THE GOVERNMENTS OF MALAYSIA AND THE STATE OF JOHOR

W.P. PINEAPPLES

WORKING PAPER

JOHOR TENGAH AND TANJONG PENGGERANG REGIONAL MASTER PLAN

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Markets

The pineapple has had a somewhat chequered history in Malaysian Agriculture. The industry has always been concentrated in Johor and in the 1930's there were 40 to 45,000 acres under the crop out of a national total of about 55,000. The other main prcduction areas then were Singapore and Selangor. At that time production was concentrated in mineral soils, frequently as an intercrop in young rubber. Plant densities were low and, since the crop was clean weeded, ground cover was thin. As a result erosion was a severe problem. The Johor Government passed some soil conservation measures in the late 30's but these fell into abeyance during the War. The Japanese occupation completely disrupted the industry which resumed on a smaller scale. It was decided after the war to confine pineapple cultivation on the coastal peat soils which had been shown to be suitable for the crop. Estate cultivation expanded more rapidly in the early years after the war, and problems were experienced by smallholers in selling their crop, which were not really resolved until the cannery at Pekan Nenas was established. At the present time estate production goes directly to the three private factories (two in Johor and one in Singapore). Smallholder production concentrated in Pontian district goes to a control centre at Pekan Nenas operated by the Malaysian Pineapple Industry Board (M.P.I.B). The government factory at Pekan Nenas takes the crop to the extent of its capacity, excess is sent to the other factories in an agreed proportion. The product of the canneries is almost entirely exported.

TABLE 1 CANNED PINEAPPLE EXPORTS: MALAYSIA AND SINGAPORE

YEAR	STANDARD CASES THOUSAND	VALUE($ million)
1958	1,938	33.3
1960	1,757	26.4
1962	2,209	35.6
1964	2,458	38.7
1966	3,205	50.0
1966+	58 (tons)	43.6
1968	66 (tons)	47.9
1969	64 (tons)	44.6
1970	62 (tons)	43.4

+ Malaysia only

TABLE 2

DISTRIBUTION OF PINEAPPLE EXPORTS BY PRINCIPAL DESTINATIONS - MALAYSIA AND SINGAPORE

Country	1958	1960	1962	1964	1966	1966+	1968+
U.K.	75	58	52	37	39	33	31
U.S.A	-	5	17	22	20	23	28
Canada	7	13	9	13	11	13	13
W. Germany	5	5	7	10	10	9	10
New Zealand	5	5	3	4	3	4	4
Middle East	4	5	6	6	6	4	2
Other European	1	6	5	5	8	8	6
Other	3	3	1	3	3	6	6

The major market in the past has been the U.K., but in the last decade this has been stagnant in quantity terms. The pineapple industry has however been able to carve out new markets, most noticeably in North America and West Germany.

Production of fresh and canned pineapples in the principal producing countries are shown in Tables 3 and 4. The production figures in Table 3 may be subject to a fair degree of error in countries which do not can much of their crop since most production then is probably in scattered smallholder patches e.g. as in Thailand. Malaysia is the third largest canner after U.S. and Taiwan. The somewhat paradoxical situation of Malaysia having the U.S. as its second largest market results from differences between the Hawaiian and Malaysian product. Malaysian pineapples have a lower citric acid content which gives them a slightly sweeter flavour. They are also yellower in colour and have a slightly crisper texture when canned.

TABLE 3 PRODUCTION OF PINEAPPLES BY COUNTRY (Thousand tons)

Country	1956/60 av.	1962	1964	1966
Malaysia	135	164	190	254
Australia	83	73	83	92
S. Africa	102	123	136	96
Hawaii	875	920	810	920
Brazil	227	272	286	288
Mexico	183	175	180	212
Cuba	100	55	50	50
Taiwan	123	189	223	266
Thailand	174	316	256	300
Philippines	112	137	153	160
Other	238	338	412	447
Total	2,352	2,762	2,779	3,085

TABLE 4 PRODUCTION OF CANNED PINEAPPLE (Thousand tons)

Country	1956/60 Av.	1962	1964	1966	1968
Malaysia	37	53	50	60	66
United States	266	265	240	290	
Taiwan	31	60	88	100	
Philippines	26	39	33	45	
Australia	23	21	23	27	
S. Africa	29	41	39	34	
Mexico	14	17	24	28	
Okinawa	7	14	23	38	
Other	18	26	32	35	
Total	451	536	552	657	

While there is obviously a limit to the extent to which Malaysia can increase its penetrations of canned pineapple markets, there are potential markets available which might be usefully exploited. Table 5 shows imports of canned fruit as a whole into major importing countries and some potential markets.

