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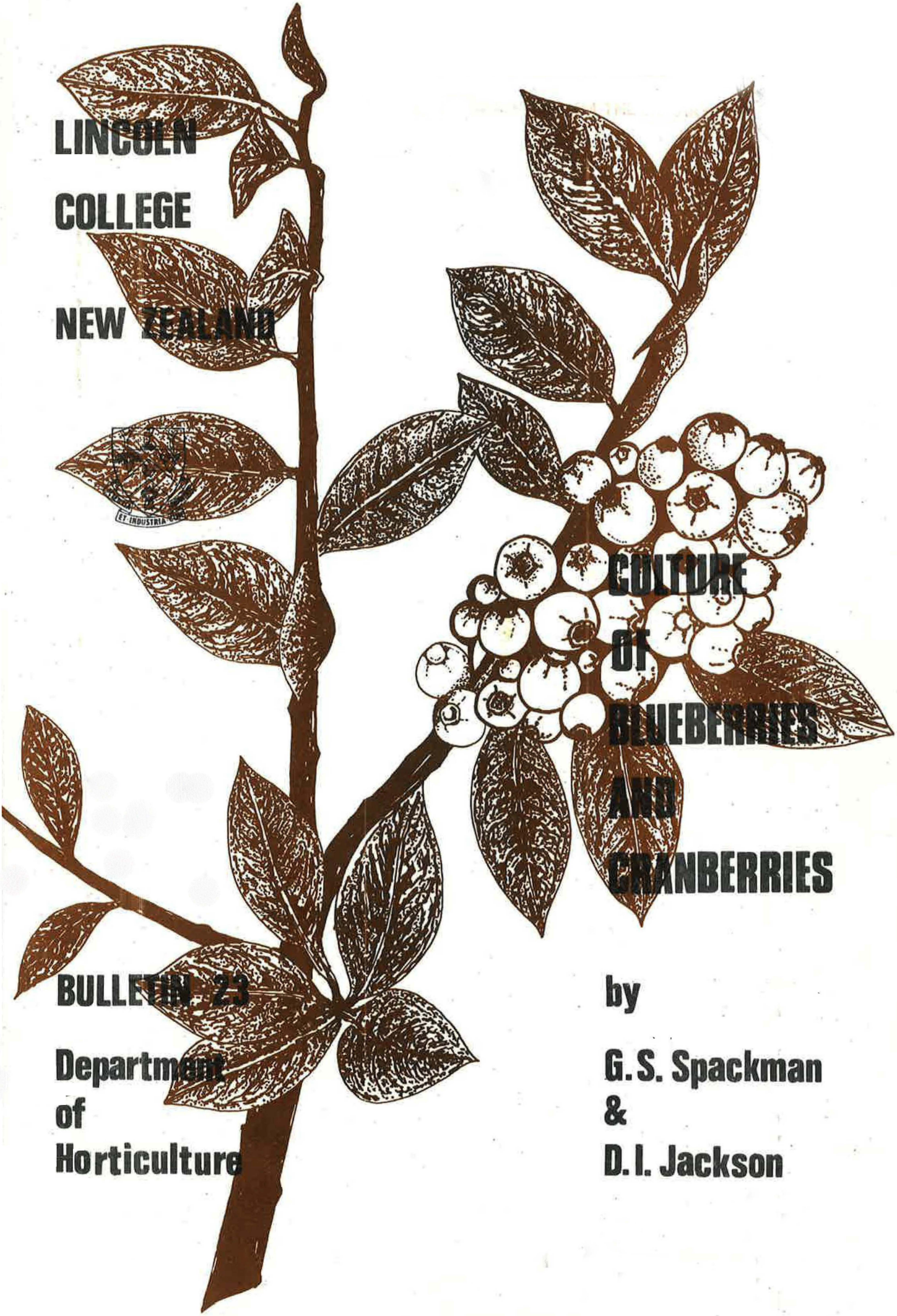

CULTURE OF BLUEBERRIES AND CRANBERRIES

BULLETIN 23

Department
of
Horticulture

by

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&
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NOTE

The basis for this bulletin is a paper by Grant Spackman presented for the Diploma in Horticultural Management at Lincoln College. Use has also been made of an essay by Tom Dormody, exchange student from Oregon, on cranberries.

We thank Roy Edwards for the drawing of a blueberry on the cover of this bulletin.

BLUEBERRIES

INTRODUCTION

Blueberries and cranberries belong to the family Ericaceae and are native to North America and East Asia. Some species such as *Vaccinium myrtillus* (bilberry) are also found in Europe but New Zealand has no native species, although the native *Gaultheria* is a close relative.

There are four useful groups of *Vaccinium* as follows:

LOWBUSH BLUEBERRY

Vaccinium angustifolium

Vaccinium myrtilloides

Vaccinium lamarkii

Vaccinium vacillans

HIGHBUSH BLUEBERRY

Vaccinium corymbosum (northern regions)

Vaccinium australe (southern regions)

RABBITEYE BLUEBERRY

Vaccinium ashei

CRANBERRY

Vaccinium macrocarpon

Blueberries and cranberries are deciduous plants, the lowbush only growing 10-40 cm high, the highbush 1-4 m, whilst the rabbiteye reaches up to 6 m. The fruit are many-seeded berries and the growth habit and size of bushes would be more like blackcurrants than any other fruit with which we are familiar in New Zealand.

Blueberries have a number of uses. Blueberry pie is considered by many to be unsurpassed, whilst jams, flavourings, juices, etc. have wide popularity. Cranberry sauce is the traditional accompaniment to the American turkey on Thanksgiving Day but its tart flavour reduces its use in pies and desserts. Juice products are, however, very popular.

The few blueberries that have appeared on the N.Z. Market have sold well for a good price and there seems to be no reason to believe that marketing of this product could not be successful. The more specialised uses for cranberry, however, may make this a slightly more difficult product; yet a good promotional campaign could no doubt build up a satisfactory market.

Work into blueberries and related crops is limited in New Zealand, but Levin Horticultural Research Centre and the Rukuhia Research Station (Hamilton) have imported or selected varieties, and done some preliminary trials into their culture. Some publications have resulted and are listed at the end of this bulletin. An advisory leaflet has been prepared by J.C. Todd, Ministry of Agriculture & Fisheries at Levin on Blueberries (1973) and this will be revised shortly.

The present Bulletin attempts to impart some of the background information needed to consider the culture of blueberries and cranberries in New Zealand.

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THE LOWBUSH BLUEBERRY

The lowbush blueberry is said to have a finer flavour than the highbush or the rabbiteye and although not so widely grown commercially in America, it can be profitable to convert abandoned farmland into lowbush blueberry production. Burning of such farmland, waste areas or forests, where this plant is native, favours its regrowth and eventual dominance by means of underground rhizomes which survive the high temperatures of the fire. Further burning of blueberry fields in spring can assist in maintaining a 100% stand.

