A survey of citrus plantings in Western Australia

Frank Melville
THE development of the citrus industry in Western Australia has been determined by the requirements of the local market and there is no reason to suppose that this will not continue to be the controlling factor.

Small quantities of lemons, grapefruit and oranges are regularly shipped to South East Asia, the Persian Gulf and some African ports but this trade has had little if any impact on planting policy. Three quarters of the lemon crop is normally processed for juice.

All types of citrus fruits are successfully grown on the west coast of Western Australia from Bindoon, some 50 miles north of Perth, to Donnybrook and Capel about 130 miles to the south. Varying climatic conditions in the various districts have enabled oranges to be marketed from some part practically all the year round. Expansion in the southern areas of the citrus belt has been based on growing Valencia oranges for the late summer and autumn market.

Post-war trends in the Western Australian citrus industry were discussed in an article published in 1956. At that time a definite preference for Valencias in all new plantings was evident and it was suggested that the differential in production between Navels and Valencias apparent at that time would continue to widen due to increases in Valencia production from young plantings on the one hand and on the other hand by a decrease in navels resulting from old trees going out of production and not being replaced by young trees.

Lemon acreage was approximately stationary and grapefruit plantings were on the decline at that time.

On the other hand mandarins showed a small but steady increase in plantings.

1963 SURVEY

In 1963 a district survey of citrus plantings was completed to provide information on variety distribution and also the age pattern of orchards.

The information was collected by district horticultural officers by personal contact with citrus growers and examination of orchards. The information collected covered variety, age and where possible rootstock. A summary of the data was compiled by the Bureau of Census and Statistics and this forms the basis of the following discussion. A condensed summary is given in Table 1.

The survey omitted citrus plantings which were not considered of commercial significance either by virtue of their small size, uneconomic condition or where plantings were situated outside accepted commercial fruit areas. For this reason the survey figures will not correspond with data collected by the Bureau of Census and Statistics.

COMPARISON WITH 1945 SURVEY

It is interesting to compare the position revealed in the 1963 survey with a similar survey conducted in 1945. The changes which have occurred reflect the post-war planting policy and market trends.
Citrus Zones

For convenience the citrus growing districts have been divided into four natural zones. These are:

**Chittering-Bindoon**

An area 35 to 50 miles north of Perth where orchards consist almost entirely of citrus fruits. In most cases the trees are grown without irrigation and where water is available it is normally only possible to water a few times during the season to alleviate summer stress.

**Hills Districts**

Citrus plantings in the hills usually form part of mixed orchards. They are located in the milder valleys close to the edge of the Darling Ranges running from Gidgegannup south through Mundaring, Kalamunda, Roleystone and Jarrahdale to Keysbrook.

**Coastal Area**

This comprises the foothills and coastal alluvial soils running from the Swan Valley just north of Perth, south through Maida Vale, Forrestfield, Gosnells, Armadale and Serpentine to Pinjarra. Soils are lighter and often sandy, and are particularly suitable for lemon growing.

**Southern Zone**

This encompasses the districts of Harvey, Donnybrook and Capel which extend to the fringe of the south west apple areas. These districts market mostly late Valencias.

These zones do not correspond with local government areas and in many instances shires have been divided between

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**Table 1.—Summary of citrus plantings**

