. W., J. E. van Eys and M. Rangkuti. 1984. Supplementation of Napier Grass with Three Tree Legumes; Effect on Intake, Digestibility and Weight Gain of Lambs. SR-CRSP Working Paper No. 33. **NCSU-Nutrition**

Mathius, I. W., J. E. van Eys and N. Thomas. 1982. Aspek Nilaigizi Makanan Dalam Usaha Peternakan Domba Kambing di Jawa Barat. (Nutritional Aspects of Sheep and Goat Production in West Java.) Seminar Teknologi Peternakan Untuk Menunjang Pengembangan Pedesaan, Malang, East Java. **NCSU-Nutrition**

Prabowo, A., I. W. Mathius, M. Rangkuti, S. Partoutoma and N. Thomas. 1982. Some Aspects of Anthelmintic Treatment for the Improvement of Small Ruminants under Village Conditions. Seminar Teknologi peternakan untak Menunjang Pengembangan Pedesaan. **BPT/NCSU-Nutrition**

Prabowo, A., D. Samaih and M. Rangkuti. 1983. The Use of Ampas Tahu as a Concentrate in Fattening Sheep Rations. Proc. Seminar Pemenfaatan Limbah Pangan dan Limbah Pertanian untuk Makanan Ternak. Yogyakarta, Indonesia. **BPT/NCSU-Nutrition**

Prabowo, A., J. E. van Eys, I. W. Mathius, M. Rangkuti and W. L. Johnson. 1984. Studies on the Mineral Nutrition of Sheep in West Java, Indonesia. SR-CRSP/NCSU Working Paper No. 40. **NCSU-Nutrition**

Pulungan, H., A. A. Reese, J. E. van Eys and W. L. Johnson. 1985. Survey of Small Ruminant Farmers in Sumatra. SR-CRSP Working Paper #47. Indonesia. **NCSU-Nutrition**

Reese, A. A. , Y. Taryo-Adiwiganda, Sumarmadji, Sri Wening H., S. Ginting and G. R. Reese. 1986. Integrating Sheep with Rubber Plantations. Mimeograph. National Rubber Research Institute. Sungei Putih, North Sumatra, Indonesia.

Thomas, N. and M. Rangkuti. 1983. Small Ruminant Production in the Small Farm Perspective. SR-CRSP Working Paper #10, Indonesia.**NCSU/BPT-Nutrition**

Thomas, N., M. Rangkuti, W. L. Johnson and G. E. Bradford. 1983. A Small-Farm Sheep and Goat Production Model for Indonesian Conditions. SR-CRSP Working Paper #27, Indonesia. **NCSU-Nutrition/UCD-Breeding**

van Eys, J. E., I. W. Mathius, H. Pulungan and W. L. Johnson. 1983. Feeding Value of Fresh and Ensiled Tropical Grasses for Growing Sheep. SR-CRSP Working Paper No. 26, Indonesia. **NCSU-Nutrition**

van Eys, J. E., I. W. Mathius, H. Pulungan, M. Rangkuti and W. L. Johnson. 1984. Small Ruminant Production in West Java; Results of One Year Monitoring by the Nutrition Village Monitoring Program. SR-CRSP Working Paper No. 34. **NCSU-Nutrition**

van Eys, F. E., I. W. Mathius, H. Pulungan, M. Rangkuti and W. L. Johnson. 1983. Forage Composition of Sheep and Goat Diets in West Java. SR-CRSP Working Paper #24, Indonesia. **NCSU-Nutrition**

van Eys, F. E., I. W. Mathius and H. Pulungan. 1984. Small Ruminant Production in West Java: Results of One Year Monitoring by the Village Monitoring Program. Working Paper 34. SR-CRSP, Bogor, Indonesia.

van Eys, J. E., S. Silitonga, I. W. Mathius and W. L. Johnson. 1985. On-farm Trials of Mineral Supplementation for Small Ruminants in West Java, Indonesia. Working Paper 58. Sr-CRSP, Bogor, Indonesia.

