

AN ABSTRACT OF THE THESIS OF

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(Degree) (Major)

Date thesis is presented August 11, 1964

Title THE GEOGRAPHY OF THE APPLE INDUSTRY OF THE  
CHELAN VALLEY, WASHINGTON

Abstract approved \_\_\_\_\_  
(Major Professor) ✓

The Chelan Valley is one of several valleys located on the eastern slope of the Cascade Mountains contributing to the leadership of Washington in apple production. Since the nature of the activity in the Chelan Valley is typical of all these producing areas, it was selected as a case study of this important segment of the agricultural economy of Washington. The study presents an analysis of the principal factors, both environmental and human, basic to the localization of apple production in this valley. The structure, organization, and problems are examined and the potential is analyzed.

The principal findings are as follows: the physical requirements of apples are nearly ideally met by the combined environmental conditions of temperature, slope, soils, drainage and irrigation water supply. Development of the activity, however, has been the responsibility of dedicated growers who have been quick

both to perfect and to accept improved techniques in the interest of selling a quality product on distant markets. This includes concentration upon four varieties: Red Delicious, Golden Delicious, Standard Delicious, and Winesap. The Standard Delicious and Winesap were the main early commercial varieties, but they are now being replaced by the Red and Golden Delicious varieties. It is the Red Delicious that has become famous as the Washington State apple.

The typical orchard, in contrast to other forms of farming in the nation, is small in acreage. A majority of units contain ten to twenty acres. Apple orchards in the Chelan Valley, however, rank among the highest of the forms of agricultural land in value per acre.

Much of the factual material presented in this thesis is applicable only to the Chelan Valley, but conclusions and inferences are applicable to the Washington State apple industry as a whole.

THE GEOGRAPHY OF THE APPLE INDUSTRY  
OF THE CHELAN VALLEY, WASHINGTON

by

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A THESIS

submitted to

OREGON STATE UNIVERSITY

in partial fulfillment of  
the requirements for the  
degree of

MASTER OF SCIENCE

June 1965

APPROVED:



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Typed by Jan Lewis



## ACKNOWLEDGEMENT

The author wishes to express his great debt to Dr. Richard Highsmith for his assistance and guidance in the writing of this paper. Many of the better qualities of this thesis are a direct result of his instruction, prodding, and knowledge in the methods of leading a student through the problems of thesis writing.

The author would like to acknowledge the consideration of the Soil Conservation Service, Chelan, Washington, and Mr. L. G. Sandburg for the use of their facilities and aerial photographs in connection with the construction of the "Orchard Location" map.

The author also wishes to express here his appreciation to his wife for the many hours spent in proofreading and typing the several drafts of this report. Without her aid and encouragement, this thesis might not have been completed.

To all other individuals who were interviewed, whether noted in the Bibliography or not, the author expresses his thanks for their time and effort. Only those quoted are listed but many more contributed to the author's knowledge of this interesting field of study.

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# THE GEOGRAPHY OF THE APPLE INDUSTRY OF THE CHELAN VALLEY, WASHINGTON

## CHAPTER I

### INTRODUCTION

Apple production in Washington, the leading state of the nation, is centered in several valleys on the eastern slopes of the Cascade Mountains. One of these, the Chelan Valley, is the focus of this thesis study. This valley, although small in size, has evolved an agricultural economy that is almost exclusively devoted to the production of apples. Thus, here is provided a microcosm which permits an appraisal of the factors that have been influential in the localization of the apple industry of the entire state.

The writer's interest in this topic stems from a direct involvement with the apple economy of the Chelan Valley. Since 1938 his parents have owned and operated an orchard in the area. A personal background in all phases of the activity was a major benefit in the formalized research as well as in the analysis presented here. An effort was made, during the summer of 1963, to deepen insight and understanding by reading the research of specialists who have been concerned with apple production in the area, by interviews with orchardists and specialists concerned with the apple industry, by

field observation, and by aerial photograph and map interpretation. The map of orchard lands was prepared by the author, based upon aerial photographs, and substantiated by field observation. All acreage figures given for areas other than the two reclamation districts were computed from the aerial photographs.

The writer's practical background and his recent research findings have been correlated into an analysis with attempts to present a holistic view of the apple industry of the Chelan Valley.

## CHAPTER II

### FACTORS THAT INFLUENCE COMMERCIAL APPLE PRODUCTION

#### Early Apple Production in the United States

The apple tree was introduced to America from Europe by the early settlers, who were attempting to transplant European agriculture in total to this country. Although the rocky soil of New England was not commonly suitable for European farming methods, the apple was one crop that was successfully transplanted.

Almost every farmer in the Colonial period grew at least one tree for his family's use. Apples were the only fruit that could be stored for fresh use throughout the winter, and this made them especially valuable in an economy that stressed self-sufficiency. There was almost no commercial production. The story of Johnny Appleseed (John Chapman) belongs to the period of the Westward Movement; from about 1800 until his death in 1847, this man travelled throughout the Ohio Valley and into Indiana and Illinois planting apple orchards for the settlers.

Orcharding in the Pacific Northwest started in 1848 when Henderson Luelling arrived in the Willamette Valley with a wagon

load of seeds, grafted trees, and cutting stock of several fruits. He planted a nursery and within a few years many Willamette Valley farmers had set out orchards from his stock (5, p. 326). By 1853 these pioneers were able to supply apples to the miners of the California gold fields. The excessive profits of this trade encouraged over-expansion of orchards in both California and Oregon. By 1880 the growers of Oregon were faced with a depression and a loss of markets (5, p. 328).

In the search for markets a shipment of high quality fruit was sent from Oregon to Europe, where it sold readily. The growers began to realize that high quality fruit could be sold economically in distant places, so they introduced quality controls to insure that only the best was shipped (5, p. 333-4). The production of top quality fruit is still the goal of the orchardists of Oregon and Washington.

### Environmental Requirements for Growing Apples

#### Requirements for Commercial Production

Although apples are grown widely throughout the United States, commercial production is limited to the most favorable locations. The factors delineating these locations are temperature, moisture, wind, soils, and slope.

Temperature places the most severe limitations upon



commercial production. Apples do best under moderate conditions, free of extremes. Winters should be cold with freezing weather but no zero temperatures, summers warm but not excessively hot. Spring and Fall temperatures should provide a gradual transition between seasons.

The apple tree goes into a rest period after harvest that must be broken by cold weather, or the bloom will be late, irregular, and weak (2, p. 184; 3, p. 60). The cold necessary to break the rest period is a product of time and temperature below a certain maximum, generally considered to be 40 to 45 degrees (3, p. 60). Apples do vary in their ability to tolerate very cold weather; the less tolerant varieties apparently need less cold to break the dormant period than the more hardy trees.

Blossom time is the most critical period, for daytime temperatures must be high enough to stimulate the pollinizing insects and nights must remain above freezing. A single hour of 26° weather during full bloom will kill all the flowers (13, p. 36). During harvest warm days are needed to mature the fruit, and cool nights to color it. Sudden and erratic temperature fluctuations in any season can be harmful. A warm spell in late winter may cause the trees to break dormancy before the danger of frost is past, whereas an unusual hot spell in summer causes sunburning and discoloration of the fruit, and may be accompanied by drought. Freezing weather before the trees

become dormant in the fall can kill the fruit spurs, and extreme cold in the winter may injure the roots (2, p. 188).

A consistent supply of moisture must be available for commercial apple production, about 25 inches a year minimum. Even a drought that does no apparent harm to the trees or to the individual apples may limit the size and quality enough to seriously reduce the income for the year. Irrigation has been successfully applied in the West so that lands normally too dry for agriculture are producing excellent fruit.

Areas of commercial production must be free of severe windstorms, especially during the blossoming and maturing seasons. A strong prevailing wind also is disadvantageous since it can distort trees and make production more difficult; however, this handicap may be overcome by careful pruning and shaping of the tree.

The characteristics of depth and permeability of soil are more important considerations for commercial production than fertility, owing to the expansive requirements for root development and intolerance to waterlogged condition. A well-drained subsoil is of utmost importance, but it must retain adequate moisture to maintain growth. A deep gravelly loam is preferable. In the general view, the apple tree is more tolerant of other poorer soil qualities than most crops are, but it responds beneficially to high qualities (2, p. 23; 13, p. 37).

Smooth, sloping lands provide the most favorable sites for commercial orchards. Because cold air flows downslope, such sites commonly escape frost damage from a late spring cold spell that could kill the tender blossoms of orchards on neighboring bottom lands (2, p. 21). Sloping land promotes drainage and reduces the problem of excessive soil moisture, as well. The maximum allowable slope on which an orchard can be established varies with production techniques. Actually, apples will grow on slopes too steep for the safe use of modern equipment, hence economic considerations are important.

#### The Locations of Commercial Orchardring in the United States

Apples are grown commercially in 34 states; however, 73 percent of the United States crop comes from only seven states (18, p. 97). A combination of factors is responsible for the prominent role that these states hold in apple production. These include especially favorable apple environment as well as notable human organizational efforts. The producing areas of Washington, Virginia, West Virginia, and Pennsylvania are on bench lands that provide good air drainage and are protected from harsh arctic storms by mountain ranges, specifically the Cascade Mountains in Washington and the Appalachians in the east. The producing areas of New York, northwest Pennsylvania, and Michigan are influenced by the proximity of

the Great Lakes. These large bodies of water reduce the spring temperatures enough to delay bloom until danger of frost is past. By autumn the Lakes have warmed so as to delay the early hard freezes and provide proper weather for maturation and harvest. Sonoma County (Gold Ridge) to the north and The Watsonville (Pajaro) Valley to the south of San Francisco Bay contain most of the California orchards (9). The mild marine-influenced climates are highly conducive to the production of the early maturing varieties, notable Gravenstein, but not to the proper coloration of the late maturing red varieties (3, p. 59).

Table I

Apples, Commercial Crop  
(Thousand bushels)

State	Average 1951-1960*	1961*	1962*	Preliminary
				1963**
Washington	22,630	16,900	22,000	29,200
New York	17,405	24,100	20,000	21,500
Michigan	10,520	16,000	12,000	12,000
Virginia	9,503	10,500	9,800	8,800
California	8,730	10,300	10,300	8,000
Pennsylvania	7,028	9,800	8,700	8,000
West Virginia	4,773	5,500	5,000	4,800
Total U. S. Production	110,332	126,710	121,390	122,840
*(18, p. 97)				
**(19, p. 37)				

## Technological Factors

### Intensive Care

The intensive care that the modern commercial orchardist gives his trees is a new concept, developed largely in this century by growers in the Pacific Northwest. The early farmers planted seeds or occasionally grafted trees and then waited for the fruit to develop. They might fertilize with animal waste, but there were no chemical fertilizers available. Pruning was usually limited to the removal of dead and broken limbs. No one sprayed, thinned, propped, or shaped the trees in an effort to produce quality fruit. Apples were expected to have worms and to be limb scarred. Since the surplus apples offered for sale were usually dried or made into cider there were no economic pressures to encourage the improvement of production methods.

The growers of the Pacific Northwest were the first to apply intensive care to the trees and fruit. These growers were far from markets and found that only the best fruit was profitable (5, p. 329). They were forced to develop techniques of growing and shipping that would put the largest possible quantity of top quality fruit on the market. In recent years growers in other areas have adopted these techniques, but the growers of the Pacific Northwest continue to be

leaders in technology and quality controls.

### Chemical Technology

The control of pests was of little concern to the early orchardist. Orchards were small and scattered, which inhibited the intensive infestations that today affect the concentrated orcharding areas. In the eastern states, pests were normally kept under control by natural predators. The loss of an occasional tree to disease or insects was of little economic importance. Moreover, the consumers expected to find insect-damaged apples.

The fruit-producing areas of Washington and Oregon were reported to be free of pests until imports of poor quality fruit from California brought them in. Once introduced, they were carried into all fruit producing areas, often in old fruit boxes or on planting stock (5, p. 332). The concentration of orchards encouraged the rapid spread of insects and diseases, and without natural predators, they were able to multiply readily. Pest control became an economic necessity.

Lead arsenate was the most important and the most widely used of the early insecticides. It was applied as a liquid spray during the summer in an effort to keep the apples completely covered to protect them against the codling moth, the principal pest in those years.

Although effective, it poisoned the soil, thus preventing replanting of

an orchard on the same site. Labor requirements were high, since the spray had to be reapplied about every two weeks during the summer season. In addition, the variety of insect pests has increased with the years, necessitating new controls and lower cost means of application.

