few apple breeding programs left in the world.

'Delicious' is declining in worldwide popularity. However, it is interesting to note that many of the newer cultivars gaining prominence in New Zealand have 'Delicious' in their background. 'Fuji' ('Ralls Janet' x 'Delicious') and 'Gala' ['Kidds Orange Red' ('Cox's Orange Pippin' x 'Delicious') x 'Golden Delicious'] have 'Delicious' in their parentage. A widely-planted North American cultivar, 'Empire' ('McIntosh' x 'Delicious'), also is a 'Delicious' hybrid. The rise in popularity of cultivars with 'Delicious' in their background suggests that it should be considered in future apple breeding efforts.

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Current Situation and Future Trends in Apple Cultivars in the Pacific Northwest

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Abstract

Between 1978 and 1985, the percentage of trees planted which were varieties other than 'Delicious' rose gradually from about 20% to over 40%. In 1985, the acres devoted to varieties other than 'Delicious' was less than 25% of the total. The principal other varieties were 'Golden Delicious,' 'Newtown,' 'Granny Smith,' 'Rome Beauty,' 'Winesap,' and "others." The acreage of those "others" totaled less than 'Rome' acreage, and was quite minor. Those other varieties were: 'Jonathan,' 'Akane,' and still "others." Two new varieties, 'Gala' and 'Fuji,' are especially in demand. Planting of 'Jonagold' appears to have peaked and is declining. 'Jonagold' is apparently too sensitive to sunburn and breakdown in hot weather.

Introduction

For more than two decades, Washington State University has conducted a small-scale apple variety trial at Mt. Vernon, on the West Coast, far from the main apple production district. After seeing the high quality of 'Jonagold,' 'Spartan,' and other new varieties in these trial plots, growers planted numerous small orchards west of the Cascades.

In 1980, a systematic trial of 30 mutant strains of 'Delicious' was begun in Washington and Oregon. Although smaller, less complete collections of strains of 'Delicious' had been studied in earlier years, these replicated trials, which were undertaken using trees propagated on two rootstocks at a single nursery, represented the first thorough attempt to investigate differences quantitatively as well as qualitatively.

In 1984-85, a study of apple varieties, advanced selections, and mutant strains was started by Oregon State University at Corvallis. In 1986-87, WSU began

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two apple variety trials in the major apple growing districts east of the Cascades.

The Fruit Testers Association, initiated by James Ballard of Selah, WA, gathers information about apple varieties in numerous trials conducted by fruit growers. Their meetings and reports have received much attention recently.

The high prices commanded at retail for imported apple varieties such as 'Gala' and 'Braeburn' have been the principal incentive to plant new varieties.

Surveys of fruit trees have been conducted rather infrequently in the Pacific Northwest. In 1986, results of surveys of tree fruits in both Oregon and Washington were published (1, 2). A survey of nurseries conducted by Robert M. Dennis (3) provides information on present and future planting trends.

Current Situation

The "Pacific Northwest" refers to Oregon, Washington and Idaho. In 1983 there were 5,400 acres (2185 ha) of apples in Idaho. These consisted primarily of 'Delicious,' 'Golden Delicious,' and minor varieties. Oregon has about 10,000 acres (4047 ha) of apples, mainly in two large districts and one smaller one. Oregon produces about 3-4 million bushels (42 lb box) annually, which is a minor amount compared with Washington's 85-115 million bushels. The principal varieties in Oregon are 'Delicious,' 'Golden Delicious,' and 'Newtown,' in that order, (Table 1). Most of the 'Newtown' production is on trees in Hood River which are 50+ plus years of age. In the period 1980-1985, about 265 acres (107 ha) of 'Newtown' trees were added to the approximately 1,000 acres planted previously. Between 1975 and 1985 'Granny Smith' plantings in Oregon increased from zero to about 400 acres (3).

In 1986, there were 160,980 acres of apples in Washington State (1). Idaho and Oregon's acreage combined did not exceed 10% of the acreage in Washington.

