

VG414

**Evaluation of temperate vegetable
cultivars for fresh export (1995)
and study tour of Japanese vegetable
buyers, market and production areas
(1994)**

Ray Hart

**Tasmanian Department of Primary
Industry & Fisheries**



Know-how for Horticulture™

VG414

This report is published by the Horticultural Research and Development Corporation to pass on information concerning horticultural research and development undertaken for the vegetable industry.

The research contained in this report was funded by the Horticultural Research and Development Corporation with the financial support of the Seed Industry Trust Fund, NaFTAS, Edgell Birdseye.

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Cover Price \$20.00

HRDC ISBN 1 86423 379 6

Published and Distributed by:



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Part I

Study Tour of Japanese vegetable buyers, markets and production areas
October 1994

STUDY TOUR OF JAPANESE VEGETABLE BUYERS, MARKETS AND PRODUCTION AREAS

30 September - 9 October 1994

SUMMARY

Natural and Fresh Tasmanian Produce (NAF-TAS) was formed in 1992 to research and develop high quality natural and fresh Tasmanian horticultural products for export through networking local resources.

A group representing NAF-TAS visited Japan in September/October 1993 to research markets, production techniques, cultivars and to establish relationships with potential Japanese buyers.

In September/October 1994 Scott Langton, Chairman of NAF-TAS and Ray Hart, Technical Officer, Department of Primary Industry and Fisheries revisited Japan to re-establish relationships and report on trials with previous Japanese contacts and to gain a clearer understanding of production methods, cultivars and market specifications for vegetables.

It was anticipated that this visit would encourage NAF-TAS to narrow its focus to one or two potential crops and Japanese partners to work with and assist it enter the Japanese export market.

Visits were made to and discussions held at a number of markets, business houses and with the IEC freight company at Narita Airport.

A clearer understanding of the market specifications and product handling was obtained. Closer relationships were formed with potential strategic partners and seed of local vegetable cultivars was brought back to Tasmania for quarantine clearance and trials.

Interest was shown by prospective buyers in asparagus, cabbages, broad beans, bi-colour and peter corn, leeks, strawberries for layer cakes, kabocha, carrots, broccoli, radicchio, shallots, red and supersweet onions and green beans. A curiosity interest was shown in establishing a new niche market for wax beans.

Information gathered during this tour is contained in the NAF-TAS Japan Study Tour Report, 30 September - 9 October 1995. Although subject to "Commercial in Confidence" restrictions much of the information contained in this report can be made available by contacting Mr Scott Langton, Chairman of NAF-TAS.

OBJECTIVES

The objectives of the study tour were to:-

- Develop closer relationships with Japanese contacts including the possibility of selecting two or three businesses to work with.
- Narrow the range of potential vegetable products for export to two or three by collecting detailed information on costs and market acceptance.
- Report to Japanese contacts on trial work being carried out.
- Develop a more detailed knowledge of market specifications, production techniques, transport costs and packaging.
- View and understand the procedure and path taken by imported vegetable products arriving at Narita Airport.
- Identify promising Japanese vegetable cultivars and collect seed for introduction to Tasmania through Quarantine.

Further trials with a limited range of products have been requested by three Japanese importers.

Information on transport costs, government duties and fumigation, etc. is being used to prepare a model to determine the economic viability of potential export crops.

Seeds of adzuki beans, shirohana mame, carrot, cucumber and daikon have been introduced for trial in Tasmania.

All data collected during the study tour is recorded in the NAF-TAS Japan Study Tour Report 1994 and will be used as a basis for determining the future directions of NAF-TAS.

RESULTS OF DISCUSSIONS

The following issues were raised in discussions:-

- Unseasonal weather conditions have caused supply problems with domestic production. If the price for local product goes above a certain price then Japan looks to import.
- Market prefers low chemical usage but is not prepared to pay for it. There is an increasing demand for clean and green quality assured vegetables. All products must have a country of origin label.
- Quality of produce supplied by China is generally considered to be poor. If China supplies a vegetable it is usually cheap and therefore unlikely to be viable for Tasmania to supply. Although the quantity of imports from China and Thailand is likely to increase there is some doubt about China's ability to continue to supply vegetables to its own people and export as well. Pickles are being imported into Japan from China.
- The health boom in carrot juice is seen as a "fad" and is expected to last only 3-5 years. Sales this year were aided by a hot dry summer. Tomato juice is also increasing in popularity.
- Japanese farmers would benefit from assurances that Tasmanian farmers do not wish to compete with them but rather to complement local production.
- Hokuren Federation is keen to source Tasmanian vegetables as an off season supply in order to keep factories processing for a longer period.
- A huge market exists in Russia for B grade onions.

- Asparagus is required for the December and January period and successful growers could name their own price. 90% of asparagus is fumigated.
- Freight costs from Tasmania to Sapporo are very expensive although the direct flight from Cairns to Sapporo has reduced costs somewhat. Penalties for cancelling shipping reservations are severe.
- Japanese farmers are ageing and the amount of imported produce of heavy crops, eg. taro and cabbage, is likely to increase. Any newcomers to farming in Japan are expected to be few and below average in performance.
- Intending exporters must conduct small scale trials and then expand into the Japanese market. It is very difficult to get a contracted price. At best 50 per cent will be on contract, with the rest on consignment.
- It is very difficult in Japan to justify growing cheap vegetables on expensive land.
- With advanced countries becoming more mechanised it may become easier to export agricultural products from advanced countries than from undeveloped countries.
- Overtime rates for handling produce at Narita Airport are high. Additional charges apply from 5 pm - 9 pm and 50 per cent extra charge applies for weekends. If a product is stored overnight a charge will be made for 2 days.
- Quality, continuity of supply and critical mass are vitally important.
- Some potential exists to export:
 - Jumbo broad bean
 - Cabbage for processing and fresh
 - Leeks
 - Bi-colour and Peter corn
 - Broccoli
 - Asparagus

- Strawberries for layer cakes
- Kabocha
- Carrots
- Radicchio
- Shallots
- Red & supersweet onions
- Yellow wax beans - (Long Shot)

and if Tobacco Blue Mould Freedom is granted: - potatoes, bell capsicums & tomatoes.

IMPLICATIONS OF THE RESULTS FOR HORTICULTURE

Results of discussions held in Japan indicate that the Japanese market will require certain vegetables from Tasmania to augment local supplies and complement imports from other countries.

Vegetables exported to Japan will need to be cultivar specific, of high quality, produced using minimal and documented pesticides and packaged according to specifications.

Vegetables produced for the Japanese market by China should be avoided by Tasmanian growers unless a time slot can be identified where there is no Chinese supply. Although the quality of Chinese product is considered poor, it has a depressing effect on price.

The development of exports to Japan continues to rely heavily on personal contact and perseverance. Japanese importers should be closely consulted regarding all aspects of product development and production.

Although quality is of major importance, prices for produce will continue to be set according to competition generated by other exporting countries and the levels of local supply.

DISSEMINATION OF INFORMATION

The NAF-TAS Japan Study Tour Report 1994 contains all of the information gained on the study tour and although subject to "Commercial in Confidence" restrictions, much of the information can be made available by contacting the NAF-TAS Chairman, Mr Scott Langton, or Department of Primary Industry and Fisheries, Tasmania.

Newspaper articles and radio interviews will be given to discuss items of interest.

A telephone interview regarding vegetable import requirements was conducted by Ray Hart with one Japanese exporter and has been made available to Tasmanian vegetable growers and packers as part of the DPIF's audio training tape "Vegie Connexions".

One slide presentation and discussion evening has been given to growers by Scott Langton and Ray Hart and others will be given on request.

RECOMMENDATIONS

- That the export potential of the following crops be more fully explored via trials, economic analyses and test marketing:- broad beans, cabbages, leeks, bi-colour and peter corn, broccoli, asparagus, strawberries, radicchio, red and supersweet onions and wax beans.
- That NAF-TAS and DPIF continue to jointly trial seed of cultivars being introduced through the Kingston Quarantine Station.
- That NAF-TAS make a determined effort to select a product and strategic alliance in order to enter the Japanese export market.
- Trials with solanaceous crops be conducted for the Japanese market in anticipation of tobacco blue mould freedom.

- That continued encouragement and assistance be given to local exporters to develop Quality Assurance programs which include package labelling providing details of chemical usage.
- When hosting or visiting Japanese industry representatives assurances be given that Tasmanian growers wish to complement Japanese production and not to compete with it.
- Exporters should avoid having produce arrive at Narita Airport after 5.00 p.m. at night and on weekends as the additional charges are severe.

Study Tour of Japanese Vegetable Buyers, Markets and Production Areas

20 September 1994 - 9 October 1994

LIST OF CONTACTS

Endo San	Nippon Plant Seed Co Ltd, Sapporo
Kawada-San	Kawada Shokai, Sapporo
Kathy Asada	Hills English, Sapporo
Nakabayashi-San	Matsuya Shoji Co Ltd, Sapporo
Hideo Ishiguro and Nobuyoshi Satoh	Maruka Sapporo Seika Co Ltd, Sapporo
Taiichi Murakawa	Murakawa Shoji Co Ltd, Sapporo
Saito-San and Satoshi Tomisawa	Hokuren Federation of Agricultural Co-Operatives, Sapporo
Dr Sanae Sawanobori	Japan Fruit Foundation and Organic Fruit Grower, Tokyo
Bungo Imagawa and Tomoyuki Horiuchi	Tokyo Seika Trading Co Ltd
Shigeru Yoshimura, Shigeo Fujii, Hiroaki Ohigashi and Homer-San	Jusco Co Ltd, Chiba
Ian Locke	Vecon Japan, Forth, Tasmania and Tokyo
Sanao Fukuchi and Noriko Fukuchi	Pro-Global Inc, Tokyo
Matt Minigawa	Toyota Tsusho Corporation, Tokyo
Kuronuma-San	Tsukiji Seika, Tokyo
Tadashi Yokotsuka	International Express Co Ltd, (I E C), Tokyo
Masaki Kiuchi and Akira Higashi	Tomei Fruits Co Ltd, Tokyo
Riichiro Shiratori	Shiratori Flour Milling Co Ltd, Tokyo
Masayuki Hikichi	T M C, Osaka

Part II

Evaluation of temperate vegetable cultivars for fresh export and processing
February 1995

VG 308

Evaluation of Temperate Vegetable Cultivars for Fresh Export and Processing

SUMMARY

Trials were conducted during 1993/94 at the Forthside Vegetable Research Station and other locations in Tasmania with a range of vegetable crops to test the suitability of various cultivars for fresh export and processing.

Carrots

Carrot cultivars were sown in September and January.

Poor weather conditions during the growth of the January sowing may have prevented cultivars from reaching their full potential.

Karotan performed well at both sowings with satisfactory yield and high quality roots that produced promising and consistent processing results.

SPS 702 and Sunex 278 were closest to the Japanese market requirements for Kuroda types. However, the root splitting and breakage of Kuroda carrots is a potential problem for growers and exporters.

Green Beans

Twenty eight cultivars were sown in mid December. A further thirteen cultivars were sown in mid January but were not harvested due to severe levels of infection with *Fusarium sp.*

BN0090 displayed potential as a processing bean with high yield and good pod quality characteristics.

Several cultivars met the Japanese fresh market specifications for short straight dark green pods. BN100 and Milagrow were rated best with Milagrow demonstrating superior colour and storage characteristics.

Green Peas

Four new cultivars were compared with the main current commercial cultivars in an August sowing. A further 14 were screened in a December sowing.

Florado met the market quality parameters for processing peas but yielded less than the industry standards.

Several lines from the December sowing were selected for further observations as specialty lines.

Onions (Coloured)

Three red and one white onion cultivars were grown in the Coal River Valley. Red Shannon and Red Moon performed well and may meet export requirements.

