UNIVERSITI PUTRA MALAYSIA

A STUDY OF COMMERCIAL SHEEP REARING UNDER IMMATURE RUBBER PLANTATION

RICHARD RAPU @ AMAN AK. BEGRI

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by

RICHARD RAPU @ AMAN AK. BEGRI

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Universiti Pertanian Malaysia,
Serdang, Selangor,
Malaysia.

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ABSTRACT

A STUDY OF COMMERCIAL SHEEP REARING UNDER IMMATURE RUBBER PLANTATION

by

Richard Rapu @ Aman ak. Begri

Supervisor : Associate Professor Dr Tengku Azmi b. Tengku Ibrahim

A study to evaluate the viability of a commercial sheep rearing under immature rubber plantation was undertaken. The scope of the evaluation included the nutrition, management, production, health status and the economic aspects of the system.

The undergrowth in the rubber plantation has a mean dry matter yield of 891.2 kg/ha of which only 45.9 per cent were edible and able to support about 14 to 16 sheep per hectare per year. The deworming programme, castration method, and recording system practised in this farm needed to be improved further. The highest mortality was among the one month of age group which was 27.2 per cent; general debility accounted for the highest cause of death.

This study also revealed that the Dorset Horn crosses has a better reproductive performance than the Wiltshire crosses. However, based on the birth weight and average daily gain, the 50 per cent Wiltshire crosses were superior than the other breeds. The money

saved from weeding cost and those obtained from selling of sheep contributed to 6.1 and 41.7 per cent of the total farm revenue, respectively. The major contribution to the total expenditure of the farm were the cost and repair of shed that was 23 per cent. It was concluded that the commercial sheep rearing under immature rubber plantation was feasible technically but not financially.

ABSTRAK

Satu kajian untuk menilai pemeliharaan bebiri secara komersial didalam kebun getah muda telah dijalankan. Penilaian ini merangkumi aspek pemakanan, pengurusan, status kesihatan dan ekonomi sistem pemeliharaan bebiri ini.

Tumbuh-tumbuhan di dalam kebun getah mempunyai purata hasilan bahan kering sebanyak 891.2 kg/ha, tetapi cuma 45.9 peratus sahaja yang boleh dimakan sambil menampung keperluan 14 hingga 16 ekor bebiri se hektar setahun. Program pembasmian cacing, cara pengkasian dan sistem rekod ladang ini perlu diperbaiki semula. Kadar kematian adalah tinggi di kalangan bebiri yang berumur satu bulan, iaitu 27.2 peratus; lemah anggota merupakan penyebab kematian yang tertinggi sekali.

Kacukan Dorset Horn menunjukkan prestasi pembiakbaikan yang lebih baik daripada kacukan Wiltshire. Walau bagaimanapun, berat lahir dan pertambahan berat harian kacukan 50 peratus Wiltshire adalah paling baik. Hasil daripada jualan bebiri ialah 41.7 peratus, sementara penjimatan kos meracun rumpai ialah 6.1 peratus. Daripada jumlah perbelanjaan keseluruhan kos pembinaan dan pengelengaraan kandang adalah yang tertinggi; iaitu 23 peratus. Kesimpulannya, pemeliharaan bebiri secara komersial dalam kebun getah boleh dijalankan tetapi kurang menguntungkan.

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1.0 INTRODUCTION

The development of livestock industry in Malaysia is generally imbalance and rather unique. The non-ruminant subsector (Pig and poultry) had expanded tremendously reaching self-sufficiency level, while the ruminant subsector is still unable to meet the increasing demand. The increase in the total population as well as in the per capita consumption of beef and mutton contributed further towards the slow attainment of self-sufficiency level in this subsector. There is a need therefore to increase mutton production in this country in view of the expected high demand for mutton in the near future.

To achieve this objective the present sheep population will have to be increased significantly, and currently a major portion of the demand for mutton is met through importation. New grazing areas have to be identified and developed. In view of the decreasing availability of agricultural land, coupled with the competition from more established commercial crops, opening of new jungle land for pasture development may not be feasible. Thus, integrating sheep with plantation crops such as rubber and oilpalm could be the suitable choice.

In 1987, Malaysia has a total area of 1.938 million hectares of rubber cultivation (Hevea brasiliensis) or nearly 50 percent of its agricultural land. The large hectarage of rubber growing areas with its undergrowths provide a huge potential for rearing sheep for mutton production.

The aim of the present study is to evaluate the viability of commercial sheep rearing under immature rubber plantation. The aspects being look into include the feasibility of the project either technically or financially. Included in this study was the farm profile which encompasses management, nutrition, production and health status of the animals.

2.0 LITERATURE REVIEW

2.1 SHEEP INDUSTRY IN MALAYSIA

In 1985, the sheep population in Peninsula Malaysia was estimated to be about 78,305 . The local indiginous sheep constituted more than 90 per cent of the country's sheep population. The highest concentration of sheep which is 72 per cent are found in the states of Kelantan, Negeri Sembilan and Kedah (9). The system of production is very similar to that of goat; tethering, extensive, intensive, and more recently the integrated systems have been practiced (8,18).

Most of the mutton sold in Malaysia is imported from Australia and New Zealand (8). Following the expansion of integrated farming system in estates and the breeding of high quality stock, the production of mutton within the country is also estimated to increase by 11.5 per cent to 870 tonnes. Nevertheless this level of domestic production of mutton is only sufficient to meet 14.4 per cent of the total domestic requirements (13).

2.2 SHEEP REARING UNDER RUBBER PLANTATION

Integrated farming is defined as a farm practice which concurrently utilizes the same unit area of land for the production of animals and crops (26). Rearing of sheep under rubber plantation was first reported in 1968 (12,23). Since then, extensive studies on goat and sheep

integration have been carried out by Rubber Research Institute of Malaysia (6,11) and a number of successful sheep rearing under rubber and oil palm plantation have been reported (5,6,16,21). Earlier reports showed that sheep rearing under rubber plantation is technically feasible (11,12,25,27) and economically viable (24).

Sheep integration under rubber plantation is one of the method of increasing mutton production to meet the increasing demand (22). It is also a form of agricultural diversification that has a great potential since it maximises land usage. The animals will act as a biological weeding agent while grazing and utilizing the undergrowth (11,21,25). In addition, it has a great potential, especially in land development schemes and rubber smallholdings, because of the better labour utilization during immaturity period (21). It also provide the smallholders with supplementary income during the rubber unproductive period (12,24).

2.3 UNDERGROWTH UNDER IMMATURE RUBBER PLANTATION

The ground vegetation in rubber plantation consist of grasses, broadleaves, ferns and others (10,19,22,25); at least 8 broadleaves species and several ferns are edible (10). During the first 3 years after planting rubber trees, about 70 to 80 per cent of the plantation

area is covered with a high density of natural undergrowth comprising of grasses and broadleaves which are available for grazing (6,25).