Verbal Presentations (SR-CRSP)

Croom, W. J. 1982. Milk Fat Synthesis Research. Bogor Agricultural Institute. **NCSU-Nutrition**

Croom, W. J. 1982. Research Program in Ruminant Physiology and Rumen Manipulation. An. Sci. Res. Inst., Bogor, and Gajah Mada Univ., Jogjakarta. **NCSU-Nutrition**

Johnson, W. L. 1983. Crop Residues in Diets for Sheep and Goats. Seminar, Balai Penelitian Ternak. Bogor, Indonesia. **NCSU-Nutrition**

Johnson, W. L. 1982. Summary of SR-CRSP Nutrition Research Results in Northeast Brazil and at Raleigh. An. Sci. Res. Inst., Bogor, Indonesia. **NCSU-Nutrition**

Johnson, W. L. 1981. Direct Climatic Influences on Forage Grasses and Their Nutritive Value for Ruminants. Seminar at An. Sci. Res. Inst., Bogor, Indonesia. **NCSU-Nutrition**

Reese, A. and W. Sinulingga. 1985. Sheep Grazing in Rubber Plantation. Seminar, Nat'l. Ctr. Rubber Research, Sungai Putih, No. Sumatra, Indonesia. **NCSU/BPT-Nutrition**

Thomas, N. 1983. Modelling Small Ruminant Production Systems for Indonesian Villages. Seminar, Dept. Anim. Science, NCSU and Balai Penelitian Ternak, Bogor, Indonesia. **NCSU-Nutrition**

van Eys, J. E. 1982. Ruminal Digestion of Grasses and Grass-Legume Mixtures. Bali Penelitian Ternak, Bogor (August) and Gadjah Mada Univ., Yogyakarta (October). **NCSU-Nutrition**

van Eys, J. E. 1985. Research to Improve Small Ruminant Feeding Practices in Indonesia. An. Sci. Dept. Seminar, NCSU, Raleigh. **NCSU-Nutrition**

Verbal Presentations (Supporting)

Johnson, W. L. 1982, 1983, 1984, and 1985. Livestock Production Systems and Research around the World. An. Sci. Senior Seminar. North Carolina State Univ. **NCSU-Nutrition**

SR-CRSP

ANNUAL REPORT

1985-86

I. **Project Title:** Sociological Analysis of Small Ruminant Production Systems

II. **Host Country:** Indonesia

III. **Principal Investigator:** Michael F. Nolan

IV. **Personnel:**

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V. **Introductory**

Indonesia is a very large and complex country, both geographically and demographically; in consequence, the farming systems found within it show remarkable variety. While food crops occupy the larger part of most farmers' resources (labor, capital, and land), animal husbandry is hardly a trivial or hobby pursuit. In Indonesia, farms raise small ruminants to enhance household economic security and to avoid risk. Few small farms in Indonesia are without animals -- and for good reason. Sheep and goats require relatively little capital from the small farmer, who can breed them himself or buy them cheaply when they are young. Their production costs are also relatively low, making them admirably suitable for farms with extremely limited cash flows. Small ruminants require tending rather than heavy labor; their care can therefore be assigned to otherwise unemployed children, old people, or women. The productivity of crop-animal combinations account for the increasing popularity of mixed farming systems in Java.

Since 1980, the Rural Sociology (RS) Project has consistently addressed the following objectives in Indonesia.

1. To develop an understanding of the social and cultural context in which small ruminant production occurs.

2. To describe the framework within which small ruminant producers in Java allocate resources and make decisions.

3. To undertake detailed studies of women's role in livestock raising, characteristics of non-producers of small ruminants, and animal sharing arrangements.

4. To increase the capability of BPT to carry out sociological analyses with its own staff resources.

VI. Research Accomplishments

SUBPROJECTS:

Social and Economic Roles of the Village Trader in Marketing and Producing Small Ruminants.

Earlier SR-CRSP profiles for sheep and goat marketing in West, Central, and East Java identified the critical role of the village collector in local small-ruminant marketing systems. More recent work has explored the social role of traders and villagers' perception of them. A major problem facing small producers of sheep and goats is the high transaction cost of marketing single animals, particularly when they are not sold but brought back to the village by the owner. The village collector reduces these costs to the farmer by collecting larger numbers of animals during a given market day. These traders can also finance production costs by placing animals with other farmers on sharing arrangements; and they can provide technical advice on small ruminant production.