Onions (Sweet)

Five sweet onion cultivars were grown in the Coal River Valley. Only the cultivars Cimarron, Sweet Winter and Sweet Brounsville were considered of high enough quality to harvest.

Further work is required to establish storage capabilities and market acceptance.

Sweetcorn (Super Sweet and Bi-colour)

Eight cultivars of sweetcorn were sown in late November. Poor weather conditions during January adversely affected this observation and the tip fill of all cultivars was poor. Bullion met the market requirements of sweet taste and tender pericarp.

Tomatoes

An unreplicated observation compared two long life tomato cultivars FA144 and TA167 with Amfora and Estrella in a commercial hydroponic greenhouse at Lauderdale in Southern Tasmania. FA144 had good quality attributes but had low brix levels.

Green Vegetable Soybeans

Four cultivars were trialled from December and January sowings.

Poor weather conditions during January may have prevented cultivars from reaching full potential.

Pods produced from Kaoshuing No. 1 met Japanese market specifications but yield was low.

Yam Beans (*Pachyrhizus ahipa*)

Three accessions from the Royal Veterinary and Agricultural University of Denmark were sown in December.

Growth was very poor and as no tubers were formed, test marketing was not possible.

Adzuki Beans

The cultivar Bloodwood was sown in December. Growth was poor and a considerable range of pod maturities were found at harvest.

Yield of seed was low.

Green Beans (Sabre)

Seed released from Kingston Quarantine Station was sown at Gatton Research Station in Queensland for seed multiplication in early September and at Forthside Vegetable Research Station in December. Seed quantities were increased and further work is required to more accurately determine the potential of this cultivar.

Daikon

Three cultivars of Daikon were sown in February for evaluation as processed diced product. Results from processing trials were promising but a wider range of cultivars and sowing times is required to evaluate the market potential for fresh and processed daikon.

Japanese Pickling Cucumbers

Seed arrived too late for field trials and was grown in a greenhouse at Turners Beach. Crop management proved difficult as female flowers were only borne on laterals. Field trials are recommended.

Extension Activities

Field days were held to view and discuss trials.

Growers and industry representatives visited and discussed trials several times during the season and at harvest.

Radio interviews and a television news item promoted this work.

Results were made available to interested parties as they became available and a Cultivar Testing Bulletin with full reports on each trial was mailed to industry representatives in November 1994.

INTRODUCTION

Opportunities exist for Tasmania to expand its export trade in high quality fresh and processed vegetables, especially to South East Asia and Japan. Local industry representatives believe there is potential for an industry in excess of \$25 million to develop.

Tasmania is recognised as a reliable supplier of quality fresh and processed vegetable produce on domestic and export markets.

Tasmania is active in enhancing its "clean and green" image with low chemical inputs and certain specific pest and disease freedoms.

In recent years, Tasmania has developed new export opportunities for shallots, kabocha and other vegetable crops.

The Department of Primary Industry and Fisheries has worked closely with industry over several years to research and develop new crops for export markets.

The Department of Primary Industry and Fisheries, Vecon Japan, Edgell-Birds Eye and several seed companies have jointly identified the need for and supported the trials described in this report aimed at identifying new vegetable cultivars that provide new export opportunities or improve the productivity of the vegetable processing industry.

The vegetable crops trialed and their perceived market requirements were:-

Carrots: Fresh export to Japan: Highly coloured, non-splitting, sweet Kuroda types 100-150mm long.

Processing (Ring): Highly coloured, non-splitting and high yielding Nantes/Berlicum types, 150-200mm long.

Green Beans: Fresh export to Japan: Straight, dark green beans, 100-150mm long with good transport and storage characteristics. The ability of picked beans to retain the fruit stalk is often important.

Processing (Whole beans): Disease resistant, dark green, high yielding, 100-150mm long.
(Slicing): Disease resistant, dark green, high yielding, 140-200mm long.

Green Peas: Processing: High yielding, small sieve size, even dark green colour, late season cultivars must have Powdery Mildew Resistance.

Coloured Onions: Fresh market: Deep red colour, globe shape, low level of pungency with good transport and storage characteristics.

Sweet Onions: Large (75mm dia) non-pungent with orange/brown colour and good transport and storage characteristics.

Supersweet and Bi-colour corn: Well filled sweet cobs with tender pericarps.

Tomatoes: Highly coloured, high yielding with long shelf life and good flavour.

Green Vegetable Soybeans (Eda Mame): Three seeded pods with white pubescence.

Yam Beans: Apple shaped white tubers.

Adzuki Beans: Highly coloured red/brown seeds.

Japanese Green Beans (Sabre): Market requirements vary. Either straight, dark green pods 100mm long (premium) or large, fleshy pods.

Daikon: Fresh export: Even, cylindrical, sweet, white roots 300mm long with green shoulders.

Processing: Even, cylindrical, white roots, 300mm long.

Japanese Cucumbers: Processing: Small, 100mm long, straight and dark green for pickling.

Most trials were located at the Forthside Vegetable Research Station (FVRS) which is representative of the krasnozem soils of north-west Tasmania's main vegetable production district.

The coloured and sweet onions were evaluated in the Coal River Valley in southern Tasmania.

The tomatoes were evaluated in a commercial hydroponic (NFT) greenhouse at Lauderdale in southern Tasmania and the Japanese cucumber in a commercial (soil) greenhouse at Turners Beach.

MATERIALS AND METHODS

Carrots

Thirty two cultivars were sown on 17 September with an additional five cultivars sown on 23 September in unreplicated plots. A second sowing of 54 cultivars was made on 13 January, 1994 including most cultivars from the September sowing. An additional two kuroda types were trialed in unreplicated plots. The trial design was a randomised block with four replicates for the September sowing and three replicates for the January sowing. Plot size varied from 4.64m² for the September sowing, to 6m² for the January sowing.

Seed was sown with a Miniair drill into raised ridges 800mm apart, in double rows 50mm apart with 45mm between seeds along the row.

Harvesting commenced on 31st January for the September sowing and 15th June for the January sowing.

At both harvests the canopies were assessed for height, disease intensity and top strength. Carrots from a 1.6m² area were harvested from each plot. Undersized and defective roots were graded out and recorded for each plot. Field split tests were also performed at this stage.

The tops were removed from the remainder of the sample, the roots were weighed and then machine washed. Broken and split roots were removed from the sample after washing and recorded. Other quality parameters were assessed and photographs taken of each cultivar.

Green Beans

Twenty eight cultivars were sown on 17 December 1993, and a further thirteen cultivars were sown on 18 January 1994. Seed was sown into non-replicated plots with three rows 500mm apart and 29m long to establish a plant density of 35-40/m².

The trial was enclosed by a sweetcorn windbreak. Poor weather conditions in January resulted in poor establishment and growth of both beans and sweet corn.

As each cultivar approached maturity, ten plants were taken from each plot for maturity assessment. The largest pod from each plant was removed and the largest seed in each pod measured. Evaluation for processing occurred when the mean seed length of whole beans reached 8mm and slicing beans reached 10mm. Records were taken of plant height, canopy width, lodging and number of pods touching the ground from a 2m length of row. All plants from that 2m length of row were then harvested and a further maturity assessment carried out on ten plants randomly selected from the harvested sample.

For fresh market assessment, a first pick was made 78 days after sowing and a second pick 5 days later. The number of diseased plants and diseased pods was recorded. All marketable pods were then hand picked and weighed.

A random, 10 pod sub-sample was assessed for pod weight, length, diameter, shape, section, cavity, constriction and colour.

A further 20 pod sample was used to assess the percentage of stalks remaining on the pods after picking.

Samples were made available to industry representatives for assessment and test marketing.

Green Peas

Sowing 1

Two commercial cultivars, Small Sieve Freezer (SSF) and Bounty, were used as controls to compare with four new cultivars.

The layout was a randomised block design with three replicates. Seed was sown on 19 August 1993 with a Fiona drill to achieve a plant density of approximately 100/m² in plots 11 metres long with 8 rows at 150mm. As each cultivar approached maturity a subplot of 2.5m² was harvested for maturity and yield assessment. Sequential harvesting continued until MI 220 was reached. Plant characteristics were assessed from a 10 plant sample randomly selected from each plot.

Sowing 2

A further 14 cultivars from Northrup King were available for screening late in the season and were sown in unreplicated observational plots on 2 December 1993. SSF and Bounty were sown as controls. The sowing was undertaken to provide preliminary data on these cultivars.

Onions (Coloured)

Three red cultivars and one white coloured onion cultivar (plus Cream Gold as the standard) were sown by hand at two sowing times, 30 August and 30 September 1993 at a density of 120/m² or 18 seeds per metre of row. There were two replicates per cultivar and the beds were four metres in length. The land had been pasture prior to planting.

Establishment of some cultivars was uneven and weed control was difficult. Hand weeding, and, later, hoeing were the methods used to control a range of weeds.

All plots in the replicated trial were progressively lifted when 50-80% of their tops were down. After field curing, bulbs were counted and weighed, and they were sorted into marketable and unmarketable yield.

Onions (Sweet)

Two replicates of five sweet cultivars were sown by hand on 5 October 1993. The sowing density was 120 per m² or 18 seeds per metre. Each bed was 4m long by 1.5 m wide.

Germination for all sweet cultivars was good and growth was rapid. However more thinning should have been done to increase bulb size.

All plots were progressively lifted when 20-80% of their tops were down. Some cultivars were still growing and some bolting was observed in Brounsville and Vaquero. After field and glasshouse curing, bulbs were counted and weighed.

Sweetcorn (Supersweet and Bi-Colour)

Eight cultivars were sown on 23 November 1993 in a non-replicated observation trial. Seed was sown into 3 rows 500mm apart as windbreaks around a miscellaneous legume trial and green bean trial. Sowing was carried out with a Gasparido drill, and seed was spaced every 96mm to establish five plants/m².

Cob characteristics were recorded for the new cultivars Bullion, Long & Sweet and the standard Honeysweet. The remaining cultivars Cupola, Dynasty, Snosweet, 98104 and Snogold were trialed last year and details published in the Vegetable Cultivar Evaluation 1992-93. Their inclusion this year was to act as a windbreak for other crops being trialed.

As plants in each plot approached maturity five cobs were taken from outside rows to assess moisture percentage. Harvest occurred when moisture levels reached 77-78%.

Plant, cob and kernel characteristics (Table 15 and 16) were recorded from 10 plants selected at random from each plot. An additional assessment of moisture percentage was made and a sample of cobs photographed. Quality parameters are given in Table 17.

Tomatoes

Seed was sown into cellular containers on 28 May 1993, and 5-6 seedlings of each cultivar transplanted into 75 mm pots on 28 June 1993. The plants were planted out into an NFT system on 29 July 1993. A density of 2.85 plants/m² was achieved, with a spacing of 450 mm between plants in double rows 500 mm apart, with 1000 mm alleyways in a block 18 x 14 m.

The trial was terminated on 23 December following an ethephon spray on 18 December, 1993.

Green Vegetable Soybeans

Seed of four cultivars of green vegetable soybean (known to the Japanese as Eda mame) were sown, with a Gasparido drill into three rows 500mm apart and 29m long. GSB1 and GSB2 from Canovan Pty Ltd and Kaoshuing No.1 from the Queensland Department of Primary Industries (QDPI) were sown on 3 December 1993. Koala from the QDPI was sown on 17 December 1993 with a second sowing on 18 January 1994. After emergence plants were hand thinned to 200mm apart.

Yam Beans (*Pachyrhizus ahipa*)

Three accessions of *P. ahipa* from the Royal Veterinary and Agricultural University of Denmark were sown on 3 December 1993. Seed was sown into unreplicated plots with three rows 500mm apart and 29m long.

Adzuki Beans

Seeds of the cultivar Bloodwood were supplied by the Queensland Department of Primary Industries and were sown on 3 December 1993, into unreplicated plots consisting of three rows 500mm apart.

