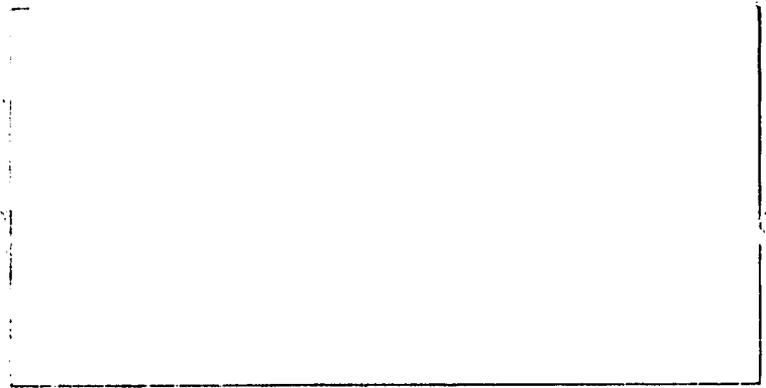


PN-ABR-720



Small Ruminant - CRSP



SUB-BALAI PENELITIAN TERNAK, SUNGAI PUTIH  
BALAI PENELITIAN TERNAK  
PUSAT PENELITIAN DAN PENGEMBANGAN PETERNAKAN

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ECONOMIC ANALYSIS OF SHEEP GRAZING IN  
RUBBER PLANTATIONS: A CASE STUDY OF  
OPMM MEMBANG MUDA

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**ECONOMIC ANALYSIS OF SHEEP GRAZING IN RUBBER PLANTATIONS:  
A CASE STUDY OF OPMM MEMBANG MUDA**

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**ABSTRACT**

Gross margin analysis indicates that a net farm income of US\$ 196/year/farm could be generated by rearing sheep in rubber plantations, accounting for 21.77% of rubber net income. From the economic point of view, grazing sheep in rubber plantations can be a good source of additional income for the farmers and can reduce pressure for overtapping rubber which reduces the lifetime of a plantation. Larger contribution of sheep rearing can be achieved by increasing initial flock size. The on-going collaborative work between SR-CRSP/RIAP and PTPs provides 11 sheep to farmers, will increase farmers' income more than 30% above income from rubber alone.

**ANALISIS EKONOMI PEMELIHARAAN TERNAK DI KEBUN KARET:  
STUDI KASUS OPMM MEMBANG MUDA**

**ABSTRAK**

Analisis gross-margin menunjukkan bahwa tambahan pendapatan bersih sebanyak US\$ 196/tahun/petani dapat diperoleh dari usaha memelihara domba di kebun karet. Tambahan pendapatan tersebut merupakan 21,77% dari pendapatan bersih yang diperoleh dari usahatani karet saja. Dari segi ekonomi, pemeliharaan domba di kebun karet merupakan sumber pendapatan tambahan pendapatan yang baik bagi petani dan akan dapat mengurangi penyadapan berlebihan yang menyebabkan berkurangnya usia produktif tanaman karet. Sumbangan usaha pemeliharaan domba terhadap pendapatan keluarga petani akan dapat ditingkatkan jika jumlah stok-awal domba yang dipelihara dapat ditingkatkan. Kerjasama SR-CRSP/SBPT dengan beberapa PTP yang sekarang sedang berlangsung meminjamkan 11 ekor domba kepada petani sebagai stok-awal yang diharapkan akan dapat memberikan pendapatan tambahan sebanyak 30% dari pendapatan usahatani karet.

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## INTRODUCTION

North Sumatra, Indonesia has a large area of rubber plantations which occupy nearly 423,000 ha, including 310,000 ha of smallholdings, 94,000 ha of government-owned estates, and 104,000 ha of private estates (Dereindra *et al.*, 1991). These plantations have abundant forages grown in the interrows and can be utilized for feeding livestock.

