



INFORMATION CIRCULAR

SPC Library



41614

Bibliothèque CPS

Classification

LIBRARY

SOUTH PACIFIC

Serial No.

Vegetable Production

COMMISSION

80

Date

April 1978

SPECIAL PROJECT FOR THE DEVELOPMENT OF VEGETABLE PRODUCTION IN THE SOUTH PACIFIC

PARTIAL RESULTS OF 1975 TRIALS

During 1975, efforts undertaken in favour of vegetable production in various South Pacific territories were geared in particular to the selection and testing of different vegetable varieties from Japan, Taiwan, the Philippines, the United States of America and Australia. Previous years had already produced extremely interesting results but experience has shown that while it is possible to draw up a list of varieties suitable for the South Pacific as a whole, each territory has its own particular environmental conditions where one variety may turn out to be more productive, more resistant to pests and diseases, or better suited to climatic extremes than another. It is therefore of the utmost importance to familiarise the entire region with the recognised qualities of the different varieties under trial in each territory and with the various farming methods practised.

The results set out in this Information Circular chiefly pertain to varieties, but we felt it relevant to include as much technical information on farming methods and plant protection as we could gather from vegetable production specialists working in the Pacific Islands.

Naturally, these results are neither complete nor final, since not all territories can despatch them at the same time or in the same form. Allowance must also be made for special difficulties encountered in each territory, particularly those connected with weather conditions, seasonal cycle, possible pest damage and, lastly, availability of staff and equipment.

It nevertheless seemed important to provide agronomists, agricultural officers and farmers with the latest data on Pacific Island vegetable production without delay. We have, therefore, tabulated all the results so far received from our colleagues in the Departments of Agriculture even though some are still tentative or incomplete. A further Information Circular to be published in the very near future; will bring you the full results of the 1975 trials.

The special project for development of vegetable production in the Pacific is drawing to a close. It is expected to end in December 1976. Choice of varieties, improvement of farming methods, pest, disease and weed control, and the best methods for harvesting, packaging, storing and canning are all among the topics

investigated over a period of three years. All the information acquired has not yet even been collated, let alone published and put into practice. However, this special project can already be deemed a success, judging from the considerable correspondence we have been receiving and by what we saw in the field during our many visits to the Islands.

However, our action will not stop at this point, for we consider it of the utmost importance to continue the variety trials in most of the Pacific territories throughout the coming years. It is necessary to see how the recently marketed varieties perform and which ones might be grown out of season, i.e. during the hot and rainy months. The work conducted at the Asian Vegetable Research and Development Center in Taiwan is sure to be of great value to the Pacific.

It goes without saying that the use of improved or adapted varieties cannot by itself bring about an improvement in vegetable production. Rational use of organic and mineral fertilizers, irrigation, crop protection and ecological control are crucial factors not to be forgotten.

Lastly, the reader's attention must be drawn to the results achieved in vegetable cultivation on the atolls. As far as we know, this is the first time that such results have been disseminated on the regional scale. The introduction of certain vegetables which could be cultivated simply and at family level, possibly using small-scale, inexpensive hydroponic methods, would certainly improve the diet of the Islanders. Every research team should report its findings, and research should be co-ordinated and intensified in order to define the methods most likely to produce good yields in atoll environments.

The perusal of this Information Circular should thus prove very valuable as it offers a wide variety of first data on vegetable production throughout the South Pacific.

Michel Lambert
Tropical Agriculturalist

CONTENTS

INTRODUCTION

CONTENTS

I. COOK ISLANDS

Bell pepper variety trials

II. FRENCH POLYNESIA

A. Partial results obtained in 1975 in Tahiti (Pirae Agricultural Research Station)

1. Carrots
2. Chinese cabbage
3. Cucumbers
4. Lettuces
5. Tomatoes

B. Results obtained in 1975 in Tahiti (Papara Agricultural Research Station)

1. Head cabbage
2. Carrots
3. Zucchini
4. Tomatoes

C. Description of a trial to develop hydroponic cultivation methods under atoll conditions.

III. GILBERT ISLANDS

- A. Head cabbage variety trials
- B. Nitrogen trials with head cabbages
- C. Hydroponic cultivation of capsicum
- D. Tomato variety trials

IV. NEW CALEDONIA

A. Introduction trials

(i) Results obtained at the Nessadiou Agricultural Research Station

1. Lettuces
2. Chinese cabbage
3. Head cabbage

4. Tomatoes
5. Bell peppers (capsicum)
6. Eggplant

(ii) Results obtained at Port Laguerre Station

1. Lettuces
2. Chinese cabbage
3. Head cabbage
4. Cauliflower
5. Tomatoes

B. Other trials

- (i) Trials for tomatoes under plastic sheets
- (ii) Trials for lettuces under plastic sheets and under shade

V. NIUE

A. Cabbage variety trials (head cabbages and Chinese cabbages)

B. Results of other variety trials

1. Head cabbage
2. Chinese cabbage
3. Cucumbers
4. Egg-plant
5. Lettuce
6. Bell peppers
7. Tomatoes
8. Watermelon

VI. KINGDOM OF TONGA

- A. Tomato variety trials (canning tomatoes)
- B. Tomato variety trial, disease screening
- C. Insecticide screening trial for the control of tomato pests
- D. Tomato fertilizer trial
- E. Control of bacterial leaf spot (Xanthomonas vesicatoria) on bell pepper
- F. Technical control of fungal diseases on watermelon
- G. Asparagus variety observation trial
- H. Recommended vegetable varieties for Tonga

VII FIJI

A. Variety trials

1. French beans
2. Head cabbage
3. Tomatoes
4. Cucumbers

5. Carrots
6. Capsicum
7. Egg-plants
8. Lettuce

B. Chinese cabbage fertilizer trials

C. Snake bean staking trials

D. Pole bean spacing trial

E. Dwarf bean spacing trial

F. Head cabbage spacing trial

G. Head cabbage variety, basal fertiliser and urea trial

VIII. LIST OF SOME COMPANIES SUPPLYING VEGETABLE SEEDS

I. COOK ISLANDS

BELL PEPPER VARIETY TRIALS

1. Location: TAKUVAINÉ

2. Object of experiment

To compare yields and quality of eight capsicum varieties; to encourage disease and pest infestation to select a resistant variety. No emphasis was put on chemical methods.

3. Treatments:

Varieties : - Glory Hybrid
 - Miyako Hybrid
 - Ace
 - Fushimi Long Green
 - New Ace
 - Midway
 - California Wonder
 - World Beater

Fertilisation :

	N	P	K
Before sowing	1	2	1
Sowing	1	2	1
Transplanting	1	2	2
Top dressing	1	2	2

Sowing : 24-5-75

Harvesting : 19-9-75 to 21-11-75

Irrigation : not often

4. Pest, disease and weed control

Pest : Spider mite on all varieties

Disease : Virus on all varieties

Weeds : Nut grass and pig weed (hoeing)

5. Descriptions of varieties, yields and observations

- Glory Hybrid : 1.8 kg/plant
(10% plants infested-virus)
- Miyako Hybrid : 2.5 kg/plant
(15% plants infested-virus)
- Ace : 1.5 kg/plant
(40% plants infested-virus)
- Fushimi Long Green : 1.5 kg/plant
(20% plants diseased)

- New Ace : 0.350 kg/plant
(51% fruit diseased)
Fruit size acceptable, of rather good quality but not bulky or heavy like other varieties. Later in production than other varieties.
- Midway : 0.600 kg/plant
(75% fruit diseased)
Fruit suitable for export.
- California Wonder : 0.500 kg/plant
(80% fruit diseased)
80% of fruit harvested not marketable due to disease infection-virus.
- World Beater : 0.550 kg/plant
(66% fruit diseased)
Fruit type excellent for export

Note: The Ministry of Agriculture, Marine, Scientific and Industrial Research is expected to send further results in the near future.

II. FRENCH POLYNESIA

A. PARTIAL RESULTS OBTAINED IN 1975 IN TAHITI (PIRAE AGRICULTURAL RESEARCH STATION)

1. Carrots : Trial from 29/4 to 7/8/1975
(T/ha)

Touchon	: 32.5
Danvers Special	: 28.1
New Kuroda	: 28.1
$\frac{1}{2}$ Longue Chantenay	: 30.1
Nantaise à forcer	: 25.4
2. Chinese cabbage : Trial from 25/4 to 24/6/1975
(T/ha)

H. W. R 60 days	: 67
H. Summer Salad	: 64
H. Tropicana	: 62.5
Nagoaka WR 60 days	: 58
Chaising Kwang Pu Tsai	: 43.9
Wong Bok	: 40.3
Chinese Mading	: 37.8
Loose Head	: 37.5
Michihili	: 33.2
G. Mustard Cabbage	: 32.1
H. Saladeer	: 30.5

3. Cucumbers : Trial from 19/11/1974 to 28/2/1975
(kg/m²)

Sweet Slice	: 10.4
Gemini 7	: 9.6
Southern Cross	: 7.7
Hybrid Gemini	: 7.0
Hybrid Sprint	: 6.5
Market More	: 6.2

: Trial from 29/4 to 21/7/1975

Southern Cross	: 12.3
Market More	: 10.6
Saticoy	: 8.8
Gemini 7	: 8.6
Hybrid Sprint	: 8.3
Sweet Slice	: 8.0

4. Lettuces : Trial from 15/11/1974 to 28/1/1975
(kg/m²)

Minetto	: 4.1
Great Lakes	: 3.5
'Pirae'	: 2.7
Northern States	: 2.1
Kwiek	: 1.8
Green Mignonette	: 1.7
Imperial	: 1.6
Santa Anna	: 1.6
Dark Boston	: 1.4

: Trial from 25/4 to 22/7/1975

Bon Jardinier	: 6.8
Great Lakes	: 5.7
Serre Woran	: 5.5
Minetto	: 5.2
Santa Anna	: 4.9
Kwiek	: 4.2
'Pirae'	: 4.0
Butter King	: 3.9
Dark Green Boston	: 3.8
New York 515	: 4.1

5. Tomatoes : Trial from 13/9/1974 to 23/4/1975
(T/ha)

N 52	: 66
N 65	: 61.1
N 5	: 48.2
Mighty Boy	: 48
F. R. 1	: 42.9
Montfavet	: 38.9
N 11	: 33.7
Kalohi	: 29

It should be noted that trials undertaken within the framework of the SPC Project by the Department of Rural Economy in 1975 were reduced due to the transfer of the Research Station from Pirae to Papara during the year.

B. RESULTS OBTAINED IN 1975 IN TAHITI (PAPARA AGRICULTURAL RESEARCH STATION)

The Papara Station has the following soil and climatic characteristics:

(i) Soil characteristics

The Station is located on a piece of land formerly occupied by a coconut plantation, the soil of which was covered with indigenous pasture

The soils are hydromorphic with moisture at variable depths.

The vegetable plots were set up on brown sandy clay soils with few stones and deep hydromorphy.

(a) Physical characteristics

Average granular measurement

Clay	: 31%
Loam	: 30%
Sand	: 28.9%

Retention capacity : 82.5%

Wilting point : 24.02%

(b) Chemical characteristics

pH	: 6.8
N	: 1.68%
P	: 0.59%
K	: 0.44%
Organic matter	: 5.19%
T	: 52.50 meq/100g

(ii) Climatological data

Month	Rainfall (mm)		Month	Rainfall (mm)	
	1975	Period 1949-1975		1975	Period 1949-1975
January	252.6	156.4	July	19.8	82.2
February	74.51	141.3	August	11.6	93.6
March	57.8	130.2	September	89.3	109.5
April	29.2	87.3	October	88.6	152.8
May	203.7	187.2	November	126.3	145.4
June	50.6	136.4	December	117.5	169.7
Total			Total	1,121.5	1,588.3

Month	Temperatures 1975		Month	Temperatures 1975	
	Minimum	Maximum		Minimum	Maximum
January	(*)		July	19.2° C	27.5° C
February			August	18.5° C	26.1° C
March			September	19.1° C	26.9° C
April			October	19.9° C	27.3° C
May			November	20.1° C	28.8° C
June			December	20.6° C	24.9° C

The variety trials undertaken at the Papara Station during the latter half of 1975 produced the following results (Cabbages - Carrots - Zucchini - Tomatoes):

1. Head cabbage

(a) Cultivation techniques

Fertilisation :

- | | | |
|------------------------|---|--|
| - Animal manure | : 40 t/ha | } Soil preparation
before planting |
| - Fertilisers 12-12-20 | : 1,000 kg/ha | |
| - Fertilisers 12-12-10 | : 500 kg/ha, three weeks after planting | |
| - Ammonium sulphate | : 300 kg/ha, three weeks later. | |

Plant protection treatment:

- Weekly: Azinphos + Maneb + trace-elements

Experimental design :

- Individual plots : 3 10 m x 1 m
- Number of plants/plot : 14 plants (2 x 7)
- Spacing : 0.4 x 0.7 m
- Number of plots/block : 12 (roughly)
- Number of replications : 4

(b) Planting and harvesting dates

- Planting out of seedlings : 22/8/75
- Harvesting : 20/10/75

(c) Results

Names of Varieties	205 Sowing	234 Transplanting	293 Harvest begins	304 Harvest ends
Kingstone Hybrid	24/7/75	22/8/75	20/10/75	31/10/75
Harvest King		295	22/10/75	31/10
Crown			20/10	31/10
Top Ace			22/10	31/10
224 cc Cross		279	6/10	
Express Cross 60			20/10	31/10
Superette			20/10	22/10
Ruby Ball			20/10	31/10
K. K. Cross			20/10	22/10
Early Yoshin Summer			20/10	31/10
Summer Conqueror			20/10	31/10
K. Y. Cross			20/10	
Tropical King			20/10	31/10

Names of Varieties	days				
	Sowing - Transplanting	Transplanting - harvesting	Length of harvesting	Land occupation	Length of cultivation
Kingstone Hybrid	29	59	11	70	99
Harvest King	29	61		70	99
Crown	29	59	11	70	99
Top Ace	29	61	9	70	99
224 cc Cross	29	45	0	45	74
Express Cross 60	29	59	11	70	99
Superette	29	59	2	61	90
Ruby Ball	29	59	11	70	99
K. K. Cross	29	59	2	61	90
Early Yoshin Summer	29	59	11	70	99
Summer Conqueror	29	59	11	70	99
K. Y. Cross	29	59	0	59	88
Tropical King	29	59	11	70	99

Yields Varieties	Total weight harvested in g	Number of heads	Average head weight	Yield per sq. metre	Daily yield per sq. metre	Yield per ha (T)
Kingstone Hybrid	68,100	55	1,238.18	5,491.94	78.46	54.919
Harvest King	37,700	42	897.62	3,040.32	43.43	30.403
Crown	72,240	50	1,444.80	5,825.81	83.23	58.258
Top Ace	69,740	54	1,291.48	5,624.19	80.35	56.242
224 cc Cross	26,060	52	501.15	2,101.61	46.70	21.016
Express Cross	75,680	39	1,940.51	6,103.83	87.19	61.032
Superette	63,700	48	1,327.08	5,137.09	84.21	51.371
Ruby Ball	24,940	46	542.17	2,011.29	28.73	20.113
K.K. Cross	83,700	53	1,579.25	6,750	110.66	67.500
Early Yoshin Summer	43,240	44	982.73	3,487.10	49.62	34.871
Summer Conqueror	80,880	54	1,497.78	6,522.58	93.180	65.226
K Y Cross	58,120	47	1,236.60	4,687.10	79.44	46.871
Tropical King	55,840	55	1,015.27	4,503.23	64.33	46.032

Observations: Percentage of seedlings lost after transplanting; these are not included in the above-mentioned yields:

Kingstone Hybrid	: 1.79%	Ruby Ball	: 17.85%
Harvest King	: 25%	K.K. Cross	: 5.36%
Crown	: 10.71%	Early Yoshin Summer	: 21.43%
Top Ace	: 3.57%	Summer Conqueror	: 3.57%
224 cc Cross	: 7.14%	K.Y. Cross	: 16.07%
Express Cross 60	: 30.35%	Tropical King	: 1.79%
Superette	: 14.29%		:

Summary of results

Varieties	Kg/head (in g)	T/ha
1. K.K. Cross	1,579.25	67.500
2. Summer Conqueror	1,497.78	65.226
3. Express Cross 60	1,940.51	61.032
4. Crown	1,444.80	58.258
5. Top Ace	1,291.48	56.242
6. Kingstone Hybrid	1,238.18	54.919
7. Superette	1,327.08	51.371
8. K.Y. Cross	1,236.60	46.871
9. Tropical King	1,015.27	45.032
10. Early Yoshin Summer	982.73	34.871
11. Harvest King	897.62	30.403
12. 224 cc Cross	501.15	21.016

Note: The varieties K.K. Cross, Summer Conqueror and Express Cross 60 give high yields, but cabbages of the Crown variety are of better quality, with compact, very firm hearts that keep well. Their culinary qualities are particularly appreciated by caterers.

