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APPLE MARKETING RESEARCH IN THE SEVENTIES

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APPLE MARKETING RESEARCH IN THE SEVENTIES
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INTRODUCTION

A glimpse into the not-too-distant future

December, 1975 . . . Hal Reed, Yakima orchardist, glowers at the mounting pile of bills. Everything seems to have cost more this year, sprays, fertilizers, electricity, fuel. Property taxes were up again. Harvest labor was harder to get and more expensive. Prices for apples have been well below the last really good year, he remembers. "I'll give it one more season," he tells himself.¹

Jack Plant, cooperative warehouse manager in Wenatchee, wrestles with his problems. Wages have just jumped another 10%. His packaging suppliers say they will have to charge more soon. An old packing line needs to be replaced but he has already exhausted his credit line for new CA rooms. Members are grumbling about poor net returns for the last two seasons. Somehow, when the coop was smaller, problems too seemed to be smaller. Can he go back to being small or is the solution to try building up his membership or to merge?

Doug Andrews, Oroville shipper, slams down the telephone angrily. The chain buyer in Chicago is complaining again. A carload of apples has arrived a week late. The chain inspector has rejected all the Fancy grades. The buyer wants apples shipped on disposable pallets to speed his warehousing operation. He can get all the Red Delicious he needs from Michigan and New York on pallets. When is Washington going to come into line? "At the prices you're paying," says the shipper, "we can't afford disposable pallets."

And so the story goes. December, 1975 . . . There are many glum faces in the Washington apple industry these days. Costs are rising while prices are not. Profits are being squeezed. Prospects for changes in these trends in the late seventies are not bright . . . .

Will this be the typical capsule picture of the Washington apple industry in the mid-1970s? Do potential problems of oversupply and decreasing fresh markets hang as a time bomb over the Washington industry? Can immediate industry action on long range planning reverse the gloomy outlook painted here?

Gearing the industry for the 70s and 80s

The purpose of this report is to analyze some strategic marketing problems the Washington apple industry might face in the immediate future and in the long run, and to suggest possible alternative courses of action to cope with these problems. In many cases, enough information simply is not available to make rational choices among possible alternatives of action. Accordingly, this report is primarily concerned with the research needed so the apple industry can make rational strategic plans to handle present and impending marketing problems.

In the following pages we will:
1. briefly document some of the strategic problems facing the Washington industry
2. list some of the main facets of the industry where key decisions will have to be made
3. indicate the implications of known research findings and the main gaps in such knowledge
4. pinpoint areas of future research where findings could yield rapid and useful results to decision makers
5. suggest research priorities for the next decade, given likely research needs and research resources available.

PROSPECTS FOR THE SEVENTIES AND EIGHTIES

The greatest potential problems of the Washington apple industry stem from the fact that since World War II, fresh consumption of apples per person in the U.S. has fallen by almost a half pound per year (1). Processed consumption per person has risen one sixth of a pound per year. The net result has been a drop in total consumption per person of about 1 pound every three years. It is possible that reversals in consumer tastes or industry actions may alter these consumption patterns in the seventies. However, if the post World War II trends continue, by 1982 fresh consumption per capita would be reduced by 40% from the 1969 level and would be surpassed by per capital consumption in processed form (figure 1).

To appreciate the impact of these trends on Washington marketers, we need to look at the total volume of apples used in fresh and processed form in the U.S. (figure 2). Despite the fall in consumption per person, a growing population helped increase total use of apples in the 50s and 60s. However, if past trends continue, fresh use is likely to reach a peak in the early 70s. It is even possible that total utilization has already peaked in 1969 or 1970 as the rate of increase in U.S. population slowed.

At the same time, all current indications point to a continuing upward trend in production. We have inserted Brunk's projection of 1975 supply in figure 2 (2). It exceeds our estimate of projected use by over 1 million tons. We are not implying that 1 million

¹The problems described in this section have been of concern to industry leaders for several years, as evidenced by reports of meetings conducted throughout the state.
PER CAPITA CONSUMPTION (lb FRESH EQUIVALENT)


Apples, the depressing effect on prices would be less if the surplus fresh apples could be used in the processed markets. However, such large-scale diversion would require a doubling of the present capacity of the Washington processing industry.

It is unlikely that Washington production will remain constant throughout the seventies and eighties. In their analysis of 1969 Census of Agriculture data, Wilcox and Harrington estimate that of the 9.2 million apple trees in Washington in 1969, one can reasonably expect 80%, or 7½ million trees to be bearing in 1974 (56). The size of the crop harvested from these trees will depend on the proportion of full crop borne by the trees in any year. A full crop, which has been about 310 pounds of apples per tree in recent years, would yield 54 million 42-lb boxes; 50% of full crop would yield only 27 million 42-lb boxes. A full crop would create an exceptional marketing problem and disastrous prices for Washington producers.

It appears, then, that around 1974 the usual or average crop will be as large as the 1969 crop.

To summarize this section, the prospects for the U.S. apple industry are supply increasingly outrunning demand in the seventies, owing to increased production and steady or declining use, and a continuing swing towards greater use of apples in processed form. Washington faces the prospect of a crunch from two sides—a squeeze on price received, due to oversupply, and a market squeeze because it is firmly entrenched in the sector of the market where growth in demand is least likely.
KEY QUESTIONS FACING THE INDUSTRY

Good plans and decisions must be based on good information. Good information in turn comes from asking the right questions. In this section we set down seven broad groups of questions critical to the future plans of the Washington apple industry. In the next few pages we focus on what the industry ought to know before turning to discussion of the information actually available and the most serious gaps in that information.

Supply

How great a threat is posed to prices and profits at various levels of U.S. and Washington supply? How great is that supply likely to be in the next decade? Is it equally important to match supply to demand for specific varieties, grades, and sizes in specific seasons, areas, etc.? If increased supply comes from a fixed acreage through higher yields per acre, will the resulting lower production costs per bushel offset lower market prices? Will the resulting increased volume through existing packing plants with high fixed costs lead to lower packing costs per box which further offset lower market prices? Common sense tells us that an industry can consistently generate profits only if harvested supplies regularly come close to packing capacity and to market demand. But where should this delicate balance be drawn for the Washington apple industry?

