

Pasture and Sheep Production Under Soursop (*Annona muricata*) Orchard

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ABSTRACT

This paper discusses the integration of sheep under soursop (*Annona muricata*) orchard. After two years of grazing, there was a decline in pasture availability from 1860 kg/ha to 480 kg/ha. Species succession or changes in botanical composition was also observed. In terms of sheep performances, the average birth weight of lambs was 2.90 +0.03 kg and the average weight at 12 months was 28.5 +0.81 kg. Average daily gains (ADG) of the lambs at pre and postweaning periods were 113.3 g/head and 57.0 g/head, respectively. The lambing percentage obtained in this integration study was 81.7% with 6% twin birth and 94.3% lamb survival rate. It is evident from the study that sheep integration with soursop orchard shows good potential as a livestock production system.

INTRODUCTION

The concept of livestock integration with tree crops such as coconut, oil palm, rubber and fruit orchard has been widely accepted. This is because of the advantages derived from integration, such as reduced cost of weeding, additional fertilizer for the tree crops from the dung and urine, increased tree crop yields and most

importantly additional income from the sales of the animals. In the present situation in which land for agriculture is scarce, integration of livestock with tree crops provides an efficient land utilization in which no new additional land is required for livestock rearing. In Malaysia, more than four million hectares of agricultural land are planted with oil palm and rubber. The idea of integrating cattle with oil palm and sheep

under rubber has been promoted since the 70's but the plantation sectors have not really accepted the idea. Recently, with the economic slowdown and with the increase in the cost of herbicides, the plantation sectors have begun to accept the idea believing that grazing animals can be used to control the weeds under these tree crops.

Beside oil palm, rubber and coconut, there is also a potential of livestock integration with fruit orchards. Literatures in Malaysia have reported integration of sheep with durian (*Mohd Najib, 1995; Azizan, et al. 1990*), mango (*Khairuddin et al. 1992*), starfruit and jackfruit (*Rajion et. al. 1988*) with good animal performance and increase in fruit yields. This paper will discuss changes in pasture availability and botanical composition after two years of sheep grazing and sheep performances under soursop.

MATERIALS AND METHODS

Site.

A 20 ha area of soursop (*Annona muricata*) orchard at MARDI Research Station, Bukit Ridan, Pahang was selected for the study. The soursop trees were 15 years old and planted at 6m x 6m and grown on soil of Rengam series (*Typic Tropudult*) developed over granite in brownish yellow colour, deep and well-drained with sandy clay to clay texture (*Law and Tan, 1977*).

The area has a mean annual rainfall of 2286 mm and mean maximum and minimum temperatures of 32.3 °C and 22.3 °C, respectively. There are two distinct dry periods each year; February to March and June to August.

Sheep Management.

The 20-ha area was divided into four paddocks with permanent chain-linked fencing. Two hundred ewes and 8 rams were allowed to graze the native undergrowths in the orchard. They grazed each paddock in rotation for 3-4 weeks. The animals were reared in a semi-intensive system in which they were let out to graze in the morning (0900) and herded back to the shed in the afternoon (1500 hours). In the shed, the sheep were given water and salt lick ad libitum. Pelleted feeds were also supplemented at the rate of 1% of their body weight. Drenching of internal parasites was given monthly or bi-monthly depending on the worm fecal count. The animals were weighed every month.

The target in the production system was to get three lambings every two years (lambing every eight months). The mating system practiced in this integration was using rams at a ratio of one ram to 20 ewes. The rams run together with the ewes for two months. When lambs were born, the mothers were kept in the shed with the lambs and given cut grass/oil palm frond silage and pellets for three to four days before the mothers are let out to graze. The lambs were kept in the shed and joined their mothers after the latter came back from grazing in the afternoon. Besides the milk from their mothers, the lambs were given pelleted feed. Lambs were weaned at three months old.

Pasture Management.

Weed control in the orchard was done by spraying with herbicides in circle of about two meters radius from the base of the tree. It was done three times per year. All the woody shrubs and

weeds not grazed by the sheep are controlled using spot spraying with herbicide after two years of grazing

Sampling of the native pasture under soursop was done prior to the sheep grazing the paddock then three times per year using the non-destructive dry-weight rank method of 't Menjetje and Haydock (1963) for botanical composition and destructive method for pasture availability.

