The Coffee Industry of Papua and New Guinea.

A summary of a report, issued by the Bureau of Agricultural Economics, Canberra, A.C.T., Australia entitled "*The Coffee Industry in Papua-New Guinea. An Economic Survey*", published February, 1961.

ALTHOUGH coffee was first introduced into New Guinea late in the last century by the German Administration, no serious commercial production occurred until 1950. High world prices in the immediate post-war years were the main stimulant for the industry which has concentrated on the production of arabica coffees. At the time of the survey[1] the industry was still mainly in the pioneering stage of development, but nevertheless playing an increasingly important role in the economic development of the Territory. Pre-war exports of coffee from the Territory constituted about eight per cent. of total Australian imports[2].

Native growers, operating very small groves, accounted for approximately 60 per cent. of the total acreage of 17,640 acres in 1960. However, their production amounted to only about 25 per cent. of the total output of coffee. It was estimated that by 1970 more than half of the Territory's production of about 12,000 tons would come from native producers.

Although accurate production figures were difficult to obtain because of the large number of native growers, export figures provided a good indication of trends within the industry—Table I.

Table I.

Coffee Exports.

Territory of Papua and New Guinea.

Year ended 30th June.	Volume. Tons.	Value. £A'000.
1952	34	11
1953	47	31
1954	87	60
1955	107	75
1956	171	94
1957	274	183
1958	385	225
1959	969	456
1960	1,487	717

The two main economic species of coffee, *Coffea arabica* (highland coffee) and *Coffea canephora* (Robusta or lowland coffee) were grown in the Territory. Arabica coffee was by far the more important. Two varieties of this species were grown, typica and bourbon, but the former made up about 75 per cent. of the total tree numbers.

The recent development of the industry was illustrated by the fact that at the end of March, 1960, 52 per cent. of the total number of coffee trees on European plantations were under five years of age.

Production Areas.

Approximately 93 per cent. of the total area under coffee at the end of March 1960 was in the Western and Eastern Highlands and the Morobe Districts of New Guinea.

Basic Characteristics of the Coffee Plantations.

Size of Holdings.

In 1960, plantations within the main production area, averaged 253 acres but of this only about 56 acres was under coffee. Very few plantations had 100 acres or more under coffee.

Management.

The most common form of management found in the survey was the owner operator. The second most common was the company controlled by a manager or director. The general pioneering stage of the industry was shown by the fact that only just over seven per cent. of those engaged in management had previous experience in coffee growing.

Cultural Practices.

The coffee industry developed too quickly for research findings to keep pace, and plantation managers were forced to experiment with cultural

(1) The field work for the survey was carried out between March and May, 1960. A total of 100 plantations out of the 166 growing coffee at the end of March, 1959, was included but those with less than 20 acres of coffee were omitted from the survey.

(2) These exports were mainly robusta coffee coming from several large plantations in the Bismarck Archipelago and the native robusta project in the Northern District of Papua; established in 1931. Buoyant conditions in the cocoa market during the post-war period resulted in the more important robusta plantings in the Bismarcks either being abandoned or replaced with cacao. The 1951 eruption of Mount Lamington wiped out the native coffee project in Papua which had been practically rehabilitated. Thus robusta production was virtually eliminated by 1951 and subsequent development showed concentration on arabica coffee in the Highlands of the Territory. Interest in robusta was renewed in the late 1950's.

practices. This resulted in a wide range of methods being used. However, as the rate of expansion slowed down, cultural methods became more uniform.

Clearing.

Most of the coffee plantations in the Highlands were situated on land with a dense natural cover of grass, and clearing had been carried out by teams of natives using bush knives. In some instances, the grass was first fired. After initial clearing, the area was cultivated mostly with a tractor and plough but hand labour was sometimes employed.

Planting.

The coffee seed had usually been obtained from research stations. The most common practice was to strike the seed in nurseries and to transplant at one year of age on a nine-foot triangle spacing.

Shading and Windbreaks.

Practically all holdings provided permanent shade for the coffee and a wide range of trees was used. For temporary shade *Crotalaria* spp. was most common, while *Leucaena glauca* and *Albizzia stipulata* were most used for permanent shade. In the Eastern and Western Highlands, temporary shade was normally planted with the young coffee, which was followed within one year by permanent shade.

Pruning.

Although many planters experimented with pruning techniques, the multiple stem system was the most common.

Mulching.

Only about 65 per cent. of the planters in the survey mulched their blocks.

Weeding.

Hand weeding was most commonly employed but some chemical and mechanical control methods were used.

Fertilizing.

Approximately 75 per cent. of the plantations used fertilizer and of these about 40 per cent. applied it only to mature trees. The rate of application varied from 0.25 to 1.5 lb. per tree.