Demand and Utilization

In light of potential U.S. trends, a critical question for Washington marketers is whether they could increase returns by diverting more of their apples to processed uses. A second major question is whether the timing of shipments throughout the marketing season could be profitably altered. We have already alluded to Washington’s dependence on the fresh market for utilization of its output. Currently, almost all its fresh output is sold through retail grocery stores for in-home eating out-of-hand.

Washington has not attempted seriously to tap the potential of the institutional trade, of the growing fast food business, of restaurants, vending machines, etc. Washington’s processing is mainly for juice and applesauce and the proportion of the crop processed is substantially below that of other major apple areas. There has been limited commercial exploitation of other promising processed products. Most packers have continued to specialize in products for out-of-hand eating and have not sought to offer a range of apple products in both fresh and processed form.

Considerable change from the present utilization pattern would seem to be desirable. In a competitive situation, profits in marketing come from serving those sections of the market that demand the mix of product-price-convenience, etc., your operation is best equipped to offer. Who are the consumers of Washington apples? When, how, where, why do they buy particular sizes, varieties, pack-types, price-levels, etc.?

How are their needs and demands changing? How do current packs, advertising, sales methods, etc. fit those needs and affect demand? How should Washington marketers go about filling potential demand for their product more effectively?

Changing technology

The industry’s ability to service the changing needs of its customers will be closely related to its adoption of changing technology in production, harvesting, packing and processing, shipping, and marketing. Among the technological changes already widely envisaged are full-dwarf hedgerows of high density plantings designed for mechanical harvesting, automated grading and packing of apples, palletizing of all merchandise in warehousing and shipping, extensive use of consumer prepacks for fresh apples and more highly concentrated or convenient forms of applesauce, apple juice, apple slices and other processed apple products. Even more startling innovations may emerge in response to cost and market pressures. How urgent is it for Washington to be in the forefront in adopting new technology? How serious is the risk that the state may become for a time outmoded and uncompetitive? What specific new technologies in production, packaging, processing and merchandising should be tested?

Changing strategy

The small firms so typical of the Washington apple industry have competed with each other for grower favor by keeping packing charges low, but in their marketing have supported a combined promotional program (through the Apple Commission) while retaining competing sales agencies and emphasizing their own brand name. How beneficial to the industry is this mixed system? Is expansion of demand for apples being hindered by failure to concentrate marketing effort, or could the industry compete more effectively by building up marketing strength in its existing sales agencies? Given its present structure, could the industry compete more effectively by hiring experts in cost cutting and quality control, rather than in marketing? Is the industry’s competitive strength to be in unity or in variety and flexibility?

Structure of marketing channels

As critical to the success of a marketing strategy as the actions of competitors are the reactions of buyers in intermediate markets (wholesalers, brokers, retailers, restaurants, and institutions). The dominant forces in these markets are large multi-unit organizations which are extremely sensitive to cost and efficiency factors affecting their operations. Many spokesmen in the Washington apple industry are concerned about the apparent “market power” of these large buyers or the “imbalance of market power” between the few, large buyers of apples and the many, small suppliers. While “market power” is nowhere precisely defined, it is
blamed for many of the adverse movements of apple prices. There has been little published analysis of the impact on the Washington apple industry of the continuing evolution of giant distributive organizations. The market place free-for-all yields high prices in short crop years and low prices when supplies are plentiful. Alternative marketing arrangements that would yield more stable prices have rarely been attempted. Alternative combinations of marketing services have not been fully explored. The extent or economic impact of "market power" on the apple industry remains unexplored.

**Washington apple industry structure**

The Washington apple industry is often thought to be predominantly composed of large numbers of small growers and small packers. A remedy suggested for the industry's problems is to reduce the number and increase the size and strength of the economic units. The number of apple cold storage warehouses in the state has risen from 126 in 1949 to 230 in 1959 and 302 in 1969 (4). Even though 1969 was a record crop year, the average warehouse handled only 132,000 bushels of apples.

In its production end, too, the industry has been subject to considerable change. The number of large growers, growers with 1,000 or more bearing trees, has grown from 523 in 1954 to 1,101 in 1964 (5). In each of the last 3 census years, these larger growers increased their share of commercial apple farms, bearing trees and loose boxes harvested (figure 4). The increase was most notable in the 1959-64 period.

About 1,000 growers in 1964 accounted for slightly over 70% of bearing trees and loose boxes harvested in the state. The 428 largest growers accounted for 51.5% of loose boxes harvested in 1964. Undoubtedly, the increased concentration of production will raise issues about desirable concentration in packing operations, and about what might be the optimal mix of number, size,

![Figure 4: Share of farms, bearing trees and harvest accounted for by Washington commercial apple farms with 1,000 or more bearing trees.](image)

and location of orchard, packing and processing firms in the industry in the future. A firm that is viable as a production unit may not have the financial strength to adopt new technology and the marketing strength needed to face new market challenges. Firms that are independently strong may work together poorly, leading to an industry that is weak.

**Marketing services**

Transportation, storage, transfer of ownership, insurance and other miscellaneous marketing services continue to increase in cost. Edman's study covering the 1956 through 1960 marketing years showed transportation of apples to New York City accounting for up to 13% of the retail price and storage enroute a further 4% (6). Higher costs can only be borne if prices increase. In the more likely event that prices will not increase, the industry will be faced with the question of how these services can be adapted or trimmed so that they will be cheaper.

**RESEARCH FINDINGS AND MAIN GAPS IN OUR RESEARCH KNOWLEDGE**

This section summarizes the main findings of research relevant to the current marketing problems facing the Washington apple industry, and isolates the most important gaps in our marketing knowledge.

**Supply**

Quite a number of research projects have sought to predict future supplies of apples in the United States. These projects were undertaken at different times with differing objectives and methodologies. The earliest pertinent to our current problem was that by French in 1956 (7). Taking into account economic forces such as population and income growth, costs of production, and competing fruits, French estimated that U.S. apple production would rise to 144-155 million bushels in 1970 and fall slowly thereafter to 140-145 million bushels by 1975. Almost a decade later, Magleby, using known data on tree numbers and 1960-63 average yields, estimated the 1970 U.S. apple crop at 154.7 million bushels and the 1975 crop at 182.8 million bushels (8). Brunk et al., using straight line projections, in 1967 anticipated an average harvest size of 150.1 million bushels in 1967-69 and 173.7 million bushels in 1975-76 (2).