Grazing of ruminants in rubber plantations results in: 1) reduced competitions for the tree crop from weeds and grasses; 2) an important source of income before the trees enter production; 3) supplemental income during tree crop production; 4) enhanced soil fertility from faeces and urine and 5) diversification of the agricultural enterprise as a hedge against fluctuating commodity prices (Thomas and Bradford, 1991). Sheep are the best species of ruminants to integrate with rubber, as sheep are less likely to browse trees than cattle or goats, do not disturb collection tins in rubber plantations, are more easily herded than goats because of sheep flocking behavior and are relatively more resistant to scabies than are goats.

The Small Ruminant-Collaborative Research Support Program (SR-CRSP) and the Research Institute for Animal Production (RIAP) Sei Putih, North Sumatra, Indonesia are developing relevant production technologies, called Integration Production System (IPS) for sheep in rubber plantations. To study sheep production at the village level SR-CRSP and RIAP established on-farm research projects,

namely Outreach Research Project (ORP) in Galang near Sei Putih and Outreach Project of Membang Muda (OPMM) in Gunung Lonceng, Membang Muda (200 km east of Sei Putih).

This paper highlights additional net farm income incurred from grazing sheep in rubber plantation in ORP and specifically presents new data from more recent findings of OPMM Membang Muda.

#### BACKGROUND INFORMATION

ORP in Sei Putih has existed since 1988. However, as the farmers do not own rubber plantations they graze sheep under rubber in an "informal" way and it has not been possible to carefully examine the economics of grazing sheep under smallholder rubber estates owned by smallholders in Sei Putih. Therefore, the SR-CRSP selected another site where an active smallholder rubber program was being developed.

OPMM in Membang Muda, in conjunction with PTP III (Government-owned Estate Company III), started in September 1991. Each farmer received 2 ha of rubber in 1986 when the plantation was 6 years old and the trees ready to tap. The Livestock Research Institute delivered 60 sheep to a total of 12 farmers in November 1991. These twelve farmers each received 4 ewes and 1 ram, and have to pay back 4 animals within 2 years (Sembiring and Scholz, 1991). It is hypothesized that diversification of income by rearing sheep will provide the necessary incentive for farmers to reduce overtapping of rubber which is commonly practiced by farmers in order to maximize short term needs for cash.

Before proceeding to the economics of sheep rearing under rubber in OPMM, a brief review of some key findings of the economics research program of the SR-CRSP in Indonesia is carried out.

Karokaro et al. (1990) found out that by rearing sheep, the average additional profit per ORP Sei Putih farmer was Rp 272,300/year (US\$ 150/year) and average returns to labor were Rp 119/hr (US\$ .07/hr).

The most important factors influencing economic returns at farm level were prices, litter size, survival rate, growth rate of lambs and lambing interval. Litter size could be divided into litter size at birth and litter size at weaning (Verwilghen et al., 1992). Litter size at birth on the ORP (Sei Putih) farms is 1.33 lambs per litter, while litter size at weaning is 1.27 lambs per litter. Survival rate is defined as the the percentage of lambs born that are still alive at weaning. The overall survival rate for lambs born at ORP farms is 92.5%. Survival rate of lambs strongly depends on litter size. The survival rate of singles, twins and triplets was 96%, 91% and 77% respectively. The average daily weight gain of lambs on the ORP farms is 79 gram per day with a standard deviation of 20 grams per day. With an average litter size at birth of 1.33, a survival rate of 92.5%, a lambing interval of about 7 months and an average flock size of 9 ewes, the average number of lambs weaned per ORP farm is 19 lambs per year. Assuming that the weight of lambs at sale is 15 kg and the price per kg live weight is Rp 2500 (US\$ 1.20), the average gross return per farm per

year from sheep is Rp 712,500 (US\$ 350). From the eleven ORP farmers who started in 1988, the average annual net income per farmer in 1989 was about Rp 1.8 million (US\$ 900), excluding net income from sheep farming. Thus, the gross<sup>1</sup> income from sheep has raised farm income by about 40% (Verwilghen et al., 1992).

