

HISTORY OF PREPACKAGING FRESH
FRUITS AND VEGETABLES

Glen H. Mitchell and Ralph W. Sherman
Department of Agricultural Economics and Rural Sociology
Department Mimeograph Series No. A.E. 254

Ohio Agricultural Experiment Station
Wooster, Ohio

Mimeograph No. A.E. 254 6/55 - 500

A HISTORY OF PREPACKAGING

FRESH FRUITS AND

VEGETABLES

Contents

- I. Introduction
- II. Growth of Specialization
- III. Advantages and Disadvantages of Prepackaging
- IV. Prepackaging of Products Other Than Fresh Fruits and Vegetables
- V. History of Prepackaging Fresh Fruits and Vegetables

A HISTORY OF PREPACKAGING FRESH FRUITS AND VEGETABLES

Introduction

In recent years, there has been an almost constant demand for more services to the U. S. consumer. Despite the fact that consumers' purchasing power has doubled in the last fifty years, the share of the consumers' net disposal income going for food has stayed relatively stable. This large amount going for food is due not to any increase in per capita food poundage but rather to an increase in the more costly protective foods and services at the expense of several of the less expensive foods. One "protective" food group that has increased significantly is fruits and vegetables, excepting potatoes. Prepackaging is one service or function that has grown considerably.

The writers are deeply indebted to a number of other persons for their aid in compiling this history. It is intended to give credit wherever possible but this has not been possible in all cases. This history is not all inclusive. It is hoped that others will add to this study in order that a complete history can be evolved. This study is the only written history of prepackaging fruits and vegetables known.

Definition of Prepackaging

Prepackaging includes weighing, packaging, and pricing before selling to the ultimate consumer items that historically had been sold in bulk.

Some prepackaging includes services such as trimming, washing and removal of excess parts of the product that would be normally discarded by the housewife. Examples are: when sweet corn is husked, the fat removed from meat, spinach is washed and chopped, tops are removed from carrots, the outside leaves are removed from lettuce. Items may be packaged in trays, baskets, or bags made of paper, wood or film or a combination of these materials with sufficient visibility so that the purchaser may fully view the product. As prepackaging becomes more commonly accepted, many of its concomitant practices such as refrigeration, self-service, 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 in prepackaging but the 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 balanced by labor savings, waste reduction, increased sales, better space utilization, transportation and handling savings.

Growth of Specialization With Special Reference To Food Marketing

As the economy develops farther from the domestic or subsistence stage to a differentiated or market economy, specialization in all segments become more common. Economic progress or change is not a single process but rather a series of interrelated developments. In order to understand the history of prepackaging we must have at least a cursory knowledge of the growth of specialization with special reference to food marketing. Packaging has grown with marketing, stage by stage and is a small but intrinsic part of marketing.

Packaging was a five billion dollar business in 1951 but its growth had been relatively slow until the twentieth century.

Economic progress is best served when fewer resources are required in the basic industries; thus more resources can be used in the tertiary industries.^{1/}

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% of the population in the United States lived in the country, today only 15% of the nation's population can be classified as living on farms.

^{1/}Clark, Colin, Conditions of Economic Progress, MacMillan, London, 1940

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% annually.^{1/}

Agricultural production has tended to move away from the consuming centers into more 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 90% of the fresh fruits and vegetables are produced a considerable distance from the point of consumption. Specialization in various fields such as production, transportation and processing, aided in this shift.

Farming today is a commercial operation with large capital requirements. The Farm Balance Sheet for 1953 showed farmers having a net worth of 149.5 billion or roughly \$27,364.00 per farm.

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 that of 17 of our sparsely 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.

Purchasing power 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.

Despite the increase in income, the percent of disposable income spent on food has increased slightly. Since 1929, the percent of disposable income spent for food has varied from 23% to 28%. The per capita food expenditure in 1953 was

^{1/} Agricultural Outlook Charts, 1954, U.S. Dept. of Agriculture, Washington, D.C., 1953

27% of disposable income but consumers could have purchased the same food as they consumed in 1939 for less than 18% of their disposable income.