2. Carrots

(a) Purpose of the trial

To establish what varieties are the most suitable for growing on the coastal plains during the rainy season.

(b) Description

(i) Varieties tested

Seven varieties were compared with the Touchon variety used as control.

- Touchon : (Pionnier or Clause)
- Danvers special : (Cooper)
- New Kuroda
- Demi Longue de Chantenay
- Nantaise à forcer : (Clause or Vilmorin)
- Royal Cross : (Takii)
- Coral Cross : (Takii)
- Early Cross : (Sunblest)

(ii) Each variety was sown on plots measuring 6.25 x 1 m; no replication

(iii) Cultivation

- Organic fertiliser: 20 t/ha of horse manure thoroughly ploughed under.
- Mineral fertiliser: 650 kg of potassium chloride harrowed in just before sowing.
- Sowing : carried out in rows 20 cm apart at the rate of 2 to 3 kg/ha of seeds on 4/9/1975.
- Thinning out : after emergence, leaving 1 plant every 5 cm.
- Fertilisation : during growth by top-dressing between rows:

Time of Application	Fertiliser	Amount (kg/ha)
1 week after emergence	12-12-20	500
4 weeks after emergence	12-12-20	800
9 weeks after emergence	12-12-20	200

- Plant protection treatment: Weekly spraying of
(Malathion (Zithiol 15cc/10l.) :
Maneb + Benomyl (Cerebel 30g/10l.)

(c) Results

The crop was harvested on 8/12/1975 and 15/12/1975, i.e. three months after sowing, and produced the following results:

Varieties	8/12/75	15/12/75	Total
Touchon	7.4 kg (119)	0.340 kg (26)	7.740 kg (145)
Danvers Special	9.8 (225)	1.940 (76)	11.740 (301)
New Kuroda	3.8 (28)	0.060 (3)	3.860 (31)
$\frac{1}{2}$ Longue de Chantenay	11.550 (237)	1.220 (0.060)	12.770 (297)
Nantaise à forcer	0.180 (3)	0.700 (16)	0.880 (19)
Royal Cross	15.0 (254)	3.400 (132)	18.400 (386)
Coral Cross	12.2 (215)	2.800 (105)	15.000 (320)
Early Cross	0	0	0

All varieties were harvested. Blight was observed in all varieties as they reached maximum size; in addition, there is a risk of rot during the wet season.

Varieties



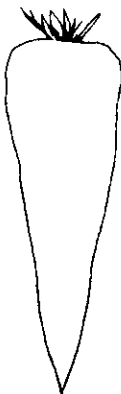

Touchon	}	Sowing date	: 4/9/75
Danvers Special		Harvest begins	: 8/12/75
New Kuroda		Harvest ends	: 15/12/75
$\frac{1}{2}$ Longue de Chantenay		Sowing - Harvesting	: 95 days
Nantaise à forcer		Length of harvesting	: 7 days
Royal Cross		Soil occupation	} 102 days
Coral Cross		Length of cultivation	
Early Cross	:	Seeds did not emerge	

Varieties	Yields					
	Total weight harvested in g.	Number of roots	Average root weight	Yield per sq. m. Plot of 6.25 sq. m. (in g.)	Daily yield per plant in g.	Yield per ha (T)
Touchon	7,740	145	53.38	1,238.40	12.14	12.384
Danvers Special	11,740	301	39	1,878.40	18.42	18.784
New Kuroda	3,860	31	124.52	617.60	6.05	6.176
$\frac{1}{2}$ Longue de Chantenay	12,770	297	43	2,043.20	20.03	20.432
Nantaise à forcer	880	19	46.32	140.80	1.38	1.408
Royal Cross	18,400	386	47.67	2,940	28.86	29.440
Coral Cross	15,000	320	46.88	2,400	23.529	24.000
Early Cross						




Observations

Touchon : To be repeated; mediocre results - poor seed emergence
 New Kuroda : Very mediocre results - poor seed emergence.
 Nantaise & forcer : To be repeated; very mediocre results poor seed
 : emergence.
 Early Cross : To be repeated.

Carrots at date of harvest
 (8/12/75)

Touchon	Danvers Special
<p>Attractive appearance, elongated, measuring up to 15 cm in length. This variety can compete with imported varieties.</p> 	<p>Elongated appearance, measuring up to 15 or 20 cm in length.</p> 
New Kuroda	$\frac{1}{2}$ Longue de Chantenay
<p>Attractive appearance; elongated, measuring up to 20 cm in length. This is a highly recommended variety.</p> 	<p>Very short; shaped like a spinning-top.</p> 

Carrots at date of harvest
(8/12/75)

Nantaise à forcer	Royal Cross	Coral Cross
<p>A useful variety, similar to <u>Touchon</u>, measuring up to 15 and 20 cm in length.</p> 	<p>A very useful variety, Attractive appearance, up to 20 cm in length; bright red in colour; can compete with imported varieties.</p> 	<p>A useful variety, Attractive appearance, up to 15 cm in length.</p> 

Summary of results

Varieties	Yields (T/ha)	Average carrot weight (g)
1. Royal Cross (Takii)	29.440	47.7
2. Coral Cross (Takii)	24.000	46.9
3. $\frac{1}{2}$ Longue de Chantenay	20.432	43.0
4. Danvers Special	18.784	39.0
5. Touchon *	12.384	53.4

(*) Very poor emergence

3. Zucchini

(a) Purpose of trial

To determine what varieties are most suitable for plain cultivation.

(b) Description

(i) Varieties tested

- 5 varieties
- Ambassador (009-000 - Pure Seed)
 - Aristocrat (030-000 - Pure Seed)
 - Diplomat (022-001 - Pure Seed)
 - 586 Diplomat (OTIS Twilley)
 - 605 Zucchini (OTIS Twilley)

(ii) The varieties were sown on plots of 8 m x 1 m, each to carry 16 plants; no replication.

(iii) Cultivation

- Soil preparation

spreading and folding in of 20t/ha of horse dung, followed by 400 kg/ha of complete fertilizer (12-12-20).

Soil insecticide treatment (RHODIASOL dusting - 300 kg/ha)

Soil harrowing

- Sowing of the various varieties on 9/10/1975 at 1 m x 1 m spacing.

- After emergence, weekly plant protection treatment

- + Azinphos Methyl (Gusathion) Until setting, then
- Benomyl (Benlate)
- + Naled (Dibrom)
- + Benomyl + Maneb (Cerebel) Until harvesting

(c) Results

Harvests from 17/11/75 to 5/12/75 produced the following results:

Zucchini - Harvest results (g)

<u>Varieties</u> Harvest Dates	P.S. Ambassador 009-000	Twilley Diplomat 586	P.S. Aristocrat 030-000	Twilley Zucchini 605	P.S. Diplomat 022-001
17/11/75	-	-	2 = 880	11 = 7,400	3 = 2,600
24/11/75	1 = 500	8 = 4,120	6 = 4,200	6 = 4,440	3 = 2,460
28/11/75	1 = 300	5 = 3,200	2 = 1,860	7 = 3,800	2 = 620
1/12/75	-	-	1 = 680	5 = 2,200	-
5/12/75	-	1 = 400	3 = 780	7 = 2,400	3 = 1,420
Total	2 = 800	14 = 7,720	14 = 8,400	36 = 20,240	11 = 7,100

Zucchini

Varieties		P. S. Ambassador 009-000	Twilley Diplomat 586	P S Aristocrat 030-000	Twilley Zucchini 605	P S Diplomat 022-001
Date sown	282	9/10/75	9/10/75	9/10/75	9/10/75	5/12/75
Harvest begins	328	24/11/75	24/11/75	17/11/75	17/11/75	17/11/75
Harvest ends	332	28/11/75	339 5/12/75	5/12/75	5/12/75	5/12/75
Sowing-harvesting		46 days	46 days	39 days	39 days	39 days
Length of harvesting		4 days	11 days	18 days	18 days	18 days
Soil occupation						
Length of cultivation		50 days	57 days	57 days	57 days	57 days
<u>Yields</u>						
Total weight harvested (g)		800	7,720	8,400	20,240	7,100
Number of fruits		2	14	14	36	11
Average fruit weight		400	551.429	600	562.222	645.455
Yield /sq. metre (g)		80	772	840	2,240	710
Yield per ha (T)		0.080	7.720	8.400	20.240	7.100

Observations:

All varieties became infected with cucumber virus.

Zucchini 605: This variety produced the highest yields of good quality fruit.

Summary of results

Varieties can be classified as follows:

Varieties	Average yield (T/ha)	Average fruit weight
1. Zucchini (Twilley)	20.240	562 g
2. Aristocrat (Pure Seed)	8.400	840 g
3. Diplomat (Twilley)	7.720	772 g
4. Diplomat (Pure Seed)	7.100	710 g

Generally speaking all the varieties tested proved very susceptible to infection by cucumber virus I; nevertheless the variety 'Zucchini' gave promising yields of good quality fruit.

4. Tomatoes(a) Cultivation techniquesFertilisation :

- Organic manure : 40 t/ha
 - Fertilizer 12-12-20 : 300 kg/ha
 - Fertilizer 12-12-20 : 400 kg/ha at date of planting out
 - Urea : 60 kg/ha monthly.
- } for soil preparation

Plant protection treatment :

- Weekly: Azinphos + Benomyl followed by Naled + Maneb.

Experimental design :

- Individual plots : 2.94 m x 1 m
- Number of plants per plot : 10 plants (2 x 5)
- Spacing : 0.5 x 1 m
- Number of plots per unit : 17 (roughly)
- Number of replications : 4

(b) Planting and harvesting dates

Planting : 21/8/75

Harvesting : 15/10/75 and 29/12/75

(c) Results

Varieties		205 Sowing	233 Transplanting (20,000 seedlings/ ha)	288 Harvest begins	363 Harvest ends
N0. 5682	(CPS)	24/07/75	21/08/75	15/10/75	29/12/75
No. 9959	(CPS)	24/07/75	21/08/75	15/10/75	29/12/75
Hybrid 49 (Takii)	(CPS)				22/12/75
Hybrid 51 (Takii)	(CPS)				29/12/75
Hybrid 52 (Takii)	(CPS)				29/12/75
620 Red Glow	(CPS)				29/12/75
631 Tropic Turilley					29/12/75
635 Market King	(CPS)				29/12/75
Montfavet F.1					29/12/75
Mighty boy (Takii)					29/12/75
Tropic					26/12/75
Fengshan Manalee	(CPS)				26/12/75
Farmers New Wonder	(CPS)				29/12/75
Harbot	(CPS)				29/12/75
V.C. 11	(CPS)				26/12/75
N. 5	(CPS)				29/12/75
F.R. No. 1					29/12/75

Varieties

No. 5682 (CPS)

Mighty boy (Takli)

Sowing-Transplanting : 28 days
 Transplanting-Harvest : 55 days
 Length of harvesting : 75 days
 Soil occupation : 130 days
 Length of cultivation : 158 days

Yields		Total weight harvested in g.	Number of fruit	Average fruit weight	Yield per plant	Daily yield per plant in g.	Yield per ha (T)
Varieties							
No. 5682	(CPS)	102,550	1,341	76.47	2,563.75	19.72	51.276
No. 9959	(CPS)	111,610	1,276	87.47	2,790.25	21.46	55.806
Hybrid 49 (Takli)	(CPS)	141,510	1,134	124.79	3,537.75	27.21	70.756
Hybrid 51 (Takli)	(CPS)	134,820	1,171	115.13	3,370.50	25.93	67.410
Hybrid 52 (Takli)	(CPS)	158,230	1,339	118.17	3,955.75	30.43	79.116
620 Red Glow	(CPS)	151,330	1,261	120.00	3,783.25	29.10	75.666
631 Tropic Turilley		126,200	927	136.14	3,155	24.27	63.100
635 Market King	(CPS)	143,980	1,024	140.61	3,599.50	27.69	71.990
Montfavet F 1		114,490	1,214	94.308	2,862.25	22.02	57.246
Mighty boy (Takli)		139,150	1,118	124.46	3,478.75	86.969	69.576
Tropic		118,400	860	137.68	2,960	22.77	59.200
Fengshan Manalee	(CPS)	109,730	1,003	109.40	2,743.25	21.102	54.866
Farmers New Wonder	(CPS)	131,420	1,382	95.09	3,285.50	25.273	65.710
Harbot	(CPS)	86,540	1,714	50.49	2,163.50	16.64	43.270
V.C. 11	(CPS)	47,090	1,144	41.16	1,177.25	9.056	23.546
N. 5		153,490	1,155	132.89	3,837.25	29.52	76.746
F.R. No. 1		115,160	951	121.09	2,879	22.146	57.580

Summary of results

Varieties	kg/plant	t/ha	Percentage of rotten tomatoes
1. Hybrid No. 52	3.955	79.116	23.75
2. Hybrid No. 5	3.837	76.746	22.25
3. 620 Red Glow	3.783	75.666	22.50
4. 635 Market King	3.599	71.990	24
5. Hybrid No. 49	3.537	70.756	28.25
6. Mighty boy	3.478	69.576	24.75
7. Hybrid No. 51	3.370	67.410	27.50
8. Farmers New Wonder	3.285	65.710	24.50
9. 631 Tropic	3.155	63.100	30.75
10. Tropic	2.960	59.200	26.75
11. F.R. No. 1	2.879	57.580	22
12. Montfavet F 1	2.862	57.246	29.5
13. No. 9959	2.790	55.806	25.25
14. Fengshan Manalee	2.743	54.866	33.25
15. No. 5682	2.563	51.276	26
16. Harbot	2.163	43.270	29
17. V. C. 11	1.177	23.546	46.5

N.B. The Harbot and V. C. 11 varieties produce small fruit which is not up to market standard, the other varieties No 52, No 5, Red Glow, etc. give good yields.

The tomato plots were given a great deal of water, which encouraged the development of fungus diseases; blight and Stemphyllium.