Since the early 1940's the agri-chemical industry has made great advances. DDT was one of the first chemicals with agricultural potential developed during this period. New and improved chemicals are appearing every year so that now the farmer has relatively economical and efficient controls available. Insect-damaged fruit has no economic value and is seldom found in the orchard.

The second major advance of the agri-chemical industry has been the discovery and manufacture of economical inorganic fertilizers. Apples have a high nitrogen requirement which is easily met by the application of fertilizer. Trace elements needed by apples are phosphorus, magnesium, potassium, manganese, calcium, sulfur, iron, boron, copper, and zinc, all of which are available in fertilizers (13, p. 38).

### Soil Management

The proper management of the soil is as important in orcharding as in other types of agriculture. Two contrasting programs,



clean cultivation and sod mulch, each with its advantages and disadvantages, can be employed. An orchard soil management program should meet the following objectives: to conserve moisture, to prevent erosion, to increase or maintain organic content, to supply nutrients, and to aerate the soil (2, p. 99). The best method of accomplishing some of those objectives may not be the best for accomplishing others.

Clean cultivation is usually practiced around small trees. Sod or any other cover competes with the shallow-rooted trees for moisture and nutrients. Some type of crop may be grown in the middle of the tree rows to prevent erosion. Often this can be mowed and the vegetable matter raked around the young trees to supply organic matter and reduce evaporation. The area immediately around the trunk must be kept free so field mice cannot find shelter there. Rodents can girdle the tree and surface roots, killing the tree (2, p. 105).

The sod mulch is superior for bearing trees. It provides vegetable matter, prevents erosion, and lessens the evaporation of water by shading the surface. Normal soil processes keep the soil loose. Mice are not likely to damage mature trees, but they should still be kept under control. If food does become scarce they will feed even on mature trees, and during harvest they may enter filled bins, causing extensive damage to the fruit.



Disadvantages of a mulch are the fire hazard, the harboring of insects, diseases, and rodents, and the taking of nutrients from the soil (2, p. 104). Usually the cover crop should be fertilized for a few years, after which the decaying matter supplied will balance the nutrients removed. The sod must not be allowed to become too heavy, since the leaves of long grass trap too much moisture before it reaches the ground.

Mowing has been found to eliminate most of the problems caused by a sod mulch. Short grass does not encourage mice or other pests; water has less difficulty soaking through short grass and mowing encourages the development of a sod that is heavy enough to control erosion well.

There seems to be less variation in soil management throughout the apple producing regions of the nation than in any other aspect of apple production. No important differences were noted between eastern and western methods in two references examined on this subject (2; 12).

#### Mechanical Technology

American farmers have always been resourceful in adapting existing equipment to specialized uses or developing new machinery. This has been especially true of the commercial orchardists. Early growers had to build specialized equipment; even today this inventive

genius is developing new machinery and new procedures to make work more efficient.

Mechanization of the fruit industry still lags behind that of most other types of farming in spite of the remarkable developments in this field. This lag is due to the difficulty of adapting the tree to mechanical procedures without foregoing quality production. Pruning, thinning, and harvesting do not lend themselves to complete mechanization, although the mechanical ladder can speed these operations.

### Marketing Factors

#### The Role of Transportation

Transportation was of minor importance when each family grew its own apples. Commercial production first developed in the eastern United States where proximity to the major population centers kept transportation costs low. In addition, much fruit was sold in processed form, which also reduced transportation requirements and costs. The Pacific Northwest, on the other hand, has been dependent from the very beginning of the commercial activity upon fast, reliable, and economical transportation. This area specializes in the production of fresh, high quality fruit which must be refrigerated and protected from bruising. The history of the apple industry of the Pacific Northwest shows a direct correlation between the development

of transportation and production, for without adequate transportation there could be no commercial production.

### The Role of Advertising

The only nation-wide apple advertising agency is supported by the growers of Washington, by assessing themselves ten cents per hundredweight of packed fruit (23). This agency, the Washington State Apple Commission, works with brokers and wholesale and retail merchants to improve selling techniques and open new markets. The advertising program of the Washington State Growers has proven so effective that apple growers of other states are now forming their own agencies.

### Storage Methods

The evolution of apple production has been paralleled by developments in storage. Home storage was a root cellar or other cool place protected from freezing. The first commercial storage was probably a pit where the apples were buried until sold. This prolonged marketing until late winter. The first above-ground storage sheds merely protected the fruit from freezing; before large refrigerator units were available, the only way to cool the shed was to blow cool night air into it.

The first commercial refrigeration units circulated brine along

the walls of the storage room. Maintenance and labor costs were high due to the necessity of defrosting the long pipe lines frequently.

Modern units are more compact with the refrigeration units in one place, which reduces operating and maintenance costs. Cold air ducts direct the air into all sections of the storage rooms. More uniform cooling is possible, thus maintaining the optimum temperature of  $33^{\circ}$  while eliminating the danger of freezing fruit stacked near the cooling unit.

The latest developments in apple storage are much more complicated than maintaining a temperature of  $33^{\circ}$ ; air is now filtered to remove the gases that speed ripening, and the  $\text{CO}_2$  content is increased to delay maturation, thus prolonging the storage life. Temperature, humidity, and air composition are all controlled. This newest technique, still in the experimental stage, is called CA (controlled atmosphere) storage (2, p. 245).

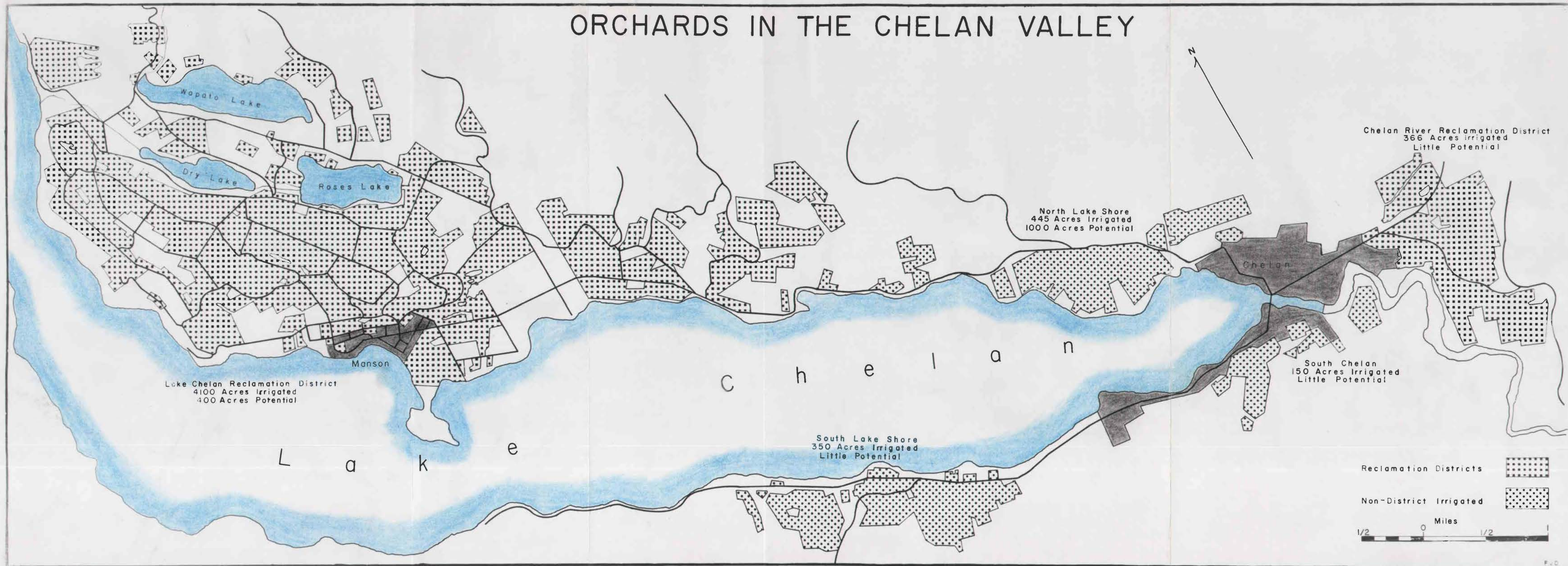
### Conclusion

The major factors that have localized commercial apple production in general relate to a favorable combination of especially satisfactory conditions of environment which have been adapted by skilled farmers using the latest methods and equipment to produce a top quality product. Seven of the 36 commercial apple producing states produce over 73 percent of the crop. These farmers have had to

invent specialized equipment for the development of the maximum potential of the environment. The most progressive development has occurred on the eastern slopes of the Cascade Mountains in Washington.



# ORCHARDS IN THE CHELAN VALLEY





### CHAPTER III

#### FACTORS THAT INFLUENCE APPLE PRODUCTION IN THE CHELAN VALLEY

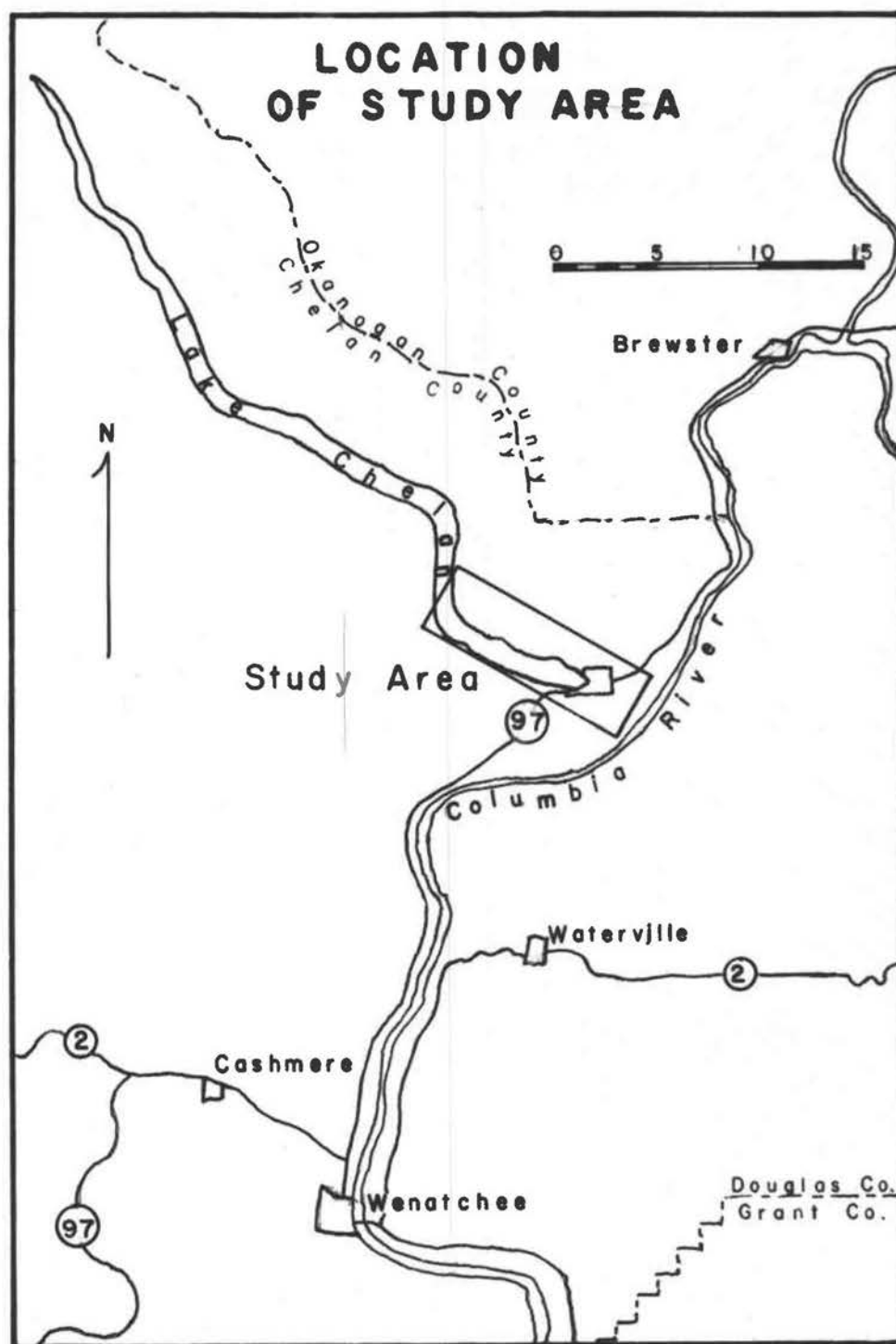
##### Purpose

Chapter III enlarges and modifies the material introduced in Chapter II with particular reference to the orcharding practices of the Chelan Valley and the Pacific Northwest.

