PN-ACA-607
94013

Final Research Reports from Nutrition Small Grants 1992 - 1993

Working Paper No. 167, July 1996

Small Ruminant Collaborative Research Support Program

Installation for Research and Assessment
of Agricultural Technology, Sungai Putih,
PO Box 1, Galang, North Sumatra, Indonesia

Editor's Note

In 1992 - 1993 the Small Ruminant Collaborative Research Support Program awarded small grants to researchers for projects to be conducted by the scientists at their home institution. Included in this working paper are the final reports of four such grants. Final papers from two other grants were presented as posters and are included in the proceedings of the SR-CRSP workshop titled "Small Ruminant Production: Recommendations for Southeast Asia" held May 12 - 15, 1996 in Parapat, North Sumatra. The four papers published here are presented as received, with no editting. Thus, readers may come across some errors. It was felt that this information should be presented even though there was no chance to revise or edit these documents.

Included in this working paper are:

1. I. Made Mastika and Manika Wodzicka-Tomaszewska. The importance of energy and protein supplementation in Indonesian goats.

2. T. Abd. Latief, C.L. Johana and M. Djuddin. Cocoa residues as a feed supplement for goats.

3. Mukh Arifin, Eddy Riyanto, Sularno DS., Sutopo and Sri Mawati. The response of goats grazed on the garbage disposal areas in Semarang city to the protein supplementation and deworming.

4. F.A. Moog. Integration of sheep in smallholder plantations.

The small grants published in the conference proceedings as described above are:

1. Elizabeth Wina and Budi Tangendjaja. Protected fat supplementation for pregnant and lactating ewes.

2. Tanda Sahat Panjaitan, E. Budisantoso and A. Bamualim. Improving growth and reproduction of local goats on dry land in Timor by supplementation with Sesbania (*Sesbania grandiflora*) and palm pith (*Corypha gebanga*).

THE IMPORTANCE OF ENERGY AND PROTEIN SUPPLEMENTATION IN INDONESIAN GOATS

I Made Mastika and Manika Wodzicka-Tomaszewska
Faculty of Animal Science, Udayana University and Indonesia Australia Eastern Universities Project, Denpasar, Bali, Indonesia

Introduction

The significant reduction of grazing land in many areas of Indonesia (e.g. Java, Bali, Madura) has led to changes in goat husbandry systems from extensive to intensive with the animals being confined to barns and handfed by farmers. Usually, the ration is provided solely or mainly by cut grass grown on roadsides, sides of cropfields or from the aftermath of crops. However, grasses in the tropics have low digestibility (due to high lignin content) with low protein content, resulting in low productivity.

Preston and Leng (1987) found that productivity of ruminants can be increased by provision of non-protein nitrogen (NPN) which greatly improves the efficiency of rumen microorganisms making more microbial protein available to the animal. If, in addition, some bypass protein is provided, production can be increased further.

In the tropics, NPN can be supplied by molasses-urea blocks (MUB). *Gliricidia* is a readily available tree legume growing in many areas of Indonesia with soluble protein. Fishmeal on the other hand is a source of partly bypass protein. In a previous experiment, Wodzicka-Tomaszewska and Mastika (1993) found that feeding of MUB did not result in significantly greater growth rate of Etawah-cross does, but the supplemented group reached puberty earlier and kidded earlier.

In these experiments , we investigated further the effects of supplying NPN, a soluble and readily available protein source and a bypass protein on growth and puberty of prepuberal Etawah-cross does.

Materials and Methods

Forty-eight Etawah-cross does with an average bodyweight of 10.4 kg and approximately four months old were allocated into four experimental treatments, randomization being restricted by bodyweight. They were kept in groups of four in pens and group-fed. The treatments were as follows:

A- fed cut grass only *ad libitum;*
B- as for A, but in addition fed MUB *ad libitum;*
C-as for B, but in addition fed 625g *gliricidia*/goat/day;
D- fed *grass ad libitum,* 625 g *gliricidia* plus a 50:50 mixture of fishmeal: MUB (FMB/MUB) . Water was provided to all goats *ad libitum.*

Table 1 Composition of MUB.

	%
Molasses	46
Urea	6
Rice bran	25
Coconut meal	10
Vitamins and minerals	2
Salt	5
CaO	6

Table 1 shows the composition of MUB.

Grass and *gliricidia* were fed at approximately 8 am and 4 pm; MUB and FMB/MUB were added if necessary at the 4 pm feed. Residues were collected before the morning feed.

The does were weighed weekly and oestrus was checked daily with two bucks.

Results and Discussion

Fig. 1 shows mean bodyweights (kg) as well as mean grass, MUB and FMB/MUB intakes (g) as well as the water intakes (ml) of the four treatment groups. The bodyweights of treatments C and D were significantly higher than those of A and B; the mean gains were 2.6 kg for A; 3.7 kg for B; 5.3 kg for C and 5.0 for D. Grass intakes were not significantly different between treatments, nor were water intakes which were variable but averaged 50 to 100 ml /goat /day. *Gliricidia* was eaten within 30 minutes of being fed.

The intakes of MUB were below 50g/goat/day during the first eight weeks and increased to above 120g. The intakes of MUB/FMB increased even more slowly to above 120g/goat/day. The slow acceptance of the two blocks reduces their usefulness. Maybe, having a "teacher" goat in each group, i.e. goats already eating the blocks, would probably mean earlier acceptance of the supplements by other animals.

Records of oestrus are incomplete and will be given when data are complete, as will be the costs of the different rations.