Green Beans (Sabre)

Seed imported into Tasmania was released from quarantine in July 1993. Approximately 250 seeds were sent to Queensland for multiplication and sown at Gatton Research Station in early September. The resulting crop was harvested in early December and sown on 19 December 1993 at Forthside Vegetable Research Station. Seed was sown with a Gaspardo drill into rows 500mm apart with seeds spaced to establish a density of 35-40/m².

The purpose of this trial was to multiply existing seed stocks and demonstrate the product to local exporters and their buyers.

Daikon

Three cultivars of Daikon were sown on 3 February 1994, into raised beds, 800mm apart and 36m long with seed spaced 100mm apart. One bed of each cultivar was sown to assess the processing potential of each cultivar.

Japanese Cucumber

Seed of a Japanese cucumber reputed to fetch high prices in Japan was supplied for trial by a Japanese company via Tasmania Development and Resources.

Seed arrived too late for sowing in the field and was grown in a greenhouse.

Extension Methods

A number of one to one phone enquiries and visits were conducted with interested growers and exporters.

A general field day to view and discuss all crops was held at Forthside on 25 January 1994. Specific field days for carrot cultivars were held on 11 February and 7 July 1994.

Processors, fresh vegetable exporters and seed company representatives visited most of the trials during the growing season and at harvest.

Radio interviews were given in January and February and a television story for evening news was produced in April to generate public awareness of this work.

Results were made available to industry immediately after trials were harvested.

The Vegetable Cultivar Testing Bulletin reporting on all trials was mailed to industry in November 1994.

RESULTS

Carrots

September Sowing - Plant growth and yield data are given in Table 1 and root quality in Tables 2 and 3.

All cultivars rated evenly on the vigour rating with the exception of SPS702 which was the most vigorous.

Fannia (63.8t/ha) had the highest yield with 21 other cultivars yielding greater than the trial mean of 43t/ha.

Kazan, SPS733 and Dakota had the deepest external root colour. Root smoothness was above average in Boston, Dakota, SPS733 and SPS734.

Shoulder greening, forking, misshapen and undersized roots were a problem in several cultivars, whilst the roots of Red Star Thru broke up badly at washing (12.5% reduction). Karotan was rated highly as a potential processing cultivar.

January Sowing - Plant growth and yield data are given in Table 4 and root quality in Tables 5 and 6. Crop establishment was good although poor weather and severe frosts impeded growth for many cultivars. There was also more disease stress than in the September sowing. SEL2755, Kazan, CR345 and Sunex 278 displayed high vigour during the crop establishment phase.

Bangor had the highest yield at 43.5t/ha, SEL2755 was the next highest at 40.9t/ha, and twenty-six other cultivars had yields higher than the trial mean of 26.4t/ha. In order Bangor, SEL2755, Kazan, Fontana, Sunex 278, SPS609, SPS702, SPS658, Crusader, Ringo and Karotan were the eleven highest yielding cultivars in the trial. However Fontana and Sunex 278 had weak tops.

New Kuroda, Sunex 278, Caroline, Asubehi (kuroda types) had high levels of breakage at washing. The breakage level of Inca, the only other Kuroda type was lower (6.3%).

At an industry field day Karotan, SPS702 and Sunex 278 attracted most interest.

Green Beans

Towards maturity for the December sowing, there was some leaf drop in all cultivars due to *Fusarium sp.* infection. This was least noticeable in 8088. Details of plant growth, maturity and yield are given in Table 7 and pod quality in Table 8. Pod quality parameters are also given.

OSU5402 had the highest yield (34t/ha), whilst BN0100 (28.9t/ha) had pods of good appearance which rated well at storage but had some hollow cavities. BN0090 (24.4t/ha) was the heaviest yielding slicing bean and exhibited similar features to BN0100. BN0112 and BN0101 stored well, retaining very good colour.

Milagrow was rated as one of the best whole fresh beans with excellent colour and pod characteristics. Samples of Milagrow and Broker were sent to Japan for market assessment. Both received favourable reports with Milagrow rating highest. Aileen also produced high quality pods and good yields.

The second sowing of beans was not harvested due to a high level of infection with *Fusarium sp.*

Green Peas

These are summarised in Table 12.

Establishment and growth was very good for all cultivars, however, some developed symptoms of *Fusarium* in the latter stages just prior to maturity. This was very severe for Encore, moderately severe for XPF239, Quantum and Bounty and very slight for Florado and SSF. The symptoms only became evident in the last week to ten days before maturity and did not seem to affect yields. No evidence of powdery mildew (*Oidium sp.*) was found in this evaluation, but SSF and Quantum were the only two cultivars to be affected in observational plots sown in mid November for the purpose of screening for susceptibility to this disease.

No significant differences in yield were recorded between any of the cultivars, although the yields varied between 11,000 kg/ha for Florado and 13,500 kg/ha for Bounty. Encore matured about a week earlier than SSF.

Pea colour was variable for all lines with some pale peas occurring in all samples. A small percentage of blonde peas appeared in SSF, Bounty and Quantum. Pea size for most lines was variable with Bounty, Quantum and SSF tending towards large, while XPF239 and Encore were medium. The most even line for both colour and size was Florado, tending to be medium. Florado also seemed to hold its quality well at slightly higher MI readings.

XPF294 (Asgrow) was not available for the August sowing, but was included in the November observational plots. It is a semi-leafless type with strong erect plants with large, well filled pods with up to 9 peas/pod. It had moderate to severe symptoms of *Fusarium*.

The observations made are shown in Table 13. Apart from SSF, all cultivars exhibited very severe symptoms of *ascochyta/mycosphaerella* root rot complex which severely stunted their growth.

Onions (Coloured)

The maturity of all cultivars covered a period of eight weeks with White being the earliest harvested onion. Both sowings of White were harvested together because of poor germination and establishment.

Red Shannon was one of the first red cultivars harvested but germination and yield was higher for the September sown bulbs.

Red Moon matured at the same time as Red Shannon. Germination was good for the August sown crop but total yield was higher for the September sown crop which had a large number of small sized bulbs.

Red Tango established well from both sowing dates but were thick stemmed and resembled leeks in growth. September sown Cream Gold was also thick stemmed. These bulbs were not assessed for number or yield.

Onions (Sweet)

The maturity of all cultivars covered a period of six weeks. However Vaquero, Brounsville and Walla Walla Sweet were 20-40% tops down when harvested. These cultivars were not assessed for yield because of thick stems. Some resembled leeks in growth and bulb size was poor or misshapen.

Sweet Winter was the first cultivar harvested and yielded well. Brounsville was harvested next and some were thick stemmed but still able to be assessed. Cimarron was harvested in the third week in March and yields were higher than the other two cultivars.

Sweetcorn (Supersweet and Bi-Colour)

Poor weather conditions during January slowed growth significantly.

The cultivar Honeysweet was the earliest to mature. It had a tough pericarp but outstanding flavour. There was little difference between the quality of Bullion and Long & Sweet. Long & Sweet produced more cobs, but almost identical total yield figures were recorded for both.

Both Long & Sweet and Honeysweet had outstanding flavour, with Bullion having the most tender pericarp.

Tomatoes

Yield data are given in Table 18.

Amfora was the earliest finishing and highest yielding cultivar. Its harvest was substantially complete when, for area management reasons, ethephon was applied on 18 December. FA144 produced the best quality tomatoes of the two long life types.

Green Vegetable Soybeans

GSB1 and GSB2 and Kaoshuing No.1 performed best and produced pods approximately 50mm in length. However yield was poor with an average of only 46 pods being produced per plant. A trial shipment of Kaoshuing No.1 was harvested and sent to Japan for assessment where quality was rated as good.

Koala grew vigorously and flowering did not occur until late in the season. Very few flowers were produced and no pods were available for harvest.

Yam Beans (*Pachyrhizus ahipa*)

Weather conditions after sowing were cold and plants did not fully develop.

Adzuki Beans

Growth was slow in the early stages of plant development due to poor weather conditions during January. Plants reached an average height of 400mm and width of 350mm. At harvest considerable plant maturity problems were encountered with a range of pods from dry to fully green found on the bushes.

Seed yield obtained was equivalent to 43kg/ha and a sample of harvested seed was sent to Dr Bob Redden (QDPI) for quality assessment.

Green Beans (Sabre)

At harvest on 12 May 1994 seed stocks had increased to just over 9.5kg.

Daikon

At harvest (88 days from sowing) Highlight had the highest yield (15t/ha) and produced white roots 310mm long and 78mm in diameter with green shoulders. April Cross (12 t/ha) and Longwhite (15 t/ha) were both proud of the soil with shoulders up to 370mm above the soil, but still provided good quality roots up to 700mm long. Roots of all three cultivars were brittle and therefore require care at harvest. Highlight had the least brittle roots.

Japanese Cucumber

Plants produced predominantly male flowers on primary vines and female flowers on laterals. This made greenhouse management very difficult. The fruit produced was green and very large.

DISCUSSION

Carrots

From the September sowing Kamaran was high yielding and had good quality roots while Narbonne and SPS734 had satisfactory root quality and high yields. Karotan performed well at processing evaluations where it retained good colour.

From the January sowing Kazan yielded well with good external and internal root colour although it had rough roots, SPS702, Karotan and SEL2755 also performed well.

Karotan satisfied the market requirements for processing ring carrots at both sowings.

SPS702 and Sunex 278 were closest to the market requirements for Kuroda types, however, the root splitting and breakage of kuroda types is a potential problem for growers and exporters. Trials are required to identify a solution to this problem. The cultivar Inca demonstrated low levels of splitting and breakage and although a little long, may satisfy market requirements.

Beans

Several cultivars met the Japanese fresh market requirements for short, straight, dark green pods. BN0100 and Milagrow were rated best with Milagrow demonstrating superior colour and storage characteristics.

Favourable test market reports were received from Japan on Milagrow and Broker with Milagrow rating highest.

BN0090 shows potential as a processing bean with high yield and good pod quality characteristics.

The cultivars 8088 and XPB256 demonstrated exceptional ability to withstand *Fusarium sp* infection.

Green Peas

Florado was closest to the market quality parameters for processing peas but yielded less than the industry standards Bounty and SSF.

Fourteen cultivars were screened late in the season and from those observations, several lines with either large or small pea size, will be assessed in next season's August sowing as the processing industry has expressed interest in developing cultivars for specialty purposes with quality characteristics different from the normal standard.

Onions (Coloured)

The evaluation has shown two red cultivars, Red Shannon and Red Moon grow and yield well in Coal River Valley and may well meet market requirements for red onions. Also White and August sown Cream Gold cultivars perform well with little disease or skin problems.

Onions (Sweet)

The skin finish was soft with all cultivars. Three of the six cultivars were assessed for yield. This evaluation shows which cultivars can be grown but further work on suitability for the present market should be investigated. Consumer acceptance and storage capabilities would also need research if these cultivars are to be grown in the future.

Sweetcorn (Supersweet and Bi-Colour)

Poor weather conditions during January adversely affected this observation. The tip fill of the cobs from all cultivars was poor. Bullion met market requirements for sweet taste and tender pericarp.

Tomatoes

FA144 exhibits the desired characteristics for export from Tasmania but has low brix levels. Further trials with a range of long life cultivars are required.

Green Vegetable Soybeans

Poor weather conditions during January may have prevented cultivars from reaching full potential.

Pods produced from Kaoshuing No. 1 met Japanese market specifications but yield was poor and competition from China has resulted in low prices.

It is recommended that work with green vegetable soybean discontinue unless more cold tolerant and higher yielding cultivars become available. The Cressy area or the Coal River Valley may provide a more suitable growing environment, due to greater concentration of heat units during the summer growing season.

