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PROSPECTS FOR SMALL FARM GOAT PRODUCTION
IN A TRANSMIGRATION AREA OF INDONESIA:
RESULTS OF A SURVEY

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PREFACE

This report sets out results of a survey undertaken as one of the initial activities of the Small Ruminants Collaborative Research project (SR-CRSP) in Indonesia. To assist with planning the overall scope of work of the SR-CRSP in Indonesia, it was decided that some attention should be given to the less densely populated areas outside of Java where land availability for small ruminant production was less of a constraint. This study represents an effort to determine goat production potential in a transmigration area in South Sumatra.

The author gratefully acknowledges the assistance of Dr. Suryatna Effendi, Head, Cropping Systems Project, Central Research Institute for Food Crops (CRIFC) Bogor and other CRIFC staff members in South Sumatra, especially Pak Toto. In addition, staff of the Animal Research Institute (BPT), Bogor provided valuable technical and administrative support. The research was carried out as part of the Small Ruminants Collaborative Research Support Program under USAID Grant No. AID/DSAN/XII-G-0049 in collaboration with BPT. International travel was provided by the Woodrow Wilson School of Public and International Affairs, Princeton University. This paper is a revised edition of the manuscript first produced in October, 1980. The editorial assistance of Rick Bernsten is gratefully acknowledged.

INTRODUCTION

This study analyzes the economic role of goats on small farms in transmigration areas of Indonesia to determine the potential role of goat production intensification programs in these areas. From the outset, it was recognized that goat raising was highly integrated with crop and animal-related farm activities, both competing for labor and cash resources and benefiting from by-products of agricultural production. In addition, our understanding of farmers' decision-making in the rapidly evolving agricultural setting of newly opened transmigration areas is still limited. By providing an overview of the agricultural system this study attempts to identify constraints to increasing farm production, with a particular focus on goat husbandry.

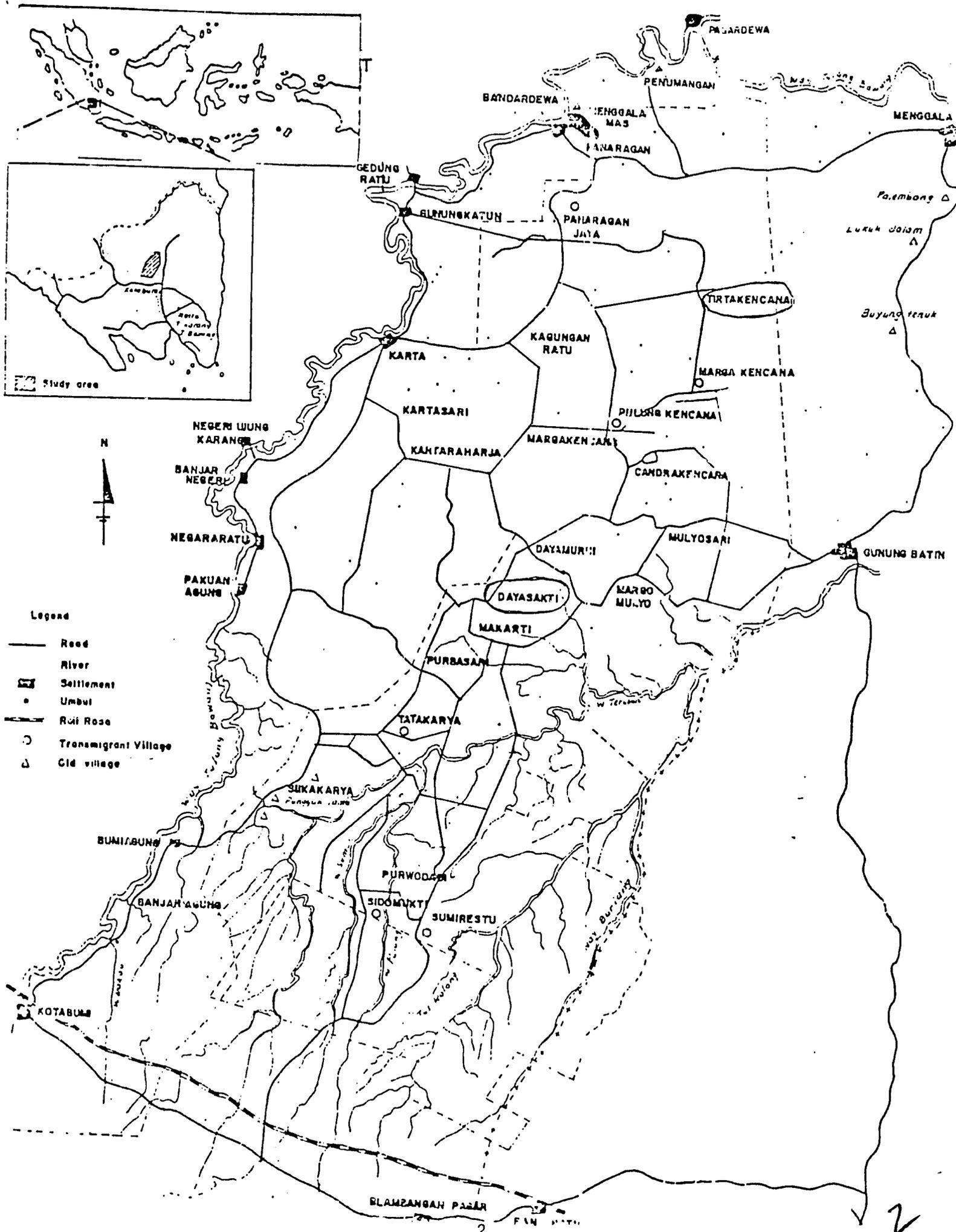
The field research was conducted over a two month period in the transmigration project of Way Abung II in Northern Lampung Province on the southern tip of Sumatera.

The study villages, Daya Sakti and Tirta Kencana (Figure 1), were selected for their representativeness of two different agricultural settings in Way Abung, to determine the influence of this basis on goat husbandry practices and potential. Daya Sakti is almost twice as old a settlement as Tirta Kencana and because it is scheduled to be irrigated for wetland rice production, has been included in the villages receiving draft cattle from a World Bank funded project. In contrast, Tirta Kencana is at too high an elevation to be irrigated and will not receive cattle. Also farmers in this village will eventually be given rubber tree parcels.

Thirty farmers in each of two villages were interviewed individually using an open ended questionnaire. Results of the survey suggest that there are not yet many significant differences between the two villages, so in this report comments apply to both except where indicated.

In addition to the survey, secondary information was collected from a local field station of the Central Research Institute for Food Crops (CRIFC), village and transmigration project officials, farmer groups, officials representing animal and crop extension services, rural credit programs and private merchants.

Figure 1. Map of Study Area



HISTORY

The settlement of Way Abung II was one of the Indonesian Government's earliest major attempts at relocating people from Java to the Outer Islands. The first group of settlers arrived in 1968, under the transmigration program in the Government's first Five Year Plan (Repelita I, 1968-73). The majority of settlers came in two later waves during 1970 and 1973.

From the start Way Abung experienced a number of problems. The project was an extremely ambitious development effort and coordination of the various government agencies responsible for different aspects of the project was sometimes inadequate. Further, there was inadequate knowledge about the kind of agriculture the soil and climate could support. Apart from advising farmers to grow cassava, extension had few proven recommendations to extend to farmers.

Resources to remedy some of these problems became available through a World Bank assisted project which began in 1977. Funds will support infrastructure development, including school, health clinic, and road construction. In addition there is a component to deliver 5,000 head of cattle to ten of the fifteen villages in Way Abung by 1982 and to establish 1,540 ha in rubber plantation which will be turned over to farmers in one ha blocks when it comes into production.

Way Abung II has now been officially closed to further settlement. Almost all of the total area of 21,970 ha has been distributed to 11,354 farm families grouped into fifteen villages. These villages are currently administered by two coordinators who are appointed by the transmigration administration (DJT). However, by 1982, all DJT programs and village administration will be integrated into the provincial administrative structure.

The population in Way Abung is still overwhelmingly composed of farmers, although as the area develops the number of shop keepers, school teachers, and civil servants is increasing. Before coming to Way Abung, all the farmers interviewed were engaged in agriculture in Java, although only a few had owned their own land or worked on family land. Most of the transmigrants had been sharecrop farmers or landless agricultural laborers. Several came to Way Abung with additional skills such as brick or tile making, carpentry, blacksmithing/and rubber tree tapping which they continue to practice on a part time basis to supplement their farm income.