There are about 60 species of grasses and broadleaves under rubber and oil palm plantation that are edible by goat and sheep which have a moderate quality enough to support the need of goat and sheep of all stages of growth (4). Nearly 75 per cent of the available weeds under rubber plantation are edible to the animals (24). Paspalum conjugatum, Ottochloa nodosa and Axonopus compressus that grow in these plantations are able to persist for number of years eventhough the closure of the crops canopy reduces the amount of sunlight reaching the ground to only 5.7 per cent (7).

Total dry matter yield per unit area is highest under immature rubber and progressively decreasing after the rubber had passed its fifth year before becoming constant after the fifteenth year. The availability of ground vegetation in rubber plantation has been shown to be affected by the age of trees, the locality and the type of management of the plantation (25).

2.4 SHEEP MANAGEMENT PRACTICE

In the integrated farming semi-intensive system is practiced, where the animals are let out to graze at 0800 - 1000 hours and herded back to the pens at 1600 1700 hours. At least 7 hours grazing time per day is

recommended (5,20). The browsing behavior and the tendency of the sheep to move in groups provide easier flock management (3).

Housing is necessary for shelter during the night as well as during adverse weather conditions. Post lambing ewes and their lamb should be kept indoor for at least 2 weeks after lambing. Lamb aged 2 to 3 weeks old are left to graze the areas surrounding the pen with the dam. Three months old lambs are weaned. Deworming, deticking and other treatment are carried out whenever necessary (3).

Various stocking rates of sheep under rubber plantation has been recommended . Six sheep per hectare is recommended for the rubber plantation consisting of 60 per cent 3 to 6 year old trees with remaining mature trees (6), 7.7 to 9.9 sheep per hectare (25), and 6 to 10 sheep per hectare for rubber trees age between 2 to 6 years old (5). Local sheep can be reared with stocking rates of 25 sheep per hectare under immature rubber while a wiltshire crossbred with stocking rate of 7.5. 15.0 and 22.0 female per hectare can be carried out (17).

Feed supplementation can improve a better animal performance and net return (14). However, an investigations indicated that large amount of highly nutritious ground vegetation found under rubber plantation was enough to support sheep without supplementation (25).

2.5 PERFORMANCE OF SHEEP

Except during the initial stages following introduction, the animal raised under rubber plantation performed well (26). Indigenous sheep reared under rubber plantation showed mean birth weight of 1.6 kg, mean lamb daily weight gain of 46.5 g for the first months and mean adult ram weight of 26.0kg (3, 25). Birth weight of Dorset Horn crosses lamb is 25 per cent to 47 per cent higher than those of local lamb (5). Local breed sheep can also reach mean body weight of 17.9kg at one year old under rubber plantation (15).

Normally, the reproductivity is 142 per cent or about 1.5 lambs per ewe per year, with lambing interval of about 207 days and ninety per cent of the lambings are single (25). However, sheep raised under rubber plantation has a average of 1.53 lambs per dam per year, while the lambing interval and percentage of twins lambing are 183 days and 36.36 per cent respectively (24).

2.6 HEALTH AND DISEASE STATUS

Endoparasite is one of the major problem encountered in this system similar to those reported in sheep raised intensively. The parasites include strongyloides, Trichuris spp, Haemonchus contortus and Bonustomum spp. Study on sheep grazing intensively showed heavy infestations of endoparasite (25,26). Ectoparasites infestation is rare in indigenous small ruminants, although it can pose a serious problem with imported breeds. Other diseases such as meliodosis, contagious ecthyma and pneumonia are reported to be common (16,21).

The average mortality rate of lamb reared under this system is 18 per cent, the mortality rate of preweaned F1 crossbred lambs is about 10 per cent; general weakness and stillbirth are the major causes (25). Other study in indigenous sheep reported higher mortality rates (21).

2.7 ECONOMIC VIABILITY OF SHEEP REARING

Integration of sheep with rubber plantation has been shown to be technically feasible and agronomically beneficial to the rubber trees (21). However, there is little information available on the economic viability of such farming system. Earlier reports on sheep rearing in commercial rubber plantation appear to indicate that it is economically viable (12,23).

A more comprehensive economic analysis of sheep reared under rubber plantation indicate that the profit for the twenty-five-month period was $ 2970 or about 107.5 per cent of the total investment. The net present value (NPV) and internal rate of return (IRR) was found to be $ 1975 and 44 per cent respectively. The payback period is about 25 months. The extra income per month per participant was $ 39.6 or $ 1.32 per man-hour of labour input. In addition the project was able to significantly reduced the weeding cost by about 21 per cent per year (24).

For sheep rearing in Mini Estate the saving in cost of controlling weeds is 45 per cent or $ 33.73 per cycle per hectare with a decrease in frequency of weeding from 6 cycles to 4 cycles per year (1).

Fifteen per cent to twenty-five per cent could be saved in the overall weed control programme. Together with sales of animals and manure, sheep rearing could give a return of 15 per cent on investment (10).

3.0 METHODOLOGY

3.1 SITE OF STUDY

The study was carried out in a sheep farm under immature rubber plantation in Melaka. The sheep rearing project is still under experimentation. The initial objectives of the farm were; a) to collect as much data to determine whether the project has any commercial viability rather than as a smallholder undertaking; b) to assess the effect on weed control, and c) to determine the effect on lambing, live weight gain and other aspects such as selection of suitable breeds for the enteprise. The operation commenced in June 1984 with an initial stock of 118 Local ewes, 30 crossbred Wiltshire ewes, 4 pure Dorset Horn rams and 3 crossbred Wiltshire rams. In October 1987, the total number of animal was 340; two-thirds were grazed under the 32 hectares of 54 month old immature rubber trees.

3.2 GROUND VEGETATION

Various aspects of ground vegetation were studied:

1. identification of forage species
2. estimation of species composition and biomass production based on dry weight determination.
3. forage preference of grazing by sheep.
4. estimation of composition of edible forage.

3.2.1 SAMPLING OF GROUND VEGETATION

A square quadrat measuring 2 x 2 feet was used for sampling. Three type of areas were sampled depending upon the thickness of canopy namely thick, medium, and thin. Four plots were taken from each thickness of canopy distributed throughout the total area of 32 hectares. Ground vegetation within the quadrat were cut about 10 cm from the ground level.

3.2.2 IDENTIFICATION OF FORAGE SPECIES

Cut samples were separated into individual species and then identified.

3.2.3 ESTIMATION OF SPECIES COMPOSITION AND BIOMASS PRODUCTION BASED ON DRY WEIGHT DETERMINATION.

Each species identified was placed in a paper bag, and oven dried at 60°C for 48 hours to determine its dry weight. Dry weight percentages were used to estimate the species composition and biomass production.

3.2.4 FORAGE PREFERENCES OF GRAZING BY SHEEP

The grazing sheep was observed closely during grazing time. Their relative preference for certain forages were scored as highly acceptable, less acceptable and completely rejected. Highly acceptable forages were those with every component being preferred by the animals, whereas the less acceptable ones were those with only certain components were preferred.