##### Introduction

The Chelan Valley, on the eastern slope of the Cascade Mountains, illustrates apple production as practiced in Washington. Most of the factors that have a bearing upon this locality also influence the other apple producing areas of the Pacific Northwest; the Chelan Valley is unique only in the extent of its dependence upon the apple industry. Apples are the backbone of the economy of this valley; with the exception of the tourist industry, the economy is apple-oriented, for even the small local sawmill was built to produce wooden apple boxes.

This valley is 35 miles north of Wenatchee, the largest town in north central Washington, and 100 miles south of the Canadian border.





U. S. 97 is the main highway connecting the valley with Wenatchee and Yakima to the south and the Okanogan Valley to the north. The Great Northern spur line up the Columbia and Okanogan Rivers to Canada is the only railroad. It was this line, constructed in 1912, that provided the impetus for the development of the Chelan Valley (6, p. 459).

The population of the valley is 6,300 (1960 census). Chelan, the only incorporated town, has a population of 2,400, while about 2,300 people live outside of Chelan, many along the south lake shore. Manson, an unincorporated town on the north shore of Lake Chelan and eight miles up lake, is the supply center for an additional 1,600 people of the Lake Chelan Reclamation District, the main orchard area. This district has 4,100 acres under cultivation in a total area of eleven square miles (8), thus a very high density of population for an agricultural area.

The agriculture in the Chelan Valley is oriented toward the production of high quality fruit that can compete with locally grown fruit in the markets throughout the United States. To maintain this high quality requires intensive care of trees and fruit through a high labor input on relatively small farm units. Twenty acres is considered a family size farm although the operator will not be able to meet all his own labor needs during thinning and picking.

This area is dependent in many ways on the Wenatchee and Yakima Valleys. They pioneered the present irrigation and

production techniques and first attracted the railroads to the valleys along the eastern slope of the Cascade Mountains. Today they continue to be the leaders, especially in technical developments. Most of the locally produced equipment is manufactured in the Yakima Valley by such companies as the Edwards Equipment Company, and the Tree Fruit Experiment Station of Washington State University is in the Wenatchee Valley. The large volume of fruit in these two areas helps draw the migratory workers that thin and harvest the crops in the several valleys.

### The Environment

#### Climatic Characteristics in Relation to Apple Production

The Chelan Valley is relatively free of sudden and erratic cold spells that would have disastrous effects in the spring and fall. The mountains that surround the valley restrain the arctic air that sweeps across the Middle West; the prevailing temperate west wind also prevents the inflow of cold arctic air from the east and north.

Winters in the Chelan Valley are cold with freezing weather and abundant snow. The January average is about 25°, which provides the necessary freezing temperature. Springs are mild and become warm gradually. Summers are warm to hot with maximum daytime temperatures seldom over 90°. Fall weather is warm during the day, while

night temperatures often drop to the 30's.

The precipitation regimen of the Chelan Valley is one of dry summers and modestly humid winters. December, January, February, and March each average over one inch of precipitation, while July, August, and September total only about another inch. This valley is in the dry shadow of the Cascade Mountains, so the average annual precipitation of eleven inches is much less than that recorded to the west. Fortunately the Lake Chelan watershed receives adequate precipitation to provide for irrigation of the orchard lands. The regimen in the watershed is ideal, heavy winter snowfall in the high mountains with the water held in refrigeration until the warmer season, when it is released slowly.

### Soils

The soil in the Chelan Valley has developed from unsorted glacial drift. It is a moderately coarse textured, brown-chestnut, well drained, deep soil containing from 20 percent to 60 percent pumice. The same characteristics occur whether the land is level or very steep. This soil, like most semi-desert soils, is deficient in nitrogen and organic matter, but both deficiencies are easily corrected. Most of the other needed elements are usually present (17).

The pumice provides most of the unusual soil characteristics.

It has the same effect as sand or gravel in making the soil porous, but the grains hold more moisture. Water for good tree growth remains available, but the excess drains off. The other characteristic of pumice is its light weight. It can float on water, so erosion control is essential on irrigated lands.

### Terrain

The terrain of the Chelan Valley is related to the effects of glacial deposition and modification. Two lateral moraines, one parallel to Lake Chelan and one parallel to Dry Lake and Roses Lake, dominate the Manson area. The orchards on the north shore of Lake Chelan are on recessional moraines, and the orchards east of Chelan are on water-modified terminal moraines. Terraces on the slopes above the Lake are the result of soil deposition by streams flowing into a much deeper lake.

Slope dominates the Chelan Valley, with grades up to 50 percent. Smooth, flat land is at a premium. The sloping terrain provides excellent water and air drainage throughout most of the valley. Thus, most orchard locations are subject to natural frost protection. The maximum slope for orchards is about 30 percent (11) since the movement of equipment prevents the planting of steeper slopes. Safety and economics are the limiting factors.

### Orchard Locations

The orchard locations are influenced by details of micro-environment. They are found on slopes under 30 percent that can be irrigated, providing there is adequate natural frost protection and there are satisfactory orcharding soils. Urbanization of the lake shore will become a factor in the future since much orchard land that provides access to the lake may eventually be of more value for homes or resorts. At present, this trend is most noticeable along the south lake shore near Chelan.

The orchard lands of the Chelan Valley can be categorized into five divisions, based upon location: south lake shore, south Chelan, Chelan River Irrigation District, north lake shore, and Lake Chelan Reclamation District (see map, page 13). The last receives water by gravity from intercepted mountain streams; the others are irrigated with water pumped directly from the lake.

The 350 acres on the south lake shore, 450 acres on the north shore, and 155 acres south of Chelan are supplied by individually owned pumping plants. Distance from and height above the lake limit the expansion of these areas. New sources of water or improved and lower cost pumping methods are prerequisite for expansion.

The Chelan River District pumps water from the lake to supply 366 acres (7). This area will probably decline in size as Chelan

(urban area) expands, for the same steep slopes to the north and river gorge to the south limit expansion of both orchard lands and town.

The Lake Chelan Reclamation District, by far the largest concentration of orchards in the valley, contains 4,100 acres. Water from seven mountain streams is intercepted to provide a gravity flow system for these orchards. The system can be feasibly enlarged (see map, page 33). When more water is available, this district will be able to expand onto the irrigable benchlands toward Chelan.

### Special Local Orcharding Methods

#### Varieties

The Winesap and the Standard Delicious were the foundation varieties when this area was planted. The Winesap (Figure 1) is an excellent shipping apple with good keeping quality; it has a crisp texture, is highly colored, tart, and flavorful. Even in the simple type of cold storage available during the early years, it kept throughout the winter. The Winesap is losing its market because consumers now prefer a sweeter apple and because, with improved storage and shipping, the Delicious can be marketed into late spring. The Standard Delicious does not have the keeping qualities of the Winesap, but its sweetness formerly made it popular in the early winter months. The market for the Standard Delicious has been depressed by the more



Figure 1. The Winesap, a bright red apple, has a rounder shape and a coarser skin than the Red Delicious. (Washington State Apple Commission)



colorful Red Delicious.

The Red Delicious (Figure 2) and Golden Delicious (Figure 3) are now replacing the other varieties. The former is a red, highly colored sport of the Standard Delicious. Its beautiful color makes it an attractive apple in a display, while the distinctive "Delicious shape" makes it easy to identify. Its flavor is almost identical to that of the Standard Delicious. The Golden Delicious has a green to butter yellow color and a sweet, distinctive flavor. It was developed to pollinate the Delicious varieties, but, due to a very thin skin, it has been hard to pack and ship. During the past few years these problems have been solved, and it is becoming a good commercial apple.

Table II

Fresh Fruit Shipments from Wenatchee in Carloads						
	1930	1935	1940	1950	1960	1962
Red Delicious	0	120	1,619	6,996	6,232	6,848
Golden Delicious	0	70	343	540	1,143	1,544
Standard Delicious	5,532	6,090	5,082	6,617	2,307	2,275
Winesap	8,278	5,570	5,745	5,509	3,865	3,181
Other	9,493	3,372	2,270	1,609	661	492

(22)

The change in varieties is illustrated in Table II based on fruit shipments from the Wenatchee district, which includes the Chelan





Figure 2. The Red Delicious, a bright red apple. Notice the characteristic shape with the five nubs at the blossom end.  
(Washington State Apple Commission)



Figure 3. The Golden Delicious, a yellow apple with the characteristic Delicious shape. (Washington State Apple Commission)

Valley. It can be assumed that the change in varieties has taken place in the Chelan Valley proportionately to that in the entire district.

The trend toward the Red Delicious and away from the Winesap will probably accelerate as the older varieties planted during the 1930's grow beyond their prime producing age of about 40 years. Most orchards in the Chelan Valley with a high percentage of Winesaps were planted 30 to 40 years ago and will need replanting soon. Also, one can observe many young orchards of Red Delicious planted since 1955 that will soon be coming into production. Many of the orchards along the periphery of the Lake Chelan Reclamation District fit this description.

#### Intensive Care

Quality production requires intensive care during the entire year. No two trees are shaped alike, so each must be pruned differently. Thinners space the apples about eight inches apart on each limb, covering the entire tree at a slow rate. Harvesting requires the careful removal of each apple from the tree and its gentle placement into a box or bin.

Spraying and cultivating are the only completely mechanized operations in orcharding. The operations of pruning, irrigating, and propping require only a small labor force, for they extend over a long

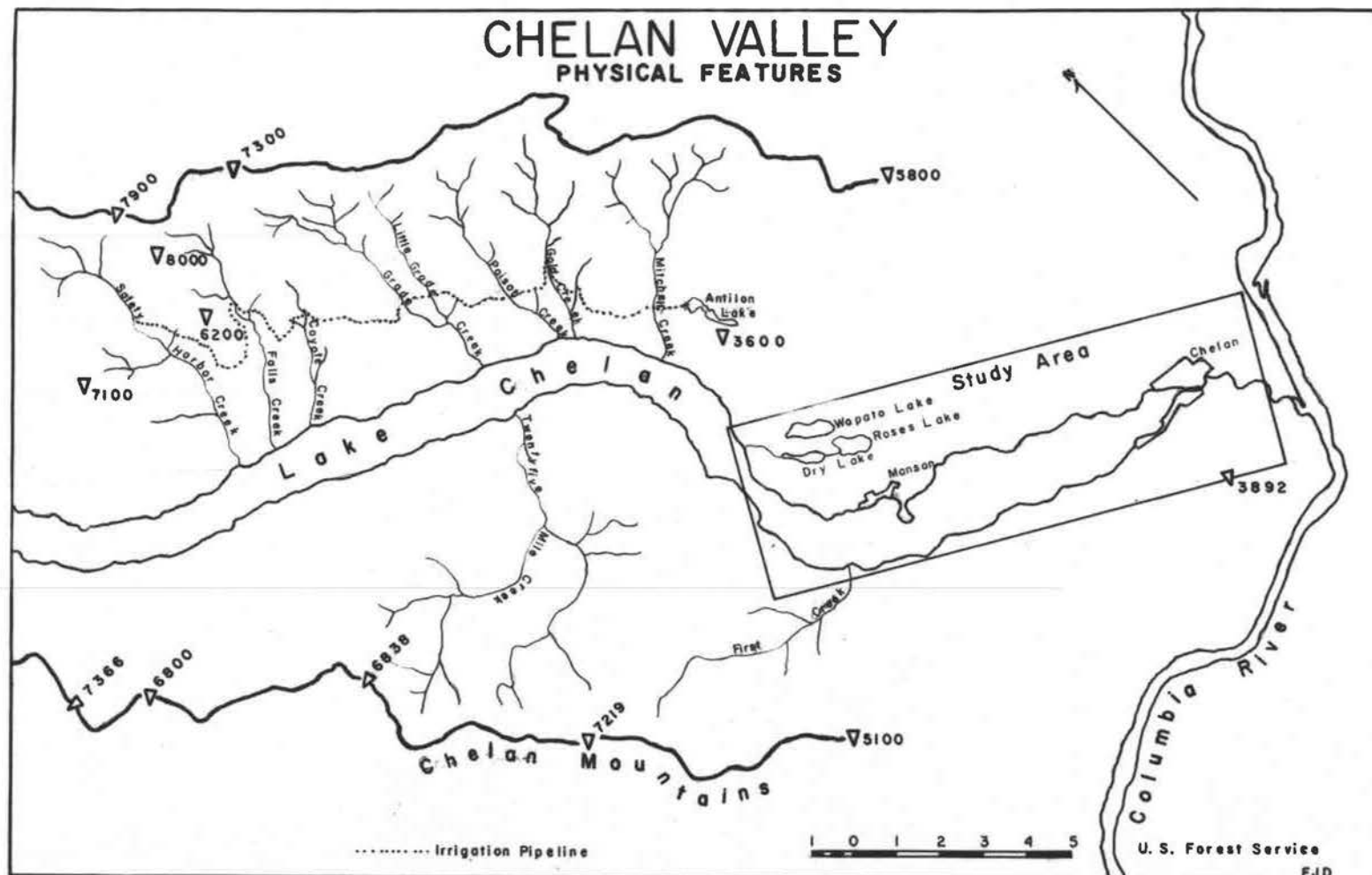
period of time, but thinning and harvesting must be completed within a specified period, therefore necessitating a large labor force. All of these operations, whether manual or mechanized, are a part of the intensive care program.

