PREPACKAGING - A MARKETING INNOVATION - OF FRESH FRUITS AND VEGETABLES WITH SPECIAL REFERENCE TO THE OHIO APPLE INDUSTRY

DISSERTATION

Presented in Partial Fulfillment of the Requirements for the Degree Doctor of Philosophy in the Graduate School of the Ohio State University

by

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"There is nothing constant in the universe, all ebb and flow, and every shape that's born bears in its work the seeds of change."

Ovid, Metamorphoses

"There is nothing permanent in the world except change."

Heraclitus, Greek Philosopher
Chapter I
Introduction

"Change is the central fact of economic life and focus of economic analysis." This dissertation deals with one of the changes now going on - prepackaging of fresh fruits and vegetables with special reference to the Ohio Apple Industry.

Importance of this study

One of the primary concerns of marketing students is the scientific study of marketing processes. A most important item is the scientific study of changes including innovations which are typical of the dynamic U.S. economy. One reason for this study is to aid in marshalling relevant facts in order to better record and analyze one of these changes - prepackaging - into the systematized knowledge of agricultural marketing.

In recent years, self-service has become more common in our retail stores. This trend is particularly pronounced in the food marketing group. Today, groceries are more often bought in markets, not shops as in former days. This - markets versus shops - is not a play on

semantics but accepts the tendency of food retailers to diminish some functions and become more nearly straight merchandisers.

Of the total 1952 grocery store sales of $33.9 billion dollars, self-service stores accounted for approximately 26.2 billion dollars or roughly 79% according to the Progressive Grocer. The stores having self-service make up approximately 45.8% of all grocery stores but do about 79% of the total business.

The self-service concept in retailing encompasses prepackaging. The two innovations — self-service and prepackaging — are complementary and have progressed together although they are not necessarily interdependent and do not have the same rate of growth. Prepackaging as used here means prepricing, preweighing and prebagging before selling in consumer units of items historically sold in bulk. Prepackaging is often used in reference to meats, cheese, fresh fruits and vegetables although the term as we will bring out is being used with many other items also.

The second reason for the importance of this study is to attempt to elucidate information on prepackaging so that it may be analyzed as a medium for reducing distribution costs.

Increasing efficiency is usually considered one of the givens or one of the goals of an economy. It is a matter of controversy whether distribution efficiency has progressed and whether distribution has kept pace with production in regard to efficiency. Efficiency standards for evaluating distribution have yet to be established and tested to the point that they are generally accepted as production efficiency standards are.

A relatively low percent of the consumer's produce dollar - 30% in 1953 - goes to the producer of fresh fruits and vegetables. This small proportion has created much misunderstanding among producers, consumers and other interested parties about marketing activities. There are wide swings to produce prices due to their perishability, peculiar growing conditions, time period in which they must clear the market, and other characteristics. Some farmers claim the factors of production are not being fully rewarded.

An estimated one-fourth of the food produced in


2 Converse, Paul D., "Marketing Costs Have Not Increased in 40 Years", Printer's Ink, New York, N.Y., August 3, 1951, pg. 27.
the United States never reaches the ultimate consumer. Robert T. Oliver of Syracuse University and the War Food Administration states that "What agricultural economists have tended to call 'normal wastage' is draining away from 20 to 30 percent of all the food our farmers produce. One pound of food in every four that is grown is destined for the garbage dump! Two hours in every eight worked by our farmers, food processors and food distributors is time thrown away. Twenty-five acres of every hundred acre farm are plowed, planted, cultivated and harvested with the produce to be finally discarded as waste."

William Kling of the War Food Administration roughly estimates that losses are: Deciduous fruits, 26%; potatoes, 23%; tomatoes and citrus fruits, 33%; leafy, green and yellow vegetables, 43%.

Although some of the above mentioned loss is unavoidable, this vast waste in itself does create doubt about the efficiency of our marketing system. Prepackaging has been offered as one avenue to alleviate part of this waste and, also, to diminish some of the charges, such as transportation, accumulated by this waste.


An examination of prepackaging as it relates to the marketing of fresh fruits and vegetables should provide general enlightenment and possible means of improvements. Through the use of this innovation - prepackaging, a differentiated product might be established which would not only reduce risk and waste, increase efficiency but have a more advantageous demand curve.

A third reason for the importance of this study is the potential of prepackaging in relationship to consumer motivation of our economy, appealing to the consumer's "insatiable desires" and agriculture's stake in using resources efficiently to produce those goods and services desired by the economy.

Adam Smith has said "Consumption is the sole end and purpose of all production; and the interest of the producer ought to be attended to, only so far as it may be necessary for promoting that of the consumer. The maxim is so perfectly self-evident, that it would be absurd to attempt to prove it. But in the mercantile system, the interest of the consumer is almost constantly sacrificed to that of the producer; and it seems to consider production, and not consumption, as the ultimate end and object of all industry and commerce." Although most classical

economists (and many later economists) gave due note to consumer demand, they generally dispensed with the subject hurriedly and turned to easier handled and more readily perceived problems of production. J. B. Say's famous rationalizing proposition that production created its own demand and thus all goods produced would be sold, was commonly accepted.

Controversial yet, we have come to realize, particularly in recent years, the importance of consumer behavior in our economic system. Changes in tastes and habits receive similar attention in economic analysis as technological developments.

U.S. consumers in 1950 could have received an adequate nutritive diet for less than $110 per capita but instead paid approximately $340 per capita for food. Hunger is generally not a problem in the United States. Food consumption is based upon desires, income, palatability, delectability and habit besides nutrition. Due to shifts in food consumption patterns, production, marketing services and income levels, the average American consumer is spending a higher percent of disposable income for food in the postwar period than the prewar period. The farmer by selling "protective" foods has been able to keep a relatively high share of the consumer's food dollar in the last forty years.
Fruits and vegetables other than potatoes have increased more in consumption since 1910 than any other food group. Prepackaging may be a medium of improving the product and increasing consumption. In the years ahead, agriculture's future is enhanced by the fact that "the elasticity of food expenditures with respect to incomes may well be close to 1.0, even if the elasticity of food consumption with respect to income is something like 0.25." The desire for "better" foods, quality foods, more services with resultant increases in food prices is a major item to be considered in any agricultural allocation or policy formulation.

Prepackaging, a marketing service conducive to marketing research analysis, offers possibilities in developing new products, tapping new markets, increasing consumption, reducing marketing costs and aiding in more orderly marketing. Adoption of prepackaging could possibly result in maximizing consumer satisfaction per monetary unit expended and aid producers in using resources more efficiently to produce consumer desired services and goods.

Purpose and Scope

The viewpoint taken herein is intended to be ecumenical and not parochial. The writer's intention is to give a general overall portrayal of the prepackaging produce area with the hope that others will implement this framework with their knowledge, analysis and empirical studies.

The purpose of this study is to contribute to an understanding of the factors leading to the origin of prepackaging produce, the growth of prepackaging of fruits and vegetables, the various economic considerations of prepackaging both to the broad field of fruits and vegetables and to the more limited Ohio Apple Industry.

Some of the more important areas that this study intends to investigate are:

1. The history of produce prepackaging.
2. Economics of prepackaging fruits and vegetables.
3. Considerations in regard to the point of prepackaging.
4. Chain store produce merchandisers' experiences and attitudes toward prepackaging both past and future.
5. Prepackaging's relationship, both actual and potential, to the Ohio Apple Industry.

Particular emphasis will be placed on this history of produce prepackaging and on the effect of prepackaging on selling apples.
Possible Benefits

An attempt is made herein to provide a general framework for others not only in relating history, facts and hypotheses but to give a checklist or beginning model so others may better analyze problems in this area.

The prepackaging produce industry has suffered severe fluctuations in its relatively young history. Part of these fluctuations are due to misconceptions and lack of information. This report does not propose to answer all questions but does desire to help in bringing out knowledge and diffusing it. It is hoped that it will serve as a frame of reference and aid in the advent growth and popularization of prepackaging where economically feasible and desirable.

One of the principle aims of this dissertation is to compile a history of prepackaging produce from various publications and returns from inquiries to various pioneers and leaders in the field which will enable others to add to and eventually to evolve a comprehensive history of this dynamic field. Since no history has been written, a historical record should be valuable to all for their own specific purposes. Future students of marketing could well study this section as a written record of a field in transition.
The history and economics of prepackaging fresh fruits and vegetables forthcoming from a comprehensive study should benefit: (1) research men in the prepackaging and marketing field, (2) growers, shippers, and produce prepackagers who are considering prepackaging fresh produce or who are already engaged in such an operation, (3) manufacturers and suppliers of packaging materials, equipment and supplies, and (4) students in the schools where attention is being given to providing some formal training in the packaging field.

The survey of leading produce merchandisers gives an indication of the future of prepackaging, the point of prepackaging, the advantages and disadvantages of prepackaging and where research should be done.

The case study of prepackaging and the Ohio apple industry should give an accurate picture of the industry, the trends therein, the effect of an innovation - prepackaging - on a declining production area (Ohio) in a declining product (apples). The acceptance of prepackaging, particularly with what is generally considered an inferior product - the 2½ inch apple and particularly

1 Both in absolute volume and as a portion of national apple production.

2 Both in total amount consumed, per capita consumption and as a percent of fruit consumed.
interesting to the apple trade but the results can well be used for many other products.

It is hoped the dissertation will further general knowledge and aid in prediction and decision making.

Research

The research done in this field has been by quite a variety of interested persons and firms, using quite different approaches, often from a micro point of view, generally uncoordinated with other research projects, and is not always conclusive.

There has been scattered research done by the U.S. Department of Agriculture, state agricultural experiment stations and various private concerns, generally manufacturers of packages and machinery - usually on individual commodities principally after 1945.

Some horticulturists and private concerns had done work in the latter part of the nineteenth century and in the early part of the twentieth century about using various forms of wrapping to improve the storage and aid in transporting fresh fruits and vegetables.

Dupont in the late twenties started promoting cellophane wrapping of fresh produce not only to aid in storage but as a medium of merchandising. Duncan Rankin was the leading figure in DuPont's significant and
pioneering contribution in prepackaging.

In 1938, DuPont along with American Stores ran a ten-year study of prepackaging and its concomittant problems. The more famous Columbus experiment (1944-48) headed up by Dr. C. W. Hauck and Mr. Rankin was a joint project of the Great Atlantic and Pacific Tea Company, The Ohio State University, DuPont, Hussman, Ohio Boxboard and Oliver Machine Company.

World War II brought many shortages and problems in packaging but it gave new emphasis as there was more interest, research, competition, change and product development in packaging. The development of films, particularly polyethylene and plioform, during the war gave new impetus to prepackaging.

Research was strengthened in the 1940's due to technological improvements particularly in bags and refrigeration, changes in consumers incomes and habits, marketing changes and the growing American economy.

Six doctoral dissertations have been written on prepackaging. They are - Abshier of Purdue on prepackaging lettuce, Marshall Godwin of Cornell on prepackaging produce on the retail level, Kramer of Michigan State on prepackaging meats, Owens of Ohio State on acceptance of prepackaging by negroes, Gilchrist of Southern California on prepackaging and self-service of meats and 1 See bibliography for complete titles.
Bennett of Illinois on self-service meats. These dissertations with the exception of Owens, are primarily cost studies and all are primarily case studies. Their work is good and basically sound for the situation where the work was done. It is felt that their work reflects the individual situations and the particular time rather than the broad field in many instances. Since this evidently was part of the authors' objectives, this should not be considered criticism. It is felt that a one year study of a new prepackaging operation just starting up is not a fair examination of all prepackaging. Neither is consumer acceptance in the first six weeks of offering prepacked items sufficient to overcome consumers customary buying habits. The use of summer months to test retail acceptance of prepackaged produce borders on being atypical rather than typical.

Author's Background

This thesis attempts to approach prepackaging from a wide base. The author's interest dates back to 1948 when W. W. Hatcher, H. F. Patterson, and himself, all part-time undergraduate help of the late Dr. Charles W. Hauck, working on an Ohio Agricultural Experiment Station project concerning fresh produce waste, contemplated entering the prepackaging business.

1 Now Captain, U.S. Air Force.
2 Now Secretary, Michigan State Apple Commission.
Since 1950, the writer has been a research assistant and later, assistant on an Ohio Agricultural Experiment Station project (RM-37) entitled farm prepackaging of farm products and their marketing. His master thesis was entitled "Farm Prepackaging of Ohio Apples and Their Marketing". Two mimeograph bulletins have been published on this subject in joint authorship with Doctors Ralph W. Sherman and John W. Sharp. Eight articles have been published on this subject in the following publications - Progressive Grocer, Ohio Farmer, The Packer (2); Pre-Pack-Age, American Fruit Grower, Pennsylvania Farmer and Ohio Farm Bureau News. The first two articles mentioned were in coauthorship with Dr. R. W. Sherman.

Three years research of the Ohio Agricultural Experiment Station project on prepackaging will be used as basic information particularly with chapter IX (prepackaging of Ohio apples). A survey of the produce merchandisers for twenty leading retail food chains was made to ascertain their experiences, attitudes, where they think prepackaging should be done, research needed and to add trade thinking in this research.

Besides the persons mentioned herein, over eighty-five personal letters were written to get data particularly about history. Replies varied from those that
showed an exceeding amount of conscientious work to no replies at all. Many persons and firms were untraceable or uncommunicative. Semantics was a problem. Often persons did not or could not tell why certain things were done. (Perhaps we are reluctant to say we desire to make money.)

Mr. Rankin, Mr. Robert Cooper, the Prepackaging Association, Mr. Donald Stokes, Mr. Kenneth Samuels, Mr. Loyd Martin, Dr. Alderman, Dr. M. P. Rasmussen, Mr. A. W. McKay, Mr. George McCargar, Mr. Wm. Lennox, Mr. MacAuley, Mr. Albert Allen, Mr. Romberg and many others too numerous to mention gave generously of their time and knowledge.

The files of the late Dr. C.W. Hauck were made available to the author. Various publications such as past editions of the U.S.D.A. yearbooks, USDA bulletins, various state agricultural experiment station bulletins, Pre-Pack-Age, Modern Packaging and others have been scrutinized for possible data.

Methodology

Mr. Julian Huxley has said that no study or field is "highly intelligible without some knowledge of its past." The writer has attempted to use systematic inquiry so that eventually a history of prepackaging might be written and the evolved data may be sufficiently comprehensive to be used for future judgements. An attempt
has been made to bring in various factors, their interactions and not just a quantitative measurement of isolated happenings.

When a trend is in progress, there is a lack of both quantitative and qualitative data to properly gauge the development. Technological developments, trade and consumer acceptance tend to be lumpy instead of having smooth rates of increase.

In a rapid developing but new field like produce prepackaging, there are more things to bother the analyst particularly when attempting to do this in an ex post analysis besides an ex ante analysis. There is presently in prepackaging a wealth of claims and counter-claims, critics and advocates; many of whom have their own interest affected and most of whom are sincere. Few of the partisans have used completely scientific methods and none have withstood the reckoning scrutiny of time.

In such a fluid, dynamic field as prepackaging, there is a lack of benchmarks. However, lack as used here does not mean complete absence and we shall attempt to use the available benchmarks to good advantage.

Due to the transitional characteristics of prepackaging, lack of statistics, lack of true input-output
data, and lack of accurate knowledge, the writer draws on some sources which may or may not be proven by statistics besides using various conventional research techniques. Any additional methods that enable one to better ascertain reality is considered desirable by the writer. The use of observations, current publications, thinking of the produce trade, logical deductions and unconventional techniques, does not preclude the responsibility of dealing with reality or interpreting experience but should be an attempt to find a closer approach, a more vivid and penetrating expression of things as they are.

The desire herein is for facts and knowledge and when this is not possible, a building up for the future evolvement of knowledge and facts. The writer has no wish to convince others of the truth as he sees it. He is not a partisan but his aim is to convince himself of the relevant facts and to record these.

In this study, the writer has used the following as research tools - a) historical study, b) controlled experiment, c) personal interview, d) mail questionnaire and inquiries, e) economic analysis, f) statistical analysis and g) logical deduction and induction.
Outline of Chapters

Part I, chapters 1 through 7, follows a macro approach in dealing with the prepackaging of fresh fruits and vegetables. Part II, chapters 8 and 9, uses a micro approach in analyzing the Ohio apple industry and prepackaging.

Chapter I serves as an introduction dealing with the scope of the paper. Chapter II, concerned with the growth of services and the history of prepackaging in the United States, is one of the largest sections. The historical method was used to develop this chapter. Chapter III, the prepackaging of products other than fresh fruits and vegetables, serves to sketch in the extent to which prepackaging has developed in other areas. Chapter IV on economics of prepackaging attempts to show the basic economics of packaging and prepackaging. The fifth chapter on the point of prepackaging goes into the controversial area of where items should be prepackaged. Considerations of perishability, transportation and production areas are introduced. Chapter VI deals with the present and future status of prepackaging as viewed by leading produce merchandisers. Chapter VII attempts to summarize and conclude this first part.

Part II deals with a specific industry and the possible effects of prepackaging. Chapter VIII entitled "The Ohio Apple Industry" sketches a brief background of
this declining production area (Ohio) and a declining product (apples). Chapter IX deals with the experiments carried on for the last three years by the Ohio Agricultural Experiment Station to aid the apple industry through better merchandising. A projection is made of prepackaging's future impact on the industry.

Limitations

The researcher is limited foremost by his own personal limitations and further limited by his tools, time and other resources.

It is questionable if anyone can properly analyze an innovation and its trend in its formative years. Historians usually consider twenty-five to fifty years passage of time a minimum before a proper evaluation can be made.

The room for error is further compounded by innovations; competition; and also, psychological and other changes in consumers, the industry and institutions. These factors are extremely difficult to predict and/or abstract out.

Endogenous and exogenous factors are practically as hard to account for in the future as they are to be derived originally.

Qualitative and quantitative data is not available in many instances. Often the rate of transition is such
that even if data are available, it is out of date when
published.

The effect of a field in transition plays strange
tricks on those who would lay down "ober dictum's" on
their limits. As an example, one leading prepackaging
researcher stated in 1950 that carrots would not be
prepackaged as the cost of prepackaging as related to
total unit value was too high. Four years later, this
commodity is one of the leading vegetables being pre­
packed. Another case is the experiment station that stated prepackaging apples would not be done at the farm
as the master container was too costly.

This thesis tends to be general. It does not
pretend to answer all questions raised. In some cases
such as the history and economics of prepackaging, it is
meant only as a starting point for more complete evolve­
ment of the subject.

The above notwithstanding, it is felt that this
should not prevent compiling information and analyzing it.
The validity of the findings may be short lived. But the
search for further knowledge should not be abridged even
if the research has use for only a short while and is
relegated to a dusty library where it may be used for a
historical source or more probably should be bound on all
four sides.
Chapter II

History of Prepackaging Fresh Fruits and Vegetables in the United States

Growth of Specialization with Special Reference to Food Marketing

Economic progress is not a single process but, rather, a system of interrelated, more or less independent developments in the different fields of economic activities, according to Schumpeter.

Rather than deal with what is often quite nebulous and highly interdependent, many economists in their theories prefer to simplify by maintaining various developments such as the state of arts as "caeribus paribus". Yet, the economist willingly or unwillingly is often called upon to contribute to aid in "improving the standard of living" or developing the economy farther from the domestic or subsistence economy to a differentiated economy or market economy. The development of economic change conducive to growth or maturation of an economy is important to the economist and to the world in general.

Twenty-three hundred years ago, Plato planned his ideal state on the basis of specialization and division of labor. Adam Smith's *Wealth of Nations* has as one of its key principles the division of labor.
Although both gentlemen would probably be shocked at the result, the United States today has probably come further into the realm of specialization than either had envisioned. A high type of cooperation between man and his environment and between man and man has increased the quantity and quality of the factors of production and their resultant products to give the highest standard of living for an entire nation up to this time.

Economic progress is best served when fewer resources are required in the basic industries; thus more resources can be used in the tertiary industries.

With this specialization, division of labor and increased productivity in the United States, there has been a change away from self-sufficiency. No longer is the family a unit where clothes, foodstuffs and other essentials of life are produced on the home place. The family unit today seldom gives time, form or place utility, but the home is a place for consumption of thousands of items.

This trend away from self-sufficiency is particularly noticeable in the production, marketing and consumption of food.

Shifts in production

Whereas in 1790, 90 per cent of the population in the United States lived in the country, today only fifteen per cent of the nation's population can be classified as living on farms. Since 50% of the farms produce approximately 90% of the agricultural commodities sold, the number of actual commercial farmers is even lower in relation to the consumers. From 1916 to 1952, farm population has been declining 0.75 per cent annually.

Agricultural production has tended to move away from the consuming centers into more or less specialized areas. Two-thirds of the people live east of the Mississippi while two-thirds of the agricultural production is west of the Mississippi. Over ninety per cent of the fresh fruits and vegetables are produced away from the point of consumption. Specialization in various fields such as production, transportation, processing, et cetera have aided in this shift.

Today's farming represents a high degree of specialization in such diversified fields as engineering, agronomy, animal husbandry, economics, horticulture, entomology. Farming today is a commercial operation with large capital equipment. The Farm Balance Sheet for 1953 showed

farmers having a net worth of $149.5 billion or roughly $27,364.00 per farm. A recent survey of 321 typical central Indiana farms showed an approximate investment of $50,000 per full-time farm worker as against an average of $13,500. capital investment that industry has per worker. (The farm figure includes worker's housing.)

**Shifts in consumption**

In 1790, the U.S. had a total population of 3.9 million and an urban population of 0.2 million. In 1950, the total population was 151.2 million and an urban population of 86.8 million.

Geographically, the U.S. population is unevenly distributed. The greater New York area including northeastern New Jersey has a larger population than the combined populations of the seventeen least populated states. In 1940, 47.8 percent of the nation's population lived in 140 metropolitan districts comprising only 1.5 percent of the nation's land areas.

Real disposable income per capita has more than doubled within the last fifty years, and despite all the additional population, has risen no less than 12 percent between 1947 and 1954. Recent studies also show a diminishing of the share of the nation's income given to the top-upper income group, a large increase in the numbers of families in the middle income groups and a decrease in the per cent of families in the low income group.
Despite the increase in income, the per cent of disposable income spent on food has stayed relatively stable with a slight increase. Since 1929, the percent of disposable income has varied from 23% to 28%. The per capita food expenditure in 1953 was 27% of disposable income but the individual could have purchased the same food as they consumed in 1939 for 18% of their disposable income.

The total quantities of food per capita has not changed much but there have been changes in types, quality and form of food consumed. Changes in income, habits, work done, nutritional knowledge, dietary fads and items offered have all contributed to the change away from energy producing foods to more nutritive "protective" foods. Whereas forty percent of the calories in American diets came from cereals in 1900, today only twenty-five per cent of our calories come from this source. Large increases in consumption of animal products and fruits and vegetables excluding potatoes have come in the last fifty years. There have been shifts away from potatoes and cereal products. A great emphasis has been placed on added services and convenience items such as prepackaged meats, frozen foods, juice concentrates, salad mixes and instant coffee.
Shifts in food distribution

Along with this growth of population and industrialization, there came improved transportation, refrigeration, marketing agencies and areas of specialization. Technology and its application grew. To facilitate this growth, the distribution system mushroomed from practically nothing in colonial days to the point today where this shifting of services takes approximately fifty cents of the consumers dollar. There has been much written on the productive progress in the U.S. but little acknowledgment is given to our large distribution system.

Distribution has a fascinating history of growth in the United States. Proper transportation, currency, communication and other essentials of commerce were lacking in the early colonial days. The high costs connected with buying and selling prevented specialization arising in many lines, thus the law of comparative advantage did not operate in favor of specialization. The individual household usually produced its own foodstuffs, clothing and extended down even to pottery and agricultural machinery.

Each colonial household was fairly well self contained. However, some marketing went on. A good deal of exchange was carried on by barter. The general store existed in this period where the average family
obtained salt, medicine, cotton, metal products, ammunition and imports. It has been estimated that in the pre-revolutionary war period the average U.S. family outlay on such purchases seldom exceeded $25 or $50 and often lower. Even in the larger settlements, families had town lots, land outside the village and sometimes there was a communal pasture and forest, to aid the family in obtaining food and fiber.

There was little trade between the colonies. However, the general store merchant did trade, normally by barter, with a merchant in the larger city.

Public markets, fairs, peddlers, factors and commission merchants also operated in this period.

The general store gave way slowly to chain stores, mail order stores, department stores and specialty stores.

The rural areas grew in wealth and population. Specialization grew in both what the farmers sold and what they bought. Better marketing facilities resulted. Farmers concentrated on producing a few items such as corn, wheat, dairy and dairy products and cotton. Agencies specializing in their handling and marketing arose.

The farmer diminished the number of items sold and the quantity sold to retail stores. The general store did not disappear completely but the other media of trade made large inroads on the volume formerly done by the general store. With this specialization, there came more interdependence.

The beginning of the chain store in the United States is generally acknowledged to be the Great Atlantic and Pacific Tea Company in 1858. However, the Hudson's Bay Company operated a chain of trading posts in the eighteenth century. Parke & Tilford opened one store in 1840 but waited until 1860 for opening a second store. F. W. Woolworth's 5 & 10¢ stores originating in 1879 had the most pronounced chain store growth.

Montgomery Ward & Co. of Chicago was the first mail order store. (1872) Parcel post in 1912 greatly stimulated the mail order houses.

Alexander T. Stewart of New York City opened the first department store in 1861. This claim is sometimes challenged by Jordan Marsh Co. of Boston. These were followed by Gimbel of Milwaukee, R. H. Macy of New York and Marshall Field of Chicago.

With the growth of large urban areas and improved transportation, further increases in numbers and
specialization were made in the retail trade. Improved methods of merchandising as used by John Wanamaker of Philadelphia, advertising, telephone ordering, improved standard of living, increased incomes and productivity, delivery systems and increased public conspicuousness of styles aided in this growth.

The twentieth century has been called the century of merchandising. It was not until this era that our industrial production caught up with the needs of the public. In other words, production was generally readily absorbed by demand at prevailing prices or average total cost. (Agriculture production surpassed demand in this sense before industrial production.) There was little interest in marketing as a field of knowledge until the twentieth century when A. W. Shaw, an obscure office equipment dealer of Jackson, Michigan began his pioneering mainly through his magazine "Systems". As pointed out later in this chapter farmers were already concerned about marketing and its effect on their economic position.

As production tended to surpass demand (at ATC), new means of satisfying consumer wants or better merchandising became a cardinal point in the American business scene. Chain stores began mass purchases, redesigned products, culminated vertical mergers, built up brand names, used large scale radio and newspaper advertisements and offered

more services.

Retail stores grew in numbers and volume in the 20th century when their growth was more than the growth in population. The number of chain retail stores multiplied over 28 times between the period of 1900 and 1928.

In the grocery business there was a tendency for stores to add perishables such as meats, fresh fruits and vegetables, dairy products and poultry products to their general line. Although the percentage would be slightly less in the 1920's, this group of perishables composes 68.7 per cent of the family food dollar in 1953. 1 This addition increased volume which furthered the trend. Other developments which culminated in the 1954 supermarkets was more service to consumers, bigger volume and less margin, better sanitary conditions, less waste in perishables, greater selling efficiency, lower labor costs, self-service and prepackaging.

The reception to change in food retailing was increased by industrialization, urbanization, the large number of persons living in apartment houses or small homes with little storage, the increasing use of the automobile, more women working, shopping centers, and the increase in buying power.

1 Lomasney, Wm. F., Food Merchandising Tips and Topics, USDA, Washington 25, D. C., 1953, pg. 5.
Food stores grew from approximately 160,000 in 1900 to 355,000 in 1935. Their numbers increased to 560,549 in 1939 but dropped to 489,200 in 1952.

The industrialization of the country and the growth of population fomented the growth of food stores in the 1900's. The 1920's brought the rise of great food corporations. There was a trend toward larger units through integration, mergers, combinations and incorporation. This was not only a result of the national tendency toward bigger units but also the result of development of new processes and new kinds of foods that required large capital investments for production.

The chain store, by careful use of business methods, integration, economy of scale, adding meats, bakery goods and fresh produce to their offerings and later, use of supermarkets and self-service, advanced in the food retailing field. The grocery chains were successful as evidenced by the return on total invested capital for six leading grocery chains which was 23.5% in 1929 and never lower than 12.5% annually in the 1929-35 period. However, the food chains' early innovations such as vertical integration (warehouses, bakeries, packing plants, milk plants, coffee roasting plants and other processing plants), modern merchandising methods, and expansion from dry groceries to include other food products, was quickly copied by the independent retailer so that the chain
store's volume stays around 40% or less of the total food sales. Independent retailers found their best competitive weapons were to take advantage of their original advantageous position (location, experience, knowledge and flexibility), join into voluntary chains or associations and often to adapt chain merchandising practices.

The depression increased the number of retailers due to the lack of alternatives and the low capital investment. However, the depression born supermarket was to start the trend toward fewer but larger stores which were characterized by complete offerings, self-service, large volume, rapid turnover, smaller margins and inclusion of other than food items.

Despite the fact that population rose from 122.7 million in 1929 to 131.7 million in 1939 and then skyrocketed to 158.7 million in 1952, retail food store numbers were 475,814 in 1929, 553,819 in 1939 and 489,200 in 1953. Thus, the 29.3% increase in population between 1929 and 1952 was accompanied by only a 2.8 per cent increase in number of food retailers in the same period.

Supermarkets (defined by Progressive Grocer as those food retailers doing a minimum of $375,000 annually) number approximately 17,000 or 3.6% of all grocery stores does 44% of all sales. The 172,750 self-service stores that make up 45.8% of the total food stores in 1952 did $21,150,000,000 gross or 79% of the total business.
Most of the stores not self-service are the type considered as semi-self service. The counter-service stores are gradually becoming a negligible factor in grocery distribution.

Two programs of control in emergencies - OPA in World War II and OPS in the Korean Conflict - caused some inflexibilities and hardships but their net effect was probably more mental grievance than actual injury. Actually during the war period with little else for consumers to purchase, the American public as a whole ate better than previously. Consumer food prices increased twice as fast as non-food prices in 1941-7. Meat increased 21 per cent faster and fruits and vegetables 11 per cent faster than the overall food price index increase in the 1941-47 period. People were not eating more but eating better.

Engel's law was disputed by the postwar food market which went from 20 billion in 1941 to 60 billion in 1952. One of Engel's four laws was: the greater the income, the smaller is the percentage of the total which is spent for food. The law does apply if used at any one moment in time but the popular version did not apply over this time period in the United States.

The current dollars spent for food tripled in the eleven year period, 1941-52, due to increases in births and
families, people buying better food, inflation, greater national product, and full employment and family income increases particularly in the lower income groups.

There has been a constant pursuit of more convenience items. Prepackaged, precooked and other means of preparing items before the consumer's purchase has become more common. In some cases, modern industrial methods have turned methods known as frugal, such as home canning and baking, into the questionable category of being non economic. Frozen foods are an example of a new industry that has sprung into prominence since World War II although many of the principles involved have been known for a great many years. In 1953, approximately 5% of all fruit sold and 15% of all poultry was purchased in frozen form. Baby foods, prepackaged meat, bakery mixes, instant coffee, orange concentrate and said mix are typical of the 1953 retail food picture.