Yam Beans (*Pachyrhizus ahipa*)

Test marketing was not possible as no tubers formed and it is recommended that work with *P. ahipa* should discontinue unless more cold tolerant species become available. The Cressy area or the Coal River Valley may provide a more suitable growing environment than North-West Tasmania, due to the greater concentration of heat units during the summer growing season.

Adzuki Beans

It is recommended that work with Adzuki bean discontinue unless more cold tolerant and higher yielding cultivars become available. The Cressy area or the Coal River Valley may provide a more suitable growing area due to the greater concentration of heat units during the summer growing season.

Green Beans (Sabre)

Trials are required at a number of sites in Tasmania to more accurately determine the potential of this cultivar.

Daikon

Trials with a wider range of daikon are required to determine the best growing season and the best cultivars for both fresh export and processing.

Japanese Cucumbers

Field trials are recommended in order to establish this plant's suitability to Tasmanian growing conditions and to ensure sufficient quantity of product for test marketing.

EXTENSION ADOPTION BY INDUSTRY OF RESEARCH FINDINGS

Regular liaison with industry including field days to view and discuss trials has ensured that promising new cultivars are rapidly adopted by Industry. Approximately 100 people representing a cross section of the fresh and processed vegetable industry attended the Field Day at Forthside in January. Twenty five people attended the first Carrot Field Day in February and 40 attended in July. Additionally, another 40-50 industry people visited trials during the growing season. The major fresh vegetable exporters Vecon and Forth Farm Produce together with the processing company Edgell-Birds Eye have demonstrated a keen interest in this work. One to one discussions with growers, packers, processors and seed company representatives continue to provide opportunities to extend information gained from these trials.

Two radio interviews for the ABC Rural Report and a television interview on Southern Cross Evening News have provided opportunities to increase public awareness. Additionally the Vegetable Cultivar Evaluation Bulletin 1993-94, mailed to industry in November 1994, will be used as a basis by all industry participants for cultivar selection. Discussions held by the Chief Investigator with Dr Vong Nguyen (NSW Department of Agriculture) have helped to facilitate a joint approach to the development of new crops for selected processing and fresh export markets.

DIRECTIONS FOR FUTURE RESEARCH AND/ OR ACTIVITIES SUPPORTED BY THE HRDC

The rapid development of new cultivars and the introduction of new cultivars and new crops into Tasmania through quarantine results in a continuing necessity to conduct similar trials.

FINANCIAL/COMMERCIAL BENEFITS OF ADOPTION OF RESEARCH FINDINGS

The SE Asian and Japanese vegetable markets are very cultivar and quality specific. The identification of carrot, green bean and other cultivars from this work will enhance the development of Tasmania's vegetable export industry, an industry estimated to by local industry representatives to develop a value in excess of \$25 million per annum.

Local exporting companies are now planning to use a number of carrot cultivars and green bean cultivars which have been grown successfully in these trials and which have produced good test market results.

Table 1 Carrot Plant Growth and Yield - September Sowing

Cultivar	Supplier	Density No/m ²	Vigour Rating 1 = weak 5 = strong	Canopy Height (mm)	Top Disease 1 = high 5 = low	Top Strength 1 = weak 5 = strong	Top:Root Ratio	Days to Harvest	Marketable Yield after washing (t/ha)	% Yield Reduction by No. after washing
Nerac	Bejo	40.5	3.3	422.5	3.3	2.3	0.18	136	35.8	0.6
Fontana	Bejo	44.2	3.0	567.5	2.8	3.0	0.24	136	48.5	2.3
Narbonne	Bejo	62.8	3.3	483.8	3.0	3.5	0.20	143	56.2	0.8
Newmarket	Bejo	52.0	3.0	472.5	2.8	4.3	0.21	143	38.8	0.5
Bangor	Bejo	43.8	3.3	527.5	3.3	4.3	0.20	136	44.2	2.6
Nairobi	Bejo	46.4	3.0	505.0	2.8	2.0	0.19	136	51.3	0.5
Newburg	Bejo	37.8	3.0	435.0	2.3	4.3	0.17	143	40.5	0.6
Nogales	Bejo	39.5	3.3	396.3	3.5	2.0	0.22	143	38.7	3.3
Ferrara	Bejo	35.2	3.0	575.0	3.3	4.0	0.26	136	30.9	3.5
Boston	Bejo	50.6	3.0	558.8	3.5	4.3	0.25	143	47.7	2.9
Kamaran	Bejo	49.8	3.3	557.5	4.0	3.8	0.29	137	63.3	0.4
Dakota	Bejo	41.1	3.3	588.8	3.3	3.0	0.34	143	48.7	7.6
Bernova	EZ	67.0	3.0	523.8	3.0	3.5	0.25	143	45.6	9.0
Fannia	EZ	46.7	3.0	578.8	3.8	3.8	0.26	143	55.6	2.7
Crusader	EZ	52.5	3.0	608.8	4.0	4.5	0.26	143	63.8	1.8
Hf Pak	SPS	51.3	3.3	516.3	3.8	4.5	0.21	137	49.5	2.2
Top Pak	SPS	43.3	3.0	517.5	3.0	1.8	0.24	136	41.7	1.3
Nandor	SPS	46.6	3.5	501.3	2.8	4.5	0.20	137	57.3	3.1
SPS 733	SPS	48.8	3.0	473.3	2.3	2.7	0.15	143	48.3	3.3
SPS 734	SPS	49.4	3.0	417.5	2.8	3.3	0.15	144	35.7	6.3
SPS 735	SPS	50.5	3.0	496.3	3.0	3.3	0.22	144	57.7	1.3
SPS 362	SPS	56.6	3.0	503.8	3.5	3.3	0.21	137	44.0	1.7
SPS 316	SPS	43.8	3.0	481.3	3.3	4.0	0.18	137	39.9	3.0
SPS 658	SPS	58.1	3.3	507.5	4.0	4.0	0.19	137	43.8	1.6
SPS 702	SPS	42.3	3.0	508.8	2.8	4.0	0.23	144	51.3	6.5
Cordia	NZ	24.8	3.8	598.8	3.5	3.3	0.27	137	60.2	1.0
Frantes	ERS	43.6	3.0	571.3	3.8	4.5	0.34	144	34.2	5.8
Magho	RZ	48.6	3.0	495.0	3.3	2.5	0.18	137	37.2	4.4
Museon	RZ	49.2	3.0	553.8	3.8	3.5	0.26	137	51.1	5.0
Karotan	RZ	55.0	3.0	430.0	1.8	3.8	0.17	144	34.8	7.0
CR287	RZ	48.3	3.3	581.3	3.3	2.8	0.37	144	46.3	4.6
*Blaze	NK	46.3	3.3	516.3	3.8	3.0	0.18	137	46.5	4.3
*Red Star	NK	16.9		460.0	3.0	4.0	0.21	136	19.1	6.7
*Red Count	Hend	16.3		450.0	3.0	4.0	0.19	136	16.6	12.5
*S-382-G	Hend	26.9		400.0	5.0	4.0	0.21	136	17.2	5.9
*Chantenay	Hend	23.8		400.0	3.0	4.0	0.32	136	26.9	5.0
Mean		20.6		540.0	4.0	4.0	0.20	136	27.2	3.8
P			3.1	514.7	3.2	3.5		140	46.5	
LSD			**	***	***	***		NS	***	
			0.6	75.0	0.9	1.6			22.4	

***, **, * < 0.1%, 1% and 5% respectively

*Sowing date: 23 September 1993

SPS Sth Pacific Seeds
EZ Enza Zaden
NZ Nickerson-Zwaan

ERS Edgett Rural Supplies
RZ Rijk Zwaan
NK Northrup King

Hend Henderson

Table 2 Carrot Root Quality - September Sowing

Cultivar	Length (mm)	Diameter (mm)	L : D Ratio	Core Diameter (mm)	Tip Shape 1 = point 5 = blunt	Smoothness 1 = rough 5 = smooth	Hairs 1 = many 5 = nil	External Colour 1 = yellow 3 = ft orange 5 = orange	Core Colour 1 = yellow 3 = ft orange 5 = orange	Cortex Colour 1 = yellow 3 = ft orange 5 = orange	Brix Level	Field Split Test 0 = nil 5 = many
Nerac	214.3	36.5	5.9	14.3	3.5	3.0	4.5	4.0	4.0	3.2	8.2	0.0
Fontana	222.5	39.5	5.6	14.6	3.0	3.0	5.0	4.0	3.7	3.2	7.4	0.0
Narbonne	200.3	38.8	5.2	14.6	4.0	3.5	4.0	4.0	4.6	3.7	7.8	0.0
Newmarket	197.8	35.4	5.6	12.5	4.0	3.0	3.5	4.0	4.1	3.4	7.8	0.0
Bangor	225.0	39.4	5.7	18.1	3.5	2.0	4.0	3.5	4.4	3.8	8.2	0.0
Nairobi	217.7	39.5	5.5	17.1	3.0	3.0	3.5	3.5	4.1	3.4	7.0	0.0
Newburg	221.9	38.4	5.8	14.9	4.5	3.0	4.0	3.0	4.9	4.0	7.8	0.0
Nogales	243.9	35.2	6.9	11.9	2.5	3.5	4.0	4.0	4.7	4.7	8.8	0.0
Ferrara	237.6	40.6	5.8	15.5	2.5	3.5	4.5	4.0	4.0	3.3	8.0	0.0
Boston	206.4	39.8	5.2	14.3	3.0	4.5	5.0	3.0	4.9	4.1	8.6	0.0
Kamaran	222.6	41.4	5.4	14.3	1.5	3.5	4.5	4.0	3.9	3.4	8.0	0.0
Kazan	234.5	43.0	5.5	15.0	2.0	2.5	4.0	4.5	4.6	4.3	8.4	1.0
Dakota	210.5	30.5	6.9	12.1	4.0	4.0	3.5	4.5	3.9	3.5	8.0	4.0
Bernova	231.3	38.4	6.0	16.7	3.0	2.0	3.5	3.0	3.9	3.3	8.2	0.0
Fannia	244.3	38.1	6.4	17.5	2.5	2.5	3.5	2.0	4.3	4.1	8.2	0.0
Crusader	205.8	37.2	5.5	13.0	3.0	3.0	4.0	3.5	2.8	2.5	7.2	0.0
Hi Pak	213.5	39.9	5.4	11.6	3.0	3.0	4.5	4.0	3.5	3.3	8.0	0.0
Top Pak	197.0	39.7	5.0	13.7	3.5	3.0	3.5	3.5	2.7	3.0	7.6	0.0
Nandor	204.3	41.0	5.0	14.4	4.0	3.5	4.0	3.5	2.0	3.2	8.2	0.0
SPS 733	203.3	36.2	5.6	9.6	5.0	4.5	4.5	4.5	4.1	3.8	8.4	1.0
SPS 734	218.4	44.0	5.0	16.5	4.5	4.0	4.0	4.0	4.6	3.7	8.0	0.0
SPS 735	189.9	34.7	5.5	11.4	3.5	3.5	4.0	4.0	3.0	3.1	8.0	0.0
SPS 362	213.3	38.9	5.5	13.3	3.5	2.5	3.5	3.5	2.4	2.7	7.8	1.0
SPS 316	207.5	41.8	5.0	12.0	3.0	3.5	3.5	3.5	2.4	3.1	8.0	0.0
SPS 658	158.0	51.7	3.1	17.4	3.5	3.5	3.5	3.5	4.5	4.2	7.4	1.0
SPS 702	176.0	50.8	3.5	15.8	3.5	2.5	3.5	4.0	2.7	2.9	7.2	1.0
Cordia	230.5	43.2	5.3	18.0	2.0	3.0	2.0	3.5	4.3	3.8	7.8	0.0
Frantes	217.8	41.2	5.3	12.3	4.0	3.0	3.5	3.5	3.3	3.2	0.0	4.0
Magno	228.3	43.3	5.3	13.0	3.0	2.5	3.5	4.0	3.5	3.6	8.0	0.0
Museon	193.6	38.1	5.1	11.9	4.0	3.0	3.5	3.5	4.4	3.5	8.8	3.0
Karotan	227.8	38.3	5.9	15.2	1.0	1.5	3.5	3.5	4.0	3.9	8.4	0.0
CR287	207.8	36.3	5.7	10.7	3.5	3.5	3.5	3.5	2.8	3.1	7.6	1.0
*Blaze	276.5	44.4	6.2	14.7	1.0	2.5	3.0	3.0	4.0	3.2	8.8	NR
*Red Star	149.5	40.9	3.7	11.8	2.0	3.5	2.5	3.5	3.8	3.5	8.6	NR
*Red Count	255.0	37.5	6.8	12.5	2.0	2.5	4.5	4.0	3.8	3.7	7.8	NR
*S-382-G	219.0	37.7	5.8	10.2	3.5	3.5	3.5	4.0	3.3	3.2	9.2	NR
*Chantenay	175.5	45.3	3.8	18.5	2.0	3.0	4.0	1.0	2.5	2.9	7.0	NR

