UNIVERSITI PUTRA MALAYSIA

EVALUATION OF SHEEP PRODUCTION UNDER RUBBER

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SERDANG, SELANGOR

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EVALUATION OF SHEEP PRODUCTION UNDER RUBBER

by

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Dedicated to

MY FATHER AND MOTHER

also to

MY BROTHERS

for their unfailing support and care
through my acedemic pursuits

and to

MY LOVE

for her care and understanding

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I wish to express my sincere appreciation and gratitute to my supervisor Mr. Andrew Alek Tuen for his constant aid, support, briliant ideas and constructive guidance throughout the course of the project. I am very grateful to Mr. Rostam Harun officer from the Livestock Extension Unit (Daerah Sepang) Pusat Pengembangan dan Pemlajaran Lanjutan, Universiti Pertanian Malaysia, for his kindness and encouragement during the project, and also to Mr. Hamdan Hamid who gave permission to conduct the project in the farm. Appreciation is also extended to the Dr. Rajan Amarthalingam from Agronomy Department, Faculty of Agriculture, Universti Pertanian Malaysia, who helped to identify the species of the undergrowth. I also would like to express my grateful thanks to the farm worker and clerk of Koperasi Pekebun-pekebun Kecil Daerah Sepang that constantly helped during the project and also to the laboratory assistants for analysing the samples of undergrowth.

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ABSTRACT

A review of the literature indicated that sheep can be integrated with rubber quite successfully although information on the subject is incomplete. Therefore a study was carried out to evaluate the health status, growth and reproductive performance of the animals as well as the nutritive value and economic aspect of sheep-rubber integration project in Bukit Ibol Mini Estate.

The results obtained were as follow:-

(i) overall observation indicates inadequacies in management, housing, health status, marketing and other facilities. This has resulted in gradual deterioration of the farm.

(ii) the quality of undergrowth avalaible in the Mini Estate can support up to 5.61 sheep/hectare/year. The analysis of grasses, broadleaves and legume indicated sufficient nutrient content in all species. The range of the nutrient content of those species on the dry matter basis are;- Crude protein from 12.31 to 20.82%, Neutral-detergent-fibre from 47.12 to 80.3 mg/g, Calcium from 1.84 to 6.65 mg/g, Phosphorus from 1.26 to 2.73 mg/g,

Magnesium from 1.0 to 3.2 mg/g, Zinc from 4.61 to 63.4 ug/g and Copper from 5.85 to 38.0 ug/g.

(iii) the mortality has increased tremendously over the last several months of 1987.

(iv) the growth rate cannot be estimated because no data is available. The reproductive efficiency is poor with lambs/ewes/9 months equal to 0.42.

(v) based on the record of the animal performance figure and the expenditure, it seems that if the current management system continue, the project will make a loss.

Finally, the failure of the farm operation to maintain the production at a high level is due to failure in management, housing design, feeding and poor marketing systems. The farm will be running at a loss if the recent high mortality, low lambing percentage and misunderstanding among the personnel involved still continues.

ABSTRAK

Merujuk kepada kajian bertulis menerangkan berbagai maklumat bahawa integrasi bebiri dengan pokok getah adalah lebih sesuai. Oleh itu kajian telah dilakukan untuk menilai status kesihatan, tumbesaran dan prestasi pembiakan, kandungan zat-zat makanan dan aspeks ekonomi bagi projek integrasi bebiri dengan pokok getah di Mini Estate Bukit Ibor.

Keputusan-keputusan yang didapati adalah seperti berikut;-

(i) pemerhatian secara keseluruhan menunjukkan bahawa pengurusan, perumahan bebiri, status, kesihatan, pasaran dan kemudahan adalah tidak sempurna. Ini telah menyebabkan kemerosotan ladang secara perlahan-lahan.

(ii) dari penganalisaan didapati kandungan zat-zat pemakanan adalah mencukupi bagi kesemua spesis tumbuhan bawah pokok getah yang telah diambil sebagai contoh. Julat kandungan Protin Kasar adalah 12.31 hingga 20.82%, `Neutral-detergent-fibre' dari 47.12 hingga 80.3 mg/g, Kalsium dari 1.84 hingga 6.65 mg/g, Fosforus dari 1.26 hingga 2.72 mg/g,

Magnesium dari 1.0 hingga 3.2 mg/g Zink dari 4.61 hingga 63.4 ug/g dan Kupram 5.9 hingga 38.0 ug/g

(iii) kadar kematian adalah terlalu tinggi pada bulan-bulan terakhir tahun 1987.

(iv) prestasi kadar tumbesaran berat badan tidak dapat dianggarkan kerana kekurangan data yang di rekodkan. Kadar pembiakkan yang dapat dinilaikan adalah 0.42 anak bebiri/ibu/9 bulan.

(v) berdasarkan kepada prestasi bebiri dan perbelanjaan , jika ianya terus berlanjutan, projek ini akan mengalami kerugian.

Akhir sekali kesimpulan berdasarkan kepada keputusan yang telah didapati bahawa kegagalan operasi ladang ini adalah disebabkan oleh pengurusan, perumahan bebiri, pemakanan, belanjawan dan sistem pemasaran tidak dilaksanakan seperti yang telah disyorkan oleh agensi-agensi penasihat. Ladang ini akan mengalami kerugian jika kadar kematian yang tinggi, kadsar pembiakan yang rendah serta ketidaksefahaman diantara individu yang terlibat berterusan.