This increase in services has come at a high price. Approximately 20% of the food marketing costs or ten percent of the total food bill is a result of the added marketing services since 1941, according to Fortune Magazine. This figure although slightly high in the writer's mind, gives credence to the thought that the demand for food is relatively inelastic but the demand for food services is relatively elastic.
Table 1
Distribution of Marketing Charges for the U.S. Food Bill, Selected Years-1941,1947 and 1953.(In Billions of Dollars)

<table>
<thead>
<tr>
<th></th>
<th>1941</th>
<th>1947</th>
<th>1953</th>
</tr>
</thead>
<tbody>
<tr>
<td>Processors</td>
<td>3.1</td>
<td>7.0</td>
<td>10.1</td>
</tr>
<tr>
<td>Retailers</td>
<td>2.7</td>
<td>6.0</td>
<td>9.7</td>
</tr>
<tr>
<td>Restaurant</td>
<td>2.1</td>
<td>4.5</td>
<td>6.2</td>
</tr>
<tr>
<td>All Others*</td>
<td>3.0</td>
<td>5.2</td>
<td>9.0</td>
</tr>
<tr>
<td><strong>Total Mkt. Chgs.</strong></td>
<td><strong>10.9</strong></td>
<td><strong>22.7</strong></td>
<td><strong>35.0</strong></td>
</tr>
<tr>
<td><strong>Total Food Bill</strong></td>
<td><strong>20.0</strong></td>
<td><strong>45.1</strong></td>
<td><strong>60.0</strong></td>
</tr>
</tbody>
</table>

Source: Fortune Magazine, October, 1953, pp. 137 and 141.
* Includes cost of assembling, grading and sorting, packaging, storage, transportation, etc.

1 Estimated 42 billion in retail food stores, 3 billion consumed on farms, 3 billion sold by non retailers to consumers (e.g. by farmers) and the sale of all eating places including commercial feeding - 13 billion. One billion was subtracted for sales to restaurants from retail food stores.

Table 2
Estimated Employment, Weekly Hours, Annual Man-Hours, Output Per Man-Hour, National Income, 1850-1960

<table>
<thead>
<tr>
<th>Year</th>
<th>Employed Workers (In millions)</th>
<th>Average Weekly Man Hours</th>
<th>Average Annual Hours</th>
<th>Price Nat'l Income Net 1940 Rent Prices</th>
<th>Out-</th>
<th>Net Prices Per Man Hour 1940 Prices</th>
</tr>
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<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
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<td></td>
</tr>
<tr>
<td>1850</td>
<td>7.4</td>
<td>70.6</td>
<td>27.2</td>
<td>47</td>
<td>2.2</td>
<td>4.7</td>
</tr>
<tr>
<td>1880</td>
<td>16.7</td>
<td>65.4</td>
<td>56.8</td>
<td>58</td>
<td>7.3</td>
<td>12.6</td>
</tr>
<tr>
<td>1900</td>
<td>27.5</td>
<td>60.9</td>
<td>87.1</td>
<td>56</td>
<td>17.4</td>
<td>31.1</td>
</tr>
<tr>
<td>1910</td>
<td>36.8</td>
<td>57.5</td>
<td>110.0</td>
<td>59</td>
<td>30.4</td>
<td>44.1</td>
</tr>
<tr>
<td>1920</td>
<td>41.8</td>
<td>51.9</td>
<td>112.8</td>
<td>142.9</td>
<td>69.5</td>
<td>48.6</td>
</tr>
<tr>
<td>1930</td>
<td>45.0</td>
<td>47.2</td>
<td>110.4</td>
<td>119.2</td>
<td>68.9</td>
<td>57.8</td>
</tr>
<tr>
<td>1940</td>
<td>46.9</td>
<td>43.0</td>
<td>104.9</td>
<td>100.0</td>
<td>77.6</td>
<td>77.6</td>
</tr>
<tr>
<td>1944</td>
<td>63.2</td>
<td>46.7</td>
<td>153.5</td>
<td>132.0</td>
<td>160.7</td>
<td>121.7</td>
</tr>
<tr>
<td>1950</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1960</td>
<td>60.2</td>
<td>37.7</td>
<td>118.0</td>
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</tr>
</tbody>
</table>

Definition of Prepackaging

Packaging has followed marketing, stage by stage. Packaging is a small but intrinsic part of marketing. Only in one of twelve encyclopedias surveyed is packaging considered as a separate topic. Usually, packaging was found under marketing. Historically packaging was usually as advanced as the commerce of the time was. Packaging was a five billion dollar business in 1951 but its growth had been relatively slow until the twentieth century.

Defining prepackaging has brought forth many many versions. There is confusion in distinguishing between prepackaged, packaged, packed and prepacked. (There are synonyms also for prepackaging such as consumer package and unit package.) In chapter 1 for a beginning definition, prepackaged was said to entail preweighing, prepackaging and prepricing before selling to the ultimate consumer items that historically had been sold in bulk.

In some cases of prepackaging there have taken place services such as trimming, washing and removal of excess parts of the product that would be normally discarded by the housewife. For instance, sweet corn is husked, meat has the fat removed, spinach is washed and chopped, carrots have their tops removed and lettuce has the outside leaves removed. Items may be packaged in trays, baskets, or bags of a paper, wooden or film nature or a combination
of these materials with a sufficient visibility so that the purchaser may fully view the product. As prepackaging becomes more commonly accepted, many of its concommitant practices such as refrigeration, quality control et cetera necessarily follow. Prepackaging is an extension of "unitization" in the fresh produce retail area.

In some instances, no additional services are added when you prepackage but these acts of weighing, packaging, and pricing are done prior to the sale. This in itself shifts labor, generally adds protection from consumer handling, prolongs shelf life, often increases salability and speeds up store traffic. Thus the costs of packaging are introduced to be balanced by labor savings, waste reduction, increased sales, better space utilization, transportation and handling savings.

Cornell University's Dr. Rasmussen defines prepackaging to mean the packing of a given vegetable or fruit in some sort of a container, in the size and shape suitable for consumer use without any repacking.

Dr. Charles W. Hauck gave a good description in 1948 which despite time is still considered quite adequate if not the best:

Prepackaging has certain descriptive weakness, but has come to be accepted as defining the process whereby prior to offering at retail these perishable goods (1) are subjected to whatever washing and trimming may be necessary to prepare them partially or completely for kitchen or table use, and (2) are transformed, either with or without precooling and refrigeration, into self-service items by packaging in prepriced, labeled, often closed, usually transparent, consumer units. The term is intended to distinguish this type of packaging (a trimmed head of cauliflower, a bunch or two of topped carrots, a pound of snap beans or tomatoes, and the like) from the familiar and conventional use of wholesale shipping containers.¹

The writer has made one change in this description to make it final definition for prepackaging in reference to fresh fruits and vegetables. This change is from "closed" to "often closed". Developments later have shown trays with little or no overwrap to be economical and quite satisfactory. This is particularly true in grapes and bananas.

History of Prepackaging

We have said previously that packaging tends to follow marketing and that marketing, although found in all societies however primitive, appears to be correlated to the degree of specialization and, if you please, the degree of civilization.

¹ Hauck, C. W., Packaged Perishables — A New Industry, address to annual conference of Teachers of Home Economics, Columbus, Ohio, July 12, 1948.
Man's desire for fruits and vegetables is found throughout his history. However, his ability to overcome their characteristics, particularly perishability and climatic requirements, have not been accomplished sufficiently till the last century to permit widespread consumption of fresh produce. Even today, consumption of fresh fruits and vegetables is not sufficient throughout the world.

The ancient Egyptians grew lentils, chick-pea, olives, dates, watermelons, onions, garlic and radishes. The Greeks later grew apples, grapes, figs, olives and onions. Little is written of their international marketing except in a dried state.

Many conquering nations such as Rome imported and exported butter, cheese, fruits, vegetables and poultry from surrounding countries. Usually, however, this commerce was of a limited nature, over short distances, and often in dried or less perishable fruits and vegetables.

The first packages were for protection and for convenience in transportation and/or storage. Outside of the natural cover of the produce, the first package


2 Hunt, Thomas F., Lectures in the History of Agriculture and Rural Economics, Classroom notes, Ohio State University, Columbus, Ohio, 1903, pg. 211.
was probably skins and hids. The Bible tells of goatskins being used as containers. As late as 1921, we were importing crude drugs from Spanish America in horsehides. The Italians and Chinese preserved items such as cheese and eggs in clay and pottery. Unfortunately our historical resources disclose no date for this except many centuries ago. We can presuppose, but with no real degree of accuracy, that this was previous to 1000 A.D. Presumably in this same era of time, the Chinese packed rice in paper cones.

"The Persian traveler, Nasiri Khosrau, on a visit to Cairo in 1035, was astonished to see "sellers of vegetables, spices, hardware, provided with paper in which all they sold was immediately wrapped up, if it were not already." This is probably the first recorded evidence of packaging in paper. "A physician of Bagdad writes in 1140 of the source of the wrapping paper used by the grocers: 'The Bedouins and fellahs search the ancient city of the dead to recover the cloth bands in which mummies were swathed and when these cannot be used for their own clothes, they sell them to the mill which make of them paper destined for the food markets'".

1 Lodian, L., "Foreign Packages in Domestic Trade," Printers Ink Monthly, August, 1921.
2 Ibid., pg. 472.
Not much is recorded of fruit and vegetable packaging until 1850. This is not to say it was not a problem, but the inadequacy of packaging was not such to make it a deterring factor to trade. Most communities were self-sufficing and marketing between distant points was not too prominent. However packaging work went on during this time. We know that even Leonardo DeVinci attempted to invent a package for perishable fruits.

Protective wrapping for overseas shipment was the forerunner of our modern films which not only protect but help sell. Stahl and Vaughan in their early study of pliofilm write that:

"Paper was the first sheet material used in wrapping and was apparently used for packing and wrapping fruit as early as 1856, when its use was reported by Hovey's Garden Magazine (1). In 1859 paper was used as a wrapper on grapes (2) and 1879, oranges shipped from Australia to England were wrapped with paper, but the paper proved inferior to a sawdust pack (3). It was used for packaging figs and peaches in 1879. After this period the wrapping of fruit was more commonly employed but their use of wrappers for protection of vegetables came somewhat later, their use for cucumbers and tomatoes being reported in 1899 (4)."

"In 1885, the original manufacture and use in the United States of vegetable parchment, now universally employed in many branches of the food packing industry."¹

About this period, western apple growers began to box apples and also to wrap apples. For the six years ending in 1899, boxed apples made up less than 5% of the total production of the United States while the six year period ending in 1923 boxed apples made up about 30% of the total. Due to the excellent treatment and care, western boxed apples built up a reputation for quality fruit. Papers were primarily to control scald and help prevent bruising of the western apples but they also helped sell the product.

Powell and Fulton in 1905 reported on "experiment with unprinted newspaper, tissue, parchment and waxed paper wrappers on apples, and found that the fruit wrapper retarded the ripening of the fruit, preserved its brighter color, checked transpiration, protected it from bruising and prevented the spread of fungus. Some wrappers were found to be slightly more efficient than the others."²

Later research deals with the influence of wrappers and impregnation of the wrappers on disease, storage, flavor, color and eating characteristics of fruits and vegetables.

National Biscuit Company in 1899 started the trend away from the barrel or bulk food retailing when they started packaging their crackers in boxes rather than placing them in cracker barrels.

Marketing aspects were also receiving more attention:

"It is a matter of record that the largest apple crop, the largest corn crop, and the largest cotton crop in the history of the Nation have yielded the producers of those crops a less amount of profit than has been obtained in certain years of less production; and it is also known that in those years of enormous crops the prices paid by consumers in most sections have not reflected, in a proper degree, the low prices paid to the farmers. With this knowledge of the facts, what farmer will be encouraged to grow "two blades of grass" when he fails to realize a fair return for the "one blade" which he now grows? It can not be made clear to him that better returns waits on increased production until he feels that present production is fairly remunerative.

To the careful student of the problem it seems evident that it is the lack of an efficient system of distribution and marketing that causes much of the trouble, and it is because of the lack of a marketing plan that the present-day average farming cannot claim to be a business but simply an occupation.

The farmer is himself a manufacturer, but when the manner of selling his product is observed the conclusion is formed that his marketing methods are not worthy of the name, as they consist chiefly of "dumping" rather than of marketing.

Marketing margins were also being analyzed as shown by this excerpt from the 1912 USDA Yearbook:

"A careful analysis of trade conditions indicates that from 33 to 36% of the price which the consumer pays for a perishable product reaches the producer. This must cover the cost as well as the risk of growing, and must also provide the profit on the "know how" and the money invested. About 26% of the cost to the consumer is required for transportation and from 5 to 10 percent for commission. Dealers' profits range from 50 to 100 percent, for it is maintained that every time perishable goods change hands the selling price must double the purchase price in order to meet losses. As the retailer receives the goods, he again adds 100 percent or thereabouts to the cost to the consumer. It is easy to see how high costs necessarily follow such methods of marketing."

In the same article, Mr. Corbett criticizes the wide variation in packages which result in quotation on a basket, hamper or container in one market may mean little in another section.

The U.S.D.A. at this time was advocating close grading, good packaging and shipping in carload lots. Farm cooperatives particularly in perishables grown away from the terminal market were increasing in numbers. A good share of their (coops) success has been in adopting sound marketing methods such as grading, orderly marketing, packing and use of storage.

Agriculture was bothered with surpluses in the period before World War I. Loss of export markets and increasing technology helped supply outstrip demand. Much misunderstanding was prevalent about marketing costs.

A popular cartoon in the Country Gentlemen showed the farmer passing the food through a curtain to the consumer and was entitled "What happens behind the curtain?". Secretary of Agriculture Wilson's Report for 1910 reported that consumers were paying more for things now, but the farmer should not be blamed as he was not getting an exorbitant price for his products. Wilson terminated his discussion of farm prices with "Possibly the trouble was with distribution".

In 1907, Samuel Fraser in upstate New York started using cardboard boxes holding either six or twelve apples. These containers were merchandised successfully through W. W. Hart of New York City. Sometime later Frazer, now vice-president of the International Apple Association, started using egg-cell carrier and cartons for shipping apples to New York.

Reception of the six and twelve apple containers was slow. Charles & Co. of Fifth Avenue, New York City, and others catering to a high income trade were ready for apples in a container with cells of various sizes. Container size varied as did number of individual cells. Cells ranged from 40 to 80 to 120. The apples were sold by count.

The apples were stored in carton, moved to New York by carload where they were placed in storage and distributed from storage. A 14% commission was paid to cover proper handling.

These apples carried a premium price. At one time, in 1923, McIntosh retailed as high as $1.75 a dozen. Mr. Frazer in some cases averaged $4.00 a carton per carload for Northern Spy apples, mainly 80 three inch apples to a carton. However at this time (1910), this was not out of line with prevailing prices.

A Mr. E. N. Loomis had a special trade at this time in Spy sold in barrels with the price ranging from $12.00 to $20.00. These apples were all layered in the barrel and it was from seeing them that Fraser went to the carton and the smaller volume in the container. Mr. Fraser concludes his letter with "There was a market in New York but acceptance of the six or twelve apples had to be developed."

A Rochester, N. Y. cooperative headed up by Mr. Seth Bush and a Mr. Baxter prepackaged potatoes in ten pound bags and half-pecks in 1910. The potatoes were packed in carlot amounts to see whether the market would take them. The fact that the operation did not continue is evidence there was resistance.

In the fall of 1915, the H. C. Shrader Company of 

1 Fraser, Samuel, personal letter, to the author, Washington, D. C., June 17, 1954.
Jacksonville, Florida, packers and shippers of citrus fruit, shipped oranges in a consumer package to the Chicago market. The box was eighteen inches long by 6 inches wide and 6 inches high, with a strap in one end to make a handle. Mr. A. W. McKay, then incharge of the packing house operations, recalls that "During the Christmas market it sold at a premium mainly because several department stores stocked this novelty package. They dropped it after Christmas, and the regular fruit and vegetable trade, who did not like our selling to department stores, bought the few remaining cars shipped at a tremendous discount. There was no question raised regarding the condition or grade of the product."

It is reported that mushrooms were prepackaged as long ago as 1915 when they were packed in two pound climax baskets at the shipping point and sold primarily to hotel purveyers and other wholesalers serving specialty stores in the high income trade."

An article in the June 19, 1953 issue of the Produce News tells of the beginning of the blueberry prepackaging which still flourishes:

"Whitesbog, N. J., June 18 -- Cultivated blueberries were the first produce item to go to market in a transparent prepack film over 30 years ago, and is still benefitting from its 'see-for-yourself' package.

1 Andrew W. McKay, Personal letter from, now acting chief, Cooperative Research and Service Division, Farm Credit Administration, USDA, Washington, D.C., Aug. 10, 1953.
2 J. K. Samuels, Personal Letter, Farm Credit Administration, USDA, Washington, D.C., August 28, 1953.
At the close of World War I, blueberries were still being shipped to market in strawberry boxes lined with newspapers and covered with a square of manila paper. Then the sharp eye of Sidney B. Hutton, manager here for Miss Elizabeth White, pioneer grower, spied a box of chocolates wrapped in a fine strange transparent film.

Tracking the wrapper down to the candy company's home office, Hutton found it was an import and the candy company was willing to divide its supplies with a non-competing item. Thus the first transparent film was used to prepackage fruit.

Since then the industry has shifted to the constantly improving types of plastic film made available by the nation's aggressive chemical manufacturers, but the basic package has not changed since that day and is still a fine merchandising piece that travels well and appeals to the consumer's eye. Only major shift has been from quarts to pints, to fit in with today's smaller-scale housekeeping."

Although not much is recorded of their success or lack of success, some breweries in New York cities at the start of the prohibition era (1920-33) attempted to use their facilities to prepackage potatoes, citrus and other commodities. Since this venture was not continued for a long duration, we could surmise that it was not too profitable.

Mr. Holt, a Maine shipper, in the early 1920's packaged potatoes in five and ten pound cardboard boxes experimentally. The more important development began in Idaho around 1923-25 with potatoes being packed in three and five pound cotton bags. This packaging was expensive and was primarily for extra quality potatoes and
to popularize Idaho potatoes on the eastern markets.

Mr. John M. McCauley of New York City started packing Idaho potatoes in apple box size boxes in New York City in 1922. Potatoes were wrapped in tissue and packed in seven sizes - 60, 70, 80, 90, 100, 120 and 140 potatoes to a box. In order to dispose of the smaller than 140 size Idaho potatoes, which are still a good size #1, he started packing these potatoes in 15# corrugated boxes.

The McCauley Potato Co. continued the 15# box which was pasted top and bottom until 1925. They then added a 25# green dyed cotton bag which was hand sewn at the top with white sewing twine. The 15# carton had been very successful but the 25# sack was only fairly popular. Consequently in 1926, a 15 lb. cotton bag was added. The 15# cotton bag was quite successful. McCauley by 1928 discontinued the 15# carton and 25# cotton bag to concentrate on the 15# bag.

Also in the twenties, a Mr. Tinklepaugh of Livingston Manor, N. Y. was packing in carload quantities apples in 6 or 12 in a small box and then packing these


in a larger container. These were reported to have been sold through A & P of New York City.

An article in the 1925 USDA Yearbook refers discouragingly to consumer packaging which would indicate that some consumer packaging had been done. The resistance by wholesalers is noteworthy.

"The package unit is, as a rule, the size which is most acceptable to the wholesale trade. Attempts have been made, from time to time, to introduce so-called "consumer packages" of fruits and some vegetables. Such attempts have generally failed because it is impossible to guarantee the keeping qualities of a perishable product. A consumer, from long experience realizes this fact and consequently, will not readily purchase fruits and vegetables without seeing them. Unavoidable deterioration which is accepted by the trade as part of the risks of business becomes a very troublesome question when the consumer is involved."

The Michigan Potato Growers Exchange, Cadillac, Michigan, began marketing potatoes in consumer size bags in 1927. "Among the first apple associations to experiment with prepackaging were the Inwood Fruit Growers Association of Inwood, West Virginia, and the Apple Capital Association of Wenatchee, Washington – the former beginning in 1926 and the latter in 1928. Both of these discontinued pre-packaging after a trial period."

1 Fraser, Samuel, Personal Letter, to the author, Washington, D.C., June 17, 1954.
Dr. Rasmussen of Cornell University, a leader of the prepackaging field, writes that "My earlier recollections are that back in 1927 and 1928 we worked unofficially with a number of potato growers in the state on the idea of prepackaging potatoes. At that time, there was already a fair amount of prepackaged onions in the stores."

Maine started packing paper 10# and 15# bags around 1930. McCauley switched from a 15# to a 10# cotton bag in 1931. The first paper bags were weak and the condensation of the potatoes caused much breakage but the 10# size was very acceptable to the consumer. McCauley added the 10# paper bag in 1934 and eventually switched completely due to consumer acceptance, lower bag price and lower cost of filling and typing these bags.

Onions and potatoes in 5, 10 and 15# bags assumed importance around 1935. Large quantities of Idaho potatoes were so packed. This was followed by the "Super Spuds" program of Maine in 1937 which further greatly increased the use of consumer potato packages. By 1938-39, shipping point prepackaging of 10# and 15# bags was fairly wide spread.

1 Rasmussen, M. P., Personal Letter, to the author, September 22, 1953.
2 Hauck, Charles W., History and Background of Prepackaging, Horticulture Marketing Class handout, Ohio State University, Columbus, Ohio, 1948.
In 1932 and 1933, Mr. Gilbert F. O'Brien under the firm name of Maxwell & O'Brien of Worcester, Massachusetts, experimented with a consumer size carton with a visibility window for McIntosh apples. O'Brien devised a two pound carton which proved practical and economical with respect to both packing and retail sales requirements. By 1935, the output was on a commercial carlot shipment and has been in usage ever since.

Meanwhile, mushrooms in consumer-size paperboard boxes had been a familiar item at least since the late 1920's.

About this time came an individual who must be acknowledged in any history of prepackaging. This man, Duncan Rankin of DuPont, not only was the possessor of an agile, inquiring mind combined with an extraordinary amount of energy, but had unswerving loyalty to a concept which made it possible for him to lead in wrapping produce in film. His duties have been mainly with cellophane and DuPont's films but his work has touched all the produce area.

DuPont had obtained the North American right for the French process of La Cellophane, S.A. and began pilot plant manufacturing around 1924. Cellophane was much higher, brittler and just not the same product as we know it today.

Rankin first started his idea by testing cellophane as a replacement for tissue in wrapping fruit with questionable results in 1929-32.

Rankin and DuPont made a study in 1932 of shipping point packaging in Florida. The results were inconclusive and little or no interest by growers or shippers was shown. One product tried was sweetcorn which was shipped to Philadelphia. Lemons were also shipped to Minneapolis.

However, Florida oranges were being shipped north in consumer size mesh bags in 1932. A & P was prepackaging celery in 1931 at Harborside, New Jersey.

Next, "Dunc" Rankin decided that a more practical approach would be nearer the market. An attempt was made to interest some repackers. None of the "name" houses were very interested. One firm, Mike Freeman of New York City, did develop a prepackaging operation to supply some large retail outlets. However, the market response in terms of prices on the New York produce market was too varying and often too low for a small company to stay in the prepackaging game. However, the Freeman Produce Co. continued their brussel sprouts prepackaging and in 1947 was one of the larger brussel sprouts prepackagers.

Rankin also worked with some growers in the east. One of these was Louis Marx of Wolcott, N. Y., a celery grower. Using a cellophane similar to the present LSAT
type, the wrap worked both here and later in Florida. This was the forerunner of the large scale self-wrap of celery, set up by Harry Becker of Detroit, a produce wholesaler, in 1937.

By 1935, Rankin decided the only groups who could supply the outlets, financial support and personnel, would be the chain stores. He could find only one chain that would go along with a full fledged study of central pre-packaging...First National Stores in Boston under the direction of the late B. F. McGoldrich, Vice President. The central packaging house supplied their Boston stores and later the operation was extended to include Hartford, Connecticut and White Plains, New York.

At this time in New England there few if any self-service stores as we think of them today. Most of the stores were 20 foot fronters with a small section relegated to produce. The main problem was to get good produce to the store and to the consumer.

A large scale test of all produce in overwrapped trays, and also cellophane bags was tried. Walnuts, normally stored under refrigeration until the following season, were included as well as cranberries, tomatoes, et cetera.

The immediate results from the firm's standpoint were not too favorable. Walnuts and cranberries were the only two products that showed promise. This appears valid
as both products have adopted prepackaging and benefitted tremendously. This company had set up six stores with self-service produce departments for this study. They were inadequately laid out and ended with unimpressive results. However, First National Stores did conclude that prepackaging was alright for self-service but not service stores.

This project was probably the first where cost and consumer reactions were recorded on an entire produce section with several stores participating. First National ran further tests in 1936 on one store in White Plains, N. Y. to get more concrete data on costs and consumers. Their work at East Hartford, Connecticut brought out a key point -- that refrigeration was essential to the successful operation of packaged produce.

The work also got repackers, retailers and the trade in this area thinking. Those firms who began tests later of their own, now lead the field in New England.

During the thirties, hardware items such as potatoes, onions, apples and citrus fruits were beginning to be prepackaged more and more.

DuPont continued to do some work in prepackaging in Boston with the Stop & Shop, Atlantic & Pacific Tea Company and others.
The biggest project was with American Stores in South Kearney, New Jersey, under the direction of Paul Cupp (now a Vice President of American Stores in Philadelphia). The work lasted from 1938 to 1948, more or less continuously, had little publicity and involved a tremendous amount of work. The broad scope of this ten year project dealt with all phases including how and what to prepackage, the actual measurable value of refrigeration in store layout, ordering techniques, delivery problems, personnel training, management problems involved, production, mechanization, buying, etc.

Two fine publications have come out of this study. One report "Waste and Spoilage Losses in Merchandising Fresh Fruits and Vegetables in Bulk Self-Service Stores" by Donald R. Stokes gives a good overall picture of wastes and costs. The other report was Dr. Bradley's on the refrigeration aspects and problems. A popular version of this appears in the Refrigeration Magazine.

Besides definite records of waste losses and recommendations, Mr. Stokes came to three main conclusions:

1. Prepackaging is not going to revolutionize the produce industry, although there are many indications that more items will be prepackaged either at the production point or in the terminal market. Consumers seem to like prepackaged foods generally; hence many retailers are interested in extending self-service to their fresh produce departments.
2. Prepackaging and refrigeration are effective in reducing losses due to waste and spoilage, and in lowering costs of servicing customers. It aids in preserving product quality that reaches the final customer.

3. Roughly, packaging costs per retail unit of 1 to 2 pounds amount to 1.5% for packaging material and 2% for packaging labor or approximately 3.5% or 10% of price. From this, loss and spoilage reduction, savings in retail labor and possibly higher price the consumer will pay must be subtracted to obtain true differences.

Many firms were pioneering in prepackaging in this era just before World War II. None of these firms had a complete line of prepackaged items and their prepackaging operation must be typified as experimental with many ups and downs. Among the leaders were Suffolk Farms and Farmer Brown in Massachusetts, Aunt Mid in Chicago, Sunny Sally in Los Angeles, Lee Duvall in Baltimore, Crossett Brothers in Cincinnati, Art Romp, Cavalier, Culling and Wilson in Cleveland and many others who were pioneering to find out how best to do the job and also working for trade and consumer acceptance. Potatoes, onions, citrus fruits, apples, spinach, kale and salad mixes were the most common prepackaged items.

Cranberries were prepackaged during this period with excellent results. Spurred on by Atlantic Commission Company, the advent of prepackaging gave the cranberry industry a better price and competitive position.

In 1939-40, DuPont's main interest switched to packaged meats, because of the lack of conclusive results with produce and lack of interest by the produce trade.
As we will see later, prepackaging of meats was to become more commonly accepted than produce prepackaging. The time was not yet ripe for produce prepackaging. World War II brought a mixture of complications. Films and containers were so scarce that prepackaging work slowed down drastically. Conversely though, it brought new interest to packaging and probably more progress was made in the forties than any other period. Self-service stores became more plentiful. The American scene showed more buying power per capita, more women working and added emphasis on leisure time and services. Pliofilm, polyethylene, seran, cellulose acetate and other films were being produced more and their value proved although mainly in military service. The actual shortage of packaging materials brought more interest, new approaches and emphasized the value of packaging.

In the later years of the war, a group of interested individuals from the Great Atlantic & Pacific Tea Company, Atlantic Commission Company, Hussman Refrigeration Company, DuPont, Ohio State University, Ohio Boxboard Company, the Food Machinery Corporation, and the Oliver Machine Company, met to initiate a project which is considered a milestone in prepackaging -- the Columbus Experiment.

The leaders in this project were of the highest type. They included Dr. Charles W. Hauck, often called the father
of modern prepackaging, of Ohio State, Mr. Rankin of DuPont and R. E. Gray and Frank McGeough of A & P. Mr. McGeough and Gray were men of vision, research temperament and produce experience that helped see the experiment through.

The basic goal was to scientifically test the pre-packaging of all items in a produce section and all prepackaged items were to be kept under refrigeration.

The project had its tribulations including the difficulties of developing machines that could prepackage items acceptably, obtaining high quality produce to pack, and finding a warehouse with water and sufficient room to work in.

The project started in operation in 1944, with merchandise coming into the warehouse in conventional shipping containers, washed and trimmed, then packaged in transparent film, usually moisture proof cellophane in consumer units, machine labeled, coded, price-marked and then cold storaged for later delivery to retail stores where they were sold from open-top, self-service refrigerated cases. Items were kept under refrigeration from the time they arrived in the mechanized, air-conditioned packing room till they were sold from the 40 to 43 degree show cases where the consumer purchased them.

This Columbus, Ohio experiment besides stimulating prepackaging in general showed that prepackaging combined
with refrigeration could (a) save half the usual distribution loss on some items (b) save labor, (c) lengthen shelf life of produce and (d) receive good consumer acceptance of prepackaged produce.

Careful records in one supermarket revealed that necessary trimming, handling and reconditioning in the conventional produce department resulted in losses and damages like these: beets, 36.1 percent by weight; cauliflower 32.3 percent; head lettuce, 20.4 percent; broccoli, 14.8 percent; and thus on down to the so-called hardware items like apples, potatoes, dry onions and citrus fruits which showed smaller losses, in some cases less than 1 percent. The average over a range of commodities was in the neighborhood of 30 percent. In contrast in retail stores handling prepackaged perishables under refrigeration, losses were found to be negligible. Little or no reconditioning, markdown or throw outs had to be done on the retail losses. Since the trimming and preparation processes amounted to about 15 percent, you could say that wastes or weight losses were diminished approximately 50 percent.

One thing that enters in is that losses in prepackaging sometimes are inedible, stems and leaves that would be left under normal bulk handling for the housewife to later remove.

The Columbus Experiment gave the prepackaging industry a big impetus. The Saturday Evening Post and various other nation-wide magazines had feature articles on the "experiment". A movie was made by a representative of the big western grower-shippers.

Members of the trade were interested both in the methods, point of and acceptance of prepackaging. One of the big questions was a matter of costs. Was prepackaging an additional cost or a different cost? There is not much data released on this. However, consumer acceptance and reduction of waste was excellent. The A & P sales of sweet corn increased three times over. Spinach which had been refrigerated and prepackaged was still 90 percent salable after five days while unrefrigerated bulk spinach after the same length of time was completely unsalable. Prepackaged cauliflower remained 100 percent salable after five days; ordinary cauliflower, unrefrigerated, was only fifty percent salable after five days.

Although not the starting place of prepackaging, the Columbus Experiment must be recorded as a milestone in prepackaging history. It could well be called the turning point to modern prepackaging.

The post-war period brought forth many films, materials and machinery that heretofore was reserved for the
military. Central prepackaging in receiving markets began to grow again and since has reached large proportions. Refrigerated self-service sales and display cases became more common on the retail level. Grower-shipers, packaging manufacturers and various members of the trade expanded their prepackaging activity to better serve the consumer.