The two more recent projections anticipate that apple production in 1975 will be 15-20% above 1970 levels. The projections cited so far have been less than 3% off in 1970. The actual crop was 151.2 million bushels. We can anticipate that the Magleby and Brunk projections will come close to the 1975 crop. Brunk, who was also concerned about the future level of demand and price, anticipated that potential demand in 1975-76 would fall 11.4 million bushels short of available supplies. Brunk expected that this would bring downward pressure on price, increased processing
use, and waste. However, he did not attempt to quantify these effects.

Projections of future production by variety or by region appear much less reliable, due primarily to data problems and the impact of local weather. Magleby's study projected production for all varieties and all regions. By 1970, his projections of large increases in Red Delicious, Golden Delicious, York, Jonathan, and Rome varieties, stable McIntosh production, and decreases in Winesaps appeared roughly on target. Likewise, the West's share of total U.S. production has risen, while the East's has dropped from the 1960-63 level. However, while Magleby successfully predicted the direction of change, the magnitude of change by variety and region is likely to be off target by 1975.

Two major attempts have been made to develop forecasts of future production trends in Washington state. Harrington in 1964 using tree number, and yield, and age of trees data, estimated 1965 production at 31-34 million bushels and 1970 production at 36-38 million bushels (9). Harrington anticipated the rapid growth in Red and Golden Delicious production and the decline in Winesaps, but the exact magnitude of the changes proved elusive. In a more recent paper, Klahre projected that apple production in Washington would range from 31 million bushels in 1969 to 36 million bushels in 1975 (10). In light of the 39.9 million bushel crop actually achieved in 1969, and Census of Agriculture data released since, then Klahre's estimates appear too low.

Projections of production in other states have met mixed fates. French seriously underestimated future Michigan production trends (7). Ben-David and Tomek in 1965 estimated apple production in New York for 1972 at 24.9 million bushels. Actual crop in 1971 is likely to be about 23 million bushels. However, the New York estimates by variety are likely to be off target (11).

Clearly, projections of total U.S. and state supplies of apples can be made with considerable accuracy, and developing trends in regional supplies and varietal mix can be highlighted. However, if they are to be an aid to industry planning, projections must be constantly updated as new data appear. The studies already cited suggest that supply projections can be reasonably reliable for up to 7 years into the future. The most recent study, that by Brunk, used data available up to 1966. Therefore, the time is ripe for a fresh attempt at projection of U.S. supply trends. It is now 16 years since the projection by French which took account of the interactions of future demand, prices, and costs on likely future supply. Such a study could contribute to our understanding of how and why industry supply is likely to behave the way it does.

Many aspects of supply have never been researched. Nothing is known about how the quality of harvested supply has altered over the years in terms of grade, size, physiological condition, etc. We are really quite ignorant as to why farmers plant new trees or pull existing trees; why they add one variety and drop another, whether in response to production or market factors, net returns, etc.

In economic jargon, we do not know what the supply response of orchardists is to changes in costs and prices. We do not know what impact an attempt at supply control would have, or whether a national marketing order or a state marketing order would be more beneficial to the Washington industry. Yet, an understanding of the level and impact of future supply is crucial to any industry long-term planning. In particular, adoption of new technologies such as high-density plantings, mechanical harvesting, etc., create whole new areas of uncertainty about future supplies. The work by Labelle in isolating the factors such as variety of apple, pressure, firmness, size, etc. which influence the proportion of usable fruit from mechanically-harvested orchards points the direction in which future research and development work must go (12).

The Economic Research Service of the USDA is giving serious consideration to a project which would examine supply response. Meantime, some indication of the rapidity with which technology can alter the pattern of an industry can be obtained from the Washington grape industry. In 1968, 1.2% of the crop was harvested mechanically; in 1970, 54.2% (13).

Demand and Utilization

A basic principle in economics is that an industry can often increase its total returns by charging different prices in different markets. Commodity producers such as apple growers can rarely directly control prices. However, by increasing or decreasing supplies to any major market, they can indirectly influence price. Economists have been aware of the practical value of this principle in increasing returns to apple growers.

The main bulk of economic research has focused on possible increases in returns from changing the volume of apples marketed in certain months. Ben-David and Tomek's findings suggested that growers of New York fresh apples could have increased their gross profits by selling fewer apples in December-February and increasing sales in the earlier and later months (11). Pasour and Gustafson considered reallocation of U.S. apples between months both feasible and potentially profitable (14). In a recent study of Washington apples, Price's results suggested that the proportion of Red Delicious and Golden Delicious apples sold in the spring should be increased, and that there is a need for more controlled atmosphere storage (15). Kenyon found similar results for California Delicious (16). Moffett et al. found that benefits would accrue to New England-New York McIntosh apple growers from control of supply and monthly allocation of McIntosh apples (17).

In view of the increasing proportion of all U.S. apples used in processed form, and the fact that the Washington industry continues to buck this trend, the question of what is the optimal utilization of total and state apple crops in fresh and processed form becomes of critical importance for industry planning. Using the
best data available up to 1962, Dalrymple argued that one would get different answers to such a question depending on whether one was interested in maximizing industry gross returns or net returns and measured returns at grower or retail level (18). Greig used Michigan consumer panel data to demonstrate the feasibility of increasing grower-processor returns through an optimal utilization model (19).

Kenyon found that California growers had gone a little too far in allocating apples to processing and that grower returns could have been increased in the years 1966-68 by allocating 12.9% (rather than the 6.7% of the crop actually allocated) to the fresh market and reducing the share allocated to canning. In the quite different context of Washington State apples, findings by Scott suggest that in order to increase total gross returns to growers, a much greater proportion of the Washington crop should be allocated to the processing markets (20). For example, a shift from the average division of the crop in the last 20 years, i.e., 80% fresh and 20% processed, to 70% fresh and 30% processed could increase industry returns 13% at the packinghouse door.