Pests and Diseases.

At the time of the survey the coffee industry in the Territory was free from serious economic pests and diseases.

Pulping and Processing.

The "wet" method of processing was universally used, comprising the pulping and washing of the cherry to produce dry parchment, and from the dry parchment to the finished green bean.

Some plantations carried out the complete process of hulling and polishing but on those lacking the necessary facilities, final processing was done by central mills or other plantations with the necessary equipment.

Financial Data.

In the developing coffee industry, the examination of financial data posed serious problems. It was difficult to find holdings at the same level of development, and financial and production data maintained by managers were usually inadequate for detailed analysis. Nevertheless, 30 holdings possessed sufficient information to allow some examination of capital investment in coffee holdings within the Territory, although these data covered only one year.

Total Investment—30 Plantations.

The total investment in holdings varied greatly, ranging from £10,000 to £71,000. However, more meaningful indicators of investment showed that capitalization per acre of planted coffee averaged £444, with a range from £277 to £853. Investment per productive acre averaged £570, varying from £378 to £862.

Coffee plantings comprised the largest single investment on these plantations. Coffee land and plantings accounted for an average of 70 per cent. of the total investment on the holdings, the remainder consisted of plant and machinery, 12 per cent.; structures, ten per cent., and eight per cent. in land not planted to coffee.

Table II.

Average Income, Costs and Returns per Acre—30 Holdings—Mature Coffee.

Coffee Area Ac.	Prodn. lb.	Income			Gross Operating Costs	Pltn. Surplus £	Return to Operator £	Total Capital Value £	Return to Capital £	Per cent.
		Coffee £	Other £	Total £						
32	1,150	212.0	1.8	213.8	115.4	98.4	68.5	570	64.7	11.5

Income, Costs and Returns per Acre.

The average area under mature coffee on these holdings at the time of the survey was 32 acres but this was only about 46 per cent. of the total area planted—Table II.

Yield averaged 1,150 lb. per acre—Table II—but individual production for the year varied from 360 to 2,540 lb. Estimates of a normal long term average yield of coffee on reasonable soil and without a fertiliser were reported to be in the vicinity of a half ton per acre(3). Approximately 60 per cent. of the holdings had yields for the one year in excess of this figure.

The average income per acre for the year—Table II—was £213.8 but there was considerable dispersion and individual figures ranged from £62.7 to £485.5 per acre.

Gross Operating Costs.

These costs averaged £115.4 per acre, ranging from £17.1 to £259.7 (Table II). The largest single cost within this figure was native labour which constituted approximately 40 per cent.—Table III.

Table III.

Average Gross Operating Costs Per Acre—30 Holdings.

Item.	£	Per cent.
Native labour (*a*)	45.8	39.6
Other labour	8.1	7.0
Vehicle and Machinery	11.4	10.0
Maintenance of structures	4.9	4.2
Hand tools	0.7	0.6
Fertiliser	13.8	12.0
Bags, twine, stencils	1.7	1.5
Insurance	0.6	0.5
Office expenses	2.1	1.8
Land rental	0.3	0.3
Freight	1.4	1.2
Undefined	10.7	9.3
Depreciation—Structures	4.4	3.8
Plant and machinery	9.5	8.2
TOTAL	115.4	100.0

(*a*) The cost of native labour was charged at the appropriate rate under the Native Employment Ordinance and Regulations. These labour costs varied considerably between the 30 plantations.

Depreciation of Plantings.

The lack of data on the life of coffee trees prevented any suitable figure for depreciation being calculated. However, most managers were well aware of this cost, and generally, provisions were made for the replacement of coffee and shade trees. Furthermore, the distinct possibility of more productive varieties of coffee trees becoming available from research stations was an important factor influencing the amortization of coffee plantings.

Returns.

The profitability of the plantations was considered in relation to management and capital—see Table II.

(*a*) *Plantation Surplus.*

The plantation surplus was calculated as the difference between income and operating expenses and represents the return to the operator's labour, management and capital. It averaged £98.4 per acre—Table II. For the individual holdings, the corresponding figure varied from minus £8.7 to plus £239.9 per acre.

(*b*) *Return to Operator.*

Return to the operator was estimated by subtracting the interest charge on capital investment from the plantation surplus. The average return to operator for these 30 holdings was £68.5—Table II—ranging from minus £37.9 to plus £201.4 per acre.

(*c*) *Return to Capital.*

This figure was arrived at by deducting an assumed allowance of £2,000 per annum—the allowance the manager—from the plantation surplus. The average was £64.7 per acre—Table II.