The total quantities of food (dry matter basis) 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 percent 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 and cake 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 such services takes more than fifty cents of the consumers' dollar. There has been much written on the productive progress in the U. S. but little acknowledgement is given to development of our 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 produced most of its own foodstuffs, clothing and even 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 families 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 per year.^{1/} 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 both in what the farmers sold and what they bought. Better marketing facilities resulted. Farmers concentrated on producing a few items such as corn, wheat, 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, F. W. Woolworth's 5 and 10¢ stores originating in 1879 had the most pronounced chain store growth.

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

^{1/}Wright, Chester W., Economic History of the United States, McGraw Hill Book Co., Inc., New York, N. Y. 1949, p. 111.

Alexander T. Stewart of New York City opened the first department store in 1861.

With the growth of large urban areas and improved transportation, further increases in numbers and specialization were made in the retail trade.

Retail stores grew in numbers and volume in the 20th century when their growth was more rapid than that of population. The number of chain retail stores increased over 2800% between 1900 and 1928. The five largest grocery chains had a growth from 7% in 1922 to 25% in 1929 of the total grocery sales.

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% of the family food dollar in 1953.^{1/} Other developments which culminated in the 1955 supermarkets were 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 has increased by industrialization, urbanization, education 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.

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.

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 and account for 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 gross or 79% of the total business. The counter service stores are gradually becoming a negligible

^{1/}Lomasney, William F., Food Merchandising Tips and Topics, USDA, Washington 25, D. C., 1953, p. 5.

TABLE 1

Distribution of Marketing Charges for the U. S., Food Bill, Selected Years 1941, 1947 and 1953 (in Billion of Dollars)

		1941	1947	1953
Processors	Processors	3.1	7.0	10.1
Retailers	Retailers	2.7	6.0	9.7
\$3w5qu4qn5	Restaurant	2.1	4.5	6.2
	All others*	<u>3.0</u>	<u>5.2</u>	<u>9.0</u>
Total Mkt. Charges		10.9	22.7	35.0
Total Food Bill		20.0	45.1	60.0 ^{1/}

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 farm, 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 - 1950

Year	Employed Workers	Average Weekly Hours	Annual Man Hours	Price Level Index	National Current	Income 1940 Prices	Net Output Per Man Hour
	(mil.)		(bil.)			<u>1940 Prices</u>	
1850	7.4	70.6	27.2	47	2.2	4.7	17.3
1880	16.7	65.4	56.8	58	7.3	12.6	22.2
1900	27.5	60.9	87.1	56	17.4	31.1	35.7
1910	36.8	57.5	110.0	59	30.4	44.1	40.1
1920	41.8	51.9	112.8	142.9	69.5	48.6	43.1
1930	45.0	47.2	110.4	119.2	68.9	57.8	52.3
1940	46.9	43.0	104.9	100.0	77.6	77.6	74.0
1944	63.2	46.7	153.5	152.0	160.7	121.7	79.3
1950							
1960	60.2	37.7	118.0	-----	-----	122.0	103.4

Source: Dewhurst and Associates, Twentieth Century Fund, New York, New York, 1947, P. 23.

factor in grocery distribution.

Prepackaged, precooked and other means of preparing items before the consumer's purchase have become more common.

Some Economic Considerations of Prepackaging Fresh Fruits and Vegetables

Many changes in the United States appear to be revolutionary but actually are evolutionary in character. There are few recorded histories of radical changes in the American marketing picture but rather slow, experimental, often reversing transition. Many principles are known that could be used in production and marketing. Until consumer and trade acceptance 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 on evolution which sounded the death knoll of the retail merchandising of flour, crackers, pickles, salt and other commodities in barrels.

The modern self-service food store selling \$10,000 weekly of groceries will sell approximately 40,000 packaged items.

Prepackaging of fresh fruits and vegetables is a way of increasing consumption through the better saleability, longer shelf-life and improved maintenance of fresh quality.

A good consumer package should have - consumer appeal, strength, durability, protection for the product, impulse sale appeal, brand identity and, if possible, reuse value. The package is no longer only 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 asked food manufacturers 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. Prepackaging is often nothing more than shifting of services rather than the addition of services.