The geographical distribution of markets has an important bearing on use of a crop. Studies of many commodities have analyzed where production and processing might best be located to supply existing markets at least cost with given production and distribution costs. Only one study, that by Greig on applesauce, has focused on an apple product (21). Greig found that Washington processors of applesauce would have to pay growers $5.50/ton less than the national average price in order to remain competitive in the national market because of higher processing and distribution costs. If Washington sought to increase its sales in the national market by 500,000 cases, it could do so only by paying its growers $9.57/ton below the national average, or by displacing to a large extent its nearest competing supplier, California.

All the studies discussed so far in this section have been normative in nature; that is, they indicate how apples would be utilized and distributed in a world concerned only with the economic factors of costs, returns and profits. Many other factors such as climate, traditional specialization, availability of labor and managerial expertise, and personal preferences of managers influence such decisions. However, these normative studies do indicate the direction in which economic forces will tend to carry the industry and are a warning to the astute manager to gradually adapt his operations accordingly. It is probable that much of the needed research in this area has already been done, and that the task facing researchers is to communicate their results and help the industry to formulate effective strategies for altering utilization.

An aspect of utilization on which there has been little research is the economic evaluation of new apple products. One example of this type of work is a study of the market potential for superconcentrated apple juice by the USDA in Fort Wayne, Indiana (22). A sales test in 23 supermarkets, followed by a consumer attitude survey, showed that the product stood a reasonable chance of commercial success. A study by Greig among apple pie manufacturers suggested a potential market for dehydrofrozen apple slices (23). Similar studies are needed on variants of established apple products and on new products and processes such as explosion puffed apple snacks, mixed apple and berry fruit juices, wines, pie fillings, etc.

In deciding priorities for research into the economic feasibility of new products, an important influence will be what the demands of the market are likely to be. Economists tend to look at demand in two ways:

1. Over a long time, how has the price of a product or the quantity consumed changed, and what broad factors have contributed to this change?

2. At any given time, what types of persons and families buy and use what quantities and kinds of the product? Both approaches seek to isolate the most important influences on demand as the basis for prediction of likely future trends and preparation of marketing plans to capitalize on these trends.

There have been many time series analyses of demand for all apples in the U. S. and for various states, varieties, end uses, and levels of the marketing channel. Dalrymple presents a lengthy discussion of the leading studies published prior to 1962 (18). He found that in general the farm value of apple sales was higher in small crop years than in large crop years, but because of relatively inflexible marketing margins, the value at retail was higher in large crop years. An excessive quantity of apples allocated to the fresh market was the main cause of depressed farm value in large crop years. Farm value from the same crop could have been increased by greater allocations to the processed apple market. An alternative way to look at these results is to say that a small (say, 10%) reduction in processed apple prices would boost demand more than 10%, but an equivalent reduction in fresh apple prices would boost demand much less than 10%.

Income was an important determinant of demand for all apples. A 1% increase in per capita income appeared to lead to a 1.1% increase in the price consumers would pay for all apples. A 1% increase in consumption of competing fruits (oranges, pears, and bananas) appeared to lead to a 1% reduction in the price of all apples. However, Dalrymple's comment that our knowledge of the relationship between apples and competing fruits is fragmentary, still holds today. Studies made in the 1930s suggested that size of apples (24) and quality of apples (25) were other important influences on the price of apples at farm level.

A thesis by Harrington completed in the same year as that of Dalrymple cited above, reported that the retail price of all apples had become more sensitive to changes in supply in the post-war period, less sensitive to citrus supplies, and less responsive to boosts in disposable income per capita (26). Washington apples were even more sensitive than all apples to changes in supply and showed zero response to changes in income.
Tomek’s findings in 1968 agreed with those of Harrington (27).

A study by Huang in 1971 found the U.S. average price of both fresh apples and of all apples significantly affected by supply, per capita disposable personal income, and the price of oranges (57). Clearly, if an apple marketer is to understand or anticipate price trends, he must keep in mind the influence of these three factors.

Studies of demand for apples for end uses other than the fresh market have been few. The studies cited by Dalrymple, which used pre-1960 data, gave conflicting results. Since the market for processed apples has changed markedly in the last decade, recent research is more relevant to this analysis. Using Michigan consumer panel data and adjusting his results to remove the influence of other factors, Greig found consumption of fresh apples at retail to be fairly insensitive to price changes (it would require a price cut of almost 30% to raise consumption 10%), but applesauce and apple juice and cider consumption could be raised 10% by much smaller price cuts, 5.5% in the case of applesauce, 4.2% in the case of apple juice and cider (19). These results are consistent with those previously cited by Harrington and Tomek.

In a 1969 study of applesauce price in the United States, Ricks found retail price depressed by increases in apple production or carryover stocks of applesauce and increased by gains in per capita income (28). A similar analysis by Tomek and Dominick of New York farm price for canning and freezing apples found that much of the variation in price could be explained by New York production and by price in the Appalachian states. New York price tended to follow Appalachian price and to be depressed by above average New York production (29).

Demand and price analyses of the types discussed so far are especially useful as a basis for demand and price forecasts, in contract bargaining between growers and processors, and in analyses of alternative patterns of use of apple crops to increase grower or industry returns.

A complementary approach to demand analysis involves scrutiny of the purchasing and use behavior of segments of the total market. This is particularly useful in formulating a firm or an industry’s future marketing strategy. The Household Food Consumption Survey of 1965-66 is the most recent in a series of studies conducted by the U.S. Department of Agriculture approximately every decade (30). Data are analyzed by household income by region and by urbanization.

Since these surveys are normally conducted in the spring when apple supplies are at a low ebb, their value is not in showing absolute levels of apple purchase and use, but in comparisons of relative consumption by different market segments. A comparison of weekly procurements of the leading apple products by region and urbanization shows very wide divergences in levels of use of each product in different market areas (table 1). An expansionist-minded apple mar-
Delicious to them indicated all too often overmaturity, mealiness and other undesirable qualities (32).

