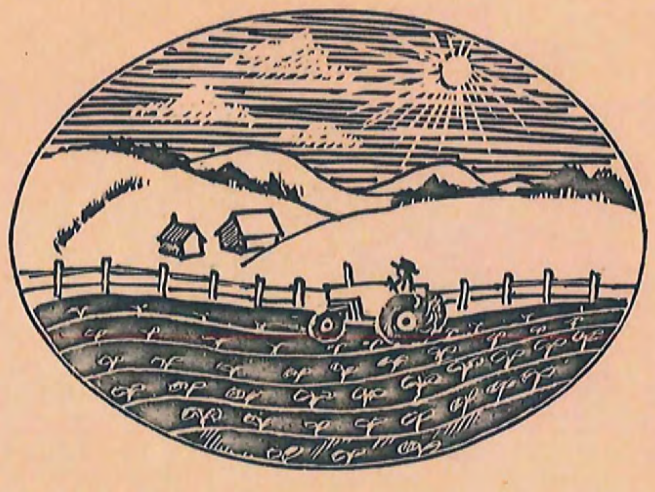
Agriculture in Maine

A Policy Report



Submitted to

the Food and Farmland Study Commission

By

Maine State Planning Office

March 1979

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AGRICULTURE IN MAINE

A Policy Report

March 1979

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State of Maine
Executive Department
State Planning Office
184 State Street, Augusta, 04333
TEL. (207) 289-3231

Joseph E. Brennan
GOVERNOR

ALLEN G. PEASE
STATE PLANNING DIRECTOR

March 5, 1979

Dr. Fred Hutchinson
Chairman
Food and Farmland Study Commission
Coburn Hall
Orono, Maine 04473

Dear Dr. Hutchinson:

Transmitted herewith is our report to the Food and Farmland Study Commission on agricultural circumstances and policy issues in Maine. The document was prepared in partial fulfillment of our Farmer's Home Administration Section 111 planning project.

As you know, the report addresses a number of issues of importance to our food and farmland situation including farmland preservation, marketing, energy, transportation, finance, human resource issues, and the role of agriculture in our rural economy. The report also includes a relatively detailed assessment of the major commodity systems in Maine's agricultural industry.

I hope that the report will be helpful to the Commission in its policy deliberations.

Sincerely,

Allen Pease
State Planning Director

AP:dm

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INTRODUCTION

This report is the result of a study of agricultural policy issues undertaken by the Maine State Planning Office with funding from the U.S. Department of Agriculture. The overall objective of the study has been to formulate policy and program recommendations aimed at improving the long term prosperity of Maine's agricultural economy. In order to address this task, relatively detailed assessments of Maine's agricultural commodity systems were undertaken and a number of important agricultural issues were examined in depth by State Planning Office staff and consultants. The study also benefited from a close working relationship with Maine's Food and Farmland Study Commission which was established by legislative action in 1978 to investigate the problem of farmland conversion and to make recommendations to the 109th Legislature regarding the general improvement of Maine's food and farming economies.

This study has come at an interesting time in our agricultural history. Many food and agricultural issues have become matters of increasing public concern. There has been a growing awareness of the prospect of increasing food shortages on a worldwide basis as the global population increases at a rate of 200,000 people per day. Food price inflation has been rapid while net farm income has declined. Farmland values have escalated sharply reaching unprecedented price levels. At the same time, nearly 1.8 million acres of cropland are being lost each year to rural development, urban, industrial, and public works uses. Additional cropland is being lost to infertility and erosion due to poor management and cultural practices. Food exports are at a high level, fortunately, to offset an increasingly adverse balance of trade. Per acre yields, after decades of dramatic growth, have stabilized and even declined for the U.S. as a whole, re-establishing the direct relationship between production volume and acreage. Farm productivity has increased dramatically and employment has dropped.

Farm credit and capital requirements have doubled nationally since 1970 and are expected to double again by the mid-1980's. Energy use has intensified tremendously in all aspects of the food system from fertilizer production and mechanized farm production practices, to food processing, transportation, and home preparation. Agriculture has become highly dependent on energy at a time when our most important energy resources seem scarce and threatened. The number of farms continues to dwindle while remaining farms continue to get larger and more specialized. At the other end of the food system, consumption patterns have been changing rapidly with a strong trend toward more processed, convenience foods.

Integration and coordination in the food complex is increasing rapidly with the poultry and dairy industries providing perhaps the most extreme examples of this trend in Maine. To reduce uncertainty and risk, and to increase profitability, farmers are increasingly using contracts, forward pricing, and other mechanisms to sell all or a portion of their products before they are raised. At the same time that farming is becoming more coordinated with other aspects of the food system, it is becoming more precise. The impetus for this is the increasing costs of inputs as well as narrower profit margins.

Maine's agricultural economy has been affected by these trends and many other issues and changes of a more local nature. There has been a resurgence in interest in farming by a new generation. Organic farming methods have become more popular. Environmental issues related to farming have become of greater concern. Direct marketing of produce has become a more important and common outlet for farmers. Transportation issues, especially in regard to potatoes and feed grains, have continued to cause economic and marketing problems for Maine producers. The decline of Maine's potato industry, despite widespread public and private sector concern, has continued unabated. At the same time, overall cash receipts for farm products have increased in recent years.

This report addresses a great many of these issues in considerable detail and proposes a wide variety of actions aimed at increasing net farm income and overall agricultural prosperity. The actions proposed are for both public and private sector action. The study recognizes that coordinated private sector action is, in many cases, a much more powerful force than government assistance or regulation in the improvement of various agricultural conditions in Maine. A broad range of strategic public sector actions, however, are also viewed as needed.

The report is organized into two sections. The first section presents an overview of general trends and characteristics of Maine's agricultural economy including trends in farm structure, sales and income, productivity, and employment. This section also presents more detailed trends and characteristics of major agricultural commodity systems in Maine. For each commodity, marketing and production structures and issues are discussed along with various government programs and industry coordinating mechanisms which influence the operations of these commodity systems. The final section of the report presents summary discussions of a variety of important issues in Maine agriculture and proposes strategies to address these issues. Issues and recommendations address the following areas: farmland presentation and conservation, marketing, transportation, energy, finance, human resource issues, and rural development issues.

While the State Planning Office bears final responsibility for the information and proposals included in this report, we wish to acknowledge the assistance of Food Business Associates, the Maine Department of Agriculture, the Departments of Agricultural Engineering and Agricultural and Resource Economics of the University of Maine, Maine's Office of Energy Resources, Joyce Patton, Avis Craig, Carolyn Britt, Charles Lawton, Kathy Sage, Joe Chaisson, Tyler Libby, and many others in the public and private sector for their valuable contributions.

David E. Shaw
Project Director
Maine State Planning Office

I.

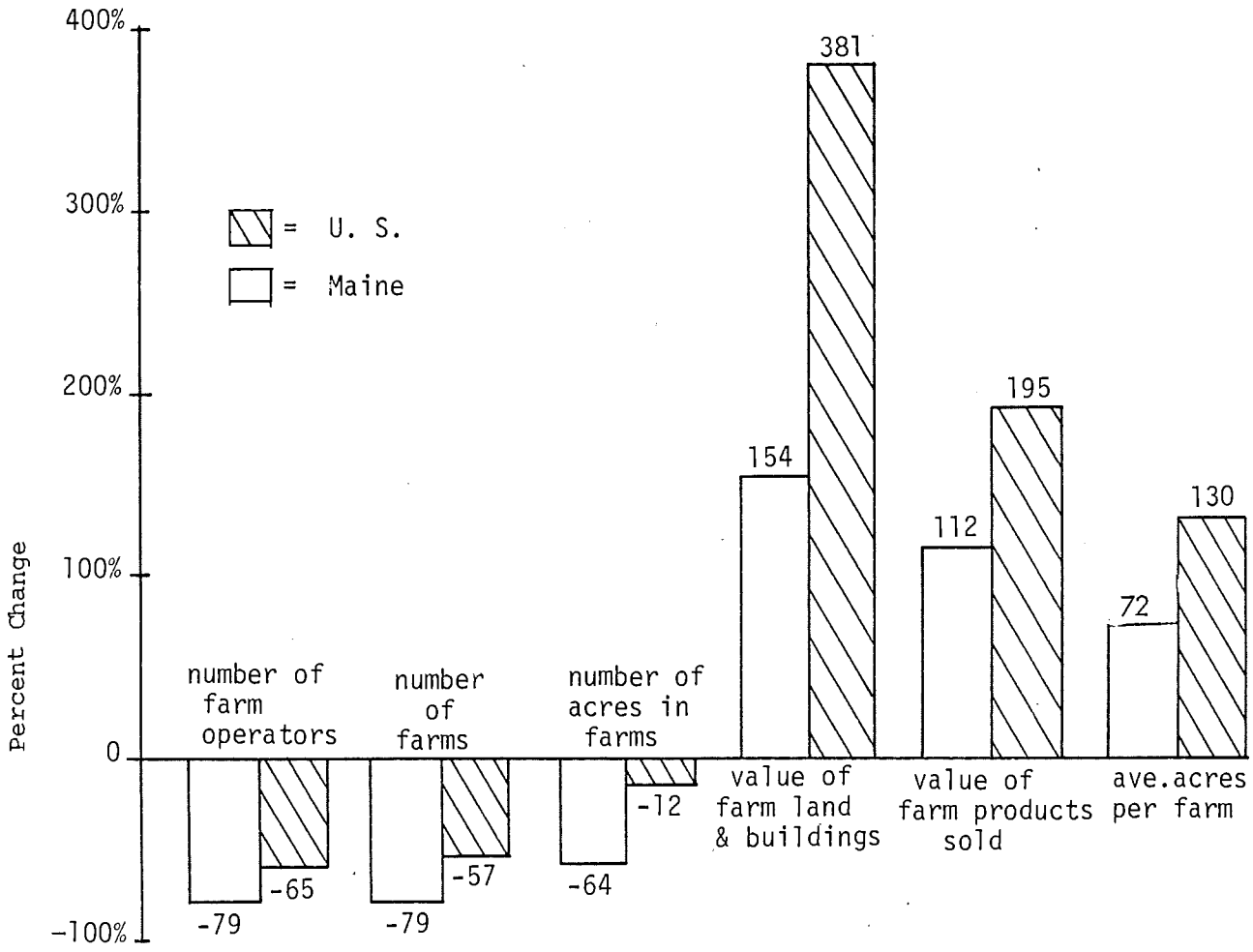
Maine Agriculture: An Assessment

A. OVERVIEW

The overall trends in Maine agriculture since 1950 have been general decline and continued specialization. Between 1950 and 1976, employment in agriculture in Maine fell from about 29,000 or 9.3% of total employment to about 13,000 or 3.9% of total employment. Over the 1950 to 1974 period, the number of farms in Maine fell by 78% from over 30,000 to just over 6,000, and the number of acres in farmland fell by 63% from just over four million acres to about 1.5 million acres. Over the 1955 to 1976 period, gross farm product as a percent of gross state product fell from 7.1% to 3.7%. These changes have paralleled similar trends in the national agricultural economy but, as indicated in Figure 1, there has been a significant difference in the degree of such changes locally versus nationally. With respect to the number of farms, farm operations, and acres in farmland, Maine experienced a greater relative decline than did the U.S. as a whole. With respect to value of farm products sold, value of farm land and buildings, and average acres per farm, Maine experienced a smaller increase than the U.S. as a whole.