TABLE 5 IMPORTS OF CANNED FRUITS (Thousand tons)

Country	Average 1956-60	1962	1964	1966
U.K.	307	407	388	412
Canada	54	61	74	91
U.S.	44	66	85	107
W. Germany	86	212	213	225
France	23	31	41	53
Belgium	21	25	36	39
Netherlands	11	25	33	43
Switzerland	9	13	17	20
Scandanavia+	26	46	51	57
Japan	11	24	38	54
Soviet Union	14	29	41	35
E. Germany	6	9	9	15
World Total	654	990	1,054	1,193

+ Sweden, Denmark, Norway and Finland.

World trade in canned fruit expanded rapidly in the 1956-62 period and somewhat more slowly thereafter. The greatest proportional increase in imports was to Japan. However this is a fairly limited market for pineapples because of local supplies from Okinawa. The greatest volume increase was to Western Europe and it was seen earlier that exports of Malaysian pineapple to that area have grown steadily. However it may become more difficult to entre that market in future, because of preferential tariffs given to associated territories and because of proposed minimum price system to be applied to a number of canned fruits and vegetables including pineapples. Imports of canned fruit into the Soviet Union and Eastern Europe as a whole appear to be relatively low (No import figures were given for E. Europe other than E. Germany). This area appears to be a useful potential market which could increase to a level similar to that for W. Europe although development may be somewhat hampered by these countries desire for bi-lateral agreements or barter type trade.

At present time these is a fixed price for pineapples delivered to the canning factory of 2.8 cents per pound for all fruit accepted. Given the general market outlook it is not anticipated that this price will rise in future and in enterprise evaluations a continuation of the present price has been assumed.

2. Cultivation Techniques

The estimates given in the following analysis will be somewhat approximate, since at the present time pineapples are grown on peat soils only in Johor. The major differences between production in the two situations are:-

(1) Drainage would presumably not be necessary on upland soils, although some terracing might be required to reduce erosion.

(2) In peat soils which are soft, the pineapple continue to rattoon for a long time and the crop does not need replanting for ten years or more. Mineral soils however tend to become compact and this inhibits rattooning and the crop normally has to be replanted often 4-5 years. Since the pineapple is a shallow rooting crop it is not possible to cultivate the soil to prevent compaction.

(3) Peat soils give rise to considerable problems in getting the crop off the field. Either an expensive network of roads has to be constructed or the fruit has to be carried by hand or bicycle to the nearest road. Because of the softness of the peat hence it is not possible to use heavy machinery. Mineral soils do not suffer from this problem and mechanical harvesting methods could be used, as in Hawaii. In addition mechanised spraying, fertiliser and hormone applications are not feasible in most situations. As labour costs rise this will become of increasing importance on the peat soils.

The following section will outline the methods assumed to be used in the enterprise as analysed, and then indicate the estimated scale of costs and returns and finally summarise the results of a series of results obtained from a number of variations of the basic assumptions.

2.1 Clearance

Clean clearance will be assumed throughout. In peat areas normal practice is to leave stumps to rot in the field, particularly in smallholder operations and plant around them. Since pineapple will ratoon for many years in peat soils for many years replanting is not needed for at least 10 years (in the interim spaces will be filled). By this time many stumps will have rotted and anyway all work is by hand. On upland soils rattooning is inhibited as soil becomes compacted and replanting is necessary in five years or so. In order to allow mechanical cultivation for first crop and replanting after five years clean clearing should be carried out immediately.

2.2 Planting

Official recommendations for planting rates are 17,400 plants per acre and this has been assumed through out. The pineapple produces suckers in a number of ways:-

(a) Ratoons - shoots from buds below ground
(b) Aerial Suckers - Shoots from axillary buds above ground.
(c) Basal Slips - suckers developed from the base of the fruit proper.
(d) Crown Slips - suckers developed at the top of the inflorescence or at the top of the fruit.