A more limited study in Fort Wayne, Indiana in 1960 suggested that over half the fresh apples bought were used for out-of-hand eating and 13-15% each for baked apples, apple pies and applesauce (22). At that time, 99% of respondents claimed to have bought fresh apples in the previous month, 55% applesauce in cans or jars, and 10% each apples sliced for pie and apple juice.

A further dimension was added to the picture of apple consumers by the 1970 A & P comparative study of product purchases in 7 widely different stores. Sales of fresh apples were 45% above the average of the 7-store composite sales in the store serving a young family clientele and that serving blue collar workers. Sales of canned applesauce were 56% above average in the discount store represented. The high income and apartment area stores each had sales of canned cider and apple juice 50% above average (33). Clearly, different apple products have their strongest appeal among different types of customers and stores.

While the foregoing data on market segments have added considerably to an understanding of current purchasing and use of apple products, the types of detailed data on demand for specific varieties, packs, product forms and prices needed by Washington marketers in developing long-term marketing strategy still are not available. There is considerable anxiety, but little or no hard evidence, on the relative weight Washington marketers ought to give to the influence of consumers and that of their intermediate customers, wholesalers, brokers, retailers, restaurants and institutions, on demand for apple products. In deciding how far and how fast they should get into the business of supplying apples in consumer packs, Washington marketers lack clear indications of how large, varied and lasting this demand is likely to be.

One third of all food is now consumed away from home in eating and drinking places of varied shapes, sizes, ownership patterns, types of service, types of customers, etc. (36). The Washington apple industry has no past experience to guide it in tapping this vast market, and information is urgently needed to help the industry discover the full potential of this complex and poorly documented market.

Changing technology

Economic research is most effective in assessing the worth of an established technology. Frequently, the initial success of a new technology is closely related to special management expertise. There is no guarantee that success will come to imitators who have not the special expertise. Many of the new technologies applicable to the apple industry are at an intermediate stage where evaluation of potential benefit to the industry is still hard; e.g., mechanical harvesting, high density plantings, automated grading and packing, etc.

More definite answers are available on several processing technologies suitable for apples that would substantially reduce shipping costs and could make it easier for Washington to compete in distant markets.

Apple slices

For apple slices, suitable for pies, tarts, cobblers, turnovers, etc., several methods may reduce weight or volume:

1. Dehydrofreezing or dehydrocanning is a method whereby prepared apple slices are dehydrated (by a tunnel dryer) to 50% of their original weight and volume and then are canned or frozen. This process was developed by the Western Regional Utilization and Development Laboratory. Several plants in New York State have produced commercial quantities of dehydr-frozen apple slices for nearly 10 years. The advantages of the process are a 50% reduction in storage and freight charges and more than a 50% reduction in packaging costs. (The product is packaged in polyethylene bags within a cardboard carton rather than in the considerably more expensive 30-lb cans.)

2. Explosive Puffing is a method whereby prepared pieces of apple are heated in a "gun" under pressure. When "shot" from the gun, the superheated water in the apple pieces vaporizes into steam and the escaping steam leaves a porous structure to the apple piece which is then readily dehydrated to 2.5% moisture. The advantage of this method is a readily rehydratable product. This process was developed by the Eastern Regional Research and Development Laboratory at Philadelphia. Apparently, there has been no commercialization of this process on apples to date.

3. Osmotic Dehydration. Technically, osmosis is the process involving the movement of water through a semipermeable membrane from a dilute solution to a more concentrated solution until equilibrium is reached. The solution is unable to diffuse through the membrane in the reverse direction, or does so very slowly, so that the major result of this process is the transfer of water to the concentrated solution. Osmotic dehydration of apple slices involves immersing them in a concentrated solution of sugar or tumbling them in dry sugar. The fruit is reduced to about 50% of its initial weight, after which it is drained and either frozen or dried further in an air or vacuum drier. The sugar syrup is then reprocessed into sugar and recycled. This process is relatively new and has not been tested commercially on apple slices, although it apparently has several advantages.

Applesauce

Applesauce can be concentrated or dried in several ways. Foam-mat drying, continuous vacuum drying, and drum drying all appear to hold promise. In foam-mat drying, a chemical foaming agent is mixed with the applesauce. The resultant foam is spread on a continuous perforated belt and warm air is blown through the perforation. The dried foam is then crushed into a powder. Drying can be done under continuous vacuum using the same principle but lower tempera-
tures. Drum drying has been tested on a commercial test basis in Washington in cooperation with the Western Regional Research and Development Laboratory of the USDA. In this case, applesauce is dried on heated metal drums.

Apple juice

Apple juice is widely concentrated in the United States to a 6-to-1 concentrate. The essence lost in the concentration process can be captured and concentrated to as much as a 100-to-1 concentrate. Apple essence is then added back to the juice or sold separately. The process can be 6-to-1 concentrate or even higher, but for retail sales, the concentrate is diluted to a 3-to-1 concentrate (3 cans of water to 1 can of concentrate). Sales tests have been conducted on 6-to-1 concentrate with only fair results (there have been problems in selling the small can of 6-to-1 at the same price as the larger 3-to-1 can, even though the amount of reconstituted juice is the same).

Dehydrated apple juice or apple juice powder of good quality can be made in at least 3 ways:

1. Foam-mat drying (although there are some problems in reconstitution, the method could probably be perfected).
2. Continuous vacuum dehydration (which yields a satisfactory product, but may be expensive).
3. Use of a falling film evaporator (this method was developed by the Eastern Regional Research and Development Division of the USDA).

Preliminary unpublished consumer preference tests compared apple juice made by the foam-mat drying process and the falling film evaporation method. The juice from the falling film evaporator was preferred (W. S. Greig, unpublished data).

This brief analysis of processing methods certainly does not exhaust the processing methods that might be used to produce new apple products of reduced weight and volume from the original products.

Competitive marketing strategy

Since evaluation of Washington's competitive strategy and of the trends taking place in the structure of marketing channels are closely related, both will be discussed in this section. As marketer of one of the many thousand products handled by marketing channels, Washington must be prepared on most occasions to react to trends rather than to make them, and to win changes it desires by persuasion rather than by market power.