Table 1. Apple Varieties in Oregon—1986 Survey (3).

Variety	Percent of Total Acres	Percent of Total Trees
Delicious	61	57
Golden Delicious	11	12
Newtown	13	11
Granny Smith	4	7
Rome	3	3
Gravenstein	2	1
Criterion	1	1
Jonathan	1	1
other & unknown	5	6

Table 2. Washington—Acres and Trees by Strain/Variety 1986 Survey (2).

Variety Strain	Acres	Trees
Delicious		
Ace	1,865	530,000
Atwood	1,740	364,600
Bisbee	15,720	2,683,100
Earlistripe	1,785	348,700
Hi-Early	3,735	477,700
Oregonspur	22,405	4,380,400
Redchief	16,680	3,571,400
Redspur	8,590	1,519,600
Ryan, Ryan red	3,775	688,000
Ryanspur	1,995	520,500
Starking	11,555	1,363,600
Topred	10,100	1,587,000
Wellspur	2,580	421,400
Other Strains	14,530	2,820,900
Unknown Strains	4,120	755,100
Total Delicious	121,175	22,032,000
Golden Delicious	22,665	3,776,100
Granny Smith	8,220	3,130,900
Rome Beauty	3,815	721,500
Winesap	1,855	232,400
Other Varieties	2,495	503,400
Unknown Varieties	755	206,500
Total Non-Delicious	39,805	8,570,800
All Apples	160,980	30,602,800

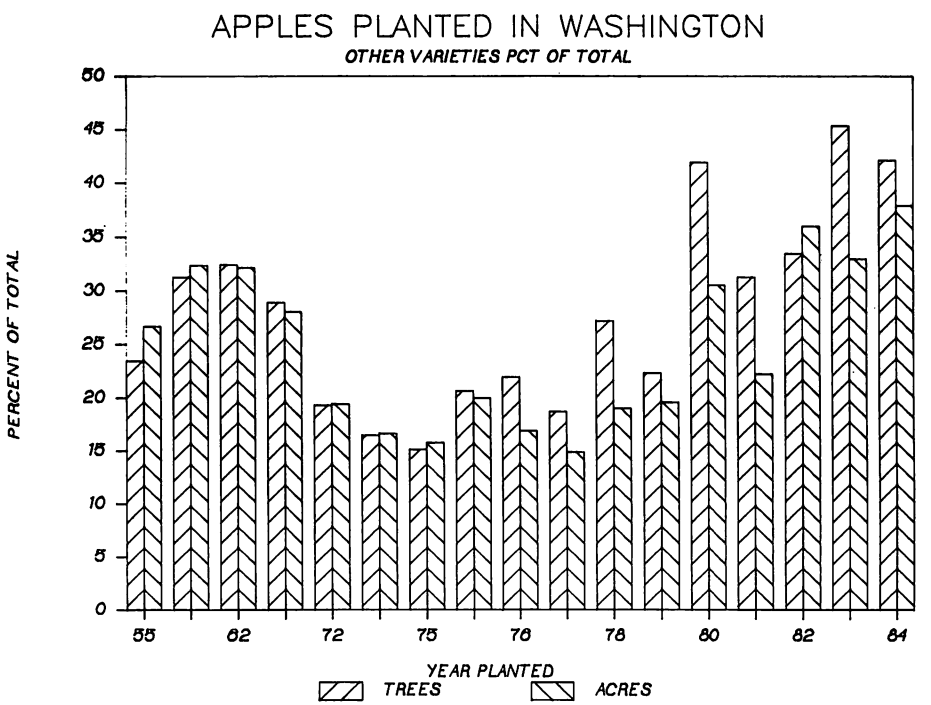

Figure 1. Apples other than Red Delicious planted in Washington, as percent of total apples planted, 1955-1984. Higher figures for trees planted than for acres probably reflects the popular practice of interplanting into producing orchards. From 1975 to 1985, the proportion of varieties, other than Delicious, planted more than doubled.

