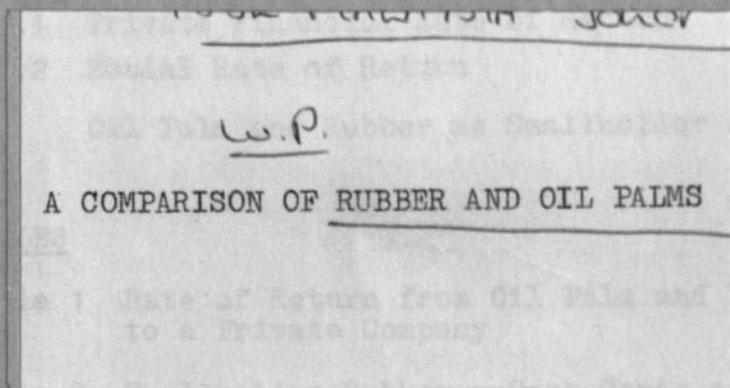


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THE GOVERNMENTS OF MALAYSIA AND THE STATE OF JOHOR



WORKING PAPER

JOHOR TENGAH AND TANJONG PENGERANG REGIONAL MASTER PLAN

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A COMPARISON OF RUBBER AND OIL PALMS

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A Comparison of Rubber and Oil Palms

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Private Financial Rate of Return

As stated a number of studies have recently reported the profitability of the two crops. These are the private financial rates of return which they also are set out in Table 1.

Table 1. Rate of Return from Oil Palm and Rubber to a Private Company

Year	Financial rate of return (%)		Ratio of rubber to palm oil price (1967 = 100)
	Oil palm	Rubber	
1967	19	21	100
1968	16	24	110
1969, 1970 (p.30)	16	29	140
1971	19	25	125

The differences in the rates of return shown in the figures are accounted for by differences in assumptions.

A COMPARISON OF RUBBER AND OIL PALMS

1. Private and Social Profitability

Besides the analyses carried out by the South East Johor Project, a number of previous studies have analysed the rate of return from oil palm and rubber plantings. Each study uses a particular set of assumptions about prices, yields and costs but the social profitability of both these crops is more sensitive to a given percentage change in the prices than to the same percentage change in the yields or costs. This is inevitable because, with higher yields, costs will rise (due to the higher cost of transporting the larger output), whereas, if the price changes, then the revenue changes with no change in the costs.

The purpose of this working paper is to serve as a guide to the relative profitability of the two crops and their suitability for smallholder cultivation. The comparisons in this section are made in terms of two rates of return, namely the rate of return to a private company on the basis of present taxes and duties and then secondly on the basis of no taxes and duties and a shadow wage for unskilled labour of \$40 per month. The second evaluation therefore shows the worth of the two crops to the national economy in a "surplus labour" situation.

1.1 Private Financial Rate Of Return

As stated a number of studies have recently compared the profitability of the two crops. These and the private financial rates of return which they show are set out in Table 1 below:

TABLE 1. Rates of Return from Oil Palm and Rubber to a Private Company

	Financial rate of return (% p.a.)		Ratio of rubber to palm oil price assumed
	<u>Oil palm</u>	<u>Rubber</u>	<u>(in year 9 of the scheme)</u>
Bevan & Goering 1967	17	11	2.2
Bevan & Goering 1969	16	14	2.9
IBRD, 1970 (p.30)	16	9	2.2
SEJP, 1971	10	8	3.0

The differences in the rates of return shown in the studies are accounted for by differences in assumptions about

prices, yields and costs, but there is clearly some consistency in the relationship between the rates of return and the relationships between the prices of the respective crops.

Figures 1 and 2 show the rates of return as revealed by the various studies plotted against the prices of the crops. The 'price' for oil palm represents a weighted average for palm oil and kernels. The palm kernel price has been given a weight of one-fifth, and the oil price a weight of four-fifths. The profitability given in the IBRD, 1970 report is strictly not comparable with the other sources. The IBRD report gave the rates of return on a financial basis except that export duties and cesses were not deducted from the sales revenue. If put on a comparable basis, the rates of return would be slightly lower than those shown in the figures.

