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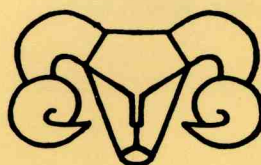
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Small Ruminant Production Systems in South and Southeast Asia

Proceedings of a workshop held in
Bogor, Indonesia, 6-10 October 1986

Proceedings Series



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Cosponsored by the
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Abstract This publication presents the results of a meeting held in Bogor, Indonesia, 6-10 October 1986, that focused specifically on the assessment of small ruminant production systems in South and Southeast Asia. It considered the prevailing circumstances, the innovations, and the strategies that are pertinent for stimulating increased productivity from goats and sheep. The present patterns of production were examined in detail with reference to characteristics of the small farms, existing management methods, and nature and components of the production systems. These systems include extensive systems, systems combining arable cropping, and systems integrated with tree cropping. The discussion of the systems were further highlighted by country case studies, issues and policies that considered the available production resources, especially the genetic and feed resources available, constraints to production, and potential means to achieve desirable improvements. An important session was devoted to examining research methodology, strategies for development appropriate to individual systems, and a conceptual framework for on-farm economic analysis. Together, these discussions enabled a definition of research protocols and the priorities for future direction that are likely to have a major impact on productivity from small ruminants.

Résumé L'ouvrage présente les conclusions d'une réunion tenue à Bogor, en Indonésie, du 6 au 10 octobre 1986, portant sur l'évaluation des systèmes de production touchant les petits ruminants en Asie du Sud et du Sud-Est. On y a brossé un tableau de la situation actuelle, des innovations et des stratégies susceptibles d'accroître la productivité dans l'élevage de la chèvre et du mouton. On a examiné en détail les méthodes actuelles de production dans la perspective propre aux petits exploitants, les méthodes actuelles de gestion, le type de systèmes de production et leurs éléments. Il s'agit ici des systèmes extensifs, des systèmes associant la culture des terres, et des systèmes intégrant la sylviculture. Les discussions ont été étayées d'études de cas, de problèmes et de politiques émanant des divers pays et portant sur les ressources disponibles pour la production, spécialement les ressources génétiques et fourragères, les contraintes à la production, et les possibilités d'amélioration qui existent. Une importante session fut consacrée à l'examen de la méthodologie de la recherche, des stratégies de développement convenant à chaque système, et d'un cadre conceptuel pour l'analyse économique des activités sur le terrain. Toutes ces réflexions ont permis de définir des plans de recherche et d'établir les priorités qui, dans l'avenir, auront vraisemblablement un impact majeur sur la productivité liée à l'élevage des petits ruminants.

Resumen Esta publicación presenta los resultados de la reunión celebrada en Bogor, Indonesia del 6 al 10 de octubre de 1986, cuyo temp principal fue la evaluación de los pequeños sistemas de producción de rumiantes en el

Sur y Sureste asiático. En la misma se analizaron las circunstancias imperantes, las innovaciones y las estrategias pertinentes para estimular la mayor productividad del ganado caprino y ovino. Se examinaron detenidamente los patrones actuales de producción con respecto a las características de las pequeñas granjas, a los métodos de manejo existentes y a la naturaleza y componentes de los sistemas de producción. Estos sistemas incluyen sistemas extensivos, sistemas que combinan el cultivo de tierras arables y sistemas integrados con plantaciones de árboles. La discusión de estos sistemas estuvo acompañada del análisis de estudios de casos en diferentes países, así como de problemas y políticas relacionados con los recursos de producción disponibles, especialmente los recursos genéticos y alimenticios disponibles, las limitantes de la producción y los posibles medios para obtener las mejoras deseadas. Una importante sesión estuvo dedicada a examinar la metodología de las investigaciones, las estrategias para el desarrollo apropiadas para cada sistema individual, y un marco conceptual para la realización de análisis económicos en las granjas. En su conjunto, estas discusiones permitieron definir los protocolos de investigación y las prioridades para el futuro, que probablemente habrán de tener importantes repercusiones sobre la productividad de los pequeños rumiantes.