*Sowing date: 23 September 1993

Table 3 Carrot Root Quality - September Sowing

Cultivar	Shoulder Configuration 1 = recess 3 = flat 5 = round	Green Shoulder 1 = many 5 = nil	Purple Shoulder 1 = many 5 = nil	% Defects of Total Number						
				Bolters	Forked	Missshapen	Split	Rotten	Under Size	Other
Nerac	5	4.5	5.0	0	6	22	0	0	7	1
Fontana	4	4.0	5.0	0	5	24	0	0	9	4
Narbonne	4	4.5	5.0	0	4	35	0	0	12	2
Newmarket	3	5.0	5.0	0	5	31	0	0	11	1
Bangor	4	2.0	5.0	0	5	37	0	0	3	3
Nairobi	4	3.5	5.0	0	6	20	0	0	12	2
Newbury	4	3.5	5.0	0	1	20	0	1	6	3
Nogales	3	5.0	5.0	0	10	18	0	2	3	6
Ferrara	4	4.5	5.0	0	7	26	0	1	7	2
Boston	4	3.5	5.0	0	5	20	0	5	7	8
Kamaran	4	4.5	0.0	0	3	19	0	0	4	2
Kazan	3	5.0	5.0	0	8	15	0	1	5	2
Dakota	3	4.0	5.0	0	6	33	0	9	13	19
Bernova	4	3.0	5.0	0	5	22	0	1	14	1
Fannia	4	2.5	5.0	1	4	25	0	1	14	1
Crusader	4	3.5	5.0	0	5	16	0	2	14	1
Hi Pak	4	0.0	1.0	0	6	27	0	1	8	3
Top Pak	4	3.5	5.0	0	3	17	0	4	3	1
Nandor	4	3.5	5.0	0	4	15	0	1	7	1
SPS 733	4	2.5	5.0	0	7	34	0	0	3	3
SPS 734	3	4.0	5.0	0	10	22	0	1	3	0
SPS 735	4	3.5	5.0	0	6	29	0	3	6	5
SPS 362	4	3.5	5.0	0	5	21	0	3	11	3
SPS 316	3	3.5	5.0	0	4	24	1	2	11	0
SPS 658	2	2.5	5.0	1	2	19	0	21	10	2
SPS 702	3	0.0	2.0	2	2	5	0	4	16	0
Cordia	4	4.0	5.0	0	3	14	0	2	2	2
Frantes	4	2.0	5.0	0	4	25	0	3	12	1
Magno	4	3.5	5.0	0	4	22	0	1	9	0
Museon	4	1.5	5.0	0	5	29	0	11	5	0
Karotan	4	5.0	5.0	0	9	39	0	1	7	4
CR287	4	3.5	5.0	0	4	22	0	4	3	1
*Blaze			2.5	0	2	17	0	0	0	0
*Red Star			1.5	0	5	9	0	0	2	0
*Red Count			2.5	0	3	37	0	0	0	0
*S-382-G			2.0	2	0	15	0	5	5	2
*Chantenay			3.5	2	2	2	0	2	5	0
Mean				0.1	3.3	15.1	0.1	1.8	5.2	1.7
P				*	***	***	NS	***	***	NS
LSD				0.8	3.3	10.1	NS	2.7	4.5	NS

***, **, *, <0.1%, 1% and 5% respectively

*Sowing date: 23 September 1993

Table 4 Carrot Plant Growth and Yield - January Sowing

Cultivar	Supplier	Density No/m ²	Vigour Rating 1 = weak 2 = strong	Canopy Height (mm)	Top Disease 1 = high 5 = low	Top Strength 1 = weak 5 = strong	Top:Root Ratio	Days to Harvest	Marketable Yield after washing (t/ha)	% Yield Reduction after washing
Nanbro	M K	47.7	3.3	333.3	3.7	3.7	0.1	159	20.0	3.5
Kabro	M K	54.0	3.7	383.3	4.3	4.3	0.2	153	29.2	3.8
G. 92. 1088	M K	67.7	3.0	330.0	2.0	2.0	0.1	159	18.6	4.4
G. 02. 1004	M K	41.5	2.3	303.3	2.3	2.3	0.1	159	23.6	5.4
Dakota	E Z	106.9	3.3	416.7	3.0	3.0	0.2	159	14.9	23.7
Bernova	E Z	69.4	3.7	433.3	3.3	3.3	0.2	159	24.8	3.7
Fannia	E Z	58.3	2.7	413.3	4.0	4.0	0.2	155	31.5	7.0
Porthos	E Z	61.0	2.3	281.7	3.0	3.0	0.1	153	26.9	5.8
Najade	E Z	69.8	3.7	298.3	3.0	3.0	0.1	159	13.4	35.9
Nerac	Bejo	66.3	4.0	343.3	2.0	2.0	0.1	159	22.4	2.8
Fontana	Bejo	42.5	3.7	363.3	1.3	1.3	0.1	159	36.9	5.9
Narbonne	Bejo	67.7	4.0	376.7	2.7	2.7	0.1	159	22.7	6.0
Newmarket	Bejo	55.4	3.0	298.3	2.3	2.3	0.1	159	17.1	7.1
Bangor	Bejo	55.0	3.7	380.0	3.7	3.7	0.1	153	43.5	4.8
Nairobi	Bejo	57.3	3.7	303.3	2.0	2.0	0.1	159	24.1	5.7
Newburg	Bejo	50.2	2.7	330.0	3.7	3.7	0.1	159	24.3	7.2
Nogales	Bejo	44.4	3.7	340.0	1.0	1.0	0.1	159	23.3	13.5
Ferrara	Bejo	66.5	3.7	370.0	3.0	3.0	0.2	159	19.5	0.5
Boston	Bejo	63.5	4.3	401.7	5.0	5.0	0.1	153	33.3	5.3
Kamaram	Bejo	60.0	4.0	396.7	3.7	3.7	0.2	159	33.5	14.4
Kazan	Bejo	59.0	4.7	455.0	4.7	4.7	0.2	153	39.0	3.4
Sel 2755	A Yates	49.0	5.0	410.0	3.3	3.3	0.1	153	40.9	4.6
Medida	A Yates	57.7	3.7	230.0	1.3	1.3	0.1	159	9.3	19.8
Crusader	SPS	50.2	3.3	303.3	2.7	2.7	0.1	153	34.0	2.1
Hi Pak	SPS	35.8	3.0	360.0	2.3	2.3	0.1	159	29.1	10.3
Top Pak	SPS	36.3	2.0	280.0	1.7	1.7	0.1	159	29.1	4.5
SPS 609	SPS	34.2	4.0	410.0	3.3	3.3	0.1	153	35.6	2.8
Nandor	SPS	60.8	3.7	283.3	2.3	2.3	0.1	159	21.5	7.6
SPS 733	SPS	46.9	2.7	223.3	1.0	1.0	0.1	159	15.0	18.2
SPS 734	SPS	60.8	3.3	310.0	1.0	1.0	0.1	159	29.7	9.2
SPS 735	SPS	61.0	2.3	286.3	1.7	1.7	0.1	159	21.8	8.7
SPS 362	SPS	36.9	2.0	246.7	1.7	1.7	0.1	159	18.6	4.9
SPS 316	SPS	41.5	3.7	270.0	1.3	1.3	0.1	159	22.1	6.3
SPS 658	SPS	56.5	4.0	356.7	2.7	2.7	0.1	153	34.1	11.6
SPS 702	SPS	32.7	3.3	350.0	3.7	3.7	0.1	153	34.5	16.2
Ringo	Edgl	49.6	3.3	373.3	3.0	3.0	0.1	153	33.6	1.5
Frantes	Edgl	45.4	2.7	293.3	2.7	2.7	0.1	159	19.4	13.9
CR287	N K	42.1	4.3	346.7	1.7	1.7	0.1	159	23.8	7.3
CR286	N K	68.5	3.7	450.0	3.3	3.3	0.2	159	25.5	29.4
CR345	N K	41.5	4.7	386.7	2.3	1.3	0.1	159	29.1	7.6
Blaze	N K	45.8	3.0	403.3	3.0	2.7	0.2	159	25.8	12.1
Magno	R Z	71.3	4.3	403.3	2.7	1.3	0.1	159	24.0	9.8
Museon	R Z	49.0	3.7	266.7	2.3	3.3	0.1	157	26.6	5.6
Karotan	R Z	68.5	4.0	456.7	4.0	3.7	0.3	159	32.0	9.2
55-62 RZ	R Z	78.5	3.7	393.3	3.3	2.7	0.1	157	29.8	5.9
Medoc RZ	R Z	50.0	3.3	423.3	3.0	4.0	0.1	157	24.9	12.5
Cordia	N Z	57.1	4.3	455.0	4.0	3.0	0.2	155	31.7	14.1
Red Count	Hend	60.0	3.3	396.7	3.7	1.3	0.1	159	26.4	14.8
Red Star Thru	Hend	51.3	3.7	386.7	2.0	3.0	0.1	159	24.4	8.2
Sel 382G	Hend	49.6	3.7	373.3	3.0	3.0	0.1	158	22.7	1.8
Sel 387G	Hend	57.9	3.3	246.7	3.7	1.3	0.1	159	15.6	5.7
New Kuroda	Vecon	49.4	2.7	366.7	4.0	3.3	0.1	159	23.5	16.7
Sunex 278	Vecon	42.5	4.7	330.0	3.0	1.3	0.1	159	36.5	23.6
Inca	Vecon	51.7	4.3	240.0	2.3	1.3	0.1	158	32.8	6.3
Caroline	Sakata	45.0	4.0	300.0	4.0	2.0	0.1	158	27.8	23.3
Asubehi	Sakata	58.1	5.0	280.0	3.0	2.0	0.1	158	25.0	44.4
Mean			3.5	349.4	3.1	2.6		157	26.5	
P			***	***	***	***		***	***	
LSD			1.5	82.5	1.1	1.9		3	17.3	

***, **, *, <0.1%, 1% and 5% respectively

MK Magnus Kahl Seeds
 EZ Enza Zaden
 A Yates Arthur Yates
 SPS Sth Pacific Seeds

EDGL Edgells
 NK Northrup King
 RZ Rijk Zwaan
 NZ Nickerson-Zwaan
 Hend Henderson