The most commonly grown variety in Malaysia for canning is the Singapore Spanish and normal practice in this variety is to use the basal slips as planting material.

2.3 Weeding

The pineapple is extremely sensitive to root competition from other plants and must be kept as free as possible from weeds. This means that the soil surface must be kept bare. As noted earlier when the crop is grown on a sloping area this can easily result in severe erosion and production in Johor moved from upland areas because of this. In Hawaii plastic strips are used as 'mulches' to cover the ground and prevent weed frowth. In Malaysia this practice has not been tried and weeding is normally by hand or occasionally by the use of chemical methods, manually or chemically.

Manual methods are normally used partly because labour is relatively cheap and also because chemicals are somewhat tricky to use and many of them can easily damage the crop. The labour requirement for manual weeding is high, smallholders appear to spend about 14 man days/acre/year and estates rise about 12 man days per acre. It is assumed that in the upland soil schemes pre-emergence week killers will be used and this will reduce the time required at least in the initial stages, combined with spraying of interrows throughout the life of the crop.

2.4 Fertilizer applications

The following fertiliser applications are recommended by the M.P.I.B. for the first crop:-

250 lbs. N	80 lbs. N
25 lbs. P_2O_5	8 lbs. P_2O_5
200 lbs. K_2O	60 lbs. K_2O

These nutrients can be supplied in two ways either as a solid spread on the ground in the normal way or as a solution in water applied as a foliar spray. The latter method is often used since the pineapple species is naturally apiphytic and absorbs nutrients more readily through the leaves than through the roots. Recommended practice here is to broadcast the first application (one-third of the total) two months after planting and then two more foliar sprays. The same amount of nutrients is assumed to be applied to the rattoon crops in years 3-5.

2.5 Trace element applications

Pineapples are susceptible to deficiency of copper and it is normal practice to apply copper sulphate in the form of Bordeaux mixture for the purpose of countering this. The M.P.I.B. recommend the application of 2 lbs. per acre per year for continous cropping.

2.6 Pest and disease control.

This is not normally a serious problem. The bordeaux mixture referred to above does have the useful property of being a general purpose fungicide. Some growers also apply an insecticide with their bordeaux mixture as a general precaution against insect damage e.g. from ants and termites.

2.7 Flower induction

It is standard practice to apply one of a variety of chemicals to the pineapple crop to induce flowering. The age at which this is fone varies somewhat with the variety but is normally about 10 months. The flower then usually begins to appear about 1½ months later. A further 4½ months is required for maturation of the fruit and harvest normally begins at 16 months. The advantages of inducing flowering in this way are that it results in fruit being produced 3-6 months sooner than would otherwise occur and also reduces the period over which the crop ripens to about one month as against 2-3 months without flower induction. A number of chemicals are used for this purpose, the most common being calcium carbide and alpha naphthylacetic acid. These are normally applied either as a pellet placed, into the crown of the plant or as a solution a spoonful of which is similarly placed.

2.8 Harvest

This is carried out by hand the fruits being cut off, and carried to the edge of the fields. In estates the construction of roads accross the peats to gain reasonable access to the crop are a major part of development. On smallholdings road access isusually poor and the fruits have to be carried along footpaths for some distance e.g. ½ mile or more, usually on a bicycle. This is an extremely laborious and time consuming exercise. On upland soils this problem will be largely avoided and on a 1000 acres unit the crop could be picked up from a large number of points by tractor and trailer.

3. Costs and Outputs - Estate Production

3.1 Requirements and Unit costs

Two types of hypothetical organization were analyzed. One based almost entirely on hand labour and the other using a moderate level of mechanization. The latter assumes mechanical spraying, fertilizer application and partial use of chemical weed control. Labour requirements have been estimated from a survey of pineapple smallholders and M.P.I.B. reports with adjustments to allow for possible differences on mineral as opposed to peat soils. The following requirements, in man hours per acre/year have been taken:

Operation	Hand Methods	Mechanical Methods
Fertiliser Application	20	2
Fungicide & Insecticide	20	2
Hormone Application	20	20
Weeding	70	40
Harvest	46	46
Transport to collection	4	4
	180	114
+ 20%	= 225	= 135
Acres per man	= approx. 9	= 4

The following labour forces have therefore been assumed.