<table>
<thead>
<tr>
<th>Variety</th>
<th>0-5 years</th>
<th>6-25 years</th>
<th>Over 25 years</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>No. of trees</td>
<td>No. of trees</td>
<td>No. of trees</td>
<td>No. of trees</td>
</tr>
<tr>
<td>Navel Orange</td>
<td>25,687</td>
<td>36,923</td>
<td>68,098</td>
<td>130,708</td>
</tr>
<tr>
<td>Valencia Orange</td>
<td>47,447</td>
<td>87,693</td>
<td>77,556</td>
<td>212,696</td>
</tr>
<tr>
<td>Mandarins</td>
<td>13,069</td>
<td>11,665</td>
<td>6,020</td>
<td>30,754</td>
</tr>
<tr>
<td>Lemons</td>
<td>13,894</td>
<td>15,271</td>
<td>16,653</td>
<td>45,818</td>
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<tr>
<td>Grapefruit</td>
<td>353</td>
<td>4,945</td>
<td>3,929</td>
<td>9,227</td>
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<tr>
<td>Miscellaneous</td>
<td>376</td>
<td>856</td>
<td>1,614</td>
<td>2,846</td>
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<tr>
<td>Total</td>
<td>100,826</td>
<td>157,353</td>
<td>173,870</td>
<td>432,049</td>
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</tbody>
</table>

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In the eighteen years between the surveys the overall increase in tree numbers amounted to 25 per cent. Washington Navel oranges and lemons changed very little but Valencias increased by more than 60 per cent. and mandarins almost doubled. Grapefruit declined by nearly a third. These changes are illustrated in Fig. 1.
two or more zones to conform to natural citrus areas. Statistics have not previously been available on this basis and there is no direct correlation with areas used by the Government Statistician. However, it is thought that these natural citrus areas will prove much more useful in considering planting trends.

**Orange Plantings**

The 1963 survey showed that 80 per cent. of all citrus plantings are oranges consisting almost entirely of Navels and Valencias. The largest concentration occurs in the northern districts of Chittering and Bindoon where over 43 per cent. of the orange trees are to be found. Twenty per cent. are located in the hills areas and 16 per cent. are on the coastal plain close to the foothills stretching from the Swan Valley south to Pinjarra. The remaining 16 per cent. are growing in the cooler southern districts. A comparison of plantings in the various areas is given in Fig 2. The proportion of Navels and Valencias is shown graphically and for comparison, plantings of lemons, mandarins and grapefruit are also included. These are discussed later.

Valencia plantings exceed Navels in each of the four zones. They dominate the picture in northern districts and in the southern zone where Valencias are grown for the late summer market, they account for 84 per cent. of the oranges planted. Valencias and Navels are more nearly balanced in the Hills and Coastal areas.

On a State basis 61.5 per cent. of orange trees are Valencias. This compares with 59 per cent. in 1955 and 49 per cent. in 1945. In terms of tree numbers this represents an increase from 131,906 trees in 1945 to 212,696 trees in 1963. The steady increase of Valencias in the post-war period is in distinct contrast to Navels which in the same period have shown little change. In fact the total number of Navel trees in 1963 was only 130,708 compared with 133,692 trees in 1945.

The large plantings of Valencias in northern districts compared with other zones is shown in Fig. 2. The Hills and Southern areas each have only about half as many trees while Coastal areas have an even smaller proportion equal to little more than one eighth of the total.

The largest planting of Navels is also in northern districts with lesser areas in the Hills, Coastal and Southern areas in that order. Navels are of minor importance in Southern districts.

**Age of Orange Plantings**

Planting preference in post-war years is well illustrated by the age distribution of Navels and Valencias. Valencias have remained the popular choice and have dominated all new plantings. This is shown in Fig. 3 by the fact that only 37 per cent. of Valencias are more than 25 years of age; that is planted before the war. On the other hand 52 per cent. of Navels are in excess of 25 years of age. In the middle age group (6 to 25 years) 41 per cent. of Valencias fall in this category as against 28 per cent. of Navels. When we come to the non-bearing 0 to 5 years old group the proportions are much closer, Valencias 22 per cent. and Navels 20 per cent. This suggests that in recent years greater interest has been shown in Navels than previously, and in fact in the Coastal area there are actually more Navels under 5 years than Valencias.
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<td>£17</td>
<td>17</td>
<td>0</td>
<td>£10</td>
<td>10</td>
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<tr>
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<tr>
<td>Hairdriers e.g.</td>
<td>£13</td>
<td>19</td>
<td>6</td>
<td>£7</td>
<td>19</td>
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<tr>
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<td>14</td>
<td>0</td>
<td>£7</td>
<td>10</td>
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**STOVES:** Electric
- Elevated model | £69 | 10 | 0 | 0 |
- Automatic Wall Oven & Hotplate Unit, complete | £99 | 10 | 0 | 0 |
- Automatic, rotisserie | £75 | 2 | 0 | 0 | £87 | 10 | 0 |
- Gas: 4-burners & timer | £55 | 10 | 0 | 0 |
- Deluxe with solar grill | £64 | 10 | 0 | 0 |