3.2.5 ESTIMATION OF COMPOSITION OF EDIBLE FORAGES.

A step point method was used to estimate the composition of edible forage. One hundred equal paces were made in a 10 x 10 meters square area either under the shed and in the open to compare the composition of edible forages. Ten areas throughout the vegetation were selected randomly with five areas representing shade and open respectively. After each pace the plant species touching the point previously made on the toe of the shoe was recorded and then identified whether it belongs to the edible or the rejected group.

3.3 FARM MANAGEMENT

Under farm management, the various aspects studied include farm resourses, flock management system, farm routine activities, breeding and recording system. Informations were gathered through personal observation, interviewing the farm conductor, personal communication with workers and from record books.

3.4 ANIMAL PERFORMANCE, HEALTH AND DISEASES, AND ECONOMICS.

These informations were obtained solely from records and personal communication. For the animal performance, two categories of data were obtained, i.e. reproductive and growth performance. Mating and birth records were studied to obtain reproductive informations.

Similarly, for growth performance, records of birth and records of monthly body weight were used to determine parameters such as birth weight and average daily weight gain. For health status, record of death was used. Basic data on the economics was obtained from records and personal communication.

3.5 ANALYSIS OF DATA

Data were subjected to statistical analysis, such as ANOVA, linear regression, and T-test. Computer spreadsheet software namely Lotus 123 was used to analyse the economic data to determine the viability of the farm.

4.0 RESULTS

4.1 FORAGE UNDER IMMATURE RUBBER PLANTATION

4.1.1 GROUND VEGETATION

Table 1 shows the major grasses, legumes and broadleaves species of ground vegetation. The availability of these species did not differ greatly in the three types of canopy.

4.1.2 SPECIES COMPOSITION

Table 2 shows that under thin canopy, grasses, legumes and broadleaves were of equal proportion. However, the composition of legumes was much higher under medium and thick canopy. Overall, Ottochloa nodosa, Calapogoniun caeruleum and Mikania cordata were the most abundant species of grasses, legumes and broadleaves respectively.

4.1.3 DRY MATTER YIELD OF TOTAL BIOMASS

Table 3 compares the dry matter (DM) yield under the three types of canopy. The highest DM yield was obtained under thin canopy. The average DM yield was 891.2 kg/ha.

4.1.4 FORAGE PREFERENCE

It was observed that much more grass species were edible as compared to legumes and broadleaves (Table 4). Most sedges and ferns were rejected. Ottochloa nodosa,

TABLE 1. GROUND VEGETATION UNDER IMMATURE RUBBER TREES OBTAINED BY QUADRAT METHOD

SPECIES	TYPES OF CANOPY		
	THIN	MEDIUM	THICK
GRASSES	Paspalum conjugatum	Paspalum conjugatum	Paspalum conjugatum
	Ottochloa nodosa	Ottochloa nodosa	Ottochloa nodosa
	Cynodon dactylon		Axonopus compressus
	Eragrotis tenella		
LEGUMES	Calapogonium caeruleum	Calapogonium caeruleum	Calapogonium caeruleum
	Calapogonium muconoides	Calapogonium muconoides	Calapogonium muconoides
	Centrosema pubescens	Desmodium ovalifolium	
BROADLEAVES	Mikania cordota	Mikania cordata	Mikania cordata
		Asystasia coromandeliana	

TABLE 2. SPECIES COMPOSITION (%) OF GROUND VEGETATION

SPECIES	TYPES OF CANOPY		
	THIN	MEDIUM	THICK
GRASSES:			
Paspalum conjugatum	3.3	4.4	1.3
Ottochloa nodosa	12.8	18.8	28.9
Cynodon dactylon	17.4	0.0	0.0
Eragrotis tenella	2.3	0.0	0.0
Axonopus compressus	0.0	0.0	8.9
TOTAL	35.8	23.2	39.1
LEGUMES:			
Calapogonium caeruleum	24.5	43.7	57.0
Calapogonium muconoides	7.9	3.7	0.8
Centrosema pubescens	1.4	0.0	0.0
Desmodium ovalifolium	0.0	13.2	0.0
TOTAL	33.8	60.6	57.8
BROADLEAVES:			
Mikania cordata	30.4	14.7	3.1
Asystasia coromandeliana	0.0	1.5	0.0
TOTAL	30.4	16.2	3.1

TABLE 3. DRY MATTER YIELD (KG/HA) OF TOTAL BIOMASS UNDER IMMATURE RUBBER TREES

	TYPE OF CANOPY				
	THICK	MEDIUM	THIN	MEAN ± $SE_{\bar{x}}$	F-TEST
DRY MATTER YIELD (G/HA)	667.9	874.7	1131.0	891.2 ± 108.2	4.59*

$SE_{\bar{x}}$ - Standard Error of Mean

* - $P < 0.05$

TABLE 4. FORAGE PREFERENCE BY GRAZING SHEEP

SPECIES	HIGHLY ACCEPTABLE	LESS ACCEPTABLE	REJECTED
GRASSES:			
Paspalum conjugatum	*		
Ottochloa nodosa	*		
Cynodon dactylon	*		
Eragrotis tenella			*
Axonopus compressus	*		
Ischaemun timorense	*		
Sporobolus diander			*
Eleusine indica	*		
LEGUMES:			
Calapogonium caeruleum			*
Calapogonium muconoides			*
Desmodium ovalifolium	*		
Centrosema pubescens	*		
Puraeria phaseoloides	*		
BROADLEAVES:			
Asystasia coromandeliana	*		
Borreria spp.	*		
Mikania cordata		*	
Cardiospermum spp.		*	
Commelina nudiflora	*		
Ageratum conyzoides			*
Cleome rutidosperma			*
Croton hirtus			*
Melastoma malabthricum	*		
Melothria affinis		*	
Mimosa pudica		*	
Mimosa invisa			*
SEDGES:			
Cyperus aromaticus			*
Cyperus compressus			*
Cyperus digitatus			*
Cyperus distans		*	
Cyperus kyllinga			*
Cyperus rotundus			
FERNS:			
Nephrolepis biserrata		*	
Stenochlaena palustris			*
Dicranopteris linearis			*

the most abundant grass species in the plantation was preferred by most sheep. On the other hand Calapogonium caeruleum, the most abundant legume was totally rejected, while for Mikania cordata the most common broadleave was edible but to the lesser extent.

4.1.5 COMPOSITION OF EDIBLE FORAGES

Table 5 shows that the mean frequency of edible grasses, broadleaves and total edible vegetation available in open and shady areas were not significantly different ($P < 0.05$). However, total vegetation was significantly higher ($P < 0.05$) in the open areas than in shade.

The overall percentage of edible vegetation was 45.9 per cent; 94.4 per cent of the grasses and 18.2 per cent of broadleaves were edible.

4.2 FARM MANAGEMENT

4.2.1 FARM RESOURSES

Presently there are 340 sheep in the farm. The breeds available were pure Local, 50 per cent Wiltshire, 25 per cent Wiltshire, 50 per cent Dorset Horn and 25 per cent Dorset Horn. There was only one raised slated floor shed that can accomodate about 300 animals.