The growth of services and processing has had little or no effect in decreasing the farmers' share of the consumers' dollar. Our accurate records date back only to 1913. From 1913 to 1953, the farmers' share of the consumers' food dollar has increased by an average of 14 hundredths of a cent per year!^{1/}

The shifting of prepackaging to the farm level would probably increase the farmers' share of the food dollar. This would probably save on transportation charges on weight now shipped but later discarded, permit brand identification, employ labor and use buildings, at lower cost, promote better adjustment of production to marketing conditions and enable the growers to have better control over the product until it reaches the ultimate consumer.

Cutting and washing kale might well be done by housewives but the use of machines in doing this chore by the prepackager would be considered an efficient method and economic if consumers desire this service.

An estimated one-fourth of the food produced in the United States never reaches the ultimate consumer.

William Kling of the War Food Administration roughly estimates that losses are: aciduous fruits, 26%; potatoes, 28%; tomatoes and citrus fruit 33%; leafy green and yellow vegetables, 43%.^{2/} Although much of the above mentioned waste is unavoidable, it does create doubt about the efficiency of our marketing system.

^{1/} Sherman, Ralph W., "Records Show - Growing Share of Consumer-Dollar Goes to Farm - Since 1913," Timely Economic Information For Ohio Farmers, March, 1954.

^{2/} Kling, William, "Food Waste in Distribution and Use," Journal of Farm Economics, Volume XXV, No. 4, November 1943, P. 858.

Prepackaging through reducing waste, increasing saleability, prolonging shelf-life, maintaining the products original quality more efficiently, diminishing some charges such as transportation and store clerk time may enable the produce industry to offer the consumer a better product at the same price or lower and/or enable the grower and others to receive a better return on their investments and product.

Although prepackaging may be only a shifting of place of performance and may result in an increase in the cost curve; if a shift in the demand curve is sufficient to cover the additional cost, if any, 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.

The principal 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 prepackaging is done in advance of retailing.
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 maintenance 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. Trends to reduce speculation.
15. Helps maintain sales of fresh produce in competition with frozen and canned produce.

The principal disadvantage 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 adaptable 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.
13. Deterioration of product in marketing channels may cause the loss of not only the products but packaging costs also.

The point of prepackaging varies extremely among commodities, localities and firms.

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.
- (8) Producer-shipper becomes more familiar with actual consumer demand and can better adjust to the market.

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 advantage of prepackaging.
- (3) Entails added cost which the prepackager may or may not be able to pass on. The prepackager's counter-vailing power is often not as large as the purchaser's.
- (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 due to larger volume, merchandization, 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 desire to act as processor.
- (4) Labor is higher and unionized. Often require extra fringe benefits.

(C) At the retail level

Advantages

- (1) Can better package for store's clientel 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.

- (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 in the week).
- (6) Quality control better established and maintained.

Disadvantages

- (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 in most self-service stores desires to be a merchandiser not a processor. Is an additional burden.
- (4) Space and time may not be sufficient to permit prepackaging.

Prepackaging of Farm 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.

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, increased turnover of stock at retail 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. Fredrick Taylor's scientific analysis and cost control originally introduced into manufacturing has been readily accepted by the distribution field. Distributors through time-motion studies, fork-lift trucks, one story warehouses, integration, et cetera, are constantly attempting to reduce costs.

Automatic Merchandising and Mass Distribution

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 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 eventually be more completely accepted in the meat industry than in the produce industry. Meats like fresh fruits and vegetables have various degrees of consumer acceptance and, also like fresh produce, are "customer attractors" for the individual retail stores.

Some meats such as hams and stuffed meats are "naturals" for prepackaging. The first storewide attempt to prepackage meats known to the author, was the Hudson Bay Company in Winnipeg, Manitoba, Canada in 1923.^{1/} 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 Parelloe 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 important contributing factors to the failure of the 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.

^{1/} Meat Merchandising - Self Service Meat Manual, Meat Merchandising Inc., St. Louis, Missouri, 1949 p. 9.

The Great Atlantic and 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 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 in a show case with a display top and stock drawers below but the refrigeration was inadequate.

The Sanitary Grocery Company of Washington, D.C., successfully merchandised 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 in 1941 opened 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.^{1/} The trend is apparent although semi-self-service will probably prevail for some time.