Table 5 Carrot Root Quality - January Sowing

Cultivar	Length (mm)	Dia (mm)	L : D Ratio	Core Diameter (mm)	Tip Shape 1 = point 5 = blunt	Smoothness 1 = rough 5 = smooth	Hairs 1 = many 5 = nil	External	Core	Cortex	Brix Level	Split Test 0 = nil 5 = many	Storage White Scurf 1 = very low 5 = severe
								Colour 1 = yellow 3 = lt orange 5 = orange	Colour 1 = yellow 3 = lt orange 5 = orange	Colour 1 = yellow 3 = lt orange 5 = orange			
Nanbro	196.0	30.3	6.5	11.1	2.7	3.7	3.3	3.7	3.8	3.5	8.6	0.7	2.3
Kabro	218.2	33.6	6.5	10.7	1.0	2.3	3.3	3.7	4.2	3.9	9.4	1.7	2.0
G. 92. 1088	157.3	30.1	5.2	7.8	3.3	3.3	4.0	4.0	3.7	3.3	8.6	0.7	2.7
G. 02. 1004	192.7	31.2	6.2	11.4	2.7	3.0	3.3	3.7	3.7	3.4	7.4	1.0	3.7
Dakota	174.8	26.8	6.5	6.3	3.3	3.7	4.0	4.0	3.9	3.9	7.6	2.7	2.0
Bernova	198.1	30.7	6.5	11.8	2.0	3.7	3.0	3.7	3.7	3.4	8.0	0.0	3.0
Fannia	207.3	34.3	6.0	12.8	1.7	3.3	4.0	3.3	3.9	3.5	7.4	0.3	1.7
Porthos	179.5	27.9	6.4	8.9	3.0	3.0	4.3	3.0	3.8	3.3	7.6	0.3	2.0
Najade	171.3	25.5	6.7	6.9	4.0	4.0	4.3	3.0	4.4	3.6	8.0	0.7	3.3
Nerac	177.3	27.8	6.4	9.3	3.0	3.3	3.7	4.0	4.1	3.7	8.8	0.0	3.7
Fontana	197.5	34.3	5.8	14.3	3.0	3.7	3.7	3.3	4.3	4.1	7.2	1.0	3.7
Narbonne	176.9	27.9	6.3	10.5	2.7	3.3	3.7	4.0	4.0	3.6	8.2	0.7	3.3
Newmarket	168.0	25.7	6.5	8.6	2.7	3.0	3.7	3.3	3.9	3.5	7.8	0.3	4.3
Bangor	190.2	31.2	6.1	13.4	3.0	2.3	4.0	3.0	4.1	3.9	6.6	0.0	2.3
Nairobi	164.3	31.6	5.2	12.0	3.0	3.3	3.7	3.7	3.2	3.3	7.8	0.0	3.0
Newburg	178.5	27.6	6.5	11.3	4.0	3.0	4.0	3.7	4.3	3.9	8.0	0.3	4.3
Nogales	220.2	31.5	7.0	9.4	2.0	3.0	3.0	4.0	4.1	3.8	10.2	0.7	4.7
Ferrara	198.8	31.4	6.3	9.8	1.0	3.3	4.0	4.3	3.6	3.4	7.8	0.7	2.7
Boston	193.5	31.9	6.1	9.6	2.0	3.0	4.7	4.0	4.0	3.6	9.0	2.7	3.3
Kamaran	190.0	33.9	5.6	10.4	3.0	3.0	3.7	4.0	4.4	4.3	7.6	3.3	2.3
Kazan	200.0	36.2	5.5	11.0	1.3	2.3	5.0	4.0	4.3	3.9	8.0	1.0	2.3
Sel 2755	196.2	30.8	6.4	9.9	3.3	3.0	4.3	3.0	4.3	3.7	7.4	1.3	2.3
Medida	212.6	28.0	7.6	8.8	2.0	3.0	4.0	3.3	4.1	3.8	8.2	0.3	2.0
Crusader	179.3	31.6	5.7	8.8	4.0	3.7	3.7	3.0	3.8	3.2	7.6	2.0	3.3
Hi Pak	204.3	38.2	5.4	11.5	2.7	3.7	3.3	3.7	3.8	3.5	7.8	1.3	4.3
Top Pak	184.8	34.4	5.4	11.4	3.0	2.7	3.3	3.0	2.9	3.3	8.0	0.3	4.3
SPS 609	200.6	35.9	5.6	10.2	4.0	3.0	4.0	3.0	2.5	3.1	8.4	0.3	3.0
Nandor	156.3	29.7	5.3	8.9	2.7	3.3	4.0	3.7	3.6	3.7	7.8	0.3	2.7
SPS 733	180.2	27.4	6.6	6.9	4.0	3.0	4.0	3.3	3.7	3.8	8.6	1.7	2.3
SPS 734	180.8	30.3	6.0	10.3	4.0	3.0	3.7	3.7	4.4	4.2	7.2	0.0	2.3
SPS 735	167.1	27.9	6.0	9.1	3.7	3.0	4.0	3.0	3.0	3.3	8.2	1.0	2.7
SPS 362	179.7	31.0	5.8	9.0	4.0	3.0	3.7	3.3	2.3	2.6	7.4	0.0	2.3
SPS 316	164.3	31.4	5.2	9.6	3.0	3.7	4.0	3.3	3.3	3.5	7.4	1.0	4.7
SPS 658	138.7	43.0	3.2	13.0	4.0	3.0	4.0	3.0	3.1	3.0	6.6	2.7	2.0
SPS 702	159.3	42.7	3.7	8.6	4.0	3.0	4.0	3.3	3.3	6.2	7.2	1.0	2.3
Ringo	184.5	33.6	5.5	12.2	2.3	3.0	4.0	3.0	3.9	3.6	6.8	0.0	1.3
Frantes	173.1	26.7	6.5	7.0	3.0	3.0	3.3	4.0	3.2	3.4	8.4	0.3	3.0
CR287	195.7	31.5	6.2	10.2	3.0	3.0	4.0	3.3	3.3	3.5	9.2	1.7	3.7
CR286	195.2	30.1	6.5	10.6	1.7	4.0	3.7	3.3	4.3	3.7	7.6	0.7	2.7
CR345	191.0	31.0	6.2	10.5	3.7	3.0	3.7	2.7	3.5	3.5	8.2	1.0	2.7
Blaze	234.0	35.4	6.6	11.0	1.0	2.3	4.0	3.0	4.0	3.0	8.8	1.3	2.0
Magno	180.3	30.9	5.8	8.8	2.0	3.7	4.0	4.7	3.9	4.0	7.6	0.7	1.7
Museon	159.4	30.0	5.3	8.5	4.3	4.0	3.7	3.3	3.9	3.6	8.4	1.3	4.3
Karotan	206.7	30.0	6.9	11.1	1.0	2.7	3.7	4.7	4.3	4.1	9.2	0.7	1.7
55-62 RZ	178.4	27.3	6.5	7.5	3.7	3.3	4.3	3.3	3.8	3.4	8.0	1.3	2.3
Medoc Rz	227.0	33.5	6.8	9.7	1.0	2.7	3.3	4.0	4.0	3.7	7.8	2.0	2.0
Cordia	197.8	34.3	5.8	11.6	1.0	2.3	3.7	4.3	4.4	3.7	8.6	2.7	2.3
Red Count	205.2	30.9	6.6	9.5	1.3	3.0	3.7	4.3	4.2	4.1	8.8	0.7	3.3
Red Star Thru	176.5	31.9	5.5	9.2	2.3	3.7	4.3	4.0	4.2	4.2	9.0	1.3	1.7
Sel 382G	186.9	31.3	6.0	7.1	2.3	3.0	3.7	4.3	4.1	3.7	8.2	1.0	3.0
Sel 387G	185.6	27.8	6.7	5.9	2.7	3.0	4.0	3.7	3.9	3.9	8.0	0.7	2.0
New Kuroda	169.8	39.1	4.3	11.1	4.0	3.3	2.7	3.3	3.4	3.4	6.8	1.7	4.3
Sunex 278	160.1	42.6	3.8	11.9	3.0	3.7	4.0	3.0	3.8	3.4	7.0	1.7	2.3
Inca	164.3	37.2	4.4	10.5	4.3	3.3	4.0	3.0	3.5	3.0	6.8	1.0	2.3
Caroline	157.5	46.2	3.4	12.3	4.0	3.0	3.0	3.0	3.1	3.2	7.6	2.0	1.0
Asubehi	163.5	42.4	3.9	10.0	3.0	4.0	4.0	4.0	#N/A	4.2	7.6	2.0	2.0
Mean					2.8	3.2	3.8	3.6				0.9	
P					***	***	***	***				***	
LSD					1.0	0.9	1.1	1.0				1.9	

***, **, *, <0.1%, 1% and 5% respectively

Table 6 Carrot Root Quality - January Sowing

Cultivar	Shoulder Configuration 1 = recess 3 = flat 5 = round	Green Shoulder 1 = many 5 = nil	Purple Shoulder 1 = many 5 = nil	% Defects of Total Number						
				Bolters	Fanged	Misshapen	Split	Rotten	Under Size	Other
Nanbro	4.3	4.0	5.0	0	6	24	0	0	28	0
Kabro	3.9	4.7	4.0	0	11	16	0	0	17	1
G. 92. 1088	3.7	4.3	4.7	0	3	33	0	0	53	0
G. 02. 1004	3.8	4.7	4.3	0	3	19	0	0	20	0
Dakota	3.5	4.0	4.7	0	9	77	0	1	81	1
Bernova	4.0	2.7	3.3	0	7	48	0	0	42	0
Fannia	4.1	1.7	3.7	0	6	20	0	0	28	1
Porthos	4.5	3.0	4.0	0	10	17	1	0	10	3
Najade	4.5	3.7	3.3	0	9	44	2	0	34	1
Nerac	4.4	4.3	5.0	3	2	46	0	0	24	0
Fontana	3.5	3.7	3.3	0	2	14	0	0	15	0
Narbonne	4.1	4.0	4.7	0	3	39	0	0	45	0
Newmarket	3.9	3.7	5.0	0	5	35	0	0	24	0
Bangor	4.2	3.0	4.3	0	3	12	0	0	18	2
Nairobi	3.9	4.0	4.3	0	7	26	0	0	34	0
Newburg	4.0	3.3	4.7	0	7	25	2	0	17	0
Nogales	3.1	4.3	4.7	3	7	25	0	0	11	1
Ferrara	4.2	4.7	4.3	1	7	56	0	0	28	0
Boston	4.7	4.0	4.7	0	5	27	0	0	16	2
Kamaran	3.5	3.7	4.7	0	5	34	1	0	19	0
Kazan	3.7	3.3	4.3	0	7	14	0	0	11	2
Sel 2755	3.8	2.0	2.3	0	7	3	2	0	14	0
Medida	4.4	3.0	4.0	0	5	60	1	0	17	3
Crusader	4.8	3.3	5.0	0	3	10	0	0	3	0
Hi Pak	3.1	3.7	4.3	0	1	20	0	0	9	0
Top Pak	2.7	3.0	4.0	0	3	14	0	0	7	0
SPS 609	4.0	3.3	3.3	0	2	7	0	0	4	1
Nandor	3.6	3.3	3.0	1	4	30	0	0	33	0
SPS 733	4.1	3.3	3.3	0	10	30	0	0	14	1
SPS 734	3.6	3.7	4.3	0	10	38	0	0	22	1
SPS 735	4.6	3.0	3.3	1	4	25	0	0	42	0
SPS 362	3.3	4.0	3.3	0	3	23	0	0	18	0
SPS 316	3.2	3.3	3.7	0	3	20	0	0	18	0
SPS 658	1.5	2.3	3.3	0	3	4	6	0	36	0
SPS 702	1.8	3.7	2.7	0	3	1	3	1	9	0
Ringo	4.0	3.3	4.0	0	5	8	0	0	20	0
Frantes	3.6	3.3	3.7	0	3	27	2	0	15	1
CR287	3.4	3.7	4.3	0	4	34	2	0	6	1
CR286	3.6	4.0	3.3	0	11	43	1	0	31	0
CR345	3.2	3.3	4.0	0	4	26	0	0	4	1
Blaze	3.5	4.7	4.7	0	6	20	0	0	18	3
Magno	3.4	4.7	5.0	0	7	42	1	0	46	0
Museon	3.1	1.7	2.7	0	5	30	1	0	14	0
Karotan	3.9	4.3	4.7	0	6	20	1	0	34	1
55-62 RZ	4.1	3.7	5.0	0	9	44	0	0	28	2
Medoc Rz	4.0	4.7	4.3	2	3	16	1	0	14	0
Cordia	3.8	4.0	4.7	0	5	11	6	0	17	0
Red Count	3.0	4.7	4.3	0	11	30	1	0	22	1
Red Star Thr	2.7	4.7	4.7	0	5	24	0	0	27	0
Sel 382G	1.8	4.7	4.3	0	7	36	0	0	16	1
Sel 387G	2.4	4.0	5.0	0	9	37	0	0	28	3
New Kuroda	2.0	4.0	2.7	2	11	14	3	0	30	0
Sunex 278	1.7	4.0	3.7	0	2	5	4	0	17	0
Inca	2.3	4.3	3.3	0	3	20	1	0	23	0
Caroline	2.7	5.0	3.0	0	4	5	10	0	35	0
Asubehi	4.3	5.0	5.0	0	4	4	20	0	24	0
Mean		3.7	4.1		4.5	20.2			17.6	
P		***	***		***	***			***	
LSD		1.3	1.4		5.3	18.6			15.7	

