# HORTICULTURE

# IN THE FALKLAND ISLANDS

A FEASIBILITY STUDY

by

Margaret Davidson

Commissioned by the Government of the
Falkland Islands

# C O N T E N T S



/contd

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# FEASIBILITY STUDY FOR HORTICULTURE IN THE FALKLAND ISLANDS

## TERMS OF REFERENCE

A feasibility study for horticulture in the Falkland Islands. The study to cover "production methods, crops, marketing and distribution, and to take account of possible future expansion".

## INTRODUCTION

In following the Terms of Reference for this report, I have done so with an eye set most firmly on future expansion.

At present the government and the people of the Colony are seeking new avenues of diversification and development. Horticulture is seen as a part of this pattern of development and it is hoped that this report may provide guidelines for the development of the industry as a significant contribution to the gross national product.

## I. HISTORICAL SITUATION

### a. Home Gardens

There has been within the Colony a long tradition of cultivating home vegetable gardens. This has arisen largely out of necessity, as regular supplies of fresh fruit and vegetables have never been available to the general population. Most houses in Stanley have quite large gardens attached, and all 'camp' employees are allocated a garden area.

Larger consumers and institutions, e.g. Government House, Stanley House, the Hospital and hotel, have large gardens and usually employ a gardener.

### b. Commercial Growing

Stanley: In the mid 19th century ships, which were frequent callers in Port Stanley, were provisioned by locally grown vegetables. In 1851 Governor Rennie erected a special market place on the water-front where settlers with garden produce could lay out their goods so that ships, storekeepers and settlers could come and buy.

/Since those early days

Since those early days supplies have always been erratic. For a time there was a small property with glasshouses situated at Moody Valley which, from all accounts, supplied Stanley with tomatoes and other vegetables. Unfortunately, accurate details of production at this property are difficult to obtain.

Extensive cultivation was carried out by the Department of Agriculture on the Stanley Common area from 1940-47. During that period 273 tons of vegetables and 160 tons of cattle fodder were produced, largely to feed troops stationed in Stanley.

Stanley House gardens have been known to sell their surplus vegetables.

Camp: Keppel Island when run as a mission station, included a market garden enterprise. In 1877 the island was quoted as having 5 acres in cultivation yielding 30 tons of potatoes and 6 tons of turnips. The potatoes fetched £11 a ton in Stanley. Labour was provided on the farm by Yahgan indians from Tierra del Fuego and the produce from the gardens, together with dairy produce, meat and wool, were transported into Stanley by the station's boat, the 'Allen Gardiner'. Keppel mission station was self-supporting from the sale of its produce in Stanley.

Other 'camp' stations have been recorded as selling fresh vegetables, mainly potatoes, when the markets presented themselves. New Island grew to supply the whaling station situated there in the early days of this century. West Point, Carcass Island, Pebble Island and Dunbar House were also noted as locations for potato growing and selling.

In more recent years there have been fairly regular sales of potatoes at Hill Cove, Chartres, Roy Cove, Pebble Island and West Point Island.

Brassica crops, e.g. cabbage, cauliflower and turnips, are also occasionally sold in small quantities. Hill Cove and West Point are the two sites producing the widest range of crops for sale.

All of these locations are situated in the more climatically favoured NW quarter of the Islands. It is also significant to note that the extent of horticulture at any of these stations has varied enormously with the people currently employed and their inclination towards growing.

It is likely that most stations have from time to time had crop surpluses which they have traded among themselves or sent into Stanley.

/II. Current Situation

## II. CURRENT SITUATION

### a. Production

At present vegetables are grown commercially in the Colony at the following places:-

1. West Point Island: a wide range of vegetables grown on 1-2 acres;
2. Hill Cove: mostly potatoes and brassicas, expanding from 1977 into soft fruit;
3. Roy Cove: potatoes - not regular;
4. Chartres: potatoes - not regular;
5. Pebble Island: potatoes and occasional small quantities of other vegetables;
6. Small quantities of vegetables are supplied by private gardeners in Stanley to the Royal Marines, visiting ships and very occasionally to the hospital. Some surplus potatoes are sold.

From 1977/78 season, vegetables may be obtainable from Keppel Island, where the new owners are cultivating part of the old market gardens.

Most vegetables are sold direct to customers, with small amounts being retailed in Stanley. Transport is by air for perishable goods and by sea for heavier items.

Fresh vegetables and fruit are imported, by air and sea, principally from Argentina, for retail sale in Stanley.

### b. Consumption

In recent years people's incomes have increased markedly and their standard of living has increased accordingly. This has led to many people reducing or completely abandoning gardening activities; this is more apparent in Stanley than in 'camp'.

Consumers are now willing to buy vegetables if they are available, but due partly to a history of lack of supplies, convenience foods have become a large component of the local diet. Increasingly large quantities of tinned and dried vegetables are being bought, a nd instant potato powder is now used in large quantities.

Such a situation is undesirable from an economic, social and health point of view.

/ III. Crops

## III. CROPS

The Falkland Islands climate and soil conditions lend themselves to the production of an abundant supply of fresh vegetables and soft fruits.

The following is a list of crops which grow well and which could be readily produced on a commercial scale:

Potatoes, early and main crop
Carrots
Parsnips
Swedes and turnips
Lettuce, summer and autumn; spring with protected cropping
Radish
Spring onions
Leeks
Cabbage
Broccoli and cauliflower
Beetroot
Brussels sprouts
Tomatoes } with greenhouse conditions
Cucumbers }

### Availability of crops

(See Figure 1)

Figure 1 shows the seasons of availability of crops. It should be noted that protective cropping can greatly increase the season of some crops and can make the difference between availability and non-availability of other crops.

In addition, other vegetables are grown successfully on a small scale, but their commercial viability is questionable e. g. spinach, Swiss chard, peas, broad beans, rhubarb, mint and all hardy herbs.

Soft fruits grow well and strawberries, raspberries, gooseberries, red and black currants could be worth considering as a commercial proposition. Adverse climatic conditions and lack of suitable pollinating agents tend to prohibit the growth of tree fruits. Further trials using recently developed varieties would, however, be desirable.

/IV. Location

## IV. LOCATION

The Falkland Islands have a cool oceanic climate, typified by the high average wind speeds and the relatively small seasonal variations in temperature. However there is considerable climatic variation throughout the Islands.

### a. Winds

The prevailing winds are westerly. There is a high frequency of strong winds, but the proportion of gales is low. The planting of shelter belts can overcome the wind damage. The strongest winds occur during October and November, a period when rainfall is at its lowest; this can lead to dessication effects on crops and suggests the desirability of irrigation during the spring months.

### b. Sunshine

(See Figure 2)

It is apparent that sunshine hours are significantly higher in the West during the spring and summer months. The overall mean daily sunshine at Stanley is 4.5 hours, Fox Bay 4.7, West Point 5.0 hours.