A major disease problem among sheep in North Sumatra is helminth infection, namely gastro-intestinal worms and pancreatic fluke. Therefore, anthelmintic treatment of the sheep is very important. Scholz (1992) revealed that anthelmintic treatment increases ewe productivity by as much as Rp 42,000 or 29 percent, assuming that survival rate increases from 0.85 to 0.95 with treatment. Having seen the benefit, farmers now regularly apply anthelmintic treatment. An Animal Health Delivery Network has been established to ensure proper distribution of anthelmintic to farmers (Kartamulia, et al., 1992).

Sheep are sold locally or in Medan, the capital of North Sumatra, mostly through middlemen. Live weight selling prices are Rp 2250 per kg (locally) and Rp 2500 per kg (in Medan). There is also the possibility of exporting live sheep to Singapore, Malaysia, and the Middle East (Kartamulia, et al., 1993).

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<sup>1</sup> We are comparing gross income from sheep with net income from rubber. However, since cash costs for sheep grazing was very small, gross and net cash income for sheep are very close so the comparison is valid for these purposes.

## CASE STUDY OF OPMM

### Farmers and Households

Most farmers that joined OPMM are over thirty years of age (range 35-57 years) and have large families (average of 6.4 children). When the project started most farmers had some experience in rearing livestock (range 0-33 years, average of 9.5 years). They are all Moslems, two of them are ethnically Batak whereas the rest are Javanese. Except for one, they all have sufficient education to be considered literate. Their children are also literate and most go on to junior and senior high school (Sembiring and Scholz, 1992).

### Rubber Production System, Yearly Income and Resources Available

Rubber trees were planted in 1980 by PTP III and were transferred to farmers in 1986 which the trees were ready to tap (Sembiring and Scholz, 1992). Farmers, their wives and sons over 14 years of age tap the trees in the morning, collect the latex and sell the latex to Village Cooperative Units (KUD). Brown and Handayani (1993) reported that husbands work on their farm and off-farm job for 6 hours and 49 minutes while the work wives 4 hours and 25 minutes and the sons for 5 hours and 34 minutes per day.

The average gross income earned by farmers from rubber in 1991 was Rp 2.7 million or approximately US\$ 1350 which comes close to the Indonesian Government target in the last five year plan (US\$ 1500). However, these farmers should repay an average of Rp 680,000 or US\$ 340 per year for the 2 hectares of rubber plantation and have to pay for housing which yields a household net income from rubber of about US\$ 900 per year. Household expenditure patterns reveals that the largest single item in the budget is still rice, followed by other food, school fees and uniforms for school children.

#### **Sheep Rearing**

Sheep are housed in 2 m x 4 m barns. More recently, the barns should be enlarged to facilitate more young rams which should be confined separately from other sheep to prevent inbreeding. The barns are placed close to the house to guard sheep more easily.

Sheep are fed with rice bran (200 g/day/sheep) in the morning and in the evening. During the day and after school (1:00 to 5:00 p.m.), sheep are herded (usually by boys) for grazing under rubber trees or grass-fields surrounding the rubber trees. Meanwhile, farmers or boys cut the grass to feed the sheep in the barns at night. Some farmers provide fire and smoke under the barn as they think smoke helps prevent sheep from disease and from biting insects.

Sheep are regularly treated with anthelmintic every three months. Mineral blocks are hung in the barn so the sheep will lick the blocks which provide essential minerals.

Average birth weight and weaning weight are 2.5 kg and 8.5 kg respectively. The overall survival rate for lambs born at OPMM farms is 95.23%.

The number of sheep held by all farmers at OPMM at the end of July 1993 is 221 head consisting of 82 ewes, 28 rams and 111 lambs. In addition, 8 head were stolen by thieves, 9 head were sold for a total of Rp 603,500 or US\$ 289, and 3 head were slaughtered for farmers own consumption, which is valued as Rp 165,000.

#### **Production Parameters**

This section represents gross figures over the 20 month-period during which ORP has operated in Membang Muda. The figures are aggregated for all 12 farms. At this stage, we only had data on gross animal numbers and disposal; later work will summarize productivity parameters for the individual farmers' flocks as has been reported earlier for ORP Sei Putih.