The labour force in the farm comprise of one farm supervisor, one shepherd, one worker for cleaning the shed and two workers to supply cut grasses.

TABLE 5. MEAN FREQUENCY OF EDIBLE GRASSES, BROADLEAVES AND TOTAL EDIBLE VEGETATION UNDER OPEN AND SHADY AREAS OF IMMATURE RUBBER PLANTATION

COMPONENT	SHADE	OPEN	SIGNIFICANCE	%
EDIBLE GRASSES	27.2	28.8	n.s.	94.4
EDIBLE BROADLEAVES	10.2	9.2	n.s.	18.2
TOTAL EDIBLE VEGETATION	37.4	38.0	n.s.	45.9
TOTAL VEGETATION	73.2	93.0	*	

n.s. = not significant

* $P < 0.05$

Farm equipments or other accesories include one weighing scale, wool shearer, ear notching plier, mineral blocks, antihelminthic and antiseptics.

4.2.2 FLOCK MANAGEMENT SYSTEM

The animal were group into :-

1. Breeding Ram group
2. Adult Ram group
3. Post Lambing ewes and lamb group
4. Mass Grazing group.

The first three groups were kept indoor and stall fed with grasses. No feed supplementation was given. Mineral block and drinking water were available.

Mass grazing group accounted for two third of the total population. This group comprises of pregnant and non pregnant ewes, castrated adult male, and lambs above 3 weeks old. They were let out to graze for 7 hours daily, starting from 8.30 am. to 3.30 pm. When not grazing, the animals were kept in the shed and were supplied with drinking water and mineral blocks. No feed supplementation was provided.

4.2.3 FARM ROUTINE ACTIVITIES

The major activities include monthly weighing and drenching. Tagging of new born animal was also carried out whenever necessary. Shearing, hoof trimming and deticking were not done. Castration was carried out during preweaning age using the rubber ring method.

4.2.4 BREEDING SYSTEM

Seasonal breeding was used. Ewes were bred twice a year; in April and September. Rams were kept with the ewes for a period of 6 to 8 weeks only at night. The ratio of ram to ewes was 1:30.

4.2.5 RECORDING SYSTEM

The farm maintained 4 basic records. These were the monthly live body weight record, monthly birth register, monthly death register and mating records.

4.3 ANIMAL PERFORMANCE

4.3.1 REPRODUCTIVE PERFORMANCE

Table 6 shows that Dorset Horn crosses are superior than Wiltshire crosses. Dorset Horn crosses has an apparently shorter lambing interval (237.23 days) and higher lambing potential (199 lambs/100ewes/year) than Wiltshire crosses. Twin lambing and triple lambing rates were also observed to be apparently higher in Dorset Horn crosses.

4.3.2 GROWTH PERFORMANCE

Figure 1 indicates that 50 per cent Wiltshire cross has superior birth weight than the other breeds, while figure 2 also shows that 50 per cent Wiltshire crosses had an apparently higher average daily gain at 3, 6, 9 and 15 months of age.

TABLE 6. COMPARATIVE REPRODUCTIVE PERFORMANCE OF EWES

REPRODUCTIVE PERFORMANCE	WILTSHIRE CROSSES	DORSET HORN CROSSES	FLOCK AVERAGE
Lambing Interval* (Days)	267.73+37.98 (n=15)	237.23+43.07 (n=13)	253.57+42.57 (n=28)
Lambing Potential (Lambs/100 ewes/year)	153	199	173
Single Lambing (%)	87.9	70.6	80.38
Twin Lambing (%)	11.6	28.8	19.07
Triple Lambing (%)	0.5	0.6	0.5