^{1/} "Facts in Food and Grocery Distribution As of January, 1953, Progressive Grocer, New York, N. Y., 1953, p. 5-7

"Progressive Grocer" although not giving all credit to self-service, stated that the 3000 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. ^{1/}&_{2/}

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

Mechanization is becoming more common in all self-service meat stores. Bandsaws 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 place of performance and resultant changes in margins, this would bring up many new problems including ordering, spoilage, discoloration and returns. It 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 firm 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. Dispensers and containers such as the two quart paper container or gallon jug will affect milk sales. Cheese is being prepackaged both at the processor level and the

^{1/} "Facts in Food and Grocery Distribution As of January, 1953, Progressive Grocer New York, N.Y., 1953, P. 5-7

^{2/} Although many factors are involved, this may give credence to the concept of windfall gains going to the innovator. A further examination of the phenomena over time might be fruitful using Paretian rents and Marshall's quasi rents as models.

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.^{1/} The consumption of poultry meats has practically doubled in the last twenty years. Eggs have increased percentage wise per capita more than any other major farm commodity.^{2/} No little part of this increase has come from new marketing techniques. Prepackaging, refrigeration, grading, storing, catup poultry and offering products the consumer desired increased demanded. 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 prepackaging may well open new methods and channels of marketing particularly in tapping the mass market in other than holiday seasons.

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

^{1/} Agricultural Outlook Charts 1954, U.S. Department of Agriculture, Bureau of Agricultural Economics, Washington, D. C., October, 1953, P. 60

^{2/} Ibid, P. 21

HISTORY OF PREPACKAGING OF FRESH FRUITS AND VEGETABLES

Packaging tends to develop with marketing specialization. Widespread use of fruits and vegetables has come mostly during the last century as we acquired knowledge, facilities to transport and preserve them. Even today, consumption of fresh fruits and vegetables is not sufficient throughout the world. ^{1/}

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. ^{2/}

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. Foods in dried form of those with a relatively low perishability made the bulk of such commerce.

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 was probably skins and hides. The Bible tells of goatskins being used as containers. As late as 1921, we were importing crude drugs from Spanish America in horse-hides. The Italians and Chinese preserved items such as cheese and eggs in clay and pottery. ^{3/} Unfortunately our historical resources disclose no date for this except that it was centuries ago. We can assume, 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 Khoarau, on a visit to Cairo in 1035, was astonished to see "sellers of vegetables, spices, hardware, provided with paper in which

^{1/} Woytinsky, W. S. and Woytinsky, E.S., World Population and World Production, Trends and Outlook, The Twentieth Century Fund, New York, N.Y., 1953, P. 306

^{2/} Hunt, Thomas F., Lectures in the History of Agriculture and Rural Economics, Classroom notes, Ohio State University, Columbus, Ohio, 1903, P. 211.

^{3/} Lodiani, L., "Foreign Packages in Domestic Trade," Printers Ink Monthly, August, P. 21.

they wrapped all they sold immediately, if it were not already."^{1/} This is probably the first recorded evidence of packaging in paper. "A physician of Bagdad writes in 1140 of the source of 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 them paper destined for the food markets.'"^{2/}

Not much is recorded of fruit and vegetables packaging until 1850. The inadequacy of packaging was not a deterring factor to trade before that time. Most communities were self-sufficing and marketing between distant points was not too common. 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 Vaughn 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 common. Use of wrappers for protection of vegetables came somewhat later, their use for cucumbers and tomatoes being reported in 1899 (4). ^{3/}

"In 1895, came the original manufacture and use in the United States of vegetable parchment, now universally employed in many branches of the food packing industry."^{4/}

^{1/} Hunter, Dard. The History and Technique of an Ancient Craft, Alfred A. Knopf, New York, N.Y., 1947, P. 471

^{2/} Ibid. - P. 472

^{3/} Stahl, A.D. and Vaughn, P.J., "Pliofilm in the Preservation of Florida Fruits and Vegetables," University of Florida Agricultural Experiment Station, Gainesville, Florida, 2/42, P. 7

^{4/} Hunter, Dard, The History of Techniques of An Ancient Craft, Alfred A. Knopf, New York, N.Y., 1947, P. 575.

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.^{1/} 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 produce.

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 effect of wrappers and impregnation of the wrapper 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 apples crop, the largest corn crop, and the largest cotton crop in the history of the nation have yielded the producers of these 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

^{1/} Pailthorp, Raymond P. and Kinsey, F.S., "Packaging of Apples in Boxes," U.S.D.A. Farmers Bulletin No. 1475, August, 1925.