FIGURE 1

Indices of Agricultural Change:
Maine and the U.S., 1950 and 1974

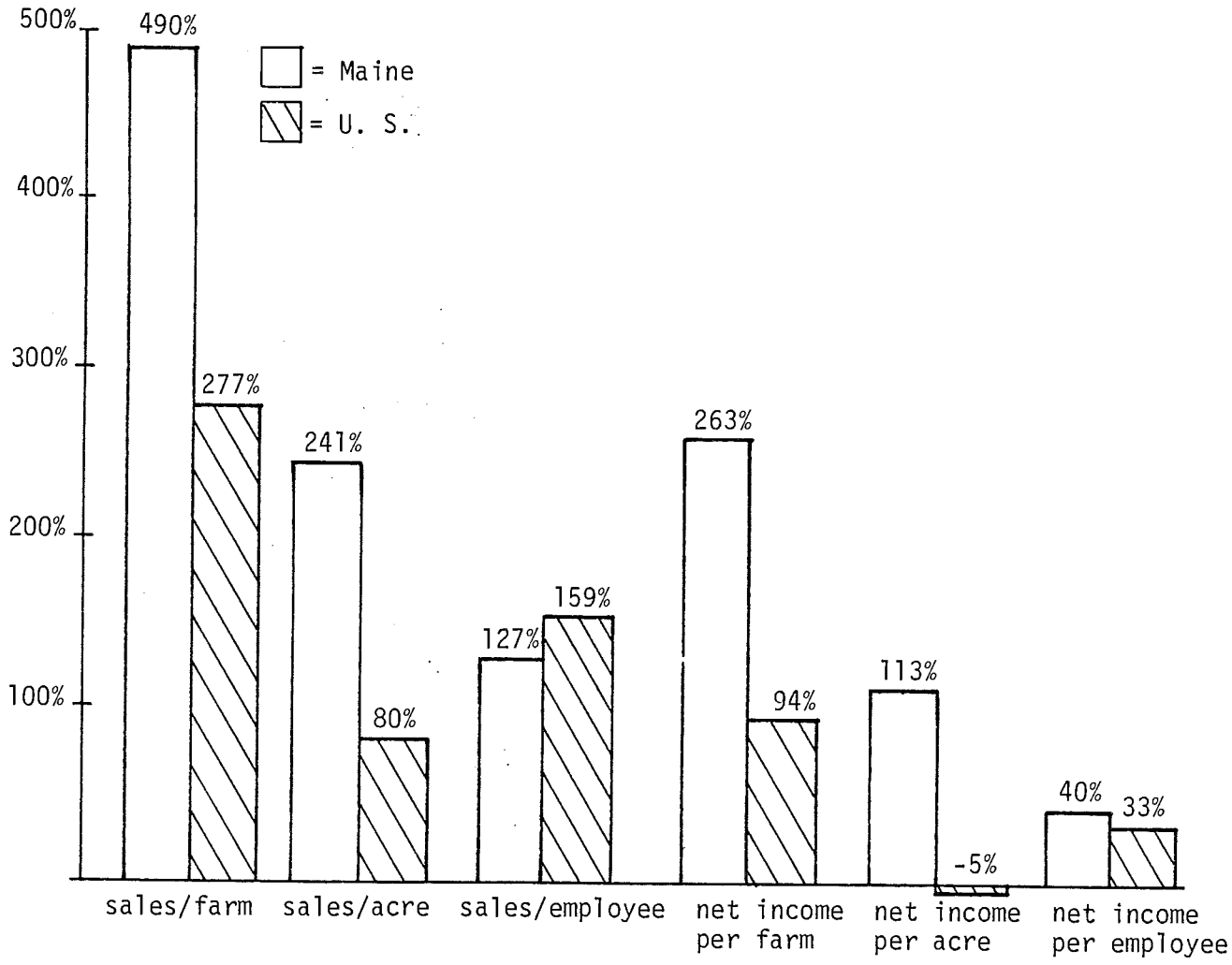


Source: U. S. Bureau of the Census 1950 and 1974 Census of Agriculture.

In spite of, or perhaps because of this greater relative decline, however, the productivity of Maine agriculture increased more than that of the U.S. as a whole. Between 1950 and 1974, the average sales of Maine farm products rose from $5,300 to $31,500 per farm, from $39 to $133 per acre, and from $5,600 to $13,000 per farm worker. Figure 2 illustrates how these trends compare to the U.S. average.

FIGURE 2

Changes in Agricultural Productivity:
Maine and the U.S., 1950 - 1974

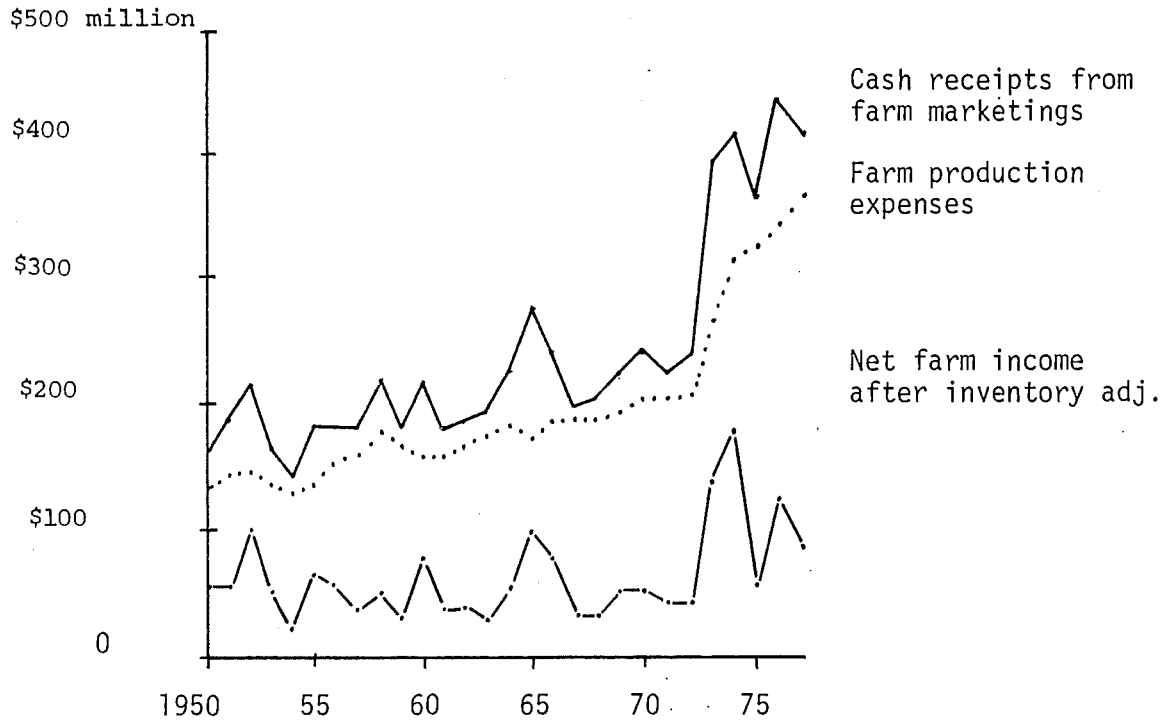


Sources: U. S. Bureau of the Census 1950 & 1974 Census of Agriculture
U. S. Department of Agriculture State Farm Income Statistics, September 1970
U. S. Department of Agriculture Handbook of Agricultural Charts, October 1976
Maine Employment Security Commission, unpublished data

It is obvious from Figure 2 that the productivity of Maine agriculture has increased more rapidly than that of the nation. This increase has not, however, been accompanied by an equivalent increase in net income per farm. While average sales per farm in real terms increased 494% over the 1950-1974 period, net farm income increased only 164%. Figure 3 illustrates the trend in farm receipts, farm expenses, and net farm income in Maine over the past 27 years. The national trend has been much the same as in Maine with a sharp increase in overall cash receipts in 1973 corresponding with a sharp increase in farm production expenses. Continuing increases in farm expenses coupled with a leveling off of cash receipts has caused net income, in real terms, to drop significantly below income levels of 5 years ago both in Maine and nationally.

FIGURE 3

Maine Cash Receipts from Farm Marketings*



* Because the value of farm sales vary so much from year to year, these changes were calculated from 1949 to 1952 and 1972 to 1977 average gross sales and net income. In addition, gross sales were deflated to 1967 dollars using the wholesale price index for farm products, and net farm income was deflated to 1967 dollars using the consumer price index.

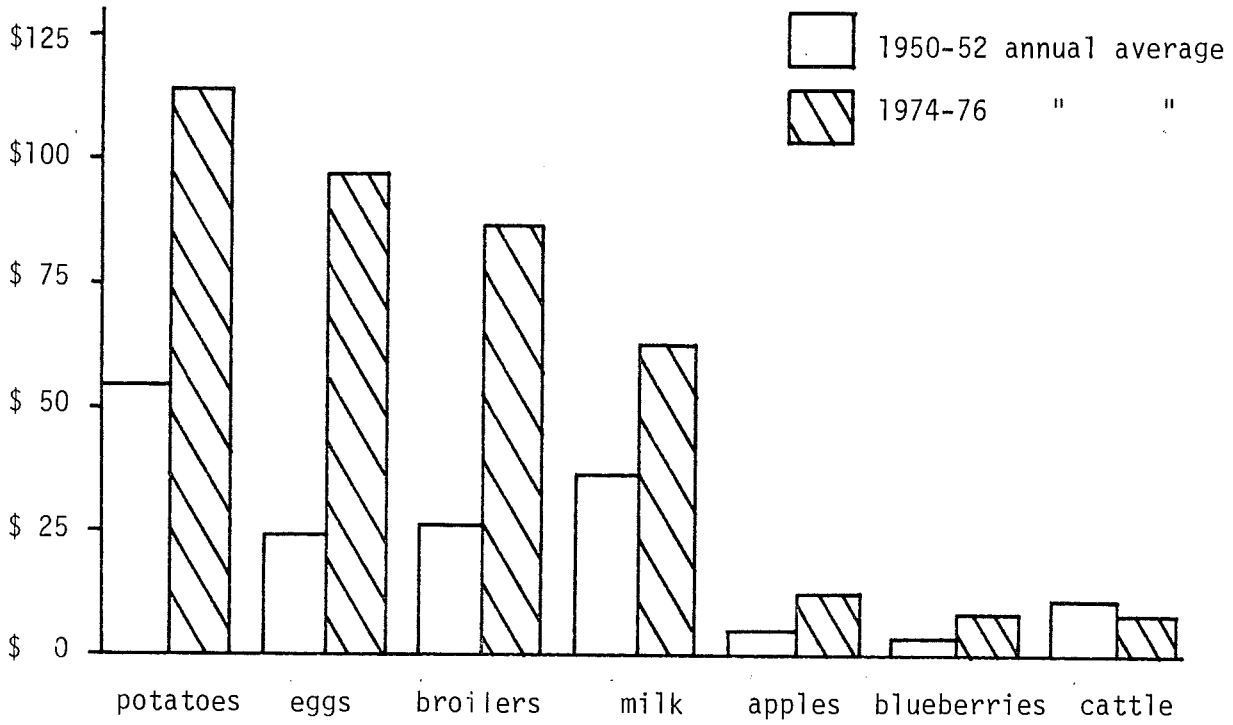
Source: U. S. Department of Agriculture State Farm Income Statistics, September 1978

Figure 3 illustrates a basic problem faced by all farmers. While total sales fluctuate up and down from year to year because of price changes, production costs do not fluctuate accordingly and tend to be more stable. As a result, net income tends to fluctuate up and down and, since net income is smaller than gross sales, its fluctuations can be relatively great in percentage terms. In short, the Maine farmer has lived through a continuous series of booms and busts.

The reason for Maine's higher relative productivity is the specialization of its agriculture. In the early 1950's approximately 84% of Maine's total cash farm income derived from seven commodities. Today that percentage has increased to about 94%. Figure 4 illustrates this change.

FIGURE 4

Maine Cash Farm Income by Major Commodity (million $)



Source: Same as for Figure 2

The sales value of all of Maine's major commodities except cattle increased substantially over the period. The nature of that increase, however, varied widely by crop. In the cases of potatoes and milk, the volume of production was actually rather stable over the period meaning that the increased value was due primarily to higher prices. In the cases of broilers and eggs, on the other hand, prices at the end of the period were not substantially different from those at the beginning meaning that the increases in value were primarily the result of increases in the volume of production. For apples and blueberries, increases in the value of sales resulted from increases in both price and volume. For cattle, prices rose but the volume of production declined even more thus reducing the value of sales. Table 1 summarizes the changes in the volume and value of production of these commodities.

TABLE 1

Changes in the Volume & Value of Production
of Major Maine Commodities, 1950-52 & 1974-76

Commodity	% increase in volume	% increase in cash income
Potatoes	- 6.8%	98.8%
Eggs	178.7	302.9
Broilers	302.5	238.9
Milk	0.2	98.4
Apples	32.7	240.0
Blueberries	33.6	228.6
Cattle	-37.3	-22.6

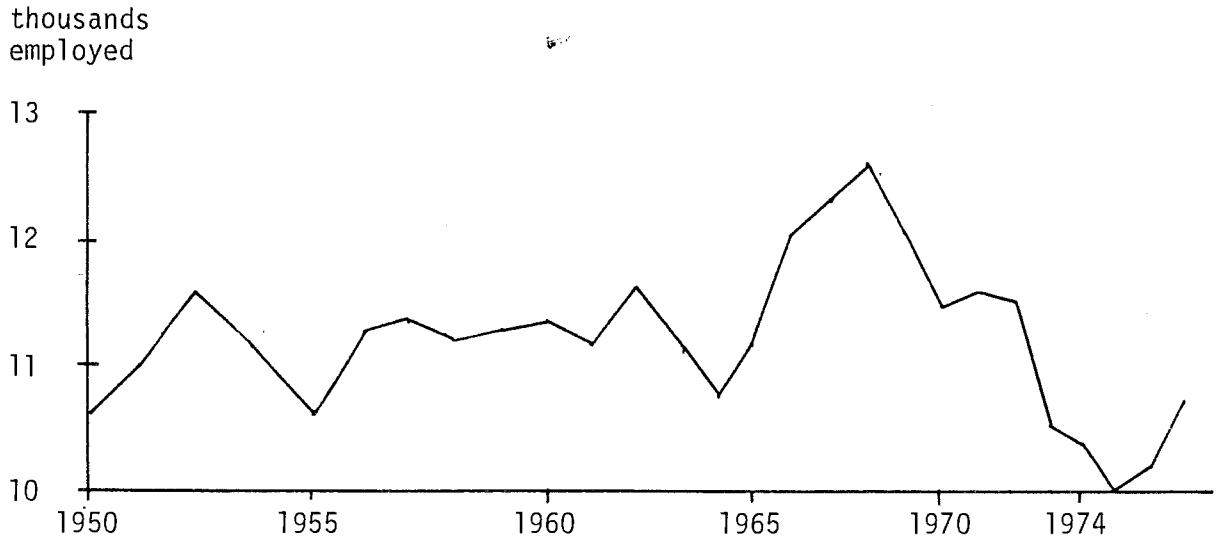
Source: U.S. Department of Agriculture Agricultural Statistics, various issues.