AGRICULTURAL SETTING

The road approaching Way Abung from Kotabumi, the nearest major town, passes first through several traditional villages inhabited by the indigenous Lampungese people. These exist in stark contrast to the resettlement further down the road which is populated primarily by Javanese. The Lampungese, who practice swidden agriculture, live primarily on the proceeds of perennial crops such as rubber, clove, coconut, pepper, and coffee, which spread out in mixed stands from their village clusters. The resettlement area is marked by a much different vegetation. Its much higher population density has mandated that permanent agriculture be practiced. As a result, almost all secondary forest has been cleared away. Fruit trees and other perennials surrounding the home plots are spaced regularly along the road. These are still young and do not block the view to open field plots which stretch away from behind the home plots. In general, the resettlement areas appear to be much poorer than the surrounding indigenous areas. Houses are less durable, mostly constructed of bamboo and thatch instead of wood with little ornamentation. Natural and cultivated vegetation seems less lush and alang alang (Imperata cylindrica) infested fields are a common sight.

The transmigrants' agricultural practices are new and experimental. The vast majority of farmers in the area arrived between 1970 and 1974. Upon arriving they faced the prospect of making a living cultivating poor upland soils when all their previous agricultural experiences were in working the rich, irrigated, volcanic soils of Java. There is little that is "traditional" about these farmers, who are still in the tentative process of adapting their permanent agricultural practices to soil, economic, and agronomic conditions in the area. It is difficult to identify stable cropping patterns as depletion of soil fertility and pest and disease problems are forcing a constant evolution of crop choices. Presently, farmers are dependent on field crops for food and income, but as the perennial crops come into production, these will provide an additional source of income.

Soils

Way Abung has mostly red-yellow podzolic upland soils with low natural fertility (Table 1). In the past, the Lampungese maintained fertility of these soils by practicing swidden agriculture, but this system has been replaced in Way Abung by the transmigrants' permanent cropping patterns. As a result, the problems of acidity, low organic material content, deficiencies in major plant nutrients, and leaching of the sandy-textured soils have been accentuated. Without application of fertilizer or manure, yields--particularly corn and upland rice--decline rapidly three to four years after the land is initially cropped.

Rainfall

Way Abung has a long wet season, generally from October to May, during which rainfall fluctuates between 200-350 mm per month (Table 2). This is followed by a dry season when rainfall averages around 100 mm per month. The date of the first rains in October/November is irregular, often causing drought stress in early plant growth stages. Also, the intensity of the dry season is variable. Although during the time of the survey (July and August) rainfall was quite regular with small dry season stands of corn (planted in June/July) doing reasonably well, several farmers reported that the dry season crop often failed because of a lack of rain. However, even in drier years, green natural vegetation is reported as continuously available for animal feed.

Land Resources

Originally, every family in Way Abung was to be given two hectares of land divided into a 0.25 ha home plot, a 0.75 ha upland field, and a 1.0 ha parcel to be irrigated at a later date. Since Tirta Kencana is at a higher elevation than most of Way Abung, the only area that could feasibly be irrigated had to be located an average of more than ten kilometers from the farmers' homes. While awaiting irrigation, most farmers in Tirta Kencana left this land fallow, as it was too far away to clear and cultivate with only manual family labor. Eventually, it

Table 1. Soil Characteristics, Way Abung,
Northern Lampung Province, Sumatra, 1980.

<u>Texture</u>		<u>Extractable Nutrients (ppm^a)</u>	
Sand	48%	MH ₄	27
Silt	24%	NO ₃	66
Clay	28%	P	1
		K	106
		Ca	315
<u>pH</u>			
H ₂ O	5.7	Mg	101
KCl 4.5	Mn	3	
		Fe	8
<u>Organic Matter</u>		Al	164
C	2.69%	Zn	1
N	0.13%		

^a Parts per million

Source: Central Research Institute for Food Crops,
Cropping Systems Research in Transmigration Areas:
Southern Sumatera, 1978, Bogor, Indonesia, p. 15.

Table 2. Monthly Rainfall (mm), Way Abung (Kota Bumi), Northern Lampung Province, Sumatra^a.

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Total
225	364	264	316	228	165	127	100	83	146	181	342	2571

^a Based on at least 15 years of data during the period 1879-1941.

Source: Oldeman, L.R., Irsal Las and S. N. Darwis. 1979. "An Agroclimatic Map of Sumatia," Contributors, Central Research Institute for Agriculture, Bogor, No. 52, pg. 35.

Table 3. Land Resources in Two Survey Villages in Way Abung,
Northern Lampung Province, Sumatra, 1980.

Land Type	Village	
	Tirta Kencana ^a	Daya Sakti ^b
	(ha)	(ha)
Home plot	199.8	149.8
Upland	599.3	434.8
Irrigated land	799.0	586.3
Other non-ag. land	<u>172.0</u>	<u>47.5</u>
Total area	1770.1	1218.4

^a Including 794 families

^b Including 599 families

Source: Transmigration Office

was determined that this area could not be irrigated. Instead, the World Bank provided a loan for establishing a rubber plantation, which will eventually be turned over to farmers in one ha blocks. As a result, the typical farm size in Tirta Kencana is 0.75 ha of upland plus the 0.25 ha home garden plot (Table 3).

Since Daya Sakti is lower in elevation, it was possible to give each farmer a contiguous 0.75 ha upland and 1.0 ha irrigated parcel within one-half kilometer of his home plot. Thus, even though irrigation has not yet been provided, Daya Sakti farmers own 1.75 ha of cropland, all within a short walk of their homes.

Once families actually began occupying the farm units, some variation in the typical size has occurred. In Tirta Kencana, twenty families are still without cropland because an ownership dispute with local Lampung people is preventing cultivation of the government land grant. Other farmers interviewed have been driven to sell a portion of their land to raise money to meet urgent needs. Almost a quarter of the farmers interviewed have added to their original land grant, usually by purchasing land from farmers returning to Java. Despite these additions to some farms, most farmers still find it difficult to cultivate all of their original land grant with available labor. As a result, the average amount of land annually cultivated by farmers is 1.13 ha in Tirta Kencana and 1.5 ha in Daya Sakti.

Major Cropping Practices

The principle crops grown in the farmers' cropping patterns in Way Abung are rice, corn, and cassava. All three crops are usually planted in mixed stands in the main field, while cassava alone is relay planted on the home plot for family consumption.

Farmers begin preparing their main field in August or September in anticipation of the first wet season rains. Ordinarily this requires two months of continuous labor, although some farmers are able to shorten this period through collective work (gotong royong), by using draft cattle, or by hiring labor.

Corn is the first crop planted, typically at a spacing of 1m x 1m. Within two weeks, upland rice (padi gogo) is interplanted at 25 cm x 25 cm. After the corn and rice are established and weeded for the first time, cassava is planted (1m x 1m) over the whole field, generally from five to six weeks after the corn was sown. The corn, which matures first, provides the farmer with a foodstuff at a time when his stores are low and before his other crops can be harvested.

After the cassava has been planted in November, the rice and corn are weeded once more before the corn harvest begins. Many farmers pick up to one-half of the ears when still green for direct consumption with the remainder harvested by January. Occasionally a third weeding is necessary before the rice is harvested in late February or early March. No further field work is required until July and August when the cassava is pulled.

Farmers who are able to buy fertilizer can usually afford only a small amount and will try to increase its effect by concentrating it on only a part of their field. In this fertilized area, rice and corn will be grown at a closer spacing, without cassava being intercropped. In such a case, cassava is grown as a monoculture on the rest of the land.

In this pattern, corn and rice are grown primarily for family consumption. Yields are low as the soil is infertile and few farmers apply fertilizer. Disease and insect attack also make yields uncertain. Downy mildew for corn, and stem borers and blast for rice are the major problems. Consequently, farmers grow just enough corn and rice to enable them to vary their diets, although most must still purchase rice to meet food requirements until the next harvest.

In past years, cassava yields have been very stable. With a ready market at two nearby cassava flour factories, farmers have increasingly seen cassava as the best crop for both consumption and cash needs. However, in the past two years bacterial leaf blight has become an important disease problem for this crop.

Some farmers will attempt a second corn crop as a monoculture on a small portion of their land, planting in June or July. Both green ears and dry kernels are again harvested.

In addition, farmers will often use a part of their main field or their home plot to grow cassava outside of the usual crop calendar. This provides them with a continuous supply of fresh tuber from which oyek--the locally processed form of cassava--is made, and also stretches out the period over which the farmer receives cash income from crop production.