**FRYPANS:** 11" metal lid | £13 | 19 | 6 | £8 | 19 | 6 | 0 |

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- Wringer | £51 | 10 | 0 | 0 |
- Wringer, Pump/Heater | £83 | 9 | 0 | £59 | 10 | 0 | 0 |
- Twin Tub, top brand | £114 | 0 | 0 | £62 | 15 | 0 | 0 |
- Semi Automatic machine | £85 | 10 | 0 | 0 |
- Full-automatic single speed | *£99 | 10 | 0 | 0 |
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  *every part guaranteed*
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  *has 10 year guarantee* |               |       |   |   |   |
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Nests of Tables | £6 | 0 | 0 | £4 | 4 | 0 | 0 |
Cleaners 240 or 32 volt | £34 | 0 | 0 | £24 | 10 | 0 | 0 |
Carpet Sweepers | £6 | 0 | 0 | £4 | 19 | 6 | 0 |
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However, on a State basis there are 47,447 Valencia trees in this group compared with 25,687 Navel trees.

On a district basis, new plantings of Valencias have been heaviest in the northern area where 70 per cent. of plantings are younger than 25 years. A substantial level of new plantings has also been maintained in southern districts where 63 per cent. of Valencias are under 25 years of age.

In the case of Navel trees, although the largest plantings have been made in northern districts, little more than half the Navel trees in that area are less than 25 years old. The proportion is much the same in coastal districts but elsewhere it is much less.

Details of tree numbers and percentages of Valencias and Navel trees in the 0 to 5 years category will be found in Table 2. These indicate quite clearly where the new plantings have been made.

**Lemon Plantings**

Lemons are grown mainly in the sandy soils of the coastal districts where growing conditions are particularly suited to this fruit. They are planted to a lesser extent in frost free valleys in the hills but most of the recent plantings have been in the Coastal area.

Lemon requirements have always been greatly influenced by the factory demand and price for processing fruit. Local

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**Table 2.—Citrus trees in the 0-5 year age group**

<table>
<thead>
<tr>
<th>Variety</th>
<th>Northern</th>
<th></th>
<th></th>
<th>Coastal</th>
<th></th>
<th></th>
<th>Southern</th>
<th></th>
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</thead>
<tbody>
<tr>
<td></td>
<td>No. of</td>
<td>Per cent.</td>
<td>No. of</td>
<td>Per cent.</td>
<td>No. of</td>
<td>Per cent.</td>
<td>No. of</td>
<td>Per cent.</td>
</tr>
<tr>
<td></td>
<td>trees</td>
<td></td>
<td>trees</td>
<td></td>
<td>trees</td>
<td></td>
<td>trees</td>
<td></td>
</tr>
<tr>
<td>Valencia Orange</td>
<td>19,656</td>
<td>21·7</td>
<td>6,697</td>
<td>14·2</td>
<td>6,742</td>
<td>23·0</td>
<td>14,352</td>
<td>13·5</td>
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<td>Navel Orange</td>
<td>11,052</td>
<td>19·0</td>
<td>5,248</td>
<td>13·5</td>
<td>7,272</td>
<td>29·3</td>
<td>2,117</td>
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<td>Lemon</td>
<td>338</td>
<td>8·0</td>
<td>2,620</td>
<td>18·0</td>
<td>10,677</td>
<td>41·7</td>
<td>259</td>
<td>19·0</td>
</tr>
<tr>
<td>Mandarin</td>
<td>4,557</td>
<td>34·7</td>
<td>2,798</td>
<td>56·6</td>
<td>5,070</td>
<td>47·5</td>
<td>644</td>
<td>31·6</td>
</tr>
<tr>
<td>Grapefruit</td>
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<td>79</td>
<td>4·4</td>
<td>157</td>
<td>11·0</td>
<td>78</td>
<td>8·0</td>
</tr>
<tr>
<td>Total, All Varieties</td>
<td>35,852</td>
<td>20·8</td>
<td>17,488</td>
<td>16·2</td>
<td>29,936</td>
<td>32·1</td>
<td>17,550</td>
<td>29·8</td>
</tr>
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</table>
market sales and exports only cater for about one third of the total production. Little change has taken place in total lemon plantings in the post-war years, as shown by the fact that the 1945 survey recorded 43,329 trees as against 45,818 trees in 1963.