Although some work had been done on potato baggers in the thirties, there were few if any acceptable machinery up till the forties. Proper bag closing, satisfactory packages and high-speed machinery were slow in coming. Most prepackaging operations up to 1940 were mainly hand operations. Packaging materials and machinery were necessary for mechanization and low cost operation. As prepackaging acceptance became more common, this problem was solved.

Although prepackaging grew rapidly in this period, it must be recorded that while the trend line might be up; there were many ups and downs with some firms dropping prepackaging entirely and many firms dropping prepackaging in some commodities. Just what to prepackage, how to prepackage and where to prepackage was still in the experimental stage. Materials, machinery and films were still in the experimental stage, and still being improved. The plastic films such as pliofilm, modified cellophane and polyethylene with their various characteristics of resistance to moisture and permeability to gases helped in
packing certain food products. The fickle Mrs. Consumer’s desires and education was a matter of no little concern. Along with the finicky Mrs. Consumer must be classified the reluctant produce trade particularly wholesalers and small retailers whose resistance to change at times was incalculable.

The passage of the Research and Marketing Act of 1946 (Hope-Flannigan) stimulated research in consumer packaging. This act was to help the farmer and the nation by aiding the farmer by market research rather than government production controls. All major agencies of the U.S. Department of Agriculture, several private companies, many land-grant colleges and state agricultural experiment stations have made economic and/or technical studies of prepackaging with the aid of RMA funds. Among the state institutions (usually in their horticultural or agricultural economics departments) aided in experimental prepackaging work were West Virginia, Washington, Purdue, Ohio State, New Jersey, Minnesota, Michigan, Maryland, Louisiana, Florida, Cornell and Connecticut.

The Western Growers Association, with A. L. Martin as director of research, climaxed experiments of several years on prepackaging with several carlot shipments of prepackaged vegetables from the west coast to eastern markets in 1947. The same year, the Florida Vegetable
Prepackaging Council came into existence and has had a continuing experiment program going in cooperation with the University of Florida and the U.S. Department of Agriculture.

Perhaps no one thing has stimulated the fresh fruit and vegetable field as has the frozen food industry. In January, 1952, the two leading fresh produce organizations united into one organization. Practically all press releases of this merger gave due note to the inroads of frozen foods and plans of better merchandising, prepackaging, less spoilage, better sanitation, less price fluctuation and less speculation to combat their adversary. A campaign of a voluntary assessment of fifty cents a car from both shipper and receiver are now being carried on to obtain a war chest to advertise and do research on the merits of FRESH fruits and vegetables.

Seven years ago, this lusty infant industry reached the point where a monthly periodical was started to deal exclusively with prepackaging matters. Pre-Pack-Age began publication in September, 1947. The first editor was Ralph David, later succeeded by Robert Cooper. Both men also served capably as secretary of the Produce Prepackaging Association.

In 1948 and 1949, national meetings were held in conjunction with the National League of Wholesale Fresh
Fruit and Vegetable Distributors, and in 1949 with the Packaging Institute, where prepackagers, related commercial interests, research workers and others members of the trade exchanged experiences and ideas. As an outcome, the Produce Prepackaging Association was founded. It now furnishes leadership and serves as official spokesman for the industry. The first Annual Conference and Exposition of the Produce Prepackaging Association was held in Columbus, Ohio, in April, 1951.

The Produce Packaging Association was and is a clearing house for disseminating all produce packaging information and at the same time solving mutual problems of interest throughout the industry. The industry had been hurt due to the many problems inherent in starting a new process, lack of proper information and by some persons looking for quick gains who prepackaged poor quality produce during the "black market days" of the 1940's.

To bring the history up to date is beyond the scope of this chapter. So much has happened, particularly since the end of World War II, it is difficult to be abreast of developments.

Many of the old problems linger on such as what to prepackage, where to prepackage and how to prepackage. There is still debate on what the consumer desires and whether prepackaging is an additional cost or a different
cost. The intricacies of the various commodities, markets and trade channels still need further empirical studies.

However, the atmosphere has changed considerably. We are no longer talking only about views and probabilities but actualities as this pioneering has been going on. Pre-packaging is no longer considered a flash in the pan but has proved its worth with many commodities under various conditions.

Prepackaging has not taken over 100 percent of all fresh fruits and vegetables sold as some early advocates predicted. But it is no longer a big corporation's plaything; it has made the grade.

Not all answers are known by any means. Much research remains to be done. Carrots - a product which in 1950 was said to have no prepackaging possibilities - is having a shift in its demand curve when prepackaged through increased sales and prices. In some fields, there is transition on the point of prepackaging. In Ohio, apple prepackaging appears to be moving back from the retail store to the grower. The same shift has happened in potatoes and dry onions to some extent. Some west coast writers are predicting lettuce, radishes and carrots to follow. This shifting of the point of prepackaging brings not only technical problems but also other questions including who absorbs the cost and also will margins vary.
It is a field in transition - innovation in a dynamic society in action. Change is going on as well as it probably will for many a year.

The extent of prepackaging was over three billion pounds of fresh fruits and vegetables in 1950 on the wholesale level. This resulted in a saving for the country of 167,000,000 pounds of food which would otherwise have been wasted, the saving of 17,000,000 man-hours of labor and direct saving of 7100 rail cars or their equivalent which would have been necessary for the transportation of fresh produce items. This prepackaging job took 12 million pounds of flexible, transparent film, 50 million pounds of paperboard, 201 million mesh bags, and 17 million paper mesh window bags.

The accompanying table for 1952 shows approximately 4,225,500,000 pounds of fresh product prepackaged at other than the retail level. With the exception of kale, cranberries, carrots, spinach, mushrooms, tomatoes and limes, the figures to be more realistic and to include the retail level would probably have be multiplied by a factor of at least four. The figure for onions, potatoes, lettuce and apples is particularly low.

The figures are hard to ascertain with accuracy or for agreement, but prepackaging is no longer a concept in

1 Data from the Produce Packaging Association.
the back of the mind of a Hauck or a Rankin or a Cupp but a tangible reality whose conception has become a reality but the potential has not yet been fully realized.

We have seen the inception of this innovation. The growth and development of this modern merchandising technique as it applies to a basic agricultural product group - fresh fruits and vegetables - is still going on and will probably continue just as the molecules and atoms are moving around you. It is a dynamic area with no final chapter in sight.
Table 3

VOLUME OF SOME MAJOR PRODUCE ITEMS PREPACKAGED IN THE UNITED STATES 1952 (In millions of pounds)

<table>
<thead>
<tr>
<th>Item</th>
<th>Approximate Fresh Consumption</th>
<th>Estimated Prepackaged Including Retail</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>Above Retail Level</td>
</tr>
<tr>
<td>Asparagus</td>
<td>208.0</td>
<td>3.0</td>
</tr>
<tr>
<td>Broccoli</td>
<td>30.4</td>
<td>2.0</td>
</tr>
<tr>
<td>Cauliflower</td>
<td>438.0</td>
<td>2.0</td>
</tr>
<tr>
<td>Sweet Corn</td>
<td>750.0</td>
<td>12.0</td>
</tr>
<tr>
<td>Kale</td>
<td>12.0</td>
<td>10.0</td>
</tr>
<tr>
<td>Onions</td>
<td>1,800.0</td>
<td>100.0</td>
</tr>
<tr>
<td>Potatoes</td>
<td>16,700.0</td>
<td>1,000.0</td>
</tr>
<tr>
<td>Spinach</td>
<td>273.7</td>
<td>200.0</td>
</tr>
<tr>
<td>Tomatoes</td>
<td>1,713.0</td>
<td>1,000.0</td>
</tr>
<tr>
<td>Mushrooms</td>
<td>30.0</td>
<td>17.0</td>
</tr>
<tr>
<td>Carrots</td>
<td>1,500.0</td>
<td>500.0</td>
</tr>
<tr>
<td>Celery</td>
<td>1,230.0</td>
<td>150.0</td>
</tr>
<tr>
<td>Lettuce</td>
<td>2,075.0</td>
<td>50.0</td>
</tr>
<tr>
<td>Salad Mix</td>
<td>50.0</td>
<td>50.0</td>
</tr>
<tr>
<td>Cole Slaw</td>
<td>50.0</td>
<td>50.0</td>
</tr>
<tr>
<td>Apples</td>
<td>3,677.0</td>
<td>100.0</td>
</tr>
<tr>
<td>Cherries</td>
<td>72.0</td>
<td>2.0</td>
</tr>
<tr>
<td>Cranberries</td>
<td>75.0</td>
<td>45.0</td>
</tr>
<tr>
<td>Lemons</td>
<td>600.0</td>
<td>25.0</td>
</tr>
<tr>
<td>Limes</td>
<td>13.6</td>
<td>5.0</td>
</tr>
<tr>
<td>Oranges</td>
<td>3,400.0</td>
<td>900.0</td>
</tr>
<tr>
<td>Peaches</td>
<td>2,000.0</td>
<td>1.5</td>
</tr>
<tr>
<td>Plums</td>
<td>150.0</td>
<td>1.0</td>
</tr>
</tbody>
</table>

1 and 2, Source - Prepackaging Produce Association. 3 Estimated by the writer.
Chapter III

Prepackaging of Products Other Than Fresh Fruits and Vegetables

Prepackaging is not relegated to the field of fresh fruits and vegetables alone. Its present greatest success and probably its largest future is in other segments of marketing. This chapter is included only to give the reader a cursory view of prepackaging in operation in other areas.

As pointed out previously, prepackaging is an extension of self-service. Self-service retailing is akin to mechanization in production. Besides probably selling more per customer, it entails increased labor efficiency, lowers labor costs, maximizes use of floor space, increases turnover of stock and turns over capital, goods and space in a shorter time than conventional retailing. This similarity of marketing to production is typical rather than atypical. Although often divided into different theories, marketing and production are not mutually exclusive. The methods of Frederick Taylor with his scientific analysis and cost control originally introduced into manufacturing has been readily accepted by the distribution field. Distribution through various mediums such as cost accounting, fork-lift trucks, one story
warehouses, integration, etcetera is constantly attempting to reduce costs.

Automatic Merchandising and Mass Distribution

Automatic merchandising is said to date back to Hero of Alexandria who concocted a device for dispensing a measured quantity of holy water. The United States public in 1949, according to Nystrom, purchased over one billion dollars worth of items ranging from penny candy to nylons through automatic selling machines. It is questionable if completely automatic selling would increase to over six billion dollars in the next decade in the United States. However, marketing through the super-marketing concept including self-service, prepackaging, low cost operation and rapid turnover, is making use and will probably expand the use of semi-automatic and automatic methods of merchandising to efficiently compete.

"One of the fundamental conflicts in our economy arises from the contradiction that we have achieved mass production in the making of goods but neither the spread of purchasing power nor the efficiency in distribution to make mass distribution a reality. And one of the underlying drives in the process of change in the channels of distribution is this effort to achieve mass distribution."


Mr. Lebow's comments may be slightly pessimistic today in 1954 but his analysis is still appropriate.

Prepackaging as a means of reducing cost per sale relative to direct sales, unitizing and packaging is receiving much consideration in all lines of retailing.

A present day tendency is for a retailer to take on items that have a higher mark-up excepting items that require technical selling, bulky or easily damaged items, and items of style and fashion. It has been estimated that 10% of the gross of food supermarkets comes from non-food items. Over sixty percent of the dentrifice sold now is sold through food stores according to the drugstore trade. This "borrowing" started some time ago as trade was won away from the general store; drugstores borrowed from candy stores and tobacconists; supermarkets borrowed from the department store, variety stores and others. Now department stores and others are adding food items. Magazines and books are outstanding examples of goods whose distribution channels have changed radically.

Department stores offer a fertile field for pre-packaging. The Merchandising Division of the National Dry Goods recently reported that "Retailing is currently entering a period of development characterized by pre-packaged selling." The author questions that self-service
will ever completely take over department stores but that a type of semi-self service will prevail. Certain sections probably can never get away from personal selling. Montgomery Ward & Company is experimenting with completely prepackaged merchandise and checkout counters. They plan to use this system however only at the busier times of the store week. Some stores such as Bombergers of Newark, New Jersey and Wieboldts of Chicago have completely self-service departments.

Allen M. Smith of the J. C. Penney and Co. states that prepackaging will increase in all types of retailing particularly department stores. He goes on to make the point that this will entail often preticketing, better packaging, and more precise standardization and grading by the manufacturer for the best results. (This is in line with observations of food chains that they would like to become more nearly "straight merchandisers".)

Drug stores have already accepted prepackaging to a degree in most stores. Some chains have complete self-service stores. Walgreen's, for instance, has super drugstores with 22,000 items and checkout counters.

Variety stores have followed the trend. The majority have prepackaged some items. Grant Co. and the Kresge Co. are experimenting with self-service and checkout counters. Practically all variety stores have
expanded their lines of merchandise and increased their price ranges. W. T. Grant is now experimenting in some cities with major appliances such as refrigerators and television sets.

According to a recent survey by National Cash Register, hardware stores could easily benefit by pre-packaging and self-service. The number of self-service hardware stores is only about 5,000 or less but the trend is increasing. Prepackaging and semi-self-service in hardware stores are more prevalent than self-service completely and are quite commonly accepted.

Prepackaging of Farm Products Other than Fresh Fruits and Vegetables

Despite the publicity and work done in the prepackaging of fresh fruits and vegetables, many other farm products are probably using prepackaging to better advantage. There are numerous reasons for this including differences in perishability, refrigeration and handling required, unit cost of packaging in relation to the unit's retail value, areas grown and consumed, integration in the industry, nature of marketing channels, transportation involved and resistance to innovation.

Red meats were consumed at a per capita rate of 148 pounds in 1953 in the United States. Like most farm products, retailing was the largest cost between the farmer
and the consumer. Many think prepackaging will be more accepted in the meat industry than in the produce industry. Meats like fresh fruits and vegetables have various degrees of consumers acceptance and, also like fresh produce, are "customer attractors" for the individual retail stores.

Some meats such as hams and stuffed meats are almost naturally prepackaged. The first storewide attempt to prepackage meats, known to the author, was the Hudson Bay Company in Winnipeg, Manitoba, Canada in 1923. Cellophane imported from France was used to wrap meats which were then sold by service clerks. Mr. Donaldson, manager of the above mentioned experiment, induced Mr. Frank Parsloe of the H. C. Bohack Company, Brooklyn, New York of the feasibility of the plan. In 1929, Bohack was using a central plant to serve prewrapped meats to over fifty stores. Inadequate wrapping materials, improper refrigeration and display equipment, high percent of returns to the main plant, and lack of knowledge of meats by the clerks were the main contributing factors to the failure of this plan.

According to Nelson Allen of DuPont, the first transparent flexible film packaging of meat was done around 1925. The wrapper did give packer identification but it was unsatisfactory due to the fact it was not moisture proof and self-service cases then employed had a high humidity. The Great Atlantic & Pacific Tea Company in the early thirties conducted experiments in prepackaging meats but discontinued them due to poor wrapping materials and inadequate refrigerated show cases.

HyGrade Food Products Corporation in 1933 experimented with pre-cut meats in cardboard bread trays overwrapped with cellophane using a bread wrapping machine. Technical and managerial difficulties forced the abandonment of this project.

The Canadian Loblaw chain in 1935 merchandised meat experimentally with a display top and stock drawers below but the refrigeration was inadequate.

The Sanitary Grocery Company of Washington, D.C. merchandised successful rolled roast in cellophane. As common in retail innovations, other stores soon copied this development. Legs of lamb were next wrapped in cellophane. Chickens were prepackaged and merchandised from service cases in 1940.

An old fish and delicatessen case was the first operational self-service meat case. Employed at the
A & P store at 468 Center Street, Jamaica Plains, Massachusetts, the case sold 1400 packages in the first week of operation. A thirty percent increase in volume was achieved with no additional labor cost.

The emergence of two innovations - moisture resistant cellophane and refrigerated show cases - aided meat prepackaging. Progress was slowed due to packaging materials being in short supply from 1940 to 1948 and 1950 through 1952. It is interesting to note that the refrigerator men assigned to the problem of developing a satisfactory refrigerated self serve show case thought it an impossibility at that time.

Empire Markets in Schenectady, New York opened in 1941 a self service meat department. Caler's followed in 1942 with a self-service department in one of their Los Angeles markets. There were ten complete self-service meat stores in 1944, 178 in 1948, 878 in 1949, 1983 in 1950, 3972 in 1951 and 5363 in 1952. The trend is apparent although semi-self service will probably prevail.

This data is taken from Fifth Annual Service Report on Self Service Meats, Armour and Company, April, 1952. This report was probably assembled by Mr. S. Tietelman, Mr. W.S. Shafer and associates. All other data, unless otherwise noted, about prepackaging of meat is derived from the excellent Meat Merchandising - Self Service Meat Manual, Meat Merchandising, Inc., St. Louis, Mo., 1949, pg. 9-12.
for quite some time. It is interesting to note that the Progressive Grocer although not giving all credit to self-service stated that the 3,000 or more independent stores with self-service meat departments in 1942 reported a gain of 21.8% over the previous year. Sales for all independent stores increased 8.1% in the same period.

There are many unsolved problems in meat prepackaging including point of prepackaging, spoilage, discoloration of meat and package, mechanization and involved investment in prepackaging, unionized labor resistance, and properly filling consumers wants according to size and quantity.

Mechanization is becoming more common in all self-service meat stores. Band-saws and sealing irons are standard equipment. Manufacturers are working towards a machine that is adaptable to prepackaging meat in a small shop.

Much pressure is being brought on meat processors to prepackage all meats. Besides changing of where functions are performed and resultant changes in margins, 1


2 Although many factors are involved, this may give credence to the concept of windfall gains going to the innovator. A further examination of this phenomena over time might be fruitful using Paretian rents and Marshall's quasi rents as models.
this would bring up many new problems including ordering, spoilage, discoloration and returns. This would probably aid the small retailer however. Packers are now commonly prepackaging bacon, frankfurters, smoked butts, luncheon meats, dried beef and pork sausage. Central prepackaging may occur at a stage between the packing house and local store. One large film concern is presently attempting to get some large chain to start a central prepackaging operation for all its retail stores within a division or locality.

Frozen meats are another possibility for increased use of prepackaging. Frozen meats, presently a small proportion of total meat sold, will probably increase but the extent is difficult to predict.

Dairy products have been prepackaged by the processors for some time. As milk is now practically 100% prepackaged, we can look for little increase here. Types of containers and dispensers as the two quart paper container or gallon jug will effect milk sales. Cheese is being prepackaged both at the processor level and the retail level. Cheese is often sold sliced and in various weights.

Consumption of eggs and poultry meat in the post-war period has increased much faster than our population, and faster than the output of any other major livestock
product. The consumption of poultry meats has practically doubled in the last twenty years. Surveying trends in our eating habits, eggs have increased percentage wise per capita more than any other major farm commodity. No little part of this increase has come from the wise use of proper marketing techniques. Prepackaging, refrigeration, grading, storing, cutup poultry and producing the products the consumer desired have aided. Packaging of eggs, poultry meats and meat parts have become rather common.

Horticultural specialities, only about 2% of the gross farm income, have a relatively unexplored marketing field. Prepackaging is being used to a small degree in cut flowers and even less in potted plants. Flower pre-packaging may well open new methods and channels of marketing particularly in tapping the mass market in other than holiday seasons.

Prepackaging in an innovation that fits into modern merchandising trends and is not relegated to only the fresh fruits and vegetables fields. Prepackaging's greatest use will probably not be in the field of fresh fruits and vegetables.


2 Ibid, pg. 21.
CHAPTER IV
Economics of Prepackaging

The Environment

The United States today, with a working force of over sixty million and a gross national product well over three hundred billion, is probably the wealthiest country in the world's history.

A great deal of this success is because of the high type of cooperation between man and man and between man and nature. The U.S. has adapted to nature and also adapted nature to work for man's best interest.

Rostow and others have placed the ability to adapt and amenability to change as a principle criterion to measure a civilization. Change in the United States has become so common that it has been reduced to routine. Economic progress is not only desired but expected.

One Englishman has said that "The world is swiftly and surely moving into a new Era, the avowed object of which will be to use all its resources, both mental and material, in a deliberate and concerted effort to increase and maintain the standard of living of the ordinary man. Everyone is concerned with the idea of planning internationally, nationally, regionally and industrially. But the idea must go much further than that if the world's new ideal is to be attained. It must go right down to

---

the design of the ordinary products of human consumption.

Hitherto this has been largely a matter of tradition or of adaption to meet supposed popular taste or the exigencies of competition. What we need for the world is a policy of scientific adaption to need.¹

It might be said that the United States has probably come farther in adapting science and resources to needs and desires than any other country.

The 20th century if it can survive its bloody international struggles may well go down into history as an era when the wants of human beings were met by a higher plane of living than heretofore thought possible. Economic progress, we contend, will make this possible for all areas and men. (Economic progress as used here means the application of better ways of doing things to satisfy our wants.)

The U.S.A. is today in an opulent period. This opulence is at times confusing and misunderstood. The large amounts of services, advertising, product differentiation, and salesmanship common in today's U.S. commerce as non-price competition would be a victim in a subsistence economy such as central Africa or China.

Packaging itself is one sign of the level or maturity of our economy. Packaging tends to keep pace with

¹ Tennyson, Sir Charles, in a foreward to "The Missing Technician" by John Gloag quoted on pg. 3 of "Planned Packaging", by Harry Jones, London England, 1950.
marketing and marketing in turn reflects the civilization of which it is a part. Irwin Wolf says "The package is a fingerprint of our modern world and identifies it unmistakably. Modern economy, mechanical efficiency, modern use of materials, new use of materials, new developments in commercial art - are all reflected in the packaging of our product." ¹

Although we are generally characterized as a democratic capitalistic economy, the U.S. economy does not closely approximate the perfect competitive model of the classical mode. ² Although the largest possible product at the lowest possible price is probably not being produced; there are few Americans who think a return to the perfect model would appreciably increase the national product.

Innovations

No little part of the progressive nature of our economy comes from innovations. Schumpeter based his theory of business cycles on innovations. Few if any business cycle theorists ignore innovations.

¹ Wolf, Irwin D., Progress in Packaging, American Management Association, New York, N.Y., 1944, pg. 1

"An innovation may consist of: (1) the introduction of a new product; (2) the introduction of a new method of production for an old product (either by new machinery or by a previously untried method of organization of the factors of production); (3) the opening of a new market; (4) the development, or acquisition of new sources of raw materials; (5) a substantive change in the organization of business." ¹ Another description of innovations is any change in the factor(s) or any new combinations of the factors whether quantitatively or qualitatively, which alter the supply or demand curve and hence the equilibrium of the firm. Innovation is not only the application of inventions or technological discoveries which are called "induced" innovations. The discovery of how to make cellophane was an "induced" innovation. The prepackaging of fresh fruits and vegetables in cellophane is an innovation which was dependent upon the "induced innovation" of cellophane manufacturing. Innovations are always changes introduced by the firm itself. Schumpeter defines innovation in 3 ways - in terms of product functions, in terms of the laws of physical returns, or in terms of marginal costs. Triffin thinks of innovation as a change either in the product function or type of product. Any

change in the product function is an innovation, no matter whether the change is a pioneering one, implying qualities of entrepreneurial leadership, or whether it is only a tardy imitation of what others have put into practice. Each innovation modifies the profit opportunities attached to a firm or rather creates a new firm provided with profit opportunities of its own. The motives for innovation are to create profit opportunities and innovation may be linked with greater efficiency of production, a higher quality product or with the achievement of a monopoly position affording a larger degree of price control.¹

Innovations are generally thought of in a production sense and usually as a lowering of the cost curve. Innovations do enter into marketing. The innovation may shift the demand curve either to the right or the left. Although it may increase the cost, gross returns will increase sufficiently that profits increase. Innovations can increase supply, decrease cost and/or reduce risk.

Resistance to Innovation

Resistance to innovation may be for a number of reasons - cultural lag, custom, inability to take advantage of any increased productivity, abandonment of existing facilities, resistancty by factors, imperfect competition.

consumer resistance and lack of perfect knowledge.

In prepackaging of fresh produce, practically all of these reasons are present in one form or a variation. There is particularly a lack of knowledge of true costs or true demand schedules. Margins are relatively fixed with great reluctance to alter. Members of the trade are hesitant to alter functions performed. A great responsibility is placed on consumer acceptance which is based generally on scattered observations and what the trade will take rather than scientific studies.

Modern business is more interested in products that add products not products to be substituted for existing ones. Corporations are concerned greatly with diversifying.

There is also a great desire for liquidity. Hence, concerns do not welcome abandoning facilities or increasing investments that do not pay out in a relatively short period of time.

Innovations in the retail trade are easily observed, and hence, copied by other firms. Manufacturing firms through secrecy and patents often are able to maintain advantages arising from innovation longer than retailers. In theory, innovational profits are imputed and computed away. In practice, much doubt would be levied on the statement if the word "imputed" was omitted. Others would say that the speed of innovations is such in the retail food trades that the innovator does not maintain a
monopoly position long enough to be rewarded successfully.

With a kinked demand curve or an inelastic demand curve, a firm may not desire a cost-lowering and/or an output increasing innovation.

Many innovation resistance problems are similar to those found in the risk and uncertainty field.

Many items that have been technically and economically proved by scientific methods are still not fully accepted or fully rewarded.

William C. Crow of the USDA advocated for many years one-story warehouses for more efficient handling. It was not till the USDA constructed such a warehouse that the trade became interested. Today, one-story warehouse are quite common.

The meat type hog has been bred to near perfection but his true worth and proper value returned to the farmer is still quite controversial.

Various farm groups and the Tennessee Valley Authority have attempted for decades to have high concentrate fertilizer produced. This would cut down on transportation and handling charges. A Mr. Williams of the Minnesota Farm Supply Cooperative has invented a "gandy spreader" so that the individual farmer can mix his fertilizer in the field to the exact proportions for the crop, ground and weather conditions. Yet, fertilizer is still sold in relatively low concentrations.
Resistance to innovation may delay the innovation for an indeterminate time interval or indefinitely.

**Economics of Prepackaging**

Many changes in the U.S. appear to be revolutionary but actually are evolutionary in character. There are few recorded histories of a radical change in the American marketing picture but rather a slow, experimenting, often reversing transition. Many principles are known that could be used in production but till consumer acceptance, favorable long range expectations, trade acceptance and other factors become amenable to change; the transition will be slow and perhaps nil in the short run.

When the National Biscuit Company in 1899 started packaging for the first time in consumer units, they started an evolution which sounded the death knoll of the retail merchandising of flour, crackers, pickles, salt and other commodities in barrels.

It was the beginning of the evolution of prepackaging, packaging machines, brand merchandise and self-service. The evolution was not as rapid as the younger generation might surmise. Crackers were still sold in the barrel in certain localities in the 1930's. Butter was sold in bulk from as late as 1940 in some Chicago groceries.
The evidences of packaging are all around us. The modern self-service store selling $10,000 weekly of groceries will sell approximately 40,000 packaged items. Packaging's importance has lead one expert to say that "Packaging is to mass distribution as automatic machines are to mass production." 1

"There have been various articles written on the services rendered by packages. But nothing of any consequence has been published about the costs of packaging." This is an excerpt from a study made by the University of Pennsylvania entitled "Bulk and Package Handling Costs" about alternatives in handling rice. With the exception of the USDA studies, this comment made in 1944 is almost equally valid in 1954.

This widespread adaption of a concept is not atypical but is rather typical of marketing innovations. We know from case histories that the "innovator-imitator" principle is followed in practically all American industries. Competition practically forces imitation or new innovations.

Yet, it is doubtful that the National Biscuit Company started and maintained an innovation that incurred more additional cost than it added in return. Any added item or service to continue for a long period must prove in

1 Berlin, Datus W., "Packaging Considerations in Converting to Self-Service", A.M.A. Packaging Series #41, New York, N.Y., 1953 pg. 44.
the crucible of the market place through consumer acceptance and price that its marginal revenue exceeds or equals its marginal cost.

Perhaps the advantages of packaging are so apparent that no studies of long duration are needed. It takes no logician to ascertain that packaged merchandise fits in with our marketing system and that the American public does not desire quantities as large as a barrel, hundred-weight or a tub.

The problems of cost of packaging and prepackaging is further compounded by the variations in packages and the various purposes of packaging. A good consumer package should have - consumer appeal, strength, durability, protection for the product, impulse sale ability, brand identity and, if possible, reuse value. The package is no longer just for protection, convenience in storage and transportation but is a key item in merchandising. The package in the self-service store must sell itself by attracting attention and helping build consumer sales.

Food industries made a survey of food manufacturers asking them what factors determine the selection of product containers. The following factors were mentioned in order of importance - appearance, display value, price, breakage, packing labor, moisture resistance, weight, size, shape, grease resistance, possible reuse by
consumers and quality.

Packaging is not only a production cost but a selling cost, particularly advertising. It is difficult to precisely and objectively evaluate joint costs and in this case the utility and costs of these various functions of prepackaging.

In dealing with the contrast between prepackaging and bulk, you are shifting the point of services and not eliminating a service. Most produce will probably be packaged regardless. This eventually may bring in the problem of whether the concerned parties are able to pass on the costs or must they absorb the costs. What might be an additional cost to the grower prepackager, might have little or no effect on total cost or business as a whole.

It is impossible to specify unique combinations of institutions and conditions that will maximize social welfare. Generally we consider certain principles as being desirable for the general welfare; although we may not carry the principles to "nth degree. Efficiency is one of the principles. Consumer demand may bring forth utility creation of questionable nature. However, efficiency in fulfilling the demand is generally considered desirable. Cutting and washing kale might well be done by housewives but the use of mechanization in doing this chore by the prepackager would be considered an efficient
method and desirable if consumers desire this service. A good or service has economic value if it is significant in directing human economic activity.

In this chapter, we consider economics as the management or science of management of the resources of a community, etc. with a view to productiveness, maximizing welfare and avoidance of waste.

In dealing with all products classified under fresh fruits and vegetables, the writer is inevitably lead to generalization. But, if the peculiarities of a particular commodity and of its marketing structure are not taken into account, serious error is liable to result.

We have already made the assumptions that the effective demand through the market may motivate the entire business system and that a good or service has economic value if it is significant in directing human economic activity. Although prepackaging may be only a shifting of where services are performed, and may result in an increase in the cost curve; if its marginal utility as reflected through the marketplace by a shift in the demand curve is sufficient to cover the additional cost, prepackaging would be considered desirable in a democratic capitalistic system.

The following list of advantages and disadvantages are the deductions of the writer after reading numerous articles, mainly case studies, and after conferring with
members of the produce trade on all levels. There are case studies that would tend to verify these remarks. But due to the dangers of generalizations, frequent lack of scientific measurement and objectivity, the writer desires to present these as deductions and have them treated as hypotheses pending more conclusive studies.

The principle advantages of prepackaging are:

(1) Creates a differentiated product.
(2) Permits brand identification and advertising.
(3) Reduces waste throughout the marketing system.
(4) Cuts down on transportation, handling costs when prepackaged other than at retail.
(5) Aids in eliminating some risks in handling produce.
(6) Reduces retail labor costs.
(7) Increases quantity sold per customer and speeds up sales.
(8) Increases quality and life of produce.
(9) May help in reducing margins.
(10) Fits in with trend toward "unitization" and self-service retailing.
(11) Makes a cleaner, neater and more attractive display.
(12) More economical and convenient handling.
(13) In some cases, provides kitchen service.
(14) Tends to reduce speculation.
Better competition to help maintain sales of fresh produce from the inroads on their market made by frozen and canned produce.