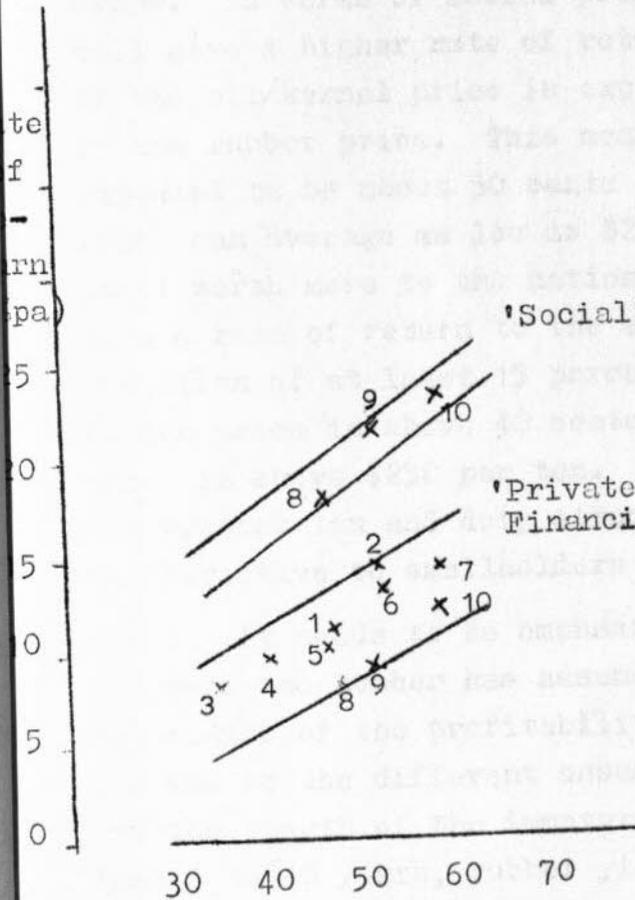
Nevertheless the figures do show quite strikingly the greater sensitivity of oil palm profitability to what are considered likely variations in prices. The greater sensitivity is revealed by the steeper slope of the palm oil profitability curves. The higher rate of return obtainable from oil palm suggests why estates have been switching plantings from rubber to oil palm in recent years. At average prices over the period between 1965 and 1970, the rate of return from oil palm is about 20 percent per annum to the company compared to a rate of return for rubber of about 13 percent per annum. This rate of return does of course assume that the average price over the yielding period would be as stated. The rate of return for oil palm assumes a peak f.f.b. yield of about 10 tons per acre; the rate of return for rubber assumes a peak yield of about 1,800 lb. per acre.

The rate of return to the company from oil palm is likely to be higher than that obtainable from rubber provided that the price per ton is at least 30 percent of the rubber price per ton. This means that if the rubber price is expected to average about 50 cents per lb. or \$1,120 per ton, then if the palm oil price is above \$340 per ton, oil palm is more profitable with the present tax and duty structure. The price may of course be expected to decline in the future, and therefore the average referred to here is the discounted average. This average will vary according to the discount rate used but if the price during the first five yielding

FIGURE 1. RUBBER

SEJP 'most likely' forest

Average price 1965-1970



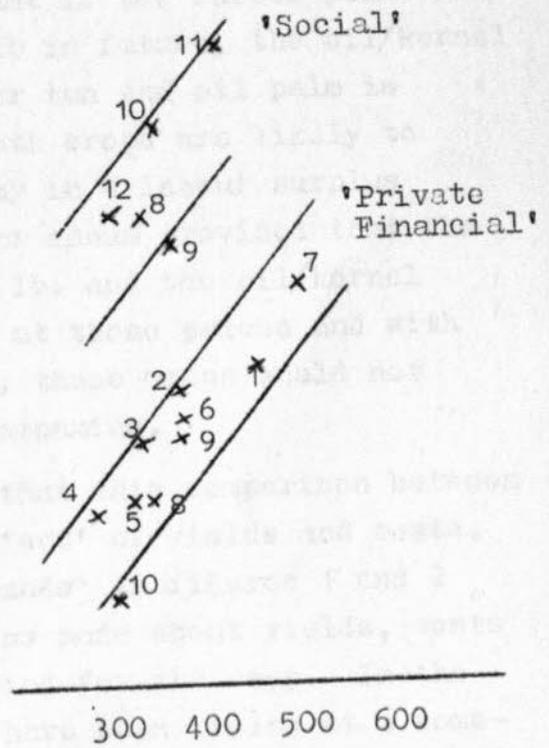
Cents/lb. - Rubber

Price (F.O.B. - Singapore)