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INTEGRATION OF SMALL RUMINANTS AND MIXED DECIDUOUS FOREST IN NORTHERN THAILAND

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Abstract A flock of 41 goats were grazed and browsed on an area of about 80 ha, which is 70% mixed deciduous forest and 30% abandoned swidden. The main forest tree species and undergrowth within the forest were identified. Dry matter yields of grasses, climbing plants, and shrubs in the forest and abandoned swidden was about 2400 kg and had 8.33% crude protein content on a dry matter basis. Productivity of the flock was compared with another flock in a Chiang Mai suburb.

Another case study was done with 25 sheep under a 24-ha teak plantation and about 2 ha of cultivation area. The main undergrowth within the teak plantation was identified. The sheep live weight at different ages was compared with the other flock. There was no apparent difference in the performance among these flocks.

The careful manipulation of the stocking rate with available dry matter production is an important consideration for the success of the integration system. Goats should be able to adapt better to the system than sheep.

The northern region of Thailand covers an area of approximately 169,644 km² or about one-third of the total area of Thailand. It is estimated that northern Thailand has about 87,756 km² of forest area or about 56% of total forest area of the country. Because of this, the agroforestry system is very important for animal production in this region. The utilization of the forest as grazing and browsing areas for cattle and buffalo has long been recognized in many villages, whereas for goats and sheep, the system is not well established. This paper presents the integration of small ruminants and mixed

deciduous forests in northern Thailand from two case studies and a discussion of the potential trend of the system for promoting sheep and goat production for the region.

POPULATION AND THE IMPORTANCE OF SMALL RUMINANTS

At present, there are about 73,644 goats and 44,877 sheep in Thailand (Table 1). The number of goats and sheep in Thailand is small compared with the number of other ruminants, but they do seem to have increased steadily over the last decade (Table 1). Because of the rapid growth of the human population, the demand for goat and sheep products, both for domestic consumption and for export, has also increased. Goat products, such as meat, milk, and skins, are consumed more readily than sheep products. Unfortunately, there are no consumption statistics available.

According to the local traders, the demand for goat and sheep meat increases during the cool, dry season (September to February). It was roughly estimated that 2000 goats are brought from Burma to Thailand during this period to be sold monthly for meat consumption. Goat milk is sold mostly in the city in small quantities. Sheep product consumption can be also roughly estimated from the import statistics of the Department of Livestock Development (Table 2).

Because there are many sheep slaughtered in the country, the home consumption of mutton and lamb is at least 41,806 kg/year. The potential exists to increase sheep production in Thailand. The Baptist Mission has introduced the utilization of sheep for the purpose of making blankets and jackets both for home use and to sell as handicrafts among Karen hill-tribe villages. Housewives can earn extra income by spinning and weaving during their free time. This program has attracted the interest of the Public Welfare Department, which will promote this aspect of sheep production in its rural development program. This means that sheep production can benefit small communities. The role of sheep and goat production in rural development is of great benefit to the communities and should not be overlooked.

FOREST TYPES IN NORTHERN THAILAND

In Northern Thailand, there are two main forest types covering the total land area: evergreen forests and deciduous

Table 1. Number of goats, sheep, cattle, and buffalo in Thailand, 1975-1984.

Year	Goats	Sheep	Cattle	Buffalo
1975	48230	71357	4141725	5596876
1976	53519	33340	4322375	5895418
1977	57136	19652	4341152	5827462
1978	63138	18551	4436607	5958734
1979	66503	31755	4275825	6027895
1980	55539	21766	3938221	5650794
1981	37561	21357	4468796	6124091
1982	48883	27081	4578699	6417433
1983	58520	32785	4832570	6354349
1984	73644	44877	4788989	6300896

Source: Office of Agricultural Economics (1985).

Table 2. Imported sheep products, 1981.

Item	Amount (kg)	Country
Sheep intestine	6044	Australia, New Zealand, and the Federal Republic of Germany
Mutton, lamb	41806	New Zealand, France, and the Netherlands
Skin	353	Australia
Stomach	68	England
Ribs	120	New Zealand
Wool	191679	New Zealand

Source: Adapted from the Department of Livestock Development (1981).

forests. These forests, of course, vary according to the local environment, i.e., soil types, soil moisture, atmospheric humidity, season, annual rainfall, temperature, and elevation.