### c. Soil Temperature

(See Figure 3)

It emerges from Figure 3 that the 10 cm soil temperature at West Point is consistently higher than it is in Stanley. If a soil temperature of 5.5°C is taken as a criteria for growth, the length of the growing season at Stanley and West Point is 26 and 33 weeks respectively. This is of most value in spring when early growth is essential. Similarly, there is a marked trend towards higher temperatures proceeding from East to West. In Stanley air frosts are uncommon in summer but can occur during any month. Ground frosts can occur throughout the year. At West Point Island, frosts are most uncommon from November to April.

### d. Rainfall

| | Mean Total |
|---|---|
| West Point Island | 459.4 mm |
| Hill Cove | 562.0 mm |
| Port Howard | 662.3 mm |
| Port Stephens | 586.7 mm |
| Fox Bay | 412.0 mm |
| North Arm | 398.9 mm |
| Stanley | 610.3 mm |

Rainfall is fairly evenly distributed throughout the year with the driest period during the spring months of September, October and November.

/In conclusion it can be said

In conclusion it can be said that as one proceeds westwards the climate becomes progressively more favourable for horticulture. This would partly account for the fact that all the current commercial growing is being carried out in the NW sector of the archipelago.

It is apparent from personal experience that climatic conditions at West Point impose very few limitations to growing the full range of crops described in the previous section, provided some form of shelter is available. From information obtained by correspondence it is clear that this is also true, with varying degrees of success, of most areas of the Islands.

## V. PRODUCTION

It is necessary to consider the organisation of the resources - land, labour and capital - in the horticultural context. All three resources are scarce and economically represent considerable expense. Production is generally geared to maximise profit; however this may, in practice, be considerably modified by the individual grower. In the Falkland Islands there is an emphasis on small scale growing - currently all growing represents a secondary source of income. It is noted that in some economically very advanced countries, e.g. Japan and Great Britain, horticulture is comprised of large numbers of small-scale growers.

### a. Land

With the exception of Keppel Island, which is owner-occupied, all growers are employees and the land they grow on is not owned by themselves. Growers in this position do not have security of tenure. In other countries horticultural holdings are traditionally owner occupied or tenanted on a secure lease.

Horticulture is not a short-term investment of resources. Many years of labour go into making a holding reach maximum profitability. In the Falkland Islands in particular the land is inherently acid and unproductive in its normal state. It would be unfair to expect an enterprising individual to invest considerable capital, time and development on property where his security of tenure was limited.

The subject of land tenure is being widely discussed in the Colony at the present time. Government have intimated some support for smaller farm units. Simultaneously, small units, perhaps as little as 4 hectare plus housing could be considered for offering as horticultural holdings. Alternatively some farms might consider leasing sections of land to prospective growers. It may be possible to arrange for part-time or seasonal labour with farms.

The key to expansion of the industry on a worthwhile scale is land availability and tenure.

/b. Labour

b. Labour

The following points are characteristic of horticultural labour:

1. Seasonal peaks. These occur at sowing/planting and harvest time. Unfortunately the most extended work peak (spring) coincides with peat-cutting and shearing, two important seasonal farm operations. Farming and horticulture are not always compatible from a point of view of division of labour.

2. Size of work force. Family holdings are the rule in many countries and will in all probability be so in the Falkland Islands. Hence the work force will be small. The seasonal peaks of labour could be met by use of women and children on holiday on a casual work basis.

c. Capital

To dato the investment of capital in horticulture in the Colony has been very low indeed. Capital is needed (a) to assist in land purchase and house construction, (b) to enable expansion to take place, (c) for replacement of equipment and plant, (d) to introduce new ideas.

The only current source of capital is the private sector. There are no lending bank facilities and no relevant government grants or loans currently available. It is considered that government help could be made available in this field with horticultural improvement grants or soft loans to enable prospective developers to establish a full-time holding and encourage others to increase their production.

d. Organising production

Production methods currently employed are very labour intensive. Some hand-operated rotary hoes are used and manure is generally collected and carted by tractor. Cultivation methods and cultivars used tend more to those typical of home gardens rather than of large commercial growers. Fertilisers are usually organic: cattle, sheep and hen manure. A little compost is made and some kelp used. If expansion takes place greater emphasis will probably have to be placed on compost and kelp. Inorganic fertilisers have been imported in small quantities but due to freight charges their cost is usually prohibitive.

/VI. Marketing and Distribution

## VI. MARKETING AND DISTRIBUTION

### a. Demand

It is often said by economists that nothing has value unless it is available in the right form at the appropriate place. This is as true of fruit and vegetables as of any other commodity.

For many people in the Falkland Islands, the virtual impossibility of obtaining fresh produce has led to an increased use of convenience foods. If horticulture is to expand in the Islands, this will be one of the difficulties to be overcome. Quality will have to be high and prices competitive - although the large increase in prices of tinned and dehydrated goods in recent years tend to favour home production.

It is likely that a regular supply of high quality produce at reasonable prices may influence the demand as it currently exists. People may be tempted to buy fresh as opposed to processed foods and those who already grow their own vegetables may make considerable economies in time and labour by growing less.

In order to make an estimate of demand, a questionnaire was compiled and circulated with the local newspaper. The response was small but nevertheless gave some indication of public demand. For a copy of the questionnaire and results, please see Appendix 1.

From the results it could be concluded that there is a good potential market for soft fruit and vegetables in Stanley. There is a small nucleus of self-sufficient gardeners and it appears that some people still grow their own potatoes after they have stopped growing other vegetables.

The demand for seedling plants is good, and although the demand for cut flowers, pot plants and a local "Interflora" service is lower, there is still considerable potential in this field. Consumers are not used to having these things but demand may well increase if they are made readily available.

### b. Price

Whilst it is desirable to keep prices competitive and as low as possible, a fair return must be ensured for growers.

/The level of prices

The level of prices has a far-reaching effect, influencing (a) what is produced: growers will naturally tend to produce what is most profitable; (b) how it is produced: high prices obtained in relation to costs may divert money into investments to improve cropping, e.g. greenhouses and machinery; and (c) distribution of produce: growers will usually dispose of their produce at the highest obtainable price.

Currently in the Colony supply is well below the level of demand. The following is a list of prices obtained ex-farm for produce in 1976/77 season.

NB: These prices do not include retail profit percentage or freight charges to Stanley.

| | |
|---|---|
| * Potatoes | |
| Early (March) | £10 per 100 lb sack |
| Main crop | £7/£8 per 100 lb sack |
| * Lettuce | |
| Nov / Dec | 20p per head |
| Jan / Mar | 15p per head |
| * Cabbage | 5p/7p per lb |
| * Cauliflower | 15p per head |
| Green broccoli | 20p per lb |
| * Brussels sprouts | 20p per lb |
| Swedes and turnips | 6p/8p per lb |
| * Beetroot | 15p per lb |
| * Carrots | |
| Early | 15p per lb |
| Main crop | 10p per lb |
| * Parsnips | 12p per lb |
| Radish | 10p per bunch |
| Spring onions | 15p per bunch |
| * Tomatoes | 35p per lb |
| * Cucumbers | 30p-50p each |
| * Leeks | 20p per lb |
| Parsley | 10p per bunch |
| Rhubarb | 10p per lb |

Those vegetables marked with an * were considerably under-supplied. All except potatoes and, to a lesser extent, cabbage, were only available in small quantities to Stanley

/consumers.

consumers. Most were not on general sale but supplied to a limited number of customers, making it difficult to estimate demand for individual crops. Larger quantities were sold to the Royal Marines and to visiting tourist ships.

