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THE STATUS AND POTENTIAL OF THE CHILLI INDUSTRY
IN THE BRITISH SOLOMON ISLANDS

by

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INTRODUCTION

The agricultural economy of the British Solomon Islands Protectorate is based on the production and export of copra. Annual production of copra over the last seven years has fluctuated between 23,304 tons in 1966⁽¹⁾ and 25,252 tons in 1964. Valued at \$A3,664,000.00, this gives an input into the Protectorate budget of approximately \$A551,000.00⁽²⁾ per annum. The dangers of the dependence of a country's economy on a single crop have long been recognised. In an attempt to diversify and strengthen the economy, the Department of Agriculture has, since 1958, been investigating ways in which this can be achieved.

A cocoa industry introduced in 1958 has gradually expanded, resulting in the sale overseas of 90 tons of cocoa in 1966 and 60 tons in 1967. Three cyclones, which devastated areas of the Solomons in late 1966 and 1967, emphasised still further the dangers of too great a dependence on a single export commodity and resulted in decreased production of both copra and cocoa.

In 1959, following a soil survey by Ballantyne⁽³⁾ of 20,000 acres on the Guadalcanal Plains, a Rice Agronomist, J.G.H. Holscheimer⁽⁴⁾ was appointed and work began on the investigation of variety, time of planting, fertiliser responses, weed control and field management of an irrigated rice crop. By mid 1968 a large commercial firm, Guadalcanal Plains Limited, financed by

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Australian and locally interested businessmen was producing 2,500 tons of non-irrigated rice per year⁽⁵⁾.

RESEARCH

The Department of Agriculture's Experimental Station at Dala was opened in 1962 and critical work was started on cocoa and general crop agronomy. A General Crops Agronomist was appointed in October 1967 and more detailed work began on subsistence and minor cash crops (Gollifer⁽⁶⁾). The experimental programme was divided into three sections:-

- (i) Subsistence Crops
- (ii) Minor Cash Crops
- (iii) Perennial Crops

Particular among the minor cash crops was the instigation of critical work on chillies (*Capsicum annum*, var. *acuminatum*).

Observation plots of eleven varieties of chillies ex India were planted and data collected on harvest period, yield, recovery after drying on a per acre basis and % seediness. Disease incidence, both fungal and insecticidal, was noted and observations made on harvesting, drying, storage and shipment techniques. Samples of all eleven Indian varieties were sent to the Tropical Products Institute, United Kingdom, and were reported on as follows:-

"The values obtained for crude fibre are mostly high. The results of the other tests are mostly satisfactory, but tend to be on the low side. Three of the varieties show greater divergencies from the values normally found for Cayenne pepper."

A spice broker stated that they regarded the samples as "capsicums suitable for grinding". They were in excellent condition, the colour was very good and the absence of stalk very satisfactory.

As a result of the encouraging reports from the Tropical Products Institute and the brokers, it was decided to extend the experimental work and to lay down field trials for commercial evaluation.

Variety Mahaillupalama was selected solely on the basis of its superior yield, and small field trials were laid down, a half acre on Malaita

by the West Kwara'ae Marketing and Transport Co-operative Limited and three and three-quarter acres by "Greenacre" Estate on the Guadalcanal Plains. It is with this latter area that the remainder of this paper is concerned.

THE GUADALCANAL PLAINS

The plains extend for some 40 miles along the north shore of Guadalcanal island, varying in width up to 7 miles inland and rising to about 150 ft. above sea level before merging into the rolling foothills. This coastal belt lies in a 'rain shadow' area and is comparatively dry with an annual average rainfall of 70 ins. as against a possible 300 ins. or more for the mountain range. The climate of the area is wet equatorial, but much modified by the surrounding ocean and mountains to bring night temperatures on the plains as low as 64°F. At Henderson Airport temperatures range from 64 - 95°F while further east the range is 67 - 94°F. The lowest temperatures are experienced during the period July to December when the south-east trade winds blow and the highest in the period January to June when the winds are variable but normally from the north or north-west. Soils on the plains were formed from materials transported by the rivers, together with a varying proportion of volcanic dust, but a diversity of soil descriptions recorded by various (7) observers shows a variability not always evident on the surface. Green in 1952, reported two main types of soil, the shallow black Rendzina formed on coral and the rather deeper, poorly drained Humic Glei, Low Humic Glei or Weissen Boden. Climax vegetation of the island is normally luxuriant ever-green rain forest but the Plains area is largely grassland. By far the most dominant grass is Kangaroo Grass (Themeda quadrivalvis) while Mission Grass (Pennisetum polystachyon) and Kunai Grass (Imperata cylindrica) occur to a lesser extent.