* Mean between 2 consecutive lambing ± standard deviation

FIG. 1. COMPARATIVE BIRTH WEIGHT

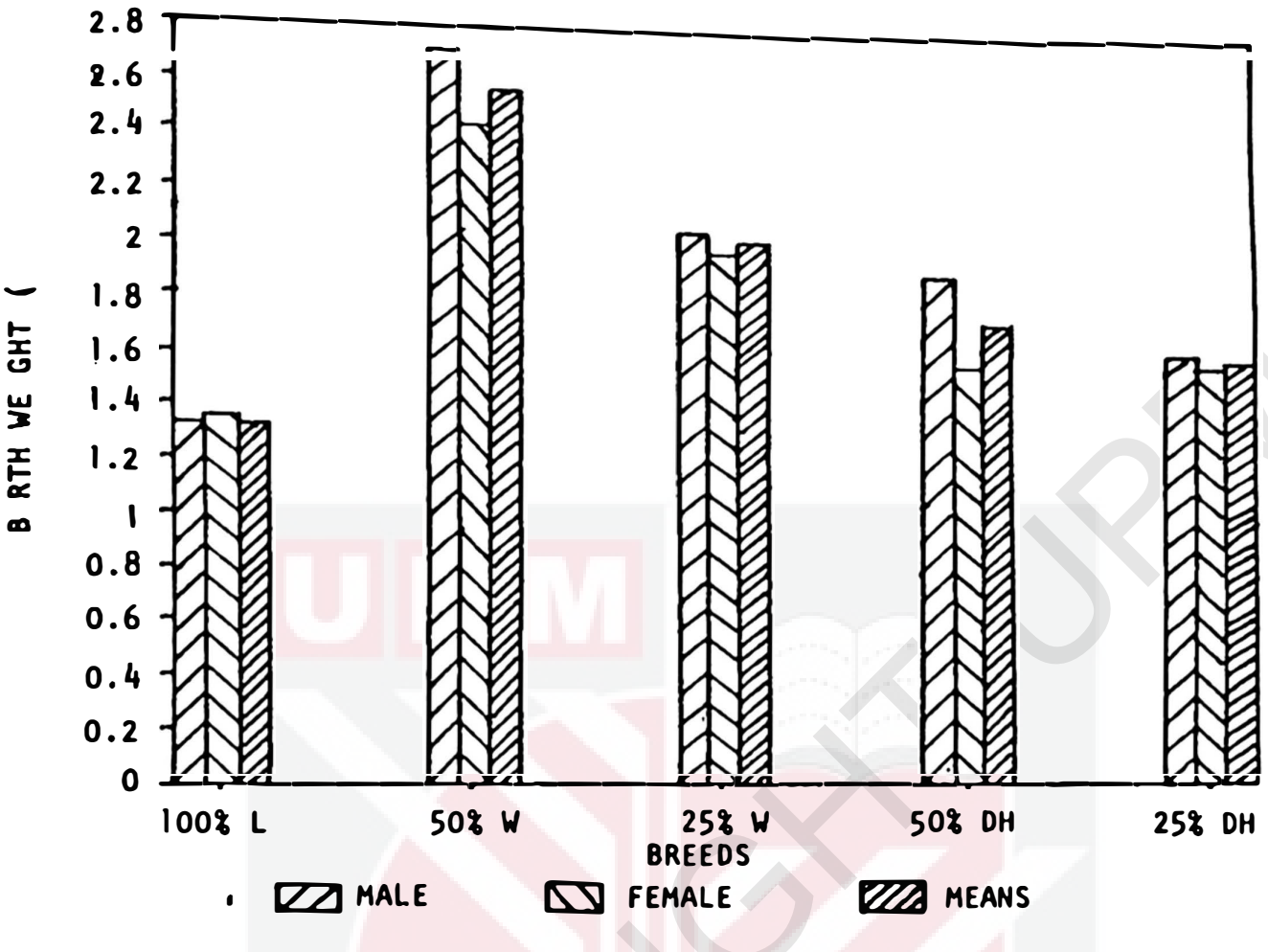
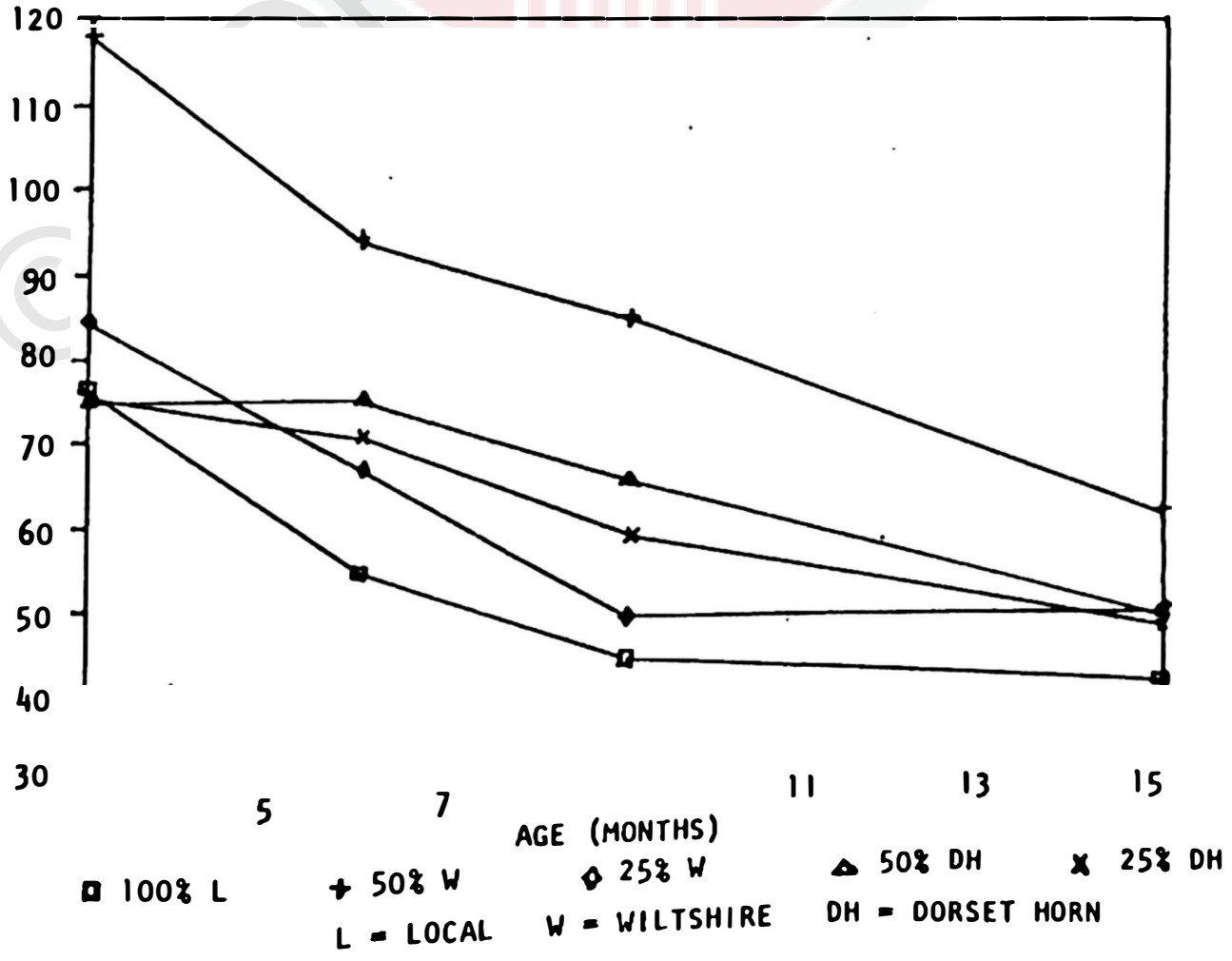


FIG. 2. COMPARATIVE ADG (G/DAY)