In 1985-86, the rural sociology and agricultural economics group at BPT developed a joint questionnaire to collect basic data on the types of traders and their functions, typical marketing transactions, credit arragements, and sharing of animals. In addition, RS conducted informal surveys on villagers' perceptions of the village trader, the acceptability of this individual as a change agent, and relationships between the village trader and village social groups. The agricultural economiists constructed financial balance sheets for sheep and goat marketing to estimate the economic efficiency of the village marketing system.

Women's Roles in Small Ruminant Production

The first phase of this study (1983-84) involved three months' training in field research methods with women in Central Java. In the second stage (1984-85) a large sample of women in the three SR-CRSP West Java study locations were surveyed. The third stage (1985-86) was comprised of in-depth focused interviews and intensive field observations among female small-ruminant producers in the District of Bogor. The aim of this third, and final, stage of research is an increased understanding of the place of animal production in women's larger round of daily activities and social/economic obligations. Based on these findings, two reports on the role of women in small ruminant production and management were completed in 1985 by Sri Wahyuni. Results indicate that women play a much larger part in animal husbandry than had previously been thought. The methodological technique of using women enumerators to collect data from women farmers themselves, rather than from their husbands, has opened up an entirely new perspective on the social organization of raising small ruminants. This project has provided useful information for developing effective outreach programs.

Bi-Monthly Meetings with Farmers in West Java Study Locations

This is an on-going project. Farmers meet bi-monthly with a particular BPT disciplinary team (e.g., breeding, nutrition, socio-economics). Coordination is done by the socio-economics group. These meetings are designed as a systematic effort to increase contact between researchers and farmers. The farmers have an opportunity to learn about sheep/goat husbandry techniques, and the researchers become better acquainted with those issues of greatest concern to farmers. Such interchanges are essential for any program of technology transfer to be successful. This program has also facilitated SR-CRSP and BPT village researches.

Evaluation of the Effects of Placing Improved Rams in West Java Villages

The aim of this study is to evaluate the socio-economic consequences of placing improved rams in West Java villages. During 1985-86,field observations and interviews were conducted in the locations where the initial group of improved rams was placed. While such rams can enhance the genetic potential of village sheep, they will have to be shared among a number of families. Findings from RS studies will be used to evaluate the arrangements that develop to permit sharing, if any, and the effectiveness of those arrangements from the perspective of the farmers. The outcome of the initial placement of improved rams in villages has considerable implications for any eventual program aimed at large-scale small-ruminant techology transfer. If the rams are not utilized or are not accessible to a broad cross-section of producers, then the program's goal of benefitting small farmers will not be met and other technology-transfer strategies will have to be considered.

Animal Sharing Arrangements in West Java

This project is linked to the one above, and has three major objectives: to delineate the current extent and nature of animal sharing arrangements in West Java; to describe the current breeding arrangements used by small-ruminant producers in the event they do not possess a breeding ram/buck; and to predict the likely consequences of placing an "improved" ram/buck in a village setting with the intent of enhancing the genetic potential of existing village flocks.

In 1985, interviews were conducted with farmers in West Java, and observations were made of village decision-making structures. RS also plans to study a village which has participated in an animal drop scheme and one which has not. The resulting information should aid in the future design of sociologically appropriate sharing arrangements for the extension of new breeding technology.

Outreach Pilot Project (OPP)

The OPP is an on-going, highly collaborative project under the coordination of the socio-economics group but including breeding, nutrition, environmental physiology, and animal-health scientists from the Research

Institute for Animal Production in Bogor, West Java. OPP is an outreach project in which groups of two to five farmers have received one male and four female adult animals, either sheep or goats, plus a subsidy of RP 125,000 ($100) for construction of an animal house. The aim of this project is threefold.

a. To raise the productive and reproductive performance of small ruminants at the village level.

b. SR-CRSP is beginning to shift its emphasis more and more from experiment station to on-farm technology testing; OPP is seen as one more move in that direction.

c. As an intermediary stage between experiment station research and on-farm extension work, OPP will act as a 1) testing ground for new technologies, 2) demonstration farm to showcase improved animal husbandry practices, and 3) multiplication center to facilitate wider practice of small ruminant production.