FIGURE 2. OIL PALM

SEJP 'most likely' price

Average price 1965-1970



\$/ton - oil and kernels

Sources:-

- 1 - Bevan and Goering, 1967
- 2 - Bevan and Goering, 1968
- 3 - 7 IBRD, 1970 (p. 31)
- 8 SEJP (Basic), 1971
- 9 -10 SEJP (Others), 1970/71

- 1 Bevan and Goering, 1967
- 2-4 Bevan and Goering, 1968
- 5-7 IBRD, 1970 (p. 31)
- 8 SEJP (Basic), 1971
- 9-10 SEJP (Others), 1970/71

years is averaged, this gives a reasonable guide to the discounted average for discount rates within the range of 10 to 15 percent per annum.

1.2 Social Rate of Return

The rate of return for both these crops is considerably higher in social terms than the private financial rate of return. This is because the taxes and duties on the output of both the crops are high and they are both labour-intensive crops. In terms of social profitability, oil palm investments will give a higher rate of return than investments in rubber if the oil/kernel price is expected to be more than 25 percent of the rubber price. This means that if the rubber price is expected to be about 50 cents per lb in future, the oil/kernel price can average as low as \$280 per ton and oil palm is still worth more to the nation. Both crops are likely to give a rate of return to the economy in a labour surplus situation of at least 15 percent per annum provided that the rubber price is above 40 cents per lb. and the oil/kernel price is above \$250 per ton. But, at these prices and with the present tax and duty structure, these crops would not be attractive to smallholders or companies.

It needs to be emphasised that this comparison between oil palm and rubber has assumed a 'set' of yields and costs. The widths of the profitability 'bands' in figures 1 and 2 are due to the different assumptions made about yields, costs and the length of the immature period for the crop. In the last 5 to 10 years, rubber yields have been rising at a somewhat faster rate than oil palm yields. In the last ten years yields per acre for rubber have doubled; this is an average rise of about 7 to 8 percent per annum. Yields of oil and kernels on the other hand seem to have been increasing at the rate of about 5 percent per annum over the past 5 or 6 years. But an increase in the yield on an oil palm scheme of about 20 percent from a peak of say 10 f.f.b. tons per acre increases the social surplus (at a discount rate of 15 percent per annum) by more than \$500 per acre, whereas the same increase in the social surplus from rubber requires an increase in the rubber yield per acre of at least 50 percent. For rubber the effect of the higher yield is dampened by the longer immature period.

Thus at the most likely prices for rubber and palm oil, oil palm gives a higher rate of return in both financial and social terms. This agrees with the analysis in the IBRD 1970 report. The IBRD report admitted that the difference in the profitability of the two crops was high but stated that the decision to plant rubber is justified by the following considerations:-

- sub-optimum yields would be obtained from oil palms planted on the areas scheduled for rubber since the soils of these areas are not suited to oil palm, and the consequent rate of return from oil palms would be about the same as that from rubber;
- while the rubber areas could be left under forest, no returns would be obtained from this land during the next 50 years or so - the time needed for the forest to regenerate a commercial volume of timber following the exploitation envisaged under the forestry project;
- Government plans for settling large numbers of unemployed or underemployed persons on the land could not be achieved if rubber were excluded from settlement programmes;
- experience on other FLDA schemes has shown that rubber is well suited to the capabilities of settlers and method of settlement.

Whether these reasons are sufficiently powerful to offset the differences in the profitability of the two crops depends on the judgements of the organisation making the investment and the size of the profitability differences. But it is clearly necessary to continuously reappraise the profitability of the two crops both for deciding on the appropriate tax and duty level and structure and for deciding on whether the public sector should invest in such crops.

2. Oil Palm and Rubber as Smallholder Crops

The previous sections of this paper have compared the profitability of rubber and oil palm essentially as estate crops, both in terms of expected financial costs and resource values. This section reviews the two as potential smallholder crops.

Rubber is the predominant smallholder cash crop in Malaysian agriculture. As a smallholder crop it has a number of important qualities;

- (a) cultivation techniques are relatively simple and are by now well established;
- (b) once the crop is mature a regular income can be obtained -- except for the brief wintering period of about one month per year;
- (c) the crop is easy to process. A few pans are required to hold the latex while it coagulates and a simple mangle can be used to press the coagulum into a sheet which can be dried in the sun and then sold. This sheet has a relatively high value to weight (35-40 cents per lb to a smallholder) and can easily be taken to the nearest selling point by bicycle;
- (d) although there is considerable uncertainty as to the future price of the commodity, sale is certain and lower quality sheet can be fairly easily reprocessed by dealers to obtain an acceptable product;
- (e) cash costs of establishing and maintaining the crop are low -- \$20 to \$30 per acre per year.