The average percentage return to capital was 11.5.—Table II. The latter figure over the 30 holdings ranged from minus 15.4 to plus 27.2 per cent.

Costs of Establishment—18 Holdings.

The stage of development of the coffee industry in the Territory raised many problems in determining the actual cost of establishing a coffee holding. The long period between the original investment and the first returns, and the wide range in the development stages of the various holdings made the assessment of establishment costs extremely difficult.

Of the total of 100 plantations in the survey only 18 possessed sufficient data to permit some analysis of these costs. These varied from £11,000 to over £43,000, while the costs per acre of planted coffee ranged from £145 to £495 per acre.

(3) Since the survey, further experience, and assessment of production statistics for the 1960 and 1961 crops indicate that this estimate may be a little high. The indications are of a biennial yield pattern developing with an average yield of 8 cwt.

The principal item was the operator's allowance of £2,000[4] which made up about 27 per cent. of the total. The other items were native labour, 17 per cent.; purchase of plant and machinery, 13 per cent. However, where a processing factory was established, machinery costs became more important. Formation costs averaged ten per cent. and varied more than any other cost as land purchases were included. The remaining items were interest, nine per cent., structures six per cent., and undefined costs five per cent.

The small proportion allotted to structure underestimated the full importance of this cost as holdings reach full development. In a number of cases, temporary structures were being utilized but these were eventually to be replaced by permanent buildings.

Capital for establishment came, in most instances, from within the Territory of Papua and New Guinea but larger companies raised considerable sums of money in Australia. One of the most interesting features of the industry was the number of holdings which were originally financed out of personal savings, often supplemented by income from trade stores and outside work. Unfortunately, the amount of funds for full development was sometimes underestimated, and once personal savings were exhausted, development was suspended until further capital became available.

Marketing Expenses.

Almost all the coffee produced in the Territory was sold in Australia but some small quantities have been exported elsewhere. There was no control over markets on which growers could sell and they were completely free to dispose of their crops where and how they pleased. Voluntary agreement between growers and agents in Australia set ruling prices for the season's crop[5].

The survey showed that native growers preferred to sell their crop for cash rather than to pay to have it hulled and then await payment until the crop was sold. Price paid depended upon quality, transport costs and competition among purchasers. In areas where private buyers were not operating, the Administration bought parchment coffee.

Transport to the main ports, Madang and Lae, was usually by air although coffee grown in Wau was transported to Lae by road.

In 1960, it was estimated that marketing costs, from the plantation to Sydney were close to 6d. per lb.[6].

Budget—Establishment of a Coffee Holding.

As data on the cost of establishing a coffee holding were inadequate the only alternative method of gauging total capital requirements was to construct a comprehensive budget covering the period from initial clearing to full production.

The budget—Table V—covered nine financial years for a holding of 100 acres managed by an owner-operator having experience in coffee growing under Territory conditions.

The basic assumptions of the budget were :—

1. The holding was situated in the Eastern or Western Highlands and produced arabica coffee for the Australian market.
2. The holding was leasehold.
3. Two blocks of 40 and 60 acres were to be planted out in the first three years ; the 40 acre block in year two, the remaining 60 acre block in year three.
4. A processing factory was to be completed for the first crop in year five.
5. Work commenced in July, and access roads, preliminary accommodation, store facilities and a coffee nursery were completed by November.
6. *Interest.* Interest was charged at 5¼ per cent.
7. *Vehicle.* A small four-wheel drive vehicle was allocated to the holding, effective life being estimated at five years, when its trade-in value would be £400.
8. *Hand Tools.* These were replaced to maintain their value at £300 per year.
9. *Yield.* A half ton to the acre was accepted as a reasonable long term yield—first full production year, year eight—Table IV.

(4) This allowance of £2,000 was assumed to cover all personal expenses of the manager such as pay, leave fares, medical benefits, etc.

(5) Coffee from the Territory enters Australia free of duty. On 8th August, 1961, the Minister for Territories, the Hon. Paul Hasluck, announced that the existing duty of 3d. per lb. on overseas raw and kiln-dried coffee would be remitted under By-law where 28 per cent. of coffee requirements are purchased from coffee produced in the Territory of Papua and New Guinea. This remission would operate for the year ending 30th April, 1962.

(6) Since the survey, marketing costs have risen.

10. *Prices.* The price of 3/6 per lb. net for processed and bagged coffee on the plantation was used in the budget. This was equivalent to 4/- lb. delivered to the buyer in Sydney. In the budget, this price was accepted as "a suitable long term projection in which to base returns in the budget." (p.83)

Establishment Costs.

Table IV.
Production and Income.