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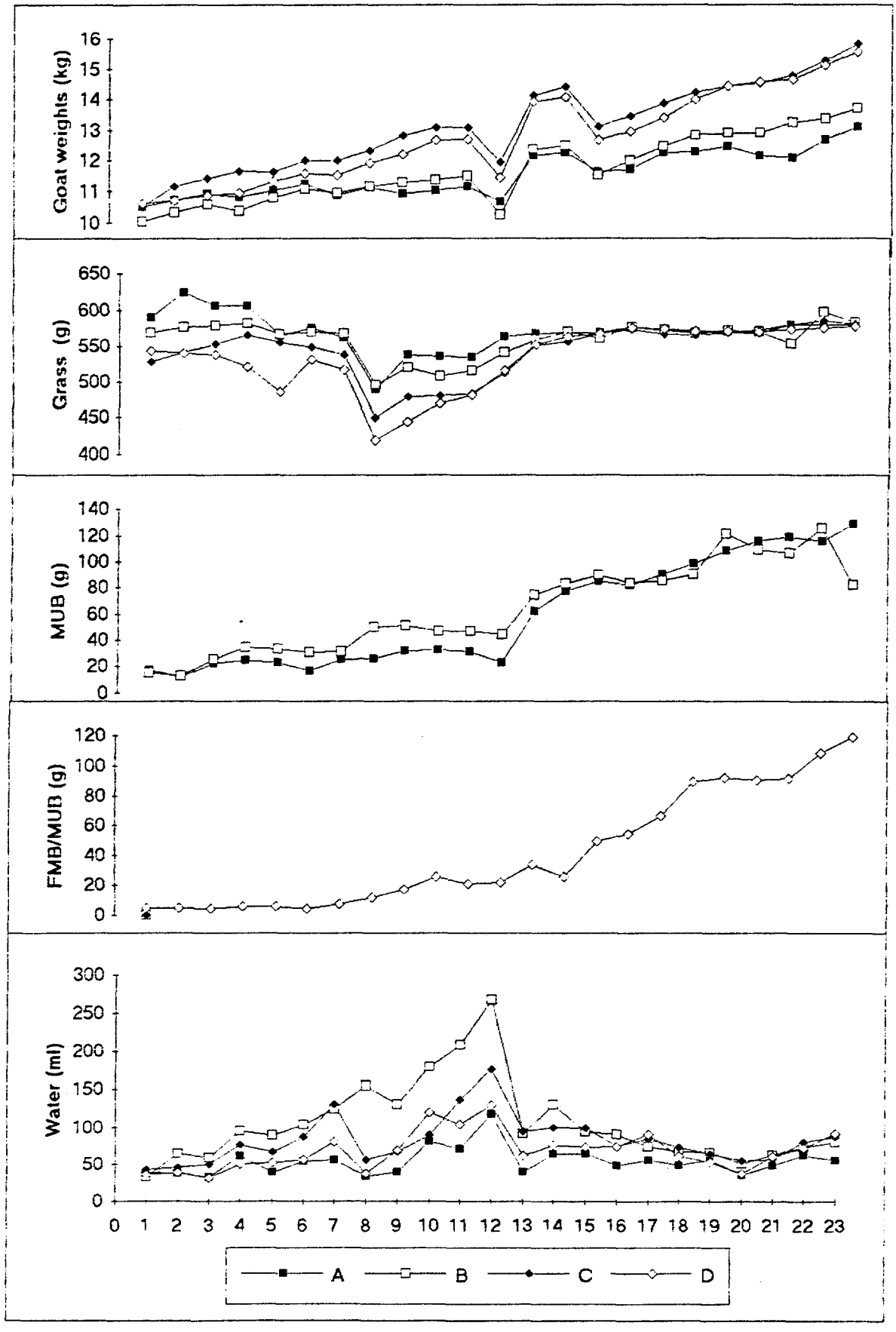

Fig. 1 Mean body weights (kg), grass, MUB and FMB/MUB intakes (g); water intake (ml) /goat/day

Final Report

COCOA RESIDUES AS A FEED SUPPLEMENT FOR GOATS

By:

Abd. Latief, T, Johana, C.L. and Djuddin, M.

A research supported by:

Small Ruminant Collaborative Research Support Program

FACULTY OF ANIMAL HUSBANDRY

HASANUDDIN UNIVERSITY

UJUNG PANDANG

1994

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COCOA RESIDUES AS A FEED SUPPLEMENT FOR GOATS

Abd. Latief, T, Johana, C.L. and Djuddin, M.:
Fac. of Animal Science, Hasanuddin University, Ujung Pandang, 90245.

SUMMARY

Cocoa leaf as a crop residues is abundantly available in South Sulawesi. This experiment investigated the effects of this residue on feed consumption and body weight in goats. Three groups of 10 young female Kacang goats were used. Each group of animals was randomly alloted to each of the three treatments, respectively; fresh cocoa leaf (CL), natural grasses (NG) and combination of CL and NG. These feeds were offered ad lib. All animals were also supplemented at 200 g/head/day with a mixture of rice bran, coconut meal, Molasses, Mineral mix and salt. Feed intake was recorded daily and body weight were measured weekly. Estrus were detected daily by using an intact buck. Serum samples from the animals in CL and NG groups were collected. The samples were analyzed for protein and minerals (Ca, P, Mg, Se and Cu).

Dry matter intake of cocoa leaf in the CL group was significantly ($P<0.01$) lower compared to that of natural grasses in the NG group or that of its combination in CL + NG group (57.34 vs 84.80 and 79.76 g/kgBW $^{0.75}$). Mean body weight of goats in Cl group was significantly higher compared to that of two other groups (115 vs 103 and 94 g/week). In the CL group 5 out of 8 animals died. This mortality rate was higher than in the two other groups (only 2 out of 8 in each group). Protein levels of the blood in the two groups of goat were similar (7.86 vs 7.69 gr %). Among the minerals measured, P level in the goats consumed cocoa leaf was significantly lower compared with the goats consuming natural grasses (1.7 vs 3.1 mg/dl).

It was concluded that although fresh cocoa leaf contains a high level of protein and can increase body weight of goats, the use of this crop residue resulted in lower dry matter intake and tended to increase the mortality rate. Further efforts are needed to evaluate the advances utilization this crop residue as an animal feed, such as upgrading it through the physical and/or chemical processes.

INTRODUCTION

The shortage of feed resources for farm animals, especially during the dry season, is a major constraint to animal production in South Sulawesi, Indonesia. Non-conventional feeds, such as crop residues, are one of the alternative that might re duce this problem.

Cocoa plantation have been developed rapidly in South Sulawesi. The Regional Office of the Agricultural Department reported that the cocoa plantation area in this region during the year of 1992 was 99.817 ha; an increase of more than 60 % compared to that of 1989. Cocoa leaf is an abundantly available by-product of these plantations. Siregar et al (1989) have calculated that there are 1680 trees of cocoa/ha and each tree produces leaf as a residue of 0,1 kg every 2 weeks. Therefore, 1 ha of cocoa plantation can produce about 1 ton of cocoa leaf dry matter per year.