By way of comparison the following prices were obtained at retail level for the vegetables listed here imported from Argentina during the winter months of 1977:

| | |
|---|---|
| Lettuce | 27p per lb |
| Cabbage | 18p per lb |
| Cauliflower | 35p per lb |
| Tomatoes | 44p per lb |
| Carrots | 20p per lb |

The above were brought in by air and were reported to be of very good quality.

Potatoes have been brought in by sea ex Mar del Plata. Prices for these have varied from as little as £4.70 per 100 lb bag to £14 per bag. Quality was sometimes poor.

Onions are imported at 10p-15p per lb and quality is usually good.

It appears that local producers do not as yet have to worry about their prices competing with those of imported vegetables.

Quality and disease control on imports, notably of potatoes, are aspects which also merit consideration. At present there are few diseases on potatoes in the Colony (see Appendix 3).

Possibilities exist to establish a seed potato industry in the Colony and it is therefore vital to ensure that the relatively disease-free status of our potato crop be maintained. Uncontrolled imports of potatoes from the South American mainland will endanger this position. Potatoes imported in Hessian sacks are also a potential danger regarding the introduction of foot and mouth disease into the Colony. It is also highly probable that pests and diseases could be introduced on other imported vegetables.

c. Transportation

c. Transportation

For the horticultural producer in the camp the following methods of transporting crops currently exist:

(i) Air. Air freight charges for fresh produce are half the standard freight charges, the following being currently applicable:

| | | |
|---|---|---|
| 11-lb box fresh produce | - | 23p |
| 22-lb box fresh produce | - | 45p |
| 30-lb box fresh produce | - | 75p |

Although these are extremely favourable rates, air transport has the following disadvantages:

(a) There is no regular guaranteed flight route: there can be up to 6-8 weeks between flights at some times of the year to some of the outlying islands, at least two of which produce vegetables;

(b) the spare carrying capacity of the aircraft is usually 30-50 lb;

(c) definite notification of available space cannot normally be given until a few hours prior to the aircraft's arrival.

In summary it can be said that although the air service is an excellent, reasonably priced mode of transport to market, it is primarily a passenger service and its freight capacity is limited.

(ii) Sea. The coastal vessel m.v.Monsunen is available to ship produce to Stanley. This vessel calls at most camp stations once every 2-3 months. Freight rates are high and upward revisions regular.

Current rates for transportation from Hill Cove and West Point Island are £15.14 and £16.98 per cubic metre respectively; the freight on a sack of potatoes shipped from West Falkland to Stanley can therefore cost approximately £1.50-£2. It is not practicable to send perishable produce, e.g.lettuce, by sea, as the vessel may take several days to reach Stanley.

It is important to note that a diversion fee/minimum freight charge of £68.36 is levied by m.v.Monsunen. (Freight rates as of October 1977).

The m.v.Forrest is operated on charter to the Royal Marines and usually collects vegetables directly from a farm for the Detachment.

There is currently no commercial growing on East Falkland with overland access to Stanley.

/Most of the growers

Most of the growers and potential growers approached considered the shortcomings of the current transport system a major limiting factor to the development of horticulture in the Colony.

d. Outlets

The current outlets for crops can be summarised as follows:-

(i) Local consumption - Stanley and Camp

Direct sale is the norm, with some small amounts through retailers. Camp consumption consists largely of potatoes. The market is undersupplied.

(ii) Institutional outlets - e.g. Royal Marines, Darwin School

Certain vegetables are undersupplied.

(iii) Construction and other firms -

There are from time to time a considerable number of outside contract and construction workers resident in the Colony. These markets are of limited duration, and are generally undersupplied.

(iv) Tourist ships - e.g. Lindblad Explorer, World Discoverer

The Lindblad Explorer is supplied at West Point Island; the World Discoverer and visiting Argentine vessels are not at present supplied with fresh produce.

(v) BAS and Naval vessels -

Some vegetables are supplied but demand is falling as ships tend to use a higher proportion of convenience foods.

Other vessels (such as the charter vessel and fishing trawlers) are not supplied at present; their marketing potential is unknown.

e. Marketing Systems

(Please see Figure 4)

From Figure 4 it can be readily seen that the marketing of produce in the Colony is simple in outline, the absence of wholesalers and dominance of direct sale being most notable. There are however some practical difficulties mainly related to transportation.

/Ideally the marketing system

Ideally the marketing system in the islands should embody the following:

(a) Marketing and distribution costs must be kept to a minimum/unit handled;

(b) quality and value of produce should be checked;

(c) a quick two-way reflection of changes in supply and demand;

(d) factual market information should be available.

Although the Islands have been settled for over one hundred years horticulture is still carried out on a rudimentary scale in the Colony. Marketing is often by direct sale. If expansion is to come changes will be necessary. If horticulture continues to be practised on its present limited scale, direct sale will remain the most profitable way to market crops. At present growers who sell produce direct receive between 80-90+% of the final retail price. It is worth noting that overseas it is usual for growers to receive approximately 40% of the final retail price. If horticulture expands (and consequently the volume of produce to be marketed expands) it will become necessary to create a retail outlet in Stanley.

Retailing

Retail mark-up is inevitably high on horticultural produce; this is understandable since fruit and vegetables are a perishable, bulky, high-risk commodity to handle. Three out of four retail outlets consulted in Stanley indicated they would be willing to handle local produce regularly: West Store, Philomel Store, Falkland Supplies. In addition, private individuals have indicated willingness to organise the retail sale of vegetables in town. Mark-ups requested varied from 10-30% after freight. Some retailers have in the past experienced problems of inconsistent supplies from producers, and would require a guaranteed arrangement. However on the whole shops were helpful and it is apparent that a retail outlet could be obtained fairly readily.

/VII. Future expansion

## VII. FUTURE EXPANSION

### a. Factors favouring expansion

There are several factors favouring future expansion of horticulture in the Colony -

1. the climate is favourable to the production of a wide range of crops;
2. the soil is suitable for horticultural purposes;
3. there are already resident people who are prepared to produce on a large scale;
4. there are adequate markets locally;
5. there is a possibility of future exports.

### b Factors limiting expansion

Against the above favourable points we could weigh -

1. the problems encountered in transporting the crop from producer to market;
2. the very limited availability of land for secure tenure or sale;
3. the limited availability of capital.

Recommendations to improve the situation concerning these three problems are proposed in section VIII.

### c. Direction of expansion

Growth could take place in two directions (a) expansion of the current growing situation as a secondary source of income, or (b) establishment of one or more full-time holdings, coincident with simultaneous encouragement for secondary growers. Assuming the latter to be the most likely and desirable position, it is possible to demonstrate the feasibility of growing units (a) in Stanley, and (b) on West Falkland.

/Example Holding 1

EXAMPLE HOLDING 1

Situation: Stanley

Land availability: 4 hectares + house on secure lease

One of the four hectares to be under intensive cultivation, the remainder for outbuildings, access to plots and grazing land for stock.