Kijkar (1985) classified the forests of northern Thailand with particular emphasis on the Chiang Mai basin; the results of this study can be summarized as follows. The dry, dipterocarp forests occur mainly on the foothills or the flat lands where soils are very poor and generally at elevations less than 1000 m. Forest trees are generally gnarled and stunted on the shallow podsollic or lateritic soils. Mixed deciduous forests are the most important source of economic timber in the country because of the presence of teak and many other species of economic value. Mixed deciduous forests are located on better soils than are the dry dipterocarp forests. Dry evergreen forests can be found both on the lowlands and on the uplands at less than 1000 m elevation where soil is moderately fertile, has a high content of soil moisture, and has clay or sandy clay loams. Hill evergreen forests are located at altitudes above 1000 m on fertile clay loam. At this high altitude, the average annual rainfall is considerable. Pine forests occur within limited areas on the ridges or on the hill slopes at elevations greater than 700 m where soil is either shallow or infertile because of very high acidity or dry sandy soil.

The northern region of Thailand has more forest area than any other region: 87,756 km² or about 56% of the total forest area of the country (Table 3). The forest of the north consists of 29.74, 28.49, and 39.11% evergreen, mixed deciduous, and dipterocarp forest, respectively. With the increase in population pressure, the need for more land for cultivation will also increase. Forest land will be put to use in different ways creating other used patterns such as semishifting cultivation, shifting cultivation, and settlement areas. Forest deterioration can be prevented by giving people the opportunity to make profitable use of the forest so that they can earn a living comparable to that earned through cultivating crops. Therefore, the development of livestock production, such as with goats and sheep, is integrated with the forestry system.

CASE STUDY: GOAT RAISING UNDER MIXED DECIDUOUS FOREST

A flock of 41 goats at 800 m elevation, Ban Om Hae, Hod district, Chiang Mai province, was used as a case study. The

Table 3. Forest area (km²) of Thailand by region, 1982.

Forest type	Northern	Northeastern	Eastern	Central and western	Southern
Evergreen	25568	930	6216	12449	14323
Mixed deciduous	25006	2618	1113	5192	-
Dry dipterocarp	34318	13819	253	540	-
Mangrove	-	-	418	335	2179
Pine	2018	144	-	-	-
Shrub woodland	846	-	-	-	-
Total	87756 (56.04%)	28886 (16.53%)	8000 (5.11%)	18516 (11.82%)	16442 (10.50%)

Source: Naiyanet (1984).

flock consists of 2 bucks, 17 does, and 22 yearling kids of local breed. The average mature weight is 55 and 38 kg for bucks and does, respectively.

The goats were raised grazing and browsing in an area of about 80 ha (0.8 km²). The area is identified as 70% mixed deciduous forest and 30% abandoned swidden. The main forest tree species are as follows: Shorea obtusa Wall., Shorea siamensis Miq., Dalbergia floribunda Roxb., Tectona glandis L.f., Cratoxylum maingayi Dyer., Bambax anceps Pirre., Terminalia chebula Retz., Phyllanthus emblica L., Dillenia spp., Gmelina arborea Roxb., Quercus brandisiana Kurz., Lagerstroemia speciosa (L.), Paramichellia baillonii Hu., Morinda tomentosa Heyne ex Roth., Hopea odorata Roxb., Baccaurea sapida Muell. Arg., Cassia tora L., Mangifera longipetiolata King., Dimocarpus longan Lour., Phyllanthus emblica L., Vetex pinnata L., Schleichera oleosa (Lour.) Oken., Bauhinia racemosa Lamk., Bauhinia variegata L., Pinus kesiya Royle ex Gordon, and Pinus merkusii Jungh-de Vriese.

The main undergrowths within the mixed deciduous forest are as follows: Bambusa arundinacea Willd., Bambusa tulda Roxb., Thyrsostachys siamensis Gamble, Imperata cylindrica Beauv., Eulalia siamensis Bor., Casearia flexuosa Craib., Euphorbia coccinea Roxb., Phoenix acaulis Ham., Acroceras munroanum (Balansa) Henr., Morinda tomentosa Heyne ex Roth., Acacia rugata Merr., Paederia spp., Leersia hexandra Sw., and Eupatorium odoratum L.