Besides providing the bulk of Maine's farm income, these commodities also provide the basis for Maine's food processing industry. In 1977, the food industry in Maine employed about 10,800 people. Of these about 2,300 were employed in poultry related operations, about 2,200 in seafood operations, about 1,800 in frozen fruit operations (largely blueberries), about 800 in milk processing and about 600 in meat and sausage preparation. The remaining 30% of workers in the food industry were engaged in baking and in canning a variety of specialty products.

Both nationally and in Maine, the food industry has been a relatively slow growth industry. Employment has been about the same over the past twenty-five years, and production has increased 20% less than the average for all manufacturing. Nationally, productivity in the food business increased 41% over the 1954 to 1976 period. This was the result, in large part, of mechanization that reduced labor costs to about 10% of total value of shipments, about half the national average for all manufacturing. In Maine, however, productivity increased only 15%, and labor costs remained at 21% of value of shipments. In addition, wages paid in the food industry in Maine in 1976 were only 79% of the national average. In short, while extensive mechanization did occur, especially in poultry, egg, and milk processing, the food industry in Maine remains basically a low wage, labor intensive industry. Figure 5 illustrates the long-run stability of employment in this industry in Maine. The industry reached peak employment in the late 1960's, declined through the early

FIGURE 5.

Employment in the Food Industry in Maine



1970's, and has recovered since 1974. Recent forecasts project basically stable employment or a very small employment drop over the next two years depending on the direction of the national business cycle.

The following sections continue this assessment of Maine's agricultural economy by characterizing important commodity systems in the state in considerable detail. These commodity "profiles" are organized as follows:

1. Fruit and Vegetable Commodities

    * Potatoes
    * Apples
    * Blueberries
    * Mixed Vegetables, Dry Beans, and Small Fruits

2. Livestock Commodities

    * Poultry
    * Diary
    * Beef, Sheep, Swine, and Goats

3. Other Commodities

    * Grains and Feed Crops
    * Beekeeping
    * Nursery and Greenhouse Operations
    * Maple Syrup

Fruit & Vegetable Commodities

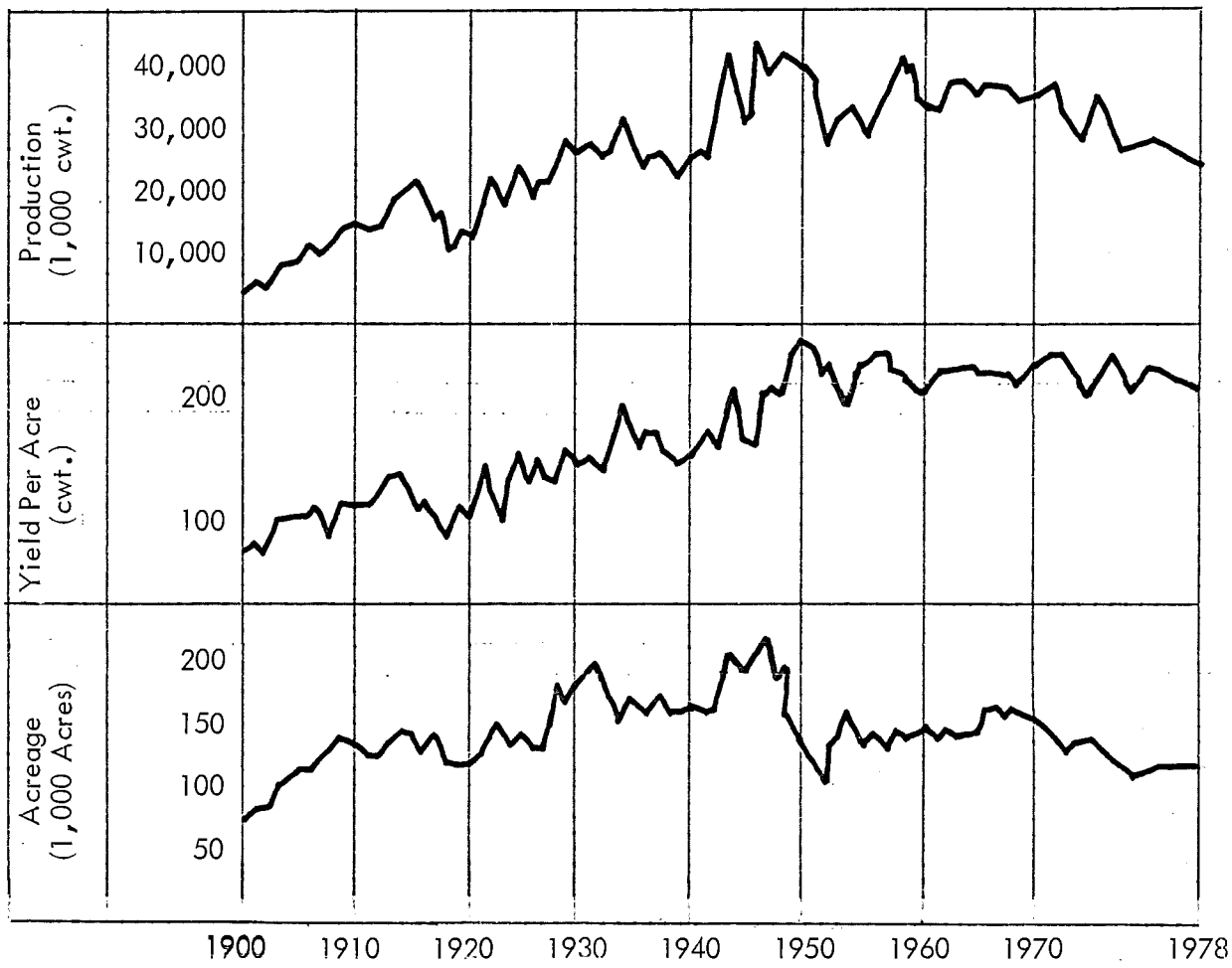
POTATOES

PRODUCTION TRENDS

Potatoes are Maine's most important vegetable crop and are a product almost exclusively (90-95%) of Aroostook County. As indicated in Figure 1, the production of potatoes in Maine since 1900 has fluctuated considerably starting from a level below 10 million hundred weight (cwt.) and reaching a peak of more than 47 million cwt. in the mid-40's when government war-time price guarantees existed and more effective pesticides were developed. Acreage also peaked in the mid-forties at nearly 220,000 acres, after which it declined dramatically to 100,000 acres in 1950 due largely to the discontinuance of federal price supports. During the 1950's and 1960's acreage rebounded moderately and remained fairly constant in the range of 140,000 to 160,000 acres before declining in the mid-seventies to about 125,000 acres including an average of almost 45,000 acres annually certified for seed production. While acreage appears to be dwindling to levels common more than 60 years ago, yields continue to run well above 200 cwt. per acre, more than double the yield at the turn of the century. The highest average yield achieved in Maine was 288 cwt/acre for the 1950 crop. The 1978 yield was 220 cwt. per acre. The 1978 harvest of 26,180,000 cwt. was grown on approximately 119,000 acres. Potato cash farm income for 1977 was $114.8 million.

FIGURE 1

ACREAGE, YIELD PER ACRE, AND TOTAL PRODUCTION OF MAINE POTATOES, 1900-1978



From 1928 to 1958 Maine led the nation in potato production accounting for up to 15% of total annual U.S. production. However, in the past two decades Maine's relative position has declined significantly as potato acreage and yields have increased in competing areas - particularly in the west where the use of irrigation has brought more land under cultivation. Maine's average yield of 245 cwt/acre in 1976 was significantly below the national average of 264 cwt/acre for fall production states and far below figures for western states currently averaging over 350 cwt/acre. Maine currently ranks fourth among potato producing states with only about 7% of national production including 11.2% of the seed potato market. Idaho is the largest producer with approximately 25% of total production in 1976 including a 27% share of seed potato production. Washington ranks second with 15% of production, and Oregon ranks third with 8%. Other important potato-producing states in order of greatest market shares are: California (6.7%), North Dakota (4.7%), Wisconsin (4.3%), New York (3.8%), Colorado (3.7%), and Minnesota (3.6%). The above 10 states accounted for 82.5% of total U.S. potato production of more than 357 million hundredweight in 1976. The same ten states accounted for 80.1% of total 1976 seed potato production of more than 25 million hundredweight.

The farm structure for potato production in Maine is dominated in number by farms of less than 100 acres, predominantly in the 50 to 80 acre range. As indicated in Table 1, farms from 1 to 99 acres in size accounted for 64% of the 1,058 potato farms identified in a 1976 survey. These same farms however accounted for only 31.5% of total potato acreage in 1976, down from nearly 40% for this size group in 1969. Potato farms of 300 acres or larger accounted for less than 3% of farms and 17.6% of potato acreage in 1969, but increased to almost 6% of farms and more than 25% of acreage in 1976. Furthermore, the total number of potato farms in Maine is estimated by the University of Maine to have dropped from close to 1,500 in 1969 to only 1,058 in 1976. Clearly the trend in Maine potato farming, as elsewhere in U.S. agriculture, continues to be toward fewer and larger farms. However, Maine potato farms are still quite small compared with farms in other potato production regions.

TABLE 1

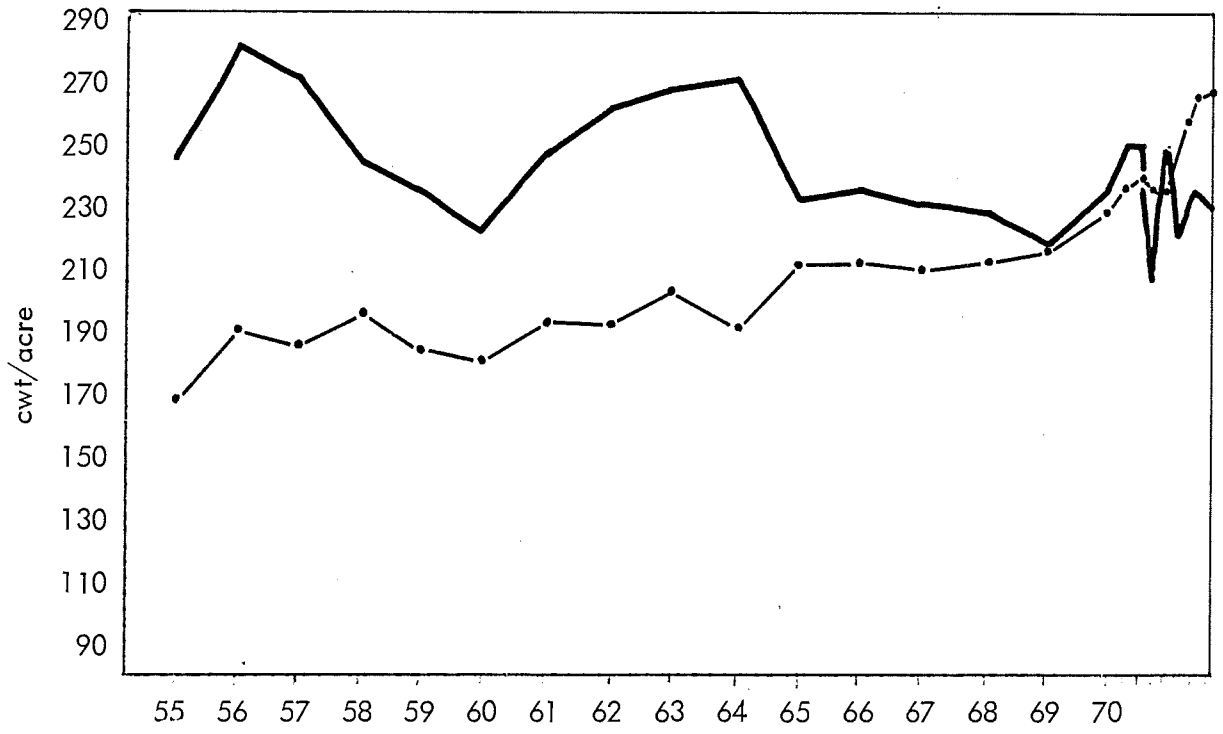
DISTRIBUTION OF MAINE POTATO FARMS BY SIZE

Size (acres)	Number of Farm Units		Percent Change	Percent of Total Farms	
	1969	1976		1969	1976
1 - 99	1029	677	(34.2)	69.6	64.0
100 - 299	407	319	(21.6)	27.5	30.2
300 -	43	62	44.2	2.9	5.8
Totals	1479	1058	(28.5)	100.0	100.0

Accompanying the trend toward fewer and larger farms, and perhaps a significant impetus for that trend, has been a change in labor and capital equipment characteristics of potato farming. Mechanical potato harvestors were introduced in Maine in the mid-1950's and began to receive broad local acceptance in the late fifties and early sixties. Mechanical harvestors are now estimated to number over 1,100, an increase of more than twenty fold over 1958. The advent of mechanical harvesting as well as other mechanized farm operations has dramatically reduced farm labor in potato production. According to University sources, there were approximately 20,000 people employed in harvesting the 1972 Aroostook potato crop compared with more than 30,000 employed prior to the introduction of mechanical harvestors in the late fifties. The most substantial reductions in labor have been in Canadian workers and local adults, although reductions have also occurred in school-age youths and the Indian labor force. School is still let out at harvest time in Aroostook County with many students participating in the harvest.