The first fact of life is the continued growth of bigness. Seventy-five retail chains in 1969 controlled about half of all U. S. retail food sales (34). These chains have tended to compete by superior efficiency in preretailing activities such as central storage and warehousing, own-packing, processing or branding, and breaking into small lots for distribution to their retail outlets (35). The future outlook is for even larger stores with less store labor and more automation of record keeping, accounting, price-marking, checkout facilities, etc.

Large as they are, the retail food chains themselves face grave competition from the phenomenal expansion of fast food restaurant chains. Greig estimated 1966 sales of food through retail stores at $51.7 billion and through food service outlets (restaurants, institutions, military, etc.) at $28.0 billion. The latter are likely to grow at 5% per year compared to 3% for retail stores (36). The clash of these forces is likely to speed up the technological revolution taking place in restaurant kitchens and to call forth varied competitive responses from major retail chains.

More often than ever before, families are buying their food ready-to-eat or served at a fast food restaurant. They are short circuiting the traditional routine of buying food in the grocery store, bringing it home and preparing and cooking it at home. Retailers have responded by increasing their offerings of foods already prepared or precooked. There is an absolute dearth of knowledge as to where apples stand in this changing situation and of where the greatest potential for improving growers' returns may lie in the future. Without that knowledge it will be difficult for the Washington apple industry to remain strong in the out-of-hand retail market, to become strong in the prepared, precooked retail market, to cater for the needs of bakers and institutions, or to break into the fast food business.

Studies already cited suggest that the industry can increase returns at retail, and grower returns, by shifting more of its output to processed uses. However, whether or not greater returns would ensue from such a policy will depend to a larger extent on the future behavior of marketing costs (see, for example, Pasour and Gustafson (14)).

Some information is available on past behavior of marketing margins for fresh apples. Edman studied Washington Delicious apples shipped to New York in the years 1956-57 to 1960-61. He found that while growers' returns fluctuated from a low of $.92 to a high of $3.20, total marketing margin ranged only from $6.03 to $7.30 (6). Total margin as a percent of retail price ranged from 65 to 87%. For the years 1961-62 to 1966-67, the total marketing margin tended to be higher, ranging from $.63 to $1.28 (37). Much of the increase can be traced to rising costs of labor, transportation and storage.

Studies of marketing costs at retail have shown a tendency for stores to carry an increasing number of produce items that account for a decreasing proportion of total store sales (33). However, produce merchandisers set and usually achieve a target gross margin of 33% of the retail price on all produce and on fresh apples (38). If a retailer buys apples at 20¢/lb he will try to sell them for at least 30¢/lb, giving him a margin of 10¢/lb. The Washington apple has come to be regarded as a staple high-price, high-margin produce item (38). Accordingly, the same approximate level and behavior of marketing margins on fresh apples can be expected in the future.
No data of comparable quality are available on margins for processing apples. However, a comparison of grower returns for processing apples and retail prices of canned applesauce and apple juice suggests that total margin as a percent of retail price is in the 70-80% range. This lack of data on margins reflects a more serious lack of information on the structure and conduct of the processing-marketing sector of the apple industry, and on the economic importance of the forces shaping competition. The 1960 A. J. Wood study of wholesalers’ and retailers’ attitudes to Washington apples gave a brief insight, but no similar study has been made of the situation a decade later (39).

Faced with these uncertainties, the formulation of economic strategy for the industry, in particular where it involves large new capital expenditure, becomes extremely difficult. Little is known about the efficiency of the distribution system now used by Washington fresh apple marketers relative to alternatives such as a reduced number of selling desks. Almost certainly, change involving both losses and gains lies ahead for Washington apple products. A prime task will be cushioning the effect of losses and consolidating new product and new market gains. Research and development will play a key role in making any necessary product modifications and improvements, while advertising and marketing will bear the brunt of selling these product changes to the public.

In 1970-71, the Washington State Apple Commission spent over $1.2 million in promoting Washington apples. As has been the case since its foundation in 1937, this money has been devoted to promotion of fresh apples; most of it is spent on the maintenance of a team of merchandisers. Henderson and Parlett estimated that in 1970 about 1,200 agricultural organizations spent $110-120 million on promotion of agricultural commodities (40). These commodity promotions tended to receive more support from retailers than comparable promotions of branded merchandise.

Evaluation of the short-run effect of advertising expenditure, even in the case of branded merchandise where a corporation can control price or the quantity of product offered, is elusive because:

1. Only rarely can the reception of a given advertising message be directly related to a change in behavior, such as immediate purchase of the items advertised.
2. It is extremely difficult to isolate advertising from all the other factors that influence purchases.

Cornell University and notably Dr. Max Brunk have used many approaches to evaluate apple advertising effectiveness. Brunk concludes that advertising does pay, although one cannot separate the benefit of increased sales from that of higher prices, and that the issue for researchers is to determine how to spend advertising budgets most effectively (41). Nichols reports the findings of four of the more recent Cornell studies. These suggest greater returns from advertising in newspapers and television than in other media; from information themes rather than situation or humor themes; and that advertising of fresh apples is a more effective way to increase total volume of apples sold than advertising of applesauce (42).

The Cornell results are directly applicable only to the New York apples and market area. A study of promotion of Washington-grown apples (now 10 years old) found similar superiority of “use” themes over “health” themes (43). Unfortunately, this study did not relate the cost of promotion to the benefits therefrom. It did reveal the important influence on sales of price, special displays, display space, and retailer advertising space.

The longer term effects of commodity promotions are of greater importance to the Washington apple industry. The Washington Apple Commission’s role, like that of many advertising commissions, has been pointedly classified by Nerlove and Waugh as “advertising without supply control” (44). One might also add “or without price control.” In effect, one of the key elements of successful corporate advertising, control over quantity to be marketed or price, is missing.