The abandoned swidden is mainly covered with shrubs and grasses. The wide range of plant species found in the abandoned swidden are as follows: Eulalia siamensis Bor., Leersia hexandra Sw., Sida rhombifolia L., Solanum torvum Sw., Imperata cylindrica Beauv., Eupatorium odoratum L., Thyssonolaena maxima (Roxb.) O.K., Solanum incanum L., Acroceras munroanum (Balansa) Henr., Agcratum conyzoides L., Bambusa arundinacea Willd., Bambusa tulda Roxb., and Thyrsostachys siamensis Gamble.

Goats were kept in stalls overnight and were let out for grazing at about 0900. They were allowed free access to the forest and abandoned swidden and returned to the stalls in the late evening. During the day, one woman occasionally tended the flock to know where they were. The animals grazed and browsed year round in the area. Rice bran was used as supplement feed during the dry season (February to April). A bone

meal and salt ratio of 2:1 was given twice a year. The flock was never vaccinated but was dewormed once.

Dry matter yields of grasses, climbing plants, and shrubs in the forest and abandoned swidden have been estimated by sample cuttings. Grasses and grasslike plants were cut short close the ground. The leaves and small twigs of climbers and shrubs were cut about 1 m from the ground. Each sample area covered 2 m² and there were 15 sample cuttings in total. This sample cutting was done during the rainy season. The estimated dry matter yield of the available forage was about 2.4 t/ha and that of the crude protein (CP) was 8.33%. The dry matter yield under rubber and coconut was 480-500 and 800-1200 kg/ha, respectively (Devendra and McLeroy 1982). The crude protein content under rubber and under coconut on a dry matter basis was 14-16 and 8-12%, respectively. In the hot, dry seasons, the dry matter yield of forage was difficult to estimate. There was rather limited forage in this period. Drinking water was also a problem. Dried leaves, sprouts, shoots, pods, and tree fruits were eaten by the flock. Fruits of the following trees were available: Mangifera longipetiolata King, Phyllanthus emblica L., Gmelina arborea Roxb., Phoenix acaulis Ham., Eugenia leptalea Craib., Acacia rugata Merr., and Irvingia malayana Oliv. ex A. Benn.

Productivity of the flock compared with a flock in a Chiang Mai suburb is shown in Table 4. In this mixed deciduous forest environment, the performance of the goats was not different from the goats raised in the Chiang Mai suburb.

Although the goats were never vaccinated, no serious disease-related problems were found. During the windy and cold period, the animals often caught cold and developed a cough. External parasites found in the area were sucking lice (Linognathus spp.), blood-sucking flies (Chrysops dispar), and leeches (possibly Haemadipsa zeylanica). This leech is found only in the nose of mammals, i.e., dogs, goats, cattle, and buffalo, and is contracted by drinking from infested water holes. Within 1 year, the number of deaths totaled six kids and one doe. The deaths were the result of dog bites. The dogs that were responsible were from other villages and followed the owners while they collected forestry products such as bamboo shoots, honey, etc. According to flock owners, dogs are a serious problem in goat raising in the area.

This preliminary study indicates that the major constraint to this system is the limited availability of forage during the

Table 4. Productivity of the case study goat flock and the Chiang Mai suburb flock.

Description	Case study flock (\bar{X})	Chiang Mai suburb flock ($\bar{X} \pm \text{SD}$)
Litter size	2 (7)	1.6 (71)
Weight (kg)		
Birth	1.9 (4)	1.7 \pm 0.4 (111)
6 months	14.0 (4)	12.8 \pm 2.8 (16)
1 year	23.8 (3)	22.2 \pm 2.4 (7)

Note: Values in parentheses are the number of observations.

hot, dry season from February to mid-May. From late April to May, the availability of forage is not as serious a problem because during this period there are many sprout shoots or seedlings and by proper management of the stocking rate and supplementation of feed, the problem can be reduced further. Theoretically, goats could lose weight during this time, and compensatory weight gain should be expected in the next rainy season. Another problem is whether the browsing habits of goats can affect the regrowth of the forest; for example:

- ° The forest is often burnt by the villager to facilitate trekking across the forest and collecting the forest products, i.e., mushrooms; this practice has more of a negative impact on regrowth than the browsing of goats;
- ° Normally, the sprout shoots and seedlings selected by goats are undergrowth plants; these plants have little chance of reaching full growth, but they have very limited economic value and timber production is not threatened; and
- ° Proper management can also avoid overbrowsing of a given area.