The essentially wild nature of the species and the lack of named cultivars makes the success in areas where it is not native somewhat dubious. The immediate prospects for New Zealand are therefore not encouraging and the effort to establish suitable conditions and strains is unlikely to be undertaken by any official organisation. Private individuals or groups would seem to be the most likely vehicle, whereby this plant could become established.

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HIGHBUSH BLUEBERRY

It is the highbush blueberry which now dominates new plantings in North America and seems to offer the most potential for this country. These do not spread by rhizomes, and new canes develop from the crown. The main commercial plantings are in New Jersey, Michigan, North Carolina and British Columbia, and cover a total area in North America of over 12,000 hectares.

POMOLOGY

Although *Vaccinium corymbosum* and *V. australe* are the species commonly quoted as parents of the cultivated species, varieties are seldom separated botanically and no doubt extensive mixing has occurred to provide cultivated varieties. Plants are 1-4 m high and are grouped into two types, spreading and upright. Leaves are 4 cm long and 2 cm wide.

Flowering takes place at the end of September with pink or white flowers being produced. Although more self-fertile than rabbit-eye, cross-pollination will improve fruit set and size and it is normal practice to have two rows of one variety followed by two rows of another. The introduction of beehives before 25% full-bloom has very beneficial effects on pollination.

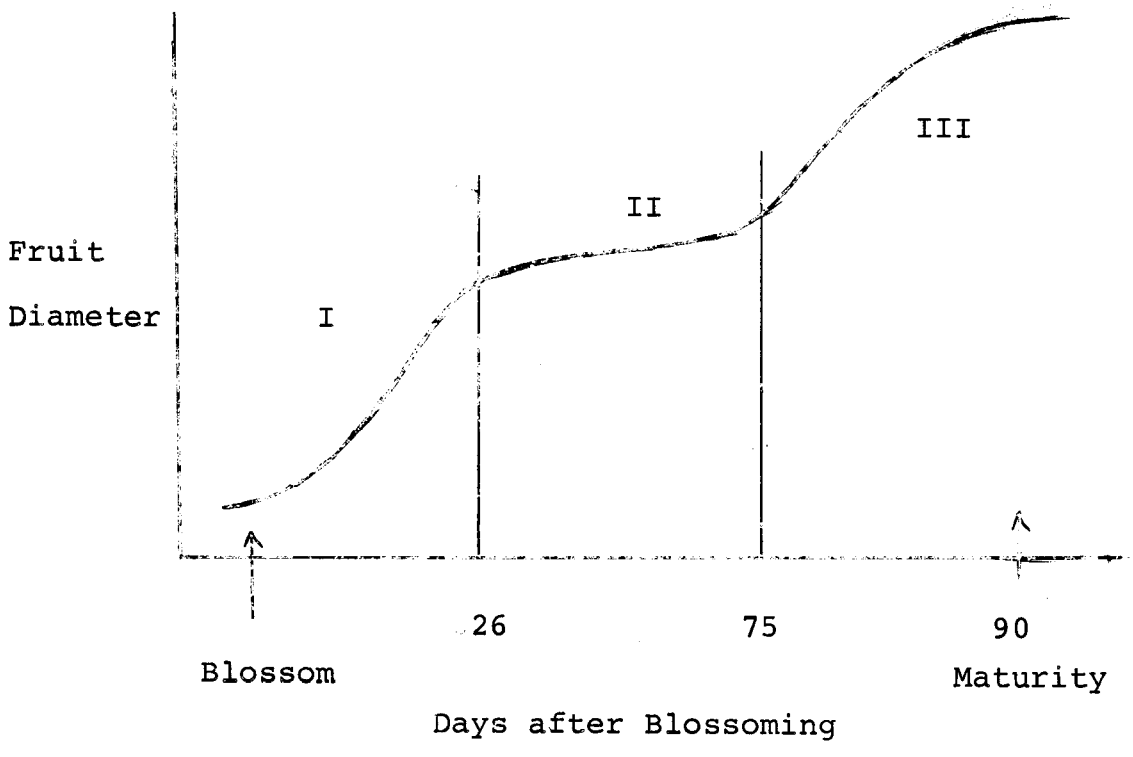
The largest berries are formed on the most-vigorous wood.

During maturity the colour of the berries changes from green to red and then to blue. The berries ripen in 60 to 90 days and mature berries can remain on the bush for up to 10 days. Fruits

form in clusters of 5 to 10 berries which ripen in succession over a period of several weeks.

There are three stages of fruit growth:

Stage I is a rapid growth phase occurring after blossoming, Stage II is a slow growth phase, whilst Stage III is the final rapid growth period before maturity.



The Highbush blueberry lacks root hairs and this may be the reason why water levels are so critical. This lack of hairs means restricted water uptake, although mycorrhizal fungi are often associated with blueberries and may play a vital role in water and nutrition uptake.

CLIMATIC REQUIREMENTS

It is generally considered that blueberries will grow in similar climatic zones to peaches, although many plantings in North America exist in areas too cold for successful peach production.