^{2/} Stahl and Vaughn, "Pliofilm in the Preservation of Florida Fruits and Vegetables Florida Agricultural Experiment Station, Gainesville, Florida, February, 1942, P. 7

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 cannot 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 of "dumping" rather than of marketing.^{1/}

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 prices 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 of 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. Dealer's 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 thereabout to the cost to the consumer. It is easy to see how high cost necessarily follow such methods of marketing."^{2/}

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

^{1/} Bassett, C.E., Moomaw, Clarence W., and Kerr, W.H., "Cooperative Marketing and Financing of Marketing Associations," USDA Yearbook, P. 185-186, Washington, D.C., 1912

^{2/} Corbett, L.C., "A Successful Method of Marketing Vegetable Products," 1912 USDA Yearbook, Washington, D.C., 1912, P. 353.

The USDA at this time was advocating close grading, good packaging and shipping in carload lots. Farm cooperatives dealing particularly in perishables grown away from the terminal market increased in numbers. A good share of the cooperation's 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 Gentleman 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."^{1/}

In 1907, Samuel Frazer 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 eggshell carrier and cartons for shipping apples to New York.

Reception of the six and twelve containers was slow. Charles and Company of Fifth Avenue, New York City, and others catering to a high income trade were equipped to pack apples in cells of various sizes. Container size varied as did size 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.

^{1/} T. Swann Harding, "Some Landmarks in the History of the Department of Agriculture," USDA History Series No. 2, Revised January, 1951, Washington, D.C., P. 62

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 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 Northern 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 Frazer concludes his letter with, "There was a market in New York but acceptance of the six or twelve apple packages had to be developed."^{1/}

A Rochester, New York cooperative headed up by Mr. Bush and a Mr. Faxter 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 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 six inches wide and six inches high, with a strap in one end to make a handle. Mr. A. W. McKay, then in charge of the packing house operations, recalls that, "During the Christmas market it sold at a premium mainly because 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."^{2/}

^{1/} Frazer, Samuel, Personal letter, to the author, Washington, D.C., June 17, 1954.

^{2/} McKay, Andrew W., Personal letter from, now acting chief, Cooperative Research and Service Division, Farm Credit Administration, U.S.D.A., Washington, D.C.

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 purveyors and other wholesalers serving specialty stores in the high income trade."^{1/}

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

"Whitsbog, 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."

"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 that 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 consumers 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.

^{1/} Samuels, J. K., Personal letter, Farm Credit Administration, U.S.D.A., Washington D.C., August 29, 1953.

Mr. Hold, 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.^{1/}

Mr. John H. McCauley of New York City started packing Idaho potatoes in apple box sizes 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 No. 1, he started packing these potatoes in No. 15 corrugated boxes.

The McCauley Potato Company continued the No. 15 box which was pasted top and bottom until 1925. They then added a No. 25 green dyed cotton bag which was hand sewn at the top with white sewing twine. The No. 15 carton had been very successful but the No. 25 sack was only fairly popular. Consequently in 1926, a No. 15 cotton bag was added. The No. 15 cotton bag was quite successful. McCauley by 1928 discontinued the No. 15 carton and No. 25 cotton bag to concentrate on the No. 15 bag.^{2/}

Also in the twenties, a Mr. Tinklepaugh of Livingstone Manor, New York, 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.^{3/}

An article in the 1925 U.S.D.A. Yearbook refers discouragingly to consumer packaging which would indicate that some consumer packaging had been done. The resistance by wholesalers is noteworthy.^{4/}

^{1/}Samuels, J. K., Personal Letter, Farm Credit Administration, U.S.D.A., Washington, D.C., August 10, 1953.

^{2/}McCauley, Frank, Personal Letter to the writer, Brooklyn, New York, April 26, 1954.

^{3/}Frazer, Samuel, Personal Letter to the author, Washington, D.C., June 17, 1954.

^{4/}McKay, Sampson, Pailthrop, Flohr, Corbett, Hawkins, Gould, Magness and Beattie, Marketing Fruits and Vegetables, 1925 U.S.D.A. Yearbook, Washington, D.C., 1925-639.