Conclusion

The Department of Rural Economy in French Polynesia is currently recommending the following vegetable varieties for cultivation on the plains of the Society Islands:

Crops	Varieties	Suppliers	Yields
<u>Eggplant</u>	Money Maker No. 2	Takii (Japan)	40/60 t/ha all year round
	Nice	Vilmorin	60 t/ha cool season 35 t/ha hot season
<u>Carrots</u>	Touchon	Clause ou Vilmorin	20-25 t/ha all year round
	Royal-Cross	Takii	25 t/ha cool season

Crops	Varieties	Suppliers	Yields
<u>Endive</u>	Round green endive with full heart	Clause or Vilmorin	15-25 t/ha all year round
	Large curly 'cabbage' head	Clause or Vilmorin	15-30 t/ha all year round
<u>Cabbage</u>	Express Cross 60	Takii	30-40t/ha hot season
	K. K Cross	Takii	40 t/ha hot season
	Crown	Nanto Seed	50 t/ha cool season
	Top Ace	Nanto Seed	50 t/ha cool season
<u>Chinese cabbage</u>	Michihili	Ferry-Morse	30 t/ha all year round
<u>Cucumbers</u>	Gemini Formula 7	Ferry-Morse	10-15 kg/m ² hot season
	Hybrid Gemini	Pure Seed	15-20 kg/m ² hot season
	Southern Cross	Takii	20 kg/m ² cool season
	Sweet Slice	Pure Seed	10 kg/m ² cool season
<u>Beans</u>	Mangetout Contender	Clause or Vilmorin	2-2.5 kg/m ² dry season
	Mangetout St Fiacre	Clause or Vilmorin	2-3 kg/m ² all year round
<u>Lettuce</u>	Green Mignonette	Ferry-Morse Takii	2-3 kg/m ² cool season
	Kwlek		2-3 kg/m ² cool season
	Minetto	Pure Seed	4-8 kg/m ² all year round

Crops	Varieties	Suppliers	Yields
<u>Onions</u>	Granex Yellow 91 110	Ferry-Morse	20-30 t/ha cool season
	Tropic Ace	Takii	30 t/ha cool season
<u>Leeks</u>	Gros Long d'Eté	Clause or Vilmorin	40-50 t/ha all year round
	Giant Musselburgh	Ferry-Morse	35-50 t/ha all year round
<u>Peppers;</u>	Midway	Pure Seed	15-20 t/ha all year round
<u>Tomatoes</u>	N 52	Takii	50-100 t/ha all year round
	N 63	Takii	50-100 t/ha all year round

Address of Suppliers:

FRANCE : - Vilmorin, B P. 61, 75012 PARIS.

- Graines d'élite CLAUSE, 91220, BRETIGNY-SUR-ORGE.

JAPAN : - Takii Seed Company Ltd, Kyoto Central, P.O. Box 7, KYOTO.

- Nanto Seed Co, Ltd, Ninamivagi, Chokashinana

U.S.A : - Ferry-Morse Seed, P.O.Box 100, MOUNTAIN VIEW, Calif 94040.

- Pure Seed, Peto Seed, P.O. Box 4.206, SATICOY, Calif 93003

C. DESCRIPTION OF A TRIAL TO DEVELOP HYDROPONIC CULTIVATION METHODS UNDER ATOLL CONDITIONS

1. Purpose of trial

To test the suitability of coral sand as a medium for hydroponic cultivation of some common vegetables.

2. Location: Pirae Station (Tahiti) for hydroponic cultivation

Officers in charge: Mlle Tauziet and

Mr Robert Yau known as Akui

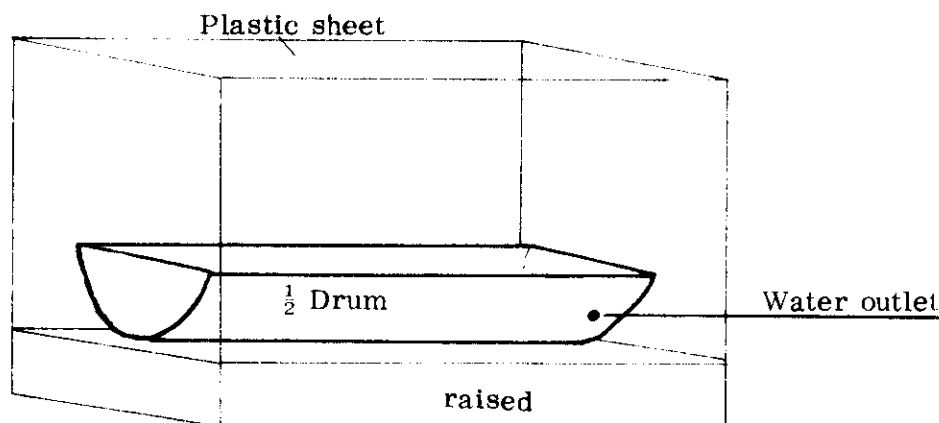
3 Description of trial

(a) Experimental design

Equipment used

- 2 half drums placed on a raised platform under a plastic sheet;
- drums filled with thoroughly rinsed white coral sand (salinity tested after rinsing);
- drainage of the drums ensured by apertures half-way up the sand.

Diagram



(b) Vegetable crops tested

- Lettuce: 'Green Mignonette' variety.
- Tomato: 'Hybrid U.H -N 63' variety

(c) Method

(1) Lettuces

- Preparation of seedlings in nursery, in the usual way
- Transplanting at 20 x 20 cm spacing (15 plants per half drum) on 30/9/75.
- From day of planting
 - . watering : 3 times a day.
 - . fertilisation : 80 g of fertiliser for hydroponic cultivation^{*} per week and per square metre (or 40 g per half drum) to be spread dry over the growing medium and then watered.
 - . treatments : spraying once weekly with the following mixture:

(foliar fertiliser (Actigil or Bayfolan*)
 + Nutramin*

* See page 27, paragraph 6.

(2) Tomatoes

- Usual preparation of seedlings in the nursery followed by
- Transplanting at 80 x 30 cm spacing (6 plants per half drum) on 26/9/75
- After transplanting
 - . watering : 3 times a day
 - . fertilisation : dry spreading of 80g/sq metre/week of hydroponic crop fertiliser, followed by watering
 - . treatments : the 2 following mixtures were used alternately every other week:

$\left(\begin{array}{l} \text{Azinphos-Methyl (Gusathion)} \\ + \text{Benomyl (Benlate)} \\ + \text{Urea} \\ + \text{Nutramin} \end{array} \right)$	and	$\left(\begin{array}{l} \text{Trichlorfon (Dipterex)} \\ + \text{Propinebe (Antracol)} \\ + \text{Urea} \\ + \text{Nutramin} \end{array} \right)$
--	-----	--
- After fruit-setting, Malathion was substituted for Azinphos-Methyl.
- . The main stem was staked.

4. Results

The following results were recorded:

(1) Lettuce(a) Medium

Following rinsing, the sand showed the following characteristics:

Moisture (%)	: 18.23
pH water	: 8.6
T Exchange capacity	: 22.50
(meq/100g)	
V Saturation rate (%)	: 61.78
Salinity (g/l)	: 0.0815

(b) Harvests

The surface of the half drum was exactly 0.54 sq. m

Harvest dates	No. of plants	Weight (kg)	Total weight/sq metre (kg)
7/11/1975	2	0.272	0.504
12/11/1975	7	1.050	2.448
19/11/1975	6	0.528	3.426
Total	15	1.850	3.426

Summary of yields obtained with 'Green Mignonette' variety:

Length of cultivation : 50 days

Yield in kg/sq. m. : 3.4

Average plant weight : 123 g

(2) Tomatoes

(a) Medtun

Sand characteristics after rinsing:

Moisture (%) : 19.2
 pH water : 8.6
 T Exchange capacity : 21.25
 (meq/100g)
 V Saturation rate (%) : 63.06
 Salinity (g/l) : 0.081

(b) Harvests

Harvests conducted from 4/12/1975 to 29/3/1976 produced the following results:

Periods of 10 days	No. of fruit harvested	Total weight (kg)	Total yields (kg/sq. m)	Average fruit weight (g)
5-15/12/75	10	1.240	2.297	124
15/12-25/12/75	31	3.533	6.542	109
25/11- 5/01/76	34	3.860	7.148	109
5-15/01/76	55	5.742	10.634	91.3
15-25/01/76	69	7.152	13.244	117.7
25/01- 5/02/76	85	8.813	16.320	100.7
5-15/02/76	90	9.117	16.884	76.1
1 15-25/02/76	105	10.563	19.561	92.9
25/02- 5/03/76	128	12.402	22.967	80
5-15/03/76	146	13.639	25.258	76
15-25/03/76	169	14.708	27.237	52.8

Summary of results obtained with U.H. N 63 variety:

Period: Transplanting-Beginning of harvest : 68 days (2 months)

Length of harvest : 115 days (4 months)

Length of cultivation : 183 days (6 months)

Average yield in kg/sq. m. : 27.2

Average fruit weight (g) : 87

5. Conclusions

Vegetable growing on coral sand does not appear to present any major problem. On the contrary, despite the high alkalinity of the sand (pH = 8.4) excellent yields were obtained for both lettuces and tomatoes.

Lettuce : Green Mignonette = 3.4 kg/m²

Tomato : N 63 = 27.2 kg/m²

For successful cultivation, the growing medium must be thoroughly rinsed beforehand and kept moist through frequent watering and the leaves regularly sprayed with trace-elements.

Further trials will be conducted on a larger scale in order to assess whether the technique is economically profitable.

6. Practical Information

(A) Mixture for hydroponic cultivation

The following mixture was made up locally

MACROELEMENTS	Potassium nitrate	380 g
	Ammonium sulphate	174 g
	Calcium sulphate	89 g
	Triple superphosphate	210 g
	Magnesium sulphate	147 g
		<u>1.000 g</u>

To these 1000 gs of macroelements we added 1.2 g of the following mixture of

TRACE-ELEMENTS	Zinc sulphate	7.7 g
	Manganese sulphate	32.0 g
	Sodium borate	27.0 g
	Copper sulphate	7.7 g
	Iron sulphate	25.2 g

(B) Foliar fertiliser

ACTIGIL in % :	N : 7.3	+ Fe, Mn, Bo, Zn, Ni, Co, Mo, S, Cl, Na, Vit BL
	P ₂ O ₅ : 7.3	
	K ₂ O : 5.6	

Supplier: PEPRO - B.P. 139, R.P. 69.212. LYON Cedex 1, France.

(C) Trace-elements for foliar spraying

NUTRAMIN in %	Manganese : 3.56	Copper : 1.17
	Iron : 2.19	Borax : 0.76
	Zinc : 1.10	Molybdenum : 0.17

Supplier: DAVIES NITRATE Co. Inc. Nitrates for Industrial Use, 114 Liberty St, NEW YORK, 6, N.Y. USA.

III. GILBERT ISLANDS

A. HEAD CABBAGE VARIETY TRIALS

1. Location: BIKENIBEU - Plot 2

2. Object of experiment:

To compare yields and quality of two Takii's hybrids under a standard fertiliser regime: K.K. Cross and K.Y. Cross.

3. Experimental design 2 x 6 randomised blocks.

- Plot (area) : 7.56 x 3.12 m approximately
- Row length : 6.5 m approximately
- Plant spacing : 0.46 m approximately
- Distance between rows : 0.46 m approximately
- Number of replications : 6
- Number of analysed rows: 3 (out of 5) per plot

4. Treatments:

- Preparation of soil : forked on 5/8 + 5
- Fertilisation (top-dressing) : IBDU (32% N) - 130 kg/ha N
Double Super Pox (18% P) - 30 kg/ha P
Potassium sulphate (45% K) - 75 kg/ha K
- Sowing : 6/8 + 5
- Planting : 25/8 + 5 - 310 plants on 100 m²
- Irrigation : hosepipe
- Hoeing : every 7 days
- Shade : entire area shaded with 'te ba ' (coconut frond mid-rib) rolls at 6 feet above ground giving approximately 50% shade.

5. Pest, disease and weed control :

Pest control : Lane's cabbage dust (Lindane + DDT) before hearting on 8/9/75 against Plusia spp.

Disease control : none. The whole of this trial suffered very badly with a bacterial disease. The trial provided ideal conditions for rapid spread. The water from the pond, used in watering, contained a large proportion of organic matter and this may have been involved in the spread. Flies were numerous and these probably aided spread of the bacteria. Rotting leaves viewed under the microscope were found to be teeming with bacteria and also numerous unidentified protozoans, the latter obviously from the pond water. The breakdown of the leaves produced a slimy, evil smelling mass. Removal of diseased plants is absolutely necessary, and this should be done as soon as they are noticed.

6. Observations

In Gilbertese conditions much longer is needed to bring these cabbages to maturity than the 60 days given by Takii. In this case most were ready at about 95 days. The K.K. Cross is well proven here in spite of the bacterial disease described below.

K.Y. Cross has very rapid early growth, but suffers from the heat. The edges of the leaves dry up and when this folds into the 'heart' it results in a layer of dead material in the harvested cabbage. The top of the 'heart' also tends to split open. K.Y. Cross has possibilities as 'Spring' greens which could be marketable within 10 days.

7. Conclusions:

Due to the disease problem-the trial was spoilt. In spite of a significant difference in yields (K.Y. superior to K.K.), the K.Y. Cross is not ideal for our conditions. It can, however be tried as 'Spring greens' for information on productivity and acceptability.

B. NITROGEN TRIALS WITH HEAD CABBAGES

1. Location: BIKENIBEU - Plot 2

2. Object of experiment:

To determine best N level for yield response on head cabbage, variety Hi-Crop.

3. Experimental design: 3 x 3 Latin Square

- Plot (area) : 91 sq.ft (8.465 sq m)
- Row length : 126 inches (3.203 m)
- Plant spacing : 18 inches (457 mm)
- Distance between rows : 2 ft (610 mm)
- Number of replications : 3
- Number of analysed rows : 3

4. Treatments:

- Preparation of soil : tilling in February 1975
- Fertilisation (top-dressing) : IBDU (32% N)
 - 1. 166.5 kg/ha N
 - 2. 111.0 kg/ha N
 - 3. 55.5 kg/ha N
- Potassium sulphate (45% K) 55.5 kg/ha K
- Sowing : 21/2/75
- Planting : 14/3/75
- Irrigation : hose when necessary
- Hoeing : every 7 days

- Media : 1. Fine sand
: 2. Coarse sand
: 3. Coconut fibre
- Tanks : Half 44-gallon drums
- Seed : Long Red Cayenne (Coopers NZ)
- Population : 6 to 8

- Fertilisation : Every 10 days: 40 g/sq.m ; applied 'dry' and watered in.
 NaNO_3 : 14 parts
 Double superphosphate : 7 parts
 K_2SO_4 : 4 parts
 MgSO_4 : 5 parts
 Trace-elements* : 1 part

* Trace-elements:

- MnSO_4 : 9 parts by weight
 CuSO_4 : 3 parts by weight
 FeSO_4 : 10 parts by weight
 ZnSO_4 : 3 parts by weight
 Borax : 3 parts by weight
 Molybdic acid: 3 parts by weight

- Sowing : 23/4/75
 - Planting : 23/4/75
 - Irrigation : hose

5. Pest,disease and weed control:

Pest control : Keltane + Sticker at a rate of 5 ml in 2 litres of water on 10/7/75, 17/7/75 and 24/7/75. Against mites.

Disease control : none

Weed control : Handweeding weekly against Phyllanthus spp.

6. Observations: (Description of varieties, and observations):

After the final recording for analysis purposes, the plants were kept in position. There is a rapid drop off in yield and the quality of fruit after two months of harvesting.