### Irrigation

The Chelan Valley could not have developed its present system of agriculture without irrigation. In 1963, 5,400 acres received water; 2,000 acres more are considered irrigable (21, p. 146).

The land is watered by two methods, sprinkler (90 percent) and rill (11). Sprinkler irrigation requires a high initial investment, but it allows better control of the amount of water applied and is less time consuming, thus reducing the over-all cost.

Irrigation water is expensive, about \$40 per irrigated acre in the Lake Chelan Reclamation District, \$35 in the Chelan River District, and \$15 to \$20 from individually owned pumps (7). High maintenance costs of the Lake Chelan Reclamation District distribution system account for most of its higher cost. This system includes 30 miles of pipe in the collection system (see map of Physical Features, page 33) and over a hundred miles of pipe in the distribution system that supplies the growers.



## Technological Development

### Mechanical Technology

The early orchardists were faced with two mechanical problems: the available equipment was expensive, and specialized equipment had not been developed. A tractor for field use was often too tall for orchard use, and the long distance from the manufacturer increased the purchase cost. Often the grower would buy a used truck or automobile, remove the body, modify the frame, and perhaps add another transmission to make a low truck or tractor capable of moving through the orchard without damaging the lower limbs of the trees.

Spray equipment was the first commercial advancement. For this, high pressure, low volume pumps were needed along with special high pressure hoses and nozzles. Most other technological developments came after World War II when farm labor costs started climbing. Now the orchard-supported industry has developed tractors, cultivators, speed sprayers, mowers, fork lifts, and mechanical ladders especially adapted to orchard use. These devices are expensive, but they do reduce labor costs, increase production, and help maintain quality. Still in the future are mechanical harvesters and pruners. The higher labor costs in the Pacific Northwest have

encouraged this area to lead in mechanization.

### Chemical Technology

The control of pests is a major problem for the quality producer. Insects attack the tree and the fruit to reduce total yield. The codling moth larva is the most important pest that attacks the apple itself. Cutworms attack the apple, tree, and blossoms in the early spring, but cease to be a pest when the ground cover becomes well established. Scale, aphid, and mites attack the tree and reduce its vigor, the aphid usually on new growth and the mites on the leaves. The codling moth is the traditional pest, but now mites seem to be the most serious problem (27, p. 5-7).

Irrigation has created an artificial environment that is beneficial to the pests but not to their natural predators. Most pests find the concentration of orchards an ideal environment, while the insect predators have more specialized requirements. The hot, dry climate that produces top quality apples also provides an ideal climate for mites and the codling moth.

Lead arsenate and sulfur were the only effective pesticides available to the early growers. Sulfur was applied as a dormant spray to control mites, scale, and aphid; then lead arsenate was used as a cover spray during the growing period to control codling moth. High labor costs and the ability of lead to accumulate in the soil and

poison it made the search for other chemicals necessary.

Modern chemicals are more effective, less difficult to remove from the fruit, non-toxic to the soil, and do not accumulate as lead does in the human body. DDT was the first such product; it eliminated the codling moth as a pest, although occasionally one does find a wormy apple. Aphid was the next pest to be controlled, using parathion, another wartime discovery. Mites were the last important pest to be controlled, and a hot, dry summer can cause mite problems yet.

Table III is included to show the number of chemicals used, pests controlled, cost per acre, and the danger to the sprayer. This table helps show the complexity of the present agri-chemical industry.

Two other developments are the thinning sprays and fertilizing sprays. A thinning spray can be used to kill late-developing blossoms or can be applied about three weeks after bloom to remove weak apples. Trace elements can be added to the spray program when needed, and nitrogen is sometimes added in June to stimulate the growth of the fruit.

### Marketing Impactors

#### Fresh Fruit Markets

It is estimated by the Chelan Chamber of Commerce that about 4,500 carloads of apples (820 bushels = one carload) are grown in the



Table III

## Commonly Used Sprays

Chemical	Pest	Amount per acre	Cost per acre+	Toxicity*
Dormant Oil	Mites, scale	16-24 gal.	\$10.40	1
Lime Sulphur	Mites, scale	44-66 gal.	17.60	2**
Parathion	Aphid, cutworm	6- 8 lb.	4.90	4
DDT	Aphid, cutworm, codling moth	12-16 lb.	4.76	2
Diazinon	Aphid, codling moth	8 lb.	16.42	2
Guthion	Aphid, codling moth	10-12 lb.	19.69	4
Thiodan	Green and woolly aphids	6 lb.	11.64	3
Phosphamidon	Green and woolly aphids	4 pt.	13.90	3
Demetron (Systox)	Green and woolly aphids	8 pt.	22.80	4
Malathion	Green and woolly aphids	16 lb.	12.00	2
BHC	Green and woolly aphids	16 lb.	7.86	2
TEPP (40%)	Green and woolly aphids	4 pt.	8.68	4
Kelthane	Mites	12-16 lb.	14.56	3
Tedion	Mites	8 lb.	12.88	2
Sevin	Mites	4 lb.	4.16	2
Moricide	Mites	4 lb.	18.40	2
Karathane (fungicide)	Mildew	4 lb.	6.00	2

+Cost computed for median amount of chemical.

\*Classification of toxicity:

- 1 = considered harmless to humans.
- 2 = avoid breathing dust, limit exposure, wash well.
- 3 = mix using respirator mask.
- 4 = mix and spray using mask, extreme danger.

\*\*Caustic.

Table III was compiled from information obtained in an interview with Orville Ott, manager of the Chelan-Manson Co-Operative Association Farm Store, and in 1963 Spray Recommendations for Tree Fruit in Eastern Washington. (27, p. 17-19)

Chelan Valley. Precise production figures are not available since some growers sell through Wenatchee, and the large fruit companies such as Wenatchee-Beebe and J. D. Hamilton Orchards own land not only in the Chelan Valley but also in other parts of north central Washington.

The fruit from the Chelan Valley is shipped throughout the United States. No Washington valley or packer dominates the market in any locality of the nation, so a study of the total sales of Washington apples represents proportionately the sales of Chelan Valley fruit. Figures for this valley alone are not available; however, from reports on total state sales some knowledge of major market areas can be inferred. California is the most important market. Texas rates second; New York, third; and Illinois, fourth. Every state receives some apples from Washington (25).

The wholesale buyers and brokers determine the price received by the growers. At fruit auctions in the major cities their bids determine the prices. If the price offered is too low, then a shed may refuse to ship until the price improves, but seldom can this effect a significant change, since apples, being perishable, must be sold within a restricted time limit. Thus the grower has little effect on the amount he receives for his crop. Price is determined by the primary market, i. e., the wholesaler (4).

### Transportation

The apples must arrive at the market in top condition if they are to be sold at prices high enough to provide the grower with a profit. Fast, refrigerated trucks and trains now carry the fruit throughout this country. When loading these refrigerated units at the sheds, experts take every precaution to prevent bruising. At the market end, others unload the fruit into cold storage so that the apples remain in good condition.

Economical shipping methods have always been a problem for the apple producer, since Washington is far from its principal markets. Trucks and trains now divide the transportation of apples almost evenly by volume, but not by distance. Trucks dominate the haul to California and local markets and can compete as far east as the Mississippi River (14). Convenience, less handling, and speed are the reasons for the shift to trucks. In the Chelan Valley most of the packing sheds are not on the railroad, and a long distance truck can load at the shed and be on its way to market with no more handling needed. A train can travel faster, but time is lost waiting for the train to be made up in Wenatchee, so that a truck may have a full day's head start on a rail car (4). Speed is important in getting a perishable crop to market.

Table IV shows the total number of carloads of Washington

apples sold in several major cities and the numbers of cars sent by truck and by rail. Notice how rail shipments decrease and truck shipments increase with the lessening distance from the producing areas. Trucks can compete with railroads for a distance of about 1,900 to 2,000 miles, or throughout the western United States.

Table IV  
Apple Unload Totals in Selected Markets  
(one unit equals 820 bushels)

Market	Distance from Wenatchee	Rail Shipments	Truck Shipments
New York, N. Y.	2,737 miles	1,051	0
Birmingham, Ala.	2,467	216	5
St. Louis, Mo.	2,028	254	45
Dallas, Texas	2,007	248	157
Chicago, Ill.	1,911	1,012	8
Denver, Colo.	1,229	76	334
Los Angeles, Calif.	1,203	416	2,604
San Francisco, Calif.	883	10	939
Portland, Ore.	293	0	346

(14)

The completion of the interstate highway system and the development of larger and more powerful trucks will probably increase the trucking share of fruit transportation. Table V shows the changeover from rail to truck shipping during the past ten years. In 1953 only

ten percent of the fruit went by truck, but by 1962 over 50 percent travelled this way. The fruit shipper is interested in finding the fastest, most economical method of carrying his product to market.

Table V

Changes in the Movement of Washington Fruit  
from Wenatchee by Truck and Rail  
(figures given are in carload units)

Shipments by Months	1953			1962		
	Rail	Truck	Percent by truck	Rail	Truck	Percent by truck
January	2,306	232	09%	1,063	1,217	53%
February	2,557	258	09	861	1,884	69
March	2,211	285	11	1,334	1,642	55
April	1,483	250	14	1,218	1,076	47
November	2,037	458	14	1,171	1,299	53
December	2,576	620	20	1,568	1,367	47

(14)

#### Economic Factors

##### Growing Costs

The cost of growing apples is high, averaging \$1.35 a box, although there can be a wide variation in this figure. Differences in yield per acre cause most of the change with higher yields reducing the cost. Most of the pre-harvest expenses, taxes, irrigation,

spraying, cultivating, and pruning, are constant per acre, so increasing the yield reduces the cost per box. Harvest and packing costs, however, are assessed by the box, so increasing the yield increases the gross cost per acre.

The skill and knowledge of the grower influence the cost of producing apples as much as any single factor, especially in the smaller orchards. If the owner is able to maintain his equipment, do most of his own work, and supervise his hired crews when extra hands are needed, his costs will be kept to a minimum. If he knows how to keep the trees and soil in top condition, knows how to prune young trees for early production, knows all the means of pest control, then yield and income will be at the maximum.

Table VI gives a breakdown of costs as computed by the Department of Agricultural Economics of Washington State University. Data have been modified in keeping with the agricultural practices of the smaller orchards of the Manson area.

#### Packing Costs

The cost of preparing the apples for market (Table VII) is even higher than the growing cost. This is primarily due to the expense of materials and labor. The materials are necessary to insure a high quality product for the market.

Table VI

Per Acre Apple Production Costs  
Manson, Chelan Valley

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Taxes		\$ 20
Water		40
Interest on loans for equipment, buildings, land, etc.		150
Depreciation		75
Machinery Operations		44
Labor		
Thinning	\$ 50	
Picking	100	
Other harvest costs	<u>25</u>	
	\$175	175
Owner (i.e., pruning, irrigation, cultivating, etc.)	200	200
Material		
Spray	\$ 82	
Fertilizer	15	
Other	<u>6</u>	
	\$103	103
Miscellaneous Expenses		<u>40</u>
Total		\$847
Minus growers labor not paid		<u>-200</u>
Total Cost Per Acre		\$647

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Table VII

## Packing Cost Per Box

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Labor	\$ .64
Materials	.56
Cold Storage	.35
Selling Fees	.10
Miscellaneous	<u>.10</u>
Total	\$1.75

---

(4)

An additional cost is transportation from orchard to packing shed. This averages about five cents per box or \$1.25 per bin. This cost is of most importance to people who do not have their own trucks, but contract the hauling.

Labor

The labor cost is the largest single item in the production of apples. It is the intensive use of labor that enables this area to produce such high quality fruit; however, the high cost is forcing mechanization. The grower is left in a dilemma of maintaining quality while reducing costs.

Wages are almost always based on piece work; thinners are paid about \$2.50 per mature tree, and harvesters \$3.75 and up per



bin of 25 bushels. Hourly wages are about \$1.50 for most operations, although highly skilled workers, such as grafters, receive more.