CASE STUDY: SHEEP RAISING UNDER TEAK PLANTATION

The sheep flock of this second case study has been developed over the past 2 years at Ban Tung Prao, Maesarieng district, Mae Hongson province. This program was supported by the Karen Christian Church in cooperation with the Baptist Mission. There were 3 rams, 12 ewes, and 10 lambs in the flock during the observation period. The purpose of sheep raising is to provide meat, cash income, and fleece for clothing. The sheep were genetically heterogenous and were identified as being of local origin.

The sheep were penned at night and were tended by a shepherd while they grazed for 8-9 h/day. The flock grazed and browsed in the teak plantation during the cropping period (June to September). From October to May, after harvesting ended, fields were also used as grazing areas. During this period, rice bran was supplemented to about 15-20 kg/day. The supplementation of rice bran had been done since last October. The estimated grazing and browsing area was about 24 ha under teak plantation and about 2 ha of cultivation area. The teak plantation belongs to the government, and the trees had been planted for more than 5 years. The main undergrowths within the teak plantation were identified as Dioscorea esculenta Burk., Paederia linearis Hook.f., Acroceras munroanum (Balansa) Henr., Pueraria mirifica Airy Show and Suvatabhandu, Croton oblongifolius Roxb., Wrightia tomentosa Roem and Schult., Lagerstroemia spp., Bauhinia spp., Terminalia spp., Dalbergia spp., and Salmalia spp.

The sheep live weight at different ages was compared with other flocks (Table 5). There was no apparent difference in the performance among these flocks. Lambing occurred at all times of the years and, as is common with many tropical sheep, seldom produced twins. Shearing was done once a year during the hot, dry season. The estimated fleece yield of the flock was 1 kg/head. The sheared fleece was sold to the Karen Church at a price of 25 THB/kg (25 Thailand baht (THB) = 1 United States dollar (USD)) and was used by the church to make shirts and blankets, both for home use and for sale as handicrafts. A shirt needs 300 g of fleece and 200 g of cotton, but, for a single blanket, the material needed is about 3 times that of a shirt. The local Thai sheep produce a very hairy fleece estimated to be 70-90% hair and 10-30% wool (Coop 1976).

Because the supplemented feed was given to the flock during the period when little forage is available, the health

Table 5. Sheep live weight at different ages.

Age	Case study flock (\bar{X})	Chiang Mai flock ($\bar{X} \pm 50$)
Birth	1.6 (3)	1.9 \pm 0.4 (28) ^a
3-5 months	10.0 (1)	9.5 \pm 1.3 (9) ^b
6-8 months	12.0 (1)	14.9 \pm 3.4 (30) ^b
12-15 months	18.0 (1)	27.9 \pm 4.5 (17) ^b
>2 years		
Ram	35.0 (1)	30.1 \pm 4.1 (11) ^a
Ewe	24.5 (4)	26.2 \pm 5.3 (37) ^a

Note: Values in parentheses are the number of observations.

^a Personal observation.

^b Adapted from Hoare et al. (1976).

of this flock was generally improved and the lamb mortality was significantly decreased. Dog attacks occurred often and caused the death of three lambs and one ewe in the last 6 months. The shepherd of this flock recognized dog biting as the main problem. In other respects, the general health of the sheep is good.

The limitation of available forage during the hot, dry season has a strong impact on the sheep performance. Although the case studies on goat and sheep raising cannot be compared, it seems that goats can more easily adapt to such situations. In a hot environment, goats pant at half the rate of sheep, do not sweat, and lose less water in their feces and urine (Devendra and McLeroy 1982). From these observations, it was learned that sheep prefer grazing in the open areas to the forest. The sheep grazed in the forest for shorter periods

than they did in the open areas. A capable shepherd is essential for the proper care and safeguarding of the animals.

The success of integrating small ruminants and deciduous forest depends on proper management during the hot, dry season. The careful manipulation of the stocking rate with available dry matter production, and feed supplementation are also important considerations. Goats should be able to adapt better to the system than sheep.

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