FIGURE 2

COMPARABLE YIELDS FOR MAINE AND TOTAL FALL HARVESTING STATES, 1955-1977



A serious production problem in Maine's potato industry is the increasingly serious soil degradation and rapid erosion of topsoil in Aroostook County due to steep terrain, inadequate crop rotation, and other production circumstances. The average rate of topsoil erosion on Aroostook potato farms has been estimated at 6 to 9 tons per acre per year with some marginal fields losing well over 100 tons per acre each year. A recent USDA study found that erosion has caused the abandonment of 2,500 acres of once active Aroostook cropland in the past 7 to 10 years. The bottom line in Aroostook's soil erosion and monoculture problems is, of

course, profitability. The most profitable apparent short-term strategy for individual small farmers has been to plant maximum acreage in potatoes year after year. For many small farmers, to do anything different would be to go out of business. The need for a second profitable crop is widely recognized as an important part of the solution not only to soil erosion and degradation but to other problems inherent in a one-crop economy. Perhaps the most promising second-crop venture, the production of sugar beets in Aroostook County, failed due to poor weather, poor market conditions, lack of widespread grower support, and other factors including mangement problems at the refinery. Other crops which are considered to offer potential diversification of the Aroostook agricultural economy include mustard and rape seed, and soybeans from which vegetable oil could be extracted for use in potato processing. Soybean meal is also an important ingredient in poultry feed. The possibility of greater livestock agriculture is also being pursued.

It is difficult to generalize about changing capital equipment and operating costs in potato farming due to wide variations in farm efficiency. University of Maine sources estimated growing, harvesting and storage costs per acre to be approximately $500 in 1973. In the same year, the average capital investment for a potato farm was estimated at $120,000 or close to $1,000 per acre including cropland, farm buildings, harvestors, diggers, trucks, tractors, and other farm equipment. Large farms showed slightly higher than average operating costs on a per-acre basis, but also showed a significantly lower per-acre capital investment of $800. By comparison, a study of Maine potato farms in 1958 and 1959 showed average per/acre costs of $383 and an average capital investment of $683 per acre. These figures would indicate that in fifteen years operating costs increased 30% and capital investment costs have increased more than 40%. However, cash receipts to farmers per acre harvested, which averaged about $350 in the late fifties, has averaged well over $800 in the seventies - an increase of approximately 135%.

MARKETING AND UTILIZATION

Most of Maine's potato crop is placed in storage at harvest and later removed from storage and prepared for market during the 7-9 months following harvest. For many years the common storage, packing and shipment pattern was for potatoes at farm storage sites to be transported in bulk to central railroad trackside facilities where they were graded and packed into consumer sized packages for shipment to terminal markets by rail. Eventually, particularly beginning in the 1940's, grading and packing operations began to take place in many farm storage facilities causing packing and grading to become more decentralized with a greater number of smaller operations. Increasing use of trucks for potato shipment beginning in the late 1950's further accelerated the trend toward packing at farm storages. By 1976 more than 58% of Aroostook potato packing facilities were located off-track in conjunction with farm storage facilities.

Tablestock

The utilization of Maine's potato crop during the 20th century has been primarily for fresh tablestock. In recent year's slightly more than 50% of sales have been as tablestock with almost 40% used for processing as food or starch, and another 10% used for seed. The majority of fresh tablestock dealers, sometimes called shippers or wholesalers, are also growers and packers although some dealers are independent operators. Conversely, most large growers are also dealers for their own product and often for the product of other growers who choose not to get involved in product marketing. Thirty-four of the most active Maine potato dealers belong to Maine Potato Sales Association (MPSA) which was organized to represent members in various public liaison functions. A representative of MPSA estimates that up to 90% of Maine tablestock sales are made by the Association's 34 members, with 6 or 8 of these accounting for more than 50% of sales. According to the Maine Department of Agriculture, the total number of licensed potato dealers (including processors) in Maine is

currently 115. The fact that Maine has a relatively large number of dealers selling products to a rather concentrated market of potato purchasers such as the large chain stores is often cited as a cause of poor leverage in the marketplace, low prices to growers, variable potato quality, and other potato marketing difficulties.

As noted previously, the method of shipment of fresh Maine potatoes to market has shifted in recent years from rail to truck. Prior to 1955 between 80% and 90% of Maine tablestock production was shipped by rail. By the mid-sixties truck transportation accounted for nearly half of Maine potato shipments (see Table 2). During the 1970's the proportion of shipments by truck has continued to increase to 85-90%. On the national level, rail shipments currently account for about 15% reflecting a greater use of rail transportation by certain western states to reach potato markets in the east and midwest. The primary cause of the shift from rail to truck transportation was the continuing unreliability of railroad timetables and poor temperature control during shipment which resulted in product losses. An important adverse effect of truck shipments has been higher transportation costs particularly to the more distant markets in the midwest and south. Lack of substantial potato export business in the past several years has further hastened the decline of rail shipments. Several prospects for reviving rail traffic, including the possibility of piggyback shipments, have been investigated recently but no improvements have been forthcoming.

TABLE 2

SHIPMENT OF FRESH MAINE AND U.S. POTATOES BY RAIL AND TRUCK: 1950-1977

(Hundredweight in Thousands)

	Maine				U.S.			
Crop Year	Rail Shipments	% Rail	Truck Shipments	% Truck	Rail Shipment	% Rail	Truck Shipments	% Truck
1977	269	1	21,038	99	25,947	15	150,063	85
1976	4,261	16	21,617	84	39,355	21	146,634	79
1975	4,607	17	22,583	83	46,116	21	171,338	79
1970-74	4,362	16	23,695	84				
1965-69	15,191	51	14,745	49				
1960-64	23,673	63	13,921	37				
1955-59	27,527	76	8,802	24				
1950-54	30,078	87	4,634	13				

The destinations of Maine tablestock shipments in the 1950's and early 1960's included most of the major metropolitan markets east of the Mississippi. More recently this market area has been contracting for a number of reasons. Table 3 shows deliveries in rail and truck units (55,000 lb. carlots) to the nine states which accounted for the bulk of Maine's domestic shipments in the past two years. Transportation problems have been a significant cause of changes in the viability of traditional marketing patterns. Perhaps a greater influence has been the strong increase in production and market competition from competing areas in the west and midwest. New York, Idaho, and California have been among the states which have been most successful in penetrating traditional Maine markets in the east including, Boston, New York - Newark, Washington - Baltimore, Philadelphia, Pittsburg, Albany, Cleveland, Miami and other metropolitan areas. In addition to domestic markets, foreign demand has occasionally provided expanded opportunities for Maine and other potato producers. Export traffic has been light and variable in the past three years with 4,500 carlots in 1975, 6,545, in 1976, and only 72 in 1977. Most of this traffic has been to Western Europe and Carribean markets.

TABLE 3

PRIMARY DESTINATIONS FOR MAINE POTATO SHIPMENT BY TRANSPORTATION MODE, 1976 and 1977

Destination	1976-77		1977-78	
	Truck Units	Rail Units	Truck Units	Rail Units
Mass.	3,845	68	4,253	72
N. Y.	2,745	242	2,638	124
Penn.	2,006	1	2,544	-
N. J.	1,927	-	2,402	-
Maine	1,397	79	1,256	21
Conn.	1,021	11	1,072	-
Fla.	1,021	-	1,599	-
Md.	803	19	953	16
R. I.	714	6	696	-

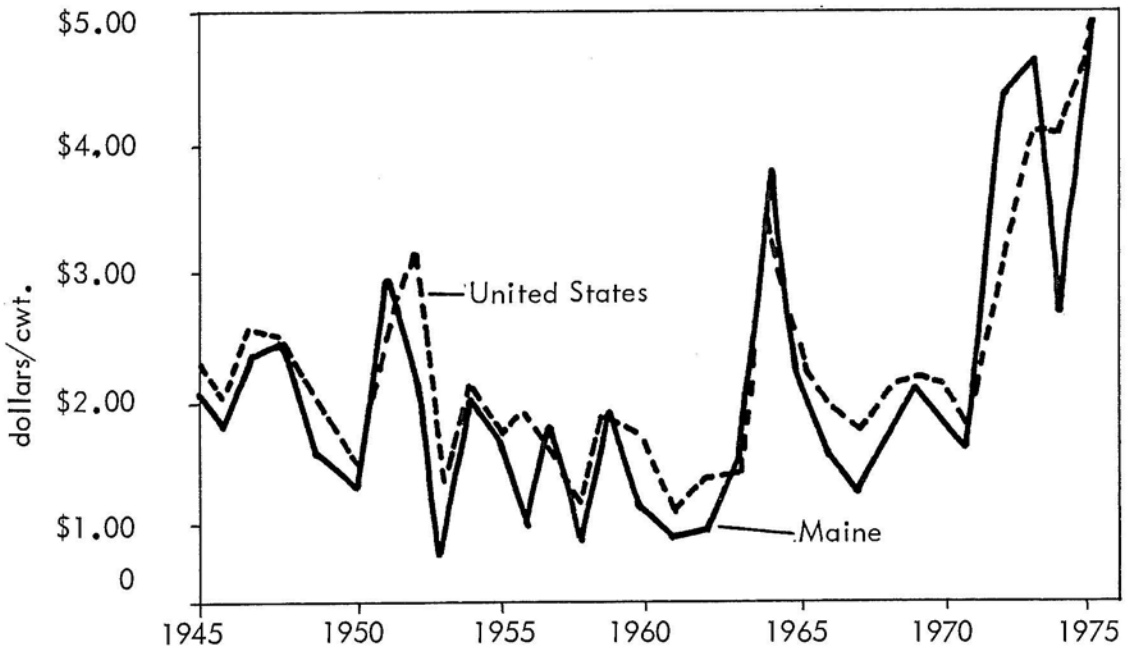
Another factor adversely affecting Maine tablestock potato marketing efforts appears to be a trend over the past two decades to hold potatoes longer in storage for shipment later in the year. Maine's proportion of shipments prior to March have declined steadily since 1950 while shipments in April, May, and June have increased. There are a number of apparent reasons for this trend. In part it reflects a desire by farmers to hold back product in hopes of a better price in the spring, and in part it seems to reflect a reluctance of buyers to purchase Maine potatoes until supplies from other areas are no longer available. The inconsistent quality of Maine product is often given as a reason for this later problem. In either case, the trend to sell product later in the year has meant that farmers must bear greater storage costs, risk greater product loss through shrinkage and spoilage, and face the prospect of selling a large portion of their crop under pressure late in the season when new supplies are about to reach the market. Fortunately there is evidence that this late-season marketing trend may have changed somewhat in the past year or two, but this may be due largely to export demand.

The problem most often discussed in relation to marketing fresh Maine potatoes is quality control, primarily size and quality variability rather than consistently poor product. In an effort to address this problem, Maine potato growers in conjunction with the federal and state government, implemented a potato Marketing Order during the period from 1954 to 1963. The Marketing Order set up grading and size standards for tablestock verified by compulsory inspection of all shipments. Historical evidence shows that Maine prices generally increased relative to competitors during the Market Order years and subsequently decreased as industry-wide quality standards were relaxed. There is also evidence that yields increased during the 1954-63 period and have gradually decreased and fluctuated widely since then. This trend may have been due to improved cultural practices used during the Marketing Order to meet more stringent inspection requirements. Quality deterioration following the inactivation of the Marketing Order also seems apparent. These factors coupled with corresponding improvements in competing potato producing areas have had an adverse impact on Maine's potato industry since the mid-sixties. To reverse this trend, the Maine Department of Agriculture and the University of Maine jointly prepared a proposal in 1972 to reinstate a Marketing Order. Because of resistance within the industry, the proposal has not been implemented.

At the same time that the potato tablestock producers have faced rising costs and increasing competition, they have had to deal with widely fluctuating prices.

FIGURE 3

AVERAGE PRICES OF POTATOES FOR THE UNITED STATES AND MAINE, 1945-1975



The fluctuation of Maine potato prices has generally followed the national trend. However, Maine prices tend to experience greater highs and deeper lows and to remain low longer than U.S. prices. Except for 1964 and 1965, prices between the mid-fifties and early seventies were lower than the 1945-50 average. This trend, together with steadily rising production costs put farmers in a severe cost-price squeeze and forced many out of business. This price squeeze was probably exacerbated by the concentration of buyers (large chain stores and wholesalers) who have been able to use considerable leverage in price bargaining in Maine because of the large number of sellers. Fortunately prices have been high since 1972 due in part to strong foreign demand in several recent years.

Processing

The largest use of potatoes in the U.S. and the second largest use of Maine potatoes is for processing for human consumption. In 1976, 25.3% of the Maine crop went to processing for food - primarily french fries, potato puffs, and chips. This represents only a slight increase from 1966 when 24.5% went to food processing. By comparison, the share of the total U.S. crop going to processing for food products has been rising continually; from 41.2% in 1966 to 58.1% in 1976. Processing utilization ratios of more than 80% in states such as Washington and Idaho account for the high national figures and for growth in potato production in these states. Figures 4 and 5 illustrate the national trend toward utilization of potatoes for various processed products. Table 4 indicates similar trends in U.S. per capita consumption of potatoes and potato products since 1950.