One major drawback of the crop is the long immature period involved -- 7 years or more. However once the crop is planted, maintenance consists primarily of keeping down weed growth and this can be done by any members of the family who might be available.

The oil palm has been grown on a modest scale in Malaysia since before the Second World War, but major expansion has only occurred since about 1960 in response to falling rubber prices and high profitability. The over-

whelming majority of the acreage is however on estates. This is due principally to the problems of harvesting, processing and transport;

- (a) the fruit of the crop must be harvested when fully ripe. If under- or over-ripe fruits are processed, the quantity or quality of the oil extracted is sharply reduced;
- (b) the fruit must be crushed to extract the oil as quickly as possible after being cut down from the palm. Delay causes deterioration in oil quality. Steam sterilisation of fruit will arrest this process but requires expensive machinery;
- (c) small hand presses for extracting oil have been used for a long time in West Africa but have not been very successful extracting only about 65 percent of available oil. Small hand operated presses were developed about 15 years ago and these are claimed to extract 90 percent or more of available oil, but these are expensive;
- (d) once extracted, the oil and kernels must be transported in bulk tanks or drums of 45 gallons capacity. Transport by individual small producers is therefore impossible;
- (e) if the oil from several producers is bulked, the effect of a small portion of low-grade oil is to down-grade the whole batch of the product. In contrast a small quantity of low grade sheet rubber can easily be separated and remilled if necessary. Thus quality control throughout the harvesting and processing is more important for palm oil.

Thus despite the relative profitability of oil palms, an individual smallholder cannot contemplate the cultivation of the crop unless he is guaranteed some sort of outlet for his crop to an existing processing plant. On the other hand the processor would want to ensure that all fruit is in good condition on arrival at the factory. In order to create

these conditions some sort of organised 'scheme' is required for smallholder development. Such a scheme has been proposed in the Johor Tenggara Master Plan and is described in the Working Paper on "The Development of Mixed Enterprise Holdings" which outlines a number of types of small and medium-sized holdings based on rubber or oil palms.

A brief evaluation is carried out here to indicate how the alternatives of rubber and oil palm might appear to a smallholder. Table 2 indicates the yields, sales value and probable cash costs involved for rubber, over the first 25 years of the life of the crop. No allowance has been made for use of special stimulants and the sale price of sheet has been taken at 37.5 cents per lb. Costs are based on those used in the Working Paper on Rubber and in the FLDA Feasibility Study (Supporting Volume 6, Part 2). It has been assumed that the smallholder will pay for some assistance with clearance and planting and half the estimated contractor costs for these operations have been charged. Other costs are low, at maturity being about \$22 per acre for fertilisers and \$7 for other chemicals and sundries. The assumed yield rises to a maximum of 1,500 lb. per acre in the fourth year of tapping and remains at that level for 9 years before falling slowly.

The resulting cash income rises to \$533 per acre during the period of peak yield. The average cash income during the mature period is \$485 per acre. On a holding of 8 acres this would mean a monthly income of \$323 or approximately \$12 per day. The long immature period is a disadvantage but to the individual who has a regular job (e.g. rubber-tapping) and who is maintaining the holding on a part-time basis, with the aid probably of his children and elderly relations, this may not matter. Once the crop is mature it will continue to yield for a considerable number of years. It has the advantage that, should an alternative and better income opportunity present itself, tapping can be stopped and resumed at a later date with no adverse effect on the tree.

Equivalent costs and returns for oil palms are shown in Table 3 based on costs in the Oil Palm Working Paper. The expected yield rises to a peak of nine tons. On the

TABLE 2. Smallholder Rubber - Cash Costs and Revenues. (\$ per Acre)

Year	Cash Costs	Yield	Revenue ⁽¹⁾	Cash Income
1	39	-	-	- 39
2	153	-	-	- 153
3	24	-	-	- 24
4	27	-	-	- 27
5	38	-	-	- 38
6	29	-	-	- 29
7	35	-	-	- 35
8	35	-	-	- 35
9	30	650	243	213
10	29	1,000	375	346
11	29	1,400	525	496
12	29	1,500	562	533
13	29	1,500	562	533
14	29	1,500	562	533
15	29	1,500	562	533
16	29	1,500	562	533
17	29	1,500	562	533
18	29	1,500	562	533
19	29	1,500	562	533
20	29	1,500	562	533
21	29	1,400	525	496
22	29	1,400	525	496
23	29	1,400	525	496
24	29	1,300	487	458
25	29	1,300	487	458

(1.)