Although soybeans, cowpeas, mungbeans, and green beans are grown in Way Abung, they are rarely planted as cash crops because of pest problems. Instead, they are cultivated on small plots or along field edges for family consumption only.

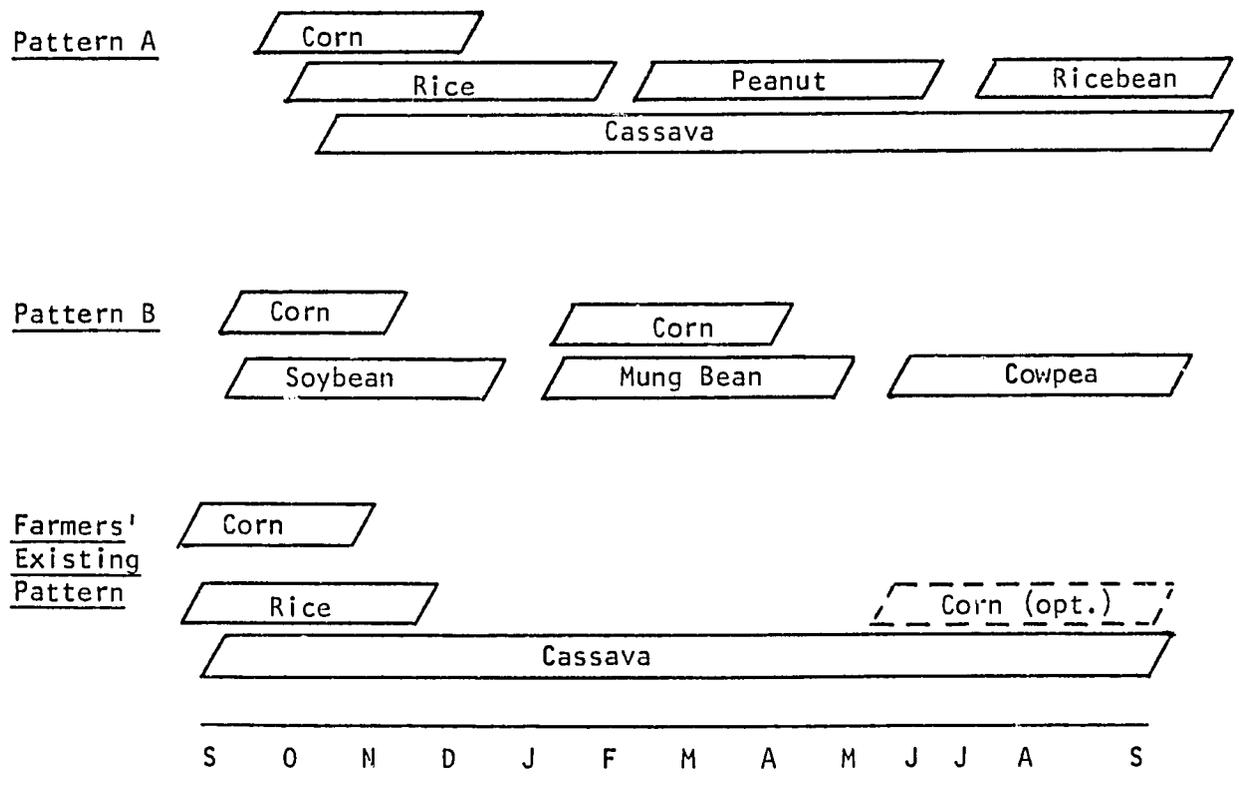
By using mixed cropping, relay planting of cassava, and dry-season planting of corn on small plots farmers try to ensure a steady stream of foodcrop harvests. These practices can also be seen as attempts to spread out labor use and the risk of crop failure over the year.

Introduced Pattern

Since 1976 the local field station of the Central Research Institute for Food Crops (CRIFC) has been conducting field trials to develop cropping patterns which will increase transmigrant farmers' yields and net crop income. These trials include two basic foodstuff-oriented sequences (Pattern A and B). Both make more intensive use of a farmer's limited land resources. Cultivation is intensified both through greater use of complementary inputs (fertilizer and pesticide) and through the extension of the growing season with the introduction of drought tolerant legume crops during the dry season (Figure 2).

Farmer adoption of the CRIFC developed patterns has been slow. One of the problems is the difficulty in educating farmers about the benefits of the new techniques. CRIFC has no extension staff and there has

Figure 2. Cropping Patterns in Way Abung, Southern Sumatra



been little incorporation of these findings into the programs of extension agents working through other governmental organizations.

Other features of the farmers' situations may also preclude adoption of the more intensive cropping patterns. First, the high cash cost of the CRIFC patterns is prohibitive for most farmers.¹ The cash outlays for Patterns A and B are more than seven times that generally spent in the farmers' existing crop pattern (Table 4). Although most farmers recognize that these high initial costs are more than offset by greater net returns, they do not have the cash resources necessary for the required input purchases when these are needed.

Future Developments

Over the next five years, several factors could lead to significant changes in the agricultural practices followed by farmers in Way Abung. These changes would affect the raising of livestock (including goats) by altering the kinds and amounts of feed available, and the use of family and hired labor.

The interrelated problems of decreasing soil fertility and increasing plant diseases have affected the farmers' planting decisions. Unable to buy fertilizer and threatened by rice blast and downy mildew, farmers have responded by planting rice and corn more thinly in their mixed stands, and relying more heavily on cassava.

¹ The CRIFC research was undertaken to evaluate the feasibility of food crop production in Way Abung. From the beginning, it was recognized that farmers would need production credit in order to adopt the introduced patterns.

Table 4. Purchased Input Costs^a in Introduced and Farmers' Cropping Patterns, Way Abung, Northern Lampung Province, Sumatra, 1979.

Input	Introduced Pattern A		Farmer's Pattern	
	Qty/ha	Cost/ha	Qty/ha	Cost/ha
SEED				
Rice	30 kg	Rp 2700	40 kg	Rp 3600
Corn	12 kg	960	10 kg	800
Cassava	4000 sticks	15000	6000 sticks	18000
Peanut	120 kg	14400	-	-
Ricebean	20 kg	1600	-	-
FERTILIZER				
Urea	460 kg	46000	-	-
TSP	470 kg	47000	-	-
Lime	200 kg	20000	-	-
ZK	149 kg	14900	-	-
PESTICIDE				
Furadan	30 kg	3000	-	-
Surecide	4.8 lt.	14400	-	-
		<u>Rp 179960</u>		<u>Rp 22400</u>

^a These inputs are the totals applied to all crops over the whole year.

Source: Central Research Institute for Food Crops, 1979, unpublished data available at the Way Abung field station.

1\$ US = Rp. 620

This trend towards cassava has been hastened by the construction over the past three years of two cassava processing factories on the outskirts of Way Abung. As a result, the factory-gate price of cassava has risen dramatically. This has led to the development of a very active middleman transport sector, with entrepreneurs buying crops in the field from farmers and contracting labor and trucks to harvest and transport the cassava to the factory. In addition to making it easier for farmers to sell their cassava crop, this development has also led to a slightly higher farm-gate price.

The heavy emphasis currently placed on cassava in Way Abung is favorable for animal husbandry because the foliage can be used as feed. However, cassava rapidly depletes the soil and without fertilizer, yields decline each year. Thus, it is at best a temporary solution in the search for a sustainable, permanent crop pattern on Way Abung's soils. In addition, since 1978 cassava bacterial leaf blight has spread, reducing yields and making the crop unsaleable to the factories. While resistant varieties exist, they have not yet been distributed. If resistant varieties are not made available, it is unclear how farmers may alter their crop choice. Yet, any decline in cassava planting will directly reduce the amount of animal feed available.

The effect of declining yields on farmers' income might be compensated by the yet unrealized harvests from perennial crops. Almost all farmers have from five to ten clove trees on their house plots, as well as coconuts and fruit trees. Clove trees can be very profitable. A mature tree yields about thirty kg of dried flower per year. With one kg currently selling in Way Abung for Rp 6500(1980), this crop gives a potential cash yield of Rp 195,000/tree/year. One farmer interviewed is already earning Rp 390,000 per year with trees that have only been in production for two years. Further, farmers in Tirta Kencana will each receive one ha of rubber in about five years when the newly established plantations come into production. Estimated production is expected to climb to two tons of latex per ha, with an estimated value of between Rp 1.5-1.7 million. While it is not yet clear what proportion of this output value the farmers will receive, it is evident that within five years the cash income of most farmers will increase significantly.