Over half of the 30 million apple trees in Washington have been planted since 1973 (Table 3). Between 1975 and 1985, the percentage of trees planted which were *varieties other than 'Delicious'* rose gradually from about 17% to about 40%, (Fig. 1). In 1985, less than 25% of the total acreage planted was devoted to varieties other than 'Delicious.' The principal other varieties were 'Golden Delicious,' 'Granny Smith,' 'Rome Beauty,' 'Winesap,' and "others," (Table 2). The acreage of those "others" totaled less than 'Rome' acreage, and was quite minor. Those other varieties were: 'Jonathan,' 'Criterion,' 'Newtown,' 'Winter Banana,' 'Gala,' 'Jonagold,' 'Akane,' and still "others."

Planting of 'Granny Smith' began in the early 1970's, and continued until, in 1985, five percent of Washington's acreage was in this variety. Many acres of such mutant strains of 'Granny Smith' as 'Granspur' and 'Greenspur' were planted. The relative importance of such older minor varieties as 'Winesap' and 'Rome Beauty' continued to decline.

Future Trends

Most growers are still planting 'Delicious,' and intend to stay mainly with that variety for some time. Planting of 'Granny Smith' is declining, (Fig. 2). Planting of 'Golden Delicious' and 'Rome Beauty' is constant.

Two new varieties, 'Gala' and 'Fuji,' are especially in demand (1). Planting of 'Jonagold' appears to have peaked and is declining, (Fig. 3). Other varieties which have been planted recently

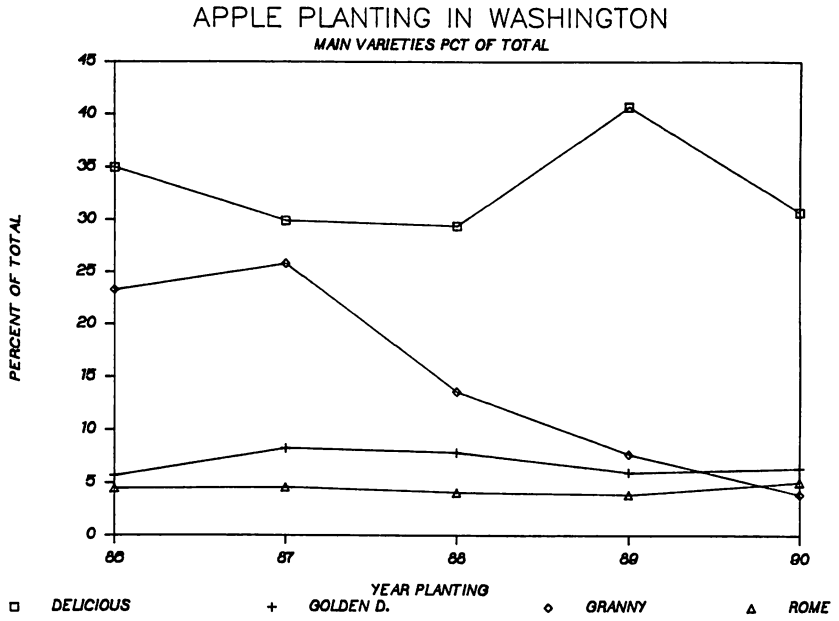

Figure 2. Planting of the principle varieties of apple trees in Washington as percentage of the total number of apple trees sold. Except for a decline in the percentage of Granny Smith trees, the share of nursery stocks represented by principle varieties is rather constant.