At an f.o.b. price of 50 cents per lb, less;

- 2 cents per pound - export duty;
- 1 cent per pound - research cess;
- 4.5 cents per pound - replanting cess;
- 5 cents per pound - dealers' costs and profit.

TABLE 3 Smallholder Oil Palm - Cash Costs and Revenues (\$ per acre)

Year	Cash Costs Production	Harvesting	ffb Yield tons/acre	Revenue	Cash Income
1	38	-	-	-	- 28
2	245	-	-	-	- 245
3	40	-	-	-	- 40
4	105	-	-	-	- 105
5	55	-	2	134	79
6	70	50	5	335	215
7	79	65	6.5	435	291
8	88	80	8	536	368
9	94	90	9	603	419
10	94	90	9	603	419
11	94	90	9	603	419
12	94	90	9	603	419
13	94	90	9	603	419
14	93	88	8.8	590	409
15	92	86	8.6	577	399
16	90	84	8.4	563	389
17	89	82	8.2	549	378
18	88	80	8.0	536	368
19	87	79	7.9	529	363
20	87	78	7.8	523	358
21	86	77	7.7	516	353
22	86	76	7.6	509	347
23	85	75	7.5	503	343
24	84	74	7.4	496	338
25	84	73	7.3	489	332

basis of f.o.b. prices of \$400 per ton for palm oil and \$350 for palm kernels the farm gate price has been estimated at \$67 per ton f.f.b. after allowing \$25 per ton f.f.b. to cover transport to mill, processing and distribution charges and after allowing for export duty at 7.5 percent of the f.o.b. price. In addition a harvesting charge of \$10 per ton has been made. If some form of rota system of collection is arranged, i.e. a producer's crop is collected weekly, then he will have to hire help to assist him in harvesting on those days. Alternatively if lorries have to go round to each holding each day and collect and weigh fruit, then collection costs will be considerably higher than normal. Either way some charge will have to be borne by the farmer. The other major item of cost is fertiliser amounting to \$84 per acre per year at peak yields. Cash income begins in year 5 and rises to a peak of \$419 per acre per year by year 9. Over the 21 year mature period average annual income per acre is \$356. On an eight acre holding this amounts to \$238 per month or \$10-\$12 per man-day required.

A major advantage of oil palm over rubber is that it starts to yield sooner and the income flow builds up more quickly. If these funds can be re-invested (e.g. by opening up another holding) then the assets and income of the individual can grow fairly rapidly. On the other hand a heavier initial cash outlay per acre is required and rubber is more likely to be more suited to inter-cropping which permit an earlier income to be earned from the holding.

It should be pointed out that cash incomes estimated for rubber and oil palm are after the payment of all cesses and duties.

Rubber cesses and duties at current levels represent 15 percent of sales revenue at an f.o.b. price of 50 cents per pound while duties on palm oil and kernels represent 7.5 percent of the f.o.b. price. In years 10 and 15 rubber cesses and duties are equivalent to \$75 and \$112.50 per acre or to more than 20 percent of the cash income in the same years. In years 10 and 15, the oil palm duty represents between \$60 and \$70 per acre or a little more than 15 percent of cash income. The rubber grower does however have the right to a sum of \$750 per acre when he replants if he owns 5 acres or

less. If his holding is larger he receives \$3,750 (i.e. 5 acre share) or \$250 per acre whichever is greater. Oil palm growers have no such scheme.

Thus while on an estate financial or on a social cost basis, oil palm may appear to be a better investment than rubber, the potential of the two crops may appear very much different to a smallholder. The return per man-day at maturity from the two crops may be similar, but oil-palm presents marketing problems and a guaranteed market outlet is required. Since land development will continue to depend significantly upon smallholders and it may not be possible, given the shortage of managerial skills, to establish enough oil palm schemes to meet their needs, rubber would appear to continue to have a major role to play in agricultural development in West Malaysia especially when its less rigorous infrastructural demands are taken into account. Any re-appraisal of proposals for oil palm or rubber production in the project areas should take these factors into account.

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