Both the nutrient composition and the effects of this residue on the performance of animals have not yet been well reported. Protein level of this residue is extreemely higher in compared to that of natural grasses. NRC of goats (1981) recomended the total protein intake that needed for promoting growth of 0,284 g/g gain.Cocoa pods have been reported to have crude fibre and protein of 20-45 and 6-8 %, respectively (Smith, 1992).

This experiment was carried out to evaluate the effects of cocoa leaf on feed consumption and body weight in goats.

MATERIALS AND METHODS

The experiment was conducted at Kabupaten Luwu (about 400 km nothern Ujung Pandang); the biggest cocoa plantation area in South Sulawesi.

Three groups of 10 young female Kacang goats with a mean body weight of 8.33 kg, aged 3-4 months were used. Each group of animals was randomly alloted to each of the three treatments, respectively; fresh cocoa leaf (CL), natural grasses (NG) and

combination of CL and NG. These feeds were offered ad lib. Nutrient composition of the cocoa leaf and natural grasses are shown in Table 1. All the animals were also supplemented with 200 g/head/day of a mixture which consist of rice bran 86 %, coconut meal 10 %, Molasses 2 %, Mineral mix 1 % and salt 1 %.

During the experimental period, the animals were kept in a raised barn and provided water ad lib. Feed intake was recorded daily and body weights were measured weekly. At the fourth month of the experimental period, serum samples of 5 animals, respectively from CL and NG groups were collected. The samples were analyzed for protein and minerals (Ca, P, Mg, Se, and Cu).

The effects of treatments were analysed by analysis of variance and the difference between the mean of treatment were analyzed by Students' t-test (Snedecor and Cochran, 1980).

Table 1: Nutrient composition of cocoa leaf and natural grasses

Nutrients	Cocoa leaf	Natural grasses	Feed supplement
	.....	%	.....
- Dry matter	29.5	22.76	10.76
- Crude protein	15.09	8.38	7.21
- F a t	6.86	4.22	2.36
- Crude fibre	32.83	28.52	36.31
- Nitrogen-free extract	36.67	49.89	34.45
- A s h	8.55	8.99	19.67
- Ca	0.73	0.21	0.13
- P	0.31	0.32	1.10

Lab. of Animal Nutrition, Fac. Animal Husbandry, Hasanuddin University, Ujung Pandang

RESULTS

During the adaptation period (2 weeks), 2 animals in each group failed to adapt to the new environment. Therefore, the number of animals in each treatment was reduced to 8.

- Feed intake

Dry matter intake of cocoa leaf, natural grasses and its combination are shown in Fig. 1.

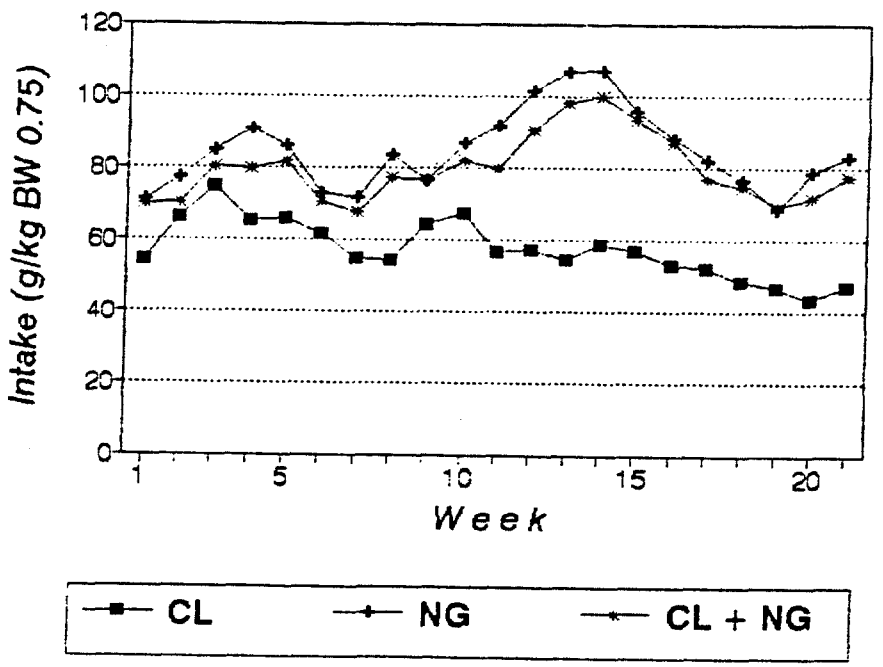

Fig. 1: Total dry matter intake (g/kg $BW^{0.75}$) of CL, NG and (CL + NG) groups during the experimental period.

During the experimental period, total dry matter intake of cocoa leaf (CL) was significantly ($P<0.01$) lower compared to that of both natural grasses (NG) and CL + NG (57.34±7.7 vs 84.80±10.7 and 79.76±9.1 g/kg $BW^{0.75}$). In the CL + NG group the intake of cocoa leaf was 33.8±8.98 % of the total intake). There was no difference between the NG and CL + NG groups.

- Body weight

Mean body weights during the experimental period are shown in Fig. 2.