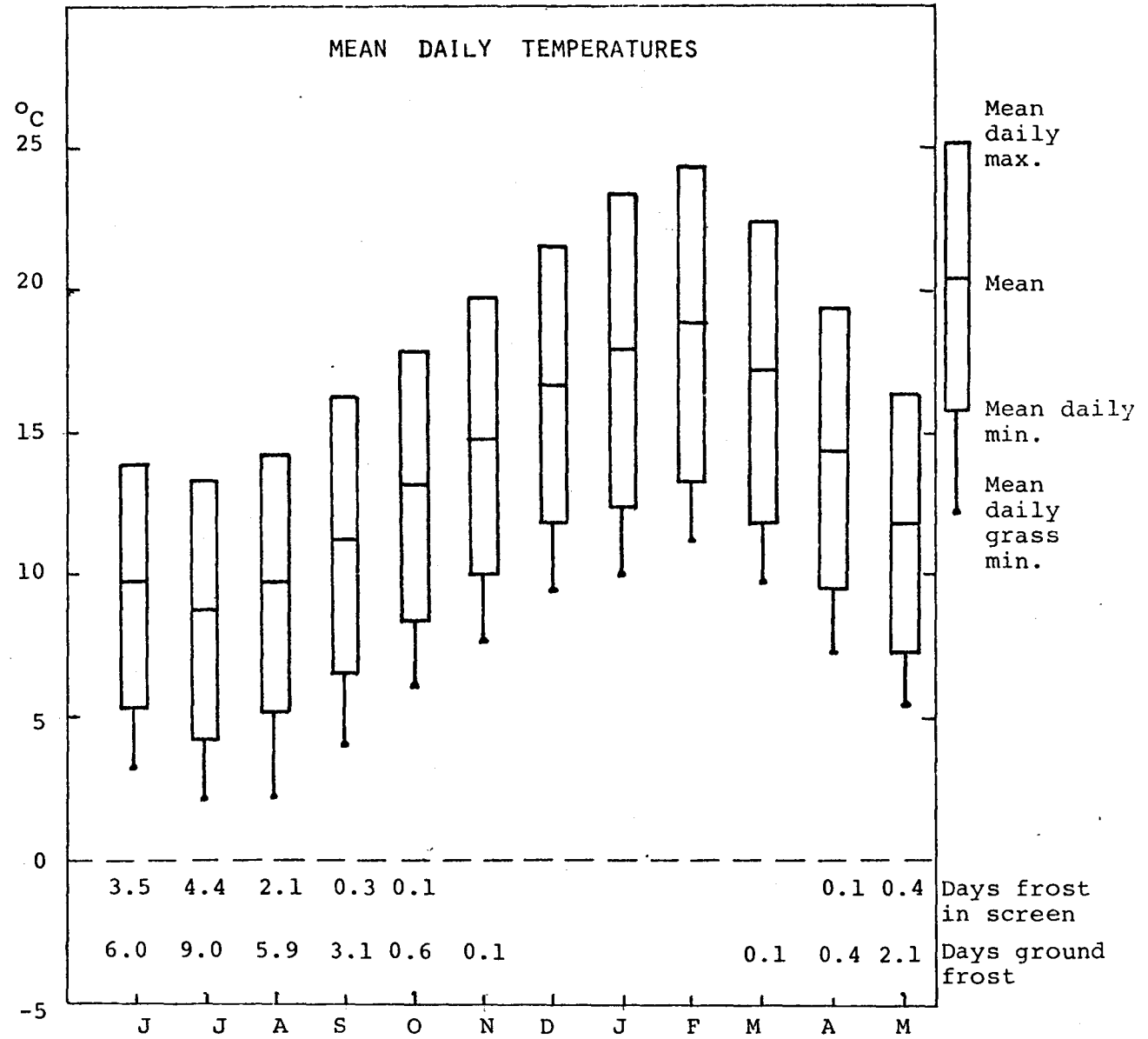
They prefer full sunlight throughout the growing season which is a requirement that can be fulfilled in most parts of New Zealand.

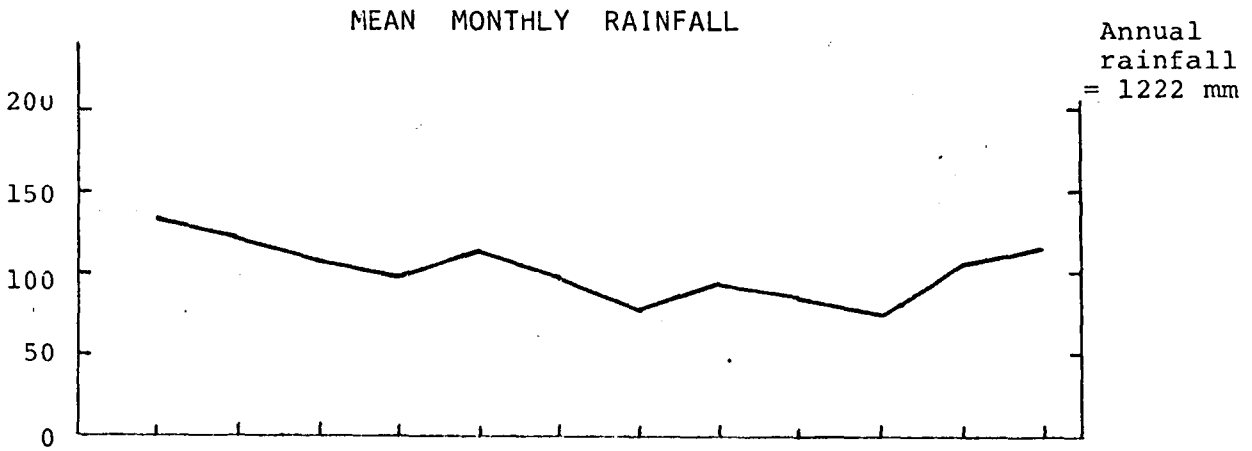
In Michigan, the climate limits successful production to a 30-40 km zone alongside the lake. Away from this area plantings are not successful because the growing season is too short (60-100 days in northern Michigan) for mature wood and fruit buds to develop. Because the plantings are close to a large area of water, frost damage during winter and spring is less than it would be inland from the lake.

In Figs. 1, 2 and 3 we present climatic data for Chicago (Lake Michigan) in comparison with data from two areas in N.Z. - a warmer area, Rukuhia (Hamilton) and a colder site, Invercargill. In no parts of N.Z. are winter temperatures as cold as those of Michigan. Shoemaker (1975) maintains that 650-850 hours of temperatures below 7°C are necessary for adequate winter chilling but trials at Rukuhia show that blueberries with 500 hours produce satisfactory crops (Toleman 1976).

Unlike most fruit plants, which are damaged by 1 to 2 degrees of frost when in blossom, blueberries can tolerate temperatures as low as -5°C. Even in Invercargill frosts of this magnitude are not common in September and October although low-lying areas can get lower temperatures and must be avoided if possible. Unfortunately, lowland peat swamps which might in other respects be suitable (see later) may fall into this category.