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1.0-INTRODUCTION

Despite much recent publicity and early initiative, for example Seminar on Integration of animals with Plantation Crops which held in Penang, 13 to 15 April 1978; Fifth World Conference of Animals Production, held in Tokyo, Japan, 14 to 19 August 1983; Sixth Anual Conference of Malaysia Society of Animal Production, held in Genting Higland, Malaysia, 10 to 11 August 1982 and Tenth Anual Conference of Malaysian Society of Animal Production, 2 to 4 April 1987, only few research has been done on the integration of sheep with cropping system such as rubber and oil farm. Sheep integration with rubber seem to be the most important among all the project initiated in terms of land acreage, number of animal and farm involved. It is therefore pertinent that as much imformation as possible should be gathered and documented on the subject.

In this project the scope is to cover the performance of the sheep reared under rubber trees in Bukit Ibol Mini Estate. The objectives in the evaluation are;-

(i) to find out the health status of the sheep

(ii) to evaluate their growth and reproductive performance,

(iii) to evaluate the nutritive value of the undergrowth and

(iv) to analyse the financial aspect of the project

2.0-LITERATURE REVIEW

2.1-Definition

Integrated farming is defined as a farm practice which concurrently utilise the same unit area of land for the production of animals and crops (Mahyuddin Dahan, et al., 1978). Integrated farming allows the farmer to have two sources of the income (animal and crops) and reduce the weeding cost (Ani Arope, et al., 1985 and Pillai, K. R, et al., 1985). According to Mahyuddin Dahan, et al., (1978) integrated farming system practised by the smallholders usually have some constraints which can be grouped into three major categories;

(i) technical - performance of the crops and/or animals.

(ii) economic input and output factors, market potential, existence of linkage between producers and buyers, and

(iii) social - for own consumption, for sale or both purpose

2.2-Feed resources

About 60 to 70% of the ground vegetation were found to be suitable as feed for grazing animals (Wan Mohamed, 1978 and Wan Mohamed et al., 1987). Ground vegetation is the plant species that grow under the main tree crops. However, the availability and importance of ground vegetation as source of feed for ruminant depended largely on the botanical composition, yield and quality. These three criteria are generally influenced by numerous factors which include agro-management practices, type and ages of main crop, rainfall intensity and distribution, soil type and terrain (Wan Mohamed, 1977). The major plant species under plantations tree crop aged five years and above, depending on the locality are, Brachiaria mutica, Ottocloa nodusa, Paspalum spp, Axonopus spp, Asystasia coromandeliana, Mikania mirantha and some ferns such as Lygobium spp and Nephrolepis spp. In the poorly managed plantation, Imperata cylindrica is a major problem.

Legumes that cover the ground under immature trees crop are gradually replaced by the more shade resistant plant such as Mikania spp and Paspalum spp as the trees become mature (Ani Arope, et al., 1985)

Dry matter yeild can be as high as 1612 kg/ha and as low as 250 kg/ha per harvest depending on the maturity of the trees crop (Wan Mohammad, 1977). According to above author, the vegetative yield was found to be highest during the immature period of rubber and lowest when the rubber trees are between four to eight years old. After this period the yield was found to remain constant at about 50% of that found under the immature trees.

Sheep integrated with the plantations crop might be faced with problems of inadequate feed supply or suffer for insufficiencies of certain nutrients such as protein and phosphorus (Mahyuddin Dahan, et al., 1978) especially if there are large amounts of rejected species. Under such circumstance supplementation with copra cake, rice bran, commercially prepared cattle pellet or other agricultural by-products would be necessary to increase their performance. Jaafar Daud and Khusahry, (1983) and Reese et al., (1986) revealed

that feed supplementation resulted in better animal performance and a better net return.

2.3-Animal resources and performance

Sheep are more compatibly integrated with the plantations crop especially rubber because of their feeding behaviour that cause little damage to the trees. Goats are not suitable because of their aggressiveness and also browsing habit which cause severe damage to the immature trees (Mahyuddin Dahan, et al., 1978).

All breed of sheep are suitable for integration with the plantations crop, however crosses of Indigenous Sheep of Malaysia with imported breed such as Dorset Horn, Wilthsire Horn, Merino and others are much better. This is due to the combination of adaptive characteristic of local animal and better production and reproduction performance of the imported breed in the cross-bred progeny (Ani Arope, et al., 1985). Fagorty, N.M. (1985) emphasized that genetic gain from selection of the best animal will be more fully expressed phenotypically resulting in higher flock performance under good management and environment. According to Moley, et al., (1978) each additional 1 kg of liveweight at mating resulted in an increase of 0.015 to 0.02 lambs

born/ewe. However for the smallholder with smaller budget, and who could not afford to import exotic breeds, the use of local breed for integration should not be disregarded because these animals are quite easily purchased at much lesser cost.