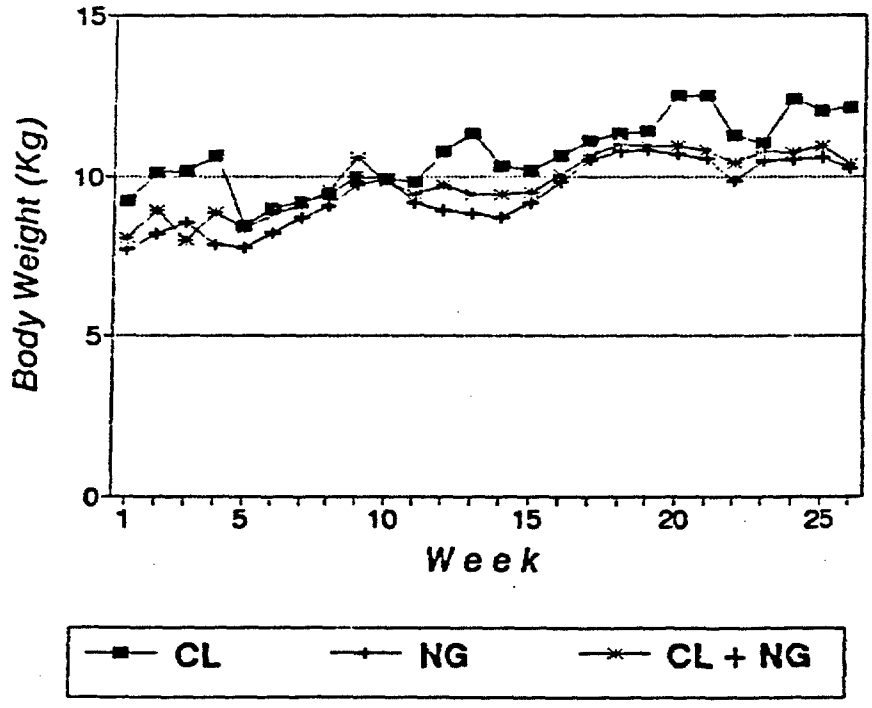

Fig. 2: Mean body weight in goats consumed cocoa leaf (CL), natural grasses (NG) and CL + NG during the experimental period.

Mean body weight of goats consuming cocoa leaf were significantly higher compared to those of the two other groups (10.66 vs 9.43 and 9.82 kg). The mean weekly gains in the three groups were 115, 103 and 94 gram, respectively for the CL, NG and CL + NG groups.

- Mortality rate

During the experimental period, 5 out of the 8 animals in the CL group dead. The mortality of this group was higher compared to the two other groups (only 2 out of 8 in each group).

- Levels of protein and minerals in the blood

Levels of protein and minerals in the blood for CL and NG groups are shown in Table 2.

Table 2: Levels of protein[a] and minerals[b] in the blood of goats consumed cocoa leaf (CL) and natural grasses (NG).

Serum content		Consumption	
		Cocoa leaf	natural grasses
- Protein	(gr %)	7.86	7.69
- P	(mg/dl)	1.7	3.1*
- Ca	(mg/dl)	7.07	6.98
- Mg	(mg/dl)	6.06	6.28
- Cu	(ug/ml)	0.80	0.75
- Se	(ug/ml)	0.22	0.20

a: Lab. of Medical Center, Ujung Pandang
b: Lab. Agricultural Research Center, Maros.
*: $P<0.05$

Protein levels in the blood of the two groups of goats were relatively similar (7.86 vs 7.69 gr %). Among the minerals measured, P concentrations in the blood of goats consuming cocoa leaf were significantly lower ($P<0.05$) compared to those in goats consuming natural grasses (1.7 vs 3.1 mg/dl).

DISCUSSION

Using cocoa leaf as the sole feed for goats cannot be recomended. Although the mean body weight gains of goats fed cocoa leaf only were greater than those fed natural grasses or grass + cocoa leaf, there was a significant reduction in dry matter intake and or unacceptable increase in mortality rate. The reason for these problems is not yet known.

Lu and Rubino (1992) have stated that lower digestible energy and protein to energy ratios in the diets of goats contributs to lower intake. Therefore, cocoa leaf as a sole diet might require improvement through physical and chemical means to increase its feed value.

The high mortality rate among goats fed cocoa leaf as a sole diet might be due high levels of poisonous substances such as theobromine or it might be related to a nutrient imbalance. the P levels in cocoa leaf were similar to those in natural grasses (0.32 vs 0.31 %), and yet the P levels in the serum of goats consuming cocoa leaf were significantly lower than those consuming natural grasses (1.7 vs 3.1 mg/dl). Level of P in the two groups of goats found in this experiment were lower than that reported in cattle (5.4 mg/dl) and buffalo (5.2 mg/dl) in South Sulawesi (Prabowo et al., 1990). The critical level of P in blood is <4.5 mg/dl (McDowel, 1985).

Surprisingly, despite the apparent feed potential of cocoa leaf, goats supplemented with cocoa leaf <u>ad lib</u> did not perform better than goats on natural grasses. Further research is needed

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to understand this (including protein digestability and toxic factors) as well as to evaluate the advanced utilization of this crop residue as an animal feed, such as upgrading it through the phisical and/or chemical processes.

ACKNOWLEDGEMENT

This experiment was funded by the Small Ruminant Collborative Reseach Support Program. Technical assistent by Al Akhmad, Ramadhan and Marli.

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THE RESPOSE OF GOATS GRAZED ON THE GARBAGE DISPOSAL AREAS IN SEMARANG CITY TO THE PROTEIN SUPPLEMENTATION AND DEWORMING

By :
Mukh Arifin, Eddy Riyanto,
Sularno DS., Sutopo, and Sri Mawati

FACULTY OF ANIMAL SCIENCE, DIPONEGORO UNIVERSITY
SEMARANG
1994

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THE RESPONSE OF GOATS GRAZED ON THE GARBAGE DISPOSAL AREAS IN SEMARANG CITY TO PROTEIN SUPPLEMENTATION AND DEWORMING

Mukh Arifin, Eddy Riyanto,
Sularno, DS, Sutopo and Sri Mawati

ABSTRACT

Forty eight, 4-6 months old goats grazed on the garbage disposal areas were used in an on farm research. Their body weight gain and benefit-cost ratio responses to protein supplementation and deworming were examined. The animals were subjected to 2x2 factorial in completely randomized design, involving 2 levels protein supplementation and 2 levels deworming application.

Protein supplementation x deworming application interaction significantly ($P<0.05$) influenced their body weight gain and benefit-cost ratio. Deworming application significantly ($P<0.01$) improved the body weight gain and benefit cost-ratio of non-protein supplemented goats, while protein supplementation significantly ($P<0.01$) reduced the benefit-cost ratio of dewormed goats.

INTRODUCTION

Goats grazed on the waste or garbage disposal areas is usual practice of goat raisers in Semarang city. There are at least 19 permanent and temporary garbage disposal areas in this city, of which many goats are allowed to graze. Approximately 10 to 15 households are rearing goats in each of the garbage disposal areas. One household keep around 4 to 35 goats (Harsojo, et al., 1990). This type of goat rearing was established by some marginal people as their additional income and saving. Although there is no study about the contribution of this system on increasing the total household income yet, this system might

contribute large enough to the people who do not have any good job in the big city like in Semarang.

Technically, goats grazed in the domestic garbage disposal areas are having poor condition. They subsist on organic material coming from the garbage. As a consequence of the unhygienic feeds, the animals suffer from endoparasites infestation and nutrient deficiencies which lead to poor production.