Fifty-six per cent. of lemon plantings are in Coastal districts and 32 per cent. in the Hills. Few lemons are grown commercially elsewhere.

The rate of replacement has been greater for lemons than for oranges, for although total plantings have altered little in 18 years the proportion of young trees is much greater for lemons than for oranges. This is indicated in Fig 4 which gives the age distribution in the various districts. In the coastal area 42 per cent. are not more than five years old and only 29 per cent. are more than 25 years. There has been less interest in planting lemons in the hills as indicated by the fact that only 18 per cent. are in the 0 to 5 year group and 45 per cent. are more than 25 years old. Detailed statistics of young lemon plantings are included in Table 2.

**Mandarins Increase**

Mandarin plantings have practically doubled since 1945 (Fig. 2) but they are still a very minor crop compared with oranges. They account for only 7 per cent. of citrus plantings.

Interest in Mandarins is indicated by the consistent planting which has gone on in recent years. This is apparent from the general age of mandarin orchards; 42 per cent. of trees are less than 5 years of age and only 19 per cent. are more than 25 years.

The main varieties planted are Imperial and Emperor which account for 81 per cent. of Mandarin trees. This preference is most definite in all plantings in recent years with Imperials far outstripping Emperors. Details are given in Table 3. Mandarins are grown chiefly in the northern and coastal areas. Only 23 per cent. of trees are located in other districts. This is shown in Fig 5. Although mandarins are not widely planted in the Hills the greater interest shown by hills growers in recent years is apparent from the high proportion of young trees in this area.

**Table 3.—Varieties and age of mandarin plantings (No. of trees)**

<table>
<thead>
<tr>
<th>Variety</th>
<th>0-5 years</th>
<th>6-25 years</th>
<th>Over 25 years</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Imperial</td>
<td>7,732</td>
<td>5,471</td>
<td>1,421</td>
<td>14,624</td>
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<tr>
<td>Emperor</td>
<td>3,955</td>
<td>4,090</td>
<td>2,185</td>
<td>10,230</td>
</tr>
<tr>
<td>Beauty of Glen Retreat</td>
<td>180</td>
<td>810</td>
<td>985</td>
<td>1,975</td>
</tr>
<tr>
<td>Others</td>
<td>1,202</td>
<td>1,294</td>
<td>1,429</td>
<td>3,925</td>
</tr>
<tr>
<td>Total</td>
<td>13,069</td>
<td>11,665</td>
<td>6,020</td>
<td>30,754</td>
</tr>
</tbody>
</table>
Fig. 7—Production of valencias, navels, lemons and mandarins for the years 1944-45 to 1963-64 (compiled from published statistics of the Bureau of Census and Statistics)

(56.6 per cent.). Details of young plantings are included in Table 2. The number of trees in the 0 to 5 year old group is much the same in both the Northern and Coastal zones.