Since manure is not generally available in Stanley, kelp could be carted whenever possible. It would however be advantageous to either run the market garden in conjunction with stock e.g. pigs, house cows, hens, or in association with a modified Stanley dairy.

Labour: Grower + wife + casual labour at potato lifting

Crops grown:

| | | |
|---|---|---|
| Potatoes - Main crop | 0.4 hectare | |
| Carrots | 0.1 " | |
| Parsnips | 0.1 " | |
| Swedes | 0.05 " | |
| Cabbage | 0.05 " | |
| Lettuce | 0.05 " | Cloches and outdoors |
| Cauliflower | 0.1 " | |
| Broccoli | 0.1 " | |
| Spring onions | 0.1 " | |
| Other small amounts of special demand crops | 0.1 " | |
| Protected cropping | 0.5 " | |
| Polythene greenhouses 6 x 30 metre | Tomatoes<br>Cucumbers<br>Winter lettuce<br>Seedling plants | |

Remainder of area used for paths, shelter hedging, etc.

Markets:

Contracted to supply either Stanley school hostel and/or Royal Marines; some sales to visiting ships; 30% retail sales, 20% direct sales. Surplus and waste supplied as cattle fodder to Stanley dairy.

/Estimated gross returns

## Estimated Gross Returns

(For yield estimates see Appendix 2)

Final marketable yield taken as 80% gross yield for root crops, 60% for leaf crops.

| CROP | | GROSS YIELD | EST.RETURN |
|---|---|---|---|
| Potatoes | .4h | 15 ton @ £8/100 lb | £2,560 |
| Carrots | .1h | 4.5 " " 10p/lb | £ 800 |
| Parsnips | .1h | 3.2 " " 12p/lb | £ 670 |
| Swedes | .05h | 3.1 " " 8p/lb | £ 450 |
| Cabbage | .05h | 1,200 head @ 15p | £ 180 |
| Lettuce early (cloche) | .025h | 1,000 head @ 25p | £ 250 |
| Main crop | .05h | 3,000 head @ 15p | £ 450 |
| Cauliflower, Broccoli, Spring onion, Radish, Other small crops | .01h | Approx. | £ 300 |
| Protected cropping | 0.025h | | |
| 6x30m polythene greenhouses, | | | |
| Tomatoes | | 720 lb | £ 220 |
| Winter lettuce | | 1,500 head | £ 325 |
| Seedling plants | | | £ 50 |
| | | Estimated Total Gross Return | £6,255 |

/Example Profit & Loss Account

Example Profit & Loss Account

| Debit | | Credit | |
|---|---|---|---|
| Interest on loan | £ 250 | Sale of produce | £6,255 |
| Rent | 500 | | |
| Depreciation | 1,000 | | |
| Fuel | 300 | | |
| Labour | 400 | | |
| Seeds | 80 | | |
| Greenhouse covers | 180 | | |
| Polythene cloche covers | 50 | | |
| Seed trays & sundries | 50 | | |
| Sacks & containers | 150 | | |
| Protective clothing | 30 | | |
| Subscriptions | 20 | | |
| Stationery & postage | 20 | | |
| Profit to Form | £3,225 | | |
| | £6,255 | | £6,255 |

Initial Capital Expenditure

| | |
|---|---|
| *Tractor - 2nd hand | £2,500 |
| Cultivator - new | 800 |
| Windbreak fencing | 1,500 |
| Standard fencing | 3,000 |
| Greenhouses - six | 900 |
| Tools | 300 |
| Irrigation equipment | 100 |
| Cloches - polythene | 100 |
| Cold Frames | 100 |
| Glasshouse heater | 100 |
| | £9,400 |

*Tractor: if a new tractor is to be purchased its approximate cost FOB Stanley would be £6,000. It is possible that a locally purchased second hand tractor could be obtained for £1,000 or less. The cost quoted in the above expenditure account £2,500, is that estimated for a good second hand tractor ex United Kingdom, plus freight. In Stanley it may be possible to hire a plough and tractor and also a vehicle for manure carting, which would negate the necessity for a tractor.

/Conclusion

Conclusion

This grower would require an initial capital loan of up to £10,000, depending on availability of personal capital.

The depreciation allowance on machinery or plant from 1st January 1978 will be 25% of the written down value, thus enabling an article to be written off in eight years, leaving a 10% scrap value.

The estimated profit of £3,225 is considered sufficient for (a) an adequate income and (b) instalments on repayment of capital.

It is to be emphasised that the whole calculation is based only on one cultivated hectare of land. If the market were assured such a grower could contemplate expanding his cultivated area, using the same labour and machinery resources until a point of maximum profitability was reached. His private income could thus be considerably increased.

EXAMPLE HOLDING 2

Situation: West Falkland

Land availability: 4 hectares + house on secure lease

Labour: grower + wife and family.

Produce supplied to farm manager/owner, in return for provision of peat, meat and cows.

As in the foregoing example, only one hectare is initially considered under cultivation, the remainder being fallow and used for stock.

Crops grown:

| | |
|---|---|
| Potatoes - early | 0.4 hectare |
| Carrots - early (cloche) | 0.05 " |
| - Main crop | |
| Beetroot | 0.05 " |
| Parsnips | 0.05 " |
| Lettuce - early (cloche) | 0.05 " |
| - Main crop | 0.05 " |
| Cabbage spring/summer | 0.1 " |
| Cauliflower, Broccoli, Spring onions | 0.15 " |
| Radish, Other small crops | 0.15 " |

/Protected cropping

Protected cropping 0.025 hectare

3 x 30 metre polythene greenhouses:

Tomatoes
Cucumbers
Winter lettuce
Seedling plants

Remainder of the hectare used for paths and hedgerows, shelter hedging etc.

Markets

Summer crops (a) direct sale to two tourist ships, (b) contracted to directly supply Stanley School Hostel and/or Royal Marines with early season crops.

Retail sale to Stanley for early and late season crops, therefore utilising climatic advantages.

Estimated Gross Returns

| CROP | | GROSS YIELD | EST. RETURN |
|---|---|---|---|
| Potatoes | .4h | 10 ton @ £12/1001b | £ 2,112 |
| Carrots | .05h | 2.25 " " 10p/1b | £ 400 |
| Parsnips | .05h | 1.6 " " 12p/1b | £ 340 |
| Beetroot | .05h | 1.25 " " 12p/1b | £ 250 |
| Lettuce early | .05h | 2,000 head @ 25p<br>1,000 head @ 20p | £ 700 |
| Lettuce Main crop | .05h | 3,000 head @ 15p | £ 450 |
| Cabbage Spring | .05h | 1,200 head @ 15p | £ 180 |
| Summer | .05h | 1,200 head @ 15p | £ 180 |
| Cauliflower<br>Broccoli<br>Spring onion<br>Radish<br>Other small crops | .15h | Approx. | £ 800 |
| Protected cropping | .025h | | |
| 3 x 30m greenhouses, | | | |
| Tomatoes | | 3601b | £ 110 |
| Winter lettuce | | 750 head | £ 225 |
| Seedling plants | | | £ 100 |
| | | Estimated Total Gross Return | £5,847 |