"The package unit is, as 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 prepackaging after a trial period."^{1/}

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."^{2/}

Dr. H. D. Brown, now a member of the Ohio Agricultural Experiment Station staff, in 1928, did work on waxed papers effect on storage and shipment of fresh vegetables and fruit. His conclusions included that waxed papers were effective in reducing moisture loss or increase and thus aided in maintaining quality. A fuller account of his experiments is found in Michigan State Technical Bulletin No. 87 entitled, "Paper Wrappers and Their Effect Upon Physical and Chemical Properties of Horticultural Products."

^{1/} Lebeau, Oscar R., "Prepackaging Fruits and Vegetables by Cooperatives," Farm Credit Administration, U.S.D.A. Miscellaneous Report 126, Washington, D.C., October, 1948, P. 1-2.

^{2/} Rasmussen, M.P., Personal Letter to the author, September 22, 1953.

Maine started packing potatoes in paper No. 10 and No. 15 bags around 1930. McCauley switched from a No. 15 to a No. 10 cotton bag in 1931. The first paper bags were weak and the condensation of the potatoes caused much breakage but the No. 10 size was very acceptable to the consumer. McCauley added the No. 10 paper bag in 1934 and eventually switched completely due to consumer acceptance, lower bag price and lower cost of filling and tying these bags.

Onions and potatoes in No. 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 No. 10 and No. 15 bags was fairly widespread.^{1/}

In 1932 and 1933, Mr. Gilbert F. O'Brien under the firm of Maxwell and 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 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.^{2/}

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

About this time can an individual who must be acknowledged in any history of prepackaging. This man, Duncan Rankin of DuPont, who not only was the possessor of an agile, inquiring mind combined with an extraordinary amount of energy, but had an 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.

^{1/} Hauck, Charles W., History and Background of Prepackaging, Horticulture Marketing Class Handout, Ohio State University, Columbus, Ohio.

^{2/} O'Brien, Gilbert F., Personal Letter to the author, New York, New York, June 3, 1954.

DuPont had obtained the North American right for the French process of La Cellophane, S. A. and began a pilot plant manufacturing around 1924. Cellophane was much higher, more brittle and 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 developed. One product tried was sweet corn which was shipped to Philadelphia. Lemons were also shipped to Minneapolis.

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, Mr. Rankin decided that a more practical approach would be nearer the market. An attempt was made to interest some prepackers. None of the "name" houses were very much 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 variable and often too low for a small company to stay in the prepackaging game. However, the Freeman Produce Company 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, New York, a celery grower. Using cellophane similar to the present ISAT 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 prepackaging - 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 were few if any self-service stores as we think of them today. Most of the stores had 20 foot fronts with a small section designed for 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 tray, and also cellophane bags was tried. Walnuts, normally stored under refrigeration until the following season, were included as well as cranberries, tomatoes, etc.

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 department for this study. They were inadequately laid out and ended with unimpressive results. However, First National Stores did conclude that prepackaging was all right for self-service but not service stores.

This project was probably the first where cost and consumer reactions were recorded on an entire section with several participating. First National ran further tests in 1936 on one store in White Plains, New York to get more information on costs and consumer reaction.

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 prepackers, 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, an increasing percentage of potatoes, onions, apples and citrus fruits were being prepackaged.

DuPont continued to do some work in prepackaging in Boston with the Stop and Shop, Atlantic and 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 over-all 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 prepacked 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 customers.
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 difference.

Many firms were pioneering in prepackaging 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, Crosset 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, the war brought new interest to packaging and probably more progress was made in the forties than in any other period. Self-service stores became more numerous. 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 in greater quantities 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 latter years of the war, a group of interested individuals from the Great Atlantic and 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. The leaders in the project 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.

The basic goal was to scientifically test the prepackaging of all items in a produce station and all prepackaged items were to be kept under refrigeration.