According to Wan Mohamed (1977), the performance of indigenous sheep under rubber plantation was as follows; reproductivity, 1.5 lamb/ewe/year/; lambing interval, 207 days; at the first lambing, 335 days, with 95% single and 5% twin lambing. The average weight of the lamb is 1.6 kg. Average daily weight gain is 46.5 g per day up to 9 months old. Lamb mortality per year is 18%. Dressing percentage reported by Mohd Salleh Rejab (1982) is 46%.

2.4-Management

Sheep integrated with plantation crops can be managed to graze freely or rotated in a fenced area (Lee, et al., 1978) by using either a permanent or removeable fence (eg. portable solar electric fence). During grazing or in the shed, rams and ewes should not mixed together to prevent unwanted mating and trampling of lambs. Only the best rams among the group should be selected for breeding purposes. By using this method

ewe reproductive performance can be increased and maintained at a high level. Lambs should be kept with their mothers and separated from the flock to avoid death due to trampling and for easy management.

2.5-Health Status

The major problems encountered in rearing sheep under plantation crops is pest, particularly endoparasitic worm. This is one of the factors that always reduce production and reproduction performance of the sheep. The important endoparasites are Strongyloides papillosus, Heamonchus contortus, Trichostrongylus colubriformis, Trichostrongylus ovis, Oesophagustomum columbianum and the others of lesser importance are Moneiza expensa, Bonustomum trigonocephalum and Cooperia punctata (C.S Shanta, 1982). Herd health program must be practised to eradicate this sort of problem. Anthelmentic and rotational grazing should be used as a control program (Mahyuddin Dahan, et al., 1978).

Ectoparasites infestation is seldom encountered with indigenous ruminant but can cause serious problems in the imported breed (Mahyuddin Dahan, et al., 1978). Myiasis (Chrysomia benziana) is one of the major problem

in Malaysia mainly to the exotic breed and its crosess (Fadzil, 1985).

Diseases that frequently cause problems to the sheep in Malaysia are Meliodosis, Contagious ecthyma and Pneumonia (Mahyuddin Dahan, et al., 1978).

2.6-Economic potential

According to Ani Arope, et. al., (1985), based on 10 years Rubber Research Institute of Malaysia experience of using sheep as `labour' for control of the weed, sheep integration has exciting possibilities. The sheep required no continous supervision, no stall feeding, had no disease and breeding problems and absolutely posed no problem to the rubber trees. Cost saving of 15 to 25% could be obtained in the overall weed control program. Together with the sale of animals and manure, sheep rearing under plantation tree crops could give a return of 15% on investment.

As a conclusion, we can say that the integration of the sheep with plantation crop especially rubber are beneficial. It reduced the cost of weeding control and increase production per unit area of land. However, to achieve a good level of animal production, a balance of breed, nutrition and management systems is required

Breed selection, optimum nutrition and improvement of the management are important for high ewe reproduction, lamb survival and lamb growth and also to ensure that the genetic potential of flock is achieved. The farmer should consult agencies or experts before starting the project in order to minimise future problems.

3.0-MATERIALS AND METHODS

3.1-Location

The study was conducted on a Mini Estate located at Kampong Pulau Meranti, Bukit Ibol, Sepang, Selangor. The mini estate which is owned by 40 smallholders, consisted of 69.6 hectares of rubber planted in 1981. The management of the Mini Estate is handled by RISDA who tendered it to the Koperasi Pekebun-pekebun Kecil Daerah Sepang (KOPEKS).

3.2-Animal Management

From January until March 1986, 215 female Indigenous Sheep of Malaysia and 6 male 50% Dorset Horn were introduced into this farm in 3 occasions. These animals were managed by one sheepherder under the

supervision of a farm manager. Except for the lambs and weak animals, the others were let out to graze in a particular section of the farm. They are grazed freely within a penned area (enclosed by moveable solar electric fence) from 9.00 am until 3.00 pm daily (Appendix-1) They are moved to the other sections when the feed avaibility become limiting. When the animals are indoors, they are supplied with cut grass, concentrate and drinking water.

3.3-Methodology

For the purpose of this project the methodology for evaluation of the farm were as follows;-

(i) samples of undergrowth were collected at random from 5 lots; each lot was sampled 4 times (figure 1). The samples were identified, dried at 60° C, ground and submitted to the laboratory for nutrient analysis.

(ii) examination was carried out ramdomly on 30% of the herd (50 animals) for body condition and observations of external indication of ill-health.Some animals that arrived recently from Australia through Department of Veterinary Services (DVS) were treated mainly