Although the grazed system are said to augment the income of the marginal people, no scientific recommendations are established to improve their productivity.

MATERIAL AND METHODS

1. Location and Duration

The study was an on-farm research carried out at the marginal community of Semarang City. The city has a tropical humid climate. It is approximately located at 615 ^{o}N latitude and 110°E longitude.

The experiment started on April 15, 1993 and terminated on August 1993. The experimental period totaled to 134 days including 25 days of preliminary survey and 15 days of preliminary treatment.

2. Experimental Animals and Design.

Forty eight, 4 to 6 months old goats with 8.32 $\pm$ 0.79 kg body weight were used in this study. The animals were composed of 24 males and 24 females. A 2 x 2 factorial in randomized Design (CRD) with two levels concentrate supplementation and two levels deworming application was used. Each treatment combination had 12

replications. The factors compared are : (1) concentrate supplementation, (2) non supplementation, (3) deworming application, and (4) undewormed.

3. Feed and Feeding.

The ration composed of : 43.5% rice bran, 16.5% ketchup meal, 30% copra meal and 10% soya bean meal. Its contained 20% crude protein.

The protein supplement was offered in the morning before the animals were grazed. Regarding with the feeding animals, this protein supplement were provided with bags ration for each animal raisers weekly containing the based on the 1% of each animal body weights. The amount of rations offered were adjusted based on their body weight.

4. Deworming and Feces Analyses.

"Rintal Boli" deworming drug is used orally in treatment animals. This deworming was carried out during the initial period of the experiment. Feces samples for egg worm analyses were taken intra-rectally from all of the experimental animals. The samples were taken one week after deworming application and were analyzed in the Laboratorium Keswan Type B in Semarang. Five of the dewormed goats were still found infested, hence retreated. Their feces were analyzed on the second week of the experimental period.

5. Data and Statistical Analyses.

Analyses of variance (ANOVA) was used to analyze the effect of the protein supplementation and deworming application on the total body weight gain and the benefit cost ratio (Gomez and Gomez, 1984). The total body weight gain parameter was taken

from the difference of the body weight at the end of the experimental period and the body weight at the initial treatment. Benefit-cost ratio was computed as the ratio between an estimate price of goats at the end of the experimental period and the total of the estimate price at their initial body weight and its operational costs for feed supplementation and deworming application (Gittinger, 1982; Amir and Knipscheer, 1989).

RESULTS AND DISCUSSIONS

1. Endoparasite Problems.

Goat production in the garbage disposal area grassing system is concentrated in small-holder farms. These goats are reared under a poor condition due to the nutrient unavailability and unhealthful environment. In this system, the endoparasite infestation is becoming a major problem in improving their productivity. Egg worm analysis from the feces taken during the 1-st week of the experimental period indicated that 92% of the undewormed goats are positively infested by various intestinal worms. Among the infested goats, 91% goats are lightly infested and only 9% goats are moderately infested. It was also found that at least 11 species of endoparasites infested the goats that grassed in the garbage disposal areas in Semarang. Among the endoparasite found, the *Paramphistomum sp.* and *Strongiloides sp.* are found dominant in the goat feces (see Table 1.).

The internal parasites have a wide range of effect on goats. These include reduced appetite and lower feed intake, anemia due to the loss of blood plasma proteins into the gastro intestinal tract, disturbances in protein metabolism, depressed mineral metabolism and some intestinal enzymes (Wodzika-Tomaszewska et al.,1993). The predominant endoparasites found in the goat that

grazed on the garbage disposal areas are classified as a lesser to unimportant parasites. Walken and Banks (1986) indicated that *Strongiloides sp.* is commonly infested goats and sheep, whereas *Paramphistemum sp.* are not considered to be important. *Oesophagustomum* and *Trichostongylus* are considered to be very important parasites of goats. These parasites cause depression of appetite, reduce growth rate, and cause diarrhea and dehydration (Sani et al. 1986). The two former species found were confirmed to cause 25 cases of diarrhea and dehydration that suffered non experimental animal during the experimental period. According to the farmers these cases occurred for a long time reducing goats production. Although these data were obtained from the non experimental animals, it gave enough proof that those parasites reduced goats production on animals grazed on the garbage disposal area system.

Table 1. Endoparasites Identification from Feces Egg Worm Analyses

No.	Species	Number of Infested Goats (Heads)
1.	*Paramphistomum*	4
2.	*Strongiloides*	4
3.	*Oesophagustomum*	3
4.	*Chabertia*	3
5.	*Dicrocallium*	3
6.	*Trichostrongilus*	2
7.	*Ostertagia*	1
8.	*Bunostomum*	1
9.	*Trichuris*	1
10.	*Gongylonema*	1

2. Body Weight Gain and Benefit-Cost Ratio

The protein supplementation and deworming application interaction were significantly influenced the body weight gain ($P<0.05$) and the benefit-cost ratio ($P<0.01$) of goats grazed on the garbage disposal area. The average body weight gain of goats fed with protein supplement was not affected ($P>0.05$) by deworming application. Contrary to the average body weight gain the non supplemented goats were increased ($P<0.01$) by deworming application. However, different phenomenon on the benefit-cost ratio was found in this study. The deworming application did not improve the average body weight gain of the goats which reduced ($P<0.01$) the benefit-cost ratio. In the other hand, deworming application improved the average body weight gain of non protein supplemented goats ($P<0.01$) and improved their benefit-cost ratio (Table 2.).

Table 2. Body Weight Gain (BWG) and Benefit-Cost Ratio (BC-Ratio) of Some Treatment Combination Goats

Treatments		Means BWG (kg)	Means BC-ratio
Deworming	Protein Suppl.		
With	Supplemented	6.13^a	1.33^a
	Not Supplemented	6.54^a	1.62^b
Without	Supplemented	4.87^a	1.22^a
	Not Supplemented	2.38^b	1.18^a

The high total body weight gain on dewormed goats might be been due to the improved health condition caused by this application. This condition was confirmed by the data obtained from feces egg worm analyses among the goats grazed on the garbage disposal areas which indicated common worm infestation cases. A better health condition due to improved appetite resulted from deworming application.