Two possible farmer responses to this increase in cash income are of particular interest because they affect crop choice and the availability of animal feed and family labor. One probable use of the new income will be to purchase more fertilizer for the annual food crops currently being grown. This option is likely both because farmers know the benefits of fertilizer and--in the short run at least--they are likely to place a priority on food crop production in order to meet family subsistence needs. A second possible response is that farmers will use the cash income to escape from the unrewarding cycle of food crop production by purchasing staple foods and putting more land into perennial crops.

This latter possibility is suggested by the fact that several wealthier farmers with outside incomes--such as military pensions and civil servant salaries--have planted their entire land grant primarily in cloves and coconuts at wide spacings. This allows them to continue planting food crops between the rows in order to provide food and a source of cash income until the perennials come into production. A few more successful farmers are making the transition from annual to perennial crops through additional land purchases. These individuals are retiring their older, worn out plot to perennial crops, while continuing to grow annuals on the newly purchased and generally more fertile plots just opened. If it occurs as a general trend the shift towards perennials would necessitate a major change in ruminant feeding practices because cassava will be replaced by crops that yield no by-products useful as animal feed.

At least for Tirta Kencana and four other villages with plantation areas, the leguminous ground cover in the rubber plantations might be a feed source that could compensate for a decrease in cassava production. Yet, yields will decrease as shading by the growing rubber trees increases. The total production of ground cover that can be taken off as feed without threatening erosion is also not known. Further, although farmers will travel daily to their rubber plot to tap the latex and tend the trees, these fields are 10 km from their homes. This will limit the quantity of animal feed they will be willing to carry back.

Nevertheless, this feed source may become important in four or five years once farmers begin making the round trip to the plantations.

One further important future development is the continued expansion of draft cattle numbers in Way Abung. When the livestock stocking project is completed in 1982, an initial total of 5000 head will have been distributed to farmers on credit. Under the program, two calves have to be returned for each of the animals originally distributed and these will again be distributed locally. An immediate consequence will be that cattle numbers will increase significantly and farmers in many villages will be able to use draft power to expand the amount of land in annual crops. In the ten villages slated for irrigation, only 1.5 out of 2.0 ha is being used by most farmers because they lack the power to till the rest of their grant. The introduction of cattle should enable them to cultivate the rest of their plot and this will in turn alter the animal feed supply as natural grasses are replaced by cassava foliage. In addition, increased cattle numbers means increased competition between cattle and goats for limited feed and labor resources. Given the priority that farmers presently give to cattle, it seems likely that goat production would suffer from such competition.

ANIMAL HUSBANDRY IN WAY ABUNG

Cattle, goats, and chickens are the most important domestic animals raised in Way Abung. Other poultry are found in small numbers. Farmers have often had experience with rabbits, guinea pigs, and sheep during the time they lived in Java, but breeding stock for these species is very scarce in Way Abung.

Goats

Goats are an integral part of mixed farms in Way Abung. They are easy to care for and feed, provide valuable manure, and are easily sold in local markets. Consequently, almost all of the farmers would like to raise goats. Finding time to care for them and finding feed are not seen by farmers to be constraints. The most common complaint of farmers

that do not presently keep goats is that they cannot afford to buy the initial breeding stock.

Over half the families surveyed had goats. Large herds were rare with the typical farmer raising only four animals. However, farmers often recalled having up to fifteen head in previous years.

Goats are most appreciated as income earners and manure producers. Families with goats commonly received more cash income from goat sales than they did from marketing any other farm product other than cassava. The manure collected from the pen is carefully applied to field and tree crops and is frequently the only fertilizer applied. Several farmers claimed that they only began growing corn after they acquired goats because of the assured supply of manure.

Slaughter of goats for home consumption is rare. Only the wealthier farmer considers slaughtering a goat for the religious feast of Idul Fitri. Nor are goats milked, either for home use or for marketing.

Ownership Pattern. Farmers who raise goats either own them or look after them for another individual under a traditional lending institution called gaduhan. In this system, poor farmers who want to raise goats, but cannot afford to purchase the initial breeding stock, frequently begin by borrowing an animal from a relative, neighbor, or person from a Lampungese village.

There are several reasons why a better-off farmer may decide to distribute his goats to others through gaduhan. He might choose to reduce the risk of theft or disease by dispersing his herd, or lead goats to help a neighboring family having a hard time making ends meet. Or he might decide his time is better spent on other activities, while still ensuring himself of some income from an investment in goats.

The owner often does not seem to care who receives his goats given under gaduhan simply making it known to neighboring farmers that loan animals are available, with the first applicant getting the animals.

Since raising goats is considered an easy task, the owner rarely considers previous experience to be important.

Under the gaduhan system the owner usually loans a female and retains rights to the original animal, plus one-half of its offspring. While he has the right to reclaim and sell the original animal at any time, in practice this is rarely done without some forewarning to the caretaker. Most often, if the owner needs cash he will first sell one of the animals he keeps on his own farm.

The caretaker is responsible for all care and makes all feeding and breeding decisions. In return, he gets one half of the kids from the loaned goat and is usually given first choice in the case of multiple births. If there is a single kid, it will either go to the caretaker or upon sale its cash value will be divided with the owner. The owner usually claims his half of the offspring when they are between six and twelve months of age.

If the animal given as gaduhan dies, the caretaker is not liable for restitution. If a kid designated as part of the owner's share dies before it is claimed, it is simply not counted in the balance and the next kid produced takes its place.

Gaduhan provides a means for a farmer to initiate goat production without making cash investment. Risk is very low, as animal loss through disease or theft is minimal, and in any case, compensation is not necessary. Farmers feel very comfortable accepting this kind of loan as they are generally neighbors with the animals' owner, and accept the animals as part of a broader and more familiar relationship than exists with formal bank loans.

However, at present there are many more farmers anxious to obtain goats through gaduhan than there are owners ready to loan animals out. Hence, there is scope for a program to expand goat production through an animal credit program.

Farmers who loan goats through gaduhan expect females to produce two sets of kids per year. Thus, the owner can normally plan on receiving two kids each year for each adult female loaned out. If the kids are claimed at the age of nine months, each can be sold for about Rp 9,000 in the market. Thus, on an investment of Rp 15,000 (adult female) plus 12% interest (opportunity cost²), the owner gets a return of Rp 18,000. This is equal to a yield of 102% on the value of capital provided to the goat raiser.

In the sample of farmers interviewed, 41% owned and cared for their own animals, 54% raised their own goats in addition to animals obtained under a gaduhan arrangement, and 10% distributed goats via gaduhan to other farmers.

Reproduction. All goat reproduction is controlled as animals are permanently penned. Since most goat farmers do not keep a male, they breed their females by taking them to the nearest farmer with a male. However, there is little selective breeding.

The only local breed is the Bean Goat (Kambing Kacang), although a few goats have features more characteristic of the Etawah breed such as long body hair and a more angular body.

² 12% interest per year is the Bank Rakyat Indonesia lending rate charged on subsidized agricultural loans. The free market rate of interest is substantially greater.

Multiple births are frequent. Based on farmer's recollection, it was calculated that there is an average of 1.7 kids per birth with pre-weaning losses insignificant.

The adult female-male ratio is ten to one, which normally is considered low for penned animals. Yet, the relatively high male population may be explained by the small size of most farmers' holdings and the common need to travel some distance to bring females to a neighbor's male.

One common practice which extends the period between kiddings is natural weaning. Kids are usually left with their mothers until they stop nursing at three or four months. It is only after this period that the female comes back in heat. Forced weaning at two months would require only separating kid from their mothers earlier with a neck cord, a common practice used for adults. However, the effect early weaning and faster breeding would have on kid mortality and growth rates as well as on the health of the breeding female is unknown.

Housing. Goats are confined in open pens near or attached to the farmer's house to deter theft. For this same reason goats are rarely tethered untended to graze in fields. Housing is very rudimentary with little cash expenditure required other than for nails. The wood or bamboo for the slatted walls and straw for the roof is gathered from the fields and the house is constructed in one or two days. In some instances, the house has a raised slatted floor.

Individual pens for the goats are rare. Adults are usually separated by neck cords tied to stakes or to the wall and kids are left free. This means that a lactating female often feeds more than her own kids.

Manure is usually left in the pen along with uneaten feed. It is only removed and spread on the fields once or twice a year. This is an undesirable practice as it favors the build-up of internal and external parasites, but reduces labor requirements. In this system, parasite build-up could possibly be reduced by suspending feed from the ceiling in bundles with a cord rather than throwing it on the floor. In

contrast, farmers with cows carefully clean the stable of manure once daily. This difference might be because of the greater value placed on cows or because cow manure is more liquid and soils the animal.