Figure 4

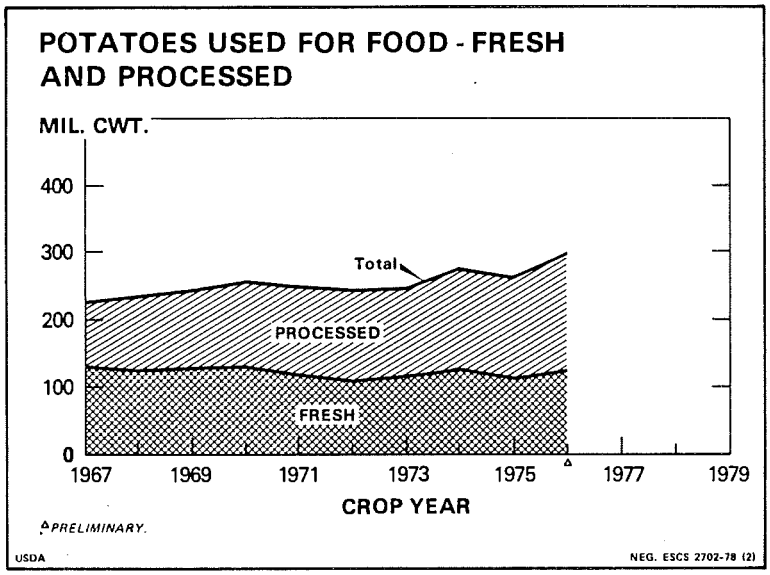


Figure 5

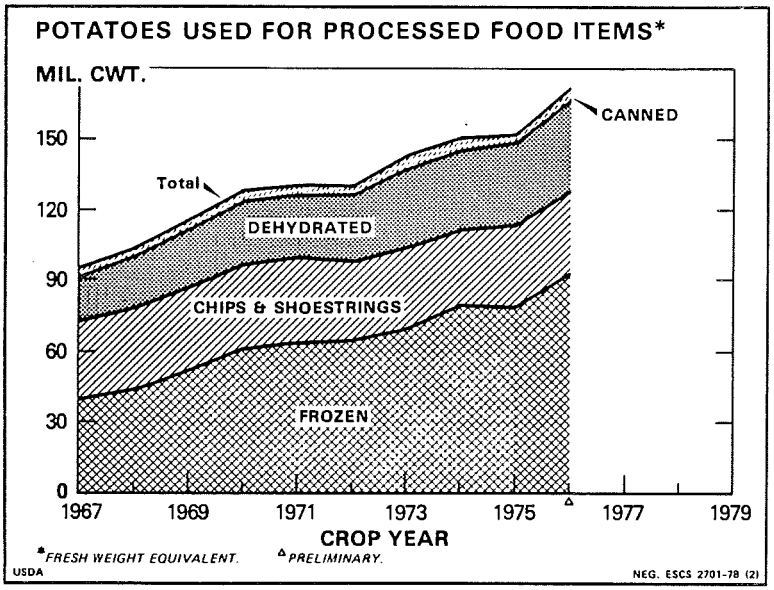


TABLE 4

U.S. PER CAPITA CONSUMPTION OF POTATOES, 1950 - 1977

Per capital consumption (in pounds)

Year	Fresh	Frozen	Chips & Shoestrings	Dehydrated	Canned	Total Fresh & Processed
1950-54	98	1	7	1	0.5	107
1955-59	91	3	10	2	1	107
1960-64	81	10	13	5	1.5	110
1965-69	66	19	17	9	1.8	113
1970-74	54	31	17	13	2.2	117
1975	55	35	16	14	2.0	122
1976	51	37	16	10	2.0	116
1977	58	38	16	9	2.0	123

Most potato processing in Maine is for the frozen market, primarily french fries and potato puffs. The freezing of potato products, in fact, originated in Maine just after World War II with the construction of several processing facilities. It is estimated that as much as 10 million cwt. will go to the frozen market from the 1978 crop. Three large processors in Aroostook County currently account for the production of frozen potato products in Maine. None of these firms are involved directly in the production of potatoes but all use forward contracting or agreements with growers to ensure an adequate supply (up to 50% of needs) of acceptable raw production. Supply requirements beyond the volume contracted for are purchased on the open market from both growers and dealers. It is important to note that frozen product processors do not rely on second grade tablestock for the bulk of their raw product supply, but prefer stock such as the Russet Burbank grown especially for processing. Most Maine potatoes

are of the round white variety which are not considered as suitable for processing as varieties grown in the west (predominantly the Russet-Burbank) which are larger, drier, and more easily stored. Furthermore, these processors require a large supply of consistent quality potatoes to optimize processing operations and meet market demands. These supply requirements are met less easily in Maine than in the west where large scale, highly mechanized and irrigation-controlled growing operations have developed. Cheaper power from large federal hydropower projects in the west is another factor which favors western frozen potato processors over those in Maine.

Potato processing for dehydration will be extremely limited in the 1978 crop year, probably amounting to less than 100,000 cwt. as a by-product of frozen product processing. In the past several years dehydration processing was more important in Maine due to the existence of a large firm which has since ceased operations. When it was in operation this firm purchased field run potatoes for conversion to potato flakes as a consumer product or as an ingredient to such products as Pringle Potato Chips. A number of factors contributed to the closing of this operation. As in the case of frozen processing, problems associated with potato varieties and the consistency or dependability of raw product supplies proved troublesome. Because of heavy energy requirements for dehydration, power costs are also a problem. Finally, the market for dehydrated potatoes appears to have weakened significantly since 1975. Future prospects for dehydration processing in Aroostook County continue to be uncertain.

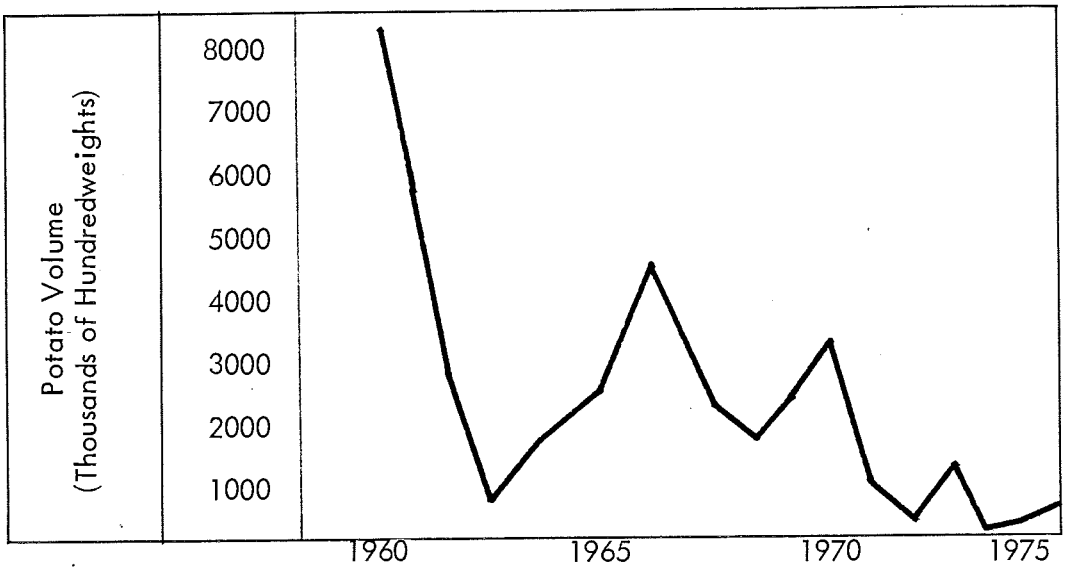
Another food product utilization of Maine potatoes is for potato chips. Two relatively large firms in Cumberland County currently manufacture chips on a year-round basis with up to 90% of their raw materials supplied by Maine growers. Recent utilization figures for these plants are between 200,000 and 300,000 cwt. annually. Both plants forward-contract for most of their supply requirements with a small number of growers in the southwestern part of the state - particularly the Rumford area. The most important chip potato production area in Maine is the Newport-Corinna area with approximately 15 growers of chip potatoes. Most of these growers belong to Sebasticook Packers, Inc., which is a cooperative sales association specializing in the chip market. Nearly all of the chip potatoes produced in this area, approximately 500,000-700,000 cwt. in 1977, are shipped to processors in Massachusetts, Pennsylvania, Maryland, and upper New York State. The chip market appears to have been relatively steady over the past ten years with up to 5,000 acres harvested annually.

The production of starch was a major factor in the development of Maine's potato industry in the nineteenth century. However, the processing of potatoes for starch has declined in recent years. The number of starch producers in the state has declined from about 20 in the early 1950's to 10 in the late 1960's to only one in 1978. The volume of potatoes going to the starch market since 1961 is illustrated in Figure 6. It is estimated that less than 400,000 cwt. of Maine potatoes will go to starch from the 1978 crop with this amount being converted primarily at frozen product plants. Investments to meet pollution control requirements have been a signficant factor in the decline in number of starch producers. In the past two years, however, several waste treatment facilities have come on line and allowed production to increase. Future prospects for the starch industry depend on further developments in the extraction of protein from potato waste waters.

Several other processing markets for Maine potatoes deserve mention. Canned boiled potatoes have been a significant outlet in the past but in recent years this market has been extremely limited. Livestock feed has at times been another important market for off-grade potatoes. A federal program has been instituted in the 1978 crop year to direct low grade potatoes to cattle feed. The program is aimed at reducing the price-depressing impact these potatoes are having on the tablestock market.

FIGURE 6.

MAINE POTATOES USED FOR STARCH MANUFACTURE
1960-1977



Seed Potatoes

Seed potato production and shipments from Maine have declined over the past two decades. Seed shipments were consistently over 3 million hundredweight in the early sixties, declining to an average of about 2.5 million cwt. in the early seventies to just over 2 million cwt. in 1977. Acreage certified by the Maine Department of Agriculture for seed production has fluctuated in the 1970's from 57,899 acres in 1970 to 36,608 acres in 1976 for an average of about 45,000 acres. There were 650 growers certified for seed production in 1977. Average acreage per grower was slightly over 70 acres.

Maine seed potatoes are shipped primarily by dealers although some growers do their own marketing. The most important destinations for Maine seed in 1977 are shown in Table 5 with the number of carlot deliveries made to each state. Shipments to these ten states account for 85% of Maine's seed potato shipments in 1977. Export demand is also a factor in the seed potato market. 42 carlots of seed were exported in the 1977-78 season with 40 of these going to Canada and the other two to Puerto Rico and Nicaragua. The greatest export year since 1960 was in 1962 with more than 700 carlots. Major competitors in seed potato production are Idaho, Washington, North Dakota, Oregon, California, Minnesota, and New York.

TABLE 5

MAINE SEED POTATO DESTINATIONS AND SHIPMENTS, 1977

Destination	Shipments (55,000 lb. carlots)
New York	986
Pennsylvania	546
Virginia	387
North Carolina	337
New Jersey	183
Florida	181
Maine	151
West Virginia	136
Massachusetts	108
Rhode Island	86

GOVERNMENT PROGRAMS AND INDUSTRY COORDINATING MECHANISMS

Federal Programs

The federal government through the U.S. Department of Agriculture provides funding and technical assistance for a wide range of programs which impact the potato industry. USDA divisions such as the Farmers Home Administration, the Economics, Statistical and Cooperative Service, the Agricultural Stabilization and Conservation Service, the Science and Education Administration, the Soil Conservation Service, and other agencies influence the operation of Maine's potato industry and other agricultural industries in the State. The only commodity-specific federal program for potatoes, however, is the Potato Diversion Program which is designed to divert low-grade stock from the fresh market in order to improve market conditions in certain situations. This program has been initiated for the 1978 crop year due to the existence of an unusually high level of low-grade stock probably caused by poor growing conditions. The program pays growers a specified price for the sale of potatoes for livestock feed. It is administered by the Agricultural Stabilization and Conservation Service and was last utilized in the late 1960's.

Maine Department of Agriculture

There are several programs within the Department of Agriculture which influence the operations of Maine's potato industry. The Division of Plant Industry has a general mandate to protect the public from hazards associated with the sale, transport, or production of weak, diseased or insect-infested commercial plant stock including potatoes. The major activity of the Division is the certification of seed potatoes. The Division of Markets and Promotion conducts Branding Law and shipping point inspections for potato shipments in Maine to ensure the accuracy of grading, sizing, and labeling. Other potato-related activities of the Division include the licensing of potato dealers and processors, the operation (in conjunction with USDA) of a market news service, and a wide variety of promotional activities. The Seed Potato Board was established in 1945 to improve the production of seed potatoes in Maine through research, production, seed sales and distribution, and other methods. The Board consists of the Commissioner of Agriculture and six grower-members appointed by the Commissioner. In the past several years it has been self-supporting through seed potato sales. The Maine Agricultural Bargaining Board was established in 1973 as a mechanism for facilitating negotiations among producers and handlers over the production and marketing of various agricultural crops including potatoes. The Board consists of five representatives of the agricultural industry and has been relatively inactive since its inception. The Maine Potato Commission was established by the Legislature in 1955 with a general mandate to promote the prosperity and welfare of Maine's potato industry. The Commission consists of seven members plus an executive secretary. Funds received through an excise tax on Maine potatoes are used to advertise and promote the sale of Maine potatoes and to underwrite research into better methods of producing, shipping, merchandising, and manufacturing potato products.