HUSBANDRY

Chilli seed var. Mahailupalama was sown in the nursery on January 29th 1968 in rows 12" apart, the seed being sifted between finger and thumb sowing to give an even spread. The pumule emerged above ground within 7 days of sowing.

Three and three-quarter acres of grassland were prepared using a Massey-Ferguson tractor and hydraulic implements. The grass cover was firstly burnt off and the surface cultivated with a disc plough. This was followed by disc harrowing four times at weekly intervals to allow for germination of dormant seeds between each harrowing. A reasonably weed-free seed bed resulted.

Planting out of the seedlings began on 26th March when the seedlings

were 6" - 9" high. Rows were 4 ft. apart with 2 ft. between each plant in the rows, giving 5,445 plants per acre. The most suitable spacing distances have yet to be determined and it is possible that a spacing of 4 ft. by 4 ft. will be more satisfactory. However, with a loss of 20% of plants due to non-establishment after planting out and a further loss of 25% caused by the fungus disease Corticium rolfsii, the closer spacing appears advisable. Subsequent establishment was reasonable but it was found that as the plants matured in the nursery, establishment on planting out gave a greater 'take'. The optimum size for planting out was when the plant was 12" - 18" high, the base of the stem woody and the first flowers appearing. A cloudy day and preferably one following rain was chosen for planting out, although, at one stage, planting proceeded during a full week without rain and subsequent establishment of the seedlings was 80%. Planting out from the nursery proceeded progressively through March and April until slightly less than four acres had been planted. It was found that 90 standard man hours were required to plant one acre. Weed growth was minimal, the main weed infestation being Sensitive Plant (Mimosa pudica, Mimosa invisa). Weeding was carried out once a month by hand, 24 man hours per acre/month being required.

No fertiliser was used and no trials were undertaken with fertiliser. It was necessary to spray the area once every two months with a copper fungicide, in an attempt to minimise Corticium rolfsii infection.

YIELDS

Harvesting started on 10th June 1968, 132 days after planting in the field, and continued to 27th January 1969. Women were used to pick the crop and trials showed that a good picker could harvest 98 lbs. per day, although figures of 124 lbs. per day have been achieved. Pickers were paid at the rate of \$A0.02½ per lb., i.e. a target of 50 lbs. giving \$A1.00 per day.

TABLE 1Sample Yields and Recovery after Drying

| Batch No. | Date of Harvest | lbs. Wet per acre | lbs. Dry per acre | % Dry to Wet | Drying Time (hrs) | Depth on Drier ins | Mois. Content % |
|-----------|-----------------|-------------------|-------------------|--------------|-------------------|--------------------|-----------------|
| 1 | 10.6.68 | 297 | 91 | 30.6 | 50 | 3 | 13 |
| 2 | 17.6.68 | 458 | 134 | 29.2 | 38 | 4 | 12½ |
| 3 | 25.6.68 | 367 | 102 | 27.8 | 31 | 3½ | 10 |
| 4 | 27.6.68 | 546 | 146 | 26.3 | 29 | 5 | 9 |
| 5 | 1.7.68 | 525 | 152 | 28.9 | 32 | 5 | 9½ |
| 6 | 3.7.68 | 683 | 167 | 24.4 | 36 | 6 | 7 |
| 7 | 8.7.68 | 587 | 158 | 26.8 | 34 | 5½ | 9 |
| 8 | 10.7.68 | 631 | 165 | 26.1 | 39 | 5½ | 8 |
| 9 | 15.7.68 | 558 | 147 | 26.3 | 34 | 5 | 9 |