The principle disadvantages of prepackaging are:

1. Cost of prepackaging in relation to cost of product may be high.

2. Entails extra handling, refrigeration and care throughout the marketing system.

3. Lack of knowledge of what to prepackage, how to prepackage and where to prepackage.

4. Resistance to change by wholesalers, retailers, consumers and others.

5. Inability in some cases of prepackager to pass on costs.

6. Inflexibility in some cases of margins throughout the marketing system.

7. Exacts high standardization and uniformity for best results.

8. Quality control difficult in perishable products.

9. Not all fruits and vegetables are conducive to prepackaging.

10. Entails certain costs and possible added investment.

11. Consumers like to pick out own merchandise.

12. Wariness of trade toward place of prepackaging in future particularly on the downward swing of the cycle.
Chapter V
Some Considerations Affecting the Point of Prepackaging
Fresh Fruits and Vegetables

One indication of the high degree of geographical specialization in the United States is the fruits and vegetable production areas. Approximately 90% of the fruits and vegetables are grown away from the point of consumption, notably in the west and south. The western part of the country, mostly in California, which is 3,000 miles away from the giant industrial centers of the east, grows over two-fifths of the total vegetables grown in the U.S. and over half of the national fruit tonnage. Washington is noted for its production of delicious apples, California for growing over 30% of the truck crops, Massachusetts for its cranberries, Maine and Idaho for their potatoes and Louisiana for its sweet potatoes.

Improvements in technology, large scale units, refrigeration, speedy transportation, and efficiency in marketing organizations have all aided in fruits and vegetables being grown, regardless of distance from market in the areas of soil and climate best suited for their production. Growers nearer the market often have greater production hazards due to weather fluctuations, low yields, small scale, high labor costs and poor marketing organization. Dr. Gilmartin points out that the
truck crop industry is probably the first segment of agriculture becoming industrialized.

Due to the perishability of the product, the long distance from the market and the resulting services and risks that must be undertaken, the produce grower receives a lower percent of the consumer's food dollar spent for his product than any other segment of agriculture outside of grain products. In 1950, the fruit and vegetable grower received 35% of the consumer's dollar versus 62% received by the livestock farmer and 62% by the poultry farmer. Despite this, fruits and vegetables grossed an annual farm value of nearly three billion dollars or almost a tenth of total cash farm receipts in 1951.

Section on transportation

Due to the distance of the producing area from the point of consumption, transportation is a big factor. Intra-market transportation before the war made up 19% of the consumer's fruit and vegetable dollar or 29.2% of the marketing margins. Freight rates have kept pace with the produce price level. Although lagging somewhat, transportation today probably takes a similar share as before the war.

Transportation, particularly the refrigerated

freight car, made it possible for distant production areas to take advantage of geographical specialization. Innovation and technology enables the consuming public throughout the United States and the world to eat the fruits and vegetables grown in distant points throughout the year. Prepackaging by reducing the shipped weights could possibly reduce this high cost of transportation and, also, waste in transit.

**Perishability**

Fresh fruits and vegetables are characterized by their perishability. They must be harvested at their due season in a narrow range of time. Fruits and vegetables are still live organisms when picked. The life processes continue although the plant or fruit has been separated from the ground or the tree. These life processes may be altered by temperature changes, additions of water and humidity, chemicals and improper physical handling among other things. Deterioration of fruits and vegetables after they are harvested is caused by physical, physiological and/or pathological factors and is usually manifested by decay, wilting, shriveling, sprouting, changes in chemical equilibrium, over ripeness or old age.

The picked produce must continue to live and it does so by destructively using up the stored reserves
within itself. This catabolic process (C6H12O6 plus 6 O2 gives off 6CO2 plus 6 H2O plus E) gives off water vapor and carbon dioxide. This rate of respiration varies extremely between plants. Below is a table showing different rates of respiration. As one could well imagine, there is a definite correlation between market life and the rate food reserves are used up.

Table 4

Approximate rate of evolution of carbon dioxide by a selected group of fresh fruits and vegetables at 60 degrees F.

<table>
<thead>
<tr>
<th>Commodity</th>
<th>Respiration Rate</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cantaloupe</td>
<td>38</td>
</tr>
<tr>
<td>Carrot</td>
<td>36</td>
</tr>
<tr>
<td>Bing Cherry</td>
<td>37</td>
</tr>
<tr>
<td>Red Malaga Grape</td>
<td>13</td>
</tr>
<tr>
<td>Elberta Peach</td>
<td>35</td>
</tr>
<tr>
<td>Bartlett Pear</td>
<td>12-45</td>
</tr>
<tr>
<td>Delicious Apple*</td>
<td>10</td>
</tr>
<tr>
<td>Peas</td>
<td>180</td>
</tr>
<tr>
<td>Spinach</td>
<td>170</td>
</tr>
<tr>
<td>Potatoes</td>
<td>9</td>
</tr>
<tr>
<td>Tomatoes</td>
<td>7</td>
</tr>
</tbody>
</table>

1 Respiration rate calculated as millgram of CO2 per kilogram of fruit per hour.

* Unpublished data, Horticulture Department, Ohio State University. This table is an adoption from "Perishability of Fresh Fruits and Vegetables", Pre-Pack-Age, July, 1953, by L. L. Claypool.

This rate of respiration is increased by higher temperatures and is retarded by lowering of temperature and other means such as surface treatments and wrapping. Wrappers generally should allow passage of oxygen and carbon dioxide but in most cases should be impervious to water vapor.
The manifestations of this perishability are shown in that approximately one-fifth to one-fourth of the food we produce never is used for human nourishment. William Kling of the War Food Administration states the following as rough estimates of the losses—deciduous fruit, 26 percent; potatoes, 28 percent; tomatoes and citrus fruits, 33 percent; leafy, green and yellow vegetables, 43 percent. These figures are quite startling. These figures are quite widely accepted but are far from homogenous with our desire for an efficient marketing system. These wastes are not only expensive in themselves alone but costly services such as transportation, labor and refrigeration are involved and thus marketing costs are compounded.

Taking the smaller figure of 20% as being correct for wastage of fruits and vegetables after leaving the farm, we could say that this wastage was over $1,600,000. at 1952 retail levels. A marketing system which incurs such waste and resultant high marketing charges should be carefully studied for possible improvements.

Dr. Raymond Scott gives the following characteristics which influence the marketing of fruits and vegetables.


2 Scott, Raymond C., Classroom notes of Horticulture 628 (marketing), Spring, 1951
Characteristics Which Influence the Marketing of Fruits and Vegetables

1. Products highly perishable -
   a. Some handled most efficiently if refrigerated from the producer to the consumer (lettuce, corn, peas.)
   b. Some require dry heat (sweet potatoes, dry onions).
   c. All must be protected against extreme cold or heat.

2. Products bulky - many with high water content.

3. Products require extra care in assembling, grading and packing.

4. Products require special containers which will withstand moisture, rough handling, prevent bruising, etc.

5. Production is highly seasonal - short period of marketing most products from a given area.

6. Production specialized in widely separated area to insure year around supply.

7. Many competing products - hundreds of kinds and varieties.

8. Transportation problems difficult.
   a. Must be rapid.
   b. Must protect against heat and cold
   c. Long average distance

9. Wide variation in the forms in which marketed.
   a. Fresh.
   b. Dried.
   c. Canned.
   d. Frozen.
   e. Dehydrated.

All these factors regarding marketing of fresh fruits and vegetables plus the marketing structure of the industry enter into the point of prepackaging.

The same limitations mentioned in chapter four about prepackaging apply to the point of prepackaging. The
difficult problem of generalizing about the general field of fresh fruits and vegetables rather than specific commodities is still with us in this field. The same advantages and disadvantages of prepackaging are still in action here as previous. This is particularly true in regard to lack of knowledge, ability to pass on costs and general inflexibility of the system.

Some Considerations in Regard to the Point of Prepackaging

(A) At the country point (farm or shipping point)

Advantages

1. Saves transportation charges on weight and bulk that is now shipped but discarded before the product is consumed.

2. Allows brand identification and national advertising.

3. Cheaper costs of factors particularly labor and property.

4. Can standardize and grade for specific standards.

5. Large scale may permit mechanization and advantages of scale.

6. Originator may have better control over product and how it reaches the consumer.

7. Enables producer to get a larger share of the consumer's dollar.

Disadvantages

1. Seasonal marketing may preclude use of machinery and facilities or may seriously limit the efficiency.

2. Spoilage may incur in the marketing channels invalidating the advantages of prepackaging.
(3) Entails added cost which may or may not be able to pass on the costs.

(4) Perishability or nature of the commodity may do away with prepackaging as some deterioration will occur regardless of how handled.

(B) At the Terminal Market and/or Wholesale Level

Advantages

1. Can have greater efficiency to larger volume, mechanization, specialization, skilled personnel, and year around operation.

2. Can maintain a more complete line throughout the year by drawing from various parts of the country with various commodities.

3. Has a more strategic position in regard to the market both local and national. Can adjust better to changes.

Disadvantages

1. Higher rents.

2. Space is usually at a premium.

3. Often do not act as processor.

4. Labor is higher and unionized. Often require extra benefits.

(C) At the Retail Level

Advantages

1. Can better package for store's clientele in regard to weight, appearance and type of package. Local consumer habits and preferences better known and easily handled.

2. Prepackaging operation can be varied easily

3. Can price produce when prepackaging which cannot be done consistently at other points.
Disadvantages

(4) Clerks are better informed concerning contents and can pass this on to the consumer.

(5) Makes more efficient use of labor by smoothing out labor peaks. (Approx. 70% of the week's grocery buying is done on the last three days.)

(6) Quality control better established and maintained.

(1) A small scale operation which can employ few mechanical devices.

(2) Large number of a wide variety of produce requires different methods and materials which the local produce manager cannot stock due to numerous requirements. Nor may personnel have sufficient knowledge.

(3) Produce manager desire in most self-service stores to be a merchandiser not a processor. Is an additional burden.

(4) Space and time may not be sufficient to permit prepackaging.
Chapter VI

Chain Store Produce Merchandisers' Experiences and Attitudes Toward Prepackaging

In an attempt to find a possible pattern of the future status of prepackaging, it was decided to survey produce merchandisers of the leading twenty food retail chains about their experiences and attitudes toward prepackaging.

Although chain food stores do less than 40% of the nation's retail food business, their merchandising methods are generally considered advanced and are quite often pacesetters in the retail food industry. The average produce merchandiser's home firm did an estimated $474,245,000 business in 1952 or about 9,425 times as much as the average food retail independent did in 1952. The chain produce merchandiser usually has a wider and more varied experience. The chain operators can experiment, then adopt a policy and execute it in a relatively short period of time in stores that gross totals in the millions. Friend and Bronfenbrenner found in their study that larger companies have better records and do more planning on their future moves.

An attempt to find the twenty largest retail food stores was unsuccessful. The following individuals were contacted for the twenty largest food chains: Miss Marguerite Burk of the USDA, Milo Lacy of the USDA, George Muller of the U.S. Department of Commerce, Dr. Roger Corbett of the National Association of Food Chains and Curt Kornblau of the Super Market Institute.

The following list was compiled through the aid of Mr. M. M. Zimmerman, Editor of Supermarket Merchandising, and Mr. Carl Dipman, Editor of Progressive Grocer. Both organizations generously furnished names, addresses and information about produce merchandisers.

The group chosen does not necessarily represent the top twenty chains but it would include the majority of the top twenty. The finding of the large twenty is complicated by individual chain stores sales dropping off over four hundred million dollars annually after you depart from the big three - Great Atlantic & Pacific Tea Company, Safeway Company and The Kroger Company. This small sample was chosen not only for dollar sales but also for geographical distribution. If returns had been 100%, the surveyed groups 1952 volume would have been approximately $8,538,079,872 or about one-fourth of the 1952 retail grocery sales.

The search herein is for indications and not precise
measurement. These chains are not altogether typical of the retail food industry but do represent a sizeable portion of the trade.

The chain stores contacted included:

The Great Atlantic & Pacific Tea Company
National Tea Company
American Stores Company
First National Stores, Inc.
Jewel Tea Company, Inc.
The Market Basket
Winn & Lovett Grocery Company
H. G. Hill Stores, Inc.
Lucky Stores, Inc.
Albers, Inc.
Safeway Stores, Inc.
National Food Stores, Inc.
Food Fair Stores, Inc.
Grand Union Company
Colonial Stores, Inc.
Alpha Beta Food Markets, Inc.
The Kroger Company
H. C. Bohack, Inc.
Dixie Home Stores
J. Weingarten, Inc.

The initial survey letter and questionnaire were mailed in August, 1952. Two follow-up letters were sent out if needed. Returns were received as late as May, 1953. Since the original material sent out assured the recipients of anonymity, the seventeen chains replying are not listed.

The approximate gross food sales of the seventeen chains responding was $8,062,471,872 in 1951 or roughly one-fourth of the total food sold. Various geographical areas and the various volume groups surveyed were well represented.
Their volume varied as three chains grossed over one billion, three chains grossed over four hundred million dollars, five chains grossed over one hundred million and seven grossed below one hundred million. No Canadian chains were included but the United States - New England, middle Atlantic, southern, Texas, central far west and mountain states are represented.

Produce sales for the group amounted to approximately $1,007,771,484 or about 13.4% of the total sales. All chains used some prepackaging in fresh fruits and vegetables. The produce merchandisers answering estimated that 28.3% of produce sold was prepackaged. This is an unweighted average with a range from 10% to 60%. The weighted average is 24.2%.

Meat prepackaging done by all chains had progressed farther than prepackaged produce. The unweighted average of meat sold packaged was 63.8% for all chains with a range of 31% to 95%. Since total meat sales is unknown, a weighted average cannot be accurately ascertained. However, if you would weigh these answers by total store volume (thus assuming all sold the same amount of meat as a % of total sales), this rough weighted average was 50.1% of all meats sold were sold prepackaged.

Advantages and Disadvantages of Produce Prepackaging

An opinion question was asked regarding what these
seventeen leading produce merchandisers considered as prepackaging's major advantages.

Table 5
Advantages of Produce Prepackaging as Evaluated by Seventeen Leading U. S. Retail Food Chain Produce Merchandisers, 1952-53

<table>
<thead>
<tr>
<th>Advantage</th>
<th>Number Commenting</th>
</tr>
</thead>
<tbody>
<tr>
<td>Increases Volume Sold</td>
<td>8</td>
</tr>
<tr>
<td>Speeds up Produce Shopping &amp; Traffic</td>
<td>8</td>
</tr>
<tr>
<td>Better Serves Consumers</td>
<td>7</td>
</tr>
<tr>
<td>Reduces Waste</td>
<td>7</td>
</tr>
<tr>
<td>Reduces Retail Labor</td>
<td>7</td>
</tr>
<tr>
<td>Protects Quality and Avoids Excessive Consumer Handling</td>
<td>6</td>
</tr>
<tr>
<td>Increases Profits</td>
<td>3</td>
</tr>
<tr>
<td>Sanitation</td>
<td>3</td>
</tr>
<tr>
<td>Cleaner, Neater Displays</td>
<td>3</td>
</tr>
<tr>
<td>Standard Package</td>
<td>2</td>
</tr>
<tr>
<td>Aids in Control of Unit Selling</td>
<td>2</td>
</tr>
<tr>
<td>Reduces Package Cost Per Unit</td>
<td>2</td>
</tr>
<tr>
<td>Less Space Needed</td>
<td>1</td>
</tr>
</tbody>
</table>

The responses about the advantages of prepackaging reiterated in various forms the advantages of prepackaging as taken up in chapter 5 - Economics of Prepackaging. An important point is the high station given to (1) increased volume sold, (2) speeding up produce shopping and (3) better serves consumers. This would indicate that the automatic merchandising and sales aspects of prepackaging - selling more, consumer appeal and utility, speed up in consumer buying time - weights heavy in the produce merchandiser's
minds. These experiences are similar to the DuPont survey and other studies. However, the placing of these sales aspects over reduction of waste (named by five merchandisers) is significant. This is in line with chain store's desire to do more volume. It brings up two questions (1) whether merchandisers know their true costs including waste losses, and (2) is prepackaging significantly reducing costs such as waste.

However, this is not to minimize the fact that seven produce merchandisers did mention as an advantage that prepackaging reduces waste. Also six merchandisers stated that prepackaging protected quality and avoided excessive consumer handling. With over one-half of the respondents answering the open end question with one of these two remarks, it does show an acknowledgement of prepackaging's ability to help in controlling waste.

Increased labor efficiency was noted by six merchandisers. They mentioned that prepackaging saves retail labor, uses manpower more efficiently and speeds up checkout. Also mentioned as advantages of produce prepackaging were increases in profits, sanitation, and cleaner, neater displays. Other advantages reported were standard package, aids in control of unit selling, reduces package cost per unit and less space needed.
Practically the reverse question was asked the same group of seventeen produce merchandisers when they were asked what were prepackaging's disadvantages.

Table 6

Disadvantages of Produce Prepackaging as Evaluated by Seventeen Selected U.S. Food Retail Chain Produce Merchandisers 1952-53

<table>
<thead>
<tr>
<th>Disadvantages</th>
<th>Number Commenting</th>
</tr>
</thead>
<tbody>
<tr>
<td>High cost of labor, material and equipment in bagging</td>
<td>5</td>
</tr>
<tr>
<td>Danger of quality control</td>
<td>5</td>
</tr>
<tr>
<td>Difference in cost between bulk and prepacks</td>
<td>3</td>
</tr>
<tr>
<td>Summer heat</td>
<td>2</td>
</tr>
<tr>
<td>Housewife likes to be produce expert</td>
<td>2</td>
</tr>
<tr>
<td>Waste in repacking</td>
<td>2</td>
</tr>
<tr>
<td>Space to prepack at a premium</td>
<td>2</td>
</tr>
<tr>
<td>Store level prepackaging too far in future</td>
<td>2</td>
</tr>
<tr>
<td>Inability to prepack for peak periods</td>
<td>1</td>
</tr>
<tr>
<td>Overordering</td>
<td>1</td>
</tr>
<tr>
<td>Some prepackaged mdse. has too much printing</td>
<td>1</td>
</tr>
</tbody>
</table>

Two significant features in this table of prepackaging disadvantages is the relative lack of responses concerning the problem of handling bulk and prepackaged at the same time and about the cost of prepackaging.

However, the high cost of labor, material and equipment in bagging were mentioned by five of the seventeen merchandisers. Three merchandisers brought in cost
difference between bulk and prepackage.

One of the leading disadvantages was danger of quality control. Summer heat was also mentioned. Waste in repackaging was listed. Prepackaging is thought to reduce waste but it does not eliminate waste. The very nature of its ability to reduce waste may lead some to overestimate its potential or ability.

Consumer resistance does not appear to be a major problem although two merchandisers mentioned that the consumer likes to be an expert on fruits and vegetables.

Five comments are in regard to store prepackaging. One states that you are unable to prepack for peak periods. Two merchandisers remark that there is lack of room to prepack. Two merchandisers state that store level prepackaging is too far in the future.

One merchandiser stated that there was too much printing on some prepackaged merchandise.

Prepackaging Experience

To most of the chains, prepackaging was not a new venture. The majority had started prepackaging ten to fifteen years ago. The most common items to be first prepackaged were spinach, tomatoes, potatoes and various hardware items.

To the question - "Do you consider that prepackaging increases sales?", nine chains answered yes, one chain
answered yes in some items and four failed to record any answer. Surprisingly, there were no answers of decreases.

In commenting, most chains noted that prepackaged merchandise was more attractive, more uniform and sanitary. They mentioned that prepackaging had greater impulse sales appeal and made a better display. Two chains noted that it led to greater variety of produce purchased. Three other informants said that it tended to increase the average sales per customer.

One chain said that it increased some items and failed to increase other items. Another chain stated that 70% of all prepackaged produce was available in bulk also.

In an attempt to find out what items were prepackaged and where, the produce merchandisers were queried whether they were selling sixteen produce items prepackaged, what percent prepackaged and at what level they were prepackaged. The sixteen items are listed in the following table. If items were prepackaged at several levels, each level was marked. The percent of the produce item prepackaged is a weighted average with weight being assigned according to the produce volume sold by each chain. Due to the nature of the responses, the level prepackaged at is not weighted by the chains involved.

As throughout this growing field, the striking
feature is the lack of uniformity in practically all categories. There is little unanimity in any segment. For example in column 2, the range of produce items prepackaged vary in most cases from zero to 75 or ninety percent.

The most commonly accepted prepackaged items were potatoes (60.1%), spinach (53.9%) and tomatoes, other than local, (51.4%).

Table 7

Percentage of Fresh Produce Prepackaged and Location Pre-packaged as Indicated by Produce Merchandisers of Seventeen Selected Food Retail Chains 1952-53

<table>
<thead>
<tr>
<th>Items</th>
<th>What % Prepackaged (weighted)</th>
<th>% Pre-packaged by Stores (range)</th>
<th>Term Chain Re-packaged</th>
<th>Chain Re-packaged</th>
<th>Whse. Retail Store</th>
<th>Other</th>
</tr>
</thead>
<tbody>
<tr>
<td>Apples</td>
<td>18.8</td>
<td>0-75</td>
<td>7</td>
<td>3</td>
<td>5</td>
<td>6</td>
</tr>
<tr>
<td>S. Corn</td>
<td>8.4</td>
<td>0-90</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>6</td>
</tr>
<tr>
<td>Potatoes</td>
<td>60.1</td>
<td>20-90</td>
<td>6</td>
<td>5</td>
<td>4</td>
<td>8</td>
</tr>
<tr>
<td>Lettuce</td>
<td>4.9</td>
<td>0-90</td>
<td></td>
<td></td>
<td></td>
<td>4</td>
</tr>
<tr>
<td>Grapes</td>
<td>3.2</td>
<td>0-90</td>
<td></td>
<td></td>
<td></td>
<td>5</td>
</tr>
<tr>
<td>Spinach</td>
<td>53.9</td>
<td>0-95</td>
<td>1</td>
<td>7</td>
<td>1</td>
<td>3</td>
</tr>
<tr>
<td>Celery</td>
<td>7.4</td>
<td>0-75</td>
<td>1</td>
<td>5</td>
<td>1</td>
<td>2</td>
</tr>
<tr>
<td>Cherries</td>
<td>2.8</td>
<td>0-70</td>
<td>1</td>
<td></td>
<td></td>
<td>1</td>
</tr>
<tr>
<td>Peaches</td>
<td>5.1</td>
<td>0-80</td>
<td>2</td>
<td></td>
<td></td>
<td>5</td>
</tr>
<tr>
<td>Oranges</td>
<td>32.7</td>
<td>0-85</td>
<td>3</td>
<td>1</td>
<td>4</td>
<td>1</td>
</tr>
<tr>
<td>Gr. Onions</td>
<td>8.4</td>
<td>0-90</td>
<td>1</td>
<td></td>
<td></td>
<td>1</td>
</tr>
<tr>
<td>Dry Onions</td>
<td>18.0</td>
<td>0-75</td>
<td>4</td>
<td>3</td>
<td>5</td>
<td>8</td>
</tr>
<tr>
<td>Carrots</td>
<td>8.3</td>
<td>0-50</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>Tomatoes</td>
<td>Local</td>
<td>20.4</td>
<td>0</td>
<td>1</td>
<td>1</td>
<td>5</td>
</tr>
<tr>
<td>Other</td>
<td>51.4</td>
<td>0-90</td>
<td>0</td>
<td>1</td>
<td>1</td>
<td>4</td>
</tr>
</tbody>
</table>
To obtain an indication of produce prepackaging, the same produce merchandisers were asked what produce should be prepackaged and where it should be prepackaged. Instead of what is being prepackaged or the actual as shown in table, this question attempts to get the thinking of this leading group on what the future might be.

Table 8

Percentage of Fresh Produce Items That Should Be Prepackaged and Location to be Prepackaged as Indicated by Produce Merchandisers of Seventeen Leading Food Retail Chains, 1952-53

<table>
<thead>
<tr>
<th>Items</th>
<th>% That Should Be Prepackaged</th>
<th>Range (%)</th>
<th>Farm</th>
<th>Term Mkt.</th>
<th>Chain Whse.</th>
<th>Retail Store</th>
<th>Others</th>
</tr>
</thead>
<tbody>
<tr>
<td>Apples</td>
<td>70.6</td>
<td>30-100</td>
<td>12</td>
<td>4</td>
<td>4</td>
<td>7</td>
<td>1 Packing Shed</td>
</tr>
<tr>
<td>S. Corn</td>
<td>27.3</td>
<td>0-100</td>
<td>4</td>
<td>3</td>
<td></td>
<td>7</td>
<td>3 Shipper</td>
</tr>
<tr>
<td>Potatoes</td>
<td>79.6</td>
<td>20-100</td>
<td>10</td>
<td>5</td>
<td>5</td>
<td>5</td>
<td>4</td>
</tr>
<tr>
<td>Lettuce</td>
<td>67.6</td>
<td>0-100</td>
<td>5</td>
<td>1</td>
<td>3</td>
<td>6</td>
<td></td>
</tr>
<tr>
<td>Grapes</td>
<td>24.9</td>
<td>0-100</td>
<td>1</td>
<td>2</td>
<td>1</td>
<td>6</td>
<td></td>
</tr>
<tr>
<td>Spinach</td>
<td>84.2</td>
<td>20-100</td>
<td>4</td>
<td>11</td>
<td>3</td>
<td>4</td>
<td></td>
</tr>
<tr>
<td>Celery</td>
<td>62.9</td>
<td>0-100</td>
<td>6</td>
<td>6</td>
<td>1</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>Carrots</td>
<td>14.7</td>
<td>0-90</td>
<td>3</td>
<td>2</td>
<td></td>
<td>7</td>
<td>1 Shipper</td>
</tr>
<tr>
<td>Peaches</td>
<td>16.4</td>
<td>0-100</td>
<td>6</td>
<td>4</td>
<td></td>
<td>8</td>
<td>1 P. Shed</td>
</tr>
<tr>
<td>Oranges</td>
<td>65.1</td>
<td>0-100</td>
<td>8</td>
<td>7</td>
<td>3</td>
<td>5</td>
<td>4 Shipper</td>
</tr>
<tr>
<td>Carrots</td>
<td>64.7</td>
<td>0-100</td>
<td>5</td>
<td>2</td>
<td>1</td>
<td>4</td>
<td>2 Shipper</td>
</tr>
<tr>
<td>Gr. Orins</td>
<td>18.5</td>
<td>0-100</td>
<td>2</td>
<td></td>
<td>1</td>
<td>3</td>
<td></td>
</tr>
<tr>
<td>Dry Onions</td>
<td>75.7</td>
<td>20-100</td>
<td>9</td>
<td>9</td>
<td>5</td>
<td>5</td>
<td>1 Shipper</td>
</tr>
<tr>
<td>Local</td>
<td>37.8</td>
<td>0-90</td>
<td>6</td>
<td>5</td>
<td></td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>Others</td>
<td>61.5</td>
<td>0-100</td>
<td>4</td>
<td>11</td>
<td>2</td>
<td>3</td>
<td></td>
</tr>
</tbody>
</table>

The returns of the produce merchandisers are quite interesting and show a surprisingly definite trend. Despite a still wide variation, prepackaging of produce would
increase. Some items will be prepackaged much more than others. The point of prepackaging is still unsettled although indications are quite definite.

To better see the differences and transition implied, let us look at table 9.

Table 9

Comparison of Percentage of Fresh Produce That Is Prepackaged and Percentage of Fresh Produce that Should Be Prepackaged Both by Range and by Weighted Average as Indicated by Produce Merchandisers of Seventeen Selected Food Retail Chains, 1952-53.

<table>
<thead>
<tr>
<th>Items</th>
<th>Range Being Prepacked</th>
<th>Range Should Be Prepacked</th>
<th>Weighted Average Being Prepacked</th>
<th>Weighted Average Should Be Prepacked</th>
</tr>
</thead>
<tbody>
<tr>
<td>Apples</td>
<td>0-75</td>
<td>30-100</td>
<td>18.8</td>
<td>70.6</td>
</tr>
<tr>
<td>S.Corn</td>
<td>0-90</td>
<td>0-100</td>
<td>8.4</td>
<td>27.3</td>
</tr>
<tr>
<td>Potatoes</td>
<td>20-90</td>
<td>20-100</td>
<td>60.1</td>
<td>79.6</td>
</tr>
<tr>
<td>Lettuce</td>
<td>0-90</td>
<td>0-100</td>
<td>4.9</td>
<td>67.6</td>
</tr>
<tr>
<td>Grapes</td>
<td>0-90</td>
<td>0-100</td>
<td>3.2</td>
<td>24.9</td>
</tr>
<tr>
<td>Spinach</td>
<td>0-95</td>
<td>20-100</td>
<td>53.9</td>
<td>84.2</td>
</tr>
<tr>
<td>Celery</td>
<td>0-75</td>
<td>0-100</td>
<td>7.4</td>
<td>62.9</td>
</tr>
<tr>
<td>Cherries</td>
<td>0-70</td>
<td>0-90</td>
<td>2.8</td>
<td>14.7</td>
</tr>
<tr>
<td>Peaches</td>
<td>0-80</td>
<td>0-100</td>
<td>5.1</td>
<td>16.4</td>
</tr>
<tr>
<td>Oranges</td>
<td>0-85</td>
<td>0-100</td>
<td>32.7</td>
<td>83.1</td>
</tr>
<tr>
<td>Carrots</td>
<td>0-50</td>
<td>0-100</td>
<td>8.3</td>
<td>64.7</td>
</tr>
<tr>
<td>Gr. Onions</td>
<td>0-90</td>
<td>0-100</td>
<td>8.4</td>
<td>18.5</td>
</tr>
<tr>
<td>Dry Onions</td>
<td>0-75</td>
<td>20-100</td>
<td>18.0</td>
<td>75.7</td>
</tr>
<tr>
<td>Tomatoes</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Local</td>
<td>0-90</td>
<td>0-90</td>
<td>20.4</td>
<td>37.8</td>
</tr>
<tr>
<td>Others</td>
<td>0-90</td>
<td>0-100</td>
<td>51.4</td>
<td>61.5</td>
</tr>
</tbody>
</table>

In a cursory examination, it is easy to see that the top range in most items has increased. Conversely, the bottom of the range (zero) has stayed relatively constant. However, the low part of the range is above zero in four
items - potatoes, apples, dry onions and spinach. Continuing our cursory examination, we see that the weighted averages show a definite increase in all items from what is being prepackaged to what should be prepackaged. There is little doubt that the consensus would be toward an increase in produce prepackaging although the rate of increase varies.

Briefly, let us look at the produce items and the proposed transitions. Although stated as figures of rigid nature, it should be remembered that this is only an indication. It is further limited by the sample, techniques employed, semantics and by the recipient's knowledge of the future.

Spinach (84.2%), potatoes (79.6%), oranges (79.1%), dry onions (75.7%), tomatoes, other than local, (71.5%), apples (70.6%), lettuce (67.6%), carrots (64.7%), and celery (62.9%) all show promise of being sold predominantly prepackaged in the future.

Spinach, potatoes, oranges and tomatoes, other than local, were commonly accepted at the time of the study. The surprising increases, according to the respondents, are in apples, dry onions, lettuce, celery and carrots. Apples and dry onions, so called hardware items are easily prepackaged. Lettuce, celery and carrots are highly perishable.
There appears to be a tendency to move prepackaging back to the grower-shipper or terminal market level although much diversity remains. The grower-shipper level of prepackaging appears most pronounced in the cases of apples, potatoes, spinach, celery, peaches, carrots, dry onions and sweet corn. The terminal market level for prepackaging was prominently mentioned in the cases of celery, spinach, oranges, tomatoes and dry onions. Many produce merchandisers still favor the retail store level for the point of prepackaging.