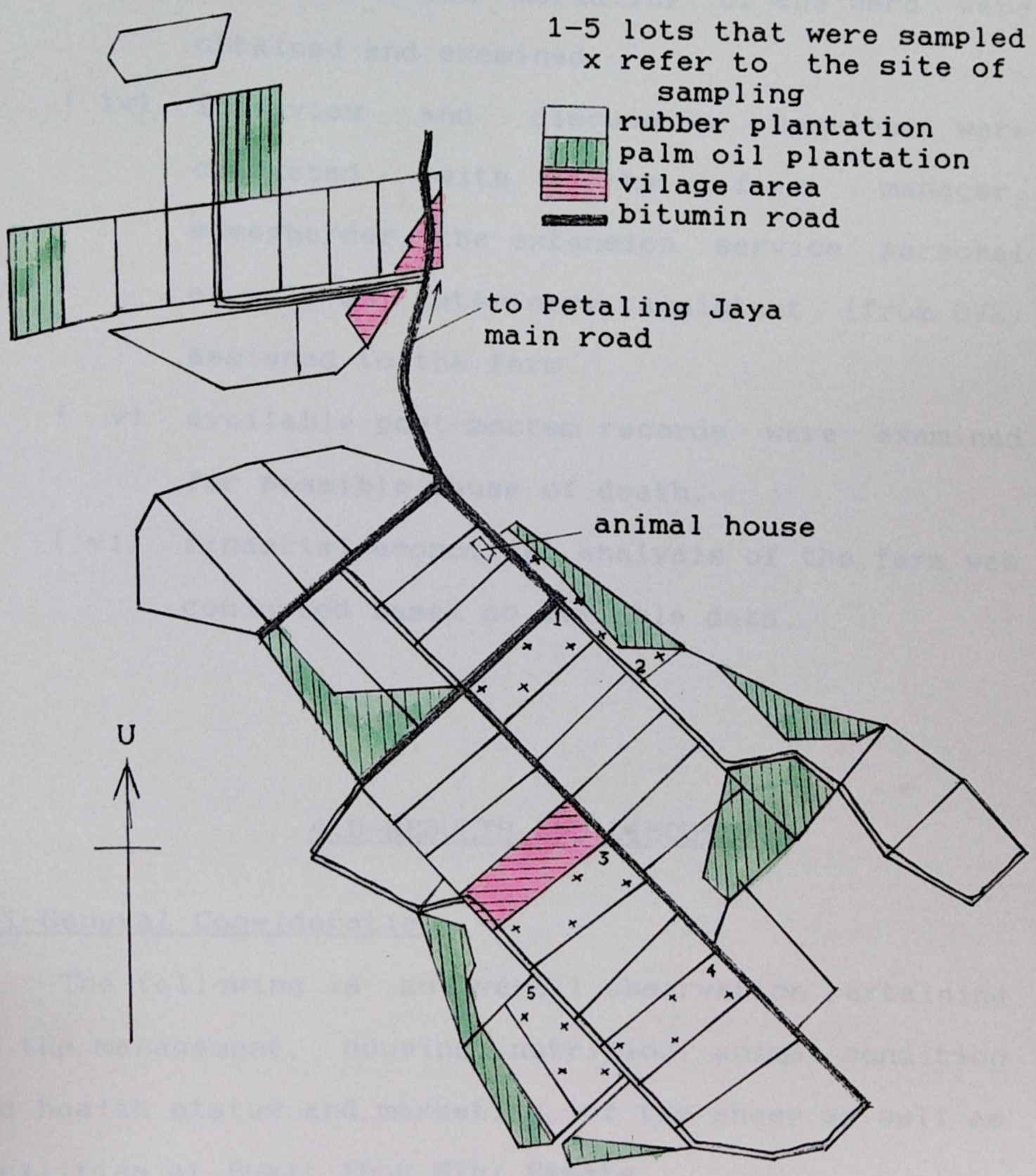

Figure 1 : Map of Bukit Ibor Mini Estate showing site of sampling for estimation of dry matter yield and species composition.

for maggots wound.

(iii) available record on body weight, reproductive performance and mortality of the herd were obtained and examined.

(iv) interview and discussion sessions were conducted with the farm manager, sheepherder, the extension service personal as well as Veterinary assistant (from DVS) assigned to the farm.

(v) available post-mortem records were examined for possible cause of death.

(vi) financial/economical analysis of the farm was conducted based on avaiable data.

4.0-RESULTS AND DISCUSSION

4.1-General Consideration

The following is an overall observation pertaining to the management, housing, nutrition, animal condition and health status and marketing of the sheep as well as facilities at Bukit Ibor Mini Estate.

4.1.1-Management

(i) There was misunderstanding and communication

breakdown among the personel involved, i.e project advisor, manager and sheepherder regarding their respective roles in the project. This leads to failure in implementry certain decision.

(ii) The rams and ewes were mixed together whether during grazing or in the stall. This resulted in uncontrolled mating

(iii) The weak and sick animals were not isolated from the healthy ones.

(iv) The recording system is inadequate.

4.1.2-Housing

(i) The floor is too low leading to difficulty in cleaning the faeces from under the shed.

(ii) The floor design is of a slatted system but some part of the floor is covered with plank wood. The faeces get stuck to these planks and are difficult to clean.

(iii) The drainage system was bad, this leads leading to collection of rain water under the shed.

4.1.3-Feeding

(i) Strategic feeding of lambs, lactating and pregnant animal was not practised.

(ii) Milk replacer was not given to the lambs below two months. Sometimes the animals in the stall did not get enough feed.

4.1.4-Health Status

(i). Almost all of the animals were lean and weak with dirty and matted wool.

(ii). Some of the sick animals were not treated.

4.1.5-Marketing

(i). There was no permanent marketing system. Animals were sold according to the current demand. Sometimes pregnant animals were also sold.

4.1.7-Facilities

(i). The farm is in an isolated area about 2 km from the main road. It has no telephone, no pipe water and no electricity.