Harvesting:

Harvest	Fine sand		Coconut fibre		Coarse sand	
Dates	(6 plants)	(8 plants)	(6 plants)	(8 plants)	(6 plants)	(8 plants)
24/6/75	44	38	6	20	46	230
4/7/75	196	232	66	160	246	283
10/7/75	248	350	288	327	411	338
18/7/75	348	244	573	657	380	344
22/7/75	253	439	352	239	494	341
31/7/75	379	431	413	341	452	502
8/8/75	492	489	468	319	545	510
15/8/75	251	122	139	123	86	181
22/8/75	243	320	316	449	275	308
Total (g)	2,454	2,665	2,621	2,635	2,335	3,037

7. Conclusions:

Non-significant differences were obtained for media and for populations, although there was a highly significant result for blocks. There was a difference in shade levels across the blocks and this was taken into account during randomisation. Those plants receiving most shade produced more fruit, and the effect of shade should be looked at further.

D. TOMATO VARIETY TRIALS1. Location: BIKENIBEU - Plot 12. Object of experiment:

To compare three varieties of tomato at a standard fertiliser regime:

Manalucie

Red Cloud

Harbot

3. Experimental design:

- Plot (area) : 9 plots 3 x 2 m (54 sq. m.)
- Row length : 274.5 cms
- Plant spacing : 45.75 cms
- Distance between rows : 61 cms
- Number of replication : 3
- Number of analysed rows : 3
- Diagram of trial :

Harbot	Manalucie	Red Cloud
Red Cloud	Harbot	Manalucie
Manalucie	Red Cloud	Harbot

4. Treatments:

- Previous use of area : sorghum and maize 1937-74
- Preparation of soil : tilling on 11/2/75
- Fertilisation (top-dressing) : 26/2/75
 - IBDU (32% N) : 107 kg/ha N
 - Double superphosphate : 30 kg/ha P
 - Potassium sulphate : 75 kg/ha K
- Sowing : 18/2/75
- Planting : 7/3/75 - 408 plants on 100 m²
- Irrigation : hose as necessary
- Post-planting work : hoeing weekly
 - staking - Casuarina poles and nylon cord.
- Pruning : removal of early laterals

5. Pest, disease and weed control:

Pest control : Keltane at a rate of 5 ml for 2 litres of water against mites in May and June. Applications twice weekly on two occasions March/April infestations untreated owing to lack of suitable acaricide.

Disease control : none

Weed control : Hoeing against Portulaca lutea

6. Observations: (Description of varieties, and observations)

CVR Manalucie was less vigorous than the other two, and suffered more from the flooding and ravages of mites. Flowering was much later and no fruit set (NO NAA was used to induce fruiting). Harbot was the more successful of the two remaining cvs.

Harvesting : 5/6/75 - 31/8/75

Manalucie : none

Red Cloud : 10.8 kg

Harbot : 21 kg

7. Conclusions:

A larger trial site is required. Statistical analysis of a 3 x 3 latin square is unsatisfactory. Generally a poor trial through early set backs. No conclusions can really be drawn until repeated. The yield of Harbot was, however, significantly greater than Red Cloud.

'Edge effects' were ignored.

IV. NEW CALEDONIA

A. INTRODUCTION TRIALS

(I) Results obtained at the Nessadiou Agricultural Research Station

Seedlings were always transplanted in soil fertilised per hectare as follows:

Fertiliser	Number of units of fertilising elements		
	Nitrogen	Phosphorus	Potash
500 kg of 10-10-20	50	50	100
300 kg of Rekaphos 22-12	-	66	36
150 kg of Potassium sulphate 45%	-	-	67
100 kg of Ammonium nitrate	33	-	-
Total per ha	83	116	203

September sowings were not planted out for technical and climatic reasons. November sowings were transplanted at the beginning of December but were destroyed by Cyclone 'David'.

1. Results of lettuce trials

Cabbage Head lettuce sown at the rate of 62,500 plants/ha produced per hectare:

Date Sown	15 May	in kg	4 August
Great Lakes 118	48,562		23,312
Great Lakes 54	44,750		26,625
Peen Lakes	40,000		-
Great Lakes 366	37,812		46,250

Butterhead lettuce sown at the rate of 95,000 plants/ha produced per hectare:

Date Sown	15 May	in kg/ha	4 August
Waya Head	11 400		14,725

2. Results of Chinese cabbage trials

Sown at the rate of 35,700 plants/ha.

Date Sown	15 May	in kg/ha	4 August
WR 55 days	64,795		-
Saladeer	38,234		72,471
Tropicana	30,016		79,611
Giant Taisai	42,126		43,839
Taisai	35,521		38,127

3. Results of cabbage trial

1974 results showed that cabbages do not perform very well on sandy soil; therefore only one introduction trial was attempted.

Planting was carried out on 4 August at the rate of 28,500 plants/ha; the yields obtained were as follows:

- Express Cross 60	46,027 kg/ha
- K.Y Cross	39,358 kg/ha

4. Results of tomato trials

Seedlings were planted out at the rate of 25,000 heads/ha.

Date of transplanting	15 May	in kg/ha	4 August
N 5 (UH)	83,600		60,275
Mighty boy	74,225		49,350

Date of transplanting	15 May	in kg/ha	4 August
Farmer's New Wonder No. 4	61,975		35,075
Farmer's New Wonder No 1	60,900		51,650
Fengshan Manalee	50,650		42,300
N 52	-		50,050
Tropic VF	-		44,025
Floralou	-		32,725
N 63	-		30,600
Burley Gem	-		30,000
Roma	-		29,100

5. Results of bell pepper trials

A single sowing in May allowed for harvesting between 30 August and 11 December.

-	Ace	65,374.4 kg/ha
-	New Age	55,619.2 kg/ha
-	Fengshan Ruby King	52,686.4 kg/ha

6. Results of eggplant trials

A single sowing allowed for harvesting from 5 September to 2 December.

-	Black Torpedo	69,472 kg/ha
-	Money Maker	46,924.8 kg/ha

(II) Results of trials conducted at Port Laguerre Station

All seedlings at Port Laguerre Station were transplanted on a clayey soil dressed with 800 kg/ha of 12-12-20, i.e. 96-96-160 units of: nitrogen, phosphorus and potash.

As well as the four (4) sowings made with 1975 seeds a trial using leftover seeds from 1974 was carried out at the beginning of the year.

1. Lettuces

Cabbage Head planted at 62,500 plants/ha yielded:

Date sown	12 March	5 June	6 August	7 October	20 Nov.
Great Lakes 54	12,562	65,187	53,750	52,562	-
Great Lakes 118	14,937	60,000	43,687	45,937	-
Great Lakes 366	19,562	60,562	53,375	46,687	-
Peen Lakes	-	54,875	43,625	60,312	-

The last sowing 'Cabbage Head' lettuces did not come up. These varieties have good compact heads, which are sensitive to excess irrigation during the cool season; however, the first sowing during the hot season did not form any heads at all.

Butterhead lettuce planted at the rate of 95,000 heads/ha.

Date Sown	11 March	7 October	20 November
Anuenue	7,980	-	-
Waya Head	6,555	41,010	26,030
Red Mignonette	5,985	-	19,855

Loose leaved varieties sown at 95,000 heads/ha on 11 March.

The 'Black Seeded Simpson' variety produced 11,875 kg/ha but this variety, which has pale yellowy green leaves and is very tender, quickly runs to seed and withers soon after being cut.

It does not seem to be suitable for the market, despite its very pleasant taste.

2. Chinese cabbage

Chinese cabbage planted at 35,700 heads/ha

Date Sown	3 January*	21 May	7 August	7 October	20 Nov.
WR 60 days	38,234	-	-	-	-
Michihili	32,308	98,603	-	-	-
Wong Bok	32,201	-	-	-	-
WR 55 days	-	50,872	59,940	28,595	25,454
Tropicana	-	29,095	29,024	-	-
Saladeer	-	27,024	7,318	-	-
Giant Taisai	-	29,095	37,699	43,911	28,595
Taisai	-	25,668	30,523	39,591	21,063

* Sown directly in position

3. Cabbage

Cabbage planted at 28,500 heads/ha

Date Sown	13 March	15 May	7 August	8 October	20 Nov. *
Express Cross 60	21,717	43,576	57,541	28,386	
Early Yoshin Summer	17,69	-	-	-	
Succession	15,903	-	33,288	-	
Y.R. Cross 50	-	48,250	3,380	33,829	28,085
K.K Cross	-	47,794	49,818	39,073	33,972
C Y Cross	-	43,576	51,813	31,492	27,075

* Only 1/3 of the cabbages sown on this date produced heads

4. Cauliflower

Planted at 28,500 heads/ha.

The cauliflower trials conducted in 1974 at Nessadiou Station produced flower-heads weighing only 100 g; trials were therefore repeated at the Port Laguerre Station for one variety only.

Date Sown	9 June	8 August
Snow King	9,975 kg/ha	11,998 kg/ha

N.B. When the second planting was harvested, a quarter of the heads exceeded 0.5 kg in weight, and were thus up to market standard.

5. Tomatoes

Transplanted at 25,000 plants/ha.

Date	22 Feb.	5 June	5 August	8 Oct.	22 Nov.
N 5 (U H)	23,925	58,125	38,400	30,075	36,025
N 52	-	59,250	-	-	37,350
N 5	19,475	58,300	34,600	24,875	-
Mighty Boy	18,475	-	46,800	27,400	38,575
Farmer's New Wonder No 4	18,400	57,350	38,525	21,450	31,925
N 69	11,675	57,125	19,700	13,275	-
Harbot (1)	10,750	-	-	-	-
Tropic VF	-	87,150	38,525	29,573	31,400
Farmer's New Wonder No 1	-	75,200	43,775	35,225	24,550
Roma (1)	-	71,225	58,550	43,150	49,050
Floradel	-	65,100	32,550	20,325	29,900
Burly Gem (2)	-	64,725	14,625	11,625	-
Grosse Lisse	-	55,875	25,875	23,425	27,725
Floralou	-	49,125	18,550	12,700	21,525
Fengshan Manalee	-	-	33,500	27,000	14,350
St Pierre	-	-	-	17,175	23,800

- (1) Harbot is a small fruit variety which can be grown without stakes; however, the Roma (Egg Tomato) seems more suitable as a summer tomato.
- (2) Burley Gem is a tomato which grows normally in season but is too sensitive to heat.

N. B. Sowings made from 5 June to 22 November allowed for tomato harvesting from 28 August 1975 to 5 April 1976, and seeds sown on 14 January produced a yield in April and May. February and March sowings should enable tomatoes to be harvested throughout the year unless a cyclone occurs at this time.

6. Eggplant

Sown at 20,800 plants/ha.

Date Sown	20 June	8 August	8 October
Black Torpedo	172,265 kg/ha	111,467	132,350
Money Maker	132,787 kg/ha	79,476	82,700

7. Bell peppers

Sown at 20,800 plants/ha.

Date Sown	3 July	8 August	8 October
Ace	32,073	41,121	17,617
Fengshan Ruby King	28,891	21,340	11,460
New Ace	28,412	39,748	21,902
California Wonder	-	-	23,171

B. OTHER TRIALS

At the beginning of February during the hot and humid season, the following trials were conducted at the Port Laguerre Station:

- I. for tomatoes under plastic sheets
- II. for lettuces under sheets and under shade

I. Trial for tomatoes under plastic sheets

A trial plantation under a 20 m³ plastic shelter was set up at the same time as tomato variety trials.

The trial was too small to give conclusive results. However, it was noted that while 80% of the plants in the variety trial were damaged by blight, only 20% of the plants under cover were affected by the disease and the plants were sturdier.

Yields were low, due to the strong gales caused by the cyclone 'Alison'.

II. Trial for lettuce under plastic, and under shade

Two varieties of lettuce were planted simultaneously:

- 1) on open ground
- 2) under plastic and under shade

- . Great Lakes 54 of the Cabbage Head Lettuce type
- . Anuenue of the Butterhead Lettuce type

Average weight (kg) per head was as follows:

	Open ground	Under plastic alone	Under plastic & shade
Great Lakes 54	0.201	0.300	0.175
Anuenue	0.084	0.138	0.209

The trial is too small for any definite conclusions to be drawn, but the following remarks can be made:

1. The Great Lakes 54 variety seems to perform better under plastic sheet than on open ground, but rot is a problem.
2. The Anuenue variety produced better results in the shade although the weight per head already increased under plastic sheets alone.
3. As not all the light can penetrate through the plastic sheets, shade can be considered the determining factor in the latter case.

These trials have made it possible to confirm the development potential of vegetable cultivation in the Territory.

However, the problem of seasonal market gluts must lead us to undertake larger scale trials on hot season production and to investigate means of preserving seasonal products.

V. NIUE

A. CABBAGE VARIETY TRIALS; (Head cabbages and Chinese cabbages)

1. Location: Airport (Dairy) Farm

With a wide range of vegetable seed variety sent by the South Pacific Commission (SPC), and the Vegetable Production Course (sponsored by the SPC) which was held in Niue in August, 1975 plus the interest of the people to grow vegetables, a trial was carried out with the following objectives:

- I) To demonstrate and to prove to the people during the Vegetable Course that vegetables could be grown successfully on Niue soils.
- II) To select the most pest and disease resistant, early maturing, high yielding and demand, and the most suitable variety (varieties) for Niue's climatic conditions.

2 Description

- Experimental design : Randomised complete block
- Replicates : 4
- Total number of plots : 24
- Area/plot : 8 m x 3 m (24 m²)
- Distance between rows : 75 cm

- Distance between plants : 60 cm
- Rows/plot : 4
- Plants/row : 10
- Total number of plants/plot : 40
- Total number of plants/Ept. : $24 \times 40 = 960$

3. Treatments (varieties) :

(a) Head cabbage

1. Hybrid Express Cross 60
2. Hybrid K.K. Cross
3. Hybrid K.Y. Cross
4. Hybrid Early Joshin Summer

(b) Chinese cabbage

5. Hybrid Tropicana
6. Hybrid WR 60 days

4. Land preparation:

The land was sown and grubbed twice from opposite directions.

At the planting all seedlings received one tablespoon of 2-0-1-fertiliser mixture (N. P₂O₅ K₂O).

After a fortnight, sulphate of Ammonia (46%N) was applied incorporated into the soil.

Fertilisation was repeated every 2-3 weeks until seedlings began to form heads.

5. Pest and disease control :

At the first sign of infection, all plants were dusted with Derris dust. This was repeated every fortnight and ceased 3 weeks before harvesting.

6. Harvesting method:

The cabbages were harvested 107 days after planting.

Data was collected from the 10 middle plants in the middle two rows. This was exercised to avoid any border effects.

However, the above method was applied to all replicated plots except Hybrid N. K. Cross rep IV where data was collected from heads at random.

This was caused by the damage done by the animal herd (cattle) at the dairy farm on the week-end of 14-15th September 1975.

The damage done to some plots was beyond repair, and, the experiment was forced to cease.

7. General observations :

A. Chinese cabbage

Varieties tested were Hybrids Tropicana and WR 60 days. It was observed that the Tropicana hybrid had a very quick start as compared to Hybrid WR 60 days.

However, both varieties were susceptible to fungal disease (Phytophthora spp) especially towards their peak of maturity.

B. English cabbages :

Varieties tested are listed under the treatment column.

All varieties were resistant to pests and diseases, except some seedlings of Hybrids K.K Cross, K.Y Cross and Early Yoshin Summer when the application of control measures was late.

However, their growth rates were excellent and indicated that they are most promising varieties for Niue, including Hybrid Express Cross 60 (tested in 1974).

8 Interpretation of data

No data was collected from the Chinese varieties because they were infected by fungal diseases.