RESULTS AND DISCUSSION

Pastures Under Soursop Orchard

Plant species present. Under the ecophysiological environment available under soursop orchard, 18 species were found growing in the interrows of soursop. In the course of the study, only 14 species were observed to contribute to the feed intake of the sheep. The other four species were not grazed by the sheep. The list of edible and non edible species is shown in **Table 1**. The number of species recorded in this study is less compared to the rich ground flora under oil palm. Under cattle integration with oil palm, Chen et.al (1978, 1983) reported 31 species under five-year old oil palm and 37 species under young oil palm. Under buffalo integration with oil palm, Hassan and Abdullah(1991) also reported a higher number of plant species at 29.

Plant species acceptability by the grazing animals is an indicator of edibility. In this study, species that were grazed were considered edible. About 78% of all the plant species recorded

Table 1. Plant species growing under soursop orchard.

Edible species	Non edible species
<p>Grasses: Axonopus compressus Digitaria spp. Imperata cylindrica Ischaemum muticum Panicum spp. Paspalum conjugatum Sporobolus diander S. indicus</p> <p>Legumes: Calopogonium mucunoides Centrosema pubescens Pueraria phaseoloides</p> <p>Broadleaves: Asystasia intrusa Mikania cordata Starchytarpheta indica</p>	<p>Broadleaves: Ageratum conyzoides Borreria laevicaulis B. latifolia Lantana camara</p>

under soursop were edible to sheep. This figure is comparable to the report by Wan Mohamad (1977) where 60-70% of the weeds under rubber are edible to sheep.

Dry matter availability and botanical composition. At the commencement of the study, the dry matter on offer of the native pastures under soursop orchard was 1860 kg/ha. However, this value declined to 480 kg/ha after two years of sheep grazing (**Table 2**). This dry matter on offer is fairly low. The probable reason was that the stocking rate used in the study was high and the animals were getting bigger with time forcing heavy grazing pressure on the native pastures. Secondly, the species, *Axonopus compressus* which dominated the pasture after two years of grazing is a creeping grass with low dry matter yield (Wong et al. 1985; Chen et al. 1984).

There are six main plant species that contributed to the bulk of the forage at the beginning of the study. *Asystasia intrusa*, *Paspalum conjugatum*, *Ischaemum muticum*, *Imperata cylindrica*, *Calopogonium mucunoides* and *Pueraria phaseoloides* contributed 86.7% to the total forage of the native pastures. The legumes *C. mucunoides*, *P. phaseoloides* and *C. pubescens* were legume covercrops still left in the soursop orchard.

After two years of sheep grazing, there was a succession of plant species (Table 2). These changes may be in part due to the grazing behaviour of sheep in terms of their selectivity and acceptability of the species. In general, there are two trends developing in species changes.

Table 2. Changes in pasture dry matter on offer and botanical composition of native pastures under soursop orchard after two years of sheep grazing.

Pasture components	Year 1	Year 2
Dry matter on offer (kg/ha)	1860	480
Species composition (%)		
Group 1.		
<i>Asystasia intrusa</i>	42.9	0.0
<i>Paspalum conjugatum</i>	13.4	1.8
<i>Calopogonium/Peuraria</i>	12.0	0.0
<i>Ischaemum muticum</i>	8.9	1.4
<i>Imperata cylindrica</i>	9.5	1.4
<i>Centrosema pubescens</i>	3.1	0.0
<i>Mikania cordata</i>	2.3	0.0
<i>Borreria laevicaulis</i>	1.3	0.0
Group 2.		
<i>Axonopus compressus</i>	2.9	35.8
<i>Digitaria spp.</i>	0.9	17.5
<i>Sporobolus indicus</i>	0.0	12.5
<i>Panicum spp.</i>	0.0	6.1
<i>Borreria latifolia</i>	1.9	5.3
<i>Ageratum conyzoides</i>	0.9	5.3
<i>Lantana camara</i>	0.0	5.2
<i>Sporobolus diander</i>	0.0	4.0
<i>Stachytarpheta indica</i>	0.0	3.5

Species in Group 1 have declined drastically, while species in Group 2 have increased in their contribution to the forage availability for the grazing sheep. Except for *Borreria laevicaulis*, all the Group 1 species were the edible and readily grazed by the sheep. This continuous grazing pressure contribute to their decline. Group 2 species consisted of the edible as well as non edible species. The non edible species such as *Ageratum conyzoides*, *Borreria latifolia* and *Lantana camara* increased in the pasture because they were not grazed by the sheep. But some of the edible species also increased. *A. compressus* for instance, increased ten fold, probably due to the growth habit of this grass which is difficult for the sheep to graze. Both *Sporobolus spp.*, *Stachytarpheta indica* and *Panicum spp.* were edible but not really liked by the sheep because of the rough and tough texture of the leaves. *Digitaria spp.* also increased after two years of grazing probably due to the fact that the grass is characteristically small with creeping to erect growth habits.