The increase in carrots, 6.3% to 64.7%, with prepackaging favored to move back to the grower-shipper level, has probably been ascertained. Approximately fifty percent of the carrot crop in 1953 was prepackaged mainly at the point of production. Produce merchandisers were aware of the carrot prepackaging development at the time of the survey but it is debatable if they can foresee technological and other changes which may bring similar sudden developments.

Attitudes Toward Prepackaging

When asked whether they planned to expand their use of prepackaging, 82.3% of the produce merchandisers stated they planned to expand, 11.8% expressed a negative reply while 5.9% of the respondents gave no comment.
When asked how long it takes to educate or get customers used to items changed from bulk to prepackaged, a wide array of answers were received. The consensus was relatively rapid although one chain did say three years. The answer varied to include - immediately, handle both, quick if handled properly, short time, rapid transition in most cases, varies with localities but all new markets set up approximately 100% prepackaged, depends on nature of merchandise, do not know, and about a week and three years.

The next question asked was "Do you think there is a justification for a difference in the price per unit between bulk and prepackaged produce? Yes ___ No ___ Why ___. There was little agreement here as six replied affirmatively, eight replied in the negative and three failed to comment.

The six chains that replied there was justification for a difference in the price between bulk and prepackaged produce gave these reasons why -

A & B - Labor and materials cost money, whether at farm or in the store

C - Trim, waste and culls have been removed. Better control of quality

D - Whether prepackaged at terminal or warehouse, heavier and more expensive package material is required
E - Labor Cost

F - Creates added expense of handling bulk and prepackaged

The five chains that replied there was no justification for a difference in the price per unit between bulk and prepackaged produce gave these reasons -

G & H - Prepackaging is more of a savings to retailer than consumer

I & J - Advantages of prepacks offsets additional costs of material

K - To remain competitive

L - Waste and production per man hour exceeds cost of packaging and packaging equipment

M - More sales

N - More Profit

These answers show a great variance. It would indicate there is a need for both economic and engineering research to show true costs and differences.

Research desired

As research workers, we are always interested in the problems confronting the industry and what research the trade would like to see undertaken. An opinion question was asked about what research they would like to see undertaken about prepackaging of fruits and vegetables. The answers varied from a list of commodities to a production area.
The replies are given here despite their lack of uniformity

Chain 1 - Shipping Point
2 & 17 - Grower Levels
3 & 14 - Size and type of package
  4 - Head Lettuce, soft deciduous fruits
  5 - Highly perishable green items
  6 - Oranges, grapefruit and potatoes
  7 - Highly perishable items
  8 - Consumer acceptance
  9 - Everything
10 - Leafy vegetables and fruits
    Research to determine most suitable type of package
11 - Transportation and point of prepackaging
12 - Apples, peaches, grapes, cherries, corn,
     green-wax-lima beans and topped carrots
13 - Flash Cooling
    Also effects of advertising on single commodities and group commodities
15 - Costs of prepackaging
16 - Differences in trade margins between bulk and prepackaged produce

The returns show the large extent and great need for research. Chain 9's reply of "everything" is probably more valid than first appears.
Apple Prepackaging

Since we are trying to find a pattern of experiences and attitudes, a single commodity was taken to see what reactions were to a definite area. Due to our other work in apples (see Chapter 9), apples were used.

Although not all chains gave their volume sold in the 1951-2 crop, the total replying sold approximately 8,384,000 bushels. The majority of chains reported that prepackaging increased apple sales. The increase for all apples ranged from zero to 30%. For all apples, the average increase was 17.1%. A majority reported prepackaging increased midwestern apple sales but the average increase was 15.1%.

Practically all chains offered apples both in bulk and prepackage at the same time. About 70.6% of the chains offered prepackaged and bulk in the same variety, size and grade of apples at the same time. Chains reporting were equally divided between those that charge more for prepackaged than bulk and those that charge the same for both. When charged, the average difference between bulk and prepackaged apples was approximately 1 1/3¢ per pound.

When asked what size of package they preferred for prepackaged apples, the retailers answered with a variety of answers ranging from 3# to 8#. One merchandiser
replied that it depended on price per pound and unit cost. The average unit size was \( 4 \frac{3}{4} \). One reason for the variation would be the differences in consumer's taste and the merchandiser's interpretation of how to best merchandise to suit the consumer's taste.

When asked what types or type of package they preferred for prepackaged apples, the merchandisers again answered with a myriad of answers. The answers included closed cartons, folding carton, polyethylene, transparent film, mesh bags and "hometoters". The most popular type was the film - cellophane, polyethylene and ploofilm.

As will be noted in chapter 9, we have done some work with farm prepackaging of apples. A question was asked about the merchandiser's experience with farm prepackaged apples. The answers ranged from poor and unhappy to very good. Several retailers commented on the lack of consistency in quality control between growers.

The apparent conclusions that can be reached by these answers to a single commodity - apples - prepackaging is that most merchandisers agree that prepackaging increases sales, and most stores offer bulk and prepack in the same variety, grade and size. There is little agreement on pricing, type of packaging and size of packages.
Chapter VII
Summary, Conclusions and Recommendations

The United States has changed from a sparsely settled agrarian nation in 1790 to an industrial nation of over 160 million people in 1954. Along with the larger population and the heavy industrialization has come specialization and a higher standard of living. People have continuously desired more and better services.

One of the indications of specialization is the growth of distribution and the distributive agencies. Self-service merchandising has been one example of specialization. Along with self service, there has come prepackaging.

The history of prepackaging fresh fruits and vegetables dates back to the Egyptians in the tenth century who packaged vegetables, spices and hardware in paper before they were sold.

There was little work done on packaging of produce before the nineteenth century due to the lack of commerce in fresh fruits and vegetables except locally or in a dried state. Protective wrapping of fruit for overseas shipment began in the last half of the nineteenth century.

Packaging in consumer units began as canning became more common after the civil war. National Biscuit Company started the trend away from bulk food retailing
when they started packaging their crackers in boxes in 1899 instead of using cracker barrels.

Apples and potatoes were prepackaged as far back as 1910. Perhaps items were prepackaged before these but no record of them has been found.

Blueberries, oranges, mushrooms, onions and salad mix were prepackaged in the twenties.

Practically all items were prepackaged at one time or another in the 1930's. Generally, results were not encouraging. Potatoes, apples, onions, salad mix, spinach, citrus, cranberries, walnuts, tomatoes and blueberries were the most promising products for prepackaging.

Most early attempts of prepackaging were discouraging due to poor materials, lack of refrigeration, counter type of retail stores, trade apathy and consumer resistance.

The war brought new emphasis to packaging. Defense commitments limited the supply of films for consumer use however.

Modified waterproof cellophane came in the early forties. Meat prepackaging aided by the new type of cellophane and refrigerated show cases became more commonly accepted than fresh produce prepackaging.

Duncan Rankin of DuPont conducted a ten year study, 1937-47, of produce prepackaging in conjunction with American Stores.
The results obtained showed (1) that prepackaging has varying influence on rate of sales of different products from a strong increase to a slight decrease and (2) the need for refrigeration.

The Ohio State University, DuPont, Great Atlantic & Pacific Tea Company and five other companies combined their talents and resources to run the now famous "Columbus Experiment". Dr. Charles W. Hauck headed up this experiment that had as its basic goal to scientifically test the prepackaging of all items in a refrigerated produce section. The project ran from 1944 to 1948. The results were in brief that prepackaging combined with refrigeration could (1) save half the usual distribution loss on some items, (2) reduce labor, (3) lengthen shelf life of produce and (4) receive good consumer acceptance.

Prepackaging aided by the preceding groundwork, new films, research aided by RMA funds and a receptive public with high incomes grew to new heights during the postwar period.

The long time trend in food marketing has been the addition of services. The U. S. consumer has desired progressively more services.

No innovation, agency, method or middleman has ever historically developed suddenly and securely into a prominent place in the American marketing picture. Practically all change has come about through outgrowth of an older
practice - evolutionary although the final result may appear revolutionary.

The status of packaging tends to follow the status of marketing. A highly advanced marketing system will usually be accompanied by a highly advanced packaging system.

Innovations are typical of the American economy. As the economy has enlarged, added emphasis has been placed on the better satisfaction of the consumer's wants. Demand today plays a stronger role in our economy than in a subsistence economy where demand is practically a given as per Say's Law. Innovation in marketing through adding to the product utility and overcoming consumer resistance, is a strong motivating factor in today's economy.

Resistance to innovation is found throughout the fresh fruits and vegetables trade channels. This is not only because of technical difficulties, fear of consumer reactions and the human tendency to resist change but also because of the trade channel's inability to take advantage of the innovation and the hesitancy in the changing of relationships and duties in the industry.

Difficulties in adapting the innovation - prepackaging fresh fruits and vegetables - further compounded by the difficulties in prepackaging perishables. These difficulties would include the perishability of fresh fruits and vegetables, refrigeration needed, distance
transported and channels of distribution.

An additional complication is the relative inflexibility of marketing margins, particularly at the retail level. The ability to pass on costs is limited by custom, competition and the unequal bargaining power of the participating parties. Imperfect imputation of costs makes it difficult for the parties to know what to pay for or charge services added. Conversely, neither is the result of prepackaging as it affects costs or the demand curve known.

In the fresh produce industry, there have been severe price fluctuations often abetted by individuals who have accentuated a normal phenomena for speculative purposes. These price fluctuations, lack of quality control and general inflexibility have been to the advantage of the frozen food industry which has made large gains at the expense of the fresh fruit and vegetable industry.

There have been few studies and little written on the costs of packaging. Packaging has various uses and the consequent joint costs are difficult to objectively ascertain.

An innovation - although commonly thought of as lowering the cost curve - may be adopted if the revenue curve is raised sufficiently to cover the increase (if any) in costs. Any added item or service, to continue for the
long run, must prove in the crucible of the marketplace that its marginal revenue exceeds or equals its marginal cost.

The principle advantages of prepackaging are:

(1) Creates a differentiated product and hence a different demand curve.

(2) Permits brand identification and advertising.

(3) Reduces waste throughout the marketing system.

(4) Cuts down on transportation, handling costs when prepackaged at points other than retail.

(5) Aids in eliminating some risks in handling produce.

(6) Reduces retail labor costs.

(7) Increases quantity sold per customer and speeds up store traffic.

(8) Aids in maintaining quality and lengthens shelf life of produce.

(9) Helps in reducing margins.

(10) Fits in with trend toward "unitization" and self-service retailing.

(11) Makes a cleaner, neater and more attractive display.

(12) More economical and convenient handling.

(13) In some cases, provides kitchen service.

(14) Tends to reduce speculation and risk.

(15) Better competition to help maintain sales of fresh produce from the inroads on their market made by frozen and canned produce.
Some of the disadvantages are:

(1) Cost of prepackaging in relation to the cost of product may be exorbitant.

(2) Entails extra handling, refrigeration and care throughout the marketing system.

(3) Lack of knowledge of what to prepackage, how to prepackage and where to prepackage.

(4) Resistance to change by wholesalers, retailers, consumers and others.

(5) Inability by prepackager to pass on costs.

(6) Inflexibility of margins throughout the marketing system.

(7) Exacts high standardization and uniformity.

(8) Quality control difficult in perishable products.

(9) Not all fruits and vegetables are conducive to prepackaging.

(10) Entails certain costs and possibly added investment.

(11) Consumers like to pick out own merchandise.

(12) Wariness of trade toward place of prepackaging in future particularly due to change in duties, effect on cost structure and possible effect of the downward swing of the business cycle.

(13) Lack of knowledge of true costs and demand schedules.

Point of prepackaging is still fluctuating in many products. Some stores like to do prepackaging on the retail level or at the chain warehouse for more efficient control. Special prepackagers have sprung up in tomatoes, salad mix and spinach at the terminal market. Many items are bagged at the grower-shipper level.
Generally, the point of prepackaging is decided by precedent, waste reduction possible, perishability and difficulty in prepackaging, trade acceptance, relative costs of prepackaging, uses of equipment and ability to pass on costs.

A survey was made of the produce managers of the twenty retail food chains in regard to their experiences and attitudes toward prepackaging. Returns were received from 17 of the 20 chains whose 1951 sales amounted to $8,062,471,872. or roughly 25% of the total 1951 grocery store sales. The chains are not necessarily representative of retail food marketing but it is thought their action would give an indication of the trend although not a precise measurement.

Advantages of prepackaging as mentioned by the merchandisers were: (1) increased volume sold, (2) speeds up produce shopping and produce department traffic, (3) better serves consumers, (4) reduces retail labor, (5) reduces waste and (6) protects quality and avoids excessive consumer handling.

Disadvantages were (1) high cost of labor, material and equipment in bagging, (2) danger of quality control, (3) difference in cost between bulk and prepack and (4) summer heat.
Prepackaging was not entirely new to the chains as the majority of them had been prepackaging five to fifteen years. A large majority of the stores considered prepackaging as having increased sales.

The produce merchandisers were asked about sixteen produce items: (1) about what percent was prepackaged and (2) where were they prepackaged. The striking feature was the lack of uniformity about any product. Range of percent prepackaged normally ran from zero to 75 or 90 percent. Potatoes were the only item that all companies prepackaged at least to some extent. The most commonly accepted prepackaged items were potatoes (60.1%), spinach (53.9%), tomatoes, other than local (51.4%) and oranges (32.7%).

A similar question was asked about what percentage of the same sixteen items should be prepackaged and where. Despite a wide variation, it was indicated that prepackaging would increase, some items much more than others.

The weighted average of amount that should be prepackaged increased in all items over the amount that was being prepackaged. All chains agreed that some apples, potatoes and dry onions should be prepackaged.

The predicted rate of increase varies from an increase from 4.9% to 62.6% in lettuce to a slight increase, 8.4% to 18.5% in green onions. Leading items to be prepackaged are: spinach (84.2%), oranges (83.1%), dry
onions (75.7), potatoes (79.6%), apples (70.6%), lettuce (67.6%), celery (62.9%), tomatoes, other than local (61.5%) and carrots (64.7%).

There was much variation in all products about point of prepackaging. There was a tendency in the following products toward a certain level: apples - farm, potatoes - grower-shipper, spinach - terminal market, celery - terminal market and grower-shipper, oranges - grower-shipper and terminal market, carrots - grower-shipper, tomatoes - terminal market and dry onions - grower-shipper and terminal market. The tendency was away from the retail level although a strong minority still favored this locality.

Although stated as figures of rigid nature, it should be remembered that this is only an indication. It is further limited by the respondents' knowledge, the sample and what the future holds. Although the merchandisers predicted well in the case of carrots (64.7% predicted against approximately 50% actually prepackaged in 1953), technological developments and innovations are not conducive to specific prediction.

A majority of the merchandisers stated they planned to expand their use of prepackaging. The majority claimed it took only a short time to educate their consumers to prepackaged merchandise. The range was from one week to
three years.

The retailers were almost evenly divided on whether there was justification for a difference in the price unit between bulk and prepackaged produce. Reasons for charging more were costs of prepackaging and added services. Reasons for not charging more were more sales, competition and advantages of prepackaging outweigh costs.

When asked what research they desired, the merchandisers answers varied extremely. One chain representative replied "everything" which might well summarize the answers.

One commodity - apples - was taken to test if there was conformity in how the group would deal with a particular item. The majority agreed that prepackaging increased apple sales. The majority were offering apples in bulk and prepack in the same variety, grade and size. There is little agreement on pricing, type of packaging and size of packages.

Conclusions

1. Prepackaging has had a long evolutionary growth although its biggest growth has been in the last decade.

2. Prepackaging is an innovation and has all the characteristics of an innovation.

3. Inventions, innovations, changes in consumer habits, changes in the standard of living and resistance to innovation have all played a contributing part to
4. Prepackaging as a means of service, packaging and retailing will in all probability increase in its use in the American economy.

5. The rate of increase in use of prepackaging fresh fruits and vegetables will vary in amount used and the time required for the trade to accept its use from product to product.

6. Technological changes make the validity of predictions questionable as to the growth and prepackaging of a particular commodity.

7. Similarly, changes in the attitudes and/or changes in the position of an industry may promote changes in the prepackaging of a commodity that are incalculable to predict.

8. Because of differences in perishability, locality grown, method of distribution, trade and consumer acceptance, to make laws about what to prepackage, how to prepackage, where to prepackage, costs and acceptance are difficult to ascertain if fresh fruits and vegetables are lumped together as an aggregate.

9. Resistance to innovation by the produce trade is one of the hardest problems faced by prepackaging. This problem is compounded by custom, habit, lack of knowledge particularly about consumer acceptance, imperfect computation of costs and in changes of functions performed
and inflexibility of margins.

10. Practically all items will be prepackaged in a larger percent of the total fresh crop marketed. Apples, potatoes, dry onions, carrots, tomatoes, oranges, lettuce, spinach, celery and mushrooms will be prepackaged in significantly larger quantities. Many other highly perishable items such as grapes, sweet corn, cherries, peaches and green onions will increase slightly. Their prepackaging in large amounts will probably be delayed till changes of an invention type, innovational type, or a change in the industry permits.

11. The point of prepackaging is still in a state of flux. This question will be decided by individual commodities on their own specific characteristics. There appears a tendency toward prepackaging at the grower-shipper level and the terminal market level.

12. The fresh produce market has often showed many of the characteristics of perfect competition. Producers individually and the industry as a whole, through a differentiated product, would have a different cost and revenue curve.

13. Prepackaging fresh fruits and vegetables is still in the state of transition and much variation remains within its boundaries.

Recommendations

Agricultural research must be placed on a near
parity or parity level with other types of research. Federal and state funds in 1951 for agricultural research amounted to less than three tenths of one percent of the total cash receipts of farming. Industrial research added to government research will bring this total to only approximately seven tenths of one percent of the total cash receipts of farming. The federal government allocates less than one-fortieth of total federal expenditures on research to agricultural research. The chemical industry spends 2.5% of its gross on research; electrical machinery, 6 percent and the aircraft industry, thirteen percent.

Marketing or distribution takes over one half of the consumer's dollar both in food and other expenditures. Yet research in distribution of agricultural products takes only a slim share of the research dollar. For example in 1952 at the Ohio Agricultural Experiment Station, marketing research as such receives less than three percent of the total.

As a result, agricultural research and marketing research have not been able to properly do their jobs. Government research has not in all cases fully rewarded the persons employed nor can it always attract the personnel needed. The people employed in turn do not have the resources to fully utilize their capabilities. Many innovations could be properly tested and brought into
being if more funds were available. Due to this shortage of funds, many small run projects are committed with limited possibilities. An attitude prevails that all government research must show results while many industries expect only about 5% of their projects to show results.

If it is desired to properly evaluate the present marketing system and to make improvements in the system, more emphasis which must be reflected in a monetary fashion must be placed on research and more specifically marketing research.

Research in technology and production should be continued on an increasing status.

To do marketing research properly, team research of the various disciplines must be encouraged. Both economic research and engineering research must be promoted. The sociologist, psychologist and social scientists will also play important roles.

Taste was considered a given by the classical economists. Today, we know that a multitude of factors affect consumer acceptance. Consumer desires and wants through the marketplace today motivate the U.S. economy. We must try to find out these desires and the underlying factors so we can produce efficiently in this direction.

Research with private companies must be encouraged so that experiments will be true to actual conditions and
also to overcome trade resistance to change.

Prepackaging of fresh fruits and vegetables is only a small segment of the total agricultural marketing field. Research of a comprehensive nature is needed for this innovation in transition. However, the marketing research needed for all agricultural commodities will adequately answer the need for research in prepackaging.

The contemporary needs for prepackaging are:

1. Knowledge of true costs of bulk handling and prepackaging of fresh fruits and vegetables.
2. Research in refrigeration, transportation, containers and consumer acceptance.
3. Knowledge of demand curve for bulk and prepack by various products. Degrees of elasticity for commodities and various related market services.

In the long run, the need is for more funds and a different attitude instead of remarks to agricultural research. Various disciplines should be used, intensification of techniques known, new approaches and actual operation of new technological developments should be encouraged and promoted.

A favorable environment for innovation should be provided and promoted in both research and the economy as a whole. A deep constant search for better methods of communication is also needed.
Agricultural economists should employ changes where needed in concepts, analytical tools and investigative tools historically used by economists to better understand our economic system which is in turn affected by our social system, ecological system and an even larger system of nature. The successful response to need and challenges, which often will involve change, may well dictate the longevity and future of our profession and our civilization.
Chapter VIII
The Ohio Apple Industry

Introduction

In this chapter an attempt is made to cover the pertinent facts and characteristics of the Ohio apple industry.

Some of the peculiarities of apples and the apple industry will be dealt with. The summary will include the decline, both absolutely and proportionately, of apple production, apple consumption and apple prices.

Since Ohio is an almost inseparable part of the United States, this analysis is practically compelled to deal with the United States to give the entire setting, although we do attempt sometimes to isolate Ohio as a separate entity.

This chapter can at best give only a cursory examination of conditions and causes of the complex intricacies of the apple industry which could well be a dissertation in itself. This chapter serves mainly to illustrate the background or environmental setting for the introduction of the innovational practice of prepackaging apples on the farm.

Nature of Apples and the Apple Industry

Apple (Malus sylvestris) is a deciduous tree fruit. Apples, the least exacting common fruit as far as weather
conditions needed for growing are concerned, can be grown in cold and temperate regions. South Africa, Australia, New Zealand, northern India, Pakistan, China, Canada, U.S.S.R., and practically all countries in Europe grow apples on a commercial basis. Apples can be cultivated in every state of the United States, with the possible exception of Arizona, Florida and the states bordering the Gulf of Mexico.

Apple yields are affected by tree variety, soil, site, climate, disease and cultural practices. Yields vary from year to year. U.S. apple picking dates differ from August in the case of Early Harvest, Yellow Transparent, Lodi and others, to Stayman Winesap, Rome Beauty and others in November. (This ripening date varies from locality to locality.) Apples when picked are still living organisms. To arrest or retard the ripening process so storage may be successful, refrigeration plus extreme care are needed. Apples are usually stored from zero to seven months and almost never from year to year commercially.

Apple trees vary extremely as to age when they first start bearing and when they come into full producing maturity. Generally, apple trees will start bearing during their fifth to eighth year but it will probably be several years from then before the trees bear sufficiently to pay operating expenses. Apple trees generally approach full
production between their fourteenth and twentieth year. There are few recent studies on the cost of establishing an orchard or even on cost of production. Rough approximations in a study made by C. W. Ellenwood, of the Ohio Agricultural Experiment Station (1930), were $218.05 in the first seven years. This figure includes labor at 20 cents to 36 cents per hour and does not include land cost.

From the above paragraph the reader can readily ascertain that establishing an orchard is a long-time proposition with relatively few guideposts and is also a heavy financial investment. The time lag in adjusting production, long-term investment, uncertainty, lack of knowledge, increasing capital requirements, decreasing per capita consumption of apples, marketing difficulties and increasing costs are major problems of the Ohio apple grower.

As will be pointed out later, marketing and competition of other fruits have changed. There have been increases in capital requirements for apple growers not only because of economies of scale but increases in related items such as spraying equipment, spray, fertilizer, storage, supplies and high cost of labor. The apple grower faced with declining per capita consumption, a

This is not to minimize the increasing complexity of production. However, as in many other fields, research and its application in production are probably in advance of marketing phases.
relatively responsive market with little or no government support and high costs looks askance at the future.

Although many marginal producers and home orchards have been forced out, the average apple producer is still a small unit with only one to three men employed throughout the entire year. In the northwest irrigated regions, 20 to 25 acres of intensively operated orchard is a usual size. Appalachian apple growers are more inclined to specialize in blocks of 60 to 500 acres. There are many family units of 20 to 60 acres of bearing orchard in Ohio and other apple states. The average apple producer's individual action has little effect on the market due to the producer's size and the relative homogeneity of the product. (Some producers through group action, like the Washington Apple Commission, have been able to organize their marketing to have some effect.) Apple growers are traditionally individualistic and independent.

Apple growers are a good example of the cobweb theorem. They are constantly faced with attempting to adjust plantings and operations over a decade or longer to better meet expected demand, supply, price and consumer preference.

**Apples as a Food**

Apples are generally consumed in fresh form in the United States. Other forms in which they are consumed are

vinegar, sauce, canned slices, cider, apple juice, frozen slices and apple butter. Apples also appear in mincemeat, pectin derivatives, apple brandy, apple wine, jams, jellies, preserves, candy, apple concentrate and apple pomace which may be used for animal feeding or insect bait carrier. Approximately 55 to 60 percent of the crop is consumed in fresh form. Processing of apples helps stabilize prices and helps dispose of culls which run ten percent or more of the crop.

The edible portion of fresh apples is approximately 84.1% water. Carbohydrates (14.9%), protein (0.3%), fat (0.4%), ash (0.29%), ascorbic acid, pectin (mainly in peel), traces of vitamin A, thiamin and other B vitamins are found in fresh apples. Three sugars - levulose, glucose and sucrose - make up more than 80% of the carbohydrates.  

**Brief Early History**

Apples are believed to have originated in the Caucasus between the Black and Caspian seas. They have probably existed from prehistoric times in both the wild and cultivated states in Europe from the Caspian Sea to the Atlantic Ocean. One account states that the apple

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2 Smock and Neubert, pg. 1
and the rose we know today were probably developed from the same parent plant. Cato (234-139 B.C.) is reported to have known seven varieties and Pliny (1st Century A.D.) thirty-six varieties.

Governor Endicott of Massachusetts is credited with introducing apples to the United States in 1629. Recorded case histories of apples being grafted upon seedling rootstocks are found in Virginia back as far as 1647. Apples were generally grown in small home orchards. This fruit was normally consumed at home in fresh and dried forms or manufactured into cider and vinegar. Apples were exported to the West Indies in 1741 and to England by 1773. Benjamin Franklin (initiated apple exporting), John Bartram (first American botanic garden), and William Coxe (pioneer pomologist) contributed heavily to the development of fruit culture in America.

Missionaries, explorers, traders and Indians often carried apple seeds and seedlings beyond the white inhabited areas. Notable among these was the Swedenborg missionary John Chapman, better known as Johnny Appleseed, who often left Indian converts tending the nurseries which he started.

2 Gourley and Hewlett, op. cit., pg. 504.
The large northwest plantings began in 1847 when Henderson Lewelling introduced nursery stock in Oregon, which he had brought by ox team from Iowa.

Apples were grown throughout most of the forty-eight states in the Nineteenth Century, usually in a small farm operation. Spray and fertilizer were practically unknown. A change has come about from the time of 1889 to 1954 in areas of apple production. What was previously part of a diversified farm operation with small numbers of trees and little intensive care found on a majority of northern farms changed to a commercial enterprise in concentrated areas. Intensive areas, such as western New York and Virginia, became known as apple growing areas in the latter quarter of the nineteenth century. Later, in the first quarter of the twentieth century, Washington, Oregon and California rose in prominence as apple producing areas. Many reasons account for this change; not the least of which is the problem of insect and disease control which made spraying a costly and time consuming operation - necessary. The number of bearing apple trees between 1900 and 1935 dropped over 50 percent.

Production of Apples and Apple Areas

Yearly apple production has varied from a low of 67 million bushels in 1945 to a high of 233 million in 1904. Between 1889 and 1953, there have been sixteen individual years which have experienced a decrease of 25% or more.
from the previous year and also fifteen years which have had an increase of 25% or more from the previous crop. Drops have at times been quite severe, such as from 207 million in 1920 to 96 million in 1921, or more recently 121 million bushels in 1944 to a low of 67 million bushels in 1945.

Historical figures are not always comparable, as since 1938 only commercial apple production has been reported. Thirty-five states presently make up the commercial area. The apples produced outside this commercial area would be only approximately twenty percent of the total national apple crop, according to the 1950 Census of Agriculture.

Previous to 1921, there were twelve years in which production having value surpassed the 200 million bushel mark. Since 1921, there have been only two years - 1926 and 1931 - when only commercial apple area production has been included, the high years were 139 million in 1939 and 134 million bushels in 1949. The twenty-year average from 1934 to 1953 is approximately 114 million bushels. The ten-year commercial apple production in the United States for 1944-53 is approximately 106 million bushels.
Table 10

Yearly Average Production of Apples Having Value, United States, for Certain Periods

<table>
<thead>
<tr>
<th>Period</th>
<th>Amount</th>
<th>Period</th>
<th>Amount</th>
</tr>
</thead>
<tbody>
<tr>
<td>1890-99</td>
<td>155,823</td>
<td>1930-39</td>
<td>134,806</td>
</tr>
<tr>
<td>1900-09</td>
<td>174,988</td>
<td>1940-49</td>
<td>117,485</td>
</tr>
<tr>
<td>1910-19</td>
<td>173,426</td>
<td>1950-52</td>
<td>110,828</td>
</tr>
<tr>
<td>1920-29</td>
<td>163,614</td>
<td>1953</td>
<td>92,500</td>
</tr>
</tbody>
</table>

1 Source: U.S. Census and miscellaneous USDA sources.

* Data from and including 1934 are for the 35 commercial states only.

With the advent of specialization hastened by changes in transportation and the need for spray, the home orchard gave way to the commercial orchard. The growing of apples tended to concentrate. Of the ten leading states in 1889, four do not appear in the top ten in 1953. Of the top ten in 1919, three do not appear in the top ten in 1953.

Washington, with its large irrigated acreage of Delicious and Winesap apples, produces approximately a quarter of the nation's apples. Washington produced less than 1% prior to 1900. About one-eighth (1939-48 average) comes from the other side of the nation, New York. Closely contesting in recent years for the third to sixth positions are Virginia, Michigan, California and Pennsylvania. Ohio has ranked seventh in the years 1939, 1949 and 1953. West Virginia and Illinois are usually members of the top ten apple producing states. (Virginia, Pennsylvania, Maryland
and West Virginia make up what is commonly called the Appalachian area.) Tenth position has been alternately held in recent years by Oregon, New Jersey and Massachusetts. Except for New York and Washington, standings in relative importance have shifted some in every recent year.

Apple production has had a declining trend line since the 1910-19 period. The decline has been the greatest in the Central States while the Eastern States have declined somewhat more slowly and the Western States have increased slightly but have since leveled off. Ohio has declined at a rate larger than the average rate of decline in the United States.

Ohio's apple production has varied from 24.7 million bushels in 1895 to a low of less than eight hundred bushels in 1892 and 1945.

From 1895 to 1904, the average yearly production having value was approximately 14,152,700 bushels, while in the ten-year period 1943-52 the average yearly commercial apple production was approximately three million bushels.