Housing is usually provided by the grower, with the worker expected to provide his own bedding, cooking utensils, and food. Minimum sanitation standards have been enacted by the State to protect the migratory worker.

### Income

The gross income for an orchard is dependent upon the variety raised, size and grade of apples, size of crop, and market conditions. The grower has control over only part of these; he can influence, to some extent, the size, grade, and yield by proper care. It takes about ten years, however, to change varieties; the features of crop size and quality are influenced by the weather, especially at blossom time, and of course no grower can influence the market. In respect to the latter he can influence only the relative price he will receive, through his influence on grade and yield.

The Golden Delicious sells for more than any other apple, but higher picking and packing costs reduce the return to the grower. The Red Delicious is the most desirable apple at present, as it returns about 75 cents per box more than the Standard Delicious and a dollar more than the Winesap. The actual return for 1962-1963 is tabulated in Table VIII. The cost of \$3.10 is based on \$1.35 for

growing plus \$1.75 for packing.

Table VIII  
Return to Grower 1962-1963  
(per box packed fruit)

Variety	F. O. B. Price	Profit (Cost \$3.10)
Red Delicious	\$4.24	\$1.14
Standard Delicious	3.39	.29
Winesap	3.64	.54
Golden Delicious	4.42	1.12*

\* Cost for Golden Delicious is about \$3.30;  
approximately 3 cents more for picking  
and 17 cents for packing.

(22)

#### Structural Impactors

The size and ownership of the farms in the Chelan Valley reflect the interaction of many impactors upon the apple industry. The most important are history, technology, and economics, each one of which influences the present structure of the apple industry.

For historical reasons, the Lake Chelan Reclamation District includes a high proportion of small farms. When the district was being developed, the area was subdivided into ten-acre tracts, this being the ideal family size farm of that period. Due to topography and other factors, the actual size varies around this figure (18).

Lately there has been a trend toward amalgamation into larger units; 20 acres is now considered to be the family size farm, but many still own only one tract.

Technology, especially intensive care, has tended to keep the farm size small. Ten to 20 acres of orchard keeps the owner busy, even with increased mechanization. Many operations require much time and effort, so the owner cannot adequately work more than 20 acres without additional help. Further mechanization of orchard operations and hence reduction of labor requirements is essential for noticeable enlargement. Yet the latter is probably essential if orcharding is to remain a profitable segment of the farm economy.

The small size of the farm units of Chelan County is evident from Table IX based on data from the 1959 Census of Agriculture. Sixty percent of the farms are under 20 acres. The overwhelming preponderance of orchards is evident as one travels through the county, so, although other types of farms are included in the statistics, the table may be understood to be nearly accurate for orchards.

An unusually high percentage of the farms are operated by their owners, and tenancy is almost nonexistent. The small farm units provide a good income only if the owner can provide most of his own labor, since orcharding is a highly skilled farming operation, and few qualified orchard operators are satisfied with tenant status. The data in Table X cover all of Chelan County, but the conclusions are

applicable to the Chelan Valley.

Table IX

Size of Farms in Chelan County

Size of Farms	Number and Percentage of Total Farms			
	1954		1959	
1- 9 acres	841	50%	675	44%
10-19 acres	422	25%	400	26%
20-29 acres	156	9%	163	11%
30-49 acres	135	8%	146	9%
50-99 acres	75	4%	85	6%

(20, p. 146)

Table X

Farm Operators in Chelan County

	1954	1959
Total	1, 875	1, 636
Full Owners	1, 647	1, 418
Part Owners	144	140
Managers	26	33
All Tenants	58	45

(20, p. 154)

### Conclusion

The Chelan Valley illustrates the methods employed by the orchardists of the Pacific Northwest in producing quality fruit. The several valleys along the eastern slope of the Cascade Mountains have cooperated to develop these techniques and the necessary equipment. Furthermore, all have cooperated to support the advertising to sell this fruit. The details may differ, especially environmental details, but the philosophy of producing only the best fruit unites this area.

## CHAPTER IV

### THE ORCHARDING CYCLE

#### Purpose

Chapter IV gives a detailed description and analysis of the present methods of producing apples in the Pacific Northwest. The impact of some of the new equipment is also appraised.

#### Introduction

The business of producing high quality fruit is a complex operation requiring year around work. The following schedule, with minor variations, is used throughout the Pacific Northwest. Equipment and techniques vary, but the basic procedures are the same.

#### Pruning

As soon as the trees are dormant in November the orchardist starts pruning, although the major share of the work is concentrated in the early spring months after the snow is gone and before blossom time.

The pruning of young trees is predominantly for shaping. Five or six main limbs or leaders are chosen to provide the framework for



the tree and the other limbs are removed. In succeeding years the growth on the leaders is pruned to keep the tree open and to prevent it from becoming excessively tall. The pruning of older trees is predominantly to encourage the vigorous growth and maximum production of quality fruit. Broken, diseased, and excessive limbs are removed and the fruit wood is spaced so that limb rub will not injure the apples.

Pruning, especially of young trees, is one of the more highly skilled operations in orcharding. The owners of small orchards generally do their own pruning. The larger orchards have a few full time employees who in season are put to pruning. Since this operation extends over a long period of time, the labor requirement is small.

The conventional equipment for pruning includes pole pruners, saws, and ladders. These have made the task tiring and time consuming. Equipment is being improved to expedite the work and to make it less laborious; today, the mechanical ladder (see Figure 4) is available. The pruner can work much more conveniently on its hydraulically adjustable platform. This machine can be equipped to supply power to mechanical loppers and saws.

The mechanical ladder has been on the market for less than two years. More developmental work is needed, but it appears that these machines may be economical for most orchardists if the

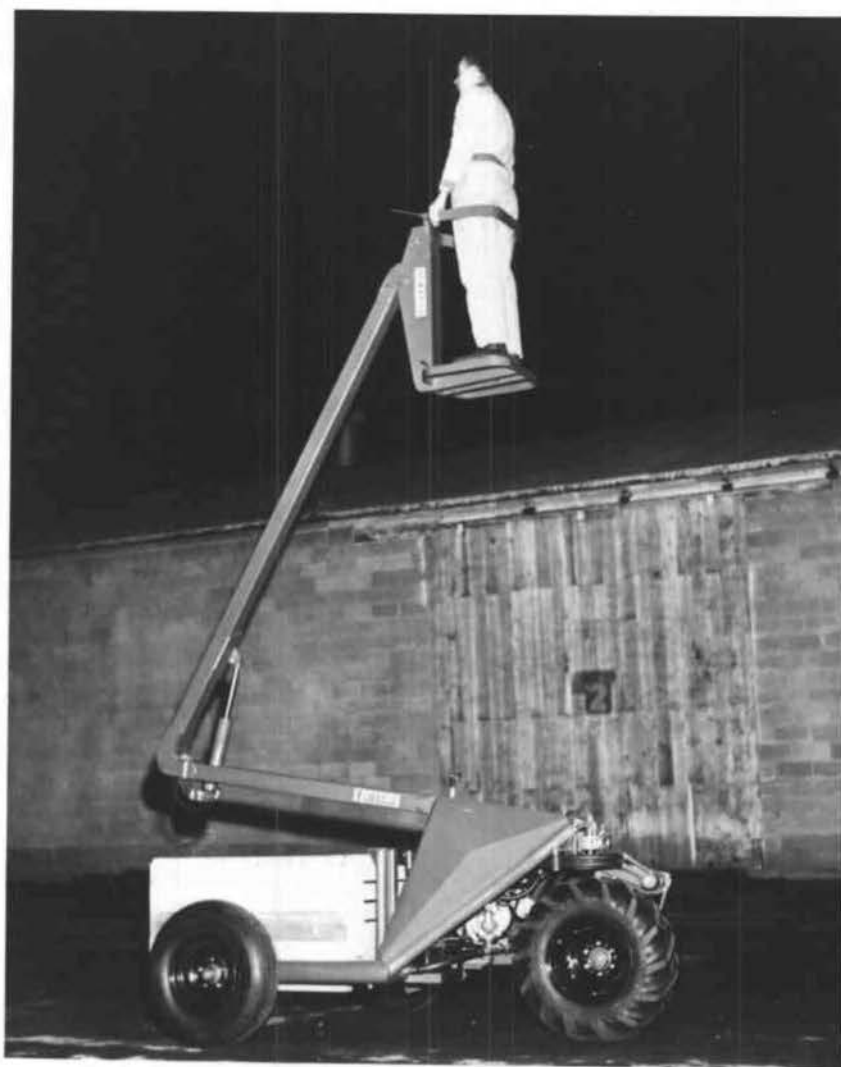


Figure 4. The platform of the Dyna-Soar, one of the mechanical ladders, can rise to eleven feet ten inches. This particular machine carries a bin so it can be used for picking as well as thinning and pruning. (Edwards Equipment Company)

operator's better position for pruning higher leaders increases quality production in the top of the tree, and if it can materially reduce the labor needs for thinning and harvesting. The economic potential has not yet been evaluated.

### Brush Removal and Spring Cultivation

Some orchardists still burn brush, but more are working it into the soil. To achieve the latter the brush is broken into small pieces which disappear under the cover crop. Several kinds of tools are used for this purpose. The brushbeater-mower has horizontally mounted blades similar to those on a lawn mower. Its major advantage is that it can handle large limbs as well as small. This mower has become very popular during the past two years. It gives excellent control of the cover crop and leaves the orchard in an aesthetically pleasing lawn-like condition. Movement through the orchard is eased and changing sprinklers is a less wet chore.

Another tool is the Culti-cutter, which cuts and pushes the brush into the ground. This device is not capable of handling limbs over one inch in diameter, so those must be removed. The Culti-cutter was developed in Yakima during the late 1940's as a replacement for the disk. Until the development of the mower it was widely used to work the brush and control the cover crop, but lately it seems to be less widely used in the Chelan Valley (see Figure 5).

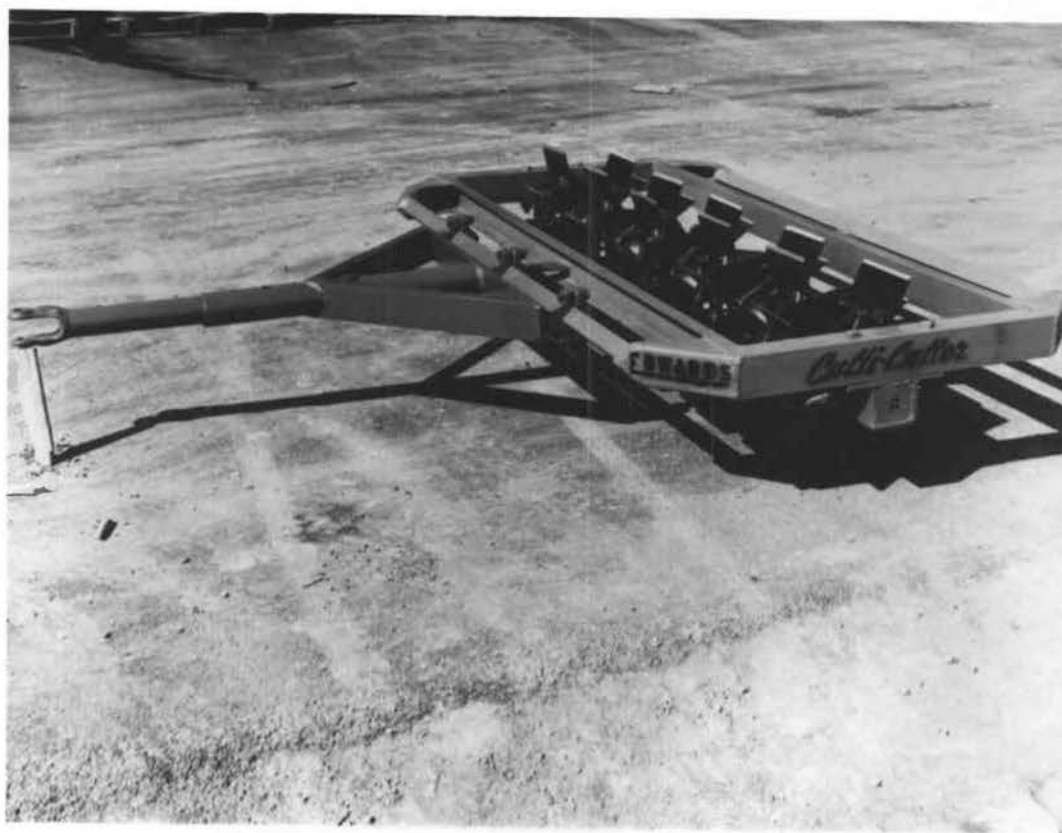


Figure 5. The Culti-cutter was designed to replace the disk in cultivating orchards. It reduces the risk of erosion by cutting depressions in the surface instead of digging furrows. (Edwards Equipment Company)

A third tool is the self-powered brush shredder which shreds smaller limbs into slivers. All limbs over three-fourths of an inch in diameter, however, must be trimmed out by hand. This device is not owned by the grower, but rented, as it is used only for a day or two during the year.