In collaboration with the Dinas Peternakan of the Kabupaten District of Bogor, initially ten "field laboratories" have been established, one per village in ten separate Kecamatan (sub-districts) of Bogor. It is hoped to eventually establish seventeen such field laboratories. Both upland and lowland villages are included in the project, representing the variety of agro-ecological zones in the Bogor area. The rural sociology-agricultural economics group is in the process of developing agro-economic profiles of each of the OPP villages, and of each group of OPP farmers. It will also study the social organization of the small ruminant production systems in two representative villages (Jonggol, a lowland village, and Rumpin, an upland village).

Socio-economic Surveys of Small Ruminant Production Systems in North Sumatra.

The goals of this project are: 1) to define the major small ruminant production systems in North Sumatra; 2) to study the variation and functions of small ruminant marketing systems, including a detailed description of marketing agents; and 3) to determine if there is a marked consumer preference for goat meat over sheep meat. (At present many more goats than sheep are being raised in North Sumatra.)

BPT is attempting to upgrade the facilities and research program at its sub-Balai at Sungei Putih, North Sumatra. One of the major research questions among scientists there is the viability of grazing small ruminants on herbage growing beneath young rubber trees. As a first step in determining the direction of research at Sungei Putih, three socio-economic sponsored surveys were conducted. First was a small scale base-line survey to determine the major production systems of small ruminant farmers in the area. Special attention was given to the constraints which farmers face in their efforts to increase productivity. Second, a survey of secondary village-level data was conducted to develop a better understanding of the socio-economic context within which animal production occurs. Third, a marketing profile will be conducted to determine the variation and functions of the market system for

sheep and goats, to understand the role of marketing agents, and to find out why there is such a marked preference for goats over sheep in North Sumatra.

VII. Significance of Findings

One of the Rural Socilogy Project's primary tasks is to identigy constraints to, and consequences of, the adoption of new technology. For the SR-CRSP in Indonesia, there are several significant concerns in this area. One is the need to limit the cost of any purchased items in a technology package to a bare minimum. Research indicates great reluctance among farmers to purchase inputs to enhance small ruminant production. This naturally reflects the scarcity of working capital in small-scale farming systems. If a recommended technology package is priced beyond most smallholders' pocketbooks, regardless of its potential cost-benefit ratio, it will not be adopted. From the smallholder's perspective, the principal attraction of his present production system is its reliance on non-purchased inputs. If a technology package can be built on improved management practices and locally available, low- or no-cost inputs, it will more likely be accepted by traditional small ruminant farmers loath to risk limited cash resources on potential productivity gains.

Another concern is precisely who the target population will be when the Indonesian livestock extension service begins to deliver new technology to small ruminant producers. RS suggests that the wives of small-ruminant producers ought to be reconceptualized as livestock raisers in their own right. While husbands may be nominally responsible for animal husbandry, in fact they are frequently away from the house for many hours each day working in their fields or at off-farm occupations. This leaves the actual care of family flocks to wives and children. It is important for extension service personnel -- whose numbers are overwhelmingly male -- to recognize ideal versus real descriptions of responsibility for small-ruminating husbandry at the farm level.

A third concern is the ability of the current livestock extension service to effectively deliver technology. Over the past two decades, the Indonesian government has committed nearly all its extension resources to rice production. This effort has recently been richly rewarded -- in 1985 Indonesia achieved self-sufficiency in this basic food crop. The question here is: can sufficient resources now be marshalled to deliver technology packages for other plant and animal food crops?