Aside from the health condition, the goats production is depended on the availability of the nutrient on their consumed feeds (NRC, 1981). Protein supplementation in this study was not adequate to influence the total body weight gain of dewormed goats. The contrasting phenomenon might be due to the high nutritional value of the garbage, since this garbage is dominated by the domestic wastes. Based on the DK3 Semarang study in 1988, the organic matter content of this garbage is about 65%, but considering the low body weight gain of non protein supplemented and non dewormed goats, it can be concluded that although the domestic garbage were rich in organic matter, these materials were worm contaminated. However, although those goats naturally have a specific feeding behavior that relish browse and tree leaves (Devendra, 1989), but it can be inferred that under the garbage based grazing system they were already adapted to eat everything available on their grazing areas.

In term of economic consideration, the 20% crude protein feed supplementation based on the 1% of the body weight gain did not improve the benefit-cost ratio of goats which grazed on the garbage disposal areas. On the other hand, deworming application was found to be very effective in improving the benefit-cost ratio of animals without protein supplement. It can also be inferred that increased body weight gain due to protein supplementation was not compensated by the received benefit.

CONCLUSION

Deworming application is an effective treatment in improving productivity of goats grazed in the garbage disposal areas in Semarang City.

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INTEGRATION OF SHEEP IN SMALLHOLDER PLANTATIONS

SUMMARY

A sheep grazing experiment was laid out in four smallholder coffee-based plantations. Initial results indicate the role of sheep in mowing down the weeds vegetation underneath, saving cost of labor for weeding. Poor lamb production (lambing) was observed due to mortalities caused by preying dogs and diarrhea. Where there are stray dogs, introducing and raising sheep by grazing should be avoided. Overgrazing occured due to high stocking rates used in the trial. Farmers involved resorted to gathering of Gliricidia, banana leaves and other biomass to augment feed shortage.

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PROGRESS REPORT

TITLE : **Integration of sheep in smallholder plantations**

Researcher : F.A. Moog

Period Covered: August 1993 to June 1994

RATIONALE:

With small landholdings in the villages and the absence of necessity to raise draft cattle and buffaloes in smallholder plantations the potential of integrating small ruminants remains high. In addition, with smaller animals, farmers could raise more in terms of number which are easier to sell.

Initial experiences in Sta. Cruz, Laguna (Philippines) with IDRC "Small ruminants-coconut systems project" indicate that sheep is more compatible and preferred by farmers under coconuts because they are less destructive to intercropped tree and food crops.

In addition they are easier to handle and more adapted to local conditions with lower mortalities. However, traditional goat meat eaters prefer goat's meat than that of sheep. But some people who had tasted sheep's meat said it is better, being more juicy and tender.

Landholding in the study site is small with 70% of the farmers owning one hectare or less, 18% with 2 hectares or below and only a few owns more than 3 hectares. In this area some farmers even utilized hired labor just to trim the weed which are composed of *Imperata, Paspalum conjugatum* and *Axonopus compressus* and in black pepper plantations where *Gliricidia* is used as support fodder from the trees are cut just to decomposed. With

these feed resources available sheep could be grazed with less or no damage at all to the crops saving costs of weeding and provide additional income.

OBJECTIVES:

1. To demonstrate the potential of integrating sheep in smallholder plantations.
2. To determine the benefits derived from integration of sheep in smallholder plantations.
3. To compare crop productions and income from grazed and ungrazed plantations.
4. To generate interest or raising sheep among smallhold plantation farmers.

METHODOLOGY

Experimental Site and Area

Four cooperator farms each representing different plantation systems were selected, fenced and stocked with sheep in village Galamay-Amo, San Jose, Batangas as follows:

Plantation (Farm)	Area (ha)	Stock
A - Coffee alone	1.0	15 ewes + 1 ram
B - Coffee + banana	0.5	5 ewes + 1 ram
C - Coffee + banana + lansones	0.25	10 ewes + 1 ram
D - Coffee (0.2 ha) with Black pepper + Citrus (0.3 ha) in adjacent area	0.5	10 ewes + 1 ram

Herbage Sampling

Standing biomass (fresh basis) were taken in August 1993 before grazing each plantation. Subsequent samplings

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were done in November 1993 and in February 1994. Four 1 m^2 quadrats were taken from each farm per sampling date.

Sheep production and mortalities

Data on lambing and mortalities were recorded as they occurred.

Economic benefits

Savings on labor for weeding each plantations were recorded based on 1992 actual costs of weeding.

Documentation

Photographs were taken periodically to monitor physical changes and ongoing farmers activities relevant to the study.

RESULTS

Fresh herbage yield (standing biomass)

Standing biomass varies in the four plantations.

Biomass available is reduced by grazing and declined during the dry season (Table 1). Pastures in all farms were overgrazed in May, that's why no sampling was done.

Table 1. Periodic fresh herbage yield (standing biomass, g/mo) from four plantations.

Plantation		1993 Aug	1993 Nov	1994 Feb
Farm	A	365	155	47
	B	200	80	12
	C	640	322	197
	D	408	268	59

Due to overgrazing, all farmers gathered Gliricidia and banana leaves and other fresh biomass outside the grazing areas. In Farm C (with the smallest area), sheep had access to feed droppings from a poultry growing house.

Botanical composition of pasture

Botanical composition of pastures at the four different farms is shown in Table 2.

Table 2. Periodic botanical composition of pastures by farm

Plantation/Species	1993 Aug[1]	1993 Nov	1994 Feb
Farm A			
Grasses	30.4	12.9	-
Legumes	8.2	-	-
Broadleaves	6.2	87.1	100.0
Farm B			
Grasses	50.5	33.8	25.0
Legumes	-	-	-
Broadleaves	49.5	66.2	75.0
Farm C			
Grasses	53.1	33.2	22.8
Legumes	0.47	1.6	1.0
Broadleaves	46.4	65.2	76.1
Farm D			
Grasses	433.6	26.9	22.0
Legumes	10.8	10.4	-
Broadleaves	45.6	62.7	78.0

[1]Before grazing

In general, the broadleaves followed by the grasses dominate the pastures. Before grazing the grass components

composed of *Axonopus compressus* *Paspalum conjugatum* and *Imperata cylindrica*, either singly or in combination had higher proportions but as grazing progresses they declined and the unpalatable broadleaves, particularly *Ageratum conyzoides* dominates. Legume component in the pasture is very small.