The main problem of the farm which lead to failure in almost all of the system factors is poor appreciation

and attitude of the personnel involved which leads to misunderstanding and communication break down. This contributed greatly to the low level of animal performance summarised as in figure 2 below;

PERSONEL AND AGENCIES
.low attitude and appreciation
.less motivation
.failure to implement decision

FARM OPERATIONAL FAILURE
.poor animal condition and health due to
-poor feeding management
-faulty housing design
-poor disease control and treatment

.incomplete record keeping

ANIMAL PERFORMANCE
.high mortality
.low growth rate
.poor reproductive performance

INEFFICIENT PRODUCTION

Figure 2 : Flow chart of factors leading to operation failure.

4.2-Feed Avaiability and Nutritive Value

4.2.1-Feed availability

Based on the 20 samplings of 5 lots with 4 sites within each lot (refer to Appendix 2) the available

biomass was equal to 307.5 kg/ha/harvest. According to the results obtained, the biomass avaibility is quite good considering the rubber trees were already 6 years old. (Wan Mohammad, 1977), quoted values ranging from 500 to 900 Kg/ha in smallholder farm and 250 Kg/ha to 1612 Kg/ha for estate.

If we assume that the undergrowth requires 3 months to regenerate, then the dry matter yield is 1230 kg/ha/year (307.5 x 4). If the animal eat 3 % of their body weight and the average weight of the animal is 20 kg, then each animal require 600 g dry matter/day or 219 kg/year. The maximum stocking rate for Bukit Ibor Mini Estate is therefore calculated to be 5.6 animals/ha/year (1230 / 219 = 5.62). The farm (69.6 hectares) capacity, assuming the absence of rejected species, is estimated to be 391 animals/year.

4.2.2-Species composition

Table-1 shows the 7 species which were identified and analysed for their nutritive value. Species composition in based on dry matter. Scleria lithosperma is the major species in this farm (17.4%), followed by Peureria muconoides (17.0%), Ottocloa nodusa (16.8%), Centrosema pubescence (16.2%), Cleome rutidosperma

6 years old rubber (Bukit Ibol)

Identification	Species Composn. (% DM basis)	NUTRITIVE VALUE %OM	%CP	NDF	ADF	ADL	Ca	P	Mg	Zn	Cu
		(mg/g)								(ug/g)	
GRASS											
Axonopus affinis	12.9	91.3	12.3	77.2	39.4	6.9	3.2	1.4	3.1	4.6	9.6
Ottoclova nodusa	16.8	89.5	16.0	73.2	36.1	8.4	2.2	1.1	2.5	7.7	13.7
Scleria lithosperma	17.4	93.4	-	80.3	-	-	1.8	0.6	1.0	2.6	5.9
BROADLEAVES											
Cleome rutidosperma	14.0	91.9	-	-	-	-	5.1	2.7	1.9	27.8	10.7
Mikania mirantha	5.8	89.2	16.6	47.1	32.6	10.7	6.6	1.3	3.2	63.4	32.7
LEGUMES											
Pueraria mucunoides	17.0	93.1	15.8	62.0	40.4	13.2	6.1	1.0	2.9	38.0	32.9
Centrosema pubesence	16.2	94.0	20.8	63.2	35.2	6.5	4.3	0.6	2.2	46.4	38.1

KEY

%OM = Percentage of Organic Matter
%CP = Percentage of Crude Protein
NDF = Neutral-Detergent-Fibre
ADL = Acid-Detergent-Lignin
ADF = Acid-detergent-Fibre
Mg = Magnesium
Cu = Copper
Ca = Calcium
P = Phosphorus
Zn = Zinc

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(14.0%) Axonopus affinis (12.9%) and Mikania mirantha (0.6%).

The species composition is influenced by the tolerence to the shade (Wan Mohammad, 1977). Other factors involved are topography and type of the soil. Species composition is an important measure of the availability of feed resources for the animal since certain species of undergrowth may be rejected resulting in insufficient supply of nutrients to the animal. In this farm the animal were observed to eat all those species that were sampled.

4.2.3-Nutritive Value

The nutritive values on dry matter basis, of the identified species of the undergrowth is shown again in Table 1. Crude protein content ranged from 12.31 to 20.82% which Centrosema pubesence contained the highest and Axonopus affinis the lowest. Non-detergent-fibre ranged from 47.12 mg/g for Mikania mirantha to 80.3 mg/g for Scleria lithosperma. The concentration of minerals are as follows: Calsium ranged from 1.84 mg/g for Scleria lithosperma to 6.65 mg/g for Mikania mirantha, Phosphorus ranged from 1.26 mg/g for Mikania mirantha to

2.73mg/g for Cleome ruthidosperma, Magnesium ranged from 1.0 mg/g for Sceleria lithosperma to 3.2 mg/g for Mikania mirantha, Zinc ranged from 4.61 ug/g Axonopus affinis to 63.4 mg/g for Mikania mirantha and Copper ranged from 5.9 ug/g for Sceleria lithosperma to 38.1 ug/g for Centrosema pubesence.

Table 1 therefore indicated that major species like Sceleria lithosperma are deficient in Calcium and Magnesium. The other species are either sufficient in protein and mineral elements or provide nutrients which exceeds the requirement of sheep.