Feeding and Feeds. Because goats are confined and seldom allowed to graze, they depend on the farmer for feed that is cut from the fields or road sides and carried to the enclosure. Therefore, there are two feed selection processes taking place. First the farmer decides what to gather for the animals, based on what he thinks the goat will eat, time available to gather feed, and the weight of the load the farmer can carry back to the pen. The second selection is by the animal once the vegetation is actually placed in the pen.

Goats are fed entirely on crop by-products and on natural vegetation. Only rarely is a crop grown primarily as an animal feed. Feed concentrates and supplements are never used, other than ordinary salt, which is added to the drinking water. This kind of cut and carry feeding is characterized by rations that are highly variable in nutritional content, as the availability and quality of crop residues depends primarily on the seasonality of rainfall.

In Way Abung cassava foliage is by far the most important component in goat feed, making up perhaps 70% of the daily ration when available. Although, fresh cassava leaf is toxic, farmers reduce the toxicity by letting the harvested leaf wilt for a day or so before distributing it to the animals. Farmers with goats obtain cassava foliage not only from their own field, but also on a regular basis from other farmers. It is rarely taken from growing fields as farmers recognize that this will reduce the tuber yield. Since cassava leaves are perishable farmers do not store the foliage after harvesting. Instead, when a farmer pulls his cassava, neighboring farmers are free to come and collect vegetation they need for their own animals. In exchange, the owner of the field has a reciprocal right to harvest leaves from others' fields. This sharing practice means that although a farmer may harvest vegetation from his own field for perhaps one week, he is assured of a leaf supply from other farmers' fields throughout the harvest period lasting from June through October. During the rest of the year, it is more difficult

to obtain sufficient cassava leaf and the farmer must rely on the small weekly harvests from his home garden.

Corn greens are another crop residue fed to goats. As with cassava, farmers limit stripping leaves from still maturing plants to avoid yield reduction. However, farmers harvest up to half of their corn crop as green ears for direct family consumption. After the ears are harvested, the plants are immediately pulled and used as animal feed. At this time, the corn stalk is still green and palatable to goats, which is not the case when it is harvested at the dry kernel stage. Corn greens are available as feed primarily in November and December and to a lesser extent in June and July to farmers who plant a second dry season corn crop.

Peanut and bean residue is not a significant animal feed in Way Abung, because these crops are not widely grown and farmers report that goats will not eat this vegetation. Several farmers reported that they often left the ratoon growth of rice remain in their field until it was needed as animal feed. This is a more common practice among farmers raising cows and only rarely done for goats.

Rainfall is apparently sufficient throughout the year to maintain vegetative growth. This implies grasses could be used during the period that crop residues are less available. However, because of the population pressure on land resources, less and less land is left fallow. Recognizing this problem, the designers of the cattle distribution program have tried to ensure a minimal planting of a fodder crop by each farmer receiving a cow. Unfortunately, this effort has had limited success. Most farmers do ring their one-fourth ha home plot with a row of Setaria. However, this provides only a small amount of grass for feed and is insufficient to meet daily feeding requirements. While very few farmers cultivate grasses on land that can be used for food crops, some also ring their field with elephant grass or Setaria. Thus, grasses that are normally fed to goats throughout the year are ordinary field grasses cut from uncultivated land.

A few times per month tree and shrub leaves such as jackfruit, banana, and hibiscus leaves, and more rarely, various local legume shrubs are fed to goats. Because of their proximity to the home, these feed sources are generally reserved for times when feed collection from the field is difficult, such as during heavy rains or when other activities fill the day.

Rainfall is sufficient throughout the year to maintain green growth and farmers reported there is no time during the year when feed is difficult to find. Therefore, it appears that the main problem is feed quality, rather than quantity. Given this situation two improvements are needed. First, it would be desirable to increase the stability of feed content from day-to-day and season-to-season since rapid changes in feed reduces digestibility and efficient nutrient utilization. Also, food supply instability may be partly responsible for the high incidence of bloat reported by farmers. Second, it would be beneficial to increase the number of protein sources available as feed. This may be partially achieved by feeding the legume cover crop being grown on the Way Abung rubber plantations. It might also be feasible to increase legume fodder production through better use of field borders, road sides, and other food crop areas.

Health. The only health problem reported by goat farmers was bloat. While farmers had various theories about its causes, there was no consistent pattern in their explanations. Losses could be significantly reduced through remedial drenching, but farmers generally do not know how to do this--even with locally mixed solutions. Puncturing the rumen is viewed an unacceptable remedy as Islam religion proscribes against mutilating animals.

Cattle

Farmers consider cattle to be their most important animals. This is indicated by the inordinate amount of care that is lavished upon them. The animal will commonly be washed several times a week and at

night the farmers will stay up to tend a smoking fire in the stable to keep mosquitoes away. Cattle reduce the physical strain and time needed to plow the fields (Table 5), permitting the cultivation of larger areas. This is most evident in Daya Sakti where farmers have larger parcels; those without cattle have generally been unable to open the whole parcel. In Tirta Kencana, on the other hand, most farmers have their entire land grant open and under crops using hand labor.

Manure is also an important resource that is carefully collected from the stable and composted under a rain shelter until spread on field crops, or sometimes applied to fruit and clove trees.

Cows are not milked. People do not like the taste of fresh milk and farmers consider it more important that the calf get it all.

Until the past few years, transporting cassava and wood by cattle-drawn carts was an important source of income for cattle owners. After the roads in Way Abung were paved, trucks were able to enter the area and this reduced the demand for cart services. Short distance hauling of loads still occurs, but increasingly cow owners do not consider it worthwhile to own a cart.

It was apparent to Transmigration officials some time ago that a shortage of labor was a serious constraint to the amount of land that a farm family could cultivate. The problem is now being remedied through

Table 5. Labor Use, by Cropping Pattern (Mandays/ha), Way Abung, Northern Lampung Province, Sumatra, 1979.

Activity	Pattern A	Farmers' Pattern	
		CRIFC Data	Survey Data
Land Preparation			
by hand	76	78	160
by draft cow	0	0	(24) ^a
Planting			
corn	11	10	7.3
rice	52	52	17
cassava	8	16	14.5
Fertilizing			
corn	8	6	0
rice	53	0	0
cassava	6	0	0
Weeding	30	62	96.8
Spraying	10	0	0
Harvesting			
corn	6	13	7.5
rice	<u>66</u>	<u>28</u>	<u>22.3</u>
Sub-total	325	265	265.4
Land preparation	0	0	0
Planting			
peanuts	60	0	0
Weeding	25	0	0
Harvesting			
Peanut	<u>52</u>	<u>0</u>	<u>0</u>
Subtotal	194	0	0
Land Preparation	32	0	0
Plant			
rice beans	52	0	0
Weeding	23	16	0
Spraying	1	0	0
Harvest			
rice beans	20	0	0
cassava	<u>25</u>	<u>20</u>	<u>14.5</u>
Subtotal	153	36	14.5
GRAND TOTAL	672	301	279.9

^a If a cow is used for plowing, only 24 MD/ha are required.

Source: Central Research Institute for Food Crops, 1979, unpublished data available at Way Abung field site.

cattle credit programs from three different organizations: the World Bank, the Mennonite Central Committee, and a joint Livestock Services (Dinas Peternakan)/Transmigration program.³

The structure of all three credit programs is essentially the same. Either one adult cow or a cow and a bull is given to farmers who have built a stable, planted one-half ha of pasture, and are recommended by village and Transmigration officials as hard workers. Farmers must return two calves (three if given a bull and cow) within a five year period following receipt of the animals.

The three breeds being distributed are Ongole, Bali, and Brahman. Farmers seem to prefer the Ongole as these are well adapted to the climate and work well in the fields. In comparison, Bali cattle do not tolerate the sun as well because of their dark color and Brahman--coming from range conditions in Australia--are not used to human handling.

Two major difficulties face these cattle projects. First, the calving rate of mature cows is low. While yearly calving rates cannot be calculated accurately from available data, in the MCC project over a three-year period only 60% of its distributed cows produced a calf (approximately 20% per year). The World Bank project has distributed 1362 cows and received back 107 calves in the first six months of 1980 for a calving rate of roughly 16%. Clearly, this low calving rate will result in a very slow herd build-up and will prevent rapid expansion of the program through the distribution of returned calves to additional farmers.