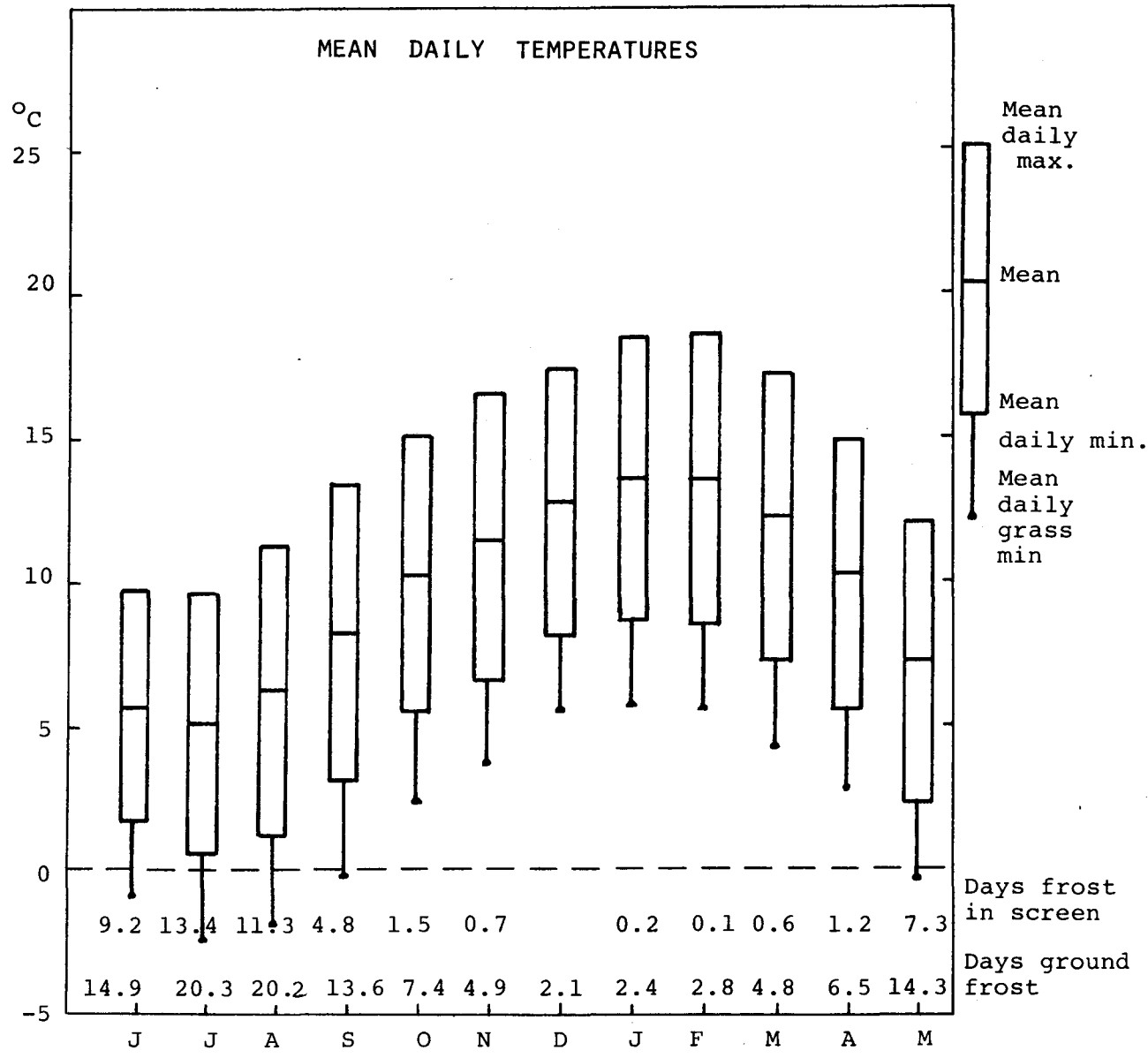
FIG. 1 CLIMATIC DATA FROM RUKUHIA

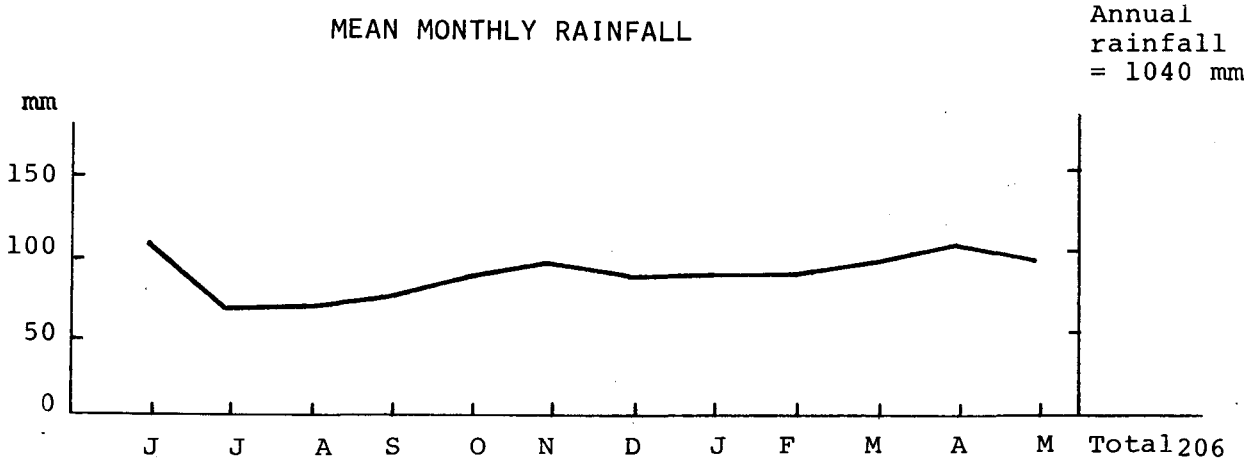




	J	J	A	S	O	N	D	J	F	M	A	M	Total
No of rain days	19	17	17	14	18	14	13	8	9	10	14	16	169
No of days bright sunshine	106	122	140	163	172	206	206	231	190	178	153	120	1987