	Year 5	Year 6	Year 7	Year 8
Production lb.	11,200	42,933	84,000	112,000
Income £	1,960	7,513	14,700	19,600

Full production was reached in year eight with an average yield of a half ton to the acre.

Estimating Establishment Cost.

The budget of establishment cost—Table V—revealed that it was not until year seven that income became in excess of cash costs. In previous years, cash costs exceeded income and a debit was added to the cumulative balance carried forward. In year seven, income was greater than the interest on the cumulative balance which was then reduced. The cumulative cost of the holding was the cumulative debit balance brought down at the commencement of year seven, which was the same as the cumulative balance carried down at the end of year six. This balance of about £56,000 was the estimated liability that an owner-operator possibly incurred before a plantation of 100 acres, developed according to the envisaged plan, was in full production—Table V.

The major component of the establishment costs was native labour—Table VI. The net establishment cost of £55,722—Table VI—was equal to £557 per acre of planted coffee for 100 acres.

Table VI.
Major Component of Establishment Costs.

	£	%
Native Labour	21,320	32.7
Owner-operators allowance	12,000	18.4
Plant and equipment	9,260	14.2
Standard improvement	7,730	11.9
Interest—Annual £1,230 Compound £7,625	8,855	13.6
Other Expenses	6,030	9.2
	65,195	100.0
Less Income	9,473	14.5
	55,722	85.5

The next step in the budget was to examine the current costs of production, including interest and depreciation. The previous budget, the cost of establishment, showed only the total costs of assets.

Year eight was the first year of full production. In this year, the plantation surplus as a return to the operator and his capital was £9,290. After assuming an amount of £2,000 for the operator's allowance, the return to capital would be £7,290 or 13.1 per cent—see Table VII

Table VII.
Budget Year 8—Production (a).

	£	£
Income (1,120 lb. per acre—100 acres 112,000 lb. at 3/6 lb.)		19,600
Gross Costs		
Labour	7,330	
Plant operating expenses	990	
Repairs	105	
Bags, twine, stencils	250	
Hand tools	50	
Miscellaneous	50	
General Costs		
Land rent	30	
Office expenses	40	
Depreciation		
Structural .... Plant and equipment	1,461	
Total Gross Costs		10,310 (b)
Plantation Surplus		9,290
Interest—5¼% on £55,720		2,930
Return to Operator		6,360
Operator's Annual Allowance		2,000
Return to Management		4,360
Interest—5¼% on £55,720 (c)		2,930
Return to Capital		7,290
Per cent. Return to Capital		13.1

(*a*) This budget does not include depreciation of trees.

(*b*) Rounded.

(*c*) See Tables V and VI. This is the net establishment cost or the estimated liability to bring a plantation of 100 acres, developed as suggested to full production.

Table V.

Budget of Establishment Costs.

Item	Year 1	Year 2	Year 3	Year 4	Year 5	Year 6	Year 7	Year 8	Year 9	Total to end of Year 6
Land (leasehold) Purchase ...	NIL									
Land Improvements	300									300
Structural improvements	1,650	920	210	3,630	1,260	60	80	100	100	7,730
Plant and equipment	3,630	150	60	90	3,950	1,380	50	50	50	9,260
Labour	1,570	3,770	4,010	3,110	3,410	3,410	6,630	7,330	7,610	21,320
Plant operating expenses	670	790	770	830	840	900	960	990	990	4,800
Packing expenses	....	....	....	....	25	95	190	250	250	120
Miscellaneous	100	80	80	80	50	50	50	50	50	440
Overheads—Land rent	30	30	30	30	30	30	50	30	30	180
—Office expenses	30	30	30	30	30	40	40	40	40	190
—Operator	2,000	2,000	2,000	2,000	2,000	2,000	2,000	2,000	2,000	12,000
Annual money outflow	9,980	7,770	7,190	9,800	11,595	10,005	10,030	10,840	11,120	56,340
Less annual income	....	....	....	....	1,960	7,513	14,700	19,600	19,600	9,473
Debit Balance	9,980	7,770	7,190	9,800	9,635	2,492	+4,670(a)	+8,760(a)	+8,480(a)	46,867
Interest (5¼%)	262	204	189	257	253	65				1,230
Total annual debit	10,242	7,974	7,379	10,057	9,888	2,557	+4,670(a)	+8,760(a)	+8,480(a)	48,097
Cumulative debit b/d		10,242	18,754	27,118	38,599	50,513	55,722			
Interest on cumulative debit b/d		538	985	1,424	2,026	2,652	2,925			7,625
Total cumulative debit b/d		18,754	27,118	38,599	50,513	55,722	53,977(b)			55,722

(a) Credit Balance.

(b) Total included cumulative debit balances brought down plus interest on that balance less credit balance in year 7.