	Hand Methods	Mechanical Methods
Manager	1	1
Mandores	4	3
Tractor Drivers	2	4
Clerks	1	1
General	120	70

+ In addition to the regular labour force assumed here casual labour will be required to meet the demand of the peak period of first harvest. A total of 6 man-days at $6 perday has been assumed giving a total of about 90 man-hours for the major harvest. Where rising yields are assumed this input has been increased pro-rata by increasing casual labour use.

The extra Mandores assumed for the hand methods operation will be to supervise maintenance carried out mechanically in the second case i.e. fertiliser and spray applications. Based on these labour forces, labour and housing

costs are as follows:-

Labour (a) Hand methods:-

Manager	1	@	$12,000/year	=	$12,000
Mandores	4	@	1,920	=	7,680
Clerks & Truck Drivers	3	@	1,920	=	5,760
General	120	@	1,440	=	173,800
					201,160

25.4

(b) Mechanical methods:-

Manager	1	@	$12,000/year	=	$12,000
Mandores	3	@	1,920	=	5,760
Clerks & Truck Drivers	5	@	1,920	=	9,600
General	70	@	1,440	=	100,800
					128,160

In addition E.P.F. is assumed at 5% of the wage bill.

Housing	Cost/Unit	Hand Methods	Mechanical Methods
Manager	20,000	20,000	20,000
Mandores	2,000	8,000	6,000
T. Drivers	2,000	4,000	8,000
Clerks	5,000	5,000	5,000
General	2,000	150,000	90,000
		197,000	129,000

It has been assumed that there are 1.5 general workers per household, and therefore 80 houses for general workers have been allowed for in the hand scheme and 45 in the mechanical operation. Maintenance assumed at 1½% per year.

Land Clearance: - $350/acre for 1,100 acres = $385,000

Roads $ 20/acre = $20,000
Maintenance at 2½%

Buildings $10,000
Maintenance 3%/year

Machinery	Hand Methods	Mechanical Methods
Land Rover	1	1
Tractors	2	4
Trailers	3	3
Sprayers	-	3
Slasher	1	1
Chisel Plough	-	1
Rotorator	-	1

Under the mechanical operations it is assumed that all fertiliser is applied in liquid form probably at more frequent intervals than when hand methods are used.

In both operations the old plants are slashed by the farm itself prior to cultivation for the new crop. The hand operation has insufficient tractors to handle these cultivations and it is assumed that this is contracted out at $40 per acre. The mechanical operation should be able to handle a good deal of this work itself with contract help where necessary $20 per acre has been assumed.

3.2 Capital Costs:

(a) Hand Methods

Year 1	-	1 Tractor @ $12,000 =	$12,000
		1 Trailer @ 1,000 =	1,000
		1 Land Rover @ 10,000 =	10,000
			$23,000
Year 2	-	1 Tractor	$12,000
		2 Trailers	2,000
			$14,000
Year 6	-	1 Slasher	2,000

Tractor & Trailer life = 8 years

(b) Mechanical Methods

Year 1	-	3 tractors	$36,000
		1 trailer	1,000
		3 Sprayers @ $1,050	3,150
		1 land rover	10,000
			$50,150
Year 2	-	1 tractor	$12,000
		2 trailers	2,000
			$14,000
Year 6	-	1 slasher	$ 2,000
		1 chisel plough	1,000
		1 rotorator	3,200
			$ 6,200

3.3 Operating Costs

(a) Annual

	Hand Methods	Mechanical Methods
Tractor @ $3/hr.	3,000 hrs. = $9,000	5,000 hrs. = $15,000
Trailers $60 cts.	3,000 hrs. = $1,800	3,000 hrs. = $ 1,800
Sprayers 70 cts.	-	2,000 hrs. = $ 1,400
	$10,800	$18,200

(b) Cultivations year

Slasher $2/hrs.	1,000 hrs. = $2,000	1,000 hrs = $2,000
Chisel Plough 50 cts./hrs.	-	1,000 hrs = 500
Rotovator $3/hrs.	-	1,000 hrs = $3,000
	$2,000	$5,500

Planting Material

To provide for 17,400 plants approximately per acre say 18,000 purchased at $9/1,000 i.e. say $160 per acre.