A decrease of 151 million bearing apple trees in 1910 to 39 million in 1950 has occurred in the U.S. The tree number decline is similar to production in that Central States tree numbers decreased the most, Eastern
### Table II

Outstanding States in Apple Production, United States, Selected Years - 1900, 1910, 1920, 1930, 1940, 1950
(In Thousands of Bushels)

<table>
<thead>
<tr>
<th>Year</th>
<th>Washington</th>
<th>New York</th>
<th>Virginia</th>
<th>Ohio</th>
<th>Michigan</th>
</tr>
</thead>
<tbody>
<tr>
<td>1900</td>
<td>1,950</td>
<td>47,000</td>
<td>8,500</td>
<td>13,800</td>
<td>11,800</td>
</tr>
<tr>
<td>1910</td>
<td>5,800</td>
<td>17,000</td>
<td>12,100</td>
<td>5,900</td>
<td>4,196</td>
</tr>
<tr>
<td>1920</td>
<td>18,300</td>
<td>44,625</td>
<td>13,744</td>
<td>13,213</td>
<td>15,097</td>
</tr>
<tr>
<td>1930</td>
<td>38,400</td>
<td>23,560</td>
<td>7,700</td>
<td>4,172</td>
<td>6,016</td>
</tr>
<tr>
<td>1940</td>
<td>25,644</td>
<td>12,865</td>
<td>11,033</td>
<td>4,345</td>
<td>6,298</td>
</tr>
<tr>
<td>1950</td>
<td>35,532</td>
<td>18,700</td>
<td>12,580</td>
<td>3,534</td>
<td>7,420</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Year</th>
<th>West Virginia</th>
<th>Oregon</th>
<th>California</th>
<th>Pennsylvania</th>
<th>Illinois</th>
</tr>
</thead>
<tbody>
<tr>
<td>1900</td>
<td>4,200</td>
<td>2,300</td>
<td>3,200</td>
<td>18,000</td>
<td>7,500</td>
</tr>
<tr>
<td>1910</td>
<td>7,100</td>
<td>3,800</td>
<td>4,906</td>
<td>11,600</td>
<td>3,093</td>
</tr>
<tr>
<td>1920</td>
<td>8,190</td>
<td>4,400</td>
<td>6,000</td>
<td>15,655</td>
<td>5,690</td>
</tr>
<tr>
<td>1930</td>
<td>4,200</td>
<td>6,000</td>
<td>11,644</td>
<td>10,098</td>
<td>3,528</td>
</tr>
<tr>
<td>1940</td>
<td>4,550</td>
<td>3,244</td>
<td>6,456</td>
<td>8,564</td>
<td>2,457</td>
</tr>
<tr>
<td>1950</td>
<td>4,402</td>
<td>3,018</td>
<td>6,748</td>
<td>6,270</td>
<td>3,980</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Year</th>
<th>Massachusetts</th>
<th>Missouri</th>
<th>Kentucky</th>
<th>North Carolina</th>
<th>Kansas</th>
</tr>
</thead>
<tbody>
<tr>
<td>1900</td>
<td>6,300</td>
<td>6,300</td>
<td>6,400</td>
<td>7,400</td>
<td>5,300</td>
</tr>
<tr>
<td>1910</td>
<td>2,900</td>
<td>7,029</td>
<td>5,148</td>
<td>7,200</td>
<td>5,541</td>
</tr>
<tr>
<td>1920</td>
<td>3,575</td>
<td>4,074</td>
<td>4,284</td>
<td>5,700</td>
<td>1,040</td>
</tr>
<tr>
<td>1930</td>
<td>4,593</td>
<td>1,440</td>
<td>833</td>
<td>2,380</td>
<td>600</td>
</tr>
<tr>
<td>1940</td>
<td>2,457</td>
<td>1,490</td>
<td>284</td>
<td>1,081</td>
<td>1,346</td>
</tr>
<tr>
<td>1950</td>
<td>1,140</td>
<td>372</td>
<td>1,856</td>
<td>432</td>
<td></td>
</tr>
</tbody>
</table>


next and Western States the least. Acreage devoted to apple trees declined more than half in this period 1910 to 1950. This national trend is expected to continue, particularly in the Eastern and Central States. Western numbers are expected to increase.

Yield per tree has increased during this period from 1910 to 1950. Ohio's average of 2.8 bushel per bearing tree is equal or higher than the Eastern and Central States average but is less than the Michigan, New York, Appalachian area or Western States average. The difference between Ohio yield and those of the United States is greater than it was thirty years ago. Also, Ohio yields variate more than the average of the nation.

In the period 1942-49, six varieties - Delicious, Winesap, McIntosh, Jonathan, Rome Beauty and York Imperial - made up approximately 58.5% of all apples produced in the U. S. In Ohio, seven varieties - Rome Beauty, Jonathan, Baldwin, Stayman Winesap, Red Delicious, Grimes Golden and Golden Delicious - make up over 70% of the commercial production between 1950 and 1953. In the United States, Delicious is the most important apple, making up roughly one-fifth of the total. Rome Beauty has a similar leading position in Ohio with an approximate and increasing 20% of 1 Apple Production by Varieties, 1951 with Comparisons, Bureau of Agricultural Economics, USDA, Washington, D.C., 1951.
the total. Ohio produces over 10% of the total Rome Beauty apples produced in the United States and over two-thirds of those produced in the Midwest.

**Marketing**

As discussed in Chapters 2 and 5, increasing specialization, aided by technological advances, has changed our marketing picture considerably in the Twentieth Century. Many persons living today can recall that oranges were a Christmas treat or special event in the rural Midwest in 1900. Today, advances in production, processing, transportation, refrigeration and distribution techniques make not only oranges, orange juice and orange concentrates but also other fruits and vegetables available throughout the year all over the United States.

Ohio, with its balanced industry and agriculture, has a bountiful market of over eight million persons. In the twentieth century, Ohio has probably been a deficit produce state.

Grading, standardization and packaging have changed considerably since 1900. However, the pre-World War I literature has practically the same characteristics as today in regard to problems of packing, grading, dumping, storing, uniting of growers, etc., as discussed between growers, dealers and consumers.
Packaging methods have changed in Ohio from barrels as a standard package for shipment, storage and resale. The round bottom baskets were mainly used for shipment and resale after World War I but their use for storage was not too acceptable. The tub bushel, which today predominates, came into use in the mid-twenties. This tub type could be used for storage as well as resale and shipment purposes as it was more rigid, had greater strength and didn't have the handicap of severe crushing in high stacking that round bottom baskets had. Barrel packing disappeared in the late twenties.

World War II brought many packaging shortages. Many substitutes were used. Re-use of packages became more common. High cost of packaging has existed from 1941 until the present. Some growers have changed over to apple boxes. Tub bushels are probably still dominant, but the use of other containers has increased. Jumble packed cardboard boxes are increasing in use. Tub bushels are not conducive to tray pack or as a master container for consumer packages. Tray pack or Friday pack and consumer packages are increasing in use in Ohio.

Except from the far West, transportation is today mainly by motor truck instead of by railroad. The improvements in transportation and refrigeration have helped apple marketing efficiency.
The advent of chain stores and independent grocers' associations has increased the circumvention of the terminal market and sometimes the necessity of breaking loads down to minute quantities.

Today, with roughly three-fourths of the retail food volume being sold on a self-service basis, fresh fruits and vegetables, including apples, must sell themselves to compete successfully. Visual appearance and unitization are becoming two primary criteria. Competition from canned and particularly frozen fruits and vegetables has become intensely keen since World War II. In addition, apples have the competition of other fresh fruits and vegetables.

The increasing use of storage has diminished the seasonal fluctuation in apple prices and the speculation in holding apples, to a degree.

In 1925-38, we exported 10% or more of the national crop, while during the period 1947-51 apples exported amounted to less than 3% of the total national crop. In 1910-14, we exported 5.5 million bushels; in 1925-29, 14.6 million bushels; 1935-39, 9.0 million bushels; and in 1947-51, 2.8 million.

Prices are discussed later, but, relatively, retail apple prices have stayed higher than other fruits.

According to Cravens and Bere, marketing margins have increased by approximately four cents a pound since
pre-World War II. When reduced to 1910-14 prices, the increase in marketing margins is only one-half cent a pound. The writer desires to point out that when comparing 1937-41 prices and 1949-53 prices at the retail and farm level that the marketing margin has stayed fairly stable and in fact has declined from approximately 58% to approximately 56% between these periods.

According to a U.S.D.A. survey in 1949, of a sample representing 42 million private households, 80% of all homemakers prefer one fruit above all other fruits. Of these, one out of three prefers apples. Nine out of ten homemakers purchased apples from that year's apple crop (1948). Apples were bought usually once or twice a month from retail stores in quantities whose median was ten pounds or less per month. Most homemakers bought only one type of apple - either an eating apple or a general purpose apple. Condition, such as absence of bruises, was the criterion mentioned most frequently for selecting apples. Color for eating apples and size and shape for baking apples were also important criteria. The majority of homemakers used apples in more than one of the three principal uses - eating, cooking and baking.

Scott and Neu found that 69.8% of the housewives could recognize Western Delicious apples correctly while

the best recognized local variety, Golden Delicious, was identified by only 25.5% of the people. Over 50% of these Ohio apple customers could not identify any variety of Ohio apple. Practically double the percentage of consumers preferred the Western Delicious for eating out-of-hand than any other variety.  

Consumption of Fruits and Vegetables  

With the exception of eggs, the consumption of fruits and vegetables (not including potatoes) has increased more on a per capita consumption basis than any other food group since 1909-13. Changes in dietary habits and nutritional knowledge, improved production and marketing techniques, rising consumer incomes and changes in working habits have all contributed to this change.  

The weight of fruit and vegetables consumed per capita is currently greater than the combined consumption of grain products, meats, fats, fish, oils and eggs. The average person consumes approximately 585 pounds of fruits and vegetables out of a total poundage of approximately 1,587 per year. These total figures show little change from prewar 1935-39 when 589.6 pounds of a total 1,529.3

1 Neu, James W., A Study of Consumers' Knowledge of Certain Apple Varieties, Purchasing Habits, Uses of Apples in the Home and Related Factors, Six Selected Stores, Columbus, Ohio, December, 1950 and January, 1951. Unpublished M.S. Thesis, Ohio State University, Columbus, Ohio, 1951, pg. 68 and 44.
pounds consumed annually were fruits and vegetables. However, the type and form consumed have changed.

This 38% of the total food volume consumed made up by fruits and vegetables makes up in cost approximately 22% of the prewar family food expenditures and about 28% of the total food marketing bill or cost.

From the accompanying chart, the steady decline in apples is quite apparent. Apple consumption in 1948-51 is less than forty percent of the 1909-13 apple consumption.

Table 12

Per Capita Consumption of Apples in the United States Farm Weight 1909-51, by Five-Year Periods

<table>
<thead>
<tr>
<th>Period</th>
<th>Average Per Capita Consumption (Lbs.)</th>
<th>Period</th>
<th>Average Per Capita Consumption (Lbs.)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1909-13</td>
<td>65.3</td>
<td>1934-38</td>
<td>29.3*</td>
</tr>
<tr>
<td>1914-18</td>
<td>63.1</td>
<td>1939-43</td>
<td>23.8</td>
</tr>
<tr>
<td>1919-23</td>
<td>50.9</td>
<td>1944-48</td>
<td>24.6</td>
</tr>
<tr>
<td>1924-28</td>
<td>49.5</td>
<td>1948-51</td>
<td>24.4</td>
</tr>
</tbody>
</table>
| 1929-33      | 42.3                                 | ** Beginning 1934, includes only apples from commercial areas sold and used in farm household.**


1 Taken from Horticulture 628 notes, Dr. R.C. Scott, Spring 1951.

2 Ibid.
The per capita consumption of fresh fruits has stayed relatively stable from the 1909-13 period to the present. Although the aggregate has been relatively constant, there have been shifts primarily in the decline of apples and the increase in citrus. Fresh apples were consumed at the rate of 58.7 pounds and citrus at 16.7 pounds annually in the 1909-13 period. In the 1949-51 period, oranges were consumed at a rate of 42 pounds while apples were at a per capita figure of 30.4. The orange figure would have been higher probably if oranges were not being consumed at a high rate in the form of juices and concentrates. Banana consumption declined during the war years but is now rising back to its former level.

Note the increase in fresh vegetable consumption.
Table 13

Per Capita Consumption (Retail Weight) of Various Fresh Fruits and Vegetables, 1909-13 to 1949-51, by Five-Year Periods. (Average Pounds Per Capita)

<table>
<thead>
<tr>
<th>Period</th>
<th>Fresh Apples</th>
<th>Total Fresh Citrus</th>
<th>Bananas</th>
<th>Pears</th>
<th>All Fresh Tomatoes</th>
<th>Total Fresh Veg.</th>
</tr>
</thead>
<tbody>
<tr>
<td>1909-13</td>
<td>58.7</td>
<td>16.7</td>
<td>20.0</td>
<td>4.6</td>
<td>130.6</td>
<td>18.5</td>
</tr>
<tr>
<td>1914-18</td>
<td>56.8</td>
<td>20.3</td>
<td>16.2</td>
<td>4.9</td>
<td>128.3</td>
<td>18.3</td>
</tr>
<tr>
<td>1919-23</td>
<td>45.8</td>
<td>25.8</td>
<td>17.6</td>
<td>5.4</td>
<td>123.3</td>
<td>19.6</td>
</tr>
<tr>
<td>1924-28</td>
<td>44.5</td>
<td>29.4</td>
<td>21.6</td>
<td>5.8</td>
<td>133.3</td>
<td>18.6</td>
</tr>
<tr>
<td>1929-33</td>
<td>38.0</td>
<td>35.7</td>
<td>20.0</td>
<td>5.4</td>
<td>127.4</td>
<td>18.9</td>
</tr>
<tr>
<td>1934-38</td>
<td>31.7</td>
<td>42.3</td>
<td>21.1</td>
<td>5.7</td>
<td>130.6</td>
<td>20.4</td>
</tr>
<tr>
<td>1939-43</td>
<td>31.1</td>
<td>53.4</td>
<td>14.7</td>
<td>5.7</td>
<td>138.0</td>
<td>22.6</td>
</tr>
<tr>
<td>1944-48</td>
<td>26.6</td>
<td>58.5</td>
<td>14.6</td>
<td>6.0</td>
<td>138.1</td>
<td>23.8</td>
</tr>
<tr>
<td>1949-51</td>
<td>26.3</td>
<td>42.0</td>
<td>17.3</td>
<td>4.7</td>
<td>118.9</td>
<td>23.9</td>
</tr>
</tbody>
</table>

* Data from 1945 to 1951 are preliminary and subject to revision.


The per capita consumption of canned fruits has increased more than the per capita consumption of fresh fruits when measured percentagewise from the 1909-13 period to the 1949-51 period. This is true of vegetables, too, over the same period. Technological improvements such as refrigeration and processing have changed the produce industry. One example would be that prior to the 1939-40 season, over 95% of the Florida orange crop was marketed in fresh form. Due to improvements in processing,
such as "hot pack" and concentrating of orange juice, the Florida orange crop in 1950-52 crop years was marketed less than 40% in fresh form. This has influenced prices, consumption and production in the orange industry by allowing a longer marketing period, lower transportation costs, wider area of distribution, lower retail prices and more citrus by-products.

Canned apples and apple sauce have increased only about two fold while canned fruit as an aggregate in this same period, 1909-13 ot 1949-51, increased over five fold. The canned apple industry, located mainly in Virginia, Pennsylvania, New York and Washington, uses approximately five million bushels a year. Total canned fruit juices increased over forty times in this period. Canned apple juices, .6 pounds per capita annually in 1949-51 period, are negligible. The United States Department of Agriculture is now conducting experiments in new methods of production of apple juices and apple concentrates.

Consumption of dried fruit per capita has stayed relatively stable at around four to five pounds in the twentieth century. Dried apples make up about .1 to .2 pounds of this quantity.

1 Hoofnagle, W.S., and Ogren, K.E., Shifts in Marketing Oranges from Fresh to Processed Form, B.A.E., U.S.D.A., Washington, D.C., 1952. (Mimeographed handout)
Table 134

Per Capita Consumption of Various Canned Fruits, Fruit Juices, and All Canned Vegetables, 1909-13 to 1949-51, by Five-Year Averages
(Average Pounds Per Capita)

<table>
<thead>
<tr>
<th></th>
<th>Canned Fruits</th>
<th>Canned Fruit Juices</th>
<th>Total Canned Fruit Juices</th>
<th>All Canned Vegetables</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Apples and Apple Sauce Peaches Pine-Apple All Canned Fruit</td>
<td>Canned Juice</td>
<td>Citrus Juices</td>
<td>Citrus Concentrate</td>
</tr>
<tr>
<td>1909-13</td>
<td>0.6</td>
<td>0.8</td>
<td>0.7</td>
<td>2.9</td>
</tr>
<tr>
<td>1914-18</td>
<td>1.0</td>
<td>1.2</td>
<td>2.0</td>
<td>6.7</td>
</tr>
<tr>
<td>1919-23</td>
<td>0.9</td>
<td>2.1</td>
<td>2.4</td>
<td>8.7</td>
</tr>
<tr>
<td>1924-28</td>
<td>0.9</td>
<td>3.2</td>
<td>3.2</td>
<td>11.3</td>
</tr>
<tr>
<td>1929-33</td>
<td>0.9</td>
<td>2.7</td>
<td>3.4</td>
<td>11.5</td>
</tr>
<tr>
<td>1934-38</td>
<td>1.1</td>
<td>3.0</td>
<td>3.8</td>
<td>12.0</td>
</tr>
<tr>
<td>1939-43</td>
<td>1.6</td>
<td>3.7</td>
<td>3.6</td>
<td>16.6</td>
</tr>
<tr>
<td>1944-48</td>
<td>1.4</td>
<td>4.1</td>
<td>2.4</td>
<td>16.3</td>
</tr>
<tr>
<td>1949-512</td>
<td>2.1</td>
<td>5.3</td>
<td>1.9</td>
<td>19.3</td>
</tr>
</tbody>
</table>

1/ Does not include baby foods and canned soups.
2/ Three-year average.

Although freezing of perishables had been done in the nineteenth century, no serious, continuous, large-scale work in the freezing of fruit was done until the 1930's. Since World War II and more particularly since 1950, it has become apparent that although the percentage of food sold in frozen form is still relatively small, frozen foods are achieving mass acceptance and will force changes in the marketing of food. Apples have not enjoyed a relatively large change in amount sold in frozen form but other fruits have. Orange concentrate, strawberries and peaches have received good consumer acceptance in frozen form.

Table 138

Per Capita Consumption of Various Frozen and Dried Fruits and All Frozen Vegetables, 1909-13 to 1949-51, by Five-Year Averages. (Average Pounds Per Capita)

<table>
<thead>
<tr>
<th></th>
<th>Frozen Fruits</th>
<th></th>
<th>Dried Fruits</th>
<th>Frozen Veg.</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Apples Citrus Juices Total</td>
<td>Apples Total</td>
<td></td>
<td></td>
</tr>
<tr>
<td>1909-13</td>
<td>0 0 0 0.3 4.00 0</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1914-18</td>
<td>0 0 0 0.4 4.94 0</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1919-23</td>
<td>0 0 0 0.2 6.18 0</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1924-28</td>
<td>0 0 0.22 0.1 2.22 0</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1929-33</td>
<td>0 0 0.52 0.1 5.18 0</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1934-38</td>
<td>0.06 0 0.34 0.1 5.54 0.40</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1939-43</td>
<td>0.04 0 1.25 0.1 5.40 0.72</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1944-48</td>
<td>0.42 0.08 2.70 0.2 4.98 2.22</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1949-51</td>
<td>0.27 1.50 4.17 0 4.37 3.47</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

1 1925-28 Average. Data not given prior to 1925.
2 1937-38 Average. Data not given prior to 1937.

Table 14


<table>
<thead>
<tr>
<th>Fruit</th>
<th>Pounds Consumed</th>
<th>Percent of Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Fresh</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Apples</td>
<td>30.4</td>
<td>24.8</td>
</tr>
<tr>
<td>Citrus</td>
<td>48.9</td>
<td>47.4</td>
</tr>
<tr>
<td>Other</td>
<td>59.2</td>
<td>52.8</td>
</tr>
<tr>
<td>Total Fresh</td>
<td>138.5</td>
<td>125.0</td>
</tr>
<tr>
<td>Canned Fruits</td>
<td>14.9</td>
<td>18.2</td>
</tr>
<tr>
<td>Canned Juices</td>
<td>3.9</td>
<td>15.5</td>
</tr>
<tr>
<td>Frozen</td>
<td>.8</td>
<td>3.5</td>
</tr>
<tr>
<td>Dried</td>
<td>5.8</td>
<td>4.6</td>
</tr>
<tr>
<td>All Fruits</td>
<td>163.9</td>
<td>166.8</td>
</tr>
</tbody>
</table>

Source: The National Food Situation, Bureau of Agricultural Economics, United States Department of Agriculture, January-March 1951 and October-December 1951.
<table>
<thead>
<tr>
<th>Vegetables</th>
<th>Pounds Consumed</th>
<th>Percent of Total</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Average 1935-39</td>
<td>Average 1949</td>
</tr>
<tr>
<td></td>
<td>Preliminary 1951</td>
<td>Preliminary 1951</td>
</tr>
<tr>
<td>Fresh</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Potatoes</td>
<td>131.0</td>
<td>108.0</td>
</tr>
<tr>
<td>Sweet Potatoes</td>
<td>21.4</td>
<td>14.3</td>
</tr>
<tr>
<td>Other</td>
<td>235.0</td>
<td>249.0</td>
</tr>
<tr>
<td>Total Fresh</td>
<td>387.4</td>
<td>371.3</td>
</tr>
<tr>
<td></td>
<td>365.1</td>
<td>87.0</td>
</tr>
<tr>
<td>Canned Vegetables</td>
<td>29.9</td>
<td>38.3</td>
</tr>
<tr>
<td>Frozen Vegetables</td>
<td>41.5</td>
<td>7.0</td>
</tr>
<tr>
<td>Dry Edible Beans</td>
<td>8.8</td>
<td>7.4*</td>
</tr>
<tr>
<td>All Vegetables</td>
<td>426.5</td>
<td>420.0</td>
</tr>
</tbody>
</table>

* Includes .4 pounds of dry field peas in 1949 and .7 pounds in 1951.

The tables which appear on pages and are presented primarily for general information. The predominance of fruit consumption is still consumed in fresh form. The losses could be attributed to improvements in processing technology, particularly in the case of canned juice, some gain in frozen fruits and the fact that the price of canned fruits and vegetables has been low relative to that of fresh fruits and vegetables in the postwar period.

**Prices of Apples**

The prices of apples appear simultaneously to be easily ascertained and also nebulous.

Dr. Karl Fox "shows that 96% of the variation in the season average price per bushel received by growers for the twenty apple crops, 1922-41, was explained by variation in the size of crop and disposable personal income."

Fox, using the Cowles Commission method of multiple regression (or correlation) in analyzing factors affecting year to year changes in farm prices, United States, 1922-41, gives the effect of one percent change in production or consumption giving a net effect of -.79% with a standard error of .04 and a net effect of 1.04% with a

---

standard error of .12 when a one percent change occurred in net income. Fox goes on to say: "These coefficients can also be used as a basis for estimating elasticities of demand at retail if (1) supplies actually reaching consumers are nearly equal to production and (2) if we have appropriate equations relating percentage changes in prices at retail and farm levels. If there are any fixed elements in the marketing margin, the elasticity of demand at the consumer level will be greater than at the farm price or dealer level." Fox states further in another communication that he "used total production rather than per capita consumption in my apple analysis. If changes in exports, stock and quantities of apples processed are correlated with changes in apple production (as I (Fox) would expect), my equation would not give a proper estimate of (say) consumer demand for apples in fresh form. A similar point is made with respect to meat production versus meat consumption."

Fox's work implies a slightly elastic demand for apples during the 1921-41 periods. His work further indicates that the price of apples in Washington State is

1 Fox, Karl A., Factors Affecting Farm Income, Farm Prices and Food Consumption, Agr. Economics Research, July, 1951 pg. 70, 71, 74 and 77.
2 Fox, Karl A., op. cit., pg. 76
strongly influenced by the production of apples east of the Rocky Mountains as well as in Washington and other western states. (Eastern production averaged larger than did Western.) Fox's work further implies "that production of Western apples has little effect on the price of apples in New York State. This may be due in considerable part to the fact that western production, much of it on irrigated land, was more stable than eastern production (the variation of $q_w$, which refers to production outside of eleven western states, was almost eight times as large as that of $q_w$, which refers to production in eleven western states)."

The writer would like to suggest that part of the variation is the result of marketing practices and that apple prices are not necessarily for a completely homogenous product.

A majority of discussions of apple prices give three principal causes, or variations of these three causes, for the price of apples. These three are: (1) the quantity and quality of apples on hand and/or offered for sale, (2) the quantity, quality and price of competing commodities and (3) the amount of disposable income in the hands of consumers. This can be found in the works of Fox, Calhoun and Scott of Washington State (1947).

Smith of Virginia (1953), Hoobler of Washington (1951), Boger of Michigan State (1953), Sharp of Ohio State (1952), and Cravens and Bere of Ohio State (1954).

The above-mentioned factors would be deducted logically and research work tends to strengthen their position. The author would like to point out that his hypothesis on apple prices, besides including the above-mentioned three factors, would include (1) general price level, (2) the seasonal starting price, (3) storage and (4) expectations of producers, marketing channels and the consumer.

From observation, it can be noted that apple prices in recent years, assuming a near normal seasonal movement to market, tend to stay near the starting price. It is noticeable that many small and average producers tend to store, depending on the previous year's personal experience in storing.

The writer would like to see a structural analysis done that would include (1) consumer demand function for fresh apples, (2) an equation relating the retail to the farm price of apples, and (3) an equation expressing the supply of fresh apples made available to consumers as a function of total apple production. Equations (1) and (3) derived simultaneously by the method of "reduced forms"
would then be compared with a single least squares equation expressing the retail price of fresh apples as a function of consumption of fresh apples and disposable income.

This might further be worked down according to variety, market and production area. The four minor factors mentioned on the previous page might be correlated thereto, also. The degree of elasticity for marketing services and, more particularly, prepackaged apples with and without brand identification should be tested for degree of elasticity empirically. Several points of dissatisfaction to the writer — (a) actual amount of non-commercial areas apples produced and marketed, (b) actual weight of apples (the forty-eight pound bushel is debatable when set up as an average with few deviations) and (c) the reliability and completeness of market movements and prices, might pay off well for research money expended. Due to differences in postwar markets, as pointed out in Chapter 3, it is the writer's hypothesis that the demand curve has probably shifted and prewar figures should be used with this thought in mind.

Dr. John W. Sharp states: "The demand curve of apples for this period (1929-49) indicates that the demand is slightly elastic with such small changes in

1 Whitacre, W. R., Packaging Problems of Eastern Apple Growers, Pennsylvania Agricultural Experiment Station, State College, Pennsylvania, April, 1941.
total revenue that for all practical purposes the demand could be called unitary in elasticity.

"Beyond a per capita supply of thirty pounds, the total per capita revenue remains approximately the same, indicating almost unitary elasticity. With supplies less than thirty pounds, the demand is rather elastic. The price per bushel falls with additional units of supply, but the fall in price is at a decreasing rate.

"There is some indication of a shift to the left in the demand for apples, possibly in the year 1947. During the years 1947-49, the indication is that the market was not willing to pay as high a price as for comparable supplies of other years."1

It should be pointed out that Sharp's work differs from Fox's work in being a later time period, using a per capita basis and prices have been adjusted by the index of prices received by farmers for food. Sharp's work also shows the reactions in price with different amounts of supply along the curve not an average.

Sharp's work suggests that there is a shift in demand in the years 1947-49. Apples tend to stay relatively elastic to a higher poundage per capita when the war years are omitted. Sharp states that four definite periods of

1 Sharp, John W., Elasticity of Demand for Selected Agricultural Products, unpublished Ph.D. Dissertation, The Ohio State University, Columbus, Ohio, 1953, pg. 104.
demand behavior can be ascertained, with shifts between each of the four. These four periods are: 1929-34, 1935-41, 1942-46 and 1947-49.

Some recent work of Dr. Max E. Brunk and associates of Cornell University, Ithaca, New York, suggests that the demand for apples when prepackaged in the method suggested by Cornell is elastic within ranges.

If we can assume that prepackaging (as shown by Dr. Brunk and others) increases apple sales and if we grant that the production of apples in the short-run is relatively fixed, the price of apples should increase if other things remain constant. Marketing practices of the Washington State Apple Commission, plus their fine product, have helped Washington Delicious apples to sell at retail five to eight cents a pound higher than the prices for eastern Delicious apples. Thus we could raise the hypothesis that marketing services, including differentiation, might increase the sales of apples and apple prices.

1 Sharp, John W., op. cit., pg. 104.
3 Stillwell, Edwin W., Address delivered to marketing clinic, Staunton, Virginia, September, 1952.
Dr. L. L. Boger, of Michigan State, states that three-fourths of the price fluctuation of apples by months can be explained by (1) the size of crop, and (2) income of persons in the United States. The decision to sell when harvested or how long to store would depend on whether prices are above or below the indicated price from the above data plus historical patterns of monthly apple prices and cost of storage.

Cravens and Bare state that "Ohio's supply of apples tends to follow in the same direction as does that in the central and eastern states and to a large extent the same as for the total United States." The similarity between Ohio and U. S. production is further strengthened by the statement of Cravens and Bare that "no significant improvement in the prediction of Ohio apple prices was obtained by the inclusion of United States supplies."

Cravens and Bare also found that "on the basis of the forty-three year relationship (1910-53) that a crop of 150% of that for the preceding year would be expected to bring a price of about 80% of the preceding year. A crop 50% as large as for the preceding year would bring a price of about 142% of that of the previous year."

Ohio apple prices tend to follow the national prices, generally being somewhat above. Seasonal prices tend to.

1 Boger, L.L., When Should Apples Be Sold, Michigan State Experiment Station, Special Bulletin 381, East Lansing, Michigan, September, 1952.
rise about one-fifth during the season in postwar years, but this varies from year to year and variety to variety. The direct monetary rewards of storing seem to have disappeared. However, we do know storage is desirable for good merchandising and movement, and we do not know what would have happened to apple prices if storage had been less.

Prices of oranges and peaches declined relative to apples during the 1909 to 1953 period.

The following table indicates apple prices have varied more and have risen higher and dissimilarly than average prices received by farmers. Apple prices rose higher on a 1935-39 basis than did prices paid by farmers. This comparison is weakened by (1) the base period years and (2) apple growers' inescapable costs (mainly labor and spray) may not be truly represented by the index of prices paid by farmers. Similar to difficulties with handling parity, farmers are concerned not with just price but price times production or total income and also net income.
Table 16

Indexes of Commercial Apple Production and Prices and Prices Received and Paid by Farmers, 1934-51
(1935-39 = 100)

<table>
<thead>
<tr>
<th>Year</th>
<th>Apple Production</th>
<th>Apple Prices</th>
<th>Prices Received by Farmers*</th>
<th>Prices Paid by Farmers*</th>
</tr>
</thead>
<tbody>
<tr>
<td>1934</td>
<td>83</td>
<td>114</td>
<td>84</td>
<td>96</td>
</tr>
<tr>
<td>1935</td>
<td>110</td>
<td>94</td>
<td>102</td>
<td>99</td>
</tr>
<tr>
<td>1936</td>
<td>77</td>
<td>135</td>
<td>107</td>
<td>99</td>
</tr>
<tr>
<td>1937</td>
<td>120</td>
<td>83</td>
<td>114</td>
<td>105</td>
</tr>
<tr>
<td>1938</td>
<td>83</td>
<td>106</td>
<td>91</td>
<td>99</td>
</tr>
<tr>
<td>1939</td>
<td>109</td>
<td>83</td>
<td>89</td>
<td>98</td>
</tr>
<tr>
<td>1940</td>
<td>88</td>
<td>104</td>
<td>93</td>
<td>99</td>
</tr>
<tr>
<td>1941</td>
<td>96</td>
<td>125</td>
<td>115</td>
<td>106</td>
</tr>
<tr>
<td>1942</td>
<td>100</td>
<td>178</td>
<td>148</td>
<td>122</td>
</tr>
<tr>
<td>1943</td>
<td>69</td>
<td>310</td>
<td>179</td>
<td>136</td>
</tr>
<tr>
<td>1944</td>
<td>95</td>
<td>287</td>
<td>183</td>
<td>146</td>
</tr>
<tr>
<td>1945</td>
<td>52</td>
<td>330</td>
<td>193</td>
<td>151</td>
</tr>
<tr>
<td>1946</td>
<td>93</td>
<td>319</td>
<td>219</td>
<td>166</td>
</tr>
<tr>
<td>1947</td>
<td>89</td>
<td>230</td>
<td>257</td>
<td>192</td>
</tr>
<tr>
<td>1948</td>
<td>70</td>
<td>290</td>
<td>266</td>
<td>207</td>
</tr>
<tr>
<td>1949</td>
<td>105</td>
<td>180</td>
<td>233</td>
<td>200</td>
</tr>
<tr>
<td>1950</td>
<td>98</td>
<td>205</td>
<td>239</td>
<td>204</td>
</tr>
<tr>
<td>1951</td>
<td>87</td>
<td>232</td>
<td>282</td>
<td>225</td>
</tr>
</tbody>
</table>

* Converted from a base of 1910-14 = 100 to 1935-39 = 100.
Source: Computed from Bureau of Agricultural Economics data.