Example Profit & Loss Account

| Debit | | Credit | |
|---|---|---|---|
| Interest on loan | £ 250 | Sale of produce | £ 5,847 |
| Rent | 250 | | |
| Depreciation | 1,000 | | |
| Fuel | 100 | | |
| Labour | - | | |
| Freight | 200 | | |
| Seeds | 80 | | |
| Greenhouses | 90 | | |
| Polythene cloche covers | 50 | | |
| Seed trays & sundries | 50 | | |
| Sacks & containers | 150 | | |
| Protective clothing | 30 | | |
| Subscriptions | 20 | | |
| Stationery & postage | 20 | | |
| Profit to Form | £2,557 | | |
| | £5,847 | | £ 5,847 |

Initial Capital Expenditure

| | |
|---|---|
| *Tractor, trailer and tools | £ 2,500 |
| Cultivator | 800 |
| Windbreak fencing | 1,500 |
| *Standard fencing | 1,000 |
| Greenhouses - three | 450 |
| Tools | 200 |
| Cloches - polythene | 100 |
| Cold Frames | 100 |
| Water piping | 500 |
| | £ 7,150 |

*Tractor: see note on Example Holding 1.
It is possible that a tractor might be hired for use if the holding were on or near a large camp station.

*Fencing: it is presumed here that some fencing and hedging already exists around the property.

Conclusion

This grower would require an initial capital outlay of £7,000. The estimated income from one hectare of cultivated land would be sufficient to ensure repayment of instalments on any loans.

/The advantages

The advantages of the location of this holding are threefold -

(i) the provision of early crops, e.g. lettuce and potatoes, to the local market

(ii) the ability to grow crops which do not succeed in Stanley, e.g. beetroot, Brussels sprouts

(iii) islands on West Falkland are visited by tourist ships making direct sales to such vessels possible.

There is considerable potential in early crops, and if tourism increases or access to local markets becomes easier, the area under cultivation could be readily expanded.

VII. d. Grower organisations

At present production in the Colony is in the hands of several uncoordinated growers. Even at the current stage of development, it may be worth considering the establishment of a co-operative. If a horticultural holding were established in Stanley, the proprietors would be in an ideal position to organise a co-operative of growers. In order to ensure its success however it would be necessary to take the following points into consideration:

(i) the co-operative must control either a large percentage or (preferably) the total supply, otherwise prices can be undercut, produce wasted and enterprises jeopardised;

(ii) there is often reluctance to pay for the services of a co-operative, which will usually make a deduction on a grower's market returns;

(iii) co-operatives have been a notable success in countries like Denmark and The Netherlands but less so in the United Kingdom, where independence seems to carry a higher value. In the Falkland Islands there is a tradition of individualism and this may limit the success of a co-operative.

One alternative to a co-operative would be a government-operated marketing board exercising a monopoly and controlling price stability. It would be worth considering the formation of such a board if horticulture expanded to a larger scale and exports of fresh produce began.

/e. Exports

e. Exports

Although it may seem premature in a situation of under-supply to contemplate exports, there are some possibilities that could justifiably be considered at this stage:

(i) Comodoro Rivadavia, which is connected to Stanley by a regular air link, is situated in an arid area of Argentina and has therefore to freight in its fruit and vegetables from other regions. It is possible that some highly perishable crops, e.g. lettuce, soft fruit, might be exported there;

In addition certain crops of limited market locally, e.g. rhubarb and herbs such as parsley, mint and dill, may be marketable in South America.

(ii) The FIC charter a vessel which visits the Colony four times a year ex UK. Although freight rates are considerable, consideration of the export of high value small bulk frozen crops (e.g. herbs) may yield some value.

(iii) It is important to note that all Falkland crops are usually, through necessity, "organically grown" - that is without the use of chemical fertilisers, insecticides, fungicides and herbicides. Such crops can command premium prices, and there are health food stores and restaurants which only utilise such produce.

(iv) Seed potatoes: the potato crop in the Colony is largely free from tuber-born diseases, and the Islands are an area completely free from virus diseases and could be suitable for the production of seed potatoes for export.

Potato root Eelworm is present in the soil in many Stanley gardens and at Green Patch but there are no recorded outbreaks outside those areas.

Other problems include skin spot (Cospora pustulans) and various storage disorders. Virus diseases appear to be absent. It is possible that if a market could be assured and with some technical assistance, that a seed potato certification scheme could be set up, along the lines of that operating in Great Britain. Assistance in marketing and certification might be sought from the International Potato Centre in Lima, Peru and from the Potato Seed Certification Boards in Scotland and Northern Ireland.

At present the possibility of an export market of seed potatoes to Argentina is being actively pursued.

/f. Technical assistance

f. Technical Assistance and Education

Horticultural advice is not normally available in the Colony and although currently members of the Grassland Trials Unit are of great help and encouragement, their presence in the Falklands is still only of a temporary nature.

Horticulture could prosper in the Colony without any technical assistance, but would benefit greatly if a permanent Agricultural Department could be established, with horticultural advisory work as part of its terms of reference. The establishment of an Agricultural Department is one of the recommendations of the Shackleton Report.

Much work needs to be done on varietal trials, use of locally available organic and inorganic manures, raising of trees and shrub seedlings etc. The administration of any development programme would come under an Agricultural Department as suggested above, and guidance on specialist matters could be sought from A D A S in Britain.

Education in the Colony is currently under review, and this would be a good opportunity to consider biological and agricultural subjects, which at present are not sufficiently emphasised in the curriculum. A "school garden" has in the past been cultivated in Stanley for the benefit of local children; this part of the curriculum could be considerably extended and formal lessons instigated for both the younger and older children. Visits to Stanley Gardens, large and small, and even trips to camp stations embarked upon horticultural development could be arranged for interested children. The latter could readily be combined with farm visits, demonstrations, and realisation of the tourism potential of the Islands' wild life.

Young people who show an aptitude for horticulture could be encouraged to spend time gaining practical experience on horticultural holdings in the Colony, and if desirable could receive further training experience, eventually overseas. The Horticultural Education Association in Britain would be able to supply guidance on further academic progress.

/ VIII. RECOMMENDATIONS

## VIII. RECOMMENDATIONS

In order to encourage development of horticulture in the Colony, the following measures are considered desirable:

### a. HORTICULTURAL DEVELOPMENT PROGRAMME

It is recommended that Government adopt a FIVE YEAR DEVELOPMENT PERIOD for horticulture in the Colony; within that period, that every encouragement be given to persons who wish to grow produce both as a primary and secondary source of income.

#### (i) Land

Government should review the land situation around the Stanley area, with a view to making available a property suitable for horticultural development.

Also, that encouragement be given to camp stations to offer secure leases and the opportunity for development of growing by interested persons.

In this initial phase of development it is felt that the Colony could support two full-time market gardens, much as outlined in the two example holdings. It is recommended that in addition, part-time growers be encouraged to produce a range of crops to make up any deficit in supply.