***, **, *, <0.1%, 1% and 5% respectively

Table 7 Green Bean Plant Growth and Yield Data

Cultivar	Supplier	Days to full flower	Plant Height (mm)	Canopy Cover (mm)	Lodging 1 = lax 5 = erect	Pods on Ground no./m ²	No. Plants /m ²	FIRST PICK (FRESH)			SECOND PICK (FRESH)			PROCESSING HARVEST			
								Days to Harvest	Yield (t/ha)	No. Diseased (Pods/m ²)	Yield (t/ha)	No. Diseased (Pods/m ²)	Total Yield Fresh t/ha	No. Plants m ²	Days to Harvest	Yield t/ha	Seed Length (mm)
Labrador	ERS	63	380	343	5	12	26	78	8.3	2	3.5	1	11.9	32	81	8.4	7.8
2342	AY	59	450	430	3	5	34	78	8.8	3	1.8	1	10.6	40	83	12.3	8.2
BN0112	NK	59	360	300	5	10	42	78	4.1	4	6.3	4	10.4	45	81	8.1	8.4
BN0101	NK	59	400	420	5	3	35	78	8.3	1	2.5	0	10.8	39	83	9.2	7.7
BN0082	NK	54	340	330	5	14	47	78	6.0	0	3.9	8	9.9	45	81	6.1	7.7
BN0100	NK	59	410	350	3	9	36	78	8.6	2	6.0	2	14.6	35	82	14.4	8.1
BN0069	NK	63	340	310	5	11	35	78	7.3	0	3.9	1	11.2	39	83	11.8	7.8
BN0097	NK	63	300	270	5	10	45	78	2.8	0	1.9	1	4.7	43	82	4.7	7.7
BN0071	NK	63	400	430	4	8	37	78	8.4	4	3.7	1	12.1	38	83	13.8	8.2
BN0090	NK	63	340	360	4	3	37	78	11.5	1	1.9	0	13.4	43	81	11.0	10.6
BN0103	NK	63	300	350	4	8	26	78	5.9	0	2.1	0	8.1	32	83	10.0	8.0
BN0060	NK	59	340	320	5	5	40	78	6.2	0	6.4	9	12.6	34	82	7.9	7.8
Aileen	SS	63	380	310	5	11	29	78	3.9	0	4.2	0	8.1	33	87	9.4	8.7
Broker	SS	63	300	350	5	8	37	78	4.0	2	5.8	1	9.8	26	83	8.7	7.9
OSU5402	SS	59	400	450	3	3	34	78	9.9	4	9.2	6	19.1	30	87	15.1	10.7
Safarie	SS	N/A	290	310	5	11	46	78	2.4	0	4.5	2	6.9	47	82	4.6	7.7
Montagne	SS	59	240	270	5	35	36	78	4.4	2	4.1	3	8.5	37	81	5.1	8.0
Milagrow	SS	54	360	340	5	16	37	78	4.8	1	5.3	1	10.1	39	81	7.3	8.3
Flevaro(SS)	SS	59	270	240	5	21	35	78	3.5	0	3.7	0	7.2	37	81	3.7	8.0
Odessa	SS	N/A	350	320	5	21	34	78	3.3	0	6.8	4	10.1	37	82	9.5	8.0

* See Table 11 for pod quality parameters

ERS	Edgells Rural Supplies	NK	Northrup King
AY	Arthur Yates	SS	Sunland Seeds

Table 8 Pod Quality Parameters

Cultivar	Mean Weight (g)	Mean Length (mm)	Mean Diameter (mm)	Shape (1-5)	Section (1-5)	Cavity (1-5)	Pod Construction (1-5)	Coolstore assessment (12 days)		Comments	
								Pod colour 1 = very pale 5 = dark green	% Stalks Remaining on Pods		% Weight loss includes diseased pods
Labrador	6.0	115.9	7.5	4.1	4.4	2.0	4	4	55	38.5	Sclerotinia
2342	4.9	119.3	6.7	4.3	1.4	4.4	5	4	15	21.0	Sclerotinia and Botrytis
BN0112	4.4	100.3	8.5	4.6	3.1	1.0	3	4	80	23.8	Sclerotinia and Botrytis
BN0101	4.8	107.2	7.0	4.1	1.0	3.8	5	4	40	5.6	Some orange flecking
BN0082	3.8	102.7	6.5	4.3	4.4	1.0	3	4	70	19.3	Pale and matt colour
BN0100	5.6	133.6	9.3	4.2	4.0	1.7	4	3	50	16.0	Sclerotinia
BN0069	5.9	116.6	8.1	3.9	4.0	1.6	5	Yellow	45	27.8	Some Sclerotinia
BN0097	2.7	82.4	7.2	4.0	3.6	1.0	5	PY	10	19.4	Sclerotinia and Botrytis
BN0071	7.2	150.0	8.6	4.1	3.8	1.9	4	3	35	24.8	Retained colour but some disease
BN0090	6.1	117.5	9.2	4.3	3.7	1.7	3	3	15	18.5	Sclerotinia and rust fleck
BN0103	5.9	114.5	8.7	4.2	3.8	2.0	4	2	65	17.1	Matt appearance
BN0060	3.8	99.3	8.0	4.8	3.9	1.0	5	3	50	18.7	Stored well, some Sclerotinia
Aileen	5.0	102.5	7.6	4.5	4.7	1.0	3	5	45	9.7	
Broker	4.9	111.5	8.6	4.0	3.9	2.9	3	3	75	12.0	Severe flecking
OSU5402	6.8	128.2	8.3	4.0	4.0	2.6	3	3	20	21.0	
Safarie	2.9	105.8	7.2	4.0	3.7	1.0	5	2	60	16.1	Orange flecking
Montagne	3.8	99.5	8.6	4.4	3.7	1.0	5	3	15	38.6	Severe flecking poor finish
Milagrow	3.8	110.5	7.8	4.3	3.8	1.0	5	5	40	6.5	No fleck dark green
Flevoro(SS)	2.9	94.0	6.6	4.5	4.0	1.0	5	4	60	11.9	Orange fleck Botrytis
Odessa	3.6	91.5	6.8	4.0	4.3	1.0	5	2	45	12.3	Orange fleck Botrytis

* See Table 11 for pod quality parameters

Table 9 Slicing Bean Plant Growth and Yield Data

PROCESSING HARVEST

Cultivar	Supplier	Days to Full Flower	Plant Height (mm)	Canopy Cover (mm)	Lodging 1 = lax 5 = erect	Pods on Ground no. /m2	No. Plants m2	Days to Harvest	Yield t/ha	Seed Length (mm)
Flo	ERS	63	450	420	3	8	21	87	10.1	10.2
2341	AY	63	355	450	4	8	29	87	13.1	10.5
Simba	SS	63	275	390	4	25	38	87	7.9	10.1
607	SS	59	325	335	5	19	43	84	7.1	10.1
69	SS	59	365	425	4	23	45	83	15.3	10.5
61	SS	63	300	445	3	12	37	84	10.5	10.0
8088	SS	63	430	390	4	7	28	88	11.5	9.5
OSU91G	SS	N/A	305	345	3	16	37	82	10.9	10.0

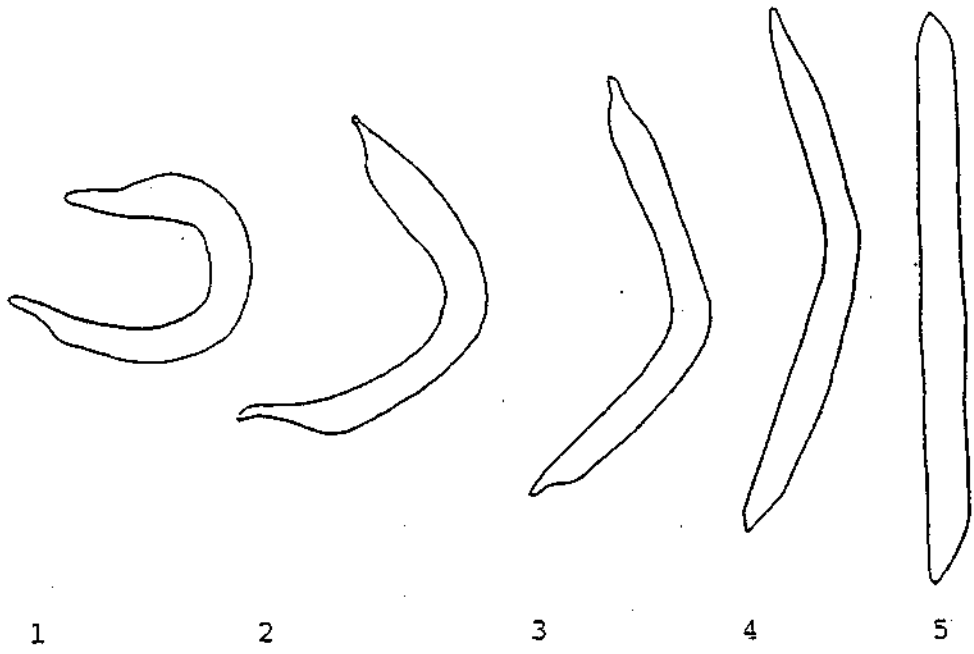
* See Table 11 for pod quality parameters

Table 10 Pod quality

Cultivar	Supplier	Mean Weight (g)	Mean Length (mm)	Mean Diameter (mm)	Shape (1-5) *	Section (1-5) *	Cavity (1-5) *	Pod Constriction (1-5)	Pod Colour 1 = very pale 5 = dark green	% Stalks Remaining on Pods
Flo	ERS	9.3	129.5	8.2	4.1	4.6	2.5	3	3	5
2341	AY	9.7	123.9	8.9	3.9	4.9	3.1	2	3	70
Simba	SS	5.0	103.7	7.3	4.4	3.8	2.2	5	4	15
607	SS	6.2	108.8	7.7	4.7	4.4	1.0	5	4	30
69	SS	6.9	124.5	8.5	4.3	4.1	1.4	4	3	65
61	SS	6.8	116.5	8.3	4.7	4.4	1.3	5	4	15
8088	SS	6.7	117.2	8.2	4.2	3.7	2.3	3	4	20
OSU91G	SS	9.0	139.0	8.5	3.9	4.1	2.7	3	4	50