FIG. 2 CLIMATIC DATA FROM INVERCARGILL AIRPORT

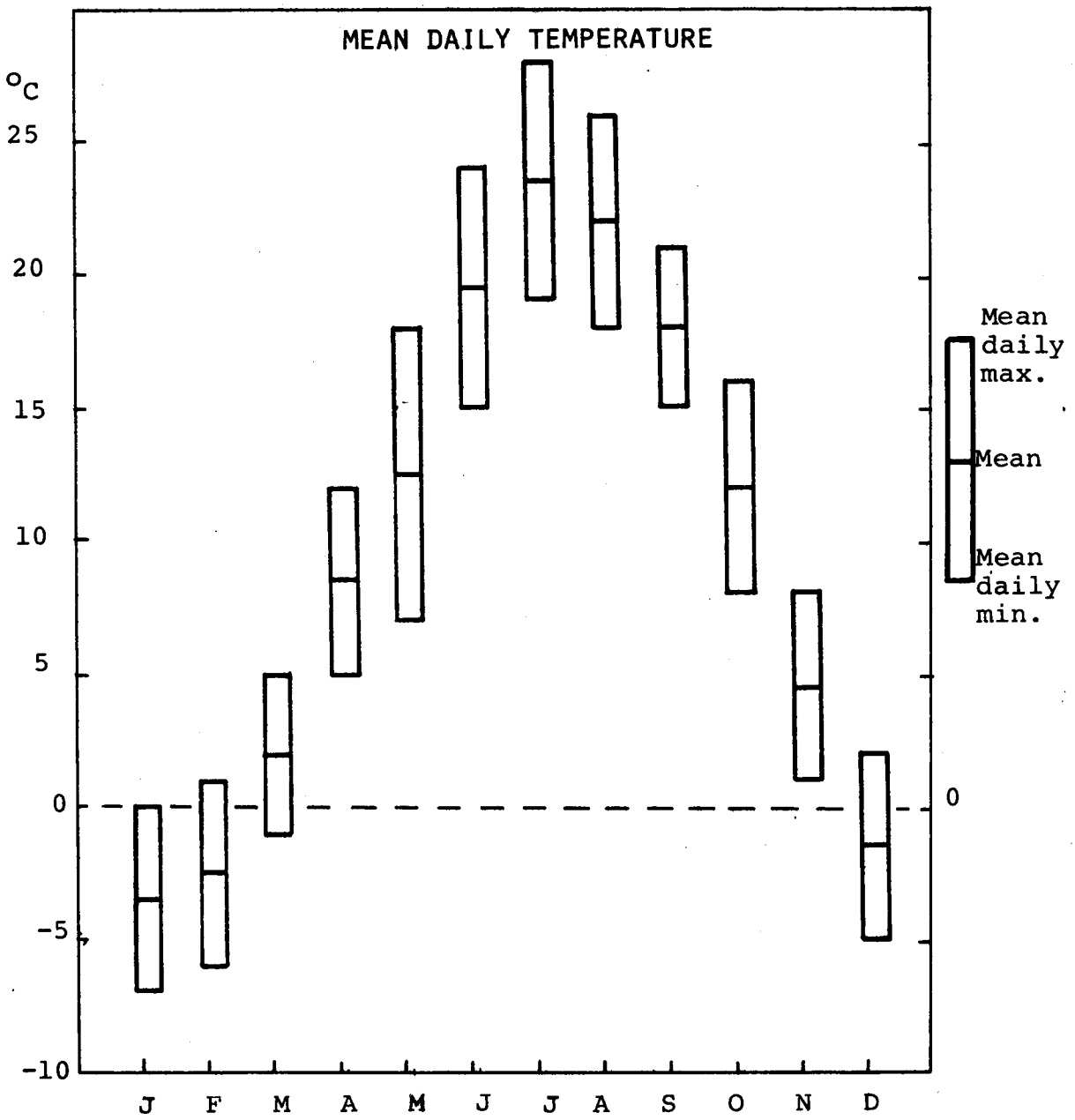


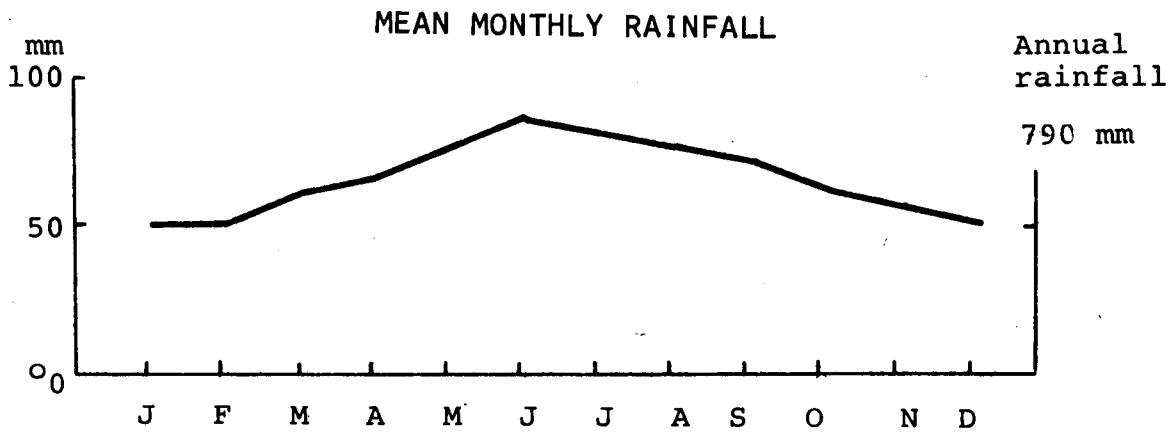


	J	J	A	S	O	N	D	J	F	M	A	M	Total
No. of rain days	20	17	15	15	17	18	18	17	16	17	18	18	206
No of hours bright sunshine	68	97	121	144	166	172	189	198	162	146	105	93	1661
													148

FIG. 3

CLIMATIC DATA FROM CHICAGO





From Fallard & Darby The Library Atlas (Geo. Philip & Son)

Summer warmth is likely to be no problem in New Zealand. For six months of the year, the mean daily temperature in Chicago is above 10°C. At Rukuhia it is above 10°C for nine months and Invercargill for seven months of the year. (Figs. 1, 2 & 3). However, it is reported that the best flavour is produced when temperatures during ripening are not excessively high. (12-20°C is best).

Shoemaker (1975) suggests that a rainfall of 2.5 cm a week is required during the growing season but only a few places in N.Z. would receive this amount and supplementary irrigation might well be necessary. Todd (1973) in New Zealand recommends maintaining adequate moisture, but warns against excessive irrigation to avoid leaching nutrients.

One might expect that blueberries would thrive better in the wetter parts of New Zealand and that areas like Hawkes Bay, Marlborough, Canterbury and Central Otago, which grow other fruit crops so well, could be less suitable. Blueberries could therefore provide a valuable industry for areas in New Zealand where horticulture has, up till now, been less successful.

SOILS

Blueberries need an acid soil with high organic matter content, good drainage and constant soil moisture levels. For example the soils of southern New Jersey have a pH range of 4.0 to 5.5, and a surface layer of forest peat, 7-13 cm thick, in an early stage of decomposition. Below this is a layer of pure sand to a depth of 50-75 cm, where there is a definite hardpan which helps

to keep the soil moist above this level. Similar soils in New Zealand are found in the following areas. (Data from D.S.I.R. Soil Bureau Bulletins).

North Auckland - Ruakaka peaty sand loam and loamy peat common in depressions among sand dunes. Where drained and fertilised they could possibly allow for successful blueberry production. Their main problem is a high water table.

Waikato - The Te Rapa peaty loams have been formed from mixtures of peat and pumiceous alluvium.
Akeake soils are loams interlayered with peat and are common on the flood plain of the lower Waikata Valley.

The Kaipaki loamy peats may be useful if formed on the edge of large peat swamps from peat mixed with alluvium washed off adjacent land. Likewise Rukuhia peat, if formed on the central part of raised peat bogs.

The peatlands of Waikato originated from forests, manuka, sedge ferns and mosses. They require careful drainage and water control because once peat dries out, it is very difficult to remoisten.

Bay of Plenty - Pongakawa soils have been formed in swamps from mixtures of pumice and peat. With adequate fertiliser and water management they should be excellent for blueberry production.