Fertiliser

Assumed quantities per acre for first crop

543 lbs. Urea	= 58.15
68 lbs. C.I.R.P.	= 3.72
333 lbs. Muriate of Potash	= 30.57
	92.44

Total over 5 years = $184.88

$ 37 per acre per year.

These requirements are assumed to rise in line with increases in yield of crop.

Other chemicals

These have been assumed at an average of $6 per acre per year.

Premium and Rent $50 per acre premium

$ 3 per acre rent.

3.4 Output

It is assumed that crop planting takes place during year 1 at 200 acres per month beginning in April. Dates of planting and first harvest will be as follows.

Phase	Date of Planting	Date of first harvest
1	Year 1 - April	Year 2 - August
2	- May	- September
	- June	- October
	- July	- November
	- August	- December

A total of 4 harvests have been assumed over the 5 year life of each planting. The harvesting period is very short for the first and heaviest crop but is much more extended for later crops. The basic pattern is as follows.

Crop	Yield per acre (tons)	Harvest Period (months)
1	12	2
2	7	4
3	7	7
4	7	7

This gives a total yield over the 5 year cycle of 33 tons per acre.

Given the planting schedule as above the basic pattern for the estate as a whole becomes:-

Yield Tons per acre

Phase	Year 2	Year3	Year 4	Year 5	Year 6	Year 7
1	12	7	5	7	2	12
2	12	7	4	7	3	12
3	12	6	4	7	4	12
4	12	4	5	7	5	12
5	6	8	6	7	6	6
	10.8	6.4	4.8	7.0	4.0	10.8

In analysis two yield projections have been used. One assumes that no change in yield takes place over the 20 year period analysed. The other assumes that yields rise by approximately 10 percent with each report. Yields per cycle are then as follows:-

Planting	Total Yield over 4 harvests (tons per acre)
1	33
2	36.3
3	39.7
4	42.9

Product Price

At the present time the price received by growers is 2.8 cents per pound minus transport costs. This is equivalent ot $62.72 per ton. The standard price assumed here is $56 per ton allowing therefore for $6.72 per ton for transport or an average haul of 35-40 miles.

3.5 Results of Analysis at Commercial Prices

The results of a series of calculations of financial profitability of an enterprise with 1,000 acres of pineapples are summarised in Table 5. From these it is clear that the financial return using mechanical methods is substantially higher than for the hand operation. This is not surprising since the mechanical operation comparised mainly the substitution of tractor, mounted sprayers for applying fertilizers and chemicals and the machinery required for this is relatively simple.

At the present time, as noted before, pineapples are grown in Malaysia on peat soils and both smallholders and estates use hand methods. Given the above results one is forced to ask why estates operate in this area if returns are so low.

(a) Since output from estates is less subject to fluctuations than that from smallholdings because of co-ordination of the programme of flower induction, and because the estates send their output direct to the privately-owned canning factories with which they are linked, the crop may be worth more to them than the $56 per ton allowed for here. If the price is raised by 10% to $61.6 per ton the rate of return rises to 14% assuming rising yields in future, or 6% if yields remain constant.

(b) It is noticeable that there has been no recorded planting by estates in recent years, in fact the recorded acreage has declined. Thus for the estates the relevant question is whether they should continue to cultivate land with no alternative use. Using hand methods and constant yields the average cash flow per acre per year is about $70 if the crop is valued at $61.60 per ton. This is not particularly startling and does not leave much room for unforseen setbacks, but might be considered just worthwhile.

Details of costs of hand and mechanical methods for

constant and rising yields, and corresponding revenues are given in Tables 7-10.

TABLE 6 RESULTS OF FINANCIAL PROFITABILITY ANALYSIS

Method	Yield	Product Price per ton	Net Present Value at 15% ($ per acre)	Internal Rate of return
Hand	Constant	$56.00	-613	0
"	"	$61.60		6%
"	"	$67.20	-124	12%
"	Rising	$56.00	-470	6%
"	"	$61.60	- 35	14%
"	"	$67.20	241	19%
Mechanical	Constant	$56.00	-239	9%
"	"	$61.60	83	17%
"	Rising	$56.00	111	18%
"	"	$61.60		22%

3.6 Analysis at Social Prices

Analysis was also carried out at social prices to attempt to evaluate the real value of a pineapple production enterprise to the economy. Rents, premia and E.P.F. payments were excluded and general labour was charged at $40 per month to take into account the extent of unemployment and underemployment in the economy. The results are summarised in Table 6.