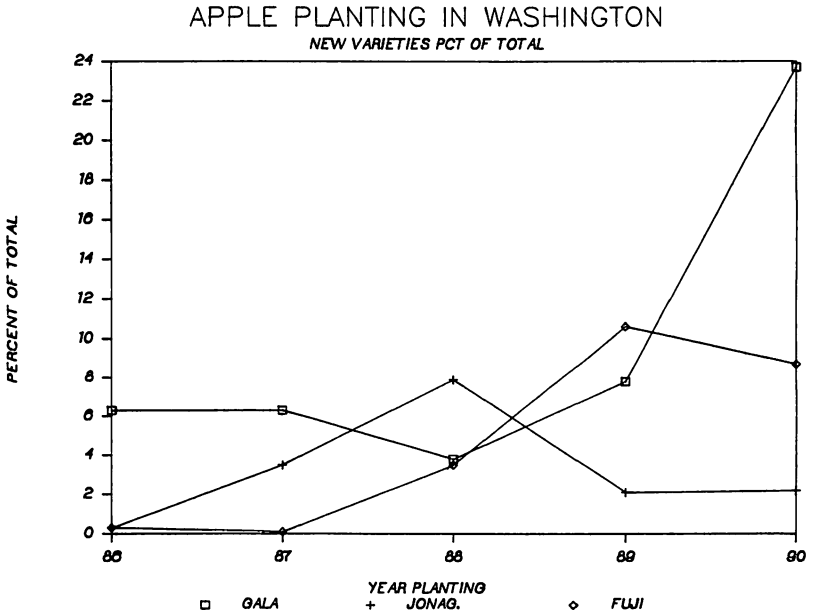

Figure 3. Planting of certain new varieties of apple trees in Washington as percentage of the total number of apple trees sold. Planting of Gala is increasing most rapidly, followed by Fuji. Jonagold plantings increased from 1986 to 1988, then declined.

Table 3. Trees by Year Planted and Density x 1,000.

Year Planted	Total Red Delicious	Total Others
<1955	519.5	159.4
1955-59	891.1	406.0
1960-64	1,247.0	598.8
1965-69	2,703.4	1,099.1
1970-73	2,879.7	688.2
1974	563.5	111.0
1975	892.1	158.9
1976	903.2	234.7
1977	639.6	179.6
1978	1,323.4	304.0
1079	1,700.5	632.9
1980	2,349.2	673.5
1981	1,566.9	1,124.3
1982	1,700.7	772.1
1983	893.4	448.9
1984	615.2	510.7
1985	643.6	468.7
Total	22,032.0	8,570.8

in very limited quantities include 'Criterion,' 'Braeburn,' and 'Elstar.'

Discussion

Higher percentages of *trees* of varieties other than 'Delicious' were planted than *acres*, (Fig. 1). This apparent discrepancy in statistics probably reflects the common practice of interplanting orchards with nursery trees, rather than pulling and replanting.

For the past three or four decades, interest in new varieties has centered around mutant strains of 'Delicious.' Probably because it has been used primarily as a pollenizer for 'Delicious,' little attention had been paid to mutations of 'Golden Delicious.' If one considers 'Delicious' plus pollinizers, less than 15% of the acreage was devoted to anything else. Clearly, there has been an extreme concentration on 'Delicious.'

'Jonagold' appears to be too sensitive to sunburn and breakdown in hot weather for planting east of the Cascades. Numerous PNW growers have received high prices for 'Gala' in the past several years, even while 'Delicious' was returning less than the cost of production. The 'Fuji' boom may be copying growers in California, and the opinion leader, Grady Auvil. A trend towards planting 'Braeburn,' based on the successful importation of this variety from New Zealand, appears to be developing.

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Influence of a Single Heading Pruning Treatment

A recent study summarized the effects of dormant heading back of terminal extension shoots on the scaffold limbs of 2-year-old 'Empire'/M.26. The single treatment was made in 1985 and resulted in increased shoot growth from 1- and 2-year old limb sections. Annual trunk enlargement was reduced in 1985 and 1986 by the 1985 heading back treatment. Yields were decreased in 1986 through 1989 by the heading back treatment applied in 1985. These results are due to 7 to 9 cuts/tree and show clearly the adverse effect on fruiting due to heading back pruning of young trees.

From Elfving, D. C. 1990. Growth and productivity of 'Empire' apple trees following a single heading back pruning treatment. HortScience 25(8): 908-910.