Animal Performances.

Live weight gains of lambs. The mean body weights of the SLT lambs from birth until 12 months are shown in Table 3. The mean body weights of male lambs were slightly higher than

Table 3. Mean body weights (+SE) at different ages of Siamese Long Tail (SLT) lambs grazing in soursop orchard.

Age (months)	Body weight (kg)		
	Male	Female	Mean
0 (Birth)	3.0 +0.10	2.8 +0.09	2.9 +0.03
3	13.7 +0.48	12.5 +0.41	13.1 +0.18
6	20.8 +0.68	18.1 +0.50	19.4 +0.27
9	27.7 +1.00	22.8 +0.52	25.2 +0.53
12	31.7 +1.28	25.3 +0.97	28.5 +0.81

female lambs at all ages until 12 months old. Mean birth weight was 2.9 ± 0.03 and this is two times higher than the local breed, Malin (*Abdullah et al., 1990; Moh Salleh et al., 1989*). The 90-day weaning weights for male and female lambs were 13.7 ± 0.48 and 12.5 ± 0.41 kg, and at 12 months, male and female lambs attained weights of 31.7 ± 1.28 and 25.3 ± 0.97 kg, respectively. One year is the common marketable age for sheep in Malaysia. With Malin, which is smaller in size compared to the SLT, the year old weight is 22.60 kg for males and 19.00 kg for females (*Moh Salleh et al., 1989*).

Average daily gains of lambs. Average daily gains (ADG) showed the same trend as that of body weights in which male lambs recorded higher ADG than the females (**Table 4**). Higher ADGs of lambs were also recorded for pre-weaning period (0-3 months) at 113.35 ± 1.8 g/head compared to postweaning period (after 3 months), indicating that SLT ewes were good mothers. However, the postweaning ADG showed a declining trend with age. The ADG of sheep under durian orchard (*Azizan et al., 1990*) showed comparable results with preweaning ADG of 97.2g/head and post-weaning ADG up to six months of 67g/head.

Table 4. Average daily gains (+ SE) of Siamese Long Tail (SLT) lambs grazing in soursop orchard.

Age (months)	Average daily gains (g/head)		
	Male	Female	Average
0-3	118.9 ± 5.1	107.8 ± 4.1	113.35 ± 1.8
3-6	78.9 ± 4.7	62.2 ± 3.8	70.55 ± 1.7
6-9	76.7 ± 6.9	52.2 ± 3.9	64.45 ± 3.2
9-12	44.4 ± 9.6	27.8 ± 9.0	36.10 ± 6.4

Ewe reproductive performance. Ewe reproductive performance is a measure of the ewe mothering ability as well as their reproductive capability. As shown in **Table 5**, the average lambing percentage or, the percent ewes lambing in this study was 81.7%. The number of lambs born/ewe, which is indicative of the twinning ability of the breed is 1.06. In other words, twin born lambs is not very common in the breed, which represents only 6% and the other 94% of the lambs were born single. The local breed, Malin, however, is more prolific with the number of lambs born/ewe of 1.6 (*Khairuddin et al. 1992*) and with births of singles, twins, triplets and quadruplets of 54.12%, 38.45%, 6.14% and 1.29%, respectively (*Moh Salleh et al. 1989*). The number of lambs weaned/ewe shows the ability of the mother to raise their lambs until weaning. In this study of integration of SLT sheep in soursop orchard, the number of lambs weaned/ewe was 1.0 and thus the survival rate was 94.3%. In other words, the preweaning mortality was 5.7%.

The overall sheep performance in this study is comparable to other report using the same size of sheep (*Azizan et al. 1990*). Sheep being a small animal compared to cattle is suitable for inte-

Table 5. Reproductive performance of Siamese Long Tail ewes grazing in soursop orchard.

Ewe traits	Mean of three lambings
Lambing percentage (%)	81.7
Number of lambs born/ewe	1.06
Number of lambs weaned/ewe	1.0
Lamb birth weight (kg)	2.90
Weaning weight (kg)	13.1
Lamb survival (%)	94.3

gration under orchard where the detrimental effects from trampling and soil compaction can be minimised. The effects of sheep grazing on the growth and fruit yield of soursop, however is being studied.

CONCLUSION

It is evident that rearing of sheep in soursop orchard provides another alternative avenue for livestock production. Even though pasture availability was declining after two years of grazing, sheep growth and reproductive performances were comparable to other sheep-tree crop integration systems. It is therefore envisaged that this sheep integration with soursop orchard has potentially good future for sheep production.

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