Fourth, rural "financial deepening" is clearly still limited in Indonesia. Additionally, formal sector financing of agricultural investment is perceived as relatively inaccessible by the RS sample of smallholders. Therefore, even what agricultural credit is available tends to be underutilized. While data on informal sector agricultural financing are not yet available, formal-sector data suggest that private investment in agriculture exceeds formal-sector lending by a wide margin. Some of this investment is in the form of "self-finance," i.e. savings. Other funds are provided by village lenders whose capital partly represents village group savings. In response to the need for affordable and, especially, available credit, Bank Rakyat Indonesia has been promoting a new policy of non-crop-specific rural crdit (Kredit Pedesaan) since early 1984. However, even with

rapid growth in the government credit apparatus, the role of informal private-sector saving and lending will likely predominate in agricultural capital formation for many years. If new capital is required for the adoption of new technology, the relative lack of affordable credit might prove a stumbling block.

On the positive side, small ruminants appear to be an important component of Indonesian farming systems, large and small alike. On Javanese farms they do not compete with crops for land, labor, or capital; rather, they complement intensive crop production in West and Central Java. It is probably unreasonable to expect major improvements in human nutrition from increased production of small ruminants, since most families raise them as a cash crop. However, providing farm families with additional cash income could perhaps enhance their overall quality of life.

VIII. Future Directions

Having established a macro view of the role of small ruminants in the Javanese farming system, the Sociology Project now plans to launch a number of more specific studies. Studies just begun or planned for the near future include the following.

The Outreach Pilot Project (OPP)

This demonstration project in Bogor, West Java integrates the expertise and insights of all four SR-CRSP biological and social science projects on a study of major importance. OPP showcases the results of research into small-ruminant nutrition and breeding in the humid tropics. The participating farmers have been divided into treatment and control groups and will receive technical assistance from animal scientists at the Research Institute for Animal Production in Bogor, while agricultural economists and rural sociologists conduct focused studies within these villages. Specific questions which the rural sociologists intend to explore are listed below.

1. What is the relationship of OPP farmer groups to their neighbors who also raise small ruminants? For example, will the farmer groups be seen as "model" small ruminant farmers?

2. Will the farmer groups "share out" the offspring from their flock, build up their flock size, or sell the offspring as needed for ready cash dictates?

3. What role will the farmers' wives play in the day-to-day management of the small ruminant enterprises? Remembering that farmer groups were initially composed of men only, will wives be involved in enterprise decision-making? What role will children play in the care of these animals?

4. Over time, how will the farmer groups react to new technologies introduced into their traditional production systems? What unanticipated consequences, both positive and negative, will result?

5. What lessons can we learn from OPP to increase successful interaction between research scientists and typical small ruminant producers in West Java?

Monitoring of Small Ruminant Producers in Estate Crop Systems

The Indonesian government, which hopes to double rubber production over the next decade, is expanding the number of state-run rubber estates in North Sumatra. These new estates will eventually employ large numbers of rubber-tappers, some of whom will be given two hectares of land for building houses, planting gardens, and establishing rubber smallholdings. Sheep and goats may be an ideal income source for these smallholders. Other estate rubber-tappers who own no land may nevertheless be able to cut-and-carry estate forage to feed small ruminants confined in animal barns next to their houses. A third possibility is largescale production of small ruminants on the rubber estates themselves. RS hopes to be active in investigating all these possibilities.

Animal Sharing Arrangements in West Java

Data indicate that animal-sharing arrangements are a relatively common feature of small ruminant production in West Java. This study will examine the nature of these arrangements and their potential for improving small ruminant production among farmers engaged in them. The biological projects, particularly breeding, seem to be moving toward a genetic improvement strategy involving sharing improved breeding rams or bucks. RS will evaluate this proposal's acceptability among villagers, and will explore who in the village might benefit or lose the most from this arrangement.

IX. Funding

Subgrant	$250,000	
	Indonesia	53,891
Matching	83,400	
	Host Country Contribution (estimate)	21,000

INDONESIA

Sociology - University of Missouri

Books and Chapters in Books

Nolan, M. F. 1985. Lambs to the Slaughter or Wolves in Sheep's Clothing? Some Comments on the Role of Rural Sociology in International Agricultural Programs. In: Rural Sociologists at Work: A Festschrift for M. E. John. The M. E. John Memorial Lecture Series Fund. University Park, PA. p. 54-61.
U. Mo.-Sociology

Theses--(SR-CRSP)