However, Niue could use these varieties as a short term crop i.e., harvest them before they reach maturity.

By doing this 2-3 crops per growing season could be grown on the same piece of land thus increasing production per unit area.

When comparing the mean weights of English cabbages from each replicate it was concluded that the Hybrid Express Cross 60 was the heaviest followed by the Hybrid Early Yoshin Summer and the Hybrid K.Y. Cross.

The lightest mean weight was collected from the Hybrid K.K. Cross.

However, when comparing the total mean weights of all replicates, it appeared that the Express Cross 60 and Early Yoshin Summer have relatively the same weights, as also Hybrids K.K. and K.Y. Crosses.

9. Recommendations

1. Grow vegetables from March to August.
2. All English cabbages tested are suitable for Niue's climatic conditions.
3. The Chinese cabbages must be harvested before they are matured.
4. Hybrid K.K. Cross should be grown for the hotel because they are medium in size.
5. Correct rates of all pesticides should be used.
6. Correct equipment for the applications of these pesticides should be used by growers.

B. RESULTS OF OTHER VARIETY TRIALS

1. Location:

The trials listed below were carried out at Vaipapahi Government Farm.

2. Treatments:

All beds were topdressed with old pig manure and wood shavings; fertilizer was applied fortnightly, either in the form of 2-0-1, or a special mixture, containing also small quantities of superphosphate, dried blood and zinc sulphate. Insects were controlled, principally by Derris dust, and occasionally by Malathion. All plants were watered, by bucket, twice daily.

3. General observations:

1. Head cabbages : Red Ruby King - small but tasty
A.S. Cross
 - Sown : 7/4/75
 - Harvested : 15/7/75
 Good cabbage
2. Chinese cabbages : Peichay Sei
 - Sown : 7/4/75
 - Planted : 28/5/75
 - Harvested : 8/7/75
 - Number of plants : 69
 - Total weight : 75.86 kg
 - Mean weight : 1.1 kg
 - Heaviest cabbage : 1.589 kg
3. Cucumbers : Southern Cross
 Northern Delight
 Giant Climbing

These three cultivars were most impressive, with good resistance, a long bearing period and large, juicy fruit. All seeds were sown on 25/6/75 and the principal harvest period was the last week of August through to mid-September. Germination rate was 100%.

- : Top Marker - grew slowly, and was much more susceptible to fungus
4. Eggplant : Long purple - An excellent crop for Niue, but growers are not yet interested.
5. Lettuce : Penn Lake - Good, but leaves become bitter, if plant left to mature.
 - Harvested : 108 heads
 - Total weight : 5.845 kg
6. Bell Peppers : 401 - Small plants and fruits; only a few fruit per plant.
 Fengshan
 Ruby King

7. Tomatoes
- : Pauni - Good growth, large fruit
 - Harbot - Susceptible to virus
 - Planted : 7/4/75
 - Main harvest : late July
 - : VC77 - Good healthy growth
 - Planted : 7/4/75
 - Main harvest : late July - early August
 - : Hope - this tomato is particularly
8. Watermelon
- : Sugar Swika - Fair
 - Imperial - Not satisfactory
 - Kodama improved - Fair
 - Green Fuku - Fair
 - Sown : 9/6/75
 - Harvested : late September
 - Gheny - Good growth: tasty melons

VI. KINGDOM OF TONGA

A. TOMATO VARIETY TRIALS (Canning Tomatoes)

Twenty five potential canning varieties of tomato were planted out on 14 November 1974. The trial design was a randomised block with three absolute replications. Spacing was 1.2 x 0.46 m (48" x 18") and there were 8 plants per plot.

Standard treatments were 45 kg nitrogen applied as urea in four equal dressings; weekly Maneb sprays to control diseases, regular Lannate sprays every 2 weeks to control insect pests and a soil application of Furadan 3G to control nematodes.

Data were collected on total fruit weight, marketable fruit weight, fruit size (< 85 g or 3 oz) and shape. Results are summarised in Table 1, with the exception of fruit shape data.

The trial was carried out during the warm, wet, summer months and although the data reflect differences in varieties it is probable that yields would have been considerably higher if the recognised (winter) production season.

The varieties in Table 1 marked with an asterisk as acceptable for canning will be carried forward to future variety trials.

Table 1: Total yield of tomatoes - Total number of tomatoes -
Weight of undamaged fruits and weight of all tomatoes less than 85 g.
(Means of 3 Replications)

Varieties	Total yield (q/ha)	No of fruits per plot	Undamaged fruits* (q/ha)	Total weight of fruit > 83 g (q/ha)
F -1 Sunlight	332.56	167	87.4	87.4
F -1 California Hill	288.81	143	132.3	67.3
F -1 Spring Giant	364.50	173	141.3	85.2
				.../

... Varieties	Total yield (q/ha)	No of fruits per plot	Undamaged fruit (q/ha)	Total weight of fruit >83 g + (q/ha)
San Marzano*	237.03	291	170.4	179.4
Early Pak	130.83	90	40.4	56.1
Chico III*	306.62	311	195.1	217.5
Super A	287.69	201	91.9	132.3
Q 3	0.41	4	22.4	2.24
Tatinter	125.94	91	35.9	71.7
Tatura Dwarf Globe	187.80	158	51.6	114.3
Niagra UF 315	226.45	173	100.9	125.6
Peelette	81.18	79	35.9	56.1
UF 145 (78 x 79)	245.48	164	91.9	114.3
UF 13L	145.68	129	69.5	78.5
Niagra UF 317	249.55	186	107.6	116.6
Ace UF 55	77.42	31	29.1	9.0
Heinz 1370	255.75	126	121.1	76.2
Petomech UF	275.79	209	201.8	172.6
Merit	193.29	143	1441.3	114.3
Rossol UFN*	214.65	252	199.0	179.4
Ventura*	404.99	429	266.8	273.5
Campbell 28	225.64	154	186.1	94.2
Roma UF*	213.33	231	148.0	168.2
Napoli UF*	314.76	415	246.6	257.8
Napoli*	484.85	590	331.8	354.3
S.E.D. ±	49.78	43	29.14	53.81

Notes: * Denotes varieties which displayed acceptable fruit size and shape for canning.

+ Note that this figure includes damaged fruits

B. TOMATO VARIETY TRIAL, DISEASE SCREENING

On 28 August 1975, 48 tomato varieties were sown for yield evaluation, disease resistance and nematode resistance. A majority of the varieties used were supplied by the Asian Vegetable Research and Development Center, Taiwan. Transplanting was completed on 2 October 1975; only insecticide was applied to control insect pests i.e. Lannate. Spacing was 1.2 x 0.46 m (48" x 18"), there were 8 plants per plot and the design was a randomised block with 3 replicates.

Table 2 summarises field data collected on "days to flower" (50% plants per plot); total mean fruit weight (kg per plot); total undamaged fruit weight (kg per plot); total mean fruit numbers (number per plot); average single fruit weight over the total fruit yield and the total fruit yield expressed as quintals per hectare.

Table 2: Observations on days to flowering

- (A) Total fruit weight
 (B) Undamaged fruit weight
 (C) Numbers of fruits
 (D) Mean weight of a single fruit
 (E) Total fruit yield per hectare
 (F) Means of 3 replicates

Varieties	A (Days)	B (kg/plot)	C (kg/plot)	D (No /plot)	E (g/fruit)	F (q/ha)
1 C6d-0-3-6-0	61	19.5	15.0	589	33.2	437.13
2 C6d-0-7-4-0	63	12.6	9.7	240	52.4	282.50
3 C7d-0-5-1-0	69	14.4	11.3	425	34.0	323.61
4 C7d-0-9-2-0	64	14.2	13.5	461	30.6	317.30
5 C8d-0-0-1-0	65	20.5	15.0	367	55.6	458.30
6 C8d-0-1-3-0	69	13.4	10.2	367	36.3	299.30
7 C9d-0-1-6-0	64	19.9	15.1	452	44.2	447.01
8 C9d-0-3-10-0	62	21.8	17.4	455	47.9	489.53
9 C11d-0-2-2-0	66	15.1	11.4	445	33.7	337.65
10 C11d-0-2-4-0	67	16.6	12.7	480	34.6	371.42
11 C30d-0-4-13-0	62	14.5	11.4	389	37.4	324.93
12 C32d-0-2-4-0	67	13.5	10.2	407	33.2	302.24
13 C32d-0-1-1-0	64	23.4	14.9	528	44.2	523.91
14 C33d-0-2-1-0	62	16.1	10.8	496	32.3	359.72
15 C33d-0-2-2-0	69	9.6	7.1	334	28.6	215.27
16 C103-0-5-2-0	63	20.1	16.5	641	31.5	450.56
17 C122-0-1-1-0	61	12.0	9.0	475	25.2	268.97
18 C122-0-1-4-0	62	10.7	8.9	534	20.1	240.29
19 C122-0-3-4-0	62	12.1	9.1	445	27.2	270.40
20 C122-0-5-3-0	67	11.3	9.2	489	23.2	254.22
21 C123-2-1-0	64	16.7	13.3	499	33.5	374.27
22 C123-4-3-0	69	7.8	5.6	215	36.0	173.76
23 C141-0-2B-3-0	58	17.1	13.6	387	44.2	382.81
24 C143-0-2B-3-0	61	23.8	18.9	773	30.9	533.37
25 C143-0-3B-2-0	58	16.2	11.8	509	31.8	363.38
26 C170-0-2B-2-0	61	17.4	13.9	761	22.7	389.12
27 C179-0-1-4-0	62	7.7	6.0	450	17.0	172.13
28 C246-0-4B-2-0	69	12.3	9.8	492	24.9	275.89
29 C246-0-4B-6-0	69	14.0	11.3	514	27.2	312.61
30 C251-0-2B-3-0	63	17.6	12.7	547	32.0	393.39
31 L124	60	13.7	11.3	365	37.7	307.12
32 C123-4-4-0	68	10.7	8.2	388	28.1	239.06
33 C122-0-4-1-0	64	11.3	8.7	357	30.1	252.59
34 L33	58	14.0	11.6	403	34.6	312.61
35 C122-0-5-1-0	61	11.6	8.9	415	28.1	260.83
36 C123-4-11-0	67	15.3	12.3	442	34.6	342.42
37 L1	60	15.0	10.7	370	40.3	335.10
38 C32d-0-1-4-0	60	20.4	11.7	510	40.0	456.57
39 C32d-0-1-13-0	57	21.6	13.2	231	50.0	483.73

Varieties	A (Days)	B (kg/plot)	C (kg/plot)	D (No /plot)	E (g/fruit)	F (q/ha)
40 T3179	64	14.4	10.7	521	27.5	322.59
41 Topmoney Hybrid	68	25.7	15.8	567	45.4	576.81
42 Kyiscdresby Dwarf	66	14.0	10.6	210	66.6	313.53
43 Roma	65	18.3	14.3	464	9.4	409.87
44 Napoli	63	20.5	16.4	722	28.4	459.92
45 Red Cloud	62	16.5	12.2	324	50.7	369.18
46 Rossol V F N	68	37.1	29.7	398	37.7	336.42
47 San Marzano	66	24.7	19.3	353	28.4	224.31
48 Ventura	65	41.9	31.3	572	29.8	380.37
S.E.D. \pm	-	7.17	5.68	80.69	-	-

At the completion of harvesting the Plant Pathology Section collected composite soil samples from each variety for nematode counts; the samples were extracted and forwarded to Dr John Bridge, ODM Plant Nematology Liaison Officer, Imperial College Field Station Silwood Park, England, for counts and identifications. The following species were identified: Meloidogyne javanica, Meloidogyne incognita, Tylenchus spp., Aphelenchus avenae, Aphelenchoides spp., Rotylenchulus reniformis, Pratylenchus brachyurus, Pratylenchus zeae, Helicotylenchus vulgaris, Helicotylenchus digytera.

Both the Horticulture and Plant Pathology Sections completed visual disease ratings for early blight (Alternaria solani), leaf mould (Fulvia fulvum) and grey leaf spot (Stemphylium B). No incidence of tobacco mosaic virus or southern leaf blight (Sclerotium rolfsii), were reported. Evaluations for diseases were indexed on a 0 to 10 scale, 0 being wholly resistant and 10 highly susceptible. The index ratings for the three diseases found affecting the the planting area are shown in Table 3. The root-knot nematode index derived from the samples sent to Dr Bridge is also given in table 3.

This trial was carried out during the warm wet season which is generally not regarded as the best production time. This exposed the varieties to the most adverse environmental conditions when observed, inherited genetic resistance to disease and nematode pests would be most genuine and valuable. This trial also resulted in the first identification of nematode species found on tomato crops in the Kingdom of Tonga. Whilst full statistical analysis is not yet complete it would seem that Fulvia fulvum (leaf mould) was the most serious disease affecting tomato in this trial.

Table 3: Root-knot index
Alternaria solani (Early blight) Index; Fulvia fulvum (Leaf mould) Index;
Stemphylium B (Gray leaf sp. DT) Index

Varieties	Disease Score Index (0-10)				Varieties	Disease Score Index (0-10)			
	Root-knot	Alternaria solani	Fulvia fulvum	Stemphylium B		Root-knot	Alternaria solani	Fulvia fulvum	Stemphylium B
1	3	0	9	0	25	6	0	10	1
2	4	3	8	0	26	7	0	8	0
3	-	0	9	3	27	-	0	10	5
4	1	0	7	2	28	1	0	6	1
5	5	2	5	2	29	4	3	5	0
6	8	0	6	0	30	4	1	9	1
7	4	0	6	0	31	4	4	6	1
8	0	0	5	7	32	4	0	5	1
9	1	0	10	3	33	0	4	6	3
10	0	0	8	1	34	8	2	8	0
11	5	6	6	1	35	1	0	10	5
12	5	0	6	1	36	2	0	5	1
13	6	0	4	0	37	2	10	5	7
14	1	5	7	6	38	6	3	3	6
15	3	5	5	6	39	4	0	5	0
16	1	5	6	6	40	3	0	9	3
17	-	0	10	4	41	6	0	3	10
18	-	0	10	0	42	7	0	6	6
19	0	5	9	3	43	0	0	5	1
20	1	0	6	2	44	1	0	7	0
21	3	0	6	5	45	4	5	7	4
22	5	0	4	1	46	0	0	7	4
23	-	0	9	1	47	4	0	5	6
24	1	0	7	1	48	2	0	9	3

For key to variety names refer to Table 2

C. INSECTICIDE SCREENING TRIAL FOR THE CONTROL OF TOMATO PESTS

Ten insecticides were evaluated for the control of tomato pests on the varieties Roma and Napoli, both canning tomatoes. The trial design was eleven treatments per replicate with split plots for variety, and three absolute replications. Plant spacing was 1.2 m (4 ft) between rows and 0.45 m (18") within rows, and there were 6 plants per sub-plot. Blanket disease control treatment was obtained with weekly applications of Maneb fungicide; nitrogen fertiliser was applied at a rate of 112 kgN/ha as urea, split into four equal applications.

The major pests under observation were fruit flies (*Dacus* spp.), tomato worm (*Helicoverpa assulta*), green semi-looper caterpillar (*Piusia chalcites*), fruit-piercing moth (*Othreis fullonia*) and 29-spot ladybird (*Epilachna vigintiocto punctata*). Observations also included spider mites and aphid species.

The tomatoes were transplanted into the field on 25 September 1975; insecticide treatments are summarised in Table 4.