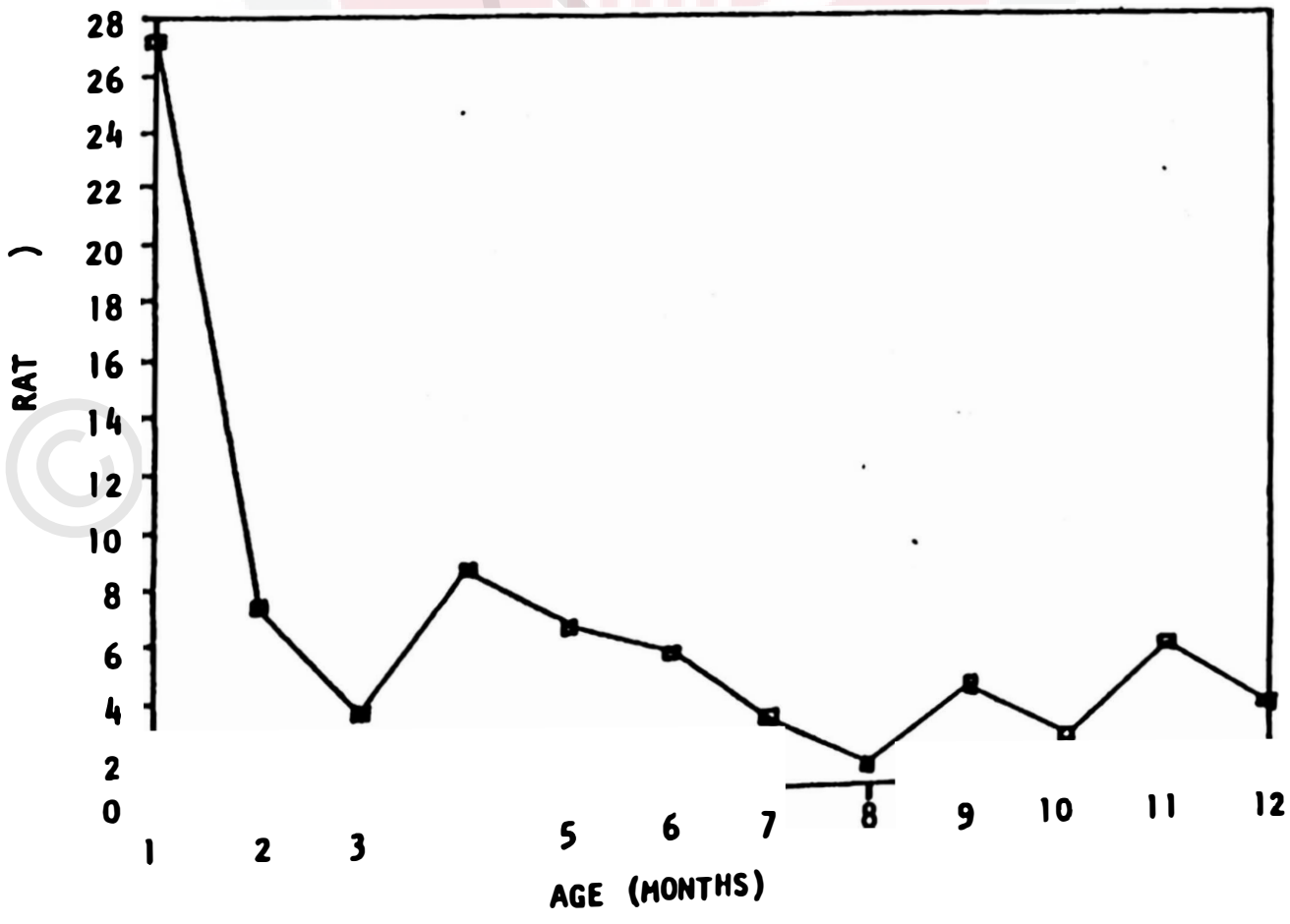


4.4 HEALTH AND DISEASE STATUS

4.4.1 AGE SPECIFIC MORTALITY RATE

Figure 3 shows the age specific mortality rate. for the first one year of life. Most death occured in 1 month old lambs (27.2 %). The rate decreased significantly to 7 per cent in the 2 months age group and maintain itself almost constantly in the successive months.

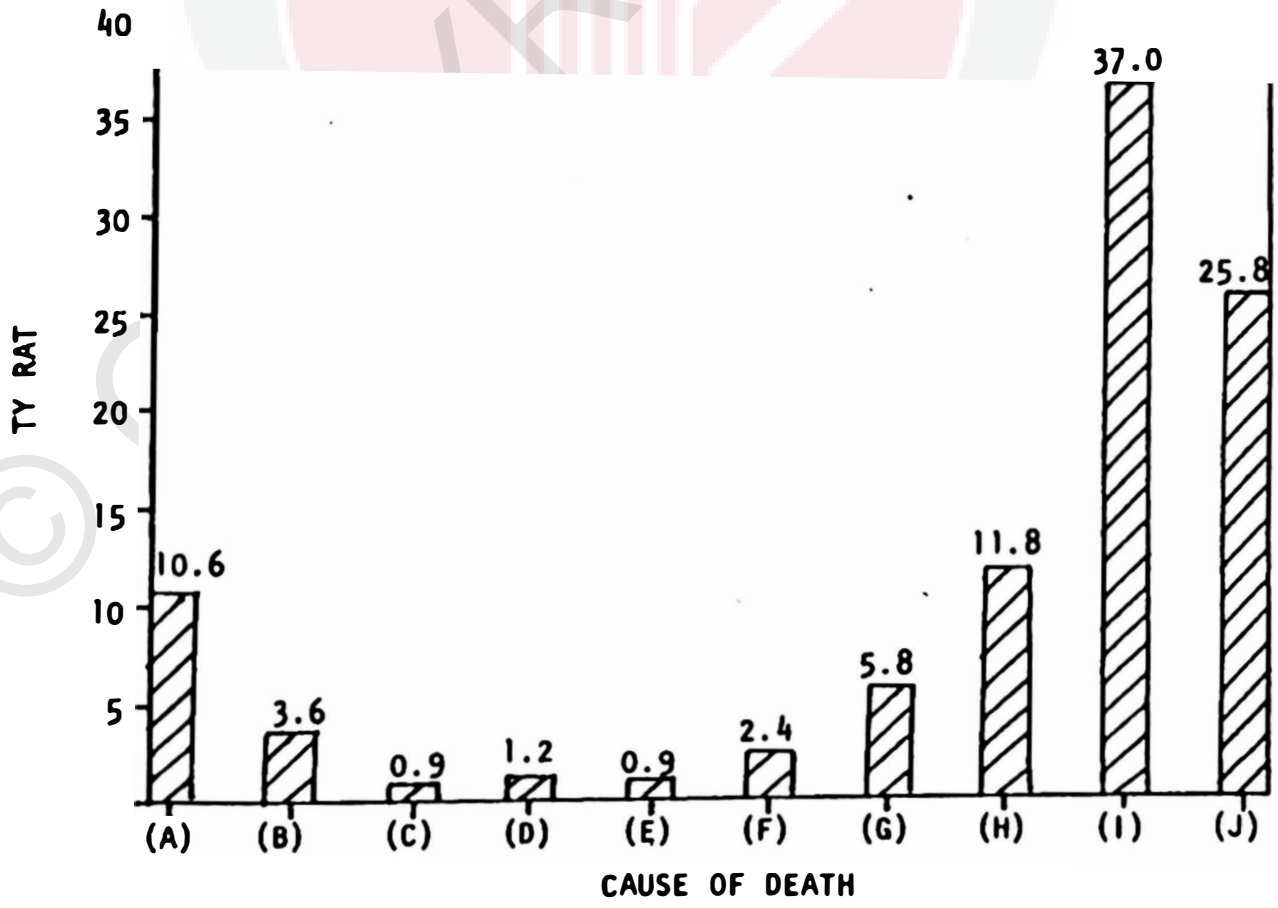
FIG. 3. AGE-SPECIFIC MORTALITY RATES OF SHEEP UP TO 12 MONTHS OLD (JUNE 1984 - OCT. 1987)



4.4.2 SYMPTOMATIC ASSESSMENT OF DEATH

Figure 4 represent the cause specific proportional mortality rates. In general, most deaths were diagnosed as due to general debility and paralysis. This was followed by unknown aetiology which was 25.8 per cent. Enteritis and endoparasitism, and neonatal starvation accounted for 10.6 and 11.8 per cent of the total death respectively.

FIG. 4. CAUSE - SPECIFIC PROPORTIONAL MORTALITY RATES FROM JUNE 1984 TO OCTOBER 1987



LEGEND:
A - ENTERITIS & ENDOPARASITISM
B - BLOAT
C - MAGGOT WOUND
D - SEPTICAEMIA
E - DOG BITE
F - POISONING & SNAKE BITE
G - STILL BIRTH
H - NEONATAL STARVATION
I - GEN. DEBILITY & PARALYSIS
J - UNKNOWN AETIOLOGY

5.0 ECONOMICS

Table 7 shows the cashflow for the sheep rearing from June 1984 until October 1987. The gross income from sales of sheep amounted to $ 19639. The total expenditure was $ 97096. As indicated by these values,the farm was running at a loss of $ 77457. Saving in weeding cost was only $ 2901, while the expected values of the remaining animal amounted to $ 24580. After considering these values, the farm was still losing $ 49976.