M. S.

Suradisastra, K. 1983. Social Aspects of Small Ruminant Production: A Comparative Study of West Java, Indonesia. University of Missouri, Columbia.
U. Mo.-Sociology

Journal Articles, Refereed (SR-CRSP)

Ihalauw, J. 1983. A Summary of Exploratory Research on Various Socio-Economic Aspects of the Goat/Sheep Production System in Central Java (1981-1982). Indonesian Agri. Res. & Devlp. J. 5:3-4. **BPT/U. Mo.-Sociology**

Ketaren, P. P., S. Karo Karo, A. A. Reese, and M. Gaylord. 1985. Goat and Sheep Husbandry in Kabupaten Deli Serdang, North Sumatra. Balai Penelitian Ternak, Pusat Penelitian Dan Pengembangan Peternakan, Bogor.
BPT/NCSU/U. Mo.-Sociology

Thahar, A. and R. R. Petheram. 1983. Ruminant Feeding Systems in West Java, Indonesia. Agricultural Systems 10:87-97. **U. Mo. -Sociology**

Wahyuni, S., H. C. Knipscheer and M. Gaylord. Women's Decision-Making Role in Small Ruminant Production: The Conflicting Views of Husbands and Wives. Agric. Admn. In Press. **U. Mo.-Sociology.**

Abstracts (SR-CRSP)

Ihalauw, J., K. I. Damanik, M. Salangka, G. Sasongko, S. Sulanjari and W. Supardan. 1983. The Role of Village Collectors in the Production and Marketing Systems of Small Ruminants in Central Java. Small Ruminants Conf., Ciawi/Bogor, Indonesia. Abst. S-11. **U. Mo.-Sociology**

Suradisastra, K. 1983. Attitude and Perception: A Characteristic of Farmer's Mentality in Developing Sheep Enterprise. The Case of Village Ciburuy, Cijeruk, Bogor. Small Ruminants Conf., Ciawi, Bogor, Indonesia. Abst. S-5. **BPT/U. Mo.-Sociology**

Suradisastra, K. 1983. Attitudinal Correlates and Variation Among Traditional Sheep Farmers. In the Case of Village, Talaga - Malajengka. Small Ruminants Conf., Ciawi, Bogor, Indonesia. Abst. S-7. **BPT/U. Mo.-Sociology**

Wahyuni, S. and R. M. Gatenby. 1985. The Role of Women in Small Ruminant Production - A Case Study in Ciburuy, West Java. Animal Science Congress, Seoul, Korea, and Working Paper No. 50, SR-CRSP, Bogor. **U.Mo. Sociology**

Technical Communications (SR-CRSP)

Damanik, K. I. and M. K. Salangka. 1983. The Role of the Village Collector (Blantik) in the Production and Marketing Systems of Small Ruminants of Central Java. Working Paper No. 28. Small Ruminants Conf., Ciawi, Bogor, Indonesia. **U. Mo.-Sociology**

Gaylord, M. 1985. The Role of Rural Sociology in Farming Systems Research. Paper # 59. **U. Mo.-Sociology**

Ihalauw, J. 1982. Penelitian Eksploratif Terhadap Beberapa Aspek Sociologis - Ekonomis Sistem Produksi Kambing/Domba. Faculty of Economics, Satya Wacana Univ., Salatiga. **U. Mo.-Sociology**

Ihalauw, J. 1984. Sheep/Goat Controllership System and the Role of the Village Collector in the Sheep/Goat Production and Marketing System. Satya Wacana Christian University. SR-CRSP Working Paper No. 39.**U. Mo.-Sociology**

Ihalauw, J. 1984. A Summary of Exploratory Research on Various Socio-Economic Aspects of the Goat/Sheep Production System in Central Java (1981-1982). SR-CRSP Working Paper #32, Indonesia. **U. Mo. -Sociology**

Suradisastra, K., and Nolan, M. F. 1983. Social Aspects of Small Ruminant Production: A Comprehensive Study of West Java, Indonesia. Working Paper 13, SR-CRSP, Bogor, Indonesia. **U. Mo. -Sociology**