Table 4: Chemical rate and frequency of insecticide treatments

Chemical	Rate	Frequency of spray
1. Sevin	2.2 kg/ai/ha	1 week
2. Lannate	100 ml/100 l	2 week
3. Furadan 3g	1.1 kg/30 ml	transplant
4. Thuricide	0.5 kg/ha	1 week
5. Lebaycid	170 ml/227 l	2 week
6. Thiodan	18 ml/13.6 l	2 week
7. Monitor	1.2 kg/ai/ha	2 week
8. Dibrom 8	1.4 l/ha	1 week
9. Rogor	85 ml/227 l	2 week
10. Lepidex	2.8 l/ha	1 week
11. Check	no	Spraying

Total fruit weights were taken and Table 5 shows the mean yield for treatment and for variety, on a plot basis

Table 5: Mean total fruit weight of each variety and treatment (kg/plot)

Varieties	Treatments											Variety Mean	
	Check	1	2	3	4	5	6	7	8	9	10		
Roma	48.8	68.2	63.4	47.1	46.7	46.9	70.8	68.9	54.3	59.8	63.4	174.2	SED \pm 3.45
Napoli	57.4	67.3	71.7	78.8	53.2	67.1	77.0	86.5	57.0	61.2	77.0	206.1	
Mean	54.1	67.8	67.3	63.0	50.0	57.0	73.9	77.7	55.7	60.5	70.2	SED \pm = 8.98	

SED (within table) \pm = 16.19

Note: See Table 4 for key to treatments

All fruits from each harvest were divided into undamaged, insect damaged, rat damaged, bird damaged, and were weighed separately. Table 6 shows the percentage of total yield which was found to be damaged by insects.

Table 6: Proportion of total crop with insect damage (%)

	Treatments													
Varieties	Check	1	2	3	4	5	6	7	8	9	10	Variety	Mean	
Roma	10.6	5.3	9.4	13.3	11.4	10.9	7.1	11.4	13.1	14.5	11.3	10.6	SED± 0.01%	
Napoli	16.0	8.4	13.1	15.9	13.9	15.5	6.8	13.8	10.9	15.5	11.5			
Mean	13.7	6.8	11.2	14.6	12.6	13.2	7.0	12.6	12.0	15.0	11.4	SED± = 0.05%		

SED (within table) \pm = 0.19%

The treatment data in this table were grouped into systemic versus contact insecticides and analysed: i.e. treatments 2, 3, 5, 6, 7 and 9 vs treatments 1, 4, 8, and 10; no differences were found between these general types of insecticides applied in this manner.

The proportion of the total crop affected by rotting (largely due to Corticium rolfsii, a wound parasite) showed the following:

Mean all treatments Rep 1 = 16.4%

Mean all treatments Rep 2 = 15.3%

Mean all treatments Rep 3 = 65.1%

Variety average over all plots:

Roma = 32.3%

Napoli = 32.3%

No large differences were observed between treatments and the much higher level in replicate 3 is attributable to the fact that this site was low lying, damp, and more heavily shaded by adjacent windbreak trees.

Bird damage was measured as a percentage of total yield. Table 7 shows mean percentage values of the total fruit weight for each variety within each treatment.

Table 7: Proportion of total crop with bird damage (%)

Varieties	Treatments												Variety Mean	
	Check	1	2	3	4	5	6	7	8	9	10			
Roma Napoli	8.7	5.6	6.7	5.4	6.7	2.6	7.2	4.1	4.1	6.7	7.1	5.8	SED \pm =0.02%	
	5.6	4.2	3.6	4.4	7.7	2.8	5.6	4.1	5.6	4.4	4.0			4.6
Mean	7.1	4.8	5.0	4.9	7.2	2.7	6.3	4.1	4.8	5.4	5.4	SED \pm = 0.08%		

SED (within table) \pm = 0.45%

Spot samplings were conducted by the Entomology Section to determine the numbers of tomato worms and green semi-loopers caterpillars on the plants. In all counts the numbers were low and inconsistent. Table 8 shows the total insect numbers collected from both varieties over the entire sampling period.

Table 8: Total numbers of tomato worms (*Helicoverpa assulta*) and green semi-looper (*Plusia chalcites*) collected from each chemical treatment for both tomato varieties

<u>Chemical</u>	<u>Number</u>
Sevin	85
Lannate	142
Furadan	115
Thuricide	104
Lebaycid	87
Thiodan	93
Monitor	141
Dibrom - 8	146
Rogor	148
Lepidex	126
Check	133

Fruit samples from each treatment were examined after each picking and very little sign of Fruit-piercing Moth damage was noted. Samples of fruit were incubated but no species of fruit flies were found emerging.

The effectiveness of all the chemicals in controlling insect populations in the plots and the obvious preference of insects for the fruits on the untreated guard or border row plants, which suffered extensive damage, resulted in a low general and overall insect presence on treated plants. Table 6 shows that the variety Roma was slightly but significantly more resistant to insect attack than the variety Napoli. Thiodan, a systemic insecticide or Sevin, a contact insecticide applied twice as frequently as the Thiodan, were the most effective materials for insect control. In general, contact insecticide sprays used weekly provided comparable insect control to systemic insecticide sprays applied every two weeks. Fruit rot did not vary between varieties or treatments; a large difference was observed between replications with replicate 3 being located near an area liable to temporary flooding on low ground.

Bird damage (Table 7) was slightly but significantly higher on the Roma variety; it will be noted that the insecticide named Lebaycid appears to have some bird repellent property and tomatoes sprayed with this chemical suffered significantly less damage. Numbers of insect larvae collected from each treatment varied greatly (Table 8) but did not follow consistently the levels of insect damage reported in Table 6.

D. TOMATO FERTILISER TRIAL

A 4x3x2, N x P x K factorial fertiliser trial was established on the Vaini Clay Soil in November 1974 (Summer season). There were two complete replications and the canning variety Roma was used.

The rates of fertiliser applied were 0, 37, 74 and 112kg/ha N as urea; 1, 112 and 224 kg/ha P₂O₅ as triple superphosphate; 0 and 56 kg/ha K₂O as muriate of potash. P and K were applied as single band placement alongside the plants and N was split into two band placements, one applied on 7th November, 1974 and the other half on 8th January, 1975.

Spacing was 1.2 m (48") between rows and 0.46 m (18") between plants in the row and the plot size was 4.3 sq.m.

A full detailed report of this trial has been prepared and only the overall yield effects are given here.

Table 9: Total yield of tomatoes in response to fertiliser application on a Vaini clay

N level (kg N/ha)	NO	N37	N74	N112	SED
Yield (q/ha)	168.0	217.9	269.3	285.2	± 20.09
P level (kg P ₂ O ₅ /ha)	PO	P112	P224		
Yield (q/ha)	253.2	244.5	225.6		N.S
K level (kg K ₂ O/ha)	KO	K56			
Yield (q/ha)	225.6	244.6			N.S

Only nitrogen fertiliser applied as urea increased the yield significantly and the optimum rate appears to be around 75 kg N/ha.

The application of 112 kg/ha of nitrogen compared with no nitrogen, increased total tomato yields by + 117.2 quintals/ha, increased the yield of undamaged fruit by + 84.3 quintals/ha, increased the total number of fruits per hectare by 272,082 and decreased the average fruit weight by 2.4 g.

E. CONTROL OF BACTERIAL LEAF SPOT (XANTHOMONAS VESICATORIA) ON BELL PEPPER

Good control of bacterial leaf spot (Xanthomonas vesicatoria) (Deidge Dows) has been achieved in Tonga on bell pepper by the Spray application of Cuprox (88% w/w copper oxychloride) plus Mancozeb at 7 g + 0.8 g per litre of water respectively. This treatment is applied every 3 - 4 days (Daft 1973).

A trial was conducted on Vaini Experimental Farm to see if the spray interval could be lengthened to 7 days and also to see if the rates of application could be reduced.

Capsicum annum, California Wonder was sown on 27 February 1975 in seed boxes in a screenhouse before transplanting into the field on March 17. Transplanted seedlings were in rows 1.8 m (6ft) apart with 0.6 m (2ft) between plants. Five plants per row constituted a treatment which was replicated 3 times.

Diammonium Phosphate (18-20-0) fertiliser was applied twice (March 19 and April 24) using 1 Level (34 g or 12 oz) tin per 5 plants.

Metaldehyde bait was applied 1 week after transplanting around each plant to control slugs and snails.

Omite at 2g/1 of water was applied weekly to all plants to control mites.

Six treatments (Table 10) including an unsprayed check, were applied at weekly intervals from 23 May until 11 July after which time all the bell peppers showed bacterial leaf spot symptoms.

All fruits in the trial were damaged by birds and the fruit piercing-moth; hence fruit yield comparisons could not be made. However the effectiveness of the treatments was assessed by taking the above ground plant dry weight. This is a suitable indicator because the degree of bacterial damage on leaves is related to the amount of defoliation in the plant.

Results (Table 10) indicate that only the Kocide treatment was significantly different from the unsprayed control. In this trial, Cuprox was supplied at a lower concentration than the recommended rate and the interval between sprays was longer than recommended, hence the poor control shown.

From these results it may be inferred that none of the treatments provided a satisfactory alternative to the current recommendation for the control of this disease.

Table 10: Effects of treatments on bacterial leaf spot of bell peppers as indicated by dry weight of the tops

Treatments (per litre of water at 7 days interval)	Plant dry weight g/plant
1. Cuprox (88% Copper oxychloride $\overline{50\% \text{ Copper}}$)	14.0
2. Kocide 101 (83% Cupric hydroxide $\overline{54\% \text{ Copper}}$) 3g	18.7
3. Dithane M45 (80% Mancozeb) 2g	13.8
4. Kocide 101, 1.5g + Dithane M45, 1g	16.5
5. Cuprox 2.5g + Dithane M45, 1g	16.5
6. Check (Unsprayed)	12.9
S. E. D. \pm	2.6

References

DAFT, G.G. and FIFITA, I. 1973 Foliar spray field trials for the control of bacterial leaf spot of Capsicum. Report to Research Committee, Department of Agriculture, Tonga.

F. CHEMICAL CONTROL OF FUNGAL DISEASES ON WATERMELON

Summary

A trial was conducted to screen the effectiveness of Difolatan and copper oxychloride together with Milcurb, Milcurb Super, Dinocap and Benomyl against Oidium spp. and Didymella bryoniae (Fuckel) Rehm. A combination of either Difolatan or Mancozeb with either Dinocap or Milcurb super is recommended. Parameters used to assess the effectiveness of control included degree of defoliation, total fruit weight, average fruit weight, total numbers of fruits, numbers of marketable fruits and numbers of damaged fruits. A cost index shows favourable returns, for these spray combinations.

Prior to 1962, watermelons were grown in Tonga without the application of any chemical sprays for disease control. In 1962, however, the quantity of watermelons exported was only a third of that in 1961 and this was attributed to powdery mildew (Oidium spp.) attack. (Rept. of the Agric. Dept. Tonga, 1962) Dinocap has been used since to combat this disease. (Jonston, 1965).

Despite the use of Dinocap, another disease has been causing considerable damage to this crop. This disease, black rot or gummy stem blight, was first recorded from Tonga by Johnston (1965) who proposed Mycosphaerella melonis as the probable causal agent; Daft (1965) confirmed this.

The current recommendation in Tonga for the control of these two foliar diseases is a Dinocap-Maneb (Mancozeb) or Benomyl-Maneb Spray.

In 1975, a trial was conducted to evaluate the current recommendations and to screen other potential chemicals for the control of powdery mildew (Oidium spp) and gummy stem blight (Didymella bryoniae (Fuckel) Rehm syn. Mycosphaerella melonis).

Watermelon cv Candy Red was sown in a field at Vaini Experimental Farm on October 15, 1975. Seven seeds were planted per hill: two hills were located 30 cm on opposite sides of marker, spaced 6 m x 3 m (20ft x 10ft) on November 12th.

Two applications (October 16 and November 12) of urea fertiliser were made in a band 24 cm around each hill. The rate was 85g per hill per application.

Insect control was achieved by an application of Furadan 3G granules at the rate of 28g per hill on 15th October. By 19th December, it was necessary to apply Diazinon at a rate of 2ml/1 to control looper caterpillars.

To control snails a metaldehyde bait was used at a rate of 2 pieces per hill on 26 October when about 75% of the seeds had germinated.

Weed control was done by hand weeding of the hills and rotary hoeing between rows (two cultivations). When the vines started to 'run' together, hand weeding was carried out.

Twelve treatments (Table 11) including a check, were replicated 3 items: each replicate had 5 paired hills. There was a border row between blocks to which no fungicides or insecticides were applied.

Powdery mildew infections appeared on 12 November, 1 month after planting and about the time of flowering. Gummy stem blight was observed later after many fruits had set. Applications of treatments began on 26 November with a knapsack sprayer. There were 3 sprays of the 14-day interval fungicides using a total of 3425 l/ha of liquid. Five sprays of the 7-day interval fungicides amounted to 5872 l/ha of liquid.

The degree of defoliation attributable to fungal diseases was estimated visually on January 6, 1976 scoring 1, 2, 3, 4, and 5 to represent 0-20, 20-40, 40-60, 60-80 and 80-100 per cent defoliation respectively. Watermelon fruits were harvested and weighed 2 days later.

Table 11: Treatments

Treatment No.	Treatments
1	Difolatan (a), 2g/l water applied at 7 days interval plus Milcurb (b), 3mls/l water applied at 14 days interval
2	Difolatan as in 1, plus Milcurb super (c), 0.6 ml/l water, applied at 14 days interval.

Treatment No.	Treatments
3	Difolatan as in 1, plus Karathane (d), 2g/l water applied at 7 days interval.
4	Difolatan as in 1, plus Benlate (e), 0.5 g/l water applied at 14 days interval.
5	Dithane M45 (f), 2 g/l water, applied at 7 days interval plus Milcurb as in 1.
6	Dithane M45, as in 5, plus Milcurb super as in 2.
7	Dithane M45, as in 5, plus Karathane as in 3.
8	Dithane M45, as in 5, plus Benlate as in 4.
9	Benlate 0.5 g/l water at 14 days interval.
10	Benlate 0.4 g/100 ml water/plant applied to the roots
11	Copper oxychloride, 4g/l water applied at 7 days interval plus Karathane, as in 3.
12	Check (Unsprayed)

Notes: For Treatment Number 1-9 and 11, Nonidet wetting agent was mixed with the sprays at 0.4 ml/l water

- (a) Captafol 80% a.i. W. P.
- (b) Dimethirimol 12.5% a.i. E. C.
- (c) Ethirimol 25% a.i. E. C.
- (d) Dinocap 25% a.i. W. P.
- (e) Benomyl 50% a.i. W. P.
- (f) Mancozeb 80% a.i. W. P.

Six parameters were measured to assess the effectiveness of the various treatments against powdery mildew and gummy stem blight and the results are summarised in Table 12.

Table 12: Effectiveness of fungicide treatments against powdery mildew and gummy stem blight of watermelons as indicated by 6 parameters.

Treatment No.	1	2	3	4	5	6	7	8	9	10	11	check	SED
Degree of defoliation	2.7*	3.0*	4.3	3.7*	3.7*	2.7*	3.7*	4.0	5.0	5.0	4.3	5.0	0.31
Total crop weight (q/ha)	247*	287*	204*	178	261*	276*	257*	189*	114	180*	171	110	23.7
No of fruits (x 1000 fruits/ha)	5.0	5.4	5.2	4.7	5.6	5.4	5.4	4.9	4.3	4.8	5.4	4.5	0.42
Exportable fruits > 9.1kg (x 100/ha)	5.0	8.2*	2.5	0.7	6.5*	5.7*	4.7	1.1	0	1.1	0.4	0	2.03
Average weights of fruits (kg)	4.9*	5.3*	4.0*	3.8	4.7*	5.2*	4.6*	3.9*	2.7	3.8	3.2	2.5	0.45
Damaged fruits (x 100/ha)	1.6	1.5	2.2	2.1	1.2*	0.9*	1.6	1.4	2.0	1.8	2.6	2.3	0.36

Note : * = Significant at $p = 0.01$

There were no significant differences (from check) for the number of fruits produced. The differences in yield were due to the differences in average fruit size which in turn, closely relates to the degree of defoliation. Seriously defoliated treatment yielded smaller fruits and vice versa.