Lamb production

Lambing started in February 1994. A total of 14 lambs was already produced (Table 3) but a majority of them died.

Table 3. Number of ewes that lambed (February to June 1994).

Plantation	Ewes that Lamb (No.)[1]
A	9
B	1
C	3
D	1

[1] One lamb per ewe.

Mortality

Table 4 shows that dogbites and diarrhea are the causes of mortality in the project particulalrly for Farm C and D. Dogs are common pets of every households. In fact, the owner of Farm C sold his dogs for preying on one of the sheep. However, dogs of other households preyed on the sheeps. Both farms had given up raising sheep due to dogs.

Diarrhea is possibly caused by overgrazing where sheeps had to grazed young shoots of growing plants (mostly broadleaves) and even the unpalatable species. The declining proportion of grasses (which are more fibrous) may have contributed too.

Table 4. Causes of sheep mortalities by farm.

Plantation	Number and Cause		
	Ewes	Dam	Lamb
A	1 - diarrhea	-	6 - diarrhea
B	2 - diarrhea	-	1 - diarrhea
C	6 - bitten by dogs	-	2 - bitten by dogs
D	7 - bitten by dogs	1- bitten by dog	-

Economic benefit

Immediate benefit derived from raising sheep under plantation is the savings obtained by getting rid of the labor supposedly for weeding.

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Table 5. Weeding costs saved by raising sheep in 4 plantations.

Plantation	Area (ha)	Cost of Weeding, 1992
Farm A	1.0	P 2,800
" B	0.5	Family labor
" C	0.25	500
" D	0.5	700

PROBLEMS ENCOUNTERED

1. High mortality caused by dogs and diarrhea
2. Lack of support staff to assist in the project.

RECOMMENDATIONS/PLAN OF ACTIONS

1. Sheeps from Farm C and D will be transferred to other farms away from concentration of households with dogs. Semi-confinement of raising sheep will be adopted.
2. One technician from IDRC-supported and terminating project had been recruited to work on 0.5 FTE (full time equivalent) with the project.

Annex 1. Botanical composition of pastures (Farm A)

	Aug		Nov		Feb	
	g/m^2	%	g/m^2	%	g/m^2	%
Grasses	**111**	**30.4**	**20**	**12.9**	**-**	
Axonopus compressus	12	3.3	-	-	-	
Imperata cylindrica	-	-	-	-	-	
Paspalum conjugatum	68	18.6	12	7.7	-	
Cyrtococum accreccens	31	8.5	8	5.2	-	
Centotheca lapacea						
Legumes	**30**	**8.2**				
Centrosema pubescens	8	2.2	-	-		
Desmodium sp.	22	6.0	-	-		
Broadleaves	**224**	**6.2**	**135**	**87.1**	**67**	**100.0**
Asystacia gagantica	19	5.2	8	5.2	-	
Mikania cordata	14	3.8	-	-		
Ageratum conyzoides	40	11.0	90	58.1	61	91.0
Elephatopus spicatus	3	0.8	-	-		
Hyptis capitata	-	-	-	-		
Sida rhumbifolia	11	3.0	9	5.8		
Synedrella nodiflora	32	8.8	12	7.7		
Triumfeta semitriloba	16	4.4	3	1.9	6	9.0
Achyranthes aspera	89	2.4	13	8.4	-	
	365		155		67	

Annex 2. Botanical composition of pastures (Farm B)

	Aug		Nov		Feb	
	g/m^2	%	g/m^2	%	g/m^2	%
Grasses	**101**	**50.5**	**27**	**33.8**	**3**	**25.0**
Axonopus compressus	–	–	–	–	–	
Imperata cylindrica	–	–	–	–	–	
Paspalum conjugatum	88	44.0	23	28.8	3	25.0
Cyrtococum accreccens	13	6.5	4	5.0	–	
Centotheca lapacea	–	–	–	–	–	
Legumes	–	–	–	–	–	
Centrosema pubescens	–	–	–	–	–	
Desmodium sp.	–	–	–	–	–	
Broadleaves	**99**	**49.5**	**53**	**66.2**	**9**	**75.0**
Asystacia gagantica	9	4.5	2	2.5	–	
Mikania cordata	12	6.0	3	3.8	–	
Ageratum conyzoides	17	8.5	12	15.0	4	33.3
Elephatopus spicatus	–	–	–	–	–	
Hyptis capitata	–	–	–	–	–	
Sida rhumbifolia	–	–	–	–	–	
Synedrella nodiflora	27	13.5	9	11.2	–	
Triumfeta semitriloba	–	–	–	–	–	
Achyranthes aspera	34	17.0	27	33.8	5	41.7
	200		80		12	

Annex 3. Botanical composition of pastures (Farm C)

	Aug		Nov		Feb	
	g/m^2	%	g/m^2	%	g/m^2	%
Grasses	**340**	**53.1**	**107**	**33.2**	**45**	**22.8**
Axonopus compressus	119	18.6	67	20.8	30	15.2
Imperata cylindrica	–	–	–	–	–	–
Paspalum conjugatum	50	7.8	–	–	–	–
Cyrtococum accreccens	73	11.4	–	–	–	–
Centotheca lapacea	98	15.3	40	12.4	15	7.6
Legumes	**3**	**0.47**	**5**	**1.6**	**2**	**1.0**
Centrosema pubescens	3	0.47	5	1.6	2	1.0
Desmodium sp.	–	–	–	–	–	–
Broadleaves	**297**	**46.4**	**210**	**65.2**	**150**	**76.1**
Asystacia gagantica	15	2.3	7	2.2	3	1.5
Mikania cordata	132	20.6	62	19.2	40	20.3
Ageratum conyzoides	60	9.4	104	32.3	91	46.2
Elephatopus spicatus	9	1.4	–	–	–	–
Hyptis capitata	–	–	–	–	–	–
Sida rhumbifolia	–	–	–	–	–	–
Synedrella nodiflora	15	2.3	21	6.5	4	2.0
Triumfeta semitriloba	9	1.4	–	–	–	–
Achyranthes aspera	57	8.9	16	5.0	12	6.1
Amaranthus spinosus	–	–	–	–	–	–
	640		322		197	

Annex 4. Botanical composition of pastures (Farm D)