4.3-Production performance of the herd

4.3.1-Population dynamics, reproduction and mortality

Dynamic of sheep population in the Bukit Ibol is shown in Table 2. However the result is inadequate because not all the data required has been recorded. Reproduction data is available for the period of January to August 1986. During this period the lamb born per ewes averaged 0.42, mortality rate for the adults and

TABLE 2 : Dynamic of sheep population at Bukit Ibol

(Jan - August 1986*)

Purchase (Jan to Mac 1986)

Ewe	215
Ram	6
Total	221

Ratio Ewe to Ram 55.8 : 1

Lambing (Jan to August 1986)

Female	60
Male	47
Total	107

Female to male 1.28 : 1

Mortality (Jan to August 1986)

Lambs	
a) female	10
b) male	5
Adult	
Total	22

* no record avaiable for Sept-Dec 1986 and the following years.

lambs are 3.17% and 13.01%, respectively. Of the total animals that died 45.5% were female and 22.7% were male lambs.

The lambing rate reported here is considered bad when compared to those reported by Wan Mohamed (1977) for indigenous sheep. The mortality rate compare reasonably well with values of 10-18% per year reported by Devendra (1976) and Wan Mohammad (1977). However it is difficulty to assess the reproductive performance accurately due to incomplete recording of data.

From personal observations and discussions with the personnel involved with the farm it was found that high losses occurred between October to December 1987. This was born out by the number of animals present in the farm during this time. On October 31st 1987 the total population of sheep at Bukit Ibol Mini Estate was 129 and this does not include the 29 purebred Polled Dorset Horn that was brought into this farm by DVS in September. By December 31st 1987 the total population of sheep was reduced to 72; the Polled Dorset Horn has been taken back by DVS. In other words, within two months 53 animals were lost with no record to indicate that the animals were sold.

4.3-Financial analysis

Based on investment cost (Appendix 4) supplied by the manager of Bukit Ibol farm and estimated income from sales and salvages value of the project, tables of financial analysis were drawn up. Saving in weeding cost was not included in these tables because no data was available from the farm.

Table-4a of the sheep production model until September 1987 shows that the project is viable with the commulative project net benefit (PNB) reaching $58.74 but this value goes down sharply to $-16,941.20 (loss) at the end of year 1987 (Table-4b). This is due to tremendous losses of the salvage value by this time However we cannot conclude that the viabilty of the project until September 1987 is due to efficiency of the production because it might be due to the 50% subsidi on the breeder as purchased but which were sold at the fullprice. This statement is confirmed by Table-4c which show that if the breeder had been purchased without the 50% subsidy the farm may lost up to $18,326.20.

until Sept `87 with 50% subsidy

YEAR	1982	1983	1984	1985	1986	1987
Age of rubber tree	1	2	3	4	5	6
Inflow						
Sales					10299.00	5769.00
Loan receipts*				6750.00	6977.75	110.88
Salvage value**						27000.00
total	0.00	0.00	0.00	6750.00	17276.75	32879.88
Outflow						
Investment cost				7500.00	7753.05	123.20
Cost operating expenses				18385.00	5037.25	6814.25
Debt service					5617.57	5617.57
total	0.00	0.00	0.00	25885.00	18407.87	12555.02
Project Net Benefit(PNB)	0.00	0.00	0.00	-19135.00	-1131.12	20324.86
Commulative PNB	58.73855					

* loan receipt is assume 90% of the fixed invesment cost.
** total value of the 129 sheep until Sept. `87 (from record).
Debt servical is the value paid for $26,385.00 loan (5 years) with 2% interest;
($28,087.84 / 5 = 5617.57).

until 31/12/87 with 50% subsidy.

YEAR	1982	1983	1984	1985	1986	1987
Age of rubber tree	1	2	3	4	5	6
Inflow						
Sales					10299.00	5769.00
Loan receipts*				6750.00	6977.75	110.88
Salvage value**						10000.00
total	0.00	0.00	0.00	6750.00	17276.75	15879.88
Outflow						
Investment cost				7500.00	7753.05	123.20
Cost operating expenses				18385.00	5037.25	6814.25
Debt service					5617.57	5617.57
total	0.00	0.00	0.00	25885.00	18407.87	12555.02
Project Net Benefit	0.00	0.00	0.00	-19135.00	-1131.12	3324.86
Commulative PNB	-16941.2					

* loan receipt is assume 90% of the fixed invesment cost.
** total value of the 72 sheep remain in the stall until 31/12/87. The average weight is assumed 18.5 kilograms with average price $7.50¢/kg.
Debt servical is the value paid for ($26,385.00) loan (5 years) with 2% interest; ($28,087.84 / 5 = 5617.57).

TABLE 3c :
until Sept. `87 if no subsidy

YEAR	1982	1983	1984	1985	1986	1987
Age of rubber tree	1	2	3	4	5	6
Inflow						
Sales					10299.00	5769.00
Loan receipts*				6750.00	6977.75	110.88
Salvage value**						27000.00
total	0.00	0.00	0.00	6750.00	17276.75	32879.88
Outflow						
Investment cost				7500.00	7753.05	123.20
Cost operating expenses				36770.00	5037.25	6814.25
Debt service				-	5617.57	5617.57
total	0.00	0.00	0.00	44270.00	18407.87	12555.02
Project Net Benefit(PNB)	0.00	0.00	0.00	-37520.00	-1131.12	20324.86
Commulative PNB	-18326.2					

* loan receipt is assume 90% of the fixed invesment cost.
** total value of the 129 sheep until Sept. `87 (from record).
Debt servical is the value paid for $26.385.00 loan (5 years) with 2% interest ($28,087.84 / 5 = 5617.57).