A very interesting result is the reduction of the amount of damaged fruits by Milcurb and Milcurb super chemicals when combined with Mancozeb (Table 12). Statistical analysis however showed that both Difolatan and Mancozeb did not reduce damaged fruits significantly from the control (Table 13). Hence this affect is attributable to either Milcurb or Milcurb super. These two chemicals also increased the number of fruits of exportable size i.e 9.1 kg per fruit (Table 12).

Dinocap tends to be better than Benlate (Table 12). This may indicate developing resistance in the powdery mildew pathogen to Benlate.

There was little difference between Difolatan and Mancozeb in the control of gummy stem blight.

Table 13: Effectiveness of Mancozeb versus Difolatan against gummy stem blight of watermelon as indicated by 6 parameters

Treatment	Difolatan	Dithane M45	Control
Degree of defoliation	3.4 a	3.5 a	4.9
Total weight (q/ha)	230 a	246 a	144 b
No. of fruits(x 1000 fruits/ha)	5.1 a	5.3 a	4.8 a
Marketable fruits 9.1 kg (100/ha)	4.1 a	4.5 a	0.4 b
Average weight of fruit (kg)	4.5 a	4.6 a	3.0 b
Damaged fruits	1.9 a	1.3 a	2.2 a

Note: Values along each line followed by the same letter are not significantly different (P = 0.01) using Duncan's Multiple Range Test.

When costs and returns are used as criteria for selection of fungicides to use, it can be seen (Table 14 or the cost index below) either Difolatan or Mancozeb in combination with either Dinocap, Milcurb or Milcurb super are favoured.

Table 14: Cost of chemicals (T\$/ha)

Chemical	Amount used kg/ha	Price unit	Cost
Difolatan	11.7 kg	2.86	33.46
Mancozeb	11.7 kg	1.49	29.13
Copper Oxychloride	23.5 kg	1.47	34.50
Milcurb	10.3 l	6.43	66.23
Milcurb super	2.1 l	6.43 *	13.50
Dinocap	11.7 kg	3.39	39.16
Benlate	2.9 kg	16.48	47.79
Benlate (root application)	1.3 kg	16.48	21.42

G. ASPARAGUS VARIETY OBSERVATION TRIAL

In January 1975 three asparagus varieties: Mary Washington 500, UC 72, and UC 66, were planted for observation and collection of rough yield data. On 8 October 1975 half the total plot of all three varieties was clipped and ridged; they produced marketable spears but it was observed that production was low because of a moisture shortage. On 1 February, 1976 the previously uncut portion of each variety plot was cut and ridged. Harvesting was carried out when spears were between 18cm and 25cm in height. Diameter grading was done by measuring a point 5 cm up from the base of the spear; the classes were: small 1cm, medium 1.2 cm to 1.8 cm, large 1.8 cm to 2.2 cm. Table 15 shows grades, numbers of spears per plot and yields per hectare for the three varieties harvested.

Table 15: Total numbers, plot weights and yields (kg/ha)

Variety	Size Grade	No. of Spears/plot	Yield (kg/ha)
UC 66	Small	54	728
UC 66	Medium	40	881
UC 66	Large	25	936
UC 72	Small	41	1770
UC 72	Medium	39	1870
UC 72	Large	29	2205
Mary Washington 500	Small	36	618
Mary Washington 500	Medium	29	760
Mary Washington 500	Large	19	762

On 15 February 1976 the portion of the plot which had been harvested after clipping in October 1975 was clipped and ridged again. Inadequate time had elapsed since the previous harvest and no realisable yield was produced. This crop appears to have potential in Tonga and work will continue.

H. RECOMMENDED VEGETABLE VARIETIES FOR TONGA

Source

T.	Takii & Company Ltd P.O. Box 7 Kyoto Central KYOTO Japan	P.	Petoseed Co. Inc. P.O. Box 4206 SATICOY 93003 California USA
PW.	Pieters - Wheeler Seeds P.O. Box 36 GILROY California USA	D.	Dessert Seed Co. Inc. P.O. Box 181 EL CENTRO 92243 California USA
UH.	University of Hawaii HONOLULU Hawaii	Y.	Arthur Yates & Co. Ltd P.O. Box 1109 AUCKLAND New Zealand

	<u>Variety</u>	<u>Suggested Source</u>
I.	<u>TOMATO (Warm season) - Fresh Market</u>	
A.	N-52 Hybrid	T
B.	N-69 Hybrid	T
C.	N-63 Hybrid	T
D.	Indian River	D, P, Y
E.	Floradelle	D, P
F.	Tropic VF	D, P, Y
G.	Floralou	D, P
H.	N-65 Hybrid	P
	<u>Canning - Pear Shape</u>	
A.	Napoli	D, P
B.	Ventura	D, P
C.	Chico III	D, P
	<u>Round</u>	
A.	F-1 Spring Giant	D
B.	F-1 Sunlight	D
C.	F-1 California Hill	D
	<u>(Cool Season) - Fresh Market</u>	
A.	N-52 Hybrid	T
B.	N-69 Hybrid	T
C.	N-63 Hybrid	T
D.	Indian River	D, P, Y
E.	Floradelle	D, P
F.	Tropic VF	D, P, Y
G.	Floralou	D, P
H.	Marglobe	D, P, Y
I.	Puunui	UH
J.	N-11 Hybrid	T
K.	N-65 Hybrid	P
	<u>Canning - Pear Shape</u>	
A.	Napoli	D, P
B.	Ventura	D, P
C.	Chico III	D, P
	<u>Round</u>	
A.	F-1 Spring Giant	D
B.	F-1 Sunlight	D
C.	F-1 California Hill	D

II. CABBAGE - All Season

A. K.K. Cross	T, Y
B. K.Y. Cross	T, Y
C. Express Cross	T, Y
D. Early Joshin Summer	T
E. Y.R. Summer 50	T

III. CHINESE CABBAGE - All Season

A. Tropicana	T, D
B. Solandeer	T, D
C. Michihili	D, P, W, Y
D. Pac Choy	T, Y

IV. CAPSICUM - All Season

A. Yolo Wonder	T, D, P, Y
B. California Wonder	T, D, P, Y
C. Hybrid Ace	T
D. F-1 Hybrid Giant Wonder	D
E. Wonder Giant	D

V. EGGPLANT - All Season

A. Kurume Long Purple	T
B. Long Purple	T, D, P, Y
C. Black Torpedo Hybrid	T
D. Honey Maker	T
E. Waimanalo Long	UH

VI. LETTUCE - All Season

A. Great Lakes	T, P, PW, Y
B. Great Lakes 5A	T, P
C. Great Lakes 366	PW
D. Anuenue	U, H, Y
E. Green Mignonette	T, D, Y, UH

VII. ONION - All Season

A. Texas Early Grand 502	D, PW, Y
B. Early Harvest F1 Hy	D, PW
C. Granex Yellow	T, Y
D. Awahia	U, H
E. Tropic Ace	T

VIII. BEETROOT - All Season

A. Early Wonder	D, PW, Y
B. Tall Top	D

IX. CLIMBING BEAN - All Season

A. Mangro	Taiwan
B. Snake Bean Green	Taiwan, Y
C. Dwarf White	Taiwan

- | | | |
|-------|--|-------------|
| D. | Hawaiian Climbing | T, UH |
| E. | Yard Long | D, Y |
| X. | <u>BUSH BEAN</u> - All Season | |
| A. | Cherokee | T, D |
| B. | Seminole | D, Y |
| C. | Contender | D, Y |
| D. | Tender Crop | T, D |
| E. | Top Crop | D, Y |
| XI. | <u>SWEET CORN</u> - All Season | |
| A. | Golden Cross Bantan (open pollinated) | T, D, Y |
| B. | Hawaiian Sugar | UH |
| XII. | <u>CARROT</u> - All Season | |
| A. | New Kuroda | T, PW |
| B. | Touchon | D, PW, Y |
| C. | Top Weight | Y |
| D. | Manchester Table | Y |
| E. | Chantenay Red Cored | T, D, PW, Y |
| XIII. | <u>CUCUMBER</u> - All Season | |
| A. | Top Marker | T |
| B. | Market King | T |
| C. | Southern Cross Hybrid | T, D |
| D. | Yard Long | D |
| E. | Hybrid Gemini | D, P |
| XIV. | <u>CAULIFLOWER</u> - All Season | |
| A. | Snow Peak | T |
| B. | Snow King | T |
| C. | Puakea | U, H |
| D. | Tropical Cauliflower | T, Y |
| E. | Snow Queen | T |
| XV. | <u>ROCKMELON, MUSKMELON</u> - All Season | |
| A. | Summer Dream | T |
| B. | Gulf Stream | D, P |
| C. | Golden Crispy | T |
| D. | Hales Best PR 45 | T, D, P, Y |
| XVI. | <u>OKRA</u> - All Season | |
| A. | Clemson Spineless | T, D, PW, Y |
| B. | Dwarf Long Pod Green | D |
| C. | Perkins Mammoth | D |
| D. | Gold Coast Dwarf | D |
| E. | White Velvet | D |

XVII. PEAS - Winter

A. Laxton Progress	D
B. Manoa Sugar (Edible-podded) Summer	D
C. Victory Freezor	D, Y
D. Dwarf Alderman	T, D
E. Green Arrow	D

XVIII. PUMPKIN - All Season

A. Queensland Blue	D, Y
B. Gold Turban	D
C. Tetsukabuta Hybrid	T, Y

XIX. RADISH - All Season

A. Japanese Wakayama	T, D
B. Summer Cross 2	T
C. Cross Chinese	D
D. Tana Cross	T

XX. NEW ZEALAND SPINACH - All Season

A. New Zealand	D, PW, Y
----------------	----------

XXI. SILVER BEET - All Season

A. Ford Hook Giant	D, PW, Y
--------------------	----------

XXII. WATERMELON - All Season

A. Empire No 2	Taiwan
B. Candy Red	Y
C. Sugar Swika	T
D. Charleston Grey	D, P, Y
E. Sugar Baby	D, P, Y

XXIII. ASPARAGUS - All Season

A. U.C. 66	D, PW
B. U.C. 72	D, PW
C. Mary Washington 500	D, PW, Y

XXIV. STRAWBERRY

A. Florida 90	Govt. Expt. Farm.
---------------	-------------------

VII. FIJIA. VARIETY TRIALS1. French beans

An evaluation of varieties confirmed that Contender was the best variety of those under test.

Contender	4.9 mt/ha
Tender Green	4.2
Suva Green	4.1
Top Cross	3.7
Redland Pioneer	3.5
Bush Blue Lake	2.8
Golden Wax	2.7

2. Head cabbage

Variety trials were conducted during the year with large variations in yield, but in all cases the hybrid cabbages K.K., K.Y. and Express Cross 60 were higher yielding than the standard varieties grown. The results are summarized below.

Date & Place sown	Sigatoka Research Station			Koronivia
	May	June	August	June
K.K. Cross	15.1	25.1	41.9	18.9
Express Cross 60	17.3	24.6	31.6	19.1
K.Y. Cross		16.3	23.6	16.3
Early Yoshin Summer		16.2	8.9	11.6
Succession		5.8	0.0	14.4

The varieties K.K. Cross and Express Cross 60 are preferred to K.Y. Cross which is susceptible to black rot, as well as being lower-yielding.

3. Tomato

Two trials were grown as ground crops during the cool season; over 50 varieties, or selections were screened. Because of bacterial wilt, the results of these trials are not reliable indicators for many of the presently available commercial varieties.

Practically all varieties supplied through the South Pacific Commission were not resistant to bacterial wilt, the only varieties which had promise being VC 11-1 U.G., 7557, L.1, Harbot.

Selections which were obtained by the Department of Agriculture from overseas research and plant breeding stations showed that resistance to bacterial wilt disease is available, although the suitability of these lines for commercial production is limited at present by the rather small fruit size, and softness and variability of the fruit.

Selections have been made from the resistant lines where there is generally segregation for plant type, leaf disease resistance and fruit size, and these will be evaluated in later plantings, with an attempt to stabilize the segregating lines.

The problem is still to find a bacterial wilt-resistant variety which will produce firm moderately-sized fruit and crops under both cool dry, and hot humid conditions which are experienced in lowland tropics.

Tomato varieties: mean marketable yield mt/ha from two screening trials at Sigatoka Research Station planted May and July

A. Commercial Varieties

Red Cloud (Yates N Z)	0.9
Red Cloud (Coopers)	0.6
Red Cloud (Andersons)	4.2
Roma	1.8
Grosse Lisse	2.1
Indian River	1.3
Strobelle	1.3
Bounty	2.8
Burnley Gem	3.4
Fengshan Manalee	1.0
Floradel	1.2
Floralou	1.7
U. H. No. 5	0.6
U. H. No. 69	2.0
U. H. No. 63	3.6
Mighty Boy	1.6
No. 51	0.8
No. 49	0.7
Saturn	2.2

B. Non Commercial Lines & Selections

V. C. 48-1	5.9	V. C. 11-1 U. G. Local selection	15.9
C. I. -22-0-1-18-0	4.4	7557	5.0
7526 E	4.6	OTB ₂ Mass U. F. 4	7.5
7557/7539	1.8	III Irai Mass U. F. 2	2.2
V. C. 11-1 U. G.	9.3	Harbot	5.2
C. 10-0-4-1-0	5.9	L. 1	3.8
CRA 74	4.85	ASS No. 2	4.6

C. A number of other varieties were grown as single row observation plots. These are listed and those marked * are considered worth further investigation as bacterial wilt-resistant lines

Kewalo	Puunui
BWN 21	V548
72 CA 900-1-5*	VC 11-1 UG Large Round Selection*
72 CA 530-3-6-2-1*	Piersol
72 CA 633-1*	YRNF 2
VC 11-1 UG Large Fruit Selection*	Napol I
Anahu	Sunblight

4. Cucumber

A total of 8 separate variety trials was harvested during 1975.

The mean yield in mt/ha for the varieties grown is shown in the table below. It can be seen there was a wide variation in yield as a result of the different planting times.

The presently recommended varieties, Supermarket, Polaris and Ashley, all yielded well, with the new varieties, New Market 1, Hybrid Early Perfection, Hybrid Early Market Hybrid Burplus No. 33 all showing promise

The variety Pixie however appears to be a pickling cucumber, as it has short blocky fruits, and is not as suitable as others for fresh market.