Orchardists are disking their orchards less now than in past years since it has been learned that disking can reduce the number of tree roots in the top few inches of soil. In many orchards, the only spring cultivation is in connection with working the brush. A clean surface is no longer considered desirable and many orchards are being allowed to develop a permanent sod cover.

### Apple Blossom

Full bloom usually comes during the last week of April or the first two weeks of May, and lasts only about four days. Each fruit spur has four or five blossoms; one, called the king bloom, develops one or two days ahead of the rest. While the king bloom is open the orchardist may apply pollen by one of several mechanical means, usually by airplane or by a hand-held wand that blows the pollen along the limbs, or he may import bees, or he may leave the trees to be pollinated by indigenous insects and wind. The Red and Standard Delicious varieties are self-sterile and will not set a crop unless cross-pollinated by other varieties. This can be accomplished by

grafting or interplanting Golden Delicious or Winter Banana varieties. When bees are used for pollination, about one hive per two acres is desirable. Many hives are imported during blossom time.

If the weather is ideal, a spray may be applied during full bloom to kill the side flowers, thus reducing thinning expenses, although a great many growers prefer to depend on hand thinning and not risk chemical thinning which could reduce the crop too much.

### Thinning

Thinning is an important operation in growing quality fruit. Undersized, damaged, and pest-marked apples are removed, then the remaining apples are spaced about eight inches apart. The apples then have room to grow and the trees bear fewer but larger apples. This improved spacing also allows the spray material to cover the apples more completely; this was especially important when lead arsenate was the only chemical for codling moth control. The size of a crop from a healthy, well loaded tree is not reduced when properly thinned; the increase in size and quality makes up for the decrease in number of apples.

The labor requirements of thinning are second only to those of harvest. The thinning season starts in early June and continues until mid July. An orchard of about ten acres needs three thinners for this period, and the operator of a 20-acre orchard will hire six to eight

people. Proper thinning techniques are not hard to teach, but ladder placement is a skill not easily learned. The mechanical ladder will probably find its widest acceptance in this operation; ladder placement will no longer be a problem, and labor needs will be drastically reduced.

### Spraying

Spraying is one of the most highly mechanized, dangerous, and expensive operations in orcharding. Some growers still spray by hand, but most have it done either by airplane or by a speed sprayer which blows the spray material through the tree by means of a high volume fan.

The first spray of the year is applied when the trees are still dormant. This spray kills the insects that have wintered in the ground or under the bark of the trees. A good dormant spray will effectively control mites and aphid by destroying the eggs of the wintering generation. The next two sprays are applied in early June and mid August to control mites, aphid, and codling moth. These three sprays make up the normal spray program for the Chelan Valley. Occasionally an additional mite spray is needed in late August or early September if the weather has been unusually hot and dry, for mites reproduce extremely fast under ideal conditions.



### Continuous Summer Work: Irrigation, Cultivation, Propping

Irrigation starts by June first and continues until the middle of September. Approximately three inches of water are applied every three weeks although some orchard soils require more, others, less. Usually the sprinkler lines are moved every twelve hours, but some growers move their lines only once a day. Some orchards can be irrigated in a few days, but it usually takes several weeks to cover an orchard so the next irrigation is started as soon as the preceding one is finished.

The frequent watering encourages a lush cover crop that may grow to a height of three or four feet. It can compete for water, but, even more important, it may prevent the water from reaching the ground under the trees where most of the roots are. This growth is mowed several times during the summer, or it may be knocked down by a Culti-cutter or even disked. Mowing to a height of four to six inches encourages the development of sod, which helps control erosion.

The operator spends one or two hours a day changing sprinkler lines and about one day a week mowing, so there is plenty of time available for other work. Most of this time during July and August is spent propping. Lodgepole Pine under three inches in diameter or rough sawed one-by-threes are used to support the heavily laden

leaders. This prevents their breaking under the load and keeps them raised so light and air can get into the tree. Propping takes a long time, as first the main leaders are supported, and then, as harvest approaches, the side limbs also need support. Props may also blow out during the few summer wind storms and must be replaced.

### Harvest

The Apple Maturity Commission made up of the County Agricultural Agent and other leading horticulturists in Wenatchee can determine in early September when the apples will be mature enough for harvest. This is called the release date and is different for each variety and each producing area. The release date for Red Delicious for Wenatchee is about September 15, while in the Chelan Valley it is generally between September 20 and 25.

The weeks preceding the release date are spent repairing ladders, hauling boxes or bins, and getting the other necessary supplies. The newspapers and labor offices report the date in other states and transient laborers come into the valley. Some who know the area well select orchards that look good and acquire their own jobs. Others apply through the Employment Office. The farmers try to have their picking crews hired by the release date.

A man and his wife can pick over 175 boxes or eight 25-bushel bins in a full day of picking. An exceptional picker may harvest 200

boxes if conditions are right, but 100 boxes is closer to the average. An orchard in top condition produces about 800 boxes an acre; thus one couple can pick an acre in four or five days. About six pickers are needed for two to three weeks to harvest a ten acre orchard.

An important change is taking place in picking containers. The one-bushel wooden apple box is the traditional container, but during the past several harvests there has been a switch to the bulk bin holding 25 bushels of apples. These bins have reduced bruising and speeded picking by eliminating the stacking of individual boxes. The introduction of these bins into the orchard was delayed until machines were developed that could handle them, since a full bin weighs approximately half a ton. Now boxes have been almost completely replaced by bins (see Figure 6).

Apples do not store well if left in the orchard over 24 hours, so the fruit is sent to the packing shed as quickly as possible. The straddle trailer truck (see Figure 7) developed in Yakima can load or unload in a few minutes. Conventional trucks may be loaded by fork lifts on tractors in the orchard, but at the shed the commercial lifts can unload them in about ten minutes. There is no time to waste, for thousands of bushels arrive each day at each packing shed during the harvest period of about four weeks. Then harvest is over, and the growers can relax for a few days before the cycle starts once again.



Figure 6. Picking into bins that have been set on sleds for easy hauling through the orchard. Notice the lodgepole pine props under the tree in the background. The girl is wearing one of the standard picking bags. (Washington State Apple Commission)



Figure 7. The straddle trailer has been developed to speed the transportation of bulk bins. This unit can back over a stack of 15 bins and pick them up in just a few minutes. (Edwards Equipment Company)

## CHAPTER V

### MARKETING THE CROP

#### Purpose

This chapter focuses on the movement of the apples after harvesting. The methods and problems of packing, marketing, and pricing are analyzed.

#### Introduction

About 15 percent of the apples grown in Washington, 4,500 carloads of a total of 30,000 (figures from Chelan Valley Chamber of Commerce), come from the Chelan Valley. This is not a significant percentage, but the problems of moving this fruit to market are about the same in the Chelan Valley as in the Yakima Valley where about 40 percent of the state crop is grown.

In this study, marketing will be covered in three phases: preparing the fruit for market, selling the crop, and advertising. Preparing the fruit for market is the responsibility of the packing shed. The growers have spent most of the year in efforts to grow the best fruit possible, and it must reach the consumers in the same fine condition. The marketing follows the same routine devised for

selling other perishable commodities; brokers in the major cities arrange most sales. Advertising is supported by all growers through an assessment on the packed fruit of each grower, and is directed by the Washington State Apple Commission.

### Preparing the Apples for Market

#### Packing Shed Operations

When harvest is over and the apples are in cold storage they are not yet ready for market, for they are unsized, covered with dust and spray residue, and in unwieldy bins. In the packing shed the apples are washed, graded, sized, and packed into cartons for shipment. The packing shed also is responsible for storing the fruit until it is sold.

Mechanical technology and automation have had a major impact on the packing shed. Rising labor costs would have increased packing costs to the point where it would be difficult to sell the fruit for a profit, but the new developments in fruit handling have so reduced personnel requirements that the final cost has not risen. Many packing shed operations, unlike most growing operations, are adaptable to mechanization. Bulk handling has been encouraged by the new equipment.

The apple is a relatively delicate fruit and bruises easily.



Every time it is handled, bruising can occur, so manual handling must be reduced as much as possible. Machines have been developed to replace personnel in many operations, usually reducing labor needs and always reducing bruising. One of the more important of these devices is the immersion dumper which lowers each bin into a tank of water. The apples then float into the washing machines with less bruising than with any previous method. This machine has been especially important in developing the commercial potential of the Golden Delicious, which is especially subject to bruising.

The apples are washed and polished in a continuous operation. A wide mesh belt moves them from the dumper into the washing machine, where a flood of water, including detergents, washes away the spray material and orchard dust. Nylon brushes scrub the apples during the washing process. Next the fruit is rinsed in clear water, dried in a rush of warm air, and polished by soft cloths turning on a shaft.

After cleaning and polishing, skilled sorters, usually women, remove the apples that are bruised, undercolored, misshapen, or insect-damaged and divide the marketable fruit into two grades, extra fancy and fancy, and sort out a third grade, the "C" grade that now usually is sent to the processors. Once the "C" grade also was sold on the fresh market.

Packing is the last major step. The apples move from the

sorting booth onto a belt-like device that weighs each apple. They drop off at the properly weighted spot into a bin where the packers wrap them and put them in boxes. Newly designed cardboard cartons and trays have helped to speed the packing process (see Figure 8).

The full boxes move on a belt past the record-keeping section, where size, grade, and packer are recorded. The size and grade are stamped on each box along with the grower's number for identification and the apples are returned to cold storage again, where they are kept until sold.

#### Labor Needs

Peak employment is sustained only during the four to six weeks of harvest. During this period trucks must be unloaded, apples supplied to the packing operations, records kept, apples loaded for shipping, and equipment maintained, all at the same time. When harvest is over the cold storage force decreases by half for the long packing season (4).

Local people provide the bulk of the labor force, and the same labor force tends to return year after year. Some employees are men who work for the sawmill, which closes down for the winter; others work in the orchards during the summer, but prefer working in the shed to picking. Many housewives in the Chelan Valley depend upon wages from packing and sorting for Christmas funds or major



Figure 8. The interior of a modern packing shed. The sizing belt is to the right of the conveyor belt with apples. Cardboard trays are stacked above the tubs containing apples.  
(Washington State Apple Commission)

household purchases.

Training a replacement worker is not a problem. Some of the very large sheds, especially in Wenatchee, run a school just before harvest to train packers and sorters. Often most of the training is done on the job, since one can learn the necessary skills in a few days.

### Packing Shed Organization

Packing sheds are organized in three ways, as grower-owned, cooperative, and custom sheds. Individuals or fruit companies with sufficient acreage will pack their own fruit under their own brands. Growers who do not own sufficient acreage may form a cooperative. Others, who prefer to have more control over the marketing of their fruit than allowed by a cooperative shed, send it to a custom packer to prepare it for marketing and store it until the grower himself sells it.

For the owner of a small acreage, the cooperative shed seems to have several advantages over the other types. Since most growers in the Chelan Valley own small acreages, it is probably the most important form of packing shed management.

### Advantages of a Cooperative Shed

About 70 percent of the growers in the Chelan Valley own less

than 30 acres (see Table IX). For these people, a cooperative shed probably provides the best service for the least expense, since the profits from the packing operation are returned to the orchardist-owners.

Equipment and cold storage are expensive. A simple washing and polishing machine has not been developed that will clean the apples to meet the spray residue tolerances enforced by the Department of Agriculture. On the other hand, when one of the available machines is used for a long period of time to wash a large number of bushels of fruit, then the cost per bushel is small. The cost of building a cold storage unit to store only a few thousand boxes is prohibitive, but the cost of a unit to store 100,000 boxes can be financed easily by a number of growers pooling capital. Growers in the Chelan Valley harvest their fruit a few weeks later than those of the Yakima and Wenatchee Valleys, so prices are often at the lowest point when Chelan Valley fruit first can be marketed. Thus, cold storage is of utmost importance in this area.