5.0–GENERAL DISCUSSION AND CONCLUSION

Of the three factors (human, system and animal) that affect the farm operation, we believe that human factors were mainly responsible for the failure of sheep production in Bukit Ibor Farm. The relationship between these factors are shown in Figure 3.

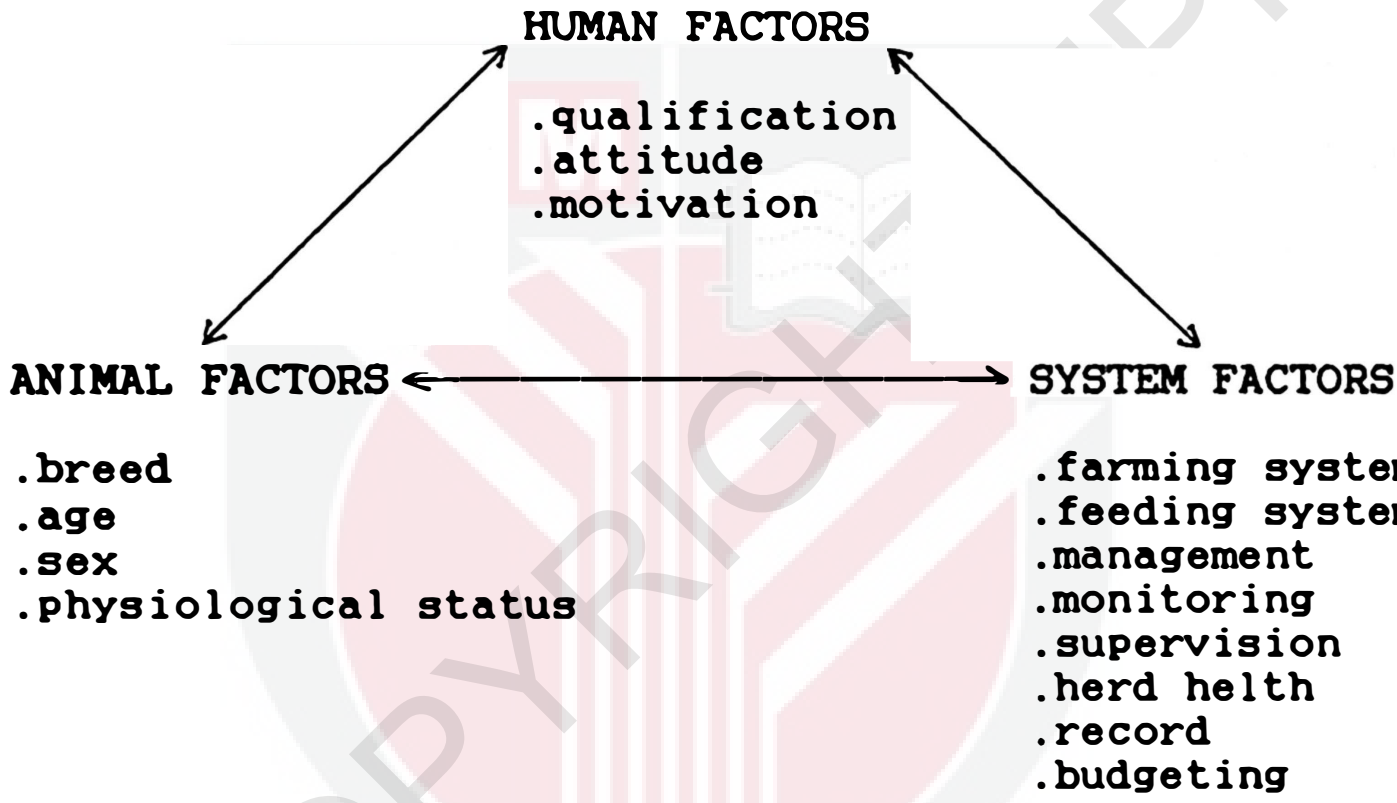

Figure 3 : Relationship between factors involved in animal production.

The manager is one of the persons in an organization who makes decisions. His skill, knowledge and experience as well as attitude toward risk will have a big influence on the decision that he makes. Failure to make the right decision at the management level affect all systems of the operation which may be difficult to

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correct. The manager must know to whom the authority should be delegated to avoid failure of the operation during implementation. Good communication and relationship between the manager and his staff is important. The worker should be a responsible person and should be fully committed to the task of managing the animal.

As a conclusion we can say that the farm failed in its operation. This statement is proven by the fact that financial analysis revealed the farm lost about $16,941.3 at the end 1987. The failure of the animals to perform to expectation was due to failure of the worker to manage the farm properly.

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APPENDIX 1 : Daily sheep management routine.

7.00 -	7.30 am.	: take sheep to grazing place.
7.30 -	8.30 am.	: manage the lambs. Give milk replacer to the lambs.
10.30	11.00 am.	: check animal in the grazing area
3.00	5.00 pm.	: take the sheep into shed treatment give milk replacer to the lambs cut grasess for the animal concentrate to animals

Comment · The sheepherder rarely give milk replacer to the lamb.