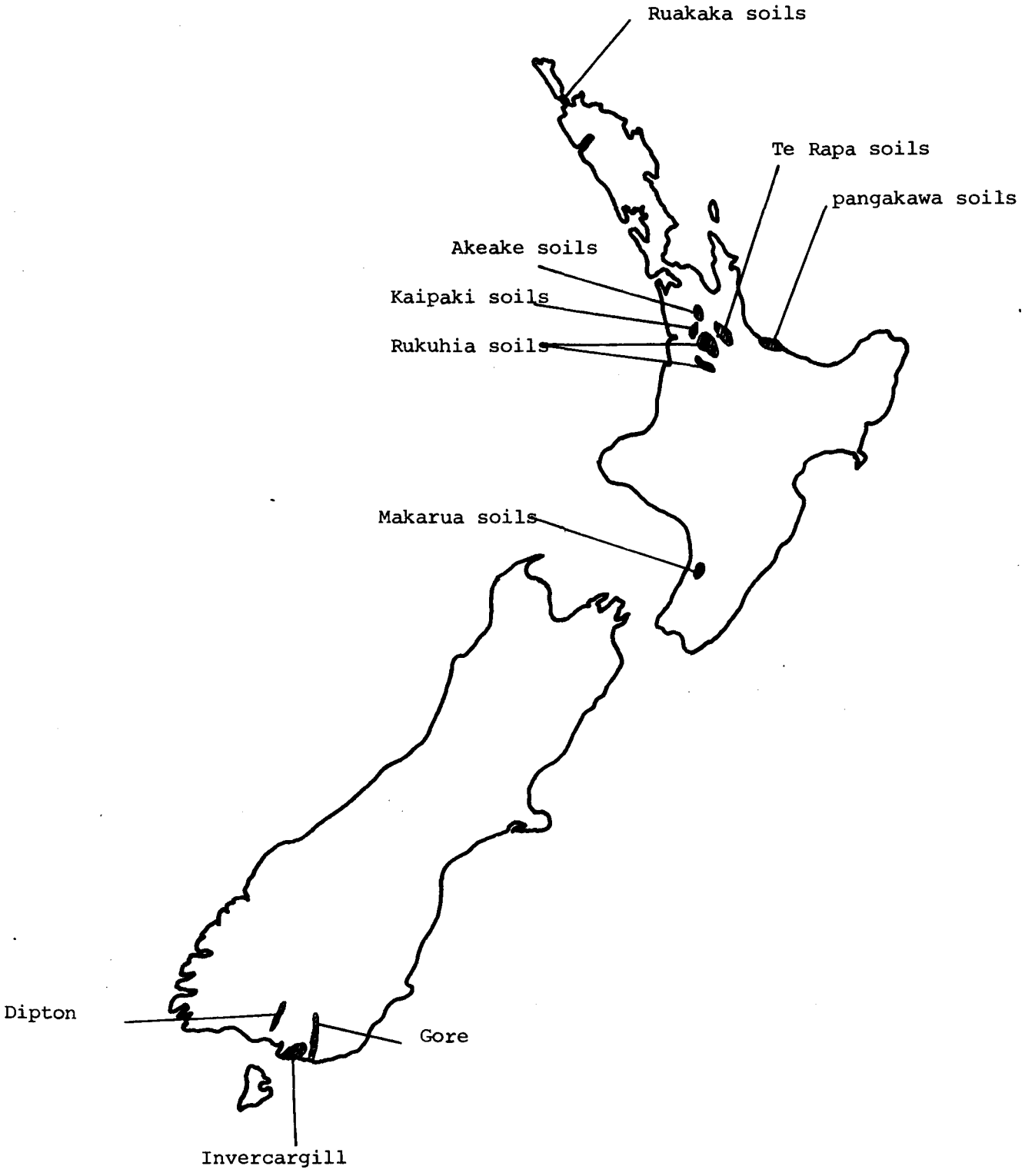
Manawatu - The Makarua soils north of Shannon are peaty swampy depressions once permanently covered with water. The drainage is poor and they are only moderately fertile. Surface sinking is also a problem especially when it exposes stumps. However, with good drainage and removal of stumps this soil may be suitable.

Southland - Peatlands are common in this area of New Zealand especially in the Dipton, Gore and Mataura regions and east of Invercargill. They are formed from fibrous sedge and are relatively undecomposed.

Whilst it will be advantageous to plant on soils which naturally have a high level of organic matter, other soils have been used successfully, although some special treatment is normally required. In sandy silt loams and sandy loams 10-15 cm of peat or sawdust can be mixed into the top 15-20 cm of soil. In poorly-drained soils such as clay, it is probably best to prepare a raised bed. The bottom of this bed should comprise of material that provides good drainage, e.g. gravel and on top should be added 20-30 cm of peat mixed with soil. Commercially however, the creation of a raised bed would probably prove uneconomic.

Most commercial plantings in North America are on naturally-acid soils and it is generally accepted that acidity is an important requirement for strong plant growth. Acidity probably assists by making certain elements such as potassium, more readily available to the blueberry plant. Successful planting has been made in areas with a wide range of soil pH if there are adequate amounts of nutrients and where soil structure, aeration, organic matter and water levels are satisfactory. Cultivars planted in 1969 at the Levin Horticultural Research Centre are thriving in silt loam with the addition of small amounts of sulphur and peat at planting. The soil has a pH of 5.5-5.7

SOME SOILS WHICH MIGHT BE SUITABLE FOR BLUEBERRY PRODUCTION



From D.S.I.R. Soil Bureau Bulletin (1968) 26(1) : 28-67

Where it is necessary to lower pH the following table will give a guide to the amount of sulphur that will be required.

To change pH from	Kg sulphur required/9m^2 (100 sq.ft.)	
	Sandy Soil	Loamy Soil
6.5 to 4.5	0.68	2.1
6.0 to 4.5	0.54	1.6
5.5 to 4.5	0.36	1.08
5.0 to 4.5	0.18	0.54

(From Rukuhia Research Station Circular, 1976).

Mulching - Mulching with sawdust, straw or peat has the following advantages.

a. Supresses weeds.
b. Maintains cooler soil temperature in summer
c. Retains soil moisture near the surface.
d. Improves soil structure.
e. Avoids erosion.
f. Prevents heaving of plants and subsequent root injury.
g. Can be used to reduce pH.

Sawdust has been most favoured because of its effect in lowering pH. Partially-decomposed soft-wood sawdust is best but it should be remembered that use of sawdust lowers the nitrogen available for plant growth and additional nitrogen fertiliser should be included.

Nutrition - Before planting, soil should be analysed and nutrient deficiencies corrected. From then on annual dressings of fertiliser may be required to maintain fertility. Todd (1973) recommends, generally, 0.75-1.0 tonne per hectare of 10 N-5P-8K fertiliser each year. To decide whether or not this is appropriate for the soil it is wise to have periodic soil tests and if necessary adjust amounts being applied. It might be better to apply half of this in the spring and make another application half way through the season. Blueberries need high levels of nitrogen and are known sometimes to suffer from deficiencies of magnesium, manganese and

boron. Ammonium nitrogen is recommended for use on blueberries.