In Summary

Apple production has shifted from numerous small farm orchards found throughout the country to larger commercial operations, usually in a relatively few production areas.

Individually, apple growers have little effect on the total market due to their size and relative homogeneity of the product now marketed.
Apple production is an example of the cobweb theorem, as growers plant and adjust operations over a decade or longer to better meet expected demand, supply, price and consumer preference relationship.

Apple production in the United States has decreased over one-third between the 1900-09 period and the 1950-53 periods' respective yearly averages. Ohio's yearly average in the same period declined over 60%.

Yields per acre of bearing fruit and per tree have increased nationally over the last fifty years. Apple yields per acre are lower and have increased less in Ohio than for the United States as a whole during the last fifty years.

Fruits and vegetables (not including potatoes) consumption per capita have increased since 1909-15 more than any other food group. Apple consumption per capita has declined over one-half in the period of 1909-13 to the present.

Total fresh fruit consumption has stayed relatively constant since 1909-13 but there has been an increase in citrus consumption and a decline in apples. Other fruits, particularly oranges, peaches and strawberries, have benefitted from technological developments such as freezing and concentrating.

Apple prices are affected by (1) the quantity and
quality of apples offered for sale, (2) the amount of consumer disposable income and (3) the quantity, quality and price of competing commodities.

Ohio apple prices and production tend to follow the national averages. Apple prices generally have fluctuated around the general price level. Ohio apple prices have usually been above the United States average, but this is diminishing.

Apples have a relatively elastic demand within certain consumption levels (25 to 55 pounds per capita), yet they do not follow the conventional characteristics of an elastic product. More apples are not being produced and consumed. Apple growers, because of problems of long-range investments, uncertainty, lack of knowledge, alternative opportunities, decreasing per capita consumption of apples, marketing difficulties, increasing costs of major inputs such as spray, labor and land, and failure to increase productivity as other competitive enterprises, have shifted to other more promising endeavors. New methods of merchandising fruits, particularly citrus, have brought stronger competition to fresh apples.
Chapter IX

An Experiment on Prepackaging Ohio Apples on the Farm and Their Marketing

The following study is based on project RM-37 of the Ohio Agricultural Experiment Station entitled "The Prepackaging of Farm Products on the Farm Level and Their Marketing." The apples phases of the project were probably stimulated by the request of Columbiana County, Ohio apple growers for work of this nature. This work is in line with other prepackaging experiments done by the Ohio Agricultural Experiment Station. Dr. O. W. Hauck's work is probably the best known of this previous work although studies in prepackaging have been done by a number of persons including Doctors Sherman, Sharp, Henning, Scott, Cravens, Brown, Kiplinger, Nelson and Winters.

Accounts of this study can be found in OAES Agricultural Economics Mimeograph Bulletins Nos. 230 and 245. The project was headed by Dr. Ralph W. Sherman, assisted by Dr. John W. Sharp and Glen H. Mitchell, began in 1950.

The Problem

As stated previously in Chapter 8, the apple industry and more particularly the Ohio apple industry is beset with declining consumption both on an absolute basis and a per capita basis. Downward trend of bearing acreage, tree plantings and total production indicates that apples do not
offer commensurate returns to growers as do other ventures. The Ohio apple grower is concerned not only with the macro problems of the apple industry but also the micro problems of the growers of the Ohio area. From casual observation, the individual grower cannot help but notice the laudable rewards from marketing improvement in the orange industry and the Washington State Apple Industry. Prepackaging was considered one avenue of progress in marketing to aid the Ohio producer.

Objectives

The objectives of this particular apple study were to (1) ascertain the costs, methods and returns of Ohio growers prepackaging apples, (2) to explore the reception of the farm prepackaged Ohio apples by retailers and consumers and (3) to explore methods of expanding the sale of Ohio apples.

Methodology

The researchers used a variety of methods in an attempt to better find the results or answers to fulfill the requirements placed by their objectives. The writer has no intention to list the advantages and disadvantages of the various conventional methods and to compare the mathematics involved.¹

¹ This information can be found in numerous good marketing research books such as L.O. Brown's *Marketing and Distribution Research*, Luck and Wales' *Marketing Research*, American Marketing Association's *Techniques of Marketing Research* and Ferber's *Statistical Techniques in Market Research*. 
As stated in chapter 1, the writer has felt free to use different methods to record and relate reality. Here in this chapter, it might be said methodology is changed to better meet actuality, to attempt to isolate one variable, to test different methods and to do this all within practical limits including the limits of time, money, personnel and other resources.

In the section regarding farm prepackaging of apples and returns, the work was done through personal interview methods. Only apple growers who had prepackaged a sizeable amount of apples (i.e. one thousand bushels or more) and had accurate records were included in this survey. The finding later—that due to prepackaging being a hand operation and hence the economics of scale did not enter in as much as in some other areas—eliminated much of the possibility of bias by the foregoing stratifying. The entire universe here is unknown but we consider this survey typical.

In the 1950-51 study, personal interview of store managers and personal interview of 373 apple purchasers were performed. This stratified sampling was drawn from high, medium and low income areas according to Census Block Rental Statistics. The sample was drawn to include storemanagers and apple purchasers in the cities and villages of Akron, Cleveland, Youngstown, Columbus, Dayton, Xenia and Yellow Springs.
The study of the effect of various sizes of bags carried on in two stores in 1951-2 and eleven stores in 1952-1953. These stores were selected through the aid of the two concerned food retail chains. The stores were chosen with the criteria of having various income groups interested and the individual stores having a sufficient amount of business to warrant research being carried on therein.

Marketing research is continuously hampered by desiring to use strict scientific method while operating in conditions true to life and yet to be able to isolate and measure one variable while keeping other variables constant.

To the extent this phase of the study succeeds is for the reader and others to evaluate. The elimination of the effect of store sales and size, time, carry-over, and price while following actual market conditions have been major considerations in this study.

Methodology will be dealt with in more detail as various situations are recounted.

The findings are limited by the extent of the data.
A Summary of Marketing Practices Relating to Ohio Apples Prepackaged at the Farm 1950-51

Store managers and their produce managers were interviewed for their experience with prepackaged and bulk apples, their attitudes and their opinions about the future and what should be done in the prepackaged apple field.

The attitude and cooperation of the retail trade was excellent. Retailers expressed a desire to do anything within reason to aid the Ohio apple producers.

A total of 24 representative stores were visited during November, January and February, 1950-51, in Akron, Cleveland, Columbus, Dayton, Youngstown, Xenia and Yellow Springs in obtaining the data. Prerequisite for a store to be included in this study was that they were handling Ohio prepackaged apples and bulk apples and that a sufficient volume was done to warrant the interviewer's time. Volume of produce sold per store ranged from $300 to $9,000 a week.

Stores in the survey had been handling some prepackaged apples for an average of two years or more and usually purchased prepackaged apples from only one grower. Displaying of prepackaged apples was fair to poor. Condition of the apples was good. Most growers had done a good job of grading and sizing before packaging.

The average store handled only one size of package with the five pound pack predominating. Most handled only one size and two different varieties in the prepackaged apples.
In bulk apples, the stores averaged 2.36 varieties made up of 1.39 local varieties, and .87 western varieties. Twenty of the 24 stores handled western apples which made up 67.1 percent of all bulk sales in the stores handling them.

The stores sold an average of 420.9 pounds of apples daily, made up of 236.5 pounds of bulk apples, and 182.4 pounds of farm prepackaged apples. Bulk, however, only out-sold farm prepackaged Ohio apples in 52.2 percent of the stores; 4.4 percent of the stores sold equal amounts of bulk and Ohio prepackaged apples, while in the remaining 43.5 percent of the stores the Ohio prepackaged apples outsold the bulk apples. When prepackaged apples were available all the time, the farm prepackaged Ohio apple outsold all other apples by 753 pounds to 523 pounds or by 44 percent.

Eighteen of the 24 stores prepackaged some apples themselves in varying size bags. If store prepackaged apple sales were combined with the farm prepackaged apples, the prepackaged apples outsold bulk apples in 19 of the 24 stores. Where store prepackaging was done, 41.9 percent of the apples received in bulk were packaged.

The average sale of farm prepackaged apples was 4.35 pounds or 47.2 percent more than the average bulk sale of 2.94 pounds. The average mark-up for the prepackaged apples was 31 percent and 52.6 for eastern bulk apples. The mark-
up for western bulk apples was considerable less than
the mark up for eastern bulk apples.

Spoilage

Store reported losses show prepackaged farm apples
spoilage to be one-fifth that of all other apple spoilage.
Spoilage losses for those reporting loss were 2.2 percent
for bulk apples and .44 percent spoilage for prepackaged
apples.

Six retailers reported absolutely no spoilage losses
in prepackaged apples. The extended shelf life, better
turnover, good grading and less customer handling all aid
in lessening the spoilage in prepackaged apples.

Retailer's Opinion of the Prepackaged Unit

Of no little importance is the attitude of the retailer
toward farm prepackaged Ohio apples. Upon their buying
and selling rest much of the success or failure of farm pre-
packaged apples.

Retailers were asked their opinion about farm pre-
packaged Ohio apples. The retailer was allowed to comment
as he cared to. Very few commented on the same details and,
in no case were they asked specific questions which might
influence their opinions.

Seventy-eight percent of the retailers stated that
they liked the prepackaged farm apples. Only one retailer
complained of poor quality in the packages. None stated any dislike for the farm prepackaged apples, but they did state certain things they thought would make for improvement in the prepackaged apples. Increases of apple sales from 50 percent to 300 percent were reported with the offering of the prepackaged units.

Uniformity, good quality and less spoilage in prepackaged apples were mentioned by many retailers as advantages. Clerks' time saved and convenience both for the retailer and customer were also claimed. Retailers also mentioned sanitation and good acceptance by consumers (especially for families with children) as advantages of prepackaged apples.

For improvements in the future, the most frequent comment was a desire for two sizes of bags. The three pound and five pound packages were commonly requested among the 56.5 per cent of retailers desiring two package sizes.

Thirty percent of the retailers wanted a more consistent supply. Five retailers stated they would like all apples to be prepackaged. Four retailers wanted more variety in the prepackaged apples.

**Consumer Acceptance of Farm Prepackaged Ohio Apples**

Three hundred seventy-one apple purchasers were interviewed for their opinions concerning their purchase of apples. These purchasers, usually housewives, were asked why they purchased the apples they did.
Reasons for purchasing prepackaged apples are given in Table 17. Most of the purchasers who said they purchased the prepackaged apples regularly went on to give some reasons why. The purchasers statement "buy regularly" is left in the tabulation as a significant figure. It shows that about one out of six become a regular customer despite the short period during which apples have been offered in this way.

<table>
<thead>
<tr>
<th>Reason</th>
<th>Number</th>
</tr>
</thead>
<tbody>
<tr>
<td>Buy regularly</td>
<td>59</td>
</tr>
<tr>
<td>Convenience</td>
<td>52</td>
</tr>
<tr>
<td>Better eating quality</td>
<td>47</td>
</tr>
<tr>
<td>Better quality</td>
<td>46</td>
</tr>
<tr>
<td>Cleaner</td>
<td>31</td>
</tr>
<tr>
<td>Bought for cooking and baking</td>
<td>19</td>
</tr>
<tr>
<td>Likes prepackage</td>
<td>17</td>
</tr>
<tr>
<td>Uses bag over</td>
<td>15</td>
</tr>
<tr>
<td>Sanitary</td>
<td>14</td>
</tr>
<tr>
<td>Size of package</td>
<td>13</td>
</tr>
<tr>
<td>Likes for cooking and eating</td>
<td>13</td>
</tr>
<tr>
<td>Appearance</td>
<td>11</td>
</tr>
<tr>
<td>Likes small size apples</td>
<td>11</td>
</tr>
<tr>
<td>Buys for children</td>
<td>10</td>
</tr>
<tr>
<td>Trying first time</td>
<td>9</td>
</tr>
<tr>
<td>Prefers Ohio apples</td>
<td>9</td>
</tr>
<tr>
<td>Well satisfied</td>
<td>7</td>
</tr>
<tr>
<td>Apples keep better</td>
<td>6</td>
</tr>
<tr>
<td>Reliable</td>
<td>4</td>
</tr>
<tr>
<td>Uniformity</td>
<td>4</td>
</tr>
<tr>
<td>Heard they were better</td>
<td>1</td>
</tr>
<tr>
<td>Bought first thing they saw</td>
<td>1</td>
</tr>
</tbody>
</table>

1/ Total number of reasons exceed number of customers as many customers gave more than one reason.
The main reasons given for the purchase of bulk apples rather than packaged were: (1) that they had never tried prepacks, (2) the packages offered were too large, (3) like to pick out own apples, (4) size of the bulk apples suited better, and (5) variety desired was available only in bulk. Other answers given less frequently were that the apples in bulk were cheaper, don't trust any kind of packaged produce and that they merely purchased the first apples they saw.

A large number of purchasers of bulk apples had purchased western apples but as far as possible their answers were eliminated because they pertained to preferences for western apples over Ohio apples, rather than for prepackaged over bulk apples.

The reasons given for purchasing bagged apples and for purchasing bulk apples provide good material from which merchandising of apples could be better fitted to consumer desire.

Prepackaging of Apples by 21 Ohio Producers

Methods of prepackaging 1/ apples at the farm changed very little in 1951 from the previous year. Each grower 1/ Prepackaging at the farm merely means that the producer puts the apples in consumer units before delivering to the buyer.
has his own improvised method and in all cases it was a hand operation. Producers were chosen on the basis of whether the growers were prepackaging a sufficient amount to have information that was meaningful, kept accurate records and were known to the researchers. The Ohio Apple Institute retailers, extension workers and individual growers were queried for persons that were farm prepackaging apples.

More growers were using polyethylene bags than in the previous year. It accounted for more volume than any other type of container. The use of the five pound package gained in popularity over the four pound size from 1950 to 1951. While no records were obtained of quantity packed in each size, it was evident that the five pound size accounted for considerably more volume than the four pound size.

Several growers were using more than one type or size of container which accounts for the number using different containers totaling more than the number of producers who furnished data for the study. Table 17A includes a complete listing of type, size and cost of containers used by the 21 producers.

The average loss of packages from breakage during the prepackaging operation continued at less than one percent.
Cardboard boxes continued to be the most popular master container for delivering the packages. A variety of improvised master containers were employed, such as used melon crates and field crates. Used cardboard or wooden cartons or boxes of various kinds were also employed. The cost of the master containers varied from zero to $1 each. The average cost per bushel of apples was 7.5 cents for the master container. This was 1.2 cents lower than for the 12 growers furnishing figures for the previous year. In part the saving was a result of experience.

Table IIIA Type, Size and Cost of Packages Used by Twenty-One Ohio Apple Growers for the Crop Year of 1951

<table>
<thead>
<tr>
<th>Type of Package</th>
<th>Number Using</th>
<th>Average Price Per Thousand</th>
<th>Price Range Per Thousand</th>
</tr>
</thead>
<tbody>
<tr>
<td>Polyethylene</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Five pound</td>
<td>7</td>
<td>$29.86</td>
<td>$27.30 to 33.50</td>
</tr>
<tr>
<td>Four pound</td>
<td>6</td>
<td>28.04</td>
<td>22.70 to 32.00</td>
</tr>
<tr>
<td>Three pound</td>
<td>2</td>
<td>26.00</td>
<td>26.00</td>
</tr>
<tr>
<td>Pliofilm</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Five pound</td>
<td>2</td>
<td>34.75</td>
<td>33.50 to 36.00</td>
</tr>
<tr>
<td>Four pound</td>
<td>4</td>
<td>28.00</td>
<td>25.50 to 31.50</td>
</tr>
<tr>
<td>Three pound</td>
<td>2</td>
<td>28.50</td>
<td>27.00 to 30.00</td>
</tr>
<tr>
<td>Baskets</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Four quart</td>
<td>3</td>
<td>58.90</td>
<td>48.50 to 73.20</td>
</tr>
<tr>
<td>Mesh bag</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Five pound</td>
<td>1</td>
<td>42.50</td>
<td>42.50</td>
</tr>
<tr>
<td>Cartons</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Window carton</td>
<td>1</td>
<td>50.00</td>
<td>50.00</td>
</tr>
</tbody>
</table>
Fifteen of the 21 producers had their master containers returned from the warehouse or store. Some of these 15 paid a slight fee for the return, varying from four to ten cents per container but in most cases the return was at no charge. The number of trips per container varied from two to forty.

Thirteen of the producers were delivering the prepackaged apples direct to the retail store while nine were delivering to the warehouse. One of these producers delivered to both places.

Several growers guaranteed the condition of the packaged apples by replacing any damaged or decayed apples. Usually the package containing such apples was replaced by another package.

Of the eleven varieties prepackaged by the 21 growers the five leading varieties were Delicious, Rome Beauty, Stayman, MacIntosh and Jonathan. An indication of one of the advantages of prepackaging was in the number of producers packaging two and one-fourth inch apples. These apples are usually moved at sacrifice prices in bulk containers but in the packages they were well accepted at little or no discount in price. Observation in the stores was that when the two and one-fourth inch apples were offered at the same price as larger apples of the same variety, the small apples were often taken in preference to the larger ones which indicated that some consumers preferred the smaller size. It might be well at some future date to study this relationship to determine its
possibilities in moving the small apples. The popularity of prepackaging as a means of moving the two and one-fourth inch apple can be seen in Table 178 which lists sizes prepackaged. Only three of the 21 producers were not packing two and one-fourth inch apples.

The advantages to be gained from mechanization of the prepackaging operation would be limited due to the comparatively small volume per producer and the comparatively low labor cost per bag. The smaller producers were able to keep their packaging costs at about the same figure as the larger producers. Economics of scale as related to the actual prepackaging operation is not a limiting scale although it probably would enter in on the marketing side of prepackaging apples.

Due to differences in skill and duties performed, the number of packages packed per worker varied from 22 to 90 per hour. The average was 57. On an average, one helper was employed for each three packers. The duty of the helper was to keep each packer constantly supplied with apples and to take the filled master containers away. In a few cases, the helpers placed the bagged apples in the master container, but this was usually the duty of the packer. The average hourly rate paid helpers was 79 cents and the average rate paid packers was 75.6 cents per hour.
Four growers paid their packers by the bag. The price paid per bag varied from one and one-fourth to two cents.

Much of the labor was family and neighbor help. In large part they were women who desired part-time temporary work.

Return from Prepackaged Apples

Among the advantages attributed by apple producers to prepackaging were, (1) increasing gross income, (2) stabilizing price, (3) moving more apples in the same or shorter time, (4) raising the price received for two and one-fourth inch apples, (5) and increasing the net income.

One grower received almost two and one-half times as much for the prepackaged apples as for the same apples in bulk containers. Another grower received only 3.4 percent more than for the same apples in bushel containers. The latter was prepackaging large apples which were selling for $3.25 per bushel basket.

No comparisons could be made on seven growers because three of them prepackaged all apples and the other four didn't sell the same apples in bulk as they sold in the package.

The average increase in returns for the prepackaged apples over those in bulk containers was 81 cents per bushel or 44.6 percent. This was less than reported by the 12 producers for the previous crop year.
Cost of Prepackaging

The average cost of prepackaging a bushel of apples was 60.7 cents for the 21 producers. These expenses including labor, package and master container costs varied from a high of 84.3 cents to a low of 40 cents. Wide variation existed in the costs of packages, master containers and labor.

Of the average cost of 60.7 cents for packaging a bushel of apples, 34.2 cents was for individual packages, 19.0 cents for labor and 7.5 cents for the master container.

Table 178 Size of Apples Prepackaged by 19 Producers and Reported Gross Cash Increase Per Bushel from Selling Apples Prepackaged Over Similar Apples Sold In Bulk by Fourteen Producers, Crop Year of 1951-52.

<table>
<thead>
<tr>
<th>Increase Per Bushel</th>
<th>Percent Increase</th>
<th>Number of Growers</th>
<th>Size of Apples (Inch)</th>
</tr>
</thead>
<tbody>
<tr>
<td>$ .11</td>
<td>3.4</td>
<td>1</td>
<td>2 3/4 and 3</td>
</tr>
<tr>
<td>.15</td>
<td>5.0</td>
<td>1</td>
<td>2 1/4, 2 1/2 and up</td>
</tr>
<tr>
<td>.20</td>
<td>5.5</td>
<td>1</td>
<td>2 1/2, 2 3/4 and 3</td>
</tr>
<tr>
<td>.44</td>
<td>17.0</td>
<td>1</td>
<td>2 1/2, 2 3/4 and 2 3/8</td>
</tr>
<tr>
<td>.48</td>
<td>21.3</td>
<td>1</td>
<td>2 1/4, 2 1/2 and up</td>
</tr>
<tr>
<td>.65</td>
<td>27.4</td>
<td>1</td>
<td>2 1/2, 2 3/8 and up</td>
</tr>
<tr>
<td>.81</td>
<td>43.6</td>
<td>1</td>
<td>2 1/4, 2 1/2, 2 3/8 and up</td>
</tr>
<tr>
<td>.86</td>
<td>34.4</td>
<td>1</td>
<td>2 1/4, 2 1/2, 2 3/8 and up</td>
</tr>
<tr>
<td>.95</td>
<td>45.0</td>
<td>1</td>
<td>2 1/4, 2 3/8 and 2 3/8</td>
</tr>
<tr>
<td>1.02</td>
<td>54.1</td>
<td>1</td>
<td>2 1/4, 2 1/2, 2 3/8 and up</td>
</tr>
<tr>
<td>1.245</td>
<td>65.8</td>
<td>1</td>
<td>2 1/4, 2 3/8 and 2 1/2</td>
</tr>
<tr>
<td>1.44</td>
<td>144.0</td>
<td>1</td>
<td>2 1/4, 2 3/8 and 2 1/2</td>
</tr>
<tr>
<td>1.49</td>
<td>79.2</td>
<td>2</td>
<td>2 1/4, 2 3/8, 2 5/8 and up</td>
</tr>
<tr>
<td>(1) (1)</td>
<td>(1)</td>
<td>2</td>
<td>2 1/4, 2 3/8, 2 5/8 and up</td>
</tr>
<tr>
<td>(1) (1)</td>
<td>(1)</td>
<td>1</td>
<td>2 1/4, 2 3/8, 2 5/8</td>
</tr>
<tr>
<td>(1) (1)</td>
<td>(1)</td>
<td>1</td>
<td>2 1/4, 2 3/8, 2 5/8</td>
</tr>
<tr>
<td>.81</td>
<td>44.6</td>
<td>Average</td>
<td>2 1/4, 2 3/8, 2 5/8 and up</td>
</tr>
</tbody>
</table>

1 The costs considered herein are direct, out of pocket costs. No attempt has been made to include different overhead and administrative cost such as social security, etc.

(1) Comparative prices not reported.
If the producers who packaged their apples had marketed them in bulk, they would have had container cost and labor expense for bulk packing. To arrive at the net difference in the two methods, these costs would have to be subtracted from the total cost of prepackaging. While exact cost of bulk packing was not determined, the estimate of several producers indicates that prepackaging costs are approximately 30 cents more per bushel than bulk packing.

**Size of Package 1951 Crop Year**

The most usual size of prepackaged units of apples offered to the consumer in Ohio prior to the study had been the four and five pound bag. To our knowledge there had been very few, if any, cases in which two or more sizes of units were offered at the same time.

The purpose of this part of the study was to see if consumers had a preference for other than the one usual size of bag and if more than one size offered at the same time might be desirable. It was decided to try three, five and ten pound bags in three offerings - (1) five pound bags alone, (2) five and ten pound bags at the same time, and (3) three, five and ten pound bags as the third offering. Note that the fairly well standardized five pound bags were never dropped from any of the combinations.

The study was conducted over a period of nine successive weeks starting in the second week of November. The same display space was used for the entire period in each store.
Records were kept for the last three days of each week to facilitate changes in offerings. The apples were placed in two self-service stores and the offerings matched in such a way that all combinations in each store were matched against all possible combinations in the other store. One producer furnished all the apples and delivered them direct to the two stores where the apples were offered. With the exception of the first two weeks practically no bulk apples were sold in these two stores until western apples came on the market.

The pricing of the apples was based on the price of the standard five pound package as determined by the cooperating stores. The three and ten pound bags were priced so as to approximate the difference in cost of packing and handling. The retail price increased as the season progressed but by a comparatively small amount. A total of 33,916 pounds of apples were sold through the test displays.

Since western apples will no doubt always furnish strong competition with Ohio apples, the sale of prepackaged apples was studied with no change in the offerings of western apples.
Table 18. Western Apples as Percentage of Prepackaged Apples, by Week.

<table>
<thead>
<tr>
<th>Week</th>
<th>Bag Sizes</th>
<th>Western apples as percent of</th>
<th>Weighted average</th>
<th>1/</th>
<th>2/</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Ohio Prepackaged</td>
<td>Ohio Prepackaged</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Store No. 1</td>
<td>Store No. 2</td>
<td>Store No. 1</td>
<td>Store No. 2</td>
<td></td>
</tr>
<tr>
<td>1</td>
<td>5 lb.</td>
<td>5 lb.</td>
<td>1/</td>
<td></td>
<td></td>
</tr>
<tr>
<td>2</td>
<td>3-5-10</td>
<td>3-5-10</td>
<td>1/</td>
<td></td>
<td></td>
</tr>
<tr>
<td>3</td>
<td>5-10</td>
<td>5-10</td>
<td>1/</td>
<td>16.3</td>
<td></td>
</tr>
<tr>
<td>4</td>
<td>3-5-10</td>
<td>3-5-10</td>
<td></td>
<td>9.1</td>
<td>11.8</td>
</tr>
<tr>
<td>5</td>
<td>5-10</td>
<td>3-5-10</td>
<td>8.3</td>
<td>33.0</td>
<td></td>
</tr>
<tr>
<td>6</td>
<td>5</td>
<td>5-10</td>
<td>30.0</td>
<td>36.5</td>
<td></td>
</tr>
<tr>
<td>7</td>
<td>5-10</td>
<td>5</td>
<td>66.6</td>
<td>68.9</td>
<td></td>
</tr>
<tr>
<td>8</td>
<td>3-5-10</td>
<td>5-10</td>
<td>35.7</td>
<td>66.4</td>
<td></td>
</tr>
<tr>
<td>9</td>
<td>3-5-10</td>
<td>5-10</td>
<td>19.9</td>
<td>13.8</td>
<td></td>
</tr>
</tbody>
</table>

1/ No western apples offered
2/ Of those weeks where both prepacks and western apples were offered.

There was little evidence of any difference in the effect of various bag sizes for local apples on western apple sales. The seventh and eighth weeks showed almost two-thirds as many western apples sold as Ohio prepackaged. These were Christmas holiday weeks. The percentage of sales represented by western apples fell sharply in the week following the holidays.

The five pound package outsold both the three and ten pound sizes in both stores except during the second week when it was outsold by three pound bags in both stores. In turn
the three pound bags always outsold the ten pound size. Only once when all three sizes were offered did any one size unit account for half or more of the apples and indicates clearly the demand of consumer for several unit sizes.

Table 19. Percent of Prepackaged Apples Sold in Each Size of Bag.

<table>
<thead>
<tr>
<th>Week</th>
<th>Bag Sizes Offered (Pounds)</th>
<th>Percent of Sales</th>
<th>Bag Sizes Offered (Pounds)</th>
<th>Percent of Sales</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>5</td>
<td>100</td>
<td>5</td>
<td>100</td>
</tr>
<tr>
<td>2</td>
<td>3</td>
<td>40</td>
<td>3</td>
<td>40</td>
</tr>
<tr>
<td></td>
<td>5</td>
<td>34</td>
<td>5</td>
<td>37</td>
</tr>
<tr>
<td></td>
<td>10</td>
<td>26</td>
<td>10</td>
<td>23</td>
</tr>
<tr>
<td>3</td>
<td>5</td>
<td>90</td>
<td>5</td>
<td>74</td>
</tr>
<tr>
<td></td>
<td>10</td>
<td>10</td>
<td>10</td>
<td>26</td>
</tr>
<tr>
<td>4</td>
<td>3</td>
<td>36</td>
<td>5</td>
<td>100</td>
</tr>
<tr>
<td></td>
<td>5</td>
<td>45</td>
<td>5</td>
<td>100</td>
</tr>
<tr>
<td></td>
<td>10</td>
<td>19</td>
<td>5</td>
<td>49</td>
</tr>
<tr>
<td>5</td>
<td>5</td>
<td>78</td>
<td>3</td>
<td>29</td>
</tr>
<tr>
<td></td>
<td>10</td>
<td>22</td>
<td>5</td>
<td>49</td>
</tr>
<tr>
<td>6</td>
<td>5</td>
<td>100</td>
<td>5</td>
<td>75</td>
</tr>
<tr>
<td>7</td>
<td>5</td>
<td>74</td>
<td>10</td>
<td>25</td>
</tr>
<tr>
<td></td>
<td>10</td>
<td>26</td>
<td>10</td>
<td>100</td>
</tr>
<tr>
<td>8</td>
<td>5</td>
<td>100</td>
<td>3</td>
<td>31</td>
</tr>
<tr>
<td></td>
<td>5</td>
<td>54</td>
<td>5</td>
<td>42</td>
</tr>
<tr>
<td></td>
<td>10</td>
<td>12</td>
<td>10</td>
<td>27</td>
</tr>
</tbody>
</table>

Since each bag size combination was offered three times in each store it might be well to mention the total pounds of apples sold with each offering. In total, the five pound unit when offered alone in the two stores accounted for 10,085 pounds of sales. The combination of five and ten pound bags
accounted for 12,670 pounds or 25.6 percent more than the five pound bags alone. The 3,5, and 10 pound combination sold 11,161 pounds or 10.7 percent more than the fives alone.

These increases indicate a significant effect from offering the extra bag sizes along with the fives. However, this analysis fails to eliminate one important variable—that of differences in store traffic or produce volume by weeks. This may be responsible for a part of the difference in sales as shown by the figures in the previous paragraph. The analysis under Table (appearing later with discussion) has this variable eliminated by putting apple sales in terms of percent of produce sales.

Table 17A shows the percent of apples sold in each size bag throughout the nine week study period when offered in different combinations.