Table 11 Bean Pod Quality Parameters

Shape



Section



Cavity

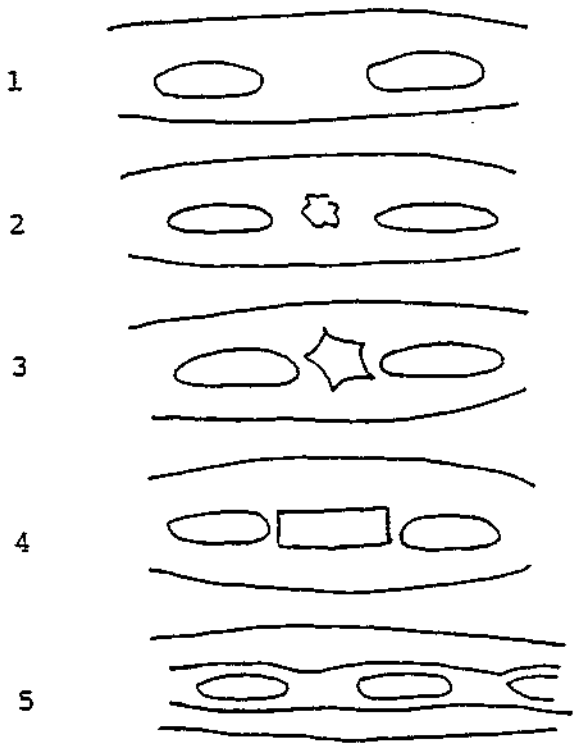


Table 13 Green Pea Sowing 2 - 2 December 1993

	Node 1st Flower	Flowering Date	Approximate Mature Date	Vine Length (mm)	Days To Maturity	Root Rot Rating	
1 PEO52	12	25/1	13/2	340	73	1	Semi leafless, erect plants, 5-6 peas/pod
2 PEO55	9	14/1	4/2	260	64	3	<u>Powdery Mildew</u> , short pods, small peas 5/pod
3 PEO56	13	26/1	14/2	340	74	2	6 peas/pod
4 PEO57	13	26/1	13/2	330	73	3	6 peas/pod
5 PEO63	9	16/1	6/2	350	66	3	Semi-leafless, short pods, large peas 4-6 peas/pod
7 PEO65	14	28/1	15/2	360	75	2	Indeterminate, 6-7 peas/pod
8 PEO66	12	24/1	13/2	340	73	1	Some short pods, 5-6 peas/pod
9 PEO67	13	28/1	15/2	340	75	2	Long thin pods, 7-8 peas/pod
10 PEO68	14	25/1	12/2	350	72	1	Semi-leafless, erect plants, 6-7 peas/pod
11 PEO69	12	20/1	11/2	330	71	3	Semi-leafless, erect plants, 6-7 peas/pod
12 PEO70	9	16/1	4/2	250	64	3	Very short pods, 5 peas/pod
13 PEO71	11	18/1	7/2	270	67	3	Pods not well filled, 3-4 peas/pod
14 PEO72	9	16/1	4/2	300	64	3	<u>Powdery mildew</u> , 5 peas/pod
SSF	13	26/1	15/2	700	75	0	<u>Powdery mildew</u> , 8-9 peas/pod
Bounty	13	25/1	14/2	510	74	2	7-8 peas/pod

3=worst
affected

Table 14 Onion (Colour)

August '93 Sowing

Cultivar	Date Lifted	Total No	Total weight t/ha	Marketable Yield		Comments
				weight t/ha	No of bulbs	
White	28-Feb	450	57	49	324	poor germination thick stems
Cream Gold	11-Mar	374	92	81	298	
Red Tango	13-Apr					
Red Moon	11-Mar	377	80	62	302	
Red Shannon	11-Mar	156	56	54	144	

September '93 sowing

Cultivar	Date Lifted	Total No	Total weight t/ha	Marketable Yield		Comments
				weight t/ha	No of bulbs	
White	28-Feb	as above				1/2 plots grouped with August thick stems thick stems Small bulbs
Cream Gold	31-Mar					
Red Tango	13-Apr					
Red Moon	14-Mar	614	102	85	389	
Red Shannon	11-Mar	713	153	145	607	

Table 15 Onion (Sweet)

October '93 Sowing

Cultivar	Date Lifted	Total No	Total weight t/ha	Marketable Yield		Comments
				weight t/ha	no of bulbs	
Vaquero	13-Apr					thick stems
Cimarron	21-Mar	1072	162	152	836	
Sweet Winter	11-Mar	673	145	127	534	
Walla Walla	21-Mar					thick stems
Sweet						
Brounville	14-Mar	421	75	66	272	1 plot, thick stem

Table 16 Sweet Corn Cultivars 1993/94

Characteristics 10 Plants

CULTIVAR	SUPPLIER	Days to Harvest	Plant Height (mm)	Primary cob Height (mm)	Tillers Total No. per plant	Tillers Productive per plant	Productive Cobs per plant	Ears with husks		Cobs	
								Weight Primary	(grams) Secondary	Weight Primary	(grams) Secondary
Bullion	A.Y.	136	1733	352.5	1.7	0.1	1.7	3400	2050	2250	1100
Long & Sweet	A.Y.	139	1843	283.5	1.7	0	2.3	2700	1850	1850	1250
Honey Sweet	R	126	1255	270	1.7	0.5	1.5	3900	1150	2242	652

* See table 18 for quality parameters

Table 17

Characteristics 10 primary cobs

CULTIVAR	Husk Colour *	Husk Length *	Husk Type *	Husk Cover *	length (mm)	diameter (mm)	Number rows	Rowing *	Tip fill *	Cob colour *	Kernel width (mm)	depth (mm)	Quality Pericarp	Flavour	% Dry matter at harvest
Bullion	3	3	L	G	187	42.5	16.4	3	2.9	3	7.8	8.6	4	3	22.85
Long & Sweet	3	3	M	A	186	38.8	14.6	3	1.8	2	8.8	8.8	3	4	21.7
Honey Sweet	3	4	M	G	191	48.4	13.2	3	2.8	3	9	10.3	2	4	22.1

* See table 18 for quality parameters

Table 18

Sweetcorn Plant, Cob and Kernel Assessment

(From Rogers Brothers, U.S.A.)

PLANT CHARACTERISTICS

Husk Type (ease of removal)

- L Light
- M Medium
- T Tight

Husk Cover (of cob tip)

- P Poor
- A Average
- G Good

COB CHARACTERISTICS

Cob Length

Measurement in mm of cobs

Diameter

Average diameter to nearest 3mm

No. of Rows

Average number of rows per cob

Rowing

- 5. Mostly perfect rows
- 4. Good rowing
- 3. Average - few slightly spiral and broken
- 2. Considerable sulci, spiral broken or drop row to cob tips
- 1. All bad sulci, spiral broken or drop row to cob tips

Tip Fill

- 5. Perfect fill well over tip
- 4. Generally good tip fill - up to 5mm blank
- 3. Up to 15mm tip blank
- 2. Up to 25mm blank
- 1. Over 25mm tip blank

KERNEL CHARACTERISTICS

Kernel Depth

Measured in millimeters

Kernel Width

Measured in millimeters

Kernel Colour - Yellows

- 5. Orange
- 4. Dark Yellow
- 3. Medium Yellow
- 2. Light Yellow
- 1. Poor Yellow

Pericarp

- 5. Very tender
- 4. Outstanding
- 3. Tender
- 2.5 Average
- 2. Sub average, tough
- 1. Very tough

Flavour

- 5. Extremely sweet and flavourful
- 4. Outstanding
- 3. Good
- 2.5 Average
- 2. Flat or slightly starchy
- 1. Poor - bitter, very starchy

Table 19 Tomato Yields (g/plant)

Week Ending	28-Oct	5-Nov	12-Nov	19-Nov	26-Nov	3-Dec	10-Dec	17-Dec	23-Dec	Total	Grade 1	**"Small"	***"Buck"	Gr. 1 av. (g)
FA 144 **	0	169	364	569	728	1123	1580	1458	1284	7275	5416(74%)	1813(25%)	46(1%)	130
Amfora	265	629	645	587	1399	1688	1552	1671	652	9088	6429(71%)	1789(20%)	871(9%)	147
TA 167	331	461	452	414	951	884	1390	1250	1232	7365	3759(51%)	2515(34%)	1091(15%)	127
Estrella	0	206	427	506	539	796	958	1205	1462	6099	2624(43%)	3451(57%)	24(0)%	112

* Weight range 60-90g; marketable at 10-20% discount.

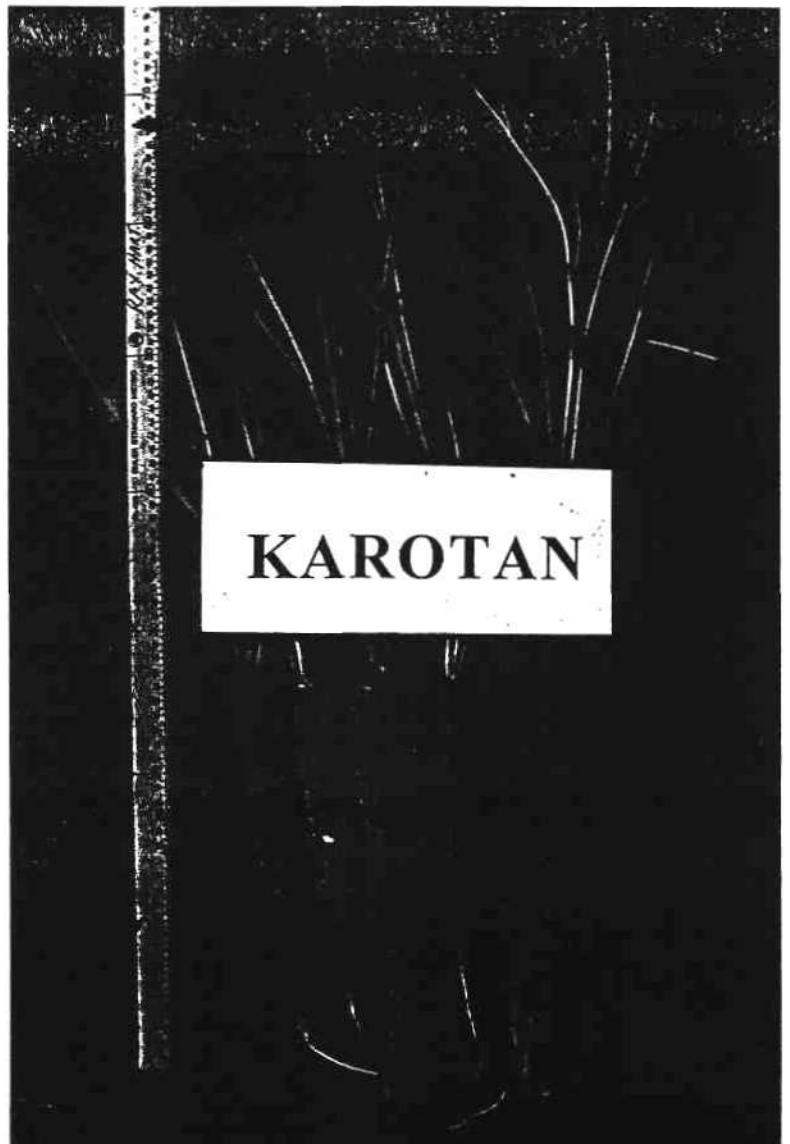
** Extra large or misshapen; marketable at 30-50% discount.

*** Brix level (8,12, 93) 4.2 degrees



L-R (front) Andrew Henderson (Henderson Seeds representative with Graeme Palmer (Serve-Ag) inspecting carrot trials at Forthside Vegetable Research Station.

Promising processing carrot cultivar Karotan.





L-R: Ray Smith (Sunland Seeds), Graeme Palmer (Serve-Ag) Peter Aird (Serve-Ag) inspecting green bean trials at Forthside Vegetable Research Station.



L-R: John Brandsema (Market gardener) and Dr Peter Lane (T.D.R.) inspecting Japanese pickling cucumber plants at Turners Beach.