VARIETIES

Trials have been taking place for some years at Rukuhia Research Station in the Waikato and at the Levin Horticultural Research Centre. Rukuhia introduced from the U.S.A. the varieties 'Atlantic', 'Burlington', 'Dixi', 'Jersey' and 'Stanley'. In addition the Levin Research Station produced 4000 seedlings and selection has been taking place on the basis of yield, quality and plant characteristics. Seedlings have been selected at Rukuhia, mainly from 'Dixi', and 'Jersey' cultivars and at least eight have given comparable and even greater yields than 'Atlantic' and 'Dixi.

The following table gives brief descriptions of the main American varieties of blueberries.

The cultivars 'Berkeley', Blueray', 'Darrow', 'Herbert', 'Ivanhoe' and 'Rubel' although well established in the U.S.A. have not yet been grown under field conditions in New Zealand.

BLUEBERRY VARIETIES (after Shoemaker, 1975)

Cultivar	Season	Vigour	Yield	Berry Size	Cluster Formation	Quality	Other Comments
Atlantic	Mid (Early Jan)	Mod.	high	Mod.	open	fair	Poor handling quality if too ripe
Berkeley	Mid	high	high	large	open	med.	very light blue
Blueray	early mid season	high	high	very large	tight	high	firm, sweet
Burlington	late (Jan-Feb)	high	high	small	tight	fair	dense growth requires thinning.
Darrow	late	high	high	large	?	high	light blue
Dixi	mid-late	high	high	large	large & open	high	ripening not uniform
Herbert	late	high	high	large	?	high	fruit rather dark
Ivanhoe	early	high	high	large	tight	high	harder to propagate
Jersey	mid	Mod.	Mod.	Mod.	loose	high	uniform ripening
Rubel	late	high	Mod.	small	very loose	Mod.	excellent process & machine harvest
Stanley	early mid (late Dec.)	Mod.	Fair	Mod.	open	high	erect growth a problem under netting.

PROPAGATION

Blueberries are normally propagated by hardwood cuttings taken in winter. The best material is previous-seasons growth with shoot tips removed. (These may contain flower parts which can depress rooting ability.) An outdoor propagating frame is used with a sawdust base over which is 15 cm of a peat/sand or peat/pumice mixture. Cuttings 10 cm long are inserted to two-thirds of their length into the medium at 5 cm x 5 cm centres. It is important that they are not allowed to dry out, especially once shoots begin to grow.

Plants grow for one season in this frame but benefit from fortnightly application of a general liquid fertiliser containing nitrogen in the form of ammonium sulphate. The percentage strike from cuttings varies between varieties. In the Rukuhia trials 'Atlantic' gave 87% and 'Burlington', 'Dixi' and 'Jersey' gave 90-98% strike.

Rooted cuttings are lifted in late August and grown in nursery beds 45 cm between the rows and 25 cm in the rows. They remain there for one year before planting out in the field.

Soil requirements for blueberries in the nursery are the same as those for field production. The site should be fully exposed to the sun and nurserymen will need to ensure that blossoms are removed from nursery plants to conserve plant vigour. Because many soils do not meet the requirements necessary for blueberry growth, a suitable alternative to open-ground nursery production is container growing. Excellent growth in polythene bags can

be obtained from using a potting mix comprising 50/50 peat/coarse pumice or sand with suitable fertiliser additives.

PLANTING, CULTIVATION AND PRUNING

Blueberries are large enough to plant after two years growth in the nursery by which time they are normally 30-45 cm high. Plants can be spaced closely at 1.2 x 2.5 m (3360 per ha.) or widely at 1.5 x 3 m (2150 per ha.). Planting distances depend on the level of mechanisation involved and the vigour of the variety.

There are a number of options available for soil management in blueberries. In the United States clean cultivation using simazine is most popular. Annual applications of herbicides for 2-3 successive years result in a nearly weed-free blueberry row (Hull, Howell & Moulton, 1971). Grass swards are also common and are especially valuable when heavy equipment is used. As with other fruit crops, grassing down is usually delayed until the bushes are well established to eliminate competition in the early critical stages. Herbicides such as paraquat and simazine could be used in the rows to control weeds, while the space between the rows is sown in grass. A third method is to use annual mulching with sawdust and straw to suppress weeds, maintain uniform soil moisture, and improve soil structure (see above).

Pruning of blueberries is minimal. After planting, all fruit buds are removed and the top is cut back by about one quarter. No further pruning takes place till the fourth year by which time the plant is mature. At this stage pruning involves the removal of bushy growth near the base of the plant, opening up dense centres,

and reducing the number of fruiting areas if they are too numerous.

There are two main types of growth habit - upright and spreading. Generally upright cultivars require centre pruning while spreading cultivars need low branch removal.

PESTS AND DISEASES

Birds will be a major problem in the establishment of a blueberry growing industry in N.Z. Berries are very attractive to birds and on small plantings entire crops can be eaten. Netting appears to be the only answer and this would involve a high capital outlay to new growers. Netting should have a permeability of at least 45% to allow adequate exposure to sunlight. In large plantings the bird population relative to area will be less and the percentage of fruit loss should be lower than cost of netting.

Young branches of blueberry plants are attractive to rabbits in winter when other food is scarce.

Few problems have been experienced with disease on blueberries in N.Z. Overseas, cankers are a serious threat but resistant cultivars have now been developed. The light-brown apple moth, already prevalent on New Zealand orchards, is known to have caused damage to blueberry plants both in Australia and New Zealand. Scales, mites, black-vine weevils, leaf rollers, botrytis could cause damage and will need to be sprayed if build-up is encountered.

HARVESTING AND MARKETING

In New Zealand the harvesting season would be expected to extend from December to February, using the range of varieties previously described. It is important for pioneer growers of blueberries to create a good impression by providing top-quality fruit and marketing in a rational manner. To this end time of picking is critical since an immature fruit will never gain top flavour and sweetness, whilst over-mature berries quickly deteriorate. In addition, fruit left on the bush too long will be more prone to bird damage and many drop before picking. A six-day period between harvests of blueberries is generally recommended.

A decision on the method of harvesting should be made before planting blueberries since cultural requirements vary for hand and machine harvesting. Hand picking is preferable on small plantings where fruit is grown for the dessert market and quality is the major factor. But for any large scale undertaking in this country, mechanisation would be necessary so as to reduce labour costs. Varieties for mechanical harvesting must be firm, resistant to bruising and decay and easily separated from the bush. Machines, unfortunately, harvest berries at all stages of maturity so some form of mechanical sorting would be necessary.

As an alternative to complete mechanisation with 'over-the-row' harvesters, hand-held vibrating units can be used. The vibrating fingers on the unit shake the berries from the caneand the fruit is collected on a portable canvas frame. For every 8-10 hand vibrating units, one cleaning unit is required to remove trash and undesirable fruit. These units seem to offer the best potential in the New Zealand situation as they increase efficiency over hand picking but

do not require the large capital outlay of mechanical harvesters. The blackcurrant harvester designed by the N.Z. Agricultural Engineering Institute could possibly be adapted for blueberries and provide a feasible alternative.