Nerlove and Waugh show that without supply control, the response of the dollar value of marketings of a commodity to advertising is influenced, on the one hand, by the innate responsiveness of sales of that commodity to promotion, and on the other hand, by the new price that results as supply and demand react to the advertising stimulus. Advertising expenditure is not justified where short-term increases in returns lead to over-rapid increases in supply and a resulting fall off in price. The rate of return on advertising, they point out, must be judged relative to that on alternative forms of investment. Assessment of current Washington apple advertising expenditure in these terms could be difficult and unrewarding. A more pragmatic approach might be to accept the enormous investment in promotion know-how, brand recognition, and nationwide good will built up by the Washington Apple Commission since 1937, and to examine how the industry might best capitalize on such a large cumulative investment.

One can easily overemphasize the critical role of advertising in the future competitive strategy of the Washington apple industry. Given Washington’s distance from major markets, technological breakthroughs in low cost production, processing and marketing, e.g., reduction of product volume or weight, million-pound shipping rates, or willingness of growers to contract, may be even more crucial.

Greig has demonstrated the location disadvantage faced by applesauce from Washington (21). In fresh apple marketing, crucial questions revolve around the industry’s adaptation to the growing prepackaged market (38). What research can tell us about the direction such adaptation should take will be discussed in the next section.

Industry structure, conduct, and performance

As of 1970, about 6,000 Washington orchardists capable of producing 40 million bushels of apples were
served by 185 fresh apple packing warehouses and by 12 processors, only 1 of which marketed both fresh and processed apple products (10). Evidence from preliminary data suggests that about one-third of the fresh apple pack could be attributed to orchardists or packers belonging to cooperatives. Apples sent to the processor were primarily culls unable to meet fresh market grade or size standards; thus, supplies available for processing were extremely erratic from year to year. Most apple warehouses had controlled atmosphere storage facilities. CA storage probably accounted for about one-fourth of all storage in 1970.

Concentration in the industry was already quite high. The largest 7% of orchardists owned half of the bearing trees and harvested half of the total apple crop in 1964 (45). More intensive cultural practices demanding greater initial investments signalled a continuing trend toward larger orchards and demise of smaller operators. The four largest fresh apple packers accounted for about one-fourth of the total apple pack. The three largest processors dominated apple processing. The three largest processors accounted for one-third of the total pack and a third of all CA storage capacity for all the cooperatives studied (46).

Average production costs per 42-lb packed box equivalent were estimated at $1.66 in 1965 (47). In a more recent study, for a 30-acre orchard in Okanogan county in 1970, assuming 20% cullage in packing, the 1970 production costs for the 42 lb of fruit in a standard shipping carton were $2.31 (48). Packing and marketing charges by warehouses would add about $2.50 per shipping carton (49). These costs would tend to be lower and returns higher for orchardists maintaining yields of over 700 field boxes per acre and having more X-Fancy grade and large apples (50). Additional costs in the marketing channels for transportation, storage, wholesaler or broker and retailer charges, etc., could be estimated at a minimum of $7.00 per shipping carton. Allowing for 2 lb of shrinkage, bruise damage, etc., per carton, the remaining 40 lb of apples would have to be priced at $11.81 (or almost 30¢/lb) to allow the average Washington grower and packer sufficient returns to break even. In such a situation it becomes vital to know what the returns are to specific added costs such as stiffer quality, grade or size standards.

Franklin, in a 1966 study, focused on methods of reducing warehousing costs by increasing the rate of flow of apples over the packing line. He found a significant difference in rate of flow between grower lots run on the same packing line. The average rate of flow for Golden Delicious was from 67% to 83% of the rate of flow of Red Delicious. His data were inconclusive as to the effect of low-grade fruit and size of apple on rate of flow (51).

Greig and O'Rourke approached the same problem in terms of the effect of fruit quality, fine organization, and rate of flow on the man minutes of actual work time for graders, packers and all other operatives required per packed box of output (49). Their findings suggested that quality of fruit and number of graders per side would explain most of the variation in grader work time, and that variations in grader work time were the major contributors to variation in total work time per packed box. The work time of packers and other operatives handling Golden Delicious was more sensitive to the quality of fruit being run than when Red Delicious fruit was being handled. Packer work time for both varieties was influenced by the balance between number of graders and number of packers (presumably, the more graders relative to packers, the faster fruit flowed to the packers) and by the type of pack being handled. Work time of other operatives was strongly responsive to rate of packed box output, and, in the case of Golden Delicious, to quality of fruit.

Greig and O'Rourke found that larger plants did gain economies of scale in annual building and equipment costs per packed box, but that equally large gains could be made by operating a plant (of whatever size) nearer to full capacity. Sax, in an earlier study found significant cost advantages to larger plants (52). Greig and O'Rourke found distinct operating economies for larger plants in their grading and miscellaneous operative activities. Cost of physically inserting apples in cartons was largely determined by the size of apples and by whether the apples were full-wrapped, top-wrapped, or had no wraps.

Packing costs can also be reduced by more efficient use of labor, machinery, and materials. Diamond Fruit Growers have developed a pack that fits exactly on a 40" x 48" pallet, immobilizes fruit, and thus reduces transit damage. Furthermore, elimination of the need to wrap the top layer of fruit offers immediate cost savings and potential for automated packing (53). Bartram's study of presorting and presizing the volume of lowest quality, suggested that packing costs would rise by about 2.5¢/box. However, the savings in storage cost and gains in marketing flexibility would outweigh that rise (54).

Methods of packing developed in the orange industry have demonstrated that substantial gains in packer productivity can be made by (a) packing face on rather than sideways (Smith cites gains of up to 50% (55)), or (b) using automatic packing machines, which with one operative can pack a standard carton every 17 seconds (38).

How well equipped is the Washington apple industry to meet its future challenges? Undoubtedly its relative ability to compete will depend on the pattern of demand for its products that emerges in the future. The industry has shown its ability to satisfy past demands. However, our analysis has suggested that Washington marketers will shortly be faced with increased potential apple supplies at the same time that demand for fresh apples both in per capita and in tonnage terms may begin to decline. Within the fresh market, factors such as prepackaging are likely to become more important. If the industry is to utilize...
prospective crops in the next decade, it must expand its processing facilities in those technologies that will lead to lowest marketing and distribution costs.