There are probably several factors contributing to this low fertility. Mineral deficiencies and poor nutritional intake may lead to temporary sterility. Stress from field work may disrupt the estrous cycle. MCC's extension staff have attempted to alleviate the

3 As of August 1980, World Bank funded project has distributed 1492 head, the MCC 160 head, and DP/T, 961 head of cattle.

problem through mineral supplements, multi-vitamin injections, artificial insemination after hormonally inducing ovulation, and improving the farmers' ability to recognize estrous, but to date these efforts have not significantly increased the calving rate.

The second major problem is the low utilization of adult animals. Animal power is mainly used for plowing, primarily in September and October, and occasionally to open small plots at other times of the year. While cattle are sometimes hitched to pull carts, this use is declining so animals are mostly idle from December through July. In order to compensate farmers for the daily work required to care for a cow, ways need to be found to make greater use of the animal throughout the year.

Chickens

Chickens are found on most farms in the area. They provide meat and eggs for family consumption, as well as a fairly continuous flow of cash income during the year. Only local breeds are raised and are left to forage for food. Seldom does a farmer purposely feed his chickens in Way Abung.

Many farmers surveyed reported chicken losses in recent years to what appears to be Newcastle Disease. None had heard of a vaccine and inquiries at the district Animal Services Office revealed that none is available in Northern Lampung.

LABOR USE BY FARM FAMILIES

The labor input for raising cows and goats is almost entirely related to feeding (Table 6). Feeding operations are characterized by: 1) simplicity--younger family members can help; 2) a lack of seasonality--a constant labor input is required throughout the year; and 3) a lack of hired or shared labor--all labor is supplied by the family.

Table 6. Estimated Work Hours Per Day Per Animal Required for Cow and Goat Care, Way Abung, Northern Lampung, Sumatra, 1980.

Activity	Cattle	Goat
	(hours/day)	
Cut and carrying feed ^a	1 - 2	2 - 3
Grazing	2 - 4	0
Watering	0.3	0.3
Cleaning pen/carrying manure	0.5	1 - 2 ^b
Washing animal	<u>1</u>	<u>0</u>
TOTAL	3.8-7.8	2.3-5.3

^a Includes labor to and from source of feed.

^b Occurs about two weeks each year.

Family labor availability for livestock husbandry is limited by crop activities during peak seasons, off-farm employment during slack agricultural seasons, and by school attendance for younger family members.

Family Structure

Since animals are cared for entirely by family members, the size and structure of families indicates manpower availability. The demographic characteristics of the transmigrant family differ from traditional Indonesian farm family structure. The demands of clearing land and establishing a home in a resettlement area are well known to farmers before they decide to transmigrate. Given the difficulties to be faced in a new resettlement area, older parents or grandparents are seen as extra mouths to feed, who are unable to contribute significantly to crop production. Similarly, a young couple might feel that their labor alone would be insufficient to do all that is necessary to establish a farm out of the forest. Consequently, few large extended families or young couples live in Way Abung. Nuclear families predominate with the father between the age of 40 and 50--although the wife's age tends to be more variable. Also, it is rare to find other relatives living as part of the household. If children are already married, they have usually established their own homes elsewhere.

In the sample of households interviewed, the average family had 6.3 members. The number of adults⁴ who regularly help with crops and animals averages 3.1 per family, generally consisting of both parents and one older child. Also, the typical household has one child under 15 years of age, but old enough to help outside of school hours.

Crop Activities

The amount of labor used for crop activities depends on the types of crops grown, the amount of land cultivated, and the presence of draft

⁴An adult is defined as anyone over 15 years of age.

animals. As draft cattle continue to be introduced into the area under the various programs, the time needed for land preparation is being dramatically reduced (Table 5).

CRIFC's improved cropping pattern requires almost twice as much labor per year as the farmers' existing cropping pattern. This increase in labor required arises mostly from the second and third plantings--the part of the sequence which farmers seem most reluctant to adopt. Possibly the presence of other short-term employment opportunities or alternate activities, and the uncertain returns from the second and third crops are responsible for the farmers' reluctance to adopt the improved pattern. Most farmers also complain that without pesticides--which are part of the recommended package, but which they cannot afford--peanuts, cowpeas, and rice beans yield poorly.

The economic returns to cropping patterns introduced by CRIFC are consistently higher than the returns to the more common local pattern. However, these introduced patterns are not compared to noncrop activities. In particular, greater consideration must be given to determining whether or not seasonal components of the cropping pattern compares unfavorably in economic terms with other seasonal activities such as home building/repair or wage employment in nearby plantations. It may well be that farmers' existing cropping pattern is the best use of farm labor. This pattern concentrates only on subsistence food production, and leaves the months of February through August relatively free of agricultural activities so that family members can pursue other profitable activities.

Farm families frequently rely on hired or exchange labor to complete crop activities. Hired wage labor (upahan) is primarily employed to harvest cassava and sometimes for land preparation. Several arrangements are available to the farmer. He can either pay piece-work (borongan), for which male workers are typically paid by the kilo of

tubers pulled, or area plowed, or they are contracted for the entire job (tebasan). Women may be hired for weeding, although this is not a common practice.

Only the richer farmers hire labor for the entire job of land preparation. Even an average farmer might hire help for a week or so--especially if he is hurrying to complete the work before the first rains.

Collective labor (gotong royong) is used more often than hired labor. In this system, a farmer and his family will be joined by neighbors to complete a task--usually hoeing, rice planting, or rice harvesting--in exchange for the day's meals and a promise to return the assistance on the others' farms. This practice is most common in rice cultivation when up to twenty women and children arrive for a day to complete the seeding. These laborers have the right to participate in harvesting the crop. Harvesting is usually completed in a day with participants receiving a fixed proportion of the amount of paddy they cut. In Way Abung the harvester's share varies between one-fourth and one-fifth of the crop cut.

Livestock Activities

In contrast to crop activities, labor requirements for livestock are met entirely with family labor. In small families all members tend to share the chores on a rotating basis. As the family grows, there is often a division of labor between the mother, responsible for water, and older children, occasionally joined by their father, for the remaining chores.

If a family is fortunate enough to own a cow, they lavish attention on it. Feeding is done through grazing on fallow land, stubble, or along field and path borders and through the cut-and-carry system. Usually the stable is cleaned daily. Apart from these basic chores, cow owners also wash the animals and tend a stable fire at night.

Caring for goats is much simpler. Goats are kept permanently in a pen near or attached to the house. They are fed once or twice a day on vegetation that has been cut in the neighborhood and watered from the house well. Cleaning the pen is done only once or twice a year with the manure carried directly to the fields.

Farmers rarely own enough animals to permit them to employ their labor most efficiently. Most goat keepers could have additional animals without significantly increasing the labor required for completing the daily chores. For example, a large portion of the time devoted to collecting feed is spent walking to and from the fields, with the bundle carried back to the animals often well below the maximum weight the gatherer could carry. While a larger herd size would require more time spent actually collecting feed, it would not necessarily require more trips to the field.

As the draft cow distribution programs progress it is likely some farmers will sell their goats in order to take better care of their cow. To date, this has not happened, possibly because the farmers initially selected to receive cows tended to be the most industrious, hardest working families. This probably explains why they have been able to maintain, without difficulty, a thriving goat operation along with the new cow operation. For example, at peak work periods of the agricultural season, such as land preparation, planting, and harvesting, the routine animal chores become more difficult to carry out. However, several farmers indicated, that even in the peak seasons they always gave priority to their animals and made sure they were fed before doing any other work. The more serious resource constraint to maintaining both goats and cattle might be feed supply rather than labor.

Off-farm Labor

Off-farm occupations are important activities for many families because of the amount of labor involved and the cash income received. Out of sixty families surveyed, twenty-eight had members who participated in off-farm wage earning activities at some point during the past year. These opportunities fall into three broad categories: 1) day

labor in plantations or cassava processing firms; 2) self-employment; and 3) wage labor on others' farms.

Off-farm employment in nearby commercial agricultural businesses is an important job market for adults and teenagers of both sexes. A major employer in the Tirta Kencana area is PNPX, a quasi-governmental business contracted to establish and maintain 1540 ha of rubber plantation until it comes into production, at which time the farmers will be given 1 ha parcels. Much of the work such as weeding is done by women, usually on a half-day basis. The other major employer is Gunung Madu, a 16,000 ha private sugar plantation and factory located about thirty kms from the two survey villages. Between 4,000 and 6,000 day laborers (mostly from Way Abung) are hired during the cane harvest lasting from June through November. Because of the tiring trip required to get to Gunung Madu, some workers remain there during the week and return to their home on the weekends.

A large number of farmers employ nonfarm skills they acquired in Java. These include blacksmithing, carpentry, brick and tile making, shop keeping, well digging, and massaging. Farmers are generally busier with these activities in the slack agricultural season when they are free of field chores.