#### (ii) Capital assistance

It is recommended that Government make available capital loans as part of the Horticultural Development Programme. These loans should be on favourable terms of interest and should include a period of grace before repayment. Persons wishing to make use of the loan facilities would be required to submit details of their proposed development to Government for approval.

Government could also consider the possibility of direct grants. These can often have the advantage of directing money to the point of real need, e.g. purchase of machinery, greenhouses etc. Usually such grants are a percentage of the final costs. In Britain for example the Horticultural Improvement Scheme offers direct grants for one third of the total cost of re-equipping and modernising holdings. If applicable here, applicants for such grants would be required to meet certain standards.

/(iii) Horticultural Incomes

(iii) Horticultural Incomes

It is desirable that Government keep a check on the incomes of any horticultural producers. It is desirable that these be kept at least at Colony average level - preferably above - otherwise there will be no attraction to the industry.

Government aid for agriculture and horticulture is widespread in other countries. If difficulty is experienced in maintaining an adequate income for producers, market intervention by means of support buying may be desirable as a short-term solution to the problem. Tariffs, minimum import prices or perhaps even total embargo may also be considered if imported vegetables become unduly competitive in price and quantity. Although there are no problems in this field at present, the whole question should be kept under review.

b. TRANSPORTATION

As shown in section VI. c), transportation is a major problem for growers situated in camp settlements. Currently there is a possibility that road development on East Falkland may proceed, and obviously a market garden situated near such a road would be a logical development. However it is felt that the climatic advantage of the west and NW sector of the Islands are considerable and, as all commercial growing is currently situated in that area, it is considered essential to improve the transport system in this sector of the archipelago in order to encourage development.

It is felt that the following recommendations would considerably improve the situation:

(i) Air transport

It is recommended that the current half freight rate for fresh produce be maintained. In addition, consideration should be given to more frequent calls at settlements having horticultural produce suitable for air freight, e. g. early lettuce and soft fruits. Close co-ordination between growers and pilots to plan the most efficient usage of space will be essential. It may be possible to arrange, for example, two extra calls to be made at a station during October (perhaps while routine mail-dropping?). This would enable early greenhouse lettuce to be sent in to Stanley for sale. Such arrangements could greatly increase the availability of vegetables and fruit for consumption in Stanley, and they would also encourage growers to produce a wider seasonal range of more perishable crops, making full use of climatic advantages.

/The introduction of larger

The introduction of larger land-based aircraft is currently under consideration; such 'planes have larger freight carrying capacity and could therefore help alleviate transportation difficulties.

(ii) Sea transport

At present the main limitations of sea transport from a horticulturalist's point of view are the infrequency of calls and the high freight rates.

Coastal Shipping Ltd are currently experiencing a period of financial difficulty and it would be unrealistic to expect them to reorganise their schedules to collect relatively small amounts of horticultural produce. However, it would be advantageous to consider that most heavy produce, e. g. potatoes, carrots etc., are ready in the Autumn months (April/May). Such seasonality of production could be accounted for in the forward planning of itineraries. Similarly, if the vessel is in the vicinity of a holding when a relatively large amount of produce is available for shipment, a request for the vessel to call could be granted without the usual high diversion fee being levied.

In respect of freight rates, it is desirable that a system similar to that operated by the Air Service be adopted, and that half freight rates be instigated for fresh produce.

c. PLANT HEALTH REGULATIONS

It is considered imperative that the relatively disease-free status of most crops in the Colony be maintained. Importation of agricultural and horticultural produce of any kind contains an inherent risk that foot and mouth virus may be present on the produce and packing materials. Accordingly it is recommended:

(i) that the importation of all potatoes be forbidden;
(ii) that the quality of all other imported fruit and vegetables be closely checked, and that any sub-standard produce or any showing signs of disease be sent back to the point of origin or destroyed;
(iii) that only certified potato seed be allowed entry into the Colony.

/d. TECHNICAL AID

d. TECHNICAL AID

It is recommended that if an Agricultural Officer is appointed he should have some understanding of horticultural production, and that he should help co-ordinate development in the Colony. Such an officer could initiate trials and experiments in Stanley and throughout the Colony.

Should it become apparent in the five-year development period that interest in horticulture is going to be considerable, then Government might consider the appointment of a Horticultural Field Officer with combined teaching duties. Such an appointment would have to be made in the light of response. If an officer is not appointed then Government could make funds available for worthwhile experiments in the horticultural field by private individuals involved with commercial horticulture.

Immediate advice will be needed in the next few years on such subjects as mechanisation, irrigation, cultivars and varieties, as well as quality control.

It is hoped that the GTU will continue to give valuable aid and advice to growers during the remaining period of their employment in the Colony.

e. EDUCATION

It is recommended that horticulture be introduced into the school curriculum, and that cultivation of the school gardens be resumed. Visits to gardens and commercial holdings should be encouraged. The Education Department could consider the purchase of a small polythene greenhouse and other forms of protective cropping for demonstration purposes.

/SUMMARY OF RECOMMENDATIONS

## SUMMARY OF RECOMMENDATIONS

1. That Government adopts a FIVE YEAR HORTICULTURAL DEVELOPMENT PROGRAMME.

2. That Government reviews the land situation around Stanley with a view to making available a property suitable for horticultural development.

3. That farm owners be encouraged to offer land on secure leases for horticultural development.

4. That Government makes available capital loans on favourable terms, and/or direct grants.

5. Air Transport. That the half freight rate for fresh produce be maintained, and that the possibility of extra calls at settlements to collect produce be considered.

6. That closer co-operation be established between Coastal Shipping Ltd and growers for collection of produce.

7. That the freight rate on sea transportation of fresh produce be at half the normal rate.

8. That the importation of all potatoes be forbidden.

9. That a closer check be kept on the quality of all other fruit and vegetable imports.

10. That only certified potato seed be allowed entry into the Colony.

11. That any future Agricultural Officer has horticulture within his compass of activities, If response during the development period merits it, a full-time Horticultural Field Officer/teacher appointment might be considered.

12. That horticulture be introduced in the curriculum of Colony schools.

m.

Figure 1

## VEGETABLE CROPS - SEASON OF AVAILABILITY

| | JUL | AUG | SEP | OCT | NOV | DEC | JAN | FEB | MAR | APR | MAY | JUN |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Lettuce | - | - | - | P | P | P | O | O | O | O | P | P |
| Spring Onions | - | - | - | - | P | P | O | O | O | O | P | P |
| Radish | - | - | - | P | O | O | O | O | O | O | P | P |
| Potatoes | S | S | S | S | S | S | Early O | O | O | O | O | S |
| Carrots | O | O | S | S | - | P | O | O | O | O | O | O |
| Parsnips | O | O | S | S | - | - | - | - | O | O | O | O |
| Swedes & Turnips | O | O | S | S | S | O | O | O | O | O | O | O |
| Cabbage | O | O | O | - | O | O | O | O | O | O | O | O |
| Cauliflower & Broccoli | O | - | - | O | O | - | - | - | O | O | O | O |
| Leeks | O | O | O | O | O | - | - | - | - | - | O | O |
| Beetroot | - | - | - | - | - | - | O | O | O | O | - | - |
| Brussels Sprouts | O | O | - | - | - | - | - | - | - | O | O | O |
| Tomatoes | - | - | - | - | - | - | P | P | P | P | - | - |
| Cucumber | - | - | - | - | - | - | P | P | P | - | - | - |