The relatively high labour content in total recurrent costs, about 60% means that the profitability particularly using hand methods is very sensitive to charges in labour cost. The internal rate of return is markedly higher when evaluation is at resource values. The return using hand methods even at constant yields is just above 20% with mechanical methods and rising yields.

Substitution of capital in the form of tractor-drawn sprayers, is seen, under the assumptions made here to be justified even at the labour cost level of $40 per month, and would probably be justified unless the labour were virtually valueless. It has been assumed however that such methods would not result in a more rapid fall off in yields over the five-year cycle resulting from soil compaction or plant damage. Since these methods have never been tried in Malaysia data are not available.

Since it is to be hoped that unemployment and underemployment in Malaysia will be reduced in the not too distant future it must be expected that labour costs will rise. Such cost increases will make the substitution of machinery for labour in the pineapple increasingly more attractive. Any reduction in product will increase the pressure for such changes. The present emphasis on pineapple cultivation on peat soils resulted from earlier erosion problems on upland soils. Since it will be much more difficult to mechanise operations on peat soils the advantage will tend to swing back to mineral soils. Because of the potential erosion hazard it would be preferable, at least initially, to restrict cultivation to areas with slopes of less than 5 to 6 degrees. It is recommended that work on pineapples be extended to cover mineral as well as peat soils. This might usefully be carried out at the M.A.R.D.I. research station proposed near Kluang. Parts of the Project Area, in Johor Tengah, are suitable for the crop and are located within 40 miles of existing canneries in Johor Baharu. Such areas would be suitable for commercial scale production, on a limited scale, until the viability of the enterprise had be established.

TABLE 7 RESULTS OF SOCIAL PROFITABILITY ANALYSIS

(a) Hand Methods

Yields	Price per ton	N.P.V. at 15% ($'000)	I.R.R.
1. Constant	$56	320	20%
2. Rising at 10% per replant	$56	470	25%
(b) Mechanical Methods			
1. Constant	$56	400	25%
2. Rising at 10% per replant	$56	700	30%

TABLE 8 PINEAPPLES HAND METHODS, CONSTANT YIELDS, 1,000 CROP ACRES ($'000)

Year	Clearance & Cultivation	Building	Machinery	Plants	Fertiliser	Management	Labour	Casual Labour	Rent	Other	Total Costs	Sales	Net Cash Flow
1	385	223	27	160	43	21	91		55	17	1021	-	-1021
2	-	4	25	-	43	24	181	32	3	17	330	605	275
3	-	4	11	-	43	25	181	4	3	17	288	358	70
4	-	4	11	-	43	25	181	-	3	17	285	269	- 16
5	-	4	11	-	43	25	181	-	3	17	285	392	107
6	40	4	13	160	43	25	181	-	3	17	487	224	- 263
7	-	4	11	-	43	25	181	32	3	17	317	605	288
8	-	4	11	-	43	25	181	4	3	17	288	358	70
9	-	4	24	-	43	25	181	-	3	17	297	269	- 28
10	-	4	25	-	43	25	181	-	3	17	298	392	93
11	40	4	21	160	43	25	181	-	3	17	495	224	- 271
12	-	4	11	-	43	25	181	32	3	17	317	605	288
13	-	4	11	-	43	25	181	4	3	17	288	358	70
14	-	4	11	-	43	25	181	-	3	17	285	269	- 16
15	-	4	11	-	43	25	181	-	3	17	285	392	107
16	40	4	11	160	43	25	181	-	3	17	485	224	- 261
17	-	4	24	-	43	25	181	32	3	17	330	605	275
18	-	4	25	-	43	25	181	4	3	17	302	358	56
19	-	4	11	-	43	25	181	-	3	17	285	269	- 16
20	-	4	11	-	43	25	181	-	3	17	285	392	107

TABLE 9 PINEAPPLES - HAND METHODS, RISING YIELDS, 1,000 CROP ACRES ($'000)