The original numbers of animal distributed and numbers held as of July 1993 are presented in Table 1 for all 12 farms.

Table 1. Numbers of animal distributed and held by farmers

	<u>November 1991</u>	<u>July 1993</u>	<u>Change</u>
Ewes	48	82	34
Rams	12	28	16
Lambs	0	111	111
Sales	n.a.	9	9
Consumption	n.a.	3	3
Theft losses	n.a.	8	<u>8</u>
	Increase		181

Mortality losses are not shown above and averaged 4.76 % of lambs from birth to weaning. The net increase in inventory was thus 34 ewes, 16 rams and 111 lambs, or a total of 161 head. The value represented by this change of inventory is calculated at the end of the next section.

### Economic Analysis

Gross margin analysis as illustrated by Lai (1987) is used to evaluate economic return of sheep enterprise in rubber plantations. Based on the above information, the gross margin analysis is depicted in Table 2 which is an aggregate for all 12 farms over the post 20 months.

Table 2 indicates that a net-income of Rp 5,880,300 or US\$ 2,820 during 20-month period could be generated from rearing sheep in rubber plantations for 12 farmers, or about \$ 196/year/farmer once herd numbers stabilize following the build up of inventory.

Table 2. Gross margin for sheep grazing in rubber plantations

<b>Gross Production Income</b>			
Sales of animals	Rp	603,500	
Animals slaughtered		165,000	
Net inventory change of sheep		<u>6,430,000</u>	
Total value added			Rp 7,198,500
<b>Variable Costs</b>			
Brooms and basins		43,200	
Ropes		15,000	
Medications		207,000	
Mineral blocks		264,000	
Rice bran		165,000	
Miscellaneous		<u>48,000</u>	
Total			Rp 742,200
<b>GROSS MARGIN</b>			Rp 6,456,300
<b>Fixed Cost</b>			
Depreciation costs* - barn		576,000	
Total fixed cost		576,000	
<b>NET FARM INCOME FROM SHEEP</b>			Rp 5,880,300

See calculation which follows.

Depreciation rate = 20% of total capital expenditure

a) Fixed Cost - barns = 12 barns x Rp 240,000/barn = Rp 2,880,000

b) Sales of Animals  
9 animals at Rp 67,055 = Rp 603,500

c) Slaughtered Animals  
3 animals at Rp 55,000 = Rp 165,000

d) Estimated Valuation of Net Inventory Change

Weight (kg)	Value/animal Rp	No. of animals	Value (Rp)
> 20	50,000	50	2,500,000
15 - 20	40,000	60	2,400,000
< 15	30,000	<u>51</u>	<u>1,530,000</u>
		<b>Total</b>	<b>6,430,000</b>

e) All values in Indonesian Rupiah.  
One U.S. dollar is equivalent to 2,085 Indonesian rupiah.

## CONCLUSION

Comparing to rubber net income of \$ 900/year/farmer, the additional net income incurred from rearing sheep is about 22. This income is higher than ORP farmers' income in Galang, which was Rp 272,300 /year/farmer (US\$ 150/year/farmer (Karakaro et al., 1990), but less than the findings of Verwilghen et al.(1992) which indicates that the average gross returns per farm per year to ORP farmers were Rp 712,500 (US\$ 350) accounting for 40% of income from rubber. Verwilghen et al.(1992), however, did not count costs for rearing sheep so net income could not be enumerated.

From the economic point of view, grazing sheep in rubber plantations can be a good source of additional income for the farmers. Above the cash income, sheep under rubber trees have additional advantages. It can reduce overtapping rubber which reduces the lifetime of a plantation. It also reduces the need for weeding between rubber trees.

Contribution of sheep rearing to farmers' income can further be increased by increasing flock size. The on-going collaborative works between SR-CRSP and PTPs provide 11 sheep to the smallholders, comprising 10 ewes and 1 ram. Even these relatively small flocks will increase farmers' income by more than 30% above income from rubber alone.

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