KEY: O = Outdoors
S = From Storage
P = Protected Cropping

FIGURE 2

MEAN DAILY SUNSHINE

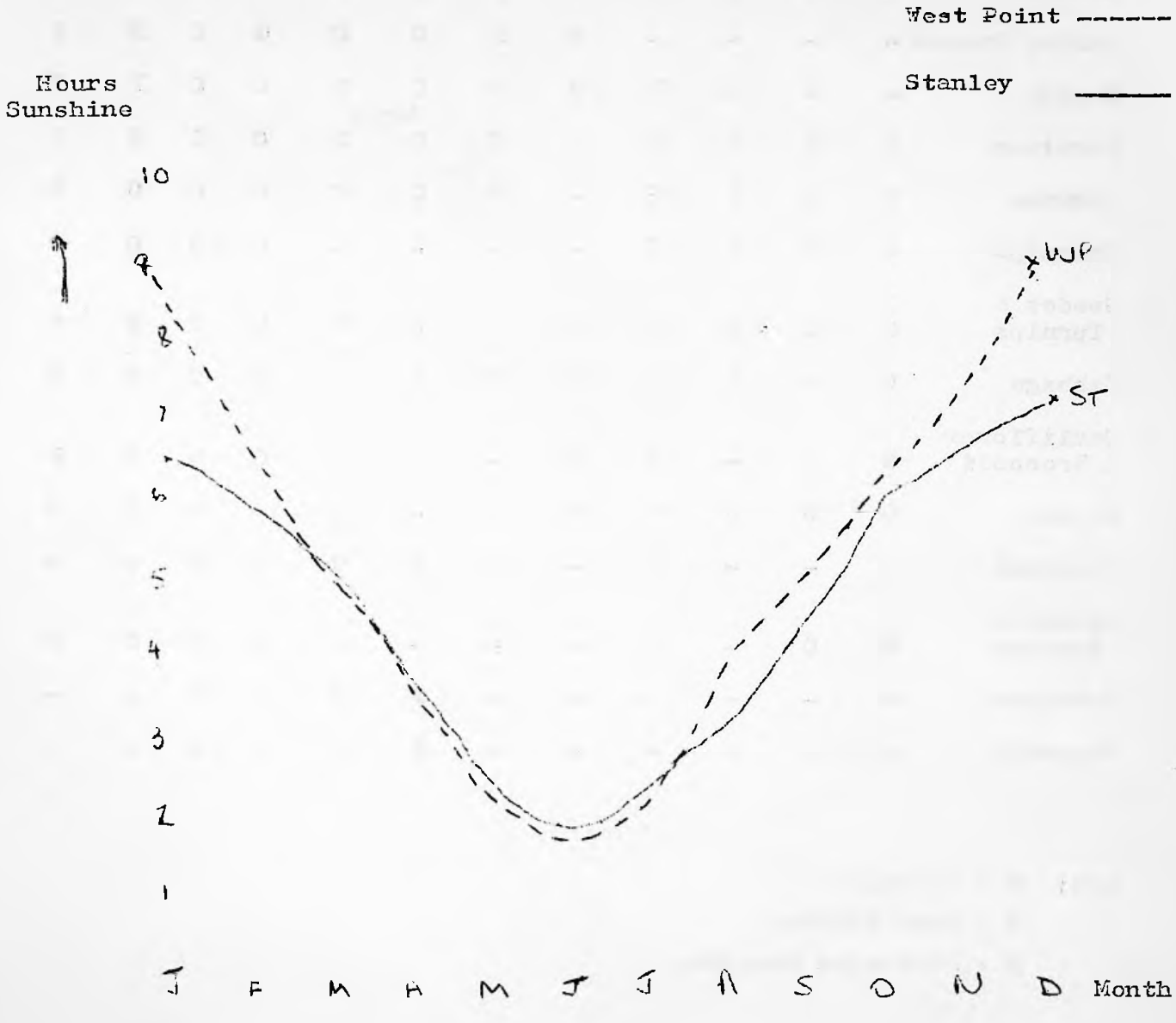


FIGURE 3

SOIL TEMPERATURE

10 cm

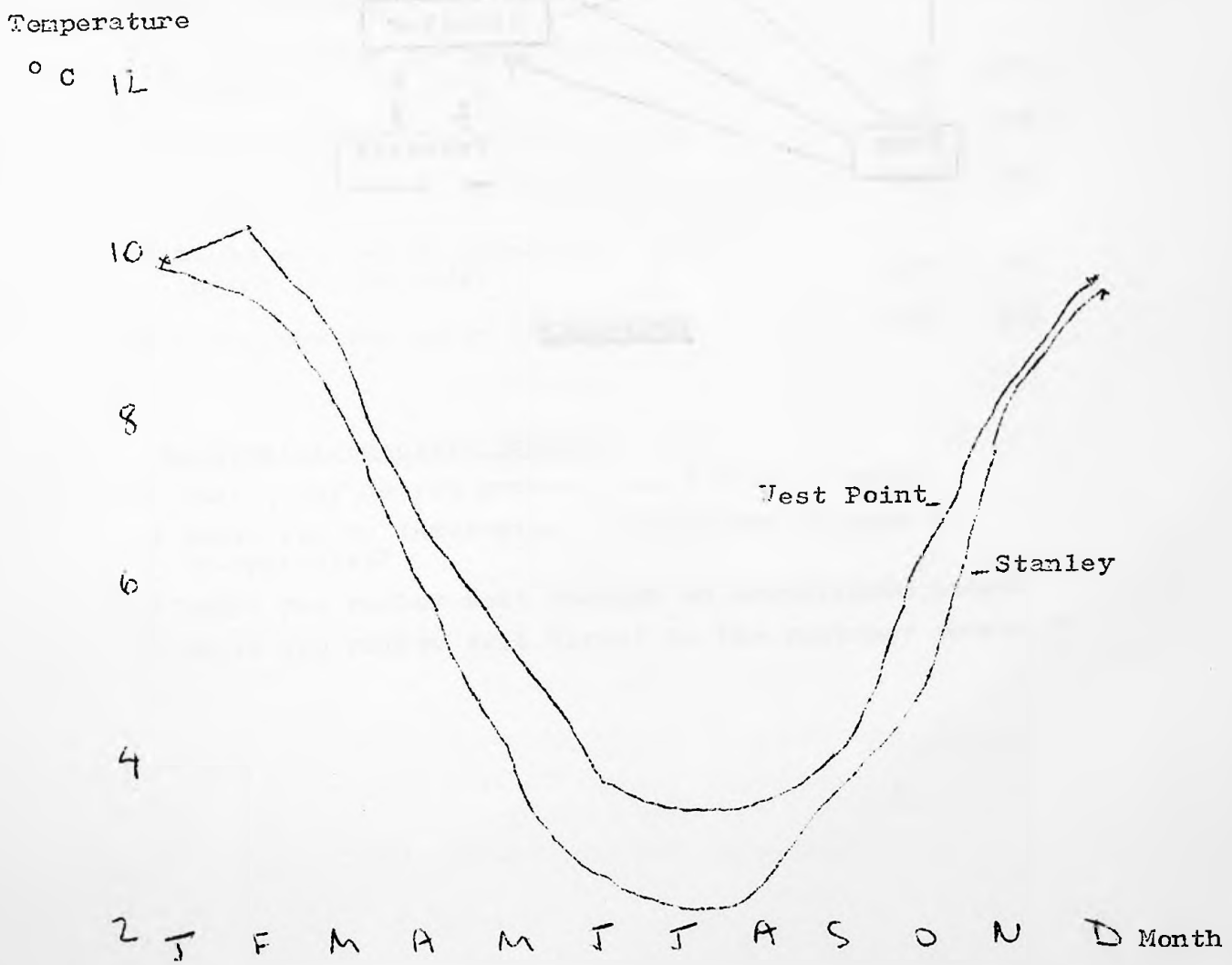
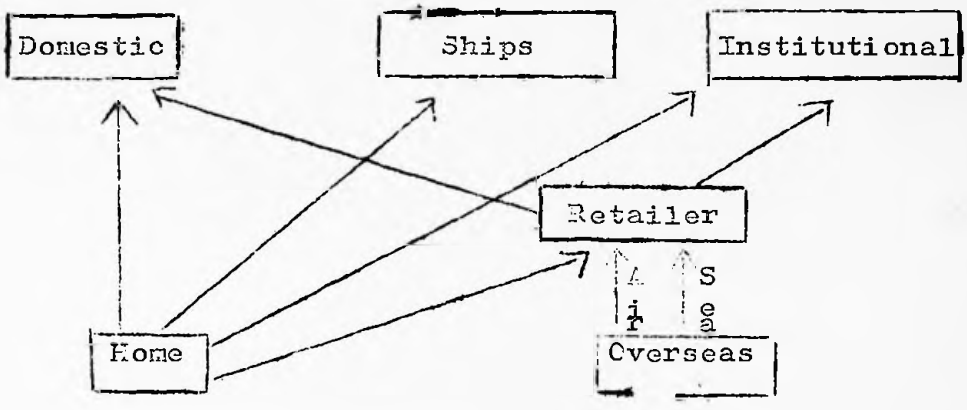