Finally, there are also some farmers who work as day-wage laborers on other transmigrants' farms. The demand for this type of work is very erratic and is usually only available in one's own neighborhood during land preparation and cassava harvesting.

MARKETS

Selling livestock--mainly goats and chickens--is an important source of cash income for Way Abung farmers. After cassava, goats and chickens were the second and third source of cash income among the farmers interviewed. The main animal market in the areas serving both Tirta Kencana and Daya Sakti is centrally located in Day Murni. This is a meeting point for middlemen from outside Way Abung who resell purchased animals in urban areas, for local middlemen selling animals acquired in their village, and for farmers both buying and selling

livestock directly. A cattle market has not yet developed as cows were only recently introduced into Way Abung, and calves are currently recycled into the credit program to provide stock to additional farmers and thus do not reach the market.

Goat Marketing

Market structure. Farmers sell goats at either the market in Daya Murni or at the farmgate to a local middleman, usually a neighbor.

If a farmer takes his own goats to the market, it usually requires a morning of work. He leaves early in the morning, traveling to the market on a local truck which charges Rp. 100/person and Rp. 150/goat.

Often the farmer prefers to sell directly to local middlemen in the village who are usually resident farmers who buy and sell goats as a secondary activity. Ordinarily, they sell ten to twenty goats a year, making a commission of about Rp. 500 per head above transport costs. Less frequently, local middlemen buy goats and hold them for fattening. In such a case, they might sell the goat to another local farmers, to a local restaurant, or to the market in Daya Murni. A farmer considers several factors in deciding his marketing strategy such as whether or not he has enough goats to sell to justify the trip; whether he has experience and feels comfortable dealing with strange middlemen in Daya Murni; and whether he has other work to do on the market day. The market in Daya Murni convenes two mornings per week. On a given market day, there are about twenty local middlemen from Way Abung as well as individual farmers selling goats to middlemen from Bandar Jaya, Metro, and Kotabumi.⁵ Less frequently--perhaps once a month--middlemen will

⁵ Kotabumi is 50 km., Bandar Jaya 75 km. and Metro 125 km. from Daya Murni. On a typical day, there are one, one and four middlemen from these towns, respectively.

come from as far as Pagar Alum and Muara Due in South Sumatra, over 300 kms. away.

These urban middlemen are of a different ethnic background than the transmigrants and include Lampungese and Javanese. Several traders are women. These traders typically rent a truck for the day's run to Daya Murni. As the usual truck's capacity is fifteen to twenty goats, this is the normal limit to one middleman's purchases in a single day.

Market Volume. Due to limited data, only a tentative projection of annual sales at the Daya Murni market can be made. Based on an estimate of the daily market volume of 70 head on Tuesdays, 100 head on Fridays and reports from middleman, the annual market volume is approximately 8,800 - 9,500 head. Nearly all of these animals leave the Way Abung area.

Seasonal Price Fluctuation. Prices farmers receive for their goats fluctuate seasonally depending on the agricultural and religious calendars. Prices are lowest during the season of scarcity (paceklik) when food stocks are low and the first corn and rice crops of the growing season have yet to be harvested. This period extends from November through January. Demand is slack and farmers forced to sell to raise cash must accept reduced prices. Market demand starts to strengthen with the beginning of the cassava harvest season, extending from May through September. This is because cassava is generally grown as a cash crop and people plan their expensive social events such as marriages to coincide with this harvest. With cash more readily available and demand for goats stronger, prices rise during these months.

The period June through August is also the time of the coffee harvest in South Sumatra. During this period of higher demand local middlemen are particularly active, bidding up the prices.

As the Islamic calendar is fifteen days shorter than the Gregorian calendar, these feast periods advance each year. However, farmer breeding practices are not yet refined to permit the coordination of breeding calendars to take advantage of variable price patterns. When this becomes feasible, it should pose no problem adopting an appropriate breeding schedule, as goat breeding tends to be aseasonal at tropical latitudes.

Market Participation. In the sample, 65% of all farmers had goats on their farm and 70% of these had sold goats during the previous agricultural year. The average number of goats sold during that year was 2.6 per goat farmer. In Way Abung goats serve as a living bank account for the farmer. Farmers "save" (buy or loan goats) when extra income is available--usually during the harvest period of May through September. Then they "withdraw" (sell goats) when other cash sources disappear and needs arise--usually during the nonharvest months.

The "saving" hypothesis appears to be supported by the survey results. Of the sample of sixty farmers, only 19 acquired goats during the previous agricultural year and of these, only six actually purchased goats. Yet, of the nine goats purchased, eight were bought during the "savings" period.

In contrast, sales of goats during the survey year do not support this hypothesis. Despite the farmers' common response that they usually sold goats when emergencies arose or to buy food during the scarcity season (November-January), 78% of the goat sales reported by farmers interviewed were made between May and September when other cash resources are usually available. Further, goat sales did not occur primarily to meet emergency expenses. Only 26% of sales were made to buy food staples, medicine, or to meet funeral costs. On the other hand, 49% of the sales did raise money for what might be called planned investments such as land purchases, store stock replacement, bicycle

purchases, or land clearing. Thus, farmers generally seem to sell goats during the months of higher prices and to use the cash for planned investment, or for predictable consumption expenses.⁶

Chicken Marketing

The market for chickens is similar to the goat market. Farmers or local middlemen sell fowl at the Daya Murni, on the local market to middlemen from urban areas, or to other farmers from Way Abung. In contrast, the market for eggs is generally limited to the neighborhood.

Chickens are sold by measured weight with stable prices for live and carcass weight. Several informants reported that weighing chickens was a new development in the market that began during the past year, and suggested that the practice might spread to goat sales in the future.

Farmers also use poultry as a means to accumulate savings. In the year of the survey, 40% of the surveyed farmers sold chickens. For these farmers, this source of income followed cassava and goat sales in terms of importance.

Crops Markets

Cassava harvesting practices influences the availability of cassava foliage for animal feed. The largest part of the marketed cassava is harvested from the farmers' main field when it matures in August-September. At this time the farmer frequently sells the entire field at a set price to a middleman (tebasan) who arrives with a truck and crew, pulling the crop in several days. A large quantity of foliage is thus available, though for only a short period, as it can't be stored. A

⁶ Marriage and birth feasts, school cost, home building and repair account for 25% of the sales.

second practice involves the farmer doing the harvesting. This takes longer and is often combined with staggered planting. In this case, the harvest and thus foliage availability for feed is spread out over a longer period. On the other hand, very poor farmers sometimes need money long before the cassava crop reaches maturity. Forced by circumstances, they sell the immature crop to a middleman (ijon) at a low price. The purchaser then waits for the crop to mature before harvesting it. Under this system, the farmer still has access to the foliage upon harvest, but the timing of this is no longer under his control.

Since farmers in Way Abung rarely produce a surplus of corn or rice, marketing of these crops is infrequent. In the rare instance when a farmer sells rice after harvest, he will usually have to repurchase it on the market later in the year at a higher price to provide food for his family.

Input Markets

The commercial market for agricultural inputs such as fertilizer, pesticide, and basic implements is developing slowly. Free market prices are above the level at which the government supply cooperatives (KUD) sell these inputs through its subsidized programs. On the other hand, deliveries through the KUD are unreliable. Most markets in Way Abung have several stores selling crop inputs throughout the year.

Livestock inputs such as feed concentrates, minerals, and medicines are not available in most of Lampung Province. Salt is the only animal input that a farmer might buy. Since farmers consider livestock a low-cash input activity, this perception, as well as the low income level will keep the demand for cash inputs at a very low level for some time to come.

AGRICULTURAL CREDIT

Formal Credit

The governmental agency providing agricultural credit in rural areas is the Bank Rakyat Indonesia (BRI). There are two branches operating in Way Abung, located in Daya Murni and in Panaragan Jaya, which are responsible for servicing approved loan schemes. While new programs can be designed in the district capital in Kotabumi, they must be approved at the national level.

There are two general ways for farmers to obtain credit. One is through programs which integrate the services of the BRI, the KUD (government-sponsored, village-wide farmer cooperatives), and local extension agents such as BIMAS (Mass Guidance), a government agricultural intensification program. In this program, agricultural extension agents recommend cropping patterns, varieties and fertilizer application rates, the KUD supplies fertilizer, seed and insecticide at subsidized prices, and the BRI provides cash credit for hired labor or family needs during the preharvest period. BIMAS is administered by the KUD with the BRI only providing the cash component which averages about Rp. 5000 per participating farmer. The value of the BIMAS package ranges from Rp. 14,750 per ha for cassava, to Rp. 23,890 per ha for corn, and a high of Rp. 32,545 per ha for upland rice.