Suradisastra K. and M. F. Nolan. 1983. Consumption of Animal Products Among Traditional Sheep Farmers in Two West Java Villages. Working Paper 16. SR-CRSP, Bogor, **U. Mo. Sociology**

Suradisastra, K. 1983. Attitudes and Valuess: Implication in Developing Animal Farming in the Upland Area. The Garut Case. Ilmu dan Peternakan 1:93-97. **U. Mo. Sociology**

Suradisastra, K. 1984. Traditional Small Ruminant Farmers: Consumption of Animal Products. Case I: Upland Villages. Ilmu dan Peternakan 1:189-192. **U. Mo. -Sociology**

Suradisastra, K. 1984. Animal Protein Consumption Among Small Ruminant Farm Families: Case II, Lowland Area. Ilmu Dan Peternakan. **U. Mo.-Sociology**

Suradisastra K. and H. C. Knipscheer. 1984. Regular Research Field Hearings (RRFH): A Discussion of the Contribution of Farmers' Opinions to Farming Systems Research. SR-CRSP Working Paper No. 38. Res. Institute for Anim. Production, Bogor. **U. Mo.-Sociology/Winrock-Economics**

Suradisastra, K., H. C. Knipscheer and M. F. Nolan. 1984. Regular Research Field Hearings: Livestock Farmers Responses to New Technologies. SR-CRSP Working Paper No. 33, Indonesia. **Winrock-Economics/U. Mo.-Sociology**

Suradisastra, K. and M. F. Nolan. 1983. Consumption of Animal Products Among Traditional Sheep Farmers in Two West Java Villages. SR-CRSP Working Paper #16, Indonesia. **U. Mo.-Sociology**

Suradisastra, K. and M. F. Nolan. 1983. Social Aspects of Small Ruminant Production: A Comparative Study of West Java, Indonesia. SR-CRSP Working Paper #13, Indonesia and SR-CRSP Tech. Rpt. #19. NTIS #PB8-4-192699. **U. Mo.-Sociology**

Suradisastra, K. and M. F. Nolan. 1982. Small Ruminant Production in the Humid Tropics: A Sociological Perspective. Proc. Rural Sociological Soc., San Francisco, CA. **U. Mo.-Sociology**

Suradisastra, K. and M. F. Nolan. 1983. Traditional Sheep Farming in Garut, West Java (Indonesia)" A Sociological Perspective. Ilmu dan Peternakan 1:141-146. **U. Mo. -Sociology**

Wahyuni, S. and R. M. Gatenby. 1985. The Role of Women in Small Ruminant Production--A Case in Ciburuy, West Java. Working Paper # 50. **U. Mo.-Sociology**

Wayuni, S. and M. Gaylord. 1985. Womens's Role in Small Ruminant Production Motivations, Perceptions and Problems. Working Paper # 57. **U. Mo.-Sociology**

Wahyuni, S. and H. C. Knipscheer. 1985. Women's Decision-Making Role in Small Ruminant Production: The Conflicting Views of Husband and Wives. SR-CRSP Working Paper 43. Res. Institute for Ani. Production, Bogor. **Winrock-Economics** **U. Mo.-Sociology**

Wahyuni, S., K. Suradisastra and E. Juarini. 1983. Women's Involvement in Small Ruminant Production in Cirebon, West Java. SR-CRSP Working Paper #14, Indonesia. **U. Mo.-Sociology**

Wahyuni, S., S. Kedi and E. Juarini. 1983. Women's Involvement in Small Ruminant Production in Cirebon, West Java. Working Paper 14. SR-CRSP. Bogor, Indonesia. **U. Mo. -Sociology**

Technical Communications (Supporting)

Campbell, M. F. and R. R. Campbell. 1986. Sociology of Agriculture Bibliography--1975-1985. Dept. of Rural Sociology, U. Mo., Columbia. **U. Mo. -Sociology**

Verbal Presentations (Supporting)

Nolan, M. F. 1985. The Small Ruminant CRSP. Panel Discussion Sesson on Collaborative Research Support Programs and FSR. Farming Systems Research Symp. on Farming Systems and Extension: Management and Methodology. Kansas State University. **U. Mo.-Sociology**