The project has its tribulations including the difficulties of developing machines that could prepackage items accurately, 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 containers, washed and trimmed, then packaged in transparent film, usually moisture proof cellophane in consumer units, machine labeled, coded, price-marked and then cold stored for later delivery to retail stores. The stores used 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 (a) saved half the usual distribution loss on some items (b) saved labor, (c) lengthened shelf life of produce and (d) received 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 one percent. The average over a range of commodities was in the neighborhood of 30 percent.^{1/}

In contrast in retail stores handling prepackaged perishables under refrigeration, losses were found to be negligible. Little or no reconditioning markdown or discarding had to be done on the retail losses. Since the trimming and preparation processes amounted to about 15 percent loss, you could say that wastes or weight losses were diminished approximately 50 percent. Losses in prepackaging usually are inedible and consist of 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 national magazines had feature articles on the "experiment". A movie was made by a representative of the Western Growers Association which helped stimulate 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 shifted 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 by 300 percent. Spinach which had been refrigerated and prepackaged was still 90 percent salable after bulk spinach exposed 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.

^{1/} Data from the Produce Prepackaging Association.

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 displays cases became more common the retail level. Grower-shippers, 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 plipfilm, modified cellophane and polyethylene with their various characteristics of resistance to moisture and permeability to gases helped in packaging certain food products.

Mrs. Consumer's desires and education was a matter of no little concern. With 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 (Hooper-Flanigan) 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 were West Virginia, Washington, Purdue, Ohio State, New Jersey, Minnesota, Michigan, Maryland, Louisiana, Florida, Cornell and Connecticut.

The Westerns 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 experimental 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 for better merchandising, prepackaging, spoilage control, 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.

Eight 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 other members of the trade exchanged experiences and ideas. As an outcome, 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 that 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, such as what to prepackage, where to prepackage and how to prepackage, linger on. 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. Prepackaging is no longer considered a flash in the pan but has proved its worth with many commodities under various conditions.

One hundred percent of all fresh fruits and vegetables are not being prepackaged as some early advocates predicted, but it is almost universally accepted.

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, shows a shift in its demand curve when prepackaged through increased sales and prices. In some field, 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, radishes, carrots, and dry onions to some extent. Some west coast writers are predicting lettuce 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.

Over three billion pounds of fresh fruits and vegetables sold in packages 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.^{1/}

The accompanying table for 1952 shows approximately 4,225,500,000 pounds of fresh product prepackaged at the retail level. With the exception of kale, cranberries, carrots, spinach, mushrooms, tomatoes, and limas, the figures for 1953 to be realistic and to correlate with a study made by the author,^{2/} would probably have to be multiplied by a factor of at least four. Onions, potatoes, lettuce and apples had in particular increased.

The figures are hard to ascertain with accuracy. Prepackaging is no longer a concept in the mind of a Hauck or a Rankin or a Cupp, but a reality. The potential is not yet fully realized.

The growth and development of this modern merchandising technique as it applies to fresh fruits and vegetables is still going on and will probably continue as techniques improve.

^{1/} Data from the Produce Prepackaging Association

^{2/} Study of 20 leading produce merchandisers. Produce sold through the various chains represented would amount to approximately one billion in 1953.

TABLE 3
 VOLUME OF SOME MAJOR PRODUCE ITEMS PREPACKAGED
 IN THE UNITED STATES
 1952 - 1953
 (In millions of pounds)

Item	Approximate Fresh Consumption ^{1/}	Estimated Prepackaged	
		Retail Level ^{2/} (1952)	Retail ^{3/} (1953)
Asparagus	208.0	3.0	15.0
Broccoli	30.4	2.0	8.0
Cauliflower	438.0	2.0	12.0
Sweet Corn	750.0	12.0	25.0
Kale	12.0	10.0	10.0
Onions	1,800.0	100.0	400.0
Potatoes	16,700.0	1,000.0	4,000.0
Spinach	273.7	200.0	200.0
Tomatoes	1,713.0	1,000.0	1,000.00
Mushrooms	30.0	17.0	17.0
Carrots	1,500.0	500.0	600.0
Celery	1,230.0	150.0	400.0
Lettuce	2,075.0	50.0	150.0
Salad Mix		50.0	50.0
Cole Slaw		50.0	50.0
Apples	3,677.0	100.0	575.0
Cherries	72.0	2.0	4.0
Cranberries	75.0	45.0	50.0
Lemons	600.0	25.0	25.0
Limes	13.6	5.0	5.0
Oranges	3,400.0	900.0	1,200.0
Peaches	2,000.0	1.5	4.5
Plums	150.0	1.0	3.0

Source ^{1/} and ^{2/} - Prepackaging Produce Association
^{3/} Estimated by the writer.