The University of Maine

The University provides research and technical assistance to the potato industry, as well as other agricultural industries in Maine, through the Cooperative Extension Service and the Life Sciences and Agricultural Experiment Station. The Cooperative Extension Service currently has five people working full time in its potato program in Aroostook County. Several other people at the University are assigned part time to the potato program. The program is oriented toward providing assistance to the potato industry in such areas as production, marketing, handling, pathology, and economics and business planning. Among other activities, program personnel advise growers on pesticide usage, conduct anti-bruising programs, assist in estate planning, and provide other assistance in educational sessions for growers. The potato program is funded in part by federal, state, and county sources. Funding is also

made available from such sources as the Maine Potato Commission and Maine Potato Council with whom the Extension Service works very closely.

The Life Sciences and Agricultural Experiment Station maintains a potato research program which is currently funded at a level of about one half million dollars by the federal government, the University, and other private sources such as the Maine Potato Commission. Potato research projects funded by the Experiment Station are conducted in a number of departments in the College of Life Sciences and Agriculture including Agricultural and Resource Economics, Agricultural Engineering, Botany and Plant Pathology, Entomology, Food Science, and Plant and Soil Sciences. The Aroostook County Farm in Presque Isle is operated by the Experiment Station as a field laboratory for its research program.

Trade Associations

Two state organizations are important factors in influencing policies and practices related to potato production and marketing. The Maine Potato Council, an organization that has existed since the 1930's under several names, is a growers' association established to inform growers on important issues facing the potato industry such as production problems, price bargaining, and various marketing or public policy concerns. The Council represents almost 1,400 growers with 5 or more acres of potatoes. Funding for the Council comes from a percentage of state potato excise taxes. The Maine Potato Sales Association is a dealers' organization representing 34 of Maine's large potato dealers or shippers. The Sales Association represents dealers in much the same way that the Council represents growers, but with an emphasis on shipping concerns such as transportation problems. Funding comes from within the Association's membership.

The National Potato Council is a non-profit potato growers' association organized in 1948 to promote the welfare of the U.S. potato industry, promote increased use of potatoes, and foster coordination among potato producing areas. Recent examples of work by the Council includes a successful action effort before the IRS to retain investment tax credits for potato storages, and the sponsorship of the National Potato Marketing Research and Promotion Act which was enacted by Congress and is administered by the National Potato Promotion Board. The National Potato Promotion Board is an interstate agency organized to promote the consumption and utilization of potatoes, regardless of where they are produced. Funding for the Board is raised through a national tax on potato shipments. Another trade association of importance to the potato industry is the National Farmers' Organization (NFO) whose prime responsibility is to improve prices and price bargaining for all farmers. The NFO has been active in Aroostook County and elsewhere in Maine in the past.

Integration, Cooperatives, and Contractural Arrangements

The most prevalent form of vertical integration in Maine's potato industry is between production and wholesaling. The majority of Maine potato dealers are also growers. This situation creates difficulties due to the number of dealers moving the crop but also provides a certain amount of benefit in terms of integrated thinking between production and marketing functions. Another form of integration - between processing and production - was a significant factor several years ago when a large potato processor in Aroostook was growing a substantial volume of potatoes for processing. At the same time another potato processor had integrated backward into production through a joint venture with a large growers cooperative. Since that time the first processor has ceased its growing operation and the joint potato processing venture has been sold to a potato processor. At the present time there is no apparent production/processing integration in Maine's potato industry with the exception of some contractural and cooperative arrangements.

The largest cooperatives in the potato industry are Maine Potato Growers and Agway. Agway is a large, diversified, nationwide cooperative with more than 120,000 members and

annual sales of over $1 billion. Agway performs a wholesale function for the sale of table-stock and seed potatoes by both members and non-members in Maine. It also is a major supplier of farm equipment, fertilizer, chemicals, and other supplies. Maine Potato Growers is an Aroostook-based cooperative with over 800 grower-members and diversified operations including potato and grain wholesaling, the manufacture of potato bags, milk production, and the sale of farm equipment and supplies including chemicals, fertilizer, fuel, hardware, and heavy equipment. Maine Potato Growers has been in operation for nearly 50 years and is a significant factor in potato marketing and production (through grower-members) in Maine. Other cooperatives in the potato industry include: Colby Cooperative Starch - the only remaining starch manufacturer in Aroostook; Limestone Potato Growers Association - an 18-member grower cooperative for packing and storage functions; and Sebasticook Packers - a sales cooperative of chip potato growers; and several other small cooperatives of seed and table-stock growers.

Contractual arrangements are another source of coordination among growers, dealers, processors, and other participants in the potato commodity system. Contracting either in a formal way or through agreements and understandings is a major factor in potato trading for the processing market. Supply agreements for up to 50% or more of processing needs for chipping, frozen processing, and dehydration has been common in Maine. In some cases forward contracts are also used in seed and tablestock marketing. Agway for instance traditionally contracts with growers for much of its seed supplies. Informal agreements are more common than contracting in tablestock marketing. It appears that forward contracting and supply agreements constitutes a significant coordinating mechanism in the potato system with the prospect of becoming more important as capital requirements and the need for business planning and potato production and marketing continues to increase.

Another form of traditional forward contracting for Maine potatoes is the trading of Maine round white potato futures contracts on the New York Mercantile Exchange. As in the case of more traditional forward contracts, the trading of potato futures provides an opportunity for farmers to reduce inventory or growing risks, secure forward pricing, obtaining capital for financing production or storage inventories, or some combination of these factors. By selling futures contracts on the mercantile a seller is able to fix the price of a portion of his crop or inventories and protect himself against a declining cash market. Potato shippers also use futures contracts to protect themselves against price declines against their inventories or to hedge against cash market price increases in cases where they have fixed-price sale agreements. Potato processors and retailers use futures contracts for protection against rising cash prices which would increase costs of production or sales, and also to ensure that an adequate volume of potatoes will be available when needed.

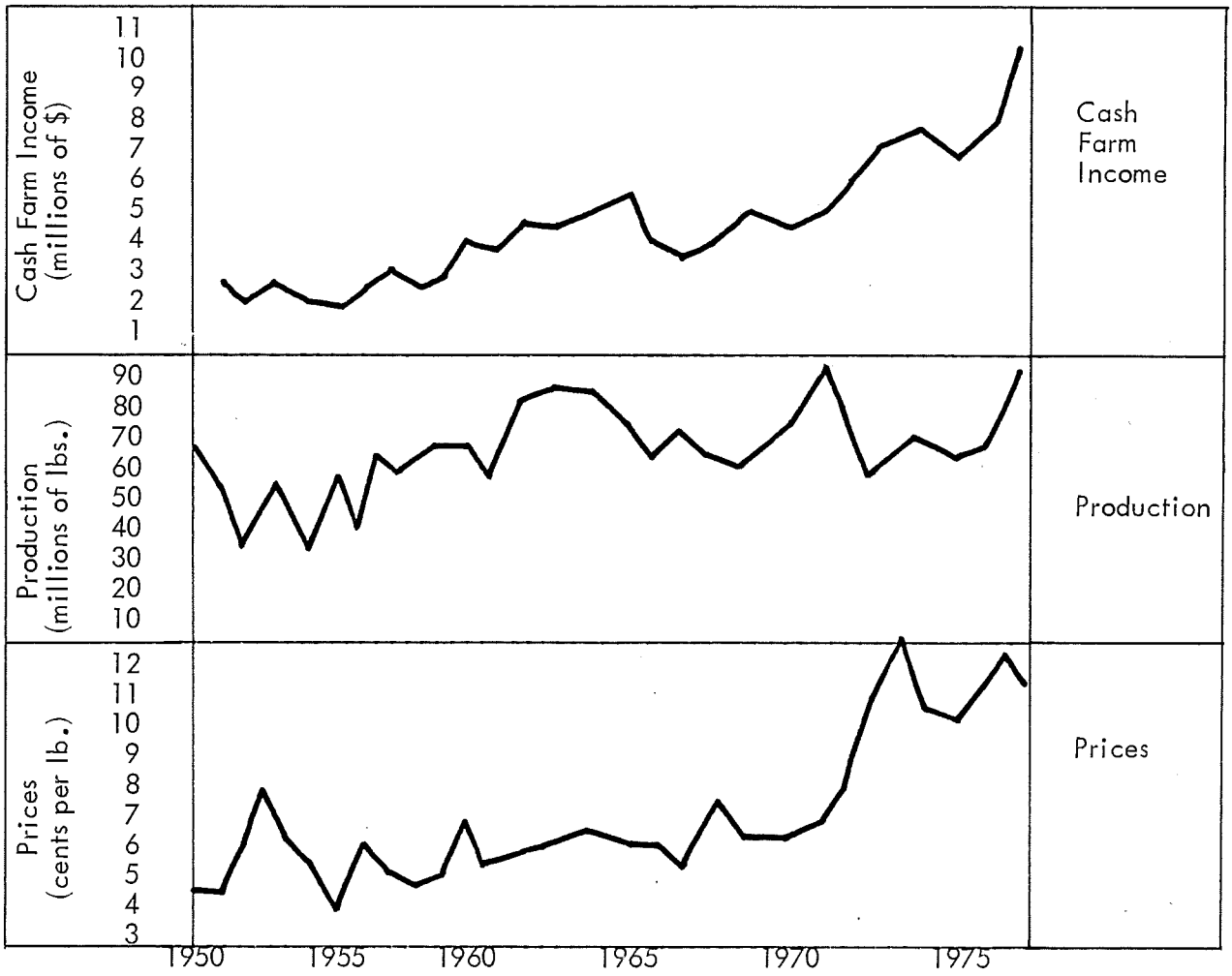
Maine potato futures contracts are traded in 50,000 pound contract units for delivery in November, March, April and May. In a sense the futures market is an underlying influence for virtually every transaction involving Maine potatoes since it acts as a price setting and supply fixing mechanism. Despite unfavorable views often voiced against potatoes future trading, it appears that up to 2/3 of Maine potato farmers traded potato futures in 1977.

PRODUCTION TRENDS

Apples are Maine's most valuable fruit crop accounting for up to 65% of state cash farm income from fruits and up to 6% of total cash farm income in recent years. As indicated in Figure 1, production has fluctuated considerably since 1950 due largely to weather conditions. A record crop of 97 million pounds was harvested in 1971. The lowest production year since 1950 was in 1954 with just 30.7 million pounds harvested. The 1978 harvest was about 75 million pounds, down 18% from the 92.0 million pounds produced in 1977. Cash farm income from apples has risen quite steadily in the past 26 years from $2.6 million in 1951 to $10.5 million in 1977. As indicated in Figure 1, cash farm income reached a low of $1.8 million in 1955 and a high of $10.5 in 1977. The increasing trend in cash income has been a result of increased production as well as increased prices (see Figure 1). Prices have been particularly strong since 1971, averaging over 11 cents per pound in the past 6 years. Prior to that prices ranged from 4 to 7 cents per pound for 20 years or more.

FIGURE 1

PRODUCTION, PRICES AND CASH FARM INCOME
MAINE APPLES 1950-77



Maine is the second largest producer of apples in New England with over 25% of cash receipts. Massachusetts is the largest apple producer in New England with about 30% of total cash receipts from apples. In 1977, New Hampshire had 17% of New England receipts, Vermont and Connecticut had 13% each, and Rhode Island had 2%. While other New England states have experienced little growth or even a decline in their share of regional apple revenues, Maine's share has increased from 22% in 1975 to 25.3% in 1977. Nationally, Maine ranks 16th among states in apple production. National production of apples for the fresh market as well as processing has averaged more than six and one-half billion pounds in the past several years. Washington is the largest producing state with approximately 30% of national production. Other major producing states with their approximate share of production based on a three year average are: New York (13%), Michigan (9%), Pennsylvania (7%), California (7%), Virginia (5%), North Carolina (4%), West Virginia (3%), Oregon (2.5%), and Ohio (2%). These ten large producing states account for more than 80% annual production in the U.S. The price of apples produced in Maine is determined by national supply and demand conditions with production in northeastern states such as New York and Pennsylvania having a particular strong impact on apple prices in Maine and throughout New England.

Apple production in Maine is concentrated in six counties: York, Androscoggin, Kennebec, Oxford, Cumberland, and Franklin. Nearly 90% of the apples produced in Maine in recent years have come from these counties. More than 50% of total production comes from Androscoggin, Kennebec, and York with the largest concentration of orchards being in the northwestern region of York County and in an area roughly bounded by Augusta, Lewiston/Auburn, and Livermore Falls.