Mean marketable yield (mt/ha) of a number of cucumber varieties

Date sown Variety	1974	1975							
	21/11	15/1	27/2	30/4	23/6	10/7	3/9	10/10	Average
Polaris	2.4	22.6	21.3		20.2	11.3	12.6	12.0	15.0
Ashley	1.0	15.5	23.1	0.4		5.5	18.5	15.8	11.4
Green Gem	4.0	27.6	18.4	0.3	13.5	11.5	19.7	16.1	13.9
New Market 1	2.2	19.9	19.4	4.8	16.7	8.5			11.9
New Market 2	1.6	10.1	8.8	2.8	13.4	8.0			7.4
Pixie	4.1	28.8				8.7	34.1	9.4	17.0
Table Queen	1.4	18.7		1.6			11.2	4.5	7.5
Supermarket	1.1	13.0	19.2	0.6	10.1	12.9	11.5	8.3	9.6
Hybrid Early Perfection				7.4	25.0	14.5	22.3	8.7	15.6
Hybrid Early Market			22.9	0.4	12.9	9.2			11.3
Kyoto Three Feet			16.3	3.2	14.9	10.6	12.3	7.2	10.7
Armenian Yard Long			0.7	0.1			1.3	13.7	3.9
Top Market				3.2					
Southern Cross				6.3	19.2	9.4			11.6
Hybrid Burplus No. 33				5.5	21.7	14.5	19.2	6.3	13.4
Money Maker Special					10.5	10.4	4.1	11.5	9.1
Revel						9.1			
Stono						4.1	15.2	6.6	8.6
Polaris D. P. M.							19.3	2.7	11.0
Hybrid Comanche							21.7	12.5	17.1

5. Carrots

Of the varieties tested the mean yields obtained were:-

New Kurume	8.2 mt/ha
Long Type Chantenay	8.1
New Kuroda	7.8
Western Red	5.0
Chantenay Red Cored	4.6
Manchester Table	3.9
Imperator No. 58	3.6

These yields are low, and replacing the presently recommended varieties such as Manchester Table and Chantenay Red Cored should not be considered at present.

6. Capsicum

In a variety trial which was affected by bacterial wilt, yields obtained were:

Yolo Wonder	7.4 mt/ha
Hybrid New Ace	5.5
Ruby King	4.5

7. Eggplant

The preference is for a local selection, which although late-maturing has a high yield. The new varieties, especially those from Japan which are dark purple-skinned, although quick-maturing were not preferred by many people.

Local Purple (Sig. Res. Stn. Selection)	45.7 mt/ha
Pusa Kranti	35.3
Kurume Long Plant	25.0
Waimanalo Long Purple	24.1
Black Torpedo	21.3
Money Maker	19.8

The varieties Black Torpedo, and Money Maker were subject to moderate bird damage, while Florida Bush and in one case Money Maker, were susceptible to bacterial wilt.

8. Lettuce

Three variety trials gave wide yield differences between trials. The average yields for the more promising varieties are given below:

Great Lakes 118	26.5 mt/ha
Great Lakes 16	23.8
Yatesdale	22.7
Great Lakes 54	21.9
Penn Lake	20.6
Minetto	16.9
Anuenue	15.4

All the above varieties formed reasonably firm heads for which there is a local demand. The butter head type lettuce and leaf lettuce, such as Green Waya head, Salad bowl, or Butterking do not find a ready market.

B. CHINESE CABBAGE FERTILISER TRIAL

In these fertiliser trials with variety Pak Choi Kwana Moon, 300 kg/ha of 1-3-1 basal fertiliser (Urea-Superphosphate-Potassium Sulphate) significantly applied 1 day prior to transplant increased the yield to 11.6 mt/ha compared to 8.1 mt/ha for no basal fertiliser.

Urea applied at 100 kg/ha 4 and 6 weeks after transplanting significantly increased marketable yield over no urea to 12.6 as against 7.4 mt/ha. There was no significant interaction between the urea and basal fertiliser.

C. SNAKEBEAN STAKING TRIALS

A staking and netting trial at Koronivia Research Station showed that growing snakebeans on stakes and netting the crop resulted in significantly higher yields. The yields obtained were as follows:

(a) Snakebeans grown on the ground	18.93 mt/ha
(b) Snakebeans grown on the stakes	64.13
(c) Snakebeans grown without nets	30.33
(d) Snakebeans grown with nets	52.70

In two staking trials conducted at Sigatoka Research Station, it was found that by the staking of the snakebeans, the yield was significantly increased (3.55 mt/ha for staked beans; 1.70 and 1.53 mt/ha for beans grown on the ground).

D. POLE BEAN SPACING

In a trial to investigate the effects of spacings on the yield of pole bean variety Shiny Fardenlosa, it was found that the two closer spacings (100,000 and 200,000 plants/ha) significantly increased the yield (6.00 and 5.80 mt/ha resp) compared to the wider spacing of 33,000 and 50,000 plants/ha (4.60 and 4.25 mt/ha).

E. DWARF BEAN SPACING TRIAL

In a spacing and rate and time of urea application trial, it was found that closer planting and application of urea produced significant increases in yield. The optimum yield of 12 mt/ha was obtained at the spacing of 200,000 plants/ha and this was significantly higher than the yield (8.5 mt/ha) at the spacing of 33,000 plants/ha used by the farmers. Side-dressing with 200 kg/ha of urea led to a significantly higher yield (12 mt/ha) compared with no urea treatment (10 mt/ha).

F. ENGLISH CABBAGE SPACING TRIAL

An investigation was carried out into the effect of different spacings on the yield of the cabbage variety K.Y. Cross.

There was a significant increase in marketable yields at the closer spacings with the optimum yield (27.0 mt/ha) being obtained at the intermediate spacing of 56,000 plants/ha. This yield was significantly greater than the yield (11.5 mt/ha) obtained at the spacing usually used in commercial production in Fiji i.e. 28,000 plants/ha.

G. HEAD CABBAGE VARIETY X BASAL FERTILISER X UREA TRIAL

In a trial comparing different varieties on 4 levels of basal 1-3-1 fertiliser and 3 levels of urea side-dressing, it was found that

- (a) the variety K.K. Cross yielded significantly better than either Succession or Early Drumhead (31.88 Mt/ha against 13.55 mt/ha and 14.06 mt/ha respectively).

- (b) Application of 200 kg/ha of urea significantly increased the yields, compared with the other treatments of 100 kg/ha and 0 kg/ha (16.77 mt/ha against 14.51 and 13.35 mt/ha respectively,).
- (c) No significant results were obtained with the basal fertiliser treatments.

VIII LIST OF SOME VEGETABLE SEED COMPANIESAustralia

Arthur Yates & Co. Ltd
P. O. Box 147
DARRA
Queensland 4076

or

Arthur Yates & Co. Ltd
P. O. Box 72
REVESBY
New South Wales 2212

Andersons Seeds Ltd
90 Paramatta Rd
P.O. Box 30
SUMMER HILL
New South Wales

France

Graines d'élite Clause
91220, BRETIGNY-SUR-ORGE

Georges Truffaut
108-114 Avenue de Paris
VERSAILLES

Vilmorin Andrieux
B.P. 61
75 012 PARIS

Japan

Fujita Seed Co. Ltd
P. O. Box 211
93 UMEDACHO
OSAKA

Takii Seed Co. Ltd
Kyoto Central
P.O. Box 7
KYOTO

New Zealand

Arthur Yates
Lower Albert St
G.P.O. Box 1109
AUCKLAND

Taiwan

Topgreen Enterprise Co. Ltd
P.O. Box 468
KAOHSIUNG

Known you nursery and Seed Production Co.
26, Chung Cheng 2nd Rd
KAOHSIUNG

Philippines

B. M. Domingo & Co. Inc
414 Padre Rada St
Divisoria Area
MANILA

U. S. A

Dessert Seed Co. Inc
P.O. Box 187
EL CENTRO
California

W. Atlee Burpee Co.
PHILADELPHIA
Pennsylvania 19132

Peto Seed Co.
P.O. Box 4206
SATICOY
California 93003

ISSUED IN THIS SERIES

	<u>Classification</u>
1. Annual Conference of O.I.E. held in Paris 13th - 18th May, 1968. Report of S. P. C. Observer. September 1968.	Livestock Production and Health
2. South Pacific Commission Publications Series. October 1968.	Publications
3. Free Diving Without Breathing Apparatus - Its Accidents. March 1969.	Public Health
4. "A" Level: Australia's Notification on Bovine Pleuropneumonia Regulations. March 1969.	Plant and Animal Quarantine
5. Study Tour to Noumea, Brisbane, Territory of Papua and New Guinea and British Solomon Islands Protectorate. March 1969.	Tropical Crops
6. "A" Level: Agricultural Education - Bulletin N° 1. April 1969.	Agricultural Education and Extension
7. Introduction and Spread of Culicoides and Other Insect Species by Aircraft. May 1969.	Public Health
8. Diarrhoeal Diseases in Adults. May 1969.	Public Health
9. "A" Level: Agricultural Education - Bulletin N° 2. May 1969.	Agricultural Education and Extension
10. "A" Level: Agricultural Education - Bulletin N° 3. November 1969.	Agricultural Education and Extension
11. Agricultural Extension Workshop - Western Samoa. November 1969.	Agricultural Education and Extension
12. Asian-Pacific Weed Science Society. December 1969.	Tropical Crops
13. The Status and Potential of the Chilli Industry in the Solomon Islands. December 1969.	Tropical Crops
14. Manpower Planning in the South Pacific. March 1970.	All

- | | | |
|-----|--|---|
| 15. | Fibreglass Water Tanks. April 1970. | Public Health
Engineering |
| 16. | U.N. World Youth Assembly. May 1970. | Social Welfare
and Youth |
| 17. | News and Views from the Journals.
June 1970 | Public Health |
| 18. | Acute Rheumatism and Chronic Rheumatic
Carditis in Fiji. June 1970. | Public Health |
| 19. | Public Health Problems of Gonorrhoea
and Syphilis. June 1970. | Public Health |
| 20. | Clinical Aspects and Diagnosis of
Leprosy. June 1970. | Public Health |
| 21. | News and Views from the Journals 2 : On
Insects and Their Control. June 1970. | Public Health
Environmental Health
and Vector Control |
| 22. | Breadfruit Diseases in the South Pacific.
June 1970. | Tropical Crops |
| 23. | Second World Consultation on Forest
Tree Breeding. June 1970. | Forestry |
| 24. | Agricultural Research in the South Pacific
July 1970. | Tropical Crops
Livestock Production
and Health |
| 25. | Crown-of-Thorns Starfish. July 1970. | Fisheries |
| 26. | Counter-Attack - Crown-of-Thorns
Starfish. September 1970. | Fisheries |
| 27. | A Simple Field Test for Determination of
Salinity of Water Supplies. December 1970. | Public Health |
| 28. | Asian Coconut Community. January 1971. | Tropical Crops |
| 29. | O.I.E./F.A.O. Regional Conference on
Epizootics in Asia, the Far East and
Oceania. January 1971. | Livestock Production
and Health |
| 30. | Plant Pest Control. January 1971 | Tropical Crops
Plant and Animal
Quarantine |

- | | | |
|-----|---|---|
| 31. | The Effect of Cultural Method and Size of Planting Material on the Yield of <u>Colocasia esculenta</u> February 1971. | Tropical Crops |
| 32. | Shell-fish and Public Health. April 1971 | Public Health
Engineering |
| 33. | Weed Control. August 1971. | Tropical Crops |
| 34. | Taro. August 1971 | Agricultural Research |
| 35. | Transmission of Virus Samples. August 1971. | Plant and Animal
Quarantine |
| 36. | Amyotrophic Lateral Sclerosis and Parkinsonism-Dementia in Guam. September 1971. | Mental Health |
| 37. | Training Programmes for Out-of-School Rural Youth. March 1972. | Agricultural Education
and Extension |
| 38. | Control of <u>Aedes aegypti</u> , the Vector of Dengue. September 1972. | Vector Control |
| 39. | Coconut Water as an Emergency Parenteral Fluid. September 1972. | Public Health |
| 40. | Viral Hepatitis. October 1972. | Hepatology |
| 41. | Biological disc treatment of waste waters. December 1972. | Public Health
Engineering |
| 42. | The Monitoring of Sewage Treatment Plants. December 1972. | Public Health
Engineering |
| 43. | The Fifth FAO Regional Conference on Animal Production and Health in the Far East. December 1972. | Livestock Production
and Health |
| 44. | The Septic Tank. January 1973. | Public Health
Engineering |
| 45. | How to deal with the sludge produced by sewage farms in the South Pacific. January 1973. | Public Health
Engineering |
| 46. | The convenience of the metric system. February 1973. | Public Health
Engineering |

- | | | |
|-----|---|--------------------------------------|
| 47. | Useful References for Animal Production and Agricultural Extension Workers of the South Pacific Commission territories. March 1973. | Animal Production |
| 48. | Twelfth World Congress of Rehabilitation (Sydney, Aug. 27 - Sept. 1, 1972). March 1973. | Mental Health |
| 49. | Primary Amoebic Meningo-Encephalitis. April 1973. | Epidemiology |
| 50. | South Pacific Agricultural Extension Survey - 1967. April 1973. | Agricultural Education and Extension |
| 51. | Collection and Shipping of Serum Specimens for Antibody Studies. May 1973. | Public Health |
| 52. | Fruit Cultivation. June 1973. | Tropical Crops |
| 53. | Recent Developments in Education in the South Pacific. August 1973. | Education |
| 54. | Shellfish Poisoning in the South Pacific. February 1974. | Public Health
Fisheries |
| 55. | Special Project - Vegetable Production in the South Pacific. January 1974. | Tropical Crops |
| 56. | Comments on Experiments Recently Undertaken in some Pacific Islands on certain varieties of Vegetables. March 1974. | Tropical Crops |
| 57. | Regional Planning. March 1974. | Economic Development |
| 58. | Some Aspects of Pasture Research and Development. April 1974. | Livestock Production |
| 59. | Something New in Sewerage : The Bio-drum. September 1974. | Public Health |
| 60. | Solar Energy. Economic appraisal of a solar water heater. November 1974. | Public Health |
| 61. | Sewage Treatment in the Pacific - Mini Glossary of Terms Used. November 1974. | Public Health |

- | | | |
|-----|---|---------------------------------|
| 62. | Potential of Animal Feed Production in Western Samoa. November 1974. | Livestock Production and Health |
| 63. | Names of Food Plants in Niue Island (South Pacific). November 1974. | Nutrition
Tropical Crops |
| 64. | Some Effects of Temperature on Pasture Germination and Growth. April 1975. | Livestock Production and Health |
| 65. | The Marketing of Fresh Vegetables. May 1975. | Vegetable Production |
| 66. | Special Project on Vegetable Production - Results of 1974 Variety Trials. June 1975. | Tropical Crops |
| 67. | Principal 1974 Vegetable Growing Results for the Pirae Agricultural Research Station, Tahiti (French Polynesia). June 1975. | Tropical Crops |
| 68. | Evaluation of Broiler (Meat Chicken) Performance. September 1975. | Livestock Production and Health |
| 69. | Towards a Better Mosquito Control Policy. September 1975. | Public Health |
| 70. | Bronchiogenic and Lung Cancer in the South Pacific. September 1975. | Public Health |
| 71. | Preliminary Information on the Intestinal Parasites of Livestock in Tongatapu, Tonga. March 1976. | Animal Production and Health |
| 72. | Expérimentation fourragère en Polynésie Française. Mars 1976. (will not be issued in English). | |
| 73. | Vegetable trials in "Motu" environment, Huahine (French Polynesia). March 1976 | Tropical Crops |
| 74. | Diabetes Mellitus. April 1976. | Public Health |
| 75. | Observations on the Generation of Methane. September 1976 | Public Health |
| 76. | Results of 1975-76 soya bean trials in certain South Pacific Territories. October 1976. | Tropical Crops |

77. Pour une sociologie des maladies mentales
en Nouvelle-Calédonie (Will not be issued
in English)
78. Penicillin-resistant gonorrhoea. April 1977 Public Health
79. Viral Hepatitis, October 1977 Public Health