Year	Clearance & Cultivation	Buildings	Machinery	Plants	Fertiliser	Management	Labour	Casual Labour	Rent	Other	Total Costs	Sales	Net Cash Flow
1	385	223	27	100	43	21	91		55	17	1021	-	-1021
2	-	4	25	-	43	24	181	32	3	17	330	605	275
3	-	4	11	-	43	25	181	4	3	17	288	358	70
4	-	4	11	-	43	25	181	-	3	17	284	269	- 15
5	-	4	11	-	43	25	181	-	3	17	284	392	108
6	40	4	13	160	47	25	181	-	3	17	490	224	- 264
7	-	4	11	-	47	25	181	45	3	17	333	666	333
8	-	4	11	-	47	25	181	5	3	17	294	392	98
9	-	4	24	-	47	25	181	-	3	17	302	297	- 5
10	-	4	25	-	47	25	181	4	3	17	306	431	125
11	40	4	21	160	52	25	181	-	3	17	498	246	- 252
12	-	4	11	-	52	25	181	57	3	17	350	728	378
13	-	4	11	-	52	25	181	6	3	17	299	431	132
14	-	4	11	-	52	25	181	-	3	17	293	325	32
15	-	4	11	-	52	25	181	9	3	17	302	470	168
16	40	4	11	160	56	25	181	-	3	17	497	269	- 228
17	-	4	24	-	56	25	181	60	3	17	370	790	420
18	-	4	25	-	56	25	181	7	3	17	317	465	148
19	-	4	11	-	56	25	181	-	3	17	297	347	50
20	-	4	11	-	56	25	181	12	3	17	309	510	201

TABLE 10 PINEAPPLES - MECHANICAL METHODS, CONSTANT YIELDS, 1,000 CROP ACRES ('000)

Year	Clearance & Cultivation	Buildings	Machinery	Plants	Fertiliser	Management	Labour	Casual Labour	Rent	Other	Total Costs	Sales	Net Cash Flow
1	385	159	59	160	43	21	75	-	55	17	978	-	- 978
2	-	3	32	-	43	25	101	32	3	17	261	605	344
3	-	3	18	-	43	27	101	4	3	17	221	358	137
4	-	3	18	-	43	27	101	-	3	17	217	269	52
5	-	3	18	-	43	27	101	-	3	17	217	392	75
6	30	3	30	160	43	27	101	-	3	17	419	224	- 195
7	-	3	18	-	43	27	101	32	3	17	249	605	356
8	-	3	18	-	43	27	101	4	3	17	221	358	137
9	-	3	64	-	43	27	101	-	3	17	253	269	16
10	-	3	30	-	43	27	101	-	3	17	229	392	163
11	30	3	34	160	43	27	101	-	3	17	435	224	- 211
12	-	3	18	-	43	27	101	32	3	17	249	605	356
13	-	3	18	-	43	27	101	4	3	17	221	358	137
14	-	3	18	-	43	27	101	-	3	17	217	269	52
15	-	3	18	-	43	27	101	-	3	17	217	392	75
16	30	3	24	160	43	27	101	-	3	17	425	224	- 201
17	-	3	54	-	43	27	101	32	3	17	285	605	320
18	-	3	30	-	43	27	101	4	3	17	223	358	125
19	-	3	18	-	43	27	101	-	3	17	217	269	52
20	-	3	18	-	43	27	101	-	3	17	217	392	75

TABLE 11 PINEAPPLE - MECHANICAL METHODS, RISING YIELDS, 1,000 CROP ACRES ($'000)