Large size in itself is an advantage. A shed which handles a high volume of apples and therefore provides work during a relatively long season, can attract the more skilled and experienced packers and sorters. These people generally prefer to work several months in a large shed rather than a few weeks in a small one. The larger sheds are in optimum position to turn out a uniformly high quality

pack, thus giving that shed's brand a reputation for high quality and a price advantage in the market. A large shed also can compete more easily in selling to firms which handle sizeable quantities of fruit. The agents for these firms expect to make repeated purchases from one reliable shed, not single purchases from many small sheds.

Few growers have the time or skill to pack or sell their own crop; for most, the processes attending the production of quality fruit are a full time job. This may well be the most cogent reason for the formation of cooperative sheds.

#### New Developments in Packing Shed Operations

The most significant change in the apple sheds has been in handling methods. In 1950 when the author was first actively engaged in transporting apples, boxes were moved by hand. Trucks were unloaded six boxes at a time by hand trucks, or one box at a time by hand onto a belt. More handling was necessary to achieve maximum storage by "high-piling," to unpile them, and finally to dump them by hand into the washer. Each time a box was handled bruising could occur, and a box dropped on the floor was worthless. Labor requirements were high, and the hours were long, especially in the receiving section.

The modern mechanization of the packing shed was begun by the development of two machines, a mechanical dumper for emptying the

apples into the washing machines, and a lift truck that could handle 24 boxes of apples by gripping four six-box stacks at once. Bulk bins were the next step, but first growers needed their own handling equipment. The first bulk bins were introduced in Yakima in 1957 and in the Wenatchee and Chelan Valleys in 1958. They have proven so successful that the growers were practically forced to convert to bins by the fall of 1960. Remodling of the cold storage units by removing the belts and rollers needed with boxes has increased storage space and lift truck efficiency. These developments have reduced labor and costs while increasing quality. It has been estimated that since 1950 labor requirements have been reduced by 60 percent in the fruit receiving sections, while the conversion from boxes to bins is estimated to reduce costs by 25 percent (4). A bin is less expensive than the equivalent 25 boxes, lasts longer, and requires less labor to handle. The life of a bin is not yet known, so exact costs cannot be calculated. The price of labor has increased, but the sheds do not have higher payrolls because there are fewer employees (4).

The cardboard carton has almost replaced the wooden box for marketing apples. Cardboard is lighter and easier to handle and to store. Paper trays with depressions for each apple are placed inside each box. Each size of apple requires a particular pattern of placement and therefore its own tray (see Figure 8). The trays have speeded up packing, since placement of apples no longer requires the



skill it once did.

Apples are still wrapped in paper, but not every apple need be wrapped; they can be alternated so that no two unwrapped apples are in contact with each other. The new packing materials have reduced labor requirements in the packing sections by ten percent (4).

Researchers are continuing to develop new methods for handling and packing fruit, and to test new materials. Before any development can be accepted it must be proven to reduce costs or to increase quality. Since it now costs more to pack apples than to grow them, a reduction in costs would be a material benefit to the growers.

### Marketing the Crop and Setting the Price

#### The Role of the Broker

Marketing the apple crop, as marketing other perishable commodities, is an involved process with a standardized routine that simplifies the movement of the fruit. Brokers or salesmen work in all the large marketing centers contacting the wholesale produce merchants and buyers for the local chain stores. A broker does not sell directly to retail merchants, but he is aware of the reaction of the consumers to the product and will do all in his power to help the packing sheds meet the local preferences.

The movement of a shipment of fruit starts when the manager

of a shed contacts the broker in the market area with information about the apples he is ready to sell. He tells the broker the desired price, number of boxes available, condition and quality, and anything else that will help the broker sell the fruit. Then the broker, through his knowledge of the local market, contacts the buyers who are most likely to want the apples. Some markets like small apples, others, large ones. Some want a bright red apple and others are less particular. If a buyer for some chain wants a very large amount of fruit, the broker, the buyer, and the shed manager arrange a three-way telephone conversation to see if special arrangements can be made. When the sale is completed the broker contacts trucking brokers who arrange for a truck to pick up the apples, or else the manager of the shed calls the local railway freight office (4; 24).

Brokers or purchasing agents are located in the producing areas as well as in the marketing areas. These brokers are employed by the large market chains such as Safeway and A and P Stores. By buying in large quantities these chains get a much better price than they could get if each store bought individually. Quality is higher as well, for the buyer can see what he is purchasing before it leaves the shed (24).

#### Setting the Price

The price of a box of apples is flexible, changing from day to

day and from year to year. The past two crops have been sold on a stable market with the fruit bringing a good return, but the crop now going to market has been selling at depressed prices that may cause hardships to many growers. Unfortunately, the grower can do little to influence the selling price of a box of apples.

The selling price is determined at fruit auctions in the major cities in the country. Brokers in the other markets use the auction figures to determine the price they can expect from the wholesale purchaser of fruit. A packing shed can refuse to ship fruit if returns are too low, but industry-wide cooperation would be necessary before they could influence the market significantly, and farmers are noted for their independence and competitive attitude.

The size and quality of the crop can influence the price, but too often only in a negative way. A large crop may bring low prices, but a small crop does not guarantee high prices; a poor quality crop will probably reduce the return to the grower, but exceptional quality does not automatically promise a high return. There is so much other fruit available for American consumers that competition limits the maximum price that a consumer will pay for apples.

Apples are available until late spring or early summer and efforts are being made to extend the marketing season to 12 months. The grower, especially the grower participating in a cooperative shed, does not receive all his money until all the apples are sold,

although the shed will advance him a portion of his expected returns. The final payment may not be received until nine or ten months after harvest. For this final payment, the average price for each size within each grade is calculated and this determines the amount received by the grower (4).

Table XI is a comparison of the final prices paid by one shed in the Chelan Valley and the district-wide prices quoted by the Washington Growers' Clearing House Association in Wenatchee. The latter figures are for the North Central Washington producing area which includes the Chelan, Entiat, Wenatchee, Columbia, Okanogan, and Methow Valleys. The packing shed quoted is the Chelan-Manson Co-operative Association with a membership of 42 growers, including the author's father, and a total pack of 263,000 boxes, i. e., a medium sized shed. This shed has a reputation for selling high quality fruit. The manager also attempts to keep equipment as modern as feasible, so an immersion dumper has been installed, which may be one reason for the high price differential for Golden Delicious. This shed also has a reputation, true or false, of culling heavily to increase the quality of the pack. Figures are presented as given by the respective sources and are thought to be comparable.

#### Processing

Only the top quality fruit is sold for fresh use, but not all of the

Table XI  
A Comparison of Apple Prices (1962-1963)

North Central Washington District (Washington Growers Clearing House)		Chelan Valley (Chelan-Manson Co-Operative Association)	
Size *	Price**	Size	Price**
<u>Red Delicious</u>			
72 and larger	\$3. 18	72 and larger	\$4.00
80-138	4. 74	80-138	4. 85
150 and smaller	4. 47	150-163	4. 45
<u>Starking Red Delicious</u>			
Included in Red Delicious		72 and larger	4. 59
		80-138	4. 90
		150-163	4. 50
<u>Standard Delicious</u>			
72 and larger	3. 18	72 and larger	3. 28
80-138	3. 90	80-138	4. 00
150 and smaller	3. 50	150-163	3. 61
<u>Golden Delicious</u>			
72 and larger	3. 75	80 and larger	4. 97
80-138	4. 84	88-125	6. 04
150 and smaller	3. 71	138 and smaller	5. 13
<u>Winesaps</u>			
72 and larger	3. 14	88 and larger	3. 84
80-138	3. 92	100-138	4. 06
150 and smaller	3. 60	150-163	3. 75

\*The sizing numbers indicate the number of apples in a bushel; the smaller the number, the larger the apple.

Data are given only for the Extra Fancy (top marketing) grade.

\*\*Prices quoted are F.O.B. Wenatchee.

apples grown fit this description. The use of cull apples and "C" grade apples has been a problem. Formerly the "C" grade was sold as fresh fruit, but it tended to depress prices for all apples, so for the past several years this grade has been culled.

Cull apples can be dried, canned, or made into sauce, but the Red and Standard Delicious, unlike the Winesap and Golden Delicious varieties, do not process well and are poor cooking apples. The relative increase in Red Delicious acreage has intensified this problem.

A wider market has been developing during the past few years for canned apple juice. About five years ago W. H. Charbonneau of Selah, in the Yakima Valley, formed Tree Top, Incorporated, to process canned apple juice. He had developed a new process that retained more of the fresh flavor than formerly possible. The next year, 1960, a plant was constructed in Cashmere in the Wenatchee Valley. Soon after completion of the plant, Tree Top, Incorporated, was reorganized into a growers' cooperative. A grower is guaranteed \$20 in stock and about \$20 in cash for each ton of apples purchased by Tree Top. This in effect returns \$40 a ton for cull fruit that formerly was worth five to ten dollars a ton for drying.

Transportation costs have limited the sale of this apple juice to the Pacific Northwest. To increase the available market, some technique of further reducing bulk so that the product can absorb shipping costs is essential. A frozen concentrate is ideal for this

purpose. Recently such a product has been developed and tested; during the summer of 1963 the plant in Cashmere was converted to the production of the concentrate, and it is now in operation. Tree Top frozen apple juice concentrate is being sold in some of the larger markets on the coast, such as Seattle, Portland, and San Francisco. Consumer reaction has been encouraging.

Early in 1963, before production started, Mr. Charbonneau stated in a letter to the growers that he expected to offer \$75 a ton for fruit and to need about 30,000 tons a year (1). The new processing plant had operational and engineering difficulties in the fall of 1963, so the full impact of this process will not be known until next harvest.

An industry capable of processing 30,000 tons of fruit should help stabilize the fresh fruit market by setting a floor to prevent prices from dropping so low that they will not even return growing and packing costs. This situation has occurred, especially to the growers of the Winesaps and Standard Delicious.

#### The Washington State Apple Commission

The Washington State Apple Commission is the advertising organization of the industry and a growers' lobby. It is financed by a charge of ten cents per hundredweight of packaged apples. The Commission now has 18 field representatives who contact brokers and



wholesale buyers of apples and help set up advertising and merchandising displays (see Figure 9). Selling contests between stores of a chain with prizes provided by the Commission are one method of encouraging sales. The field representatives are responsible for all advertising in the field (23).

The Commission in Wenatchee is responsible for advertising in nationwide publications, and spends a large portion of its budget for this purpose. The Commission also supports experiments to prove the healthfulness of apples. Several have been conducted using high school and college students; the incidence of colds and flu was reduced by eating apples regularly and teeth and gums were improved (23). Unfortunately, in the author's opinion, the reports read like health food advertisements. Apples are good food, but not a cure-all, and apples are not the only food that might have these effects.

### Conclusions

The packing shed is responsible for preparing the fruit for market and for keeping it in cold storage until it is sold. All operations within the shed are engineered to retain the quality of the fruit. Many operations have been mechanized, but no machine is adopted, regardless of its efficiency, if it impairs quality.

The cooperative form of the packing shed is the most important in the Chelan Valley, and generally, for the owner of a small



Figure 9. A market display of apples showing some of the promotional material provided by the Washington State Apple Commission. This one is obviously intended for use during the Christmas season. (Washington State Apple Commission)

acreage, the most economical.

Regardless of whether he sells his fruit through a cooperative shed or by himself, the grower has insufficient influence over the selling price of the crop. He can influence the relative price he receives by improving the quality of his fruit or by selling at an opportune time, but he cannot change the general market price.

## CHAPTER VI

### PROBLEMS OF THE APPLE INDUSTRY

#### Introduction

Several problems confront the apple industry of the Chelan Valley. Some of these confront all agriculture, such as increasing costs and fixed gross income; other problems are specific to the apple industry, such as the need to expand markets; still others are unique to the Chelan Valley, such as those involving the local irrigation system. In this chapter three major problems will be covered: the problem of producing high quality fruit, the problem of over-production, and the problem of increasing costs.

#### The Problem of Producing High Quality Fruit

Washington is the leading commercial producer of apples in the United States. A superior product is one reason for this primary position. Long sunny days and abundant water through irrigation enable this area to produce a highly colored apple with a very sweet, juicy taste. Thus the environment gives the area an advantage; moreover, local production methods and the growers' attitude have developed cultural procedures that take advantage of these natural factors. The

trees are pruned, the fruit thinned and sprayed and finally harvested carefully and prepared for market so the quality inherent in the produce of this region can be maintained.

A very intensive, high labor input type of orcharding is found in the Chelan Valley and in the State of Washington. The high cost of this labor is forcing growing costs to uneconomical heights. At present, labor is the largest single item in the cost of growing apples (Table VI). This cost must be reduced if apples are to continue to be a profitable crop for the Chelan Valley.