	Aug		Nov		Feb	
	g/m^2	%	g/m^2	%	g/m^2	5
Grasses	**178**	**43.6**	**72**	**26.9**	**13**	**22.0**
Axonopus compressus	–		–		–	
Imperata cylindrica	140	34.3	60	22.4	13	22.0
Paspalum conjugatum	–		–		–	
Cyrtococum accreccens	38	9.3	12	4.5	–	
Centotheca lapacea	–		–		–	
Legumes	**44**	**10.8**	**28**	**10.4**	**–**	
Centrosema pubescens	44	10.8	28	10.4	–	
Desmodium sp.	–		–		–	
Broadleaves	**186**	**45.6**	**168**	**62.7**	**46**	**78.0**
Asystacia gagantica	–		–		–	
Mikania cordata	13	3.2	2	0.75	–	
Ageratum conyzoides	17	4.2	48	17.9	33	55.9
Elephatopus spicatus	12	2.9	3	1.1	–	
Hyptis capitata	22	5.4	67	25.0	–	
Sida rhumbifolia	–		–		–	
Synedrella nodiflora	17	4.2	24	9.0	–	
Triumfeta semitriloba	91	22.3	18	6.7	13	22.0
Achyranthes aspera	14	3.4	6	2.2	–	
	408		268		59	

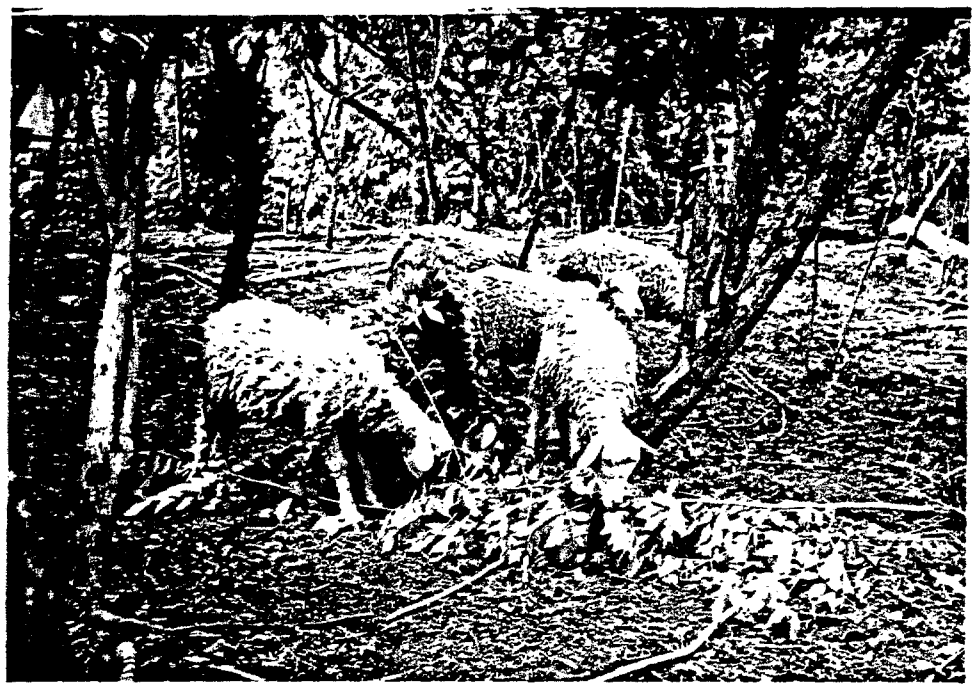
A typical vegetation.

Ka Ido, one the cooperators, was very happy he only had to worry about Ageratum. He spends ₱2,800 per year paying contractual labor for weeding before the sheep was introduced in his coffee plantation. He could take care or cut Ageratum by himself.

IT'S SUMMER!!

... Most of the vegetation underneath the plantations were grazed down by sheep.

... Gliricidia branches are cut/harvested.

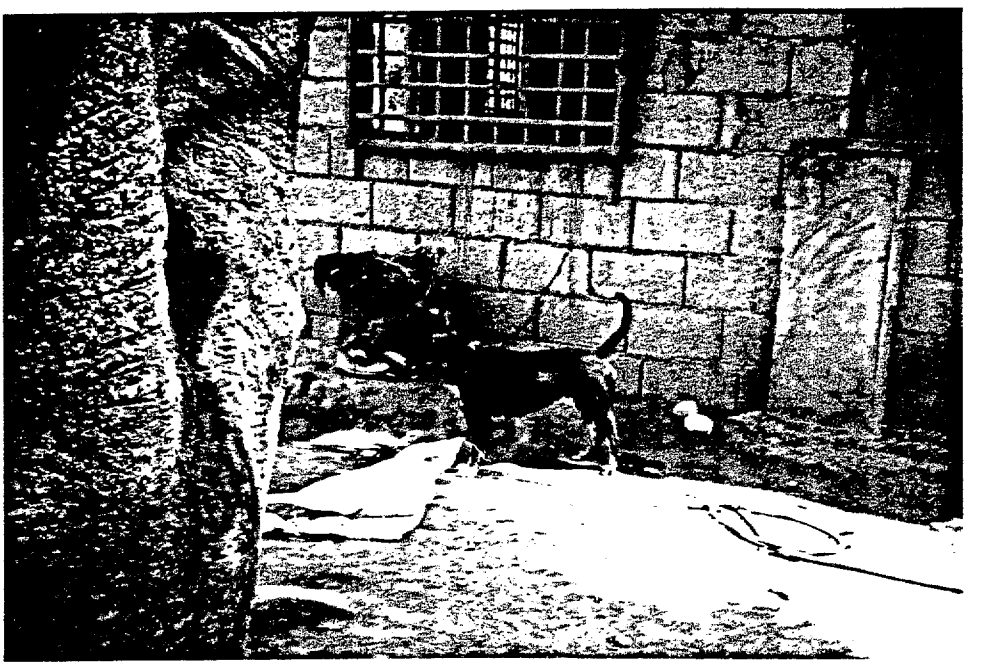


...Harvested Gliricidia
are fed to sheep.

....Dried branches serve as
fuelwood.

...Banana leaves
are fed too.

Socially-friendly fencing method. Traditional pathways should never be closed, otherwise people in the village will feel bad about the project. Take note of the "Y" post which conveniently accomodate passersby.



Keep dogs tied or confined. Stray dogs have preyed on sheep in two cooperator farms.