Table 17A Percent of Prepackaged Apple Sales Represented by Different Size Units, by Combination of Bag Sizes Offered During the Nine Week Experimental Period

<table>
<thead>
<tr>
<th>Bag Size</th>
<th>Store No. 1</th>
<th>Store No. 2</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>5-10</td>
<td>5-10</td>
<td>5-10</td>
</tr>
<tr>
<td></td>
<td>3,5,10</td>
<td>3,5,10</td>
<td>3,5,10</td>
</tr>
<tr>
<td>lbs.</td>
<td>lbs.</td>
<td>lbs.</td>
<td>lbs.</td>
</tr>
<tr>
<td>3</td>
<td>36.7</td>
<td>35.5</td>
<td>35.5</td>
</tr>
<tr>
<td>5</td>
<td>80.9</td>
<td>75.3</td>
<td>78.5</td>
</tr>
<tr>
<td></td>
<td>44.2</td>
<td>42.7</td>
<td>43.6</td>
</tr>
<tr>
<td>10</td>
<td>19.1</td>
<td>24.7</td>
<td>21.5</td>
</tr>
<tr>
<td></td>
<td>19.1</td>
<td>23.7</td>
<td>20.9</td>
</tr>
</tbody>
</table>

When only five pound packages were offered, they accounted for the total sales and therefore there was no need to include these facts in Table 17A. The last two columns are the important statistics to note here. These indicate that the ten pound bags will sell slightly more than 20 percent of the apples whether in combination with pounds only or with both three and five pound units.
These two columns make it apparent that the competition is almost solely between three and five pound bags as far as Ohio apples are concerned. If it were possible to eliminate the effect of both time and place at the same time in such an experiment we could determine whether the addition of the three pound unit to the 5-10 pound combination would sell more apples. Since this is not possible, some other method of determining the contribution of the three pound unit would be necessary. Some conclusions may be drawn by first setting up norms for 3-5-10, and 5-10 pound combinations and comparing what happened when matched in different ways at different times in the test. Such conclusions cannot be entirely conclusive because of the impossibility of eliminating influence of time. These comparisons are shown in Table 178.

Table 178 Percent of Prepackaged Apple Sales of Two Stores in Different Size of Bag by Different Combinations

<table>
<thead>
<tr>
<th>Week</th>
<th>Bag Sizes (lbs)</th>
<th>Percent of Total</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Store No. 1</td>
<td>Store No. 2</td>
</tr>
<tr>
<td>Control Period</td>
<td></td>
<td>Store No. 1</td>
</tr>
<tr>
<td>1</td>
<td>5</td>
<td>55.4</td>
</tr>
<tr>
<td></td>
<td>3-5-10</td>
<td>57.4</td>
</tr>
<tr>
<td></td>
<td>5-10</td>
<td>51.3</td>
</tr>
<tr>
<td>Experimental Period</td>
<td></td>
<td></td>
</tr>
<tr>
<td>4</td>
<td>3-5-10</td>
<td>56.4</td>
</tr>
<tr>
<td>5</td>
<td>5-10</td>
<td>62.9</td>
</tr>
<tr>
<td>6</td>
<td>5</td>
<td>51.7</td>
</tr>
<tr>
<td>7</td>
<td>5-10</td>
<td>53.2</td>
</tr>
<tr>
<td>8</td>
<td>5</td>
<td>56.3</td>
</tr>
<tr>
<td>9</td>
<td>3-5-10</td>
<td>55.6</td>
</tr>
<tr>
<td>All Offerings</td>
<td>5</td>
<td>55.6</td>
</tr>
</tbody>
</table>


During the first three weeks the same combinations of units were offered in both stores and the percentages of total sales by each store recorded. These percentages can then be matched against the percentages for later weeks when different matchings were made.

When five pound bags only were in both stores, 55.4 percent of the prepackaged apples of both stores were sold by Store No. 1. Later when Store No. 1 offered five pound bags only against 5-10 and 3-5-10 pound combinations in Store No. 2, the respective percentages of the total were 51.7 and 56.3. This shows no conclusive evidence that adding other size units to the offerings of store No. 2 changes the relationship materially. This was likewise true when the store No. 1 had 5-5-10 pound units with varying combinations in store No. 2. With 5-10 pound units in store No. 1, the percentage went up materially when the other store offered 2-5-10's at the same time.

As a summary, it can be said that the evidence of any great effect of adding 3 and 10 pound bags to the 5's on total sales is not too apparent in this kind of analysis where effect of total produce sales on apple sales has not been taken into account. The next paragraph takes into account this variable and sheds new light on volume of sales attained when more than one size of package was offered.

Probably the best method of measuring the effect on sales of adding the three and ten pound units to the five pound unit
is by comparison of the percentage of produce sales represented by apples when the various combination of bag sizes were offered at different times. This measure shows a distinct increase in the proportion represented by apples when both the 10's separately and the three and ten's together were added to the five's. When the five pound bag was offered alone, apple sales made up 4.30 percent of the total produce sales. When the ten's alone and the three and ten's were added to the five pound offering apple sales represented 4.92 percent of produce sales in both cases. When considering the difference between these percentages, one must consider that the produce sales of these stores amounted to thousands of dollars each week. Thus a small increase in percent of produce sales represented by apples means a large increase in dollars worth of apple sales. When stated in terms of increase in apple sales the addition of the ten's and three's and ten's to the five's amounted to 14.4 percent in both cases. This increase amounted to a total of 2,800 pounds of apples in both stores for the nine week period when either combination was added to the five pound bag. By adding either combination of the ten's alone or the three's and ten's together with the five's the increase amounted to slightly over 300 pounds of apples per week in the two stores.
Table 19C Percent of Produce Sales Represented by Ohio Packaged Apples with Different Combinations of Bag Sizes

<table>
<thead>
<tr>
<th>Bag Size Combination (lb.s)</th>
<th>Store No. 1</th>
<th>Store No. 2</th>
<th>Both Stores</th>
<th>Index of Apple Sales Volume (5# alone = 100%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>5 only</td>
<td>3.63</td>
<td>5.11</td>
<td>4.30</td>
<td>100.0</td>
</tr>
<tr>
<td>5 and 10</td>
<td>4.57</td>
<td>5.51</td>
<td>4.92</td>
<td>114.4</td>
</tr>
<tr>
<td>3, 5, and 10</td>
<td>5.17</td>
<td>4.56</td>
<td>4.92</td>
<td>114.4</td>
</tr>
</tbody>
</table>

Since the increase was identical for both the addition of the ten pound bag alone and the three and ten pound bag at the same time the conclusion could be made that the addition of the ten pound bag to the five pound will accomplish the result of increasing sales. Addition of the three pound bags has little effect on sales of ten pound units or on total sales. However, the offering of three pound units probably should be made since the consumers demonstrated that they want it.

The three pound bag was priced with enough premium to pay its extra cost per pound and the packer and trade should therefore not be prejudiced against it on the basis of cost.

Since it is apparent that the ten pound bag increased sales no more evidence is necessary to establish its value. But apparently the value of the use of three pound bags would rest largely on the fact that since the customers have shown their desire for it that good merchandising and the retailer's desire to get away from bulk would probably dictate its use. Further possibilities in the value of the three pound bag to Ohio producers would be in its effect on competition of western apples.
or in its use to sell small apples. Such effect would have to be tested further than this year’s study allowed to reach any definite conclusion.

1952 Crop Year

In order to test the validity of the first year’s results under different price levels it was decided to continue the test of the effect of various sizes of bags on volume for a second year. The national apple crop was smaller in 1952 than in 1951 and prices of local prepackaged apples were approximately two cents higher per pound at the retail level. Western apple prices also were higher. It was thought best as a result of the higher level of apple prices to offer three, four, and eight pound units instead of three, five, and ten which were offered the first year.

The study sample was enlarged to include seven experimental stores and five control stores. The control technique was modified to eliminate carry-over effects of different offerings.

Over 200,000 pounds of apples were sold through the 12 experimental stores during the test period in this second year’s study. During these experimental weeks over 500,000 customers passed through the stores and it is felt that this volume of apples and number of customers was large enough to permit valid conclusions to be made of the results.

The twelve stores were located in greater Columbus,
Fairborn, Knollwood, Washington Court House and Urbana. Various sizes of self-service stores were selected and the stores were located so as to represent various consumer income areas. Except to keep the display at the same location and of the same size throughout the ten week period, no other special treatment was given the experimental apples by any of the twelve produce departments. All apples in the experiment went through regular marketing channels to get to the stores.

Records were kept for each offering of apples sold during the ten week study period during October, November, and December. These records covered all six market days of each week. All stores handled the four pound prepackaged apples during the first two week control period which was used as a base. After the two-week control period, three stores added eight-ound prepacks to the standard four-pound while four stores added both three and eight pound packages to the regular four-pound offering. The other five stores were used as control stores and continued to handle apples as during the two-week base period. All stores continued to sell bulk western and eastern apples in addition to the Ohio prepackaged apples.
Table 20. Offerings of Various Sizes of Bags of Ohio Prepackaged Apples by Stores According to Weeks, 1952.

<table>
<thead>
<tr>
<th>Weeks</th>
<th>M</th>
<th>N</th>
<th>O</th>
<th>P</th>
<th>Q</th>
<th>R</th>
<th>S</th>
<th>T</th>
<th>U</th>
<th>V</th>
<th>W</th>
<th>X</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>A</td>
<td>A</td>
<td>A</td>
<td>A</td>
<td>A</td>
<td>A</td>
<td>A</td>
<td>A</td>
<td>A</td>
<td>A</td>
<td>A</td>
<td>A</td>
</tr>
<tr>
<td>2</td>
<td>A</td>
<td>A</td>
<td>A</td>
<td>A</td>
<td>A</td>
<td>A</td>
<td>A</td>
<td>A</td>
<td>A</td>
<td>A</td>
<td>A</td>
<td>A</td>
</tr>
<tr>
<td>3</td>
<td>C</td>
<td>C</td>
<td>B</td>
<td>B</td>
<td>A</td>
<td>A</td>
<td>A</td>
<td>C</td>
<td>C</td>
<td>B</td>
<td>A</td>
<td>A</td>
</tr>
<tr>
<td>4</td>
<td>C</td>
<td>C</td>
<td>B</td>
<td>B</td>
<td>A</td>
<td>A</td>
<td>A</td>
<td>C</td>
<td>C</td>
<td>B</td>
<td>A</td>
<td>A</td>
</tr>
<tr>
<td>5</td>
<td>C</td>
<td>C</td>
<td>B</td>
<td>B</td>
<td>A</td>
<td>A</td>
<td>A</td>
<td>C</td>
<td>C</td>
<td>B</td>
<td>A</td>
<td>A</td>
</tr>
<tr>
<td>6</td>
<td>C</td>
<td>C</td>
<td>B</td>
<td>B</td>
<td>A</td>
<td>A</td>
<td>A</td>
<td>C</td>
<td>C</td>
<td>B</td>
<td>A</td>
<td>A</td>
</tr>
<tr>
<td>7</td>
<td>C</td>
<td>C</td>
<td>B</td>
<td>B</td>
<td>A</td>
<td>A</td>
<td>A</td>
<td>C</td>
<td>C</td>
<td>B</td>
<td>A</td>
<td>A</td>
</tr>
<tr>
<td>8</td>
<td>C</td>
<td>C</td>
<td>B</td>
<td>B</td>
<td>A</td>
<td>A</td>
<td>A</td>
<td>C</td>
<td>C</td>
<td>B</td>
<td>A</td>
<td>A</td>
</tr>
<tr>
<td>9</td>
<td>C</td>
<td>C</td>
<td>B</td>
<td>B</td>
<td>A</td>
<td>A</td>
<td>A</td>
<td>C</td>
<td>C</td>
<td>B</td>
<td>A</td>
<td>A</td>
</tr>
<tr>
<td>10</td>
<td>C</td>
<td>C</td>
<td>B</td>
<td>B</td>
<td>A</td>
<td>A</td>
<td>A</td>
<td>C</td>
<td>C</td>
<td>B</td>
<td>A</td>
<td>A</td>
</tr>
</tbody>
</table>

Code: A—4# only, B—4# and 8#, C—3#, 4# and 8#.

The first thing to be checked was the sale of western bulk apples. Sale of these apples normally increases from the start of their season to the Christmas holidays. Thus, a check was made of what happened to their sale during the experimental weeks compared to the control weeks with different offerings of Ohio prepackaged apples.

These percentage increases are shown in Table 21. It can be seen that the increase was in direct inverse relation to the number of bag sizes of local apples offered. This is shown in both actual percentage increases in volume compared to base period and in increases in the western apples as a percentage of produce sales.
Table 21. Changes in Sales of Western apples During Experimental Period as Percentage of Base Period in Twelve Ohio Stores, 1952.

<table>
<thead>
<tr>
<th>Bag Sizes Offered (lbs)</th>
<th>Increase in Volume as Percent of Base Period</th>
<th>Increase in Volume as Percent of Produce Compared to Base Period</th>
</tr>
</thead>
<tbody>
<tr>
<td>3, 4 and 8</td>
<td>42.69</td>
<td>13.3</td>
</tr>
<tr>
<td>4 and 8</td>
<td>68.60</td>
<td>45.1</td>
</tr>
<tr>
<td>4 only</td>
<td>132.12</td>
<td>77.2</td>
</tr>
</tbody>
</table>

This constitutes good evidence that offering two or more bag sizes of Ohio apples gives increased competitive advantage to the local prepackaged apples over western apples. Statistically it means that the offering of three bag sizes of Ohio apples replaced 191 pounds of western apples per week per store which would have been sold if only one size unit of Ohio apples had been offered.

While the combination of three, four and eight pound bags was most effective in competing with western apples the four and eight pound combination was also effective but not to the same degree. The more varied the offering of Ohio apples, at least up to three bag offerings, the stronger is the competition which it affords western apples.

Evidence is presented in Table 22 that the competition of prepackaged apples with apples other than western was also very effective but that this competition was about as effective regardless of number of bag sizes offered. In all three offerings
the sales of apples other than western and prepackaged apples dropped by at least 49 percent during the experimental period.

In Table 21A is shown the relative sales of apples by bag size during the test period with the only variable as the number of bag sizes offered. Bulk apple sales are not summarized in this table. The most important thing brought out in this table is the comparative importance of each bag size in the different combinations of offerings regardless of what happened to bulk or total apple sales.

Table 21A Percent of Prepackaged Apples Sold in Each Size of Bag, by Store Groups Having Various Types of Bag Offerings.

<table>
<thead>
<tr>
<th>Bag Size (lbs.)</th>
<th>Store Group 1 (4th)</th>
<th>Store Group 2 (3rd)</th>
<th>Store Group 3 (5th)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>% of Sales</td>
<td>% of Sales</td>
<td>% of Sales</td>
</tr>
<tr>
<td>3#</td>
<td>33.5</td>
<td>4#</td>
<td>65.5</td>
</tr>
<tr>
<td>4#</td>
<td>41.7</td>
<td>8#</td>
<td>36.5</td>
</tr>
<tr>
<td>6#</td>
<td>24.8</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

It is evident that there was an important demand by consumers for all three sizes of bags offered. In the stores presenting three bag sizes the three pound bag accounted for one-third of the sales. Where the three pound bag was omitted, the sales in eight pound bags made up a much higher percent of the total

To aid in analyzing more accurately the effect of various combinations of bags, the effects of differences in volume of produce sales in different weeks were eliminated by expressing sales of apples as a percent of total produce sales. (Although
these percentages represented by apples may seem small, it must be remembered that these produce departments sold well over a quarter of a million dollars worth of produce in this ten week period.) From these percentages then can be calculated the change in apple sales associated with the various treatments.

Table 22. Apple Sales as a Percent of Produce Sales.

<table>
<thead>
<tr>
<th>Offerings</th>
<th>Control Period</th>
<th>Experimental Period</th>
<th>Exp. Period as a % of Control</th>
</tr>
</thead>
<tbody>
<tr>
<td>Stores offering three bag sizes</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Prepackaged</td>
<td>1.59</td>
<td>4.81</td>
<td>+246.0</td>
</tr>
<tr>
<td>Western apples</td>
<td>1.59</td>
<td>1.81</td>
<td>+ 13.8</td>
</tr>
<tr>
<td>Other</td>
<td>4.14</td>
<td>2.11</td>
<td>-  49.0</td>
</tr>
<tr>
<td>Total</td>
<td>7.12</td>
<td>8.73</td>
<td>+ 22.6</td>
</tr>
<tr>
<td>Stores offering two bag sizes</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Prepackaged</td>
<td>2.19</td>
<td>3.75</td>
<td>+  71.2</td>
</tr>
<tr>
<td>Western apples</td>
<td>2.15</td>
<td>3.12</td>
<td>+  45.1</td>
</tr>
<tr>
<td>Other</td>
<td>3.29</td>
<td>.95</td>
<td>-  71.1</td>
</tr>
<tr>
<td>Total</td>
<td>7.63</td>
<td>7.82</td>
<td>+  2.5</td>
</tr>
<tr>
<td>Stores offering one bag size</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Prepackaged</td>
<td>2.04</td>
<td>3.78</td>
<td>+  85.3</td>
</tr>
<tr>
<td>Western apples</td>
<td>1.36</td>
<td>2.41</td>
<td>+  77.2</td>
</tr>
<tr>
<td>Other</td>
<td>5.76</td>
<td>2.11</td>
<td>-  63.4</td>
</tr>
<tr>
<td>Total</td>
<td>9.16</td>
<td>8.30</td>
<td>-  9.4</td>
</tr>
</tbody>
</table>

The first two columns under each combination of bag sizes shown in Table 22 are percentages of total produce represented by sales of different offerings of apples for both the control and experimental periods. Total sales of apples expressed in percentage of produce were affected differently by the three different offerings. Three sizes
resulted in 22.6 percent increase in total apple sales (as percent of produce) for the experimental period and in 246.0 percent increase in prepackaged apples.

Where only two sizes were offered total sales went up only 2.5 percent with the experimental prepacks increasing 71.2 percent. In control stores with only the one size of bag offered total apple sales dropped 9.4 percent but sales of experimental prepackaged apples increased 85.3 percent based on produce sales. However, in these control stores bulk western apples had a much greater increase than in stores with two and three bag sizes.

Comparing the effectiveness of various bag size offerings as was done for the 1951 study shows the same outcome for 1952 but to different degrees. Using the one bag size as base it was found that the two bag size offering increased sales by 13.1 percent and the three bag size offering increased the sales by 35.3 percent.*

It is evident that the display of three sizes is more effective in increasing total apple sales and in selling prepackaged apples. The big increase in sale of prepackaged apples where three sizes were offered was partly in the sale of more apples in total and partly in displacement of western apples which would have increased by about 77 percent (as shown by the control stores) with only one bag size competition. Bulk

* These percentages were obtained by dividing (100% + 2.5%) by (100% - 9.4%) and (100% + 22.6%) by (100% - 9.4%).
other than western apples showed about the same pattern of
decrease from the control period to the experimental period
regardless of offerings of prepackaged apples. This is
rather conclusive evidence that any displacement coming
from more than one bag size offering was almost entirely
in the displacement of western apples.

Sales of various offerings of apples as well as of
produce were computed as a percent of control period and
are shown in Table 23. This table differs from Table 22
in that apple sales have not been corrected by produce vol­
ume as was done in Table 23. The main use of this table is
to show actual figures and changes. The relative changes
shown in Table 23 are more accurate measures of effect of
various offerings.

Table 23 Average Weekly Sales of Apples and of Total
Produce Control and Experimental Periods by Twelve
Retail Stores in Ohio.

<table>
<thead>
<tr>
<th>Offerings</th>
<th>Control Period</th>
<th>Exp. Period</th>
<th>%Change from Control to Exp. Period</th>
</tr>
</thead>
<tbody>
<tr>
<td>Stores offering 3 bag sizes (3#, 4#, 8#)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Prepackaged apples (lbs.)</td>
<td>309</td>
<td>1149</td>
<td>271.5%</td>
</tr>
<tr>
<td>Western apples (lbs.)</td>
<td>214</td>
<td>305</td>
<td>42.7%</td>
</tr>
<tr>
<td>Other (lbs.)</td>
<td>940</td>
<td>466</td>
<td>-50.4%</td>
</tr>
<tr>
<td>Total apples (lbs.)</td>
<td>1463</td>
<td>1981</td>
<td>34.1%</td>
</tr>
<tr>
<td>Total produce (dollars)</td>
<td>2874.54</td>
<td>3259.56</td>
<td>13.4%</td>
</tr>
<tr>
<td>Stores offering 2 bag sizes (4#, 8#)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Prepackaged apples (lbs.)</td>
<td>401</td>
<td>736</td>
<td>95.9%</td>
</tr>
<tr>
<td>Western apples (lbs.)</td>
<td>274</td>
<td>461</td>
<td>68.2%</td>
</tr>
<tr>
<td>Other (lbs.)</td>
<td>752</td>
<td>202</td>
<td>-73.1%</td>
</tr>
<tr>
<td>Total apples (lbs.)</td>
<td>1427</td>
<td>1449</td>
<td>1.5%</td>
</tr>
<tr>
<td>Total produce (dollars)</td>
<td>2419.30</td>
<td>2770.86</td>
<td>14.5%</td>
</tr>
</tbody>
</table>
Table continued.

<table>
<thead>
<tr>
<th>Offerings</th>
<th>Control Period</th>
<th>Exp. Period</th>
<th>%Change from Control to Exp. Period</th>
</tr>
</thead>
<tbody>
<tr>
<td>Stores offering 1 bag size (4#)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Prepackaged apples (lb.)</td>
<td>265</td>
<td>545</td>
<td>+105.6</td>
</tr>
<tr>
<td>Western apples (lb.)</td>
<td>105</td>
<td>244</td>
<td>+132.4</td>
</tr>
<tr>
<td>Other (lb)</td>
<td>799</td>
<td>321</td>
<td>-59.8</td>
</tr>
<tr>
<td><strong>Total apples (lb)</strong></td>
<td>1169</td>
<td>1110</td>
<td>-5.1</td>
</tr>
<tr>
<td><strong>Total produce (dollars)</strong></td>
<td>1658.24</td>
<td>1955.62</td>
<td>+17.9</td>
</tr>
</tbody>
</table>

All groups of experimental stores had an increase in total produce sales per week in the experimental period compared to the control weeks. For apples alone the increase was 34 percent for those stores with three bag sizes and 1.5 percent for those with two bag sizes. The control stores with only the one bag size actually had a drop of five percent in apple sales. This change represented all apples with the only variable in handling apples being in the number of sizes of bag offerings. The differences in the changes between the groups were almost entirely associated with this one variable since all other variables had been eliminated by the use of controls with the exception that produce managers were asked to handle western apples just as they were accustomed to.

Analysis of volume of sales of experimental apples shows that stores with three sizes of bags increased sales by 271 per cent over the control period. Stores with 2 sizes
increased 96 percent and the control stores increased sales 106 percent indicating that three sizes of bags was much more effective than two sizes in increasing apple sales volume.

There was no significant statistical difference between stores or between weeks from the general results.

Observations

The following statements are observations made during this study. They are not based on research findings but were the observation of the entire research staff on this project. These observations should be treated as such and not as statistically proven facts. Most of these observations would be worthy of empirical study.

1. When closely graded and carefully sized two and one-quarter inch apples were packaged in polyethylene bags, consumers bought them at the same price and often in preference to larger apples. By questioning, it was found that these purchasers usually had small children in their families. Just as in the larger sizes the coloring of the small apple is important to the consumer acceptance.

This movement of two and one-quarter inch prepackaged apples is in contrast to slow movement of the same apple in bulk at discounted prices.

2. Improvements could be made in the proper spacing of air holes in the films to avoid "fogging" and collection
moisture on the film. The less clouded bags moved before the clouded ones. Consumers seemed suspicious of clouded bags.

3. Spoilage losses were extremely low in packaged apples. A higher rate of spoilage was noticed in unpackaged midwestern apples and especially in western bulk apples. This was probably caused by damage in transit and by customer handling until the less desirable apples had to be thrown out.

4. In some stores where large (3 1/2 inch and over) well colored Ohio Red Delicious apples were offered in the same manner as western apples, people readily bought the Ohio apples at the same price they were paying for Washington Delicious apples.

5. Uniform sized apples appear better in the polyethylene bag and moved much better than mixed sizes. Color and quality should be uniform. It was noticed that one poor apple in the bag often caused that bag to be laid aside by the customer.

6. Practically all produce manager commented that they like a small size of bag added to the larger sizes so they would not have to handle any bulk apples.

7. There was no evidence that unconventional prices such as 3 1/2, 3 2/3, 4 1/2, 5 3/4, 5 1/2, 5 7/8, 6 1/2, 9 1/2, 9 3/4, 9 7/8, $1.01, $1.09, $1.12 had any detrimental effect on unit sales. Likewise, there is no definite price limit or range as far as the research showed.

8. Breakage of bags is not a problem. Eight and ten pound bags of .0015 polyethylene film were sufficiently
strong to stand customer handling. Customers did not seem
to be afraid of breaking the large bag.

9. The spoilage loss of apples handled in prepack-
aged units was much lower than in bulk.

Summary and Conclusions

Prepackaging at the Farm for Two Crop Years, 1951, 1952

Farm prepackaging of apples was mainly a hand opera-
tion with considerable variation in detail between growers.
There were wide ranges in labor cost per bag and in master
container costs. The average cost of packaging a bushel
of apples in consumer packages was 60.7 cents for the 21
producers or about 30 cents higher than packaging in bulk
as estimated by the growers. These growers reported an
increase in returns of 81 cents per bushel for prepackaged
apples over the same apples in bulk.

Although many types of materials were used, poly-
ethylene seemed to be most satisfactory.

Eleven varieties and all sizes of apples were pre-
packaged. The 2\(\frac{1}{2}\) inch apple was packaged by more growers
than any other size. Advantages attributed by growers
to prepackaging are: (1) increasing gross income,
(2) stabilizing price, (3) moving
more apples in the same or shorter time, (4) raising the price received for two and one-fourth inch apples, and (5) increasing net income.

Sale of Prepackaged Apples Through Retail Stores

1951 Crop year

Addition of three and ten pound bags to the regular offering of five pound polyethylene bags of apples in two stores in Columbus, Ohio in 1951 increased apple sales 14.4 percent.

When all three sizes of bags were offered at the same time in 1951, 35.5 percent of the total sales were in three pound units, 45.6 percent in the five pound units and 20.8 percent in the ten pound bag. When five and ten pound units were offered at the same time without the three pound units, 78.5 percent of the sales were in five pound and 21.5 percent in the ten pound units.

1952 Crop year

In 1952 the addition of eight pound units to the four pound units increased both total and prepackaged apple sales both in amount and as a percent of produce sales. The addition of the three pound unit further increased total apple sales and prepackaged apple sales.

Stores having three bag size offerings increased total apple sales as a percent of produce sales over the base period by 22.69 percent, the stores with two bag sizes had a 2.53
percent increase while the stores having only one bag size had a decline of 9.34 percent in total apple sales as a percent of produce from the base period.

When all three (3, 4, and 8 pound) units were offered at the same time, 33.5 percent of the volume of sales were in three pound units, 41.7 percent in four pound units and 24.8 percent in eight pound units. With the offering of two (4 and 8 Pound) units at the same time, 63.5 percent of the volume sold was in four pound and 36.5 in eight pound units. It will be noted that in both cases the eight pound unit sold a larger percent of the total than did the ten pound unit in the previous year.

Effective competition with the western apple seems to depend on number of bag sizes offered since each addition of an extra bag size of the prepackaged apples decreased the sale of western apples.

The sale of prepackaged apples varied less from week to week throughout the season than did bulk eastern and western apple sales.

Combined Conclusions

Increasing the number of bag sizes offered increased
packaged and total apple sales both in volume and as a percent of produce sales.

Demand for different size sales units was clearly demonstrated by the acceptance of each size offered. Particular attention should be paid to acceptance of both eight and ten pound units. The study lends doubt to the wisdom of offering only one size unit if total sales and competition with other apples are important.

The value of the addition of a three pound sales unit was demonstrated.

Summary

In closing we might say that this study has thrown new light and a new aspect, if not proven, on the following: (1) an experimental method for retail stores which eliminates effects of variables to a low minimum, (2) prepackaging apples and placing them in a variety of bag sizes increases sales, (3) increased gross and net returns to growers through moving more apples in the same or shorter time, raising the price received for 2\(\frac{1}{2}\) inch apples, and tends to stabilize price, (4) prepackaged apples are bought in larger amounts than bulk apples, and (5) prepackaging helps Ohio apples compete more effectively with western apples, and finally (6) reduces waste.

If the foregoing conclusions and hypotheses are correct, we could say there would be a shift in the demand curve. In
all fairness, we should say that the demand shifts not only for apples but demand shifts for apples and apple services.

We have not proved that the demand will shift the same degree as in our study if all Ohio apple growers prepackaged their apples. It would be logical to say that they would tend to.

However, Washington apple growers as well as other apple growers are already prepackaging apples. The Ohio apple growers because of their position in a deficit consuming area can better prepackage for the peculiar needs of the home market, have less package breakage and less apple deterioration, can often bypass some market channels and can more easily follow their apples through the store to the final consumer.

If this research can educate the consumer to the desirable characteristics of Ohio apples as compared with out-of-state, particularly western apples, it would enhance the Ohio apple industry's competitive position. As this study shows, the Washington Delicious is well known and well regarded while most Ohio apples are not recognizable to the majority of the public and their qualities are often unknown. If the Ohio apple is a good product, the research is desirable to help improve the method of presenting Ohio apples to the consuming public by making a good product show to better advantage. If prepackaging results in
more apple consumption per capita, this would be evaluated favorably according to our standards of a good nutritional diet. If prepackaging aids in acceptance of a desirable product (Ohio apples), this should increase competition and hence efficiency.

This analysis is mindful that other fruit can be prepackaged. It is also conceivable and probable that the consumption of frozen fruits will increase. However, prepackaging of apples will probably help them maintain their position and possibly strengthen their relative per capita consumption position. With the probable increase in population, even a halt or retraction of the per capita decline of apple consumption would benefit the apple industry to a large degree.

In the short run, prepackaging in various sizes of bags could shift the demand curve for those adopting the innovation. This increase in gross and net income will probably be retained partially by the innovator as would be expected by a student of an innovation thing. The retail trade through reduced labor costs, relatively fixed margins, reduction in spoilage and increased sales is benefiting. The consumer is generally getting a better product and more services. The Ohio apple grower due partially to his location may well take advantage of this innovation.
Theoretically in the long run, all excessive profits should be imputed and computed away. Due to the lack of true data on input and output relationship and the inflexibilities in the marketing channels, the lag for this occurring fully may be slow although the trend will be occurring.

In a competitive society such as ours, change in the long-run will be effected by not only what the apple industry does but what the entire food industry does. Besides this, we have to cope with technological changes, comparative prices, cultural lags and patterns, basic human drives, dietary knowledge and fads, and social-institutional arrangements among other things.

The author feels that he is neither scientific nor convincing in attempting to evaluate or predict the long run. Change will probably spring continuously and pre-packaging—an innovation or change—may be decadent in the long run. However, at the present time, it is reasonable to expect prepackaging in general to increase in the 20th century.

In the short run, the prepackaging of apples should and probably will benefit the innovator. Competition will probably force imitation. The Ohio apple growers through prepackaging's many advantages including improving his product, in the customer's eye, making the 2½ inch apple
salable at normal prices and also the Ohio apple grower's advantage in location should benefit by this innovation, to better compete with other apple areas. Apples as a whole should be better able to compete with other fruits. The extent to which the downward trend of per capita apple consumption is retarded, stopped or reversed is problematical; coupled with population growth, prepackaging should shift the demand curve for apples. The extent to which the demand curve shifts depends on the adoption of apple prepackaging, the extent to which apple consumption increases when prepackaging dominates, tends to follow this experiment, the reactions of other food items toward changes in marketing, consumer acceptance and also many other factors affecting why persons buy.

To whom the benefits of this study accrue is not a main concern of this researcher. It is hoped however that if prepackaging is considered desirable from the standpoint of efficiency that the innovation or change be adopted so as to better utilize our resources and to benefit the general welfare of all.


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