According to the New England Fruit Tree Survey, the number of apple trees in Maine's commercial orchards (at least 100 trees or approximately $1\frac{1}{2}$ acres) has expanded considerably since 1965. There were 380 thousand apple trees in Maine in the 1976 survey - up 58% from 1965. The number of commercial orchards has also increased during this period; from 130 in 1965 to 176 in 1976. As indicated in Table 1, there has been a substantial increase in the number of smaller farms producing apples commercially. In 1965 there were 34 orchards (26% of total orchards) with 100-500 trees which accounted for less than 4% of Maine's total number of apple trees in commercial orchards. By 1976, there were 71 orchards in this size category accounting for 40% of total orchards and 4.6% of Maine's total trees. The most significant growth, however, has been in orchards in the largest size classes. In 1976, Maine's 40 largest apple orchards (22% of the state's orchards) accounted for about 75% of Maine's apple trees - up from about 55% in 1965. These same orchards accounted for approximately three-quarters of apple production in Maine. According to the Cenus of Agriculture, Maine has had as many as 20,000 or more apple orchards in the past (1930) with nearly 2 million trees. As recently as 1950 the Census showed more than 10,000 farms and more than one-half million apple trees in Maine. As in other agricultural industries the long term trend has been toward fewer and larger farms. Acreage in apple orchards according to Census figures, has decreased from more than 36,000 in 1930, 13,700 in 1950, 8,700 in 1964, and 6,400 in 1974. It is important to note that Census data includes many inactive orchards and non-commercial farms, and may therefore give a somewhat inaccurate picture of trends in commercial apple production in Maine

TABLE 1

NUMBER OF APPLE ORCHARDS AND TREES BY SIZE GROUP, 1965 and 1974

Orchard Size (# of trees)	1976 Number of Orchards	1976 Number of Trees	1965 Number of Orchards	1965 Number of Trees	% of Total Trees 1976	% of Total Trees 1965
100-499	71	17,523	34	9,275	4.6	3.9
500-999	30	20,957	29	21,416	5.5	8.9
1000-2499	35	57,571	46	78,986	15.2	32.8
2500-4999	22	75,592	9	33,897	19.9	14.1
5000 or more	18	208,377	12	97,216	54.8	40.2
TOTALS	176	380,020	130	240,790	100.0	100.0

The dominant variety of apple produced in Maine is McIntosh. It constituted 63% of all varieties in 1976 as compared to 61% in 1970 and 57% in 1965. Second in popularity is Red Delicious with 17 percent of the state total. Some of the older varieties such as Baldwin, Northern Spy and Wealthy continue to decline in numbers while newer ones such as Paulared and Macoun are increasing. Another important trend is the continuing popularity of semi-dwarf trees over the past ten years. Semi-dwarfs have expanded in number from about 25 thousand in 1965 to 132 thousand in 1975. This represents an increase in their proportion of total trees from 10% to approximately 35%. Table 2 and Figure 2 illustrate this trend.

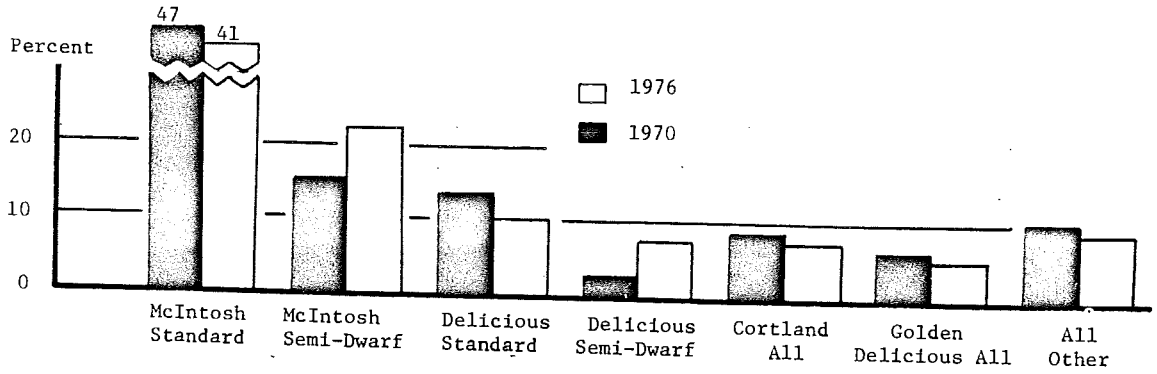
TABLE 2

NUMBER OF MAINE APPLE TREES BY VARIETY
1965-76

Variety	Survey Year 1965	1970	1976	%Change 1965-76	% of Total 1976
McIntosh	138,266	195,674	238,598	+73	63
Standard	121,382	150,248	154,690	+27	41
Semi-dwarf	16,884	45,426	83,908	+397	22
Delicious	37,574	48,226	63,077	+68	17
Standard	32,909	40,339	37,642	+14	10
Semi-dwarf	4,665	7,887	25,435	+445	7
Cortland (all)	19,400	24,670	27,068	+40	7
Golden Delicious (all)	19,325	20,632	19,274	0	5
Early McIntosh (all)	6,596	9,754	6,208	-6	2
All Others	19,629	23,083	25,795	+31	7
Total	240,790	322,039	380,020	+58	100
Standard	215,983	256,063	247,929	+15	65
Semi-dwarf	24,807	65,976	132,091	+432	35

FIGURE 2

LEADING APPLE VARIETIES IN MAINE BY PERCENT OF TOTAL
1970 and 1976



Major investment items in apple production are land, rootstock, machinery and equipment, and farm buildings including cold storage facilities. Major operating costs are labor, fertilizer and chemicals, and the amortization of farm assets. An investment of $3,000 or more per acre may be required to establish a new orchard and bring it into production. In both investment and operating costs there appears to be an efficiency in production operations in small to medium sized orchards. In smaller farms capital equipment economies of scale are difficult to achieve while in larger farms greater dependence on hired labor becomes a large cost factor.

The harvesting of apples in Maine is accomplished entirely by handpicking. Mechanical harvesting using "shakers" and catching frames is common in certain parts of the country where apples are produced more extensively for processed products. This type of harvesting has not been applied with much success in the harvesting of apples for the fresh market due to bruising problems and the need for selective picking. Data available through Maine's Department of Manpower Affairs indicates that annual apple harvesting employment in the state has ranged between 500 and 1,000 during the 1970's depending on annual crop volumes. Table 3 summarizes employment statistics during this period. In recent years foreign workers from the Carribean area and Canada have become an extremely important factor in apple harvesting in Maine and elsewhere in the northeast. Of the 723 workers employed in harvesting the 1978 apple crop in Maine, 57% were foreign. Government restrictions on the use of foreign harvest labor has developed into the most controversial issue in apple production in Maine in recent years. Growers claim that domestic workers are neither sufficiently available or productive to effectively harvest Maine's apple crop during the intensive 2 to 3 week harvesting period. The government, largely through the Federal Department of Labor, has a policy of certifying foreign harvest labor only after every effort has been made to enlist domestic labor. In recent years government approval of the use of foreign harvest labor has been delayed until the last several weeks before harvest time and has been the source of considerable anxiety and anti-government sentiment among orchardists. The harvest labor situation is expected to improve gradually as the use of dwarf and semi-dwarf trees makes apple picking easier and as chemical treatment and apple variety changes extend the length of the harvest season. Early-maturing varieties currently comprise 5% of production and are increasing in importance.

TABLE 3

PEAK SEASONAL EMPLOYMENT, MAINE APPLE HARVEST
1970 - 1978

Foreign Workers	1978	1977	1976	1975	1974	1973	1972	1971	1970
British West Indies	350	118	225	170	118	93	30	40	14
Canadian	35	40	70	49	173	229	324	341	196
Jamaica	25	189	-	-	58	11	-	-	-
U.S. Labor									
Maine or other	313	354	470	553	558	464	528	583	336
Total	723	701	765	772	907	797	882	964	546
% Foreign Workers of Total	57%	50%	39%	28%	38%	41%	40%	39%	38%

MARKETING AND UTILIZATION

Maine's apple crop is utilized nearly exclusively for the fresh or "tablestock" market; a small amount goes to processed products or cider. Except in the case of pick-your-own operations apples are harvested into bins and transported to packing or storage facilities located at most of the larger farms. Packing lines vary considerably among orchards. In some of the larger operations apples proceed from a water dump through various mechanical sizers to graders for packing. Smaller operations, which handle the minority of Maine apples, involve manual packing and grading. Mechanical packing equipment is used for approximately 70-80% of the crop. Depending on market conditions and the size of the crop, up to 40-50% of the crop is packed and marketed fresh at harvest time. The rest goes into storage to be marketed until the following summer.

Total packing and storage costs on the average represent 20-25% of retail value. Storage facilities represent a major investment and important marketing tool in the apple industry. The most profitable apple sales appear to occur at harvest time when premiums for fresh product exist in the market place and storage or other inventory costs are minimized. However, the consumer market will not absorb the entire fresh crop in the fall without severe price depression so storage has evolved as an important mechanism for extending the fresh apple marketing season and improving overall profits in the industry. Storage is either conventional cold storage or more costly and effective controlled atmosphere storage. Conventional cold storage facilities, which involve a combination of cold temperature and high humidity, are capable of holding apples as late as February or March. Controlled atmosphere facilities, which further retard respiration and ripening by limiting oxygen in the storage rooms, are capable of holding apples until mid-summer. Of more than 1.5 million bushels of storage capacity in Maine's apple industry, more than half is now controlled atmosphere. The larger growers dominate storage operations. Storage facilities, both conventional and controlled atmosphere, owned by Maine's ten largest orchardists accounts for nearly 60% of the industry's total storage capacity. Only a handful of storages are larger than 40,000 bushels capacity; only 4 growers have facilities with a capacity for more than 100,000 bushels. Most storages are in the 5,000-25,000 bushel range. It is estimated that as many as two-thirds of Maine's apple growers own no storage facilities and either market their apples at harvest or, to a lesser degree, lease storage space from larger growers.

Marketing methods and outlets for Maine apples, as indicated by a 1971 survey, are summarized in Table 4. Although the survey is rather dated the basic market structure is estimated to be relatively the same today. More than half of Maine's crop is marketed out-of-state with the most important sales areas being major metropolitan areas in the northeast and northern midwest including Boston, New York, Cleveland, and Washington-Baltimore. A limited volume of apples is sold in the southern and western areas of the U.S., and in foreign markets (primarily Canada and Northern Europe). The major market outlet for apples both in-state and out-of-state is grocery stores. Two large wholesalers in New York and Massachusetts account for nearly all of Maine's apple sales to large institutional buyers. As many as two-thirds of Maine's orchardists use these two wholesalers to market part or all of their crops. In-state, several large growers market a portion of their apples directly to supermarkets and other food outlets. Additionally, many of the smaller growers rely heavily on roadside sales and pick-your-own operations. These direct marketing alternatives are attractive because of high returns to growers. Although they represent somewhat limited outlets, the percentage of Maine's apple crop moving through direct market sales by growers appears to be increasing slowly. It is estimated that 14 orchardists had pick-your-own operations in 1978, mostly in the outskirts of the more metropolitan areas of the state. In 1971, 4.5% of Maine produced apples or about 70,000 bushels, were used for cider.

TABLE 4

MARKET OUTLETS FOR MAINE APPLES
1971*

Orchard Size	In-State use		Out-of-State Use		Roadside Sales	Pick Your Own
	Orchard Run	Packed	Orchard Run	Packed		
0-20 A.	36,999	7,089	2,000	13,796	25,920	6,890
20-50 A.	56,496	19,750	35,510	53,115	62,947	7,740
50-100 A.	26,656	15,500	22,325	221,500	38,900	500
Over 100 A.	94,050	107,368	53,000	553,733	30,911	200
TOTAL	210,201	149,707	112,835	842,144	158,678	15,330
% of TOTAL	13.5	9.6	7.2	54.0	10.2	1.0

* reported in bushels

The dominance of large growers and wholesalers in the apple marketing system in Maine corresponds to a similar pattern in other apple producing areas. This pattern has evolved largely as a result of such developments as the growth of supermarkets, the emphasis of mass merchandising of uniform products, the increased geographical concentration of fruit production, large farm units, and improved transportation. Nationally, most apple growers now deliver their crop to central shipping points where fruit is graded, packed, and sold by shippers to corporate food chains, private wholesalers, and some voluntary and cooperative wholesalers. The increased volume of sales at central shipping points has weakened the bargaining position of individual growers. In some areas, particularly the Pacific Northwest, cooperative marketing associations have developed to provide growers greater leverage in the marketing system.

Prices for fresh apples, as mentioned earlier, have increased considerably in the past twenty years. Apple prices continue to vary widely from season to season among varieties and outlets. Most Maine apples, particularly McIntosh and Red Delicious, command a premium in the marketplace due to high quality. Major competition in these varieties is the Hudson and Champlain Valley areas in New York as well as other parts of New England and Michigan. Annually prices tend to peak in the summer months and bottom-out in late fall or early winter. Grower returns generally range from 10 to 20 percent of retail prices.