Grapefruit on the Decline

Except during the war years grapefruit have never been extensively planted. In the 1945 survey, 13,477 trees were recorded. This had dropped by 1963 to 9,227 trees which is little more than 2 per cent. of citrus plantings. From Fig. 6 it will be seen that most of these are in the northern areas with token quantities elsewhere. Table 2 shows how few grapefruit trees have been planted recently.

Rootstocks

The majority of citrus trees are growing on citronelle stock which has been the popular stock for very many years. In recent years considerable interest has been shown in alternative stocks particularly Trifoliata. The 1963 survey showed that 11,770 orange trees and 2,628 mandarins were worked on Trifoliata. Although the greater proportion of the orange trees are Valencias a considerable number of Navels on Trifoliata has also been planted.

A total of 1,424 oranges and 78 mandarins were growing on Sweet Orange stock.

Production of Oranges

No information on production was collected during the 1963 survey. However, figures published by the Bureau of Census and Statistics have been used to illustrate the trend in production from 1945 to 1964. This is illustrated in Fig 7. Seasonal fluctuations are considerable in oranges and lemons but less marked in mandarins.

However, the general trend is apparent. Valencia oranges are gradually increasing while Navels are on the decline. Lemons, although fluctuating very considerably, appear to show a definite upward trend probably reflecting in part the high proportion of younger plantings coming into bearing. Mandarins also show a trend towards increasing production. It is interesting to note the similarity in seasonal fluctuations between the various kinds of citrus. Thus in 1961 Navels, Valencias and lemons were at a peak—in 1962 production of all three was low, and so on for other years. This emphasises the strong influence of seasonal conditions on citrus production which makes it so difficult to consider trends on a short term basis. Mandarins appear rather less variable than other fruits but this may be due in part to the younger age structure of mandarin plantings.

CONCLUSIONS TO BE DRAWN

The 1963 survey provided information on varieties and tree age which has not been available since the 1945 survey. It has provided an excellent opportunity for checking the predictions made in 1956 resulting from a study of figures published by the Bureau of Census and Statistics and
at the same time providing a factual picture of future expectations.

The divergence of plantings of Navels and Valencia has continued mainly due to increases in Valencias which are still maintaining a very satisfactory proportion of young trees (22 per cent. less than 5 years old). The number of Navel orange trees has not materially changed but the proportion of young trees has greatly increased (20 per cent. less than 5 years) which suggests a fairly strong replacement rate in recent years and this could react favourably on Navel production. The effect is particularly noticeable in the coastal area. This may mean an end to the decline in Navel plantings, a levelling out of tree numbers and ultimately some increase in production. However, one must not lose sight of the fact that more than half of the trees are more than 25 years old and old trees going out of production will partly counter any potential increase.

In any case, increased orange production can be anticipated from the young Valencia plantings commencing to crop plus increased yields from slightly older trees as they mature. With almost two thirds of the trees in the less than 25-year-old bracket and nearly a quarter not yet in commercial bearing this increase could be quite substantial.

Lemon plantings have remained fairly constant in terms of total plantings but here again the proportion of young trees has increased. There has been evidence of increased production since 1956 and with the large number of young trees in the favourable coastal districts this will no doubt be maintained and probably slightly increased.

The full effect of increased plantings of mandarins over recent years will not be felt for several years as the survey showed 42 per cent. to be less than 5 years of age. Considerable increase in mandarin production can therefore be expected within a very few years. Against this must be weighed the compensating effect of the shorter life of mandarin trees resulting in trees going out of production at an earlier age than oranges. However, as less than one fifth are more than 25 years old the prospects of increased production appear most favourable. The emphasis at present is on two varieties, Imperial and Emperor. A good late mandarin would be an advantage. Grapefruit have continued to decline and there appears to be little prospect of a revival.

ACKNOWLEDGMENTS

The field work of collecting the survey data was carried out by district Horticultural Officers and the survey sheets were prepared for tabulation by Head Office staff. Tabulation was carried out by the Bureau of Census and Statistics. The excellent co-operation of all concerned provided the information for this article.
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