Blueberries are grown extensively in the United States for processing and in New Zealand it will no doubt become important as plantings increase.

Blueberries are being sold at auction in the North Island packaged in 250 gram containers such as those used for strawberries. Although polythene bags can be used for dessert fruit, the presentation is obviously not as attractive and the shelf life is greatly reduced.

The potential for growing blueberries is greater than for many other horticultural crops. The fruit is extremely popular in Canada and the U.S.A. where the market is large. If exports were considered they would occur during the American off-season, i.e. their winter months; but much work would need to be done to build up a reputation for quality to promote and maintain access to that market.

CONCLUSIONS

Given the appropriate conditions, highbush blueberries could become an important berryfruit crop in New Zealand, but they are not one that can be grown anywhere in the country. The site is of prime importance in a grower's decision to plant blueberries and this involves looking at climate and soils of the area and relating these to known requirements.

Until more information is available on adapting these requirements to the New Zealand situation it is best to follow the practices known to be successful in North America. But it may be shown in time that satisfactory growth can be obtained on mineral soils throughout the country and machine harvesting may not have to involve the excessively large 'over-the-row' harvesters presently used in the United States. Birds could prove to be a major restriction to commercial production. Thrushes and blackbirds, in particular, go to considerable trouble to get at the berries and netting is a very expensive method of protection.

Blueberries are a fruit of undoubted popularity on the consumer-market overseas and with careful management they will become a very profitable crop for growers in New Zealand.

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RABBITEYE BLUEBERRY

The Rabbiteye (*Vaccinium ashei*) is native to the more southerly regions of U.S.A. It is a much more vigorous plant than the highbush and can attain a height of 6 m. Berries are larger and their flavour is not so attractive, although still quite acceptable for most purposes. A number of varieties are already present in New Zealand, such as Tifblue, Walker & Myers. Plants can be propagated by cuttings and are set out in light sandy acid soils - (pH 4.5-5.5) at 2 x 4 m. In most other respects rabbiteye blueberries are treated in a manner similar to highbush blueberries except that they are less self-fertile and benefit more by providing alternative varieties flowering at the same time for pollination.

Rabbiteye originates in warmer parts of America than highbush yet seems to grow satisfactorily in those climates that suit the latter species. They mature normally about one month later and this can have obvious advantages for spreading the harvesting period.

INTRODUCTION

It is unlikely that the cranberries will have the same potential for New Zealand as highbush blueberries, but limited production does seem possible provided adequate information is made available to the trade and the public on their uses. We note that *Actinidia chinensis*, the Kiwifruit or Chinese Gooseberry was launched from an almost unknown garden plant to be a major contributor to our export earnings in a relatively short time. The same sort of expertise could surely find a challenge in promoting cranberries. In America the cranberry is the basis of an industry bringing $25 million to growers and this is increasing every year. Plants begin to bear fruit in 3-4 years.

POMOLOGY

Vaccinium macrocarpon is an Ericaceous bog plant native to North America. It is prostrate and sends our runners of up to 2 m long and eventually the whole area becomes a dense shrubby mat. Cranberries are semi-evergreen and leaves last two-three seasons before they fall. Axillary buds on the runners break in spring and grow into upright shoots from 10-40 cm long which bear most of the fruit the following season. Bud burst in New Zealand would probably be September/October whilst berries take 75-100 days to ripen. One would therefore expect to harvest in January/February. Flowers can be self pollinated but the presence of hives in a plantation is considered necessary. On ripening, fruit changes from green to pink to red. Fruits are round - oval and measure 1-2 cm in diameter.

CRANBERRIES

CLIMATIC REQUIREMENTS

In the U.S.A. it is considered that cranberries need 2500 hours below 3°C in the winter for satisfactory blossoming and yields. This is much more than we would expect in New Zealand but research has indicated that a lower number of hours may still enable plants to grow and hormone sprays have been considered as one way to overcome lack of winter chilling. They grow satisfactorily at Levin with comparatively mild winter. Heat availability in New Zealand would be quite adequate for cranberries.

Cranberries grow normally in bogs with high water availability and it is this factor which suggests that the West Coast of the South Island might be an area to consider for cranberry production.

SOILS AND ESTABLISHMENT OF A BOG

Acid peat soils of pH. 4.0-5.0 are required for cranberry production. As already indicated, cranberries are usually grown in bogs and plants can survive these conditions because of a special relationship between the roots and fungi called mycorrhizae which help nutrient absorption. Lack of suitable mycorrhizae could be a problem in New Zealand but it is noted that cranberries are cultivated in other parts of the world outside their native America so presumably some adjustment can be made.

A great advantage of cranberries is that they can be grown in wastelands, drained marshes and wet areas unsuitable for other crops, but the establishment of a bog can be quite expensive. The following method can be used.

The land must be cultivated and levelled and a system developed for rapid drainage and flooding. Perennial and other weeds must be removed before organising a method for flooding. Ten to 12 cm of coarse sand is then spread over the area. Planting is done in spring with cuttings of one-year-old wood, 18-24 cm long, which are planted in groups of 2-5 on the square at 30 x 30 cm, being pushed well down into the sand, close to the soil below. The land is then flooded for one or two days which will maintain soil moisture for a long period. Flooding can be done again during the summer at appropriate times to maintain soil moisture, and can be used in spring for frost control.

Little fertiliser is used, although nitrogen at 50-150 kg/ha. per annum will help plants get established.

VARIETIES

The following varieties are popular in America and are worth trying in New Zealand.

Early Black	A dark red fruit with pyriform shape. It covers the greatest area of any variety.
Howes	A late-market, shiny-red berry that keeps well and has good colour and firmness.
McFarlin	Resistant to false blossoming but has poor colour.
Searles Jumbo	A mid-season variety that has a mottle problem in storage.
Stevens	A new variety that keeps very well, and has great quality and flavour. Suitable for mechanical harvesting.

PRUNING

A number of the runners that are produced each year are thinned back after harvest or in early spring. In practice this means the cutting back of runners that have been pulled up during the harvesting operation.

HARVESTING

Berries can be pulled from the bush with a hand-held scoop with rake-like fingers and a collecting tray. In U.S.A. mechanical harvesters now collect much of the crop and this is either done dry, as with other bush type fruit, or done wet after flooding the bog. The latter seems to be more popular; berries are beaten off the plants and float on the surface where they are moved by flat bottomed boats to one corner of the field and are picked up by conveyors and placed into waiting trucks. Cranberries will store for 2-3 months at 1°C.

CONCLUSION

The method of growing cranberries is rather more complex than indicated here and a potential grower should refer to some of the books and articles listed below to fill in gaps. Places like the West Coast would seem ideal and, for an area looking for development, investigation into the potential for cranberries should be fostered.

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