Figure 4

## FLOW OF HORTICULTURAL PRODUCE IN THE COLONY

C O N S U M E R S




PRODUCERS

APPENDIX 1

Questionnaire circulated with edition No 11/77 of the Falkland Islands TIMES and Monthly Review, 7/11/77

| Consumers | REPLIES YES | NO |
|---|---|---|
| 1) If fresh vegetables were available regularly would you buy them? | 80% | 20% |
| 2) Would you buy potatoes? | 60% | 40% |
| 3) Would you buy cabbage, tomato etc., plants? | 80% | 20% |
| 4) Would you buy flower/shrub plants? | 80% | 20% |
| 5) Would you buy fresh flowers/pot plants? | 50% | 50% |
| 6) Would you use an interflora service inside the Islands? | 60% | 40% |
| 7) Would you buy berry fruit? | 80% | 20% |

Growers/prospective growers

1) What crops do you grow or would like to grow?
2) Would you be interested in marketing through a co-operative?
3) Would you rather sell through an established store?
4) Would you rather sell direct to the customer yourself?

APPENDIX 2

## COMMERCIAL CROPS

### Recommended varieties and estimated yields

N.B. All varieties have performed well under West Falkland conditions. Yields quoted are those obtained under good soil conditions.

| Crop | | Recommended Variety | Estimated Yield |
|---|---|---|---|
| Potatoes | Early | Home Guard<br>Duke of York<br>Catriona | 25 tonnes/hectare |
| | Main Crop | Kerrs Pink<br>Ilam Hardy<br>Arran Banner | 45 tonnes/hectare |
| Carrots | Early | Nantes early<br>Short Horn | |
| | Main Crop | St Valery | 45 t /hectare |
| Parsnips | | Tender & True<br>Hollow Crown | 32 t/hectare |
| Swedes | | Purple Top Globe | 62 t/hectare |
| Cabbage | Spring | Durham early<br>Flower of Spring | 15 t/hectare |
| | Summer/ Autumn | Golden acre<br>Progress<br>Enkhuizen Glory<br>Pride of the Market<br>Emerald Cross (F1 hybrid) | 25 t/hectare<br>40,000 head/hectare |
| Cauliflower | Autumn | Veitchs Autumn Giant | |
| | Broccoli | Angers Numbers 1-4<br>Late Queen | |
| | Calabrese (Green Broccoli) | Express Corona (F1)<br>Italian Sprouting | |
| Brussels Sprouts | | Peer Gynt (F1) | |
| Beetroot | | Boltardy<br>Detroit Globe | 25 t/hectare |

/Lettuce

| Crop | | Recommended Variety | Estimated Yield |
|---|---|---|---|
| Lettuce | Spring | Kweik<br>Kloek<br>Premier | |
| | Summer | Suzan<br>Webbs Wonderful | 110,000 head/hectare |
| | Cos | Lobjoits Green cos<br>Little Gem | 50 t/hectare |
| Onions | Green | White Lisbon | |
| | Salad | Pukekohe Long<br>Keeper (New Zealand) | |
| Radish | | Scarlet Globe<br>Red forcing | |
| Tomatoes | | Alicante<br>Maascross<br>Ailsa Craig<br>Pixie | |
| Cucumber | | Telegraph<br>Burpless | |

APPENDIX 3

## PESTS AND DISEASES OF CURRENT AND POTENTIAL ECONOMIC IMPORTANCE, ON HORTICULTURAL CROPS IN THE FALKLANDS

### Potatoes

Skin spot (*Oospora pustulans*) - Widespread

Potato root Eelworm (*Heterochera rostochiensis*) - To date recorded at Stanley and Green Patch only.

Dry rot
Scab
Pink rot
} Recorded only in isolated instances.

### Onions and Leeks

White rot (*Sclerotium cepivorum*)

Grey mould (*Botrytis cinerea*) - Widespread on a wide range of crops, during conditions of high humidity, e. g. strawberries, lettuce, tomatoes.

Damping-off (*Phythium* and *Rhizoctonia* sp.) affects a wide range of seedling plants.

### PESTS

Caterpillars (cutworms) of a variety of moth species.

Foliage and soil types.

Can be of considerable importance especially in dry seasons.

Crops particularly affected: potatoes, carrots, all Brassicas.

Beetle larvae (weavils). Damage largely confined to lettuce and some flower species.

Can be of considerable importance locally.

Slugs. Of particular damage to fruit crops, e.g.strawberries, and under polythene structures.

Greenfly. Seasonally variable. Not important.

Birds: Robin (*Pezites militaris*). Damage in some areas to potato crops.
Sparrows (*Passer domesticus*) Damage to seedling crops.

Rats
Hares
Rabbits
} Locally very destructive.