The industry needs answers to some rather basic questions: Can apples be produced solely for processing? How large an orchard will be needed to justify owning a mechanical harvester? What will be a reasonable contract price for growers and processors? If producers are to continue to specialize in growing for the fresh market, what proportion of lesser quality fruit should be diverted to processing? At what point should the diversion decision be taken? Can stable supplies for processing be secured without legal sanctions?

In servicing the fresh market, what is the optimum trade-off between increased cost and increased quality? What is the optimal level of CA storage? Are fewer packers and marketing agencies desirable? Which packers can afford to install a pregrading and presizing system and facilities for a wide variety of consumer packs? Should consumer packaging be done at source or elsewhere? Should the industry adopt alternative systems for getting packed fruit to market? Can the industry afford the necessary investment in new technology?

The Duft study showed that the burden of installing CA storage had brought the debt-to-equity ratio of north central Washington cooperative warehouses from 43:57 in 1963 to 55:45 in 1968, and seriously reduced their future borrowing capacity (46). Can the problems of transportation of fresh apples, high cost, damage, delays, be brought under control at a reasonable cost?

Obviously, answers to all these questions can not be found rapidly. However, this report should help to indicate that much useful information of value in current decision-making is already available. With regard to gaining further information, on which of these questions should the industry and its researchers focus? In the next section we outline what we see as the most pressing problems facing the Washington apple industry.

THE INDUSTRY’S MOST PRESSING PROBLEMS

So far in this report we have tried to be as all-inclusive as possible in outlining the Washington apple industry’s problems, its present stage of knowledge, and gaps in that knowledge. However, if this report is to meet its objective of being a springboard for industry action in planning and research, we must now zero in on those key economic problem areas that will most vitally affect the industry’s future.

The industry’s most pressing problems can be conveniently grouped into three clusters, supply, market expansion, and organization of the industry.

Supply

Washington state has the potential to produce crops even larger than the disastrous 1969-70 crop. The other major producing states also have the potential to repeat the 1969-70 experience. In blunt language, the U. S. apple industry has the productive capacity to drive many of its participants to bankruptcy. Voluntary control of supply either by pulling trees or leaving fruit unharvested has not worked in the past. The Washington industry’s problem is compounded by its dependence on the fresh market. Research studies have shown that in many instances, Washington could have benefited by greater diversions to processing outlets, but no mechanism existed for getting industry agreement on such diversions. The industry needs to examine the feasibility of a federal marketing order or agreement, or a state marketing order or agreement, or other state legal means for controlling crop size and managing the allocation of the crop to fresh or processing markets in the most profitable way.

Market expansion

The more reluctant the industry is to have supply or utilization control, the more urgent becomes the need to find new and enlarged markets for apple products if returns to growers are to be maintained. Expansion can be pursued on a number of fronts at the same time:

1. More fully exploit existing customers, market areas and outlets through reduced costs, increased convenience, etc. Selling an additional apple to an existing customer may be as easy as selling a first apple to a new customer.

2. The Washington apple industry has barely scratched the surface of potential demand for apples in the U. S. hotel, restaurant (in particular fast food outlets) and institutional trade.

3. Rising affluence in the Far East, notably Japan, Korea, The Philippines, Indonesia and China, and Washington’s geographical situation, makes these countries natural targets for expanded export markets.

4. Apples can follow the lead of other industries that have increased sales through variations in packaging, product presentation, merchandising or advertising of new or existing products.

What has been said above about fresh apples can be equally well applied to apples in processed form. Processed apple products have three additional pluses. Per capita demand has been rising steadily, there appear to be a number of new product forms with economic potential, and some of these new forms can help overcome Washington’s location disadvantages through their lightness, reduced bulk, etc.

Organization of the industry

Market expansion on the scale envisaged, and supply or utilization control may be impractical without major changes in industry and firm organization. The potential changes are limited only by the range of one’s
imagination. Of the more obvious possible changes, it would seem that a larger processing industry competitive in national and international markets might demand the sort of production cost reductions only possible with dwarf, high-density plantings and mechanical harvesting. Reduced costs, greater convenience, new packages, etc. in fresh apple marketing might demand a review of the present handling system, packing, storing, grading, wrapping, wholesaling, prepackaging, etc. The existing system evolved piecemeal to meet past needs and may not have the financial structure, technology or skills to meet future demands. Finally, if, as our analysis has suggested, Washington is forced into allocating more of its apple harvest to processed products, this may demand:

1. New laws to govern control of supply and allocation
2. Plant and industry reorganization to handle and market the much greater volume of processed products
3. A planning or guiding authority to assemble information, formulate long-term policy and short-term plans, and control the implementation of these policies and plans.

**MARKETING RESEARCH PRIORITIES**

Of the three most pressing problems of the Washington apple industry cited above, the second, market expansion, stands out as the one offering most immediate and significant returns on the research dollar. Market expansion can be approached in two ways. The industry can adopt a new innovation, e.g., a new form of consumer pack, and attempt to sell it forcefully to a more or less willing consumer. It should be clear from our report that we think the Washington apple industry can not, by such an approach, successfully woo its wholesalers, retailers or consumers. Alternatively, the industry can use marketing research to find out what its wholesalers, retailers and consumers want, and then go about devising feasible and profitable ways to fill those wants. We think that in this way marketing research can become a powerful tool for increasing the strength and prosperity of the Washington apple industry.

Many well tried techniques are available for finding out the wants of consumers—attitude surveys using questionnaires, household survey panels, taste panels, in-store experimental tests, mail or telephone surveys, etc. Choice of technique will depend on time available, research funds available, degree of accuracy required, etc. Given the present state of knowledge of markets and market potential for Washington apples, the industry needs basic facts on its consumers and their preferences, and choice of technique does not seem critical.

Similarly, the industry needs basic facts on what, how and when its intermediate customers (wholesalers, retailers, restaurants, and institutions) would like apples supplied in the future. Once in possession of key marketing facts, researchers can build on this base, for example, in running specific in-store tests for a new apple product, or in focusing on cost reduction techniques in markets where a significant number of customers are showing resistance to current price levels, or in developing experimental sales of apples to fast food outlets.

With a further 40 million bushel crop of apples a distinct possibility in the marketing year 1972-73, research into potentials for market expansion become increasingly urgent.

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