Table 8 shows the income statement. The sales of sheep, saving in weeding cost and the expected value of the remaining animals accounted for 41.7, 6.2 and 52.1 per cent of the total revenue respectively. However, the major contribution to the total expenditure of the farm were cost of construction and repair of shed, labour cost for cutting grass, shepherd's wage, cost of original stock and miscellaneous.

TABLE 7. CASHFLOW FOR COMMERCIAL SHEEP REARING UNDER IMMATURE RUBBER PLANTATION

	ITEM	YEAR					
		TOTAL	83/84	84/85	85/86	86/87	87/88
		$	$	$	$	$	$
A.	TOTAL GROSS INCOME	19639	0	464	11482	6522	1171
B.	TOTAL EXPENDITURE	97096	34819	16661	12182	25994	7440
C.	NET PROFIT/LOSS (A-B)	-77457	-34819	-16197	-700	-19472	-6269
D.	CUMULATIVE NET PROFIT/ LOSS		-34819	-51016	-51716	-71188	-77457
E.	SAVING IN WEEDING COST**	2901	768	640	640	640	213
F.	TOTAL EXPECTED SALES OF REMAINING ANIMAL	24580	0	0	0	0	24580
G.	ACTUAL PROFIT/LOSS (C + E + F)	-49976	-34051	-15557	-60	-18832	18524

** SAVING IN WEEDING COST: First year - 20% of $120/ha
Second year - 20% of $100/ha
Third to Fifth year - 25% of $80/ha

TABLE 8. INCOME STATEMENT OF SHEEP REARING UNDER IMMATURE RUBBER PLANTATION FROM JUNE 1984 TO OCT. 1987

COMPONENTS	AMOUNT ($)	%
A. REVENUE		
(1) Sales of sheep	19639	41.7
(2) Saving in weeding cost	2901	6.2
(3) Expected sales of remaining animals		
a. sales of adult sheep @ $4/kg	21880	46.4
b. sales of lambs by number of heads @ av. price of $30/head	1500	3.2
c. sales of breeding rams @ $300/head	1200	2.5
B. TOTAL REVENUE	47120	100
C. EXPENDITURE		
(1) Cost of original stock	15371	15.8
(2) Construction and repair of shed	22315	23
(3) Shepherd's wage	15708	16.2
(4) Supervision charges	6531	6.7
(5) Cost of fencing	1934	2
(6) Transport cost of sheep	1060	1.1
(7) Labour for cutting grass	17319	17.8
(8) Veterinary expenses	2457	2.5
(9) Miscellaneous costs	14401	14.9
D. TOTAL EXPENDITURE	97096	100
E. NET PROFIT/LOSS (B - D)	-49976	

5.0 DISCUSSION

5.1 GROUND VEGETATION UNDER IMMATURE RUBBER PLANTATION

As the canopy became thicker, there was an apparent difference in the proportion of grasses, legumes and broadleaves. This probably related to the level of sunlight reaching the ground which was higher under thin canopy. Since thick canopy recieved less sunlight, the grasses and broadleaves tend to degenerate faster. This will give chance to certain legumes to rapidly re-established.

Again the increase in dry matter (DM) yield in thin canopy was explainable on basis of light availability. As only 45.9 per cent of the ground vegetation was edible by the sheep, therefore only 409 kg/ha of the DM yield were edible. This value is able to support about 14 to 16 sheep per hectare per year.

The most abundant legume observed was Calapogonium caeruleum. Since it was completely rejected by the sheep, this can reduce the feed availability substantially and had to incur extra expenditure for removing them from climbing over the rubber trees.

Age of rubber trees also influences the type of canopy, which is thicker under older trees. Other factors of importance are the planting distance, type of clone of rubber trees, soil, terrain and climate. Hence, as the rubber trees get older the DM yield is lesser.

In this plantation, it seems that the forage availability to the animal is decreasing due to the rapid establishment of rejected species of legume over the desirable grasses and broadleaves. In the near future, the stocking rate need to be reduced or if possible selective spraying of the undesirable species of the undergrowth.

5.2 MANAGEMENT SYSTEM

The animal house was the type raised from ground with slatted flooring. This is suitable for sheep rearing as it provide better ventilation and facilitate cleaning. The ground underneath the shed was cemented and it was observed that this requires frequent cleaning which need extra labour. This was not necessary as it incur extra cost interm of construction and cleaning, and beside that bareground can absorb moisture better.

Seven hours of grazing was sufficient to meet the daily requirement of the sheep. The stocking rate at present was about 7 to 8 animals per hectare. This was still below the maximum stocking rate that can be supported by the ground vegetation as calculated earlier on.

The monthly weighing of the animal was essential in order to assess their performance. It was observed to require extra workers. This was partly due to the

inadequate handling facilities for this purpose. Drenching was not done at a regular basis. The reason could be due to the lack of awareness of the consequences of this practices. There had been problem with the castration technique in the farm which make use of rubber ring method. A number of animals had been unsuccessfully castrated and this create problems when they graze together with the ewes. Seasonal mating practised in this farm was satisfactory since it facilitate easier management and supervision of pregnant and newborn lambs. The records had been maintained satisfactorily except for mating record where the identification of the sire was not properly recorded. Identification of sire was essential to avoid unidentified breeds.

5.3 ANIMAL PERFORMANCE

The flock reproductive average was within the range as reported by others. In this farm, Dorset Horn crosses was apparently superior in term of reproductive performance than Wiltshire crosses. Eventhough Dorset Horn crosses performed better, other factors have to be considered before deciding on the desired breed for the farm. However, the growth performance of 50 per cent Wiltshire was superior than the rest of the breeds.

Base on these performance data, it is suggested that the farm should decide to rear 50 per cent Wiltshire crosses. The reason was that a fast growing animal that reach marketable weight earlier is necessary to reduce the cost of production.

5.4 HEALTH AND DISEASE STATUS

In this farm, the highest mortality was observed among the one month old lambs. The reason for this was probably due to the animals being weaker physically and immunogenically. This predispose them to various problems. This rate can be substantially reduced with an improved lamb management as well as better management of late pregnant ewes.

The reason for the high proportion of general debility leading to death in this farm could be attributed to some nutrient deficiency in the forages, or there could be other secondary factors such as endoparasitism. However, the high percentage of enteritis and endoparasitism may be related to the irregular deworming programme.

5.5 ECONOMICS

In this farm there had been low return from sales of sheep due to limited market of adult males which were abundant in this farm. Majority of them were not successfully castrated and also with long horns. This factors had prevented them from grazing together with the grazing group. This has result in the extra cost to supply them with cut grasses. Thus, to overcome these problems, there was a need to review the management practices such as a proper castration technique and to dehorn all sheep. In addition to that a better marketing system need to be studied such as to find new outlet either locally or elsewhere. On the overall expenditure of the farm, cost of construction and repair of shed account for the highest percentage. This could had been reduced if the farm were to use a reasonably cheaper building materials.