TABLE 2Total Yields June 1968 - January 1969

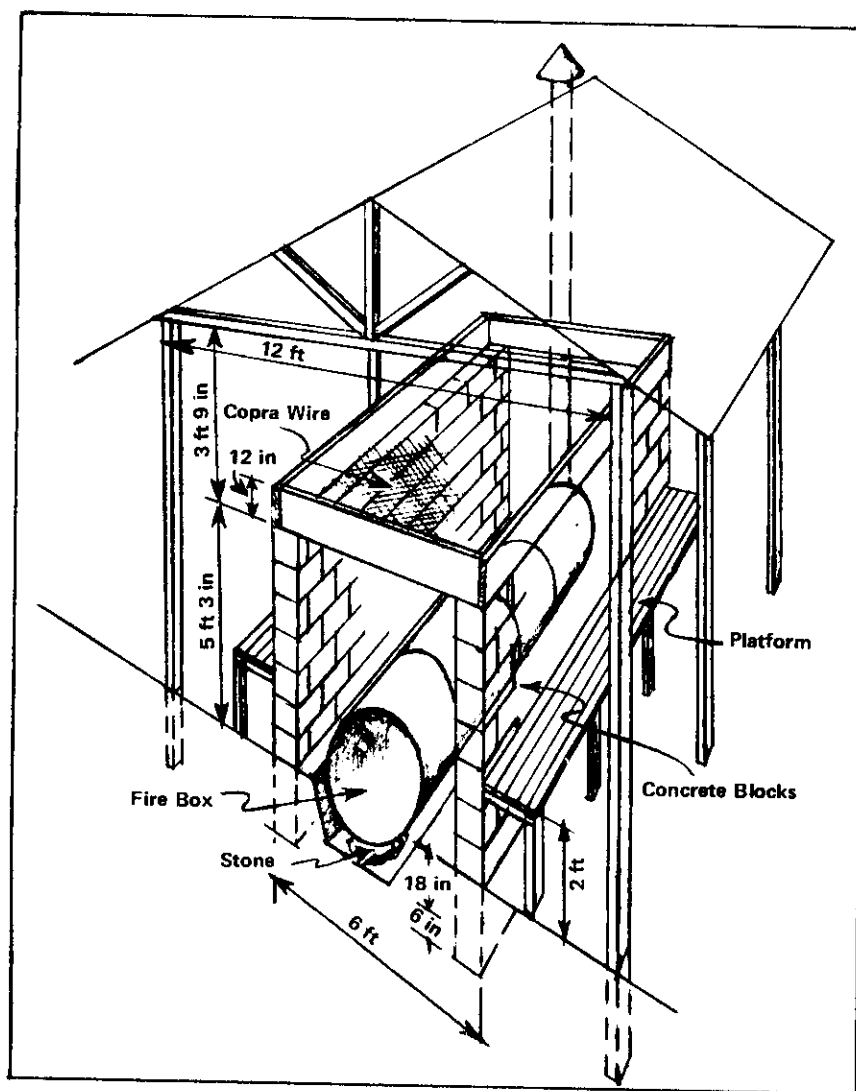
(in lbs.)

| | <u>Month</u> | <u>Yield</u> |
|-------|--------------|---------------|
| 1968 | June | 1,668 |
| | July | 5,668 |
| | August | 3,112 |
| | September | 13,025 |
| | October | 3,188 |
| | November | 4,360 |
| | December | 731 |
| 1969 | January | 640 |
| TOTAL | | <u>32,392</u> |

32,392 lbs. of wet chillies were harvested from 3¼ acres. With a recovery rate after drying of 38%, 12,320 lbs. or five and a half tons of dry fruit was obtained, giving a yield of 3,285 lbs. of dry chillies per acre over a harvest period of eight months.

Drying was achieved in a Kukum type copra drier (a local type of drier, the design being based on the Samoan drier).

TABLE 3



Simple trials to ascertain the optimum conditions for drying showed that variation in temperature as drying proceeded gave the most suitable final product. Consequently the following procedure was adopted.

TABLE 4Drying Procedures

| <u>Temperature *</u> | <u>Period of Time</u> | <u>Movement of Pods</u> |
|----------------------|-----------------------|---|
| 70°F | Initial four hours | Chillies turned on drier every half hour |
| 60°F | Next 20 hours | Chillies turned on drier every two hours |
| 45-50°F | Final 10 hours | Slower drying pods moved to hottest part of drier |

A constant thickness over the net of $5\frac{1}{2}$ inches was found to be the most suitable. Trial work using a specially calibrated Kappa moisture meter showed that the optimum moisture content for the dried pods was 9%. This was achieved using the technique shown in Table 4 above, in an average of 34 hours drying time.