APPENDIX 2 : Table of dry matter/lot

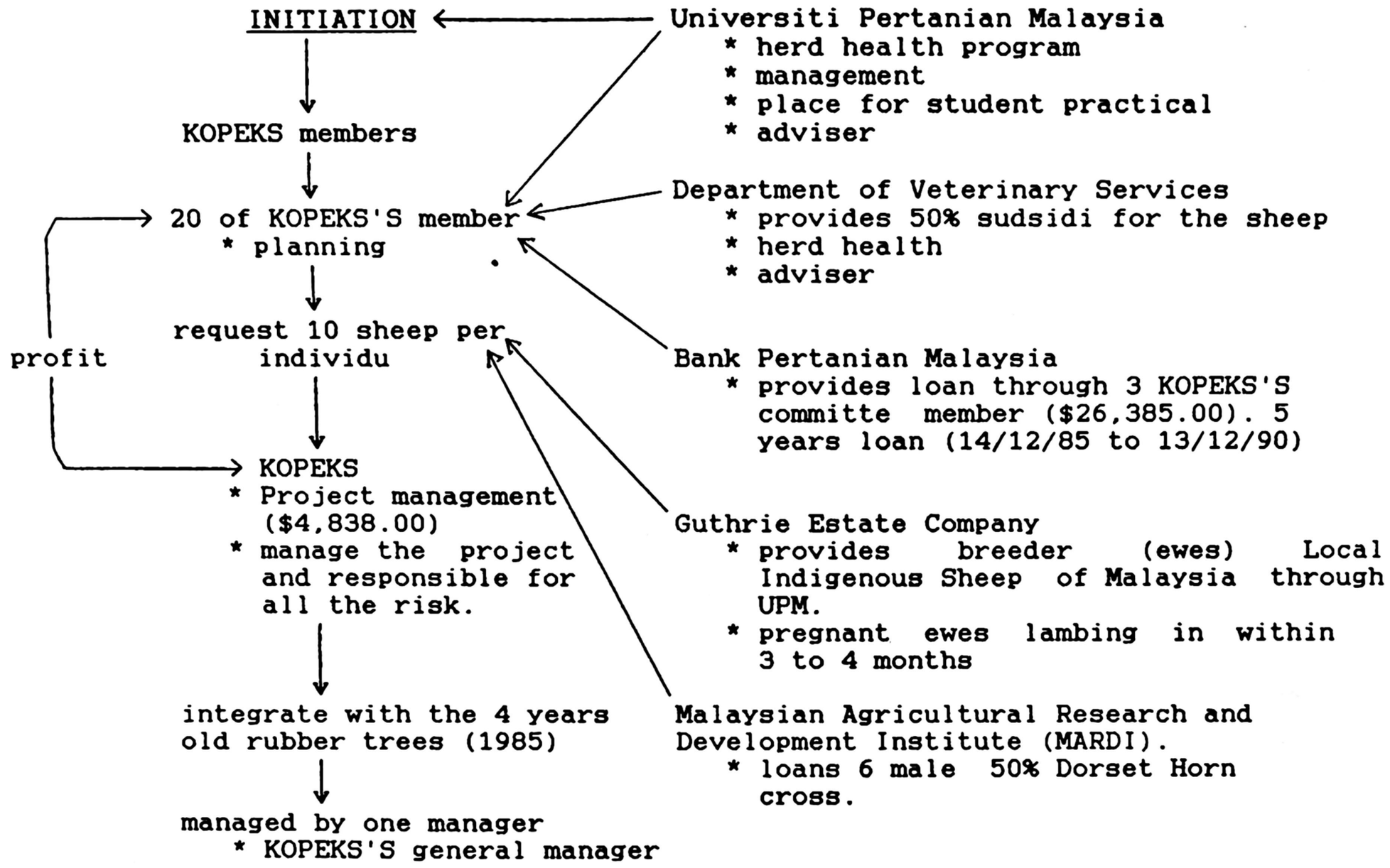
no. of lot	total dry matter (g/m2)
4947	33.30
4935	27.16
4926	29.20
4925	23.41
4938	40.68

mean = 30.75 g/m2

$$= \frac{30.75 \times 10000}{1000} \text{ m2}$$

= 307.5 kg/ha

in the establishment and development of Bukit Ibor Mini Estate Sheep-rubber integration.



APPENDIX 4 : SHEEP INVESMENT COST

	YEAR 0 (`85) number of unit	cost	YEAR 1 (`86) number of unit	cost	YEAR 2 (`87) number of unit	cost
Investment						
Fixed						
1. building & equipment	2	7500.00	1	2418.80	-	-
2. portable solar electric fence	-	-	1	3353.80	-	-
3. miscellaneous	-	-	-	1980.45	-	123.20
		7500.00		7753.05		123.20
Incremental						
Working Capital						
1. ewe purchased	215	18385.00	?	753.00	-	-
2. ram purchased	6	0.00	-	-	-	-
3. feed & madicine	-	-	-	834.26	-	841.00
4. labour	-	-	2	3450.00	2	5009.05
		18385.00		5037.26		5850.05
Total Investment		25885.00		12790.31		5973.25