The philosophy of intensive care does not need to be revised, but labor can be made more efficient. Two developments are now being studied that may strengthen the economy of the industry: the mechanical ladder and semi-dwarf trees. The former development was covered more fully in Chapter IV.

The mechanical ladder, a hydraulically controlled lift, has been marketed only a short time. Studies of the economic and cultural impact of these machines have not been completed. The author knows personally two orchardists who own them, and both are enthusiastic. One, Robert Leismaster, Manson, is able to thin his own seven-acre orchard and then contract to thin other orchards, thus providing himself with a good summer income and paying for the machine in a short time. Another orchardist, Walter McCullum, Manson, reported that pruning was almost fun with the pneumatic loppers attached to the

ladder. He was able to make closer cuts along the tops of the high limbs, thus discouraging sucker growth. Pruning these high limbs has always been exceedingly tiring, whether it is done from a ladder or using pole pruners. The mechanical ladders are reported stable on all slopes now planted in the Chelan Valley. The author believes that if they can enable one person to thin or prune 20 or more acres in a season they will be economically feasible.

The semi-dwarf tree may have the greatest impact of any new development in the history of orcharding. These trees grow only 15 feet tall and are planted 20 feet apart in the rows. Conventional trees may grow 20 feet tall and are planted 30 to 40 feet apart. Semi-dwarf trees start to bear commercial crops about two years earlier than conventional trees and bear heavily. It is, however, not their bearing characteristics that make them important, but their growth patterns.

The semi-dwarf tree is more uniform in size and shape than the full-sized tree and is therefore easier to prune and to spray (2, p. 76). Its small size makes it easier to pick and thin since all the bearing wood can be reached from an eight foot ladder and much of it, from the ground. Working from the ground instead of a ladder is one of the best ways to increase labor efficiency. With conventional trees, perhaps 25 percent of the fruit can be picked from the ground, but for semi-dwarf trees that figure is 50 to 75 percent.

Few semi-dwarf orchards have been planted in the Chelan Valley. Probably the older orchards will be replanted to them. Extensive plantings have been made in the Okanogan Valley, particularly around Brewster; most of these plantings are less than ten years old, therefore much information still is lacking on maximum tonnage per acre and the life of the tree. At the present time these trees seem to be one way of achieving greater labor efficiency. They are available in both the Red Delicious and Golden Delicious varieties.

#### Problems of Overproduction and Marketing

A tree census, now underway in Washington, is expected to show that there are many young trees soon to be in commercial production, and that within a few years the Washington apple harvest may reach 35,000,000 bushels. The maximum is now about 29,000,000 bushels. Overproduction will result if selling methods are not changed and the market is not enlarged.

Two methods appear available to enlarge the fruit market for Washington apples, advertising and processing. The growers are now assessed ten cents per hundredweight of packed fruit or approximately five cents a box. This could be doubled without causing the growers financial hardship and might be worth many times the cost. Last summer the growers voted, by a small margin, against a two cent increase per hundred pounds, but this does not change the



writer's opinion.

Apples are facing serious competition from oranges, which are the most popular fruit grown in the United States. Is this due to the natural appeal of the fruit or to other factors, such as advertising? This writer feels that advertising has a great deal to do with it. Many magazines with nation-wide circulation carry full color advertisements for oranges, but one seldom, if ever, sees such an advertisement for apples. The bright red color and distinctive shape of the Red Delicious apple should make it an excellent subject for such displays.

Orange juice for breakfast is generally considered a dietary necessity, but apples, too, contain essential vitamins and minerals, and in a nation made conscious of the need to brush one's teeth after every meal, the promotion of apples as "nature's toothbrush" would be logical. There is no reason why an apple in the lunch box should not be as common as orange juice for breakfast.

No other fruit is as versatile as the apple. It can be served fresh, baked, stewed, or sauced; in salads, pies, cakes, puddings, or breads; as juice, cider, or hard liquor. Here is a fruit that all should want to keep on hand, yet per capita apple consumption has been steadily declining for many years. An intensive advertising program should increase apple consumption significantly.

A growing market for processed fruit should be of benefit to the

industry. Apple juice seems to have the greatest potential. As mentioned in Chapter V, Tree Top, Incorporated, has been marketing a single strength apple juice for several years and, since late autumn of 1963, a frozen concentrate. It would be in the best interests of the growers to encourage this product. One can find from six to a dozen types of frozen citrus products and occasionally grape juice, but never apple juice, in the frozen goods section of the market. Unfortunately, the laws that enabled the formation of the Washington State Apple Commission prohibit the advertising of processed products by the Commission. This should be amended. Tree Top can carry on its own advertising program, but additional help from the industry would benefit everyone.

Apples will soon be facing competition from other sources: for example, tropical fruits from Mexico and other tropical countries. Fortunately trade can be a two-way transaction; as the tropical countries prosper, they may become interested in importing Washington apples. The superior dessert quality of these apples makes it reasonable to suggest that other countries would desire them.

#### The Problem of Financing

The costs and capital needs of the apple industry are high. A box of apples costs about \$1.35 to grow and \$1.75 to pack. This means that a producer of 8,000 boxes on ten acres of land will spend

about \$10,800 growing the crop and \$11,300 packing 6,500 boxes of the fruit for a total growing cost of approximately \$22,000 (26).

The costs of land and its development are high as well. A producing orchard costs as much as \$4,000 an acre, although raw land in the Chelan-Manson area would cost \$500. By the time a new orchard can produce a significant return, at seven years of age, the owner may have invested about \$3,500 an acre, or \$35,000 in a ten-acre tract. One half of this is due the first year and includes the cost of land, trees, and planting (26).

People who have small young orchards often work for other orchardists or at other jobs, but if work is not available or the orchard requires full time effort, then an outside source of capital is necessary.

Each crop must pay for itself, since few growers are able to get enough funds ahead to pay growing costs in advance. This means that short term, low interest loans are needed. To meet this need, the government and the fruit growers each have set up an agency to provide funds.

The Farmers' Home Administration is one source of funds. This is a federally operated program, self-renewing once it has been set up. The FHA offers loans for purchasing land or equipment, operating loans, housing and farm building loans. It does not compete with other credit agencies. A farmer must show that he is

unable to obtain low cost credit elsewhere before he is eligible (15; 16). Usually this is not hard to do, for there is no credit agency in the area that can provide long term loans at a low enough rate to be feasible for the farmer.

The growers themselves have established a source of short term loans in the Fruit Growers' Credit Corporation. This is a stockholders' financial institution with shares owned by the growers and the Seattle First National Bank. This corporation is the most important source of operating funds in the Chelan Valley. It makes no long term loans and will not finance land, but it will finance machinery. There are no limits to the amount a grower may borrow as long as the loan is within the reasonable and probable returns for the orchard (12).

One of the important fixed costs for an orchard in the Lake Chelan Reclamation District is the water tax of \$40 a year. This is necessary to provide maintenance and operating costs. The present system is getting old and the pipe, much of it wooden, needs renovating.

The federal laws that authorized the construction of the Chief Joseph Dam on the Columbia River allocated a percentage of the profit from the production of power to the United States Bureau of

Reclamation. It is these funds that are to help pay for the renewal of the Lake Chelan Reclamation District. The renewal project has not been authorized yet, but the feasibility studies have been completed. The bill is in Congress, where the Reclamation Committee has given it preliminary approval. Final authorization is not expected for about another year, but the writer believes that it will be authorized, for the value of irrigation in this area has been proven.

The total project will have cost \$12, 113, 500 by the time it has been repaid at the end of 50 years. About half, \$6, 044, 000, will be paid from funds received from the sale of Chief Joseph Dam power. The other half, \$6, 069, 500, will be paid by the people receiving water. It is estimated that it will cost the growers \$35 an acre, which is less than the present charge, and it will provide a more substantial supply of water (21, p. 35). Lower maintenance and operating costs will effect this reduction.

### Conclusion

The problems facing the apple industry are not insurmountable. It will be necessary that the growers themselves achieve a better understanding of them. Then, if the whole industry will cooperate, many problems can be solved, especially those related to low prices

and high costs. Outside help may be necessary for regional projects such as enlarged irrigation systems, but the future of the industry depends mainly upon local developments in mechanization, advertising, and financing.

## CHAPTER VII

### MAJOR FINDINGS AND CONCLUSIONS OF THE STUDY

This study of the Chelan Valley provides an insight into the factors which tend to localize apple production as well as the methods and problems of the industry in Washington. The following points highlight the findings and present the author's conclusions.

1. The major factors that have localized apple production in general relate to a favorable combination of especially satisfactory conditions of environment which have been adapted by skilled farmers using the latest methods and equipment to produce a top quality product. These factors have enable Washington to become the leading state in apple production.

2. The Chelan Valley presents a microcosm of the Washington apple industry environment. The climate is one of moderately cold winters and warm summers, free from erratic and sudden temperature fluctuations, and with long, sunny summer days for maximum growth, color, and sweetness of the fruit; the terrain is rolling, providing good air drainage and maximum frost protection; the soil is fertile, deep, and well drained for good tree root development; the snow fields on the mountains to the west of the orchard lands



provide abundant water for irrigation.

3. Quality has been stressed from the inception of commercial production in the Chelan Valley as well as in the Pacific Northwest in general. The growers have led the national industry in the use of chemical pest controls, intensive care of trees and fruit, and constant attention to the reduction of bruising at all stages of production and shipping. They are aware that only the best fruit can be sold at a profit in distant markets. This attitude of the growers has enabled Washington to maintain leadership in commercial production techniques.

4. The orchards of the Chelan Valley are characterized by small size, intensive land use, and owner management. The average orchard is under twenty acres in size and many are under ten acres, although there is a trend toward amalgamation into more economically sized farms. At present, about twenty acres will keep the owner working full time with additional help needed during thinning and harvest.

5. The growers of the Chelan Valley have concentrated on the production of only four varieties of apples: Standard, Red, and Golden Delicious and Winesap. During the past few years, more attention has been directed toward the Red Delicious to the exclusion of the Standard Delicious and Winesap. The Red Delicious has a very bright color, a distinctive shape, and a sweet, crisp taste. Most new

orchards and replacements are being planted to the Red Delicious with the Golden Delicious included for pollinizers.

6. Mechanical technology has not had as extensive an impact on orcharding as it has had on other types of agriculture. The intensive hand labor employed in the production of top quality fruit is not easily replaced by machines. The mechanical ladder seems to provide some help through increasing labor efficiency, since it eliminates the necessity of moving ladders while pruning, thinning, and harvesting. Skilled hands will be needed in apple production for a long time, but fatigue can be reduced and the operations speeded by enabling the workers to move among the trees with less effort.

7. Chemical technology has been important and may become more so in the future. Pest controls and chemical fertilizers are currently the most important contributions of this science.

8. The packing shed is responsible for preparing the fruit for market and for keeping it in cold storage until sold. All operations within the shed are engineered to retain the quality of the fruit. Many operations have been mechanized, but quality is of foremost importance and continues to require much hand work.

9. Packing sheds may be owned by individuals, by packing companies, or by cooperating growers. Since individual holdings are small in the Chelan Valley, the cooperatively owned and operated shed seems to be the most economical. Cooperative selling and

packing has the advantage of providing a large marketing unit while allowing the grower maximum independence in production.

10. The growers have insufficient influence over the selling price of their crop, whether sold through a cooperative or by individuals. They can influence their relative price by improving the quality of their fruit or by selling at an opportune time, but they cannot change the market price at a given time. The agents with the most influence appear to be the brokers who work at the fruit auctions in the major markets, since buyers throughout the industry base their prices on the auctions. Industry-wide cooperation might influence the price, but this is not likely in the foreseeable future.

11. Three major problems face the apple industry: the problems of producing quality fruit, the problem of increasing costs, and the problem of over-production. The first two may be most readily solved by local efforts once the problem of over-production is met.

12. The most pressing problem is over-production. Increased advertising and increased emphasis on processing methods probably will do much to increase sales. The citrus industry now seems to be the major advertiser of fresh fruit, and it is also the chief competitor for apples. Doubling the present advertising assessment would make the apple program more nearly comparable to that of the citrus industry. A second method of solving over-production

would be to expand the processing market. At present the industry is oriented toward fresh fruit. Research is needed in new products.

13. Apples have provided the most satisfactory basis for agriculture in the Chelan Valley. They provide the highest return per acre of any product adaptable to the area. They also have a very high value per unit of volume. The high cost of water and the long distance to market make these very important factors in enterprise selection.

14. An agricultural economy based upon apple production has enabled the Chelan Valley to develop a relatively healthy economy. The environment enables the growers to produce apples that have excellent commercial possibilities; it is likely that the full extent of market potentials have yet to be realized.

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