6.0 CONCLUSION

It is concluded from the present study that sheep rearing was viable technically but not financially. However, the hidden advantages of this system were the animals help to reduce the cost of weeding, maximise land usage, provide manure to the plantation and when managed on a large scale it could create additional employment. Also, there was a lack of systematic management practices in this farm, hence there is a need to review the overall management system. On the other hand, endoparasitism was the main disease problem. The breed of sheep maintained at the farm was not satisfactory in terms of growth rate, thus a fast growing breed should be used in this type of enterprise.

REFERENCES

1. ANON., (1985). Projek ternakan biri-biri secara berkelompok dalam kebun getah - Pengalaman awal. Siaran Pekebun, 95, m.s. 11 - 18.

2. ANON., (1985). Ternakan Biri-biri. Teknologi Getah Asli. Inst. Penyelidikan getah Malaysia. m.s. 452 - 457.

3. ABD. RAHMAN, M.Y., dan MOHD. KHUSAHRY, M.Y.(1985). Integrasi kambing dan biri-biri dengan tanaman utama. Teknologi Ternakan, Jil.1, Bil. 2, m.s. 111 - 120.

4. ABD. RAHMAN, M.Y., LIM, F. dan MOHD. DAUD, K.(1985). Rumput dan Dedaun Tempatan sebagai Makanan kambing dan biri-biri. Teknologi Ternakan, Jil. 1, Bil 1, m.s.55 - 66.

5. AHMAD TAJUDDIN, Z., WAN ZAHARI, M. dan ABD. RAHMAN, M.Y. (1985). Status Industri Ternakan di Malaysia. Teknologi Ternakan, Jil. 1, Bil. 1, m.s. 1 - 10.

6. ANI, A., TAJUDDIN, I., CHONG,D.T. (1985). Ternakan Biri-biri di kebun Getah. Nota Kursus Pengurusan Ternakan biri-biri, m.s. 1 - 13.

7. CHEN, C. P. and BONG JULITA, I. (1983). Effect of cattle production on forage under oil palm - a preliminary report. Proc. 7 th. Ann. Conf. Malays. Soc. Anim. Prod., Port Dickson, 1983. pp 214 - 227.

8. DEVENDRA, C. (1976). Productivity of Goats and Sheep in Malaysia, II. Sheep Production and Exploitation. Proc. Symposium, "Smallholder Livestock Production and Development,Shah Alam. pp 29 - 47.

9. JABATAN PERKHIDMATAN HAIWAN, (1985). Lapuran tahunan bilangan dan banci ternakan bagi tahun 1985. Kementerian Pertanian Malaysia, Kuala Lumpur.

10. LANE, I.R. (1984). Natural Forages fof Ruminants. In Animal Production in Malaysia. (ed. Pravee, V., Tuan Ariffeen, B. and Mohd. Mahyuddin, D.) pp 89 - 103. Serdang: UPM.

11. LEE, K. A., WAN MOHAMMED, W.E., NG, L.H., NG, F.C. and PHANG, A.K. (1978). Performance of sheep and goats under rubber - Preliminary results. Proc. Sem., "Integr. Animals with Plantation crops," Pulau Pinang, Malaysia. pp 206 - 212.

12. LOWE J. S. (1968). Sheep Under Rubber. Rubb. Res. Inst. Malaysia Plrs' Bull. No. 98, pp 141 -145.

13. MINISTRY OF FINANCE, Malaysia (1987). Economic Report 1987/1988, Vol. 16.

14. MOHD. JAAFAR, D. and MOHD. KHUSAHRY, M.Y. (1983). Supplementation with Selected Feedstuffs for Sheep Grazing under Rubber Plantations. Proc. 7 th. Annual Conf. MSAP 1983. pp 199 - 205.

15. MOHD. KHUSAHRY, M. Y. (1984). Perusahan ternakan kambing dan biri-biri satu pengenalan. Nota Kursus Teknol. Ternakan Kambing dan Biri-biri, Serdang, 16 - 28 Jul. 1984, 35 hlm.

16. MOHD. MAHYUDDIN, D., HUTAGALUNG, R.I. and WAN MOHAMMED, W.E. (1978). Integration of Small Ruminants with Plantation Crops. Proc. of the Seminar on Integration of Animals with Plantation Crops, pp 70 - 83.

17. PILLAI, K.R., THIAGARAJAN, S. and SAMUEL, C. (1985). Weed Control by Sheep Grazing Under Plantation tree crop. In "Anility in Livestock production". Proc. 9th. Ann. Conf. MSAP. Serdang, Selangor, Malaysia, 1985, pp 43 - 52.

18. RAJENDRAN,S. and MOHNA, S.S. (1982). Goat and Sheep Production and Marketing. Proc. of the 6th. Annual Conf. of the Malaysian Society of Animal Production, 1982, pp 118 - 137.

19. RUSTAN, S. (1987). Nutrition of sheep grazing under rubber and oil palm. Animal Industry Project paper. FKVSP, Universiti Pertanian Malaysia.

20. TAJUDDIN, I., CHONG, D. T., ABD. SAMAT, M.S., MOHD. ISMAIL, Y., SILVARAJOO, M. and ADAM, M.P. (1986). Sistem Pengurusan Ternakan Biri-biri di Kawasan Tanaman Getah. Buletin Pemindahan Teknologi, IPGM, Bab 5, Bil.1/86, m.s. 1 - 18.

21. TAN, K.H. and ABRAHAM, P.D. (1981). Sheep Rearing in Rubber Plantations. Proc. of RRIM Planters' Conf. 1981, pp 163 -73.

22. TAN, K.H., CHONG, D.T., ABRAHAM, P.D. and ISMAIL, Y. (1981). Performance of F1 crossbred Sheep (Indigenous x Dorset Horn) Under Rubber : Some Preliminary Observations. Proc. of the Conf. on Exotic and Cross-bred livestock Performance in Malaysia, Genting Highland, Malaysia 1981, pp 158 - 169.

23. VEERSEMA, J. (1968). Sheep Weeding. Planter, 44, pp 75 - 76.

24. WAN MANSOR, W.S. and TAN, K.H. (1982). Viability of Sheep Rearing Under Rubber. Animal Production and Health in the Tropics, pp 333 - 335.

25. WAN MOHAMMED, W. E. (1977) Utilization of Ground Vegetation in Rubber Plantation for Animal Rearing. Proc. of RRIM Planters' Conf. 1977, pp 265 - 281.

26. WAN MOHAMMED, W. E. (1978). The Concept and Potentials of Integrated Farming with Rubber. Proc. of the Seminar on Integration of Animals with Plantation Crops 1978, pp 49 - 60.

27. WAN MOHAMMED, W. E. and ABRAHAM, P.D. (1976). The potential of Livestock Production in Rubber Smallholdings. Paper Presented at The Sypm. on Smallholder Livestock Production and Dev., Shah Alam 1976, pp 108 - 114.