Credit is also available directly from the BRI for rice production, small commercial activities, poultry projects, and cow purchase. This last program might serve as a model for establishing a credit scheme for goat purchases. The main criteria for identifying credit worthy farmers is that they are responsible and capable. Generally, this is determined on a case-by-case basis, jointly by the village head and the extension agent. Repayment of the loan is made in six month installments over a period of three years, with interest on the outstanding balance charged at a rate of one percent per month.

The impact of agricultural credit in the Way Abung area is limited because only a small number of farmers are involved. In 1976-77, out of

a total of 11,345 farm families in Way Abung, 636 initially families participated in BIMAS's upland rice program. This number declined steadily to 334 families in 1979-80. Farmers reported that BIMAS supplies were often delivered late or never arrived at the KUD. Others reported they felt uncomfortable about accepting credit and preferred to buy agricultural inputs on the private market even at higher prices.

BRI direct credit programs for animals include support for cow purchases and poultry projects. These two credit programs operate only where the Department of Animal Husbandry (Dinas Peternakan) is providing extension services. Currently, its staff is too shorthanded to service Way Abung. As a result, no BRI credit for animals is available to farmers there.

Recently the World Bank provided a loan under which the BRI has been able to expand the cow purchase credit program in Lampung Province. Called the Rural Credit Programme (RCP), it provides participating farmers with a package valued at Rp. 460,000. Of the total amount, Rp. 45,000 is delivered in cash for animal shelter and pasture development and the rest is supplied in kind as two head of cattle. Farmers have eight years to repay the loan, at 10.5% interest per year, with a three year grace period. Packages have already been prepared for a total of 200 farmers in three subdistricts of Northern Lampung, although Way Abung is not included. Unfortunately cow delivery has been delayed because of an increase in the purchase price of cows. The program is expected to expand gradually to include all of Lampung Province.

Formal credit for goat purchases through the BRI is currently unavailable anywhere in Indonesia. Several factors reduce the likelihood of a successful program being established in transmigration areas. First, the animal extension service would be required to provide assistance. At present, the limited staff available is concentrating on cattle projects. Second, farmers would probably be reluctant to use such a credit program. They much prefer receiving goats under gaduhan arrangements from neighbors since this requires no cash repayment and no dependence on strangers.

Informal Credit

Money lending by private sources was prevalent in both of the villages studied. Interest rates are over 15% per month and land certificates (deeds) must be turned over to the money lender as collateral. These are kept if farmers fail to meet their payment schedule. Although no farmers interviewed admitted to having forfeited their land certificates for non-repayment, one respondent estimated that in Tirta Kencana as many as 150 of the 794 farmers had at least temporarily given up their titles. Unfortunately, without this document, farmers cannot qualify for BRI loans.

Informal credit is also beginning to be available on a very modest scale within some farmers' groups (kolompok tani). Several of these in Way Abung have begun borrowing-lending schemes among their members. These systems are operated completely by the farmers without government advice or funds. Most are familiar with the rules, having participated in similar groups in Java. After a year in operation, one group with about twenty members had total assets of over Rp. 100,000 in cash on hand and outstanding debts plus interest (1% per month). The maximum loan allowed per farmer was Rp. 5000 and payments to the pool were made at monthly group meetings.

CONCLUSIONS AND DISCUSSION

Although the clear preference among farmers in Way Abung is for cattle there is considerable potential for increasing the numbers of goats raised in the area. Goat production is a profitable activity for farmers under current practices and many are eager to undertake such an enterprise. Goats have some advantages over cows. Most importantly, their fertility is higher and their mortality lower under the local conditions and feed regimes. Also, once a farmer acquires a cow to provide draft power, goats are an appropriate alternative for expanding animal production for home consumption and cash sales.

The main constraint to raising more goats is poverty and the lack of cash resources. Yet, credit projects to promote goat production

should not necessarily be given high priority. If cash flows on these farms are not increased, any goat project will suffer from the tendency among poor farmers to liquidate their goat holdings when cash is needed. Thus, it is likely that injecting large numbers of goats into Way Abung would have only a short run impact, as many would soon be sold outside of the Way Abung area. In other words, goat projects per se are not necessarily the most effective strategy for increasing farmers welfare. On the other hand, once the cash flow on these farms is increased, the farmers could, without any assistance, invest in goats to increase their herd size to the level that best uses their available resources. Under current plans, cash flows will be increasing on Way Abung farms during the next several years as clove, fruit trees, and rubber plantations come into production. As a result farmers will have cash resources available to invest in goats.

Presently, livestock projects which seem more appropriate than goat projects are:

- 1) Vaccination of poultry against Newcastle Disease. Current losses to this disease are high, both in number and terms of cash value. Vaccination is simple, and the low cost could be recoverable through a minimal user fee. Such a program would best be implemented by the Dinas Peternakan extension staff. Establishing this program would require convincing them of the value of a vaccination program for village chickens when their current poultry programs are restricted to exotic breeds and medium sized flocks.
- 2) Increasing cattle use in the slack agricultural season. Although options are limited, one potentially high payoff program would be to introduce technology which uses cattle to power water lifting devices designed for large-bore shallow wells. This seems feasible because local carpenters and blacksmiths could manufacture and repair the necessary gears and water lifting components and wells can be easily dug to the shallow water table. The irrigation water could be used for dry season rice or vegetable production, both of which would significantly increase farm incomes. One Way Abung farmer double cropping 800 m² of irrigated rice produced an annual harvest greater than the average output for nearby upland plots of one hectare.

Goat projects which might be initiated are:

- 1) Introduction of improved male breeding stock. The introduction of males will generally benefit a whole neighborhood. Consequently, an individual farmer will be reluctant to incur the cost of maintaining a male and repaying the loan. Yet, bucks could be provided on credit with repayment preferably being, as with gaduhan, in kind, or in cash if this is administratively easier to organize. An alternative approach would be to work through farmers' groups. Because these units are generally cohesive and progressive, they are an ideal working group for an animal distribution program because the demonstration effect would be greatest and best use of the animals ensured. However, the benefits of such a program may be limited, as attempts to upgrade the local stock might have little effect on animal performance unless an adequate supply of adequate quality feed is available.
- 2) Large scale animal credit program for providing female breeding stock. This strategy follows the existing cattle program model and might be designed to absorb the local personnel and cattle holding points when the project terminates in 1982. Ideally, the credit terms should be similar to the present gaduhan system for goats. The appeal of this project might increase if it were designed so animals returned as repayment of the original credit were used to establish similar goat credit programs in nearby transmigration programs. In addition, it would have a more rapid impact on farmers' welfare, compared to, for example, introducing males. Also, it would likely draw into the program government support. Finally, it would direct farmers towards a feasible mixed farming option that would be more likely to succeed than expanded cattle production, since the recently introduced cattle appear to have low fertility under local conditions. On the other hand, the introduction of female breeding stock has some disadvantages. Such a program may have limited long run impact unless ways are found to increase farmers welfare to the point where they no longer need to periodically sell their breeding stock to meet cash needs. Also, substantial resources would be required initially to purchase the animals, as well as to provide personnel to supervise the

administration of the credit repayment scheme and technical support to the farmers.

- 3) A BRI credit program to enable individual farmers to buy goats. Under this alternative, the credit extended and repayment would be in cash. This scheme has the advantage of being simple, relatively inexpensive to undertake, and would utilize current institutions. Yet, farmers are reluctant to take out loans from BRI, as indicated by the decline in BIMAS participation and farmers' comments. Also, the BRI would probably not allow a farmer to obtain a loan for goats and then give these animals to another farmer under a gaduhan arrangement. This latter possibility is an option that better off farmers would normally follow, one which makes better use of available feed resources, and which would spread the social benefits of the program. Also, this program would require substantial coordination between government agencies (CRI, Dinas Peternakan) which would require a policy decision at a fairly high level in the national government. Finally, it is possible that Way Abung is not the best place to initiate such a program as the need and feasibility may be greater elsewhere.

Any goat project in the Way Abung area must have a research component to investigate means to increase production of high quality fodder on small farms. Efforts should focus on intensifying use of land not normally put under crops, including road sides, path borders, and field edges. Also, additional feed may come from greater use of multi-function legume trees especially if considered along with intensified use of home plots for fodder production. The goal of the research would be to test a range of grass and legume fodder crops under local conditions to determine production potential, optimal management practices, and ease in incorporating these into the farming system.