Year	Clearance & Cultivation	Buildings	Machinery	Plants	Fertiliser	Management	Labour	Casual Labour	Rent	Other	Total Costs	Sales	Net Cash Flow
1	385	159	59	160	43	21	75	-	55	17	978	-	- 978
2	-	3	32	-	43	25	101	32	3	17	261	605	344
3	-	3	18	-	43	27	101	4	3	17	221	358	137
4	-	3	18	-	43	27	101	-	3	17	217	269	52
5	-	3	18	-	43	27	101	-	3	17	217	392	175
6	30	3	30	160	47	27	101	-	3	17	423	224	- 199
7	-	3	18	-	47	27	101	45	3	17	266	728	462
8	-	3	18	-	47	27	101	5	3	17	226	431	205
9	-	3	64	-	47	27	101	-	3	17	257	325	68
10	-	3	30	-	47	27	101	4	3	17	237	470	133
11	30	3	34	160	52	27	101	-	3	17	427	269	- 158
12	-	3	18	-	52	27	101	57	3	17	282	846	564
13	-	3	18	-	52	27	101	6	3	17	231	504	273
14	-	3	18	-	52	27	101	-	3	17	225	375	150
15	-	3	18	-	52	27	101	9	3	17	234	549	315
16	30	3	24	160	56	27	101	-	3	17	437	314	- 123
17	-	3	54	-	56	27	101	60	3	17	325	907	582
18	-	3	30	-	56	27	101	7	3	17	250	538	288
19	-	3	18	-	56	27	101	-	3	17	220	403	173
20	-	3	18	-	56	27	101	12	3	17	242	588	346

4. Smallholder Production

Table 11 summarizes expected per acre costs for a smallholder producer over a typical five year crop cycle. Product price is again taken as $56 per ton after transport charges and cash costs have been assumed as for estates.

TABLE 12 PINEAPPLE-SMALLHOLDER PRODUCTIOM. CASH COSTS & SALES

Year	Planting Material	Fertiliser	Chemical	Casual Labour	Total Cost	Yield	Value	Cash Surplus
1	160	37	6	25	228	4(1)	224	- 4
2		37	6	75	118	10	560	442
3		37	6	25	68	6	336	268
4		37	6	25	68	5	280	212
5		37	6	25	68	7	392	224

(1) Yield from previous crop being replanted.

Casual labour requirements cannot be estimated with accuracy since they will they will depend greatly upon holding size and the availability of family labour. Normally some labour has to be hired to assist with peak harvesting periods. In the above example the average annual cash income per acre is $230.

In a study of pineapple smallholdings in Api Api Tan Kee Meng(1) found that average cash income was $203 per acre. Average casual labour costs were however higher than suggested above, at $79 per acre. Ignoring interest on capital, his results from a sample of 37 Malay and 52 Chinese farmers may be summarised in Table 12.

TABLE 13 SUMMARY OF RESULTS OF PINEAPPLE SMALLHOLDER SURVEY ($ PER ACRE)

Item	Malays	Chinese	Total
Crop Sales ($)	279.35	370.99	352.51
Cash Costs ($)	86.68	179.98	149.13
Cash Income ($)	192.67	191.01	203.38
Family Labour Input (man-days)	72.0	29.1	37.74
Income per man-day	2.68	6.59	5.38

(1) Tan Kee Meng "A Casestudy of Pineapple Smallholders" M.P.I.B. Research Paper Number 14. 1969.

There was a considerable difference in family labour input per acre between Malay and Chinese households. The high input for Malays was probably due to the smaller size of their holdings and somewhat less easy access to alternative employment opportunities. The Malays lived on their holdings and thus would tend to work on their holdings unless they were certain of getting a days work somewhere else. Half the Chinese on the other hand lived in the nearby town and would presumably not go out to their holding unless it was necessary to carry out a specific task or they had nothing else to do.

Pineapples have been examined as a subsidiary enterprise with coconuts. Details are given in the Working Paper on Coconuts.

5. Conclusion

The above analysis suggest that pineapples as an estate crop on mineral soils could be a relatively profitable enterprise if yields are expected to rise and if an element of mechanisation is introduced. As a smallholder crop they give a quick return and can yield a reasonable return to labour. As such they could be a useful enterprise in a mixed holding (see Working Paper on Mixed Enterprise Holdings).

Planting of pineapples by smallholders in Pontian is continuing to be stimulated by the planned new factory at Api Api. The Pineapple Research Station has developed a new strain of Singapore pineapple which they claim is capable of doubling present yields. It will take some years to multiply stocks to provide planting material for general use. However, these two trends could more than double pineapple output from the State in the next ten years. The M.P.I.B. also intends to encourage smallholder production in Klang and Kuala Langat. Development of new pineapple acreages in the Project Area, at least over the next decade, should be restricted to fairly modest acreages unless profitability proves to be much greater on mineral than peat soils. Small acreages in the areas proposed for mixed farming development or in the specialised fruit and vegetable area proposed for Penggerang might be considered.