To obtain an overall 9% moisture content it was found necessary to reduce the moisture % of some chillies to 8% or even 7%. Care must be taken not to fracture the brittle skins of chillies in this state of dryness.

After drying was completed pods were left on the drier to cool and then bagged. It was noticed that the dry brittle pods re-absorbed moisture up to 9% but did not rise above this point whilst in store.

After drying, the chillies were packed in hemp copra sacks, 80 lbs. of pods per bag, and stored. Five and a half tons were shipped to Australia, attracting a price of \$A0.18½ per lb.

* The thermometer was placed in the chillies on the platform over the hottest part of the firebox.

TABLE 5Moisture Content

| Moisture Content % | Drying Time (hours) | Condition of Pods |
|--------------------------|---------------------------|--|
| 13 | 50 | Very bad - pods rejected |
| 12 | 38 | Very bad - no keeping quality - must be redried |
| 11 | 40 | Bad - pods gradually deteriorate - must be redried |
| 10 | 31 | Satisfactory - pods keep well in store |
| 9 | 29 | Excellent - optimum moisture content |
| 8 | 39 | Satisfactory - pods keep well in store |
| 7 | 36 | Bad - pods brittle, some breaking and loss of seed |
| 6 | 35 | Very bad - pods very brittle, crack and break easily. |

Costs of establishment, maintenance and harvesting in Table 6 show that the cost of establishing one acre of chillies and bringing it to first harvest is \$A110.00.

TABLE 6Cost of Establishing One Acre of Chillies to First Harvest

| | |
|---|------------------|
| | \$A |
| Burning Grassland = 2 man days @ 75¢ per day | 1.50 |
| Cultivation: | |
| 1 pass with disc plough | |
| 4 passes with disc harrow | 25.00 |
| Husbandry, Nursery and Field: | |
| Nursery - 14 man days @ 75¢ per day | 10.50 |
| Field - 70 man days @ 75¢ per day | 52.50 |
| Weeding: By hand 14 x 2 = 28 man days @ 75¢ per day | 21.00 |
| | <u>\$A110.50</u> |

The cost of establishing 1 acre of chillies is \$A110.00 per acre, or with the yield of 3,285 lbs/acre dry achieved, a cost of \$A0.3.36¢ per lb. or \$A75.26 per ton.

The costs incurred in harvesting, drying and shipping to Australia are equal to 6.18¢ per lb. or \$A138.43 per ton as shown in Table 7.

TABLE 7

Costs per lb. of Harvesting, Drying and Shipping Chillies

| | <u>Per lb.</u> | <u>Cents.</u> |
|--|----------------|---------------|
| A. Cost of picking @ 2¢ per lb. | | 2.00 |
| B. Transport - Field/Drier ^(a) | | 0.24 |
| C. Cost of drying ^(b) - (i) Labour ^(c) | | 0.43 |
| (ii) Firewood ^(d) | | 1.14 |
| D. Depreciation on drier ^(e) | | 0.14 |
| E. Cost of bags ^(f) | | 0.44 |
| F. Transport store/wharf ^(g) | | 0.14 |
| G. Shipping - (i) Freight ^(h) | 1.43 | |
| (ii) Wharfage ⁽ⁱ⁾ | 0.15 | |
| (iii) Insurance ^(j) | <u>0.07</u> | <u>1.65</u> |
| | TOTAL | <u>6.18¢</u> |

NOTES: General explanation of figures

- (a) Based on a 14-mile return journey at 12¢/mile with a 700 lb. load.
- (b) Based on an average drying time of 34 hours, with a platform capacity of 700 lbs.
- (c) Four 8½ hour shifts or four days work @ 75¢ per day.
- (d) At \$1.25/54 cu.ft. split in 2 ft. lengths, the prevailing rate, 351 cu.ft. being required.
- (e) Fire boxes and chimneys costing \$A100.00 depreciated over six years.
- (f) Eighty lbs. of chillies per copra bag at 35¢ per bag.

- (g) An eight mile return journey with a 700 lb. load at 12¢ per mile.
- (h) At \$A30.00/ton.
- (i) At \$A3.50/ton.
- (j) At \$A1.60%

Total cost/lb. therefore from picking to arrival at overseas market is 6.18¢/lb. or \$A138.43/ton.

An average yield of 3,285 lbs/acre was obtained from the area during the eight month period in which the chillies were harvested. At a market price of 18¢/lb. this gave a gross output/acre of \$591.30. A summary of these costs shows:-

TABLE 8

| <u>Variable Costs</u> | <u>Gross Margin/Acre</u> \$A | <u>Gross Output</u> \$A |
|-----------------------|---------------------------------|----------------------------|
| Seed | Nil | |
| Cost to first harvest | 110.50 | |
| Cost of harvesting) | | |
| drying) | 203.01 | |
| shipping) | | |
| TOTAL | 313.51 | 591.30 |

Gross Margin per Acre = \$A277.79

TABLE 9

| <u>Costs</u> | <u>Net Income Per Ton</u> \$A | <u>Return</u> \$A |
|---|----------------------------------|----------------------|
| Cost to first harvest | 75.26 | |
| Cost of harvesting, drying, and shipping | 138.43 | |
| Net Income | 189.51 | 403.20 |
| | <u>403.20</u> | <u>403.20</u> |

A net income of \$A189.51 was achieved. However, the inclusion of fixed costs, were they known, would reduce this figure considerably and show that the profit margin on this crop is not as favourable as appears at first sight. From a peasant crop point of view however, the fixed costs would be negligible and it is in this direction that the most favourable net returns would be obtained. It seems likely that in order to attract adequate numbers of casual labour, the piecework rate for picking would have to be raised from 2¢ per lb. wet to 3¢. This would have the effect of reducing the net income/ton to \$A167.11.

POTENTIAL

With market development advancing satisfactorily, the potential for this crop in the Solomons appears promising.

Contracts placed overseas, particularly in Australia will mean forward buying of the crop and should eliminate what has been to date the problem of selling on an adequately supplied world market. With Australia looking towards its nearer neighbours for supplies of this type and with the Australia/Solomons trade heavily weighted in favour of exports to the Solomons, it is hoped that with this commodity, some reciprocal trade may be established.

There is no doubt too, that chillies can be grown successfully in the Solomons on the northern coast of Guadalcanal. The main obstacle to its spread as a peasant crop will be the Solomon Islanders' evident dislike of a crop which needs daily maintenance, and is tedious to pick. It seems more likely that the crop will be more successfully grown by some of the larger farmers, both local and expatriate on a relatively large scale. Casual labourers on a piecework basis are available for picking whilst the routine husbandry can be done by semi-skilled employed labour. It is in this way therefore that the chilli industry will develop.

To what extent it will develop and establish its importance in the agricultural pattern within the Solomons, will depend solely on the satisfactory negotiation of export orders.

SUMMARY

Experimental work instigated with chillies (*Capsicum annum* var. *acuminatum*) at Dala Experimental Station in mid-1967 showed that the crop grew well, gave satisfactory yields, and was relatively free from pests and diseases. Samples sent to the Tropical Products Institute, United Kingdom, and to brokers, also showed that the quality was good and that there would

be a demand for this crop on world markets. Consequently, the experimental work at Dala was continued and field trials laid down in the Central District to evaluate the commercial possibilities of this crop both as a peasant crop and for growing on a relatively large scale.

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REFERENCES

- (1) Annual Report (1967) - Department of Agriculture, B.S.I.P.
 - (2) Annual Report (1967) - British Solomon Islands Protectorate.
 - (3) Ballantyne, A.O. (1959-61) - A report on the Soil Survey of the Guadalcanal Plains and other areas of the British Solomon Islands Protectorate.
 - (4) Holscheimer, J.G.H. (1966) - Investigations for Mechanised Rice Production on the Guadalcanal Plains in the British Solomon Islands Protectorate. South Pacific Bulletin Second Quarter.
 - (5) Kendrick, A.R. (1968) - The Development of Large Scale Agriculture on the Guadalcanal Plains in the British Solomon Islands. World Crops (December).
 - (6) Gollifer, D. (1967) - Annual Report, Dala Experimental Station, Department of Agriculture, British Solomon Islands Protectorate.
 - (7) Greene, H. (1952) - Coastal Soils of Malaita (Interim Report - Unpublished).
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