Processing is not a particularly important market for apples in Maine. The production of apple cider, juice, and applesauce generally utilizes approximately 10-15% of Maine's apple crop. A. L. Stewart and Sons is the only commercial producer of applesauce in the state. Only one cider operation in Maine produces on a large commercial scale; the rest, up to 50 small operations, are largely for farm stand or home consumption. Other apple processing operations in New Hampshire and Massachusetts use Maine apples for juice, sauce, and vinegar. However, processed products remain a low valued outlet for fruit unsuitable for the higher valued fresh market. In years with a high percentage of poor quality fruit

there appears to be a significant shortage of processing markets while in years with high prices and a shortage of second quality apples processing operations have a difficult time securing a source of supply at reasonable prices. The closest area with significant apple production for processing on a relatively stable basis is western New York State where approximately 60% of the crop goes to processors.

The overall market for apples in the U.S. is expanding slowly recently due to rising per capita consumption and an increased consumer population. As indicated in Table 6, per capita consumption has stabilized in recent years after a period of decline following World War II. Total apple sales for the fresh market increased more than 10% in the past 25 years but the proportion of sales for fresh use dropped from 70% to about 55%. Conversely, consumption of processed products is increasing steadily with the proportion of apple sales for processing use increasing from 30% in the early 1950's to about 45% in the mid-1970's. Most of the increase has been in canned apple juice and frozen slices but canned applesauce still accounts for a large portion of total production. Changes in the composition of per capita apple consumption can be attributed to changes in consumer preferences and eating habits. The trend is toward convenient, time-saving foods and processed apple products have benefitted from this trend.

TABLE 5

APPLE PER CAPITA CONSUMPTION, 1950-77

	Pounds Per Capital Consumption			
Year	Fresh	Canned	Process/Dried	Total*
1950-54	22.2	3.6	1.5	28.2
1955-59	20.3	4.4	1.5	27.3
1960-64	17.4	5.0	1.4	25.5
1965-69	15.8	5.0	1.7	25.0
1970-74	16.5	4.8	1.8	27.3
1975	17.9	4.4	1.8	28.5
1976	18.8	3.2	1.6	28.8
1977	18.5	3.4	1.8	28.9

* Column weights will not add to total because canned and chilled juices are not listed in chart but are included in totals.

OTHER ORCHARD FRUITS

In addition to apples, four other orchard fruits have been raised in Maine in small volumes. These fruits are peaches, pears, plums, and cherries. Production of these fruits has been generally limited to very small scale, backyard operations for home consumption. The Census of Agriculture shows more than 10,000 peach trees in 1950 and only 150 in 1974. Four farms account for these 150 trees and, according to the Census, all had gross sales of at least $2,500 although that level of sales is not necessarily attributable to fruit. Current peach production in Maine is estimated at less than 8,000 pounds with little potential for expansion in the near future due to climatic problems.

The 1974 Census shows 14 farms with a total of approximately 700 pear trees. By comparison the 1950 Census shows 3,000 farms with a little more than 11,000 trees. Current production of pears in Maine is estimated to be 10,000 lbs. some of which is marketed commercially to local stores. Potential for expansion of pear production appears good and the University is currently involved in efforts to evaluate root stocks and varieties suitable for pear production in Maine.

Plum production in Maine is currently limited to a handful of farms with 300-400 trees. As in peaches and pears, the production trend has been downward since the early 1950's when there were several thousand trees on 200-300 farms in Maine. Cherry production has been as high as 20,000 pounds in the past 20 years. As in peaches, pears, and plums, very little if any of this production was on a commercial basis. Current cherry production is nearly non-existent in Maine. The potential for expansion of plums or cherries on anything other than a small backyard basis or as a supplemental crop for retail marketing seems remote at this time.

GOVERNMENT PROGRAMS AND INDUSTRY COORDINATING MECHANISMS

Federal Programs

Federal programs through the Farmers Home Administration, the Economics, Statistical and Cooperative Service, and the Soil Conservation Service provide funding and technical assistance to the apple industry but not on a commodity-specific basis. There are no commodity-specific federal programs for the apple industry. However, a federal market order has been proposed for New England and will be voted upon this year. The market order, though a self-taxing scheme for growers in the 6 New England states, would provide funds for market promotion and agricultural research.

Maine Department of Agriculture

Several programs in the Department of Agriculture influence the apple industry. The Division of Plant Industry has general responsibilities for the inspection of root stock for diseases and insect infestations. Additionally, this Division operates the Apple Tree Pool each year to assist orchardists in securing bulk shipments of quality trees from western nurseries. This program accounts for about one-half of the total number of trees purchased in Maine each year, many of which go to backyard and small, part-time operations. The Division of Markets primary function regarding apples is to inspect controlled atmosphere storage facilities to ensure that proper conditions exist to represent apples as having been kept under a controlled atmosphere. All operators of these storage facilities are registered and are required to maintain records on storage conditions throughout the season. The Division of Promotions operates a market news service in conjunction with the federal government. The Division also participates in various promotional programs at trade shows or other places and assists the industry in general promotional efforts in such forums.

The University of Maine

The Cooperative Extension Service employs 2 tree-fruit extension specialists at Highmoor Farm in Monmouth. These specialists, whose tree-fruit activities equal the equivalent of one man-year, have primary responsibility for state-wide contact with commercial orchardists. Major activities include training, educational, and consultation programs for weed control, pest management, fertilizer application, orchard design, cultural practices, labor and capital management, and matters related to the storage and marketing of fruit. The apple extension program is highly regarded by growers in Maine.

The apple research program of the Agricultural Experiment Station was funded for approximately $160,000 in 1977-78 and includes work in pest control, virus studies, and other aspects of production and post-harvest physiology. Except for analytical services at Orono, nearly all apple research is located at Highmoor Farm which includes 250 acres of land, approximately 70 acres of which is currently in orchards. At present the principal efforts of the apple research program are expended on production/management and post-harvest physiology studies involving: nutrient requirements and methods of application, herbicide-irrigation-nutrition interactions; productivity and longevity of cultivar/rootstock combinations; influence of growth regulators on vegetative growth, flowering and fruiting, and maturation and ripening of fruit. Post-harvest physiology studies include methods of predicting fruit maturity, and the effects of pre- and post-harvest treatments on storage behavior and market quality of apples following refrigerated and controlled-atmosphere storage.

Trade Associations

The Maine State Pomological Society is a growers' association organized in 1873 to promote the general welfare of Maine's apple industry. The Society sponsors research in a

number of technical areas on Highmoor Farm, conducts an apple promotional program, and provides an information and liaison service in such matters as harvest labor problems and various governmental concerns. The Society currently consists of approximately 50 growers and an additional number of associate members. Funds are raised through an acreage assessment on members. The New York and New England Apple Institute is a regional association of growers formed largely for promotional purposes. With funds secured through a per-box contribution by members, the Institute promotes apples, mainly McIntosh, through the media, at trade shows, and in schools. The Institute's total budget is about $400,000, $30,000 of which comes from Maine growers. The New England Apple Council is another regional growers' association. Its specific function is to assist growers in coping with harvest labor problems. The International Apple Institute is a national apple growers' association funded through member dues. It's functions are in the area of public relations and government liaison work.

Integration, Cooperatives, and Contractual Arrangements

A number of forms of integration exist in Maine's apple industry. Most of the larger orchardists are also involved in packing and storage operations for both their own product and for smaller growers. There is also a certain amount of grower integration in marketing, with several large growers involved in substantial direct store-door marketing programs, and many smaller growers involved in roadside sales or other direct marketing programs for a large portion of their crops. There is no real integration in processing with the exception of a number of growers who operate cider mills.

There are several instances of cooperative ventures in storage ownership. Maine Apple Growers in Buckfield is the largest of these. However, there are no true producer marketing or buying cooperatives in Maine's apple industry. Nor is there any evidence of forward contracting. The major coordinating mechanisms in apple marketing in Maine are the two large wholesalers who market up to 80% of Maine's crop.

PRODUCTION TRENDS

Maine is the leading producer of wild lowbush blueberries in North America, accounting for 45-50% of total annual lowbush blueberry production in the United States and Canada. Other commercial production areas for lowbush blueberries in the U.S. include small sections of New Hampshire and Massachusetts. In Canada the principle production areas are Quebec, Nova Scotia, New Brunswick, Prince Edward Island, and Newfoundland. Michigan, New Jersey, and several other states in the Great Lakes and Mid-Atlantic regions produce a large quantity of blueberries but these are primarily cultivated, highbush berries produced largely for the fresh market. Maine's average annual production of 18-20 million pounds accounts for 15-20% of total blueberry production in North America - including both highbush and lowbush varieties.

Maine has approximately 40,000 acres of commercially harvested native lowbush blueberry stands located largely (up to 80%) on extensive barrens in Washington and Hancock Counties. Other counties with significant blueberry production are Knox, Waldo, and Lincoln. Due to cultural practices only about half of Maine's blueberry acreage is harvested each year. Maine's annual production has fluctuated considerably in the period since 1960, due primarily to changing temperatures, precipitation, and other weather conditions. As indicated in Figure 1, 1976 production was about 25 million pounds compared to 21 million pounds in 1960. During the interim period production peaked at 30.3 million pounds in 1962 and reached a low of just 9.2 million pounds in 1970. Figure 1 also shows cash receipts and prices for blueberries since 1960. Due to somewhat stable prices the trend in cash receipts generally followed production trends until 1970. Since then prices have increased substantially from 20.9 cents per pound in 1970 to more than 60 cents in 1977. At the same time cash receipts have experienced a corresponding increase relative to earlier years despite a poor crop in 1975.

FIGURE 1

PRODUCTION, CASH RECEIPTS AND PRICES FOR MAINE BLUEBERRIES, 1960-1977

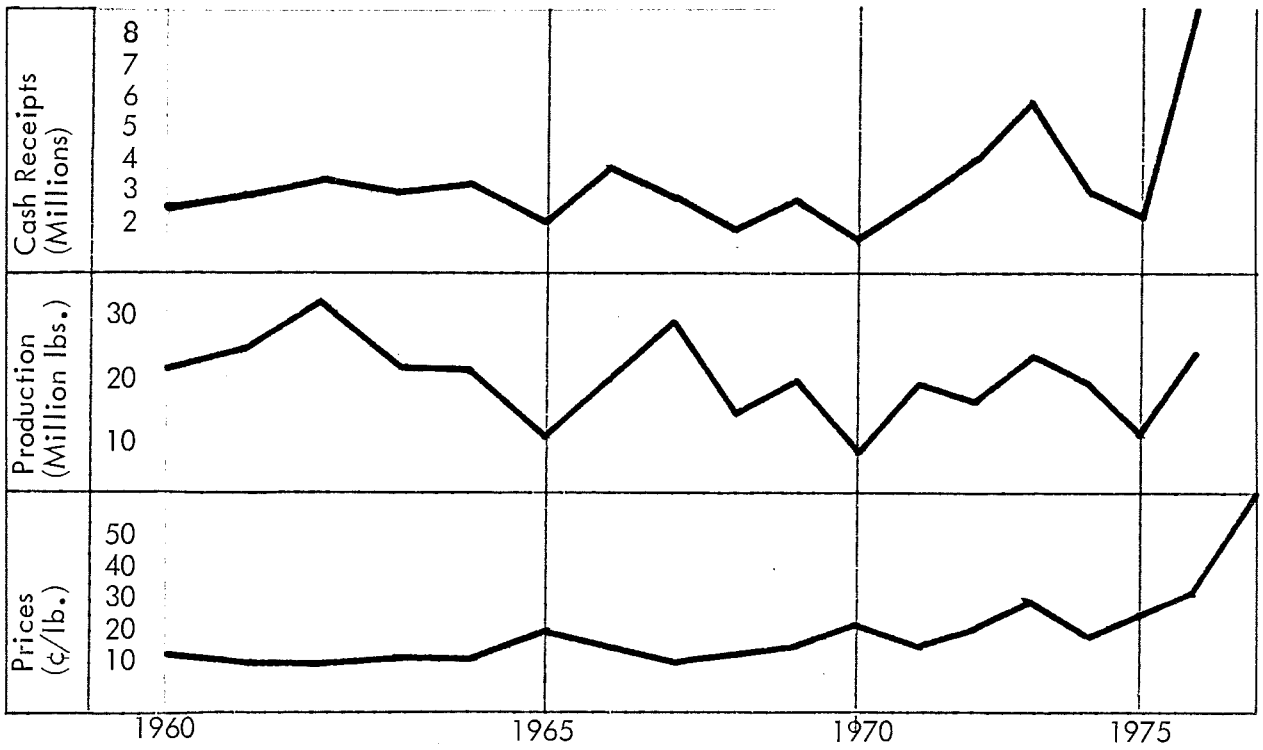


TABLE 1

Farms and Acreage with Commercial Blueberry Harvesting
Census Years: 1949-1974*

	1949		1954		1959		1964		1969**		1974**	
	Farms	Acres	Farms	Acres	Farms	Acres	Farms	Acres	Farms	Acres	Farms	Acres
Androscoggin	21	86	15	111	17	141	4	63	-	-	-	-
Aroostook	1	9	1	-	2	2	1	-	-	-	-	-
Cumberland	56	423	84	1,251	38	1,239	21	449	6	157	6	187
Franklin	14	77	11	320	14	294	8	88	3	95	-	-
Hancock	310	4,438	380	6,630	299	4,707	212	4,170	28	2,122	34	1,757
Kennebec	27	276	19	210	22	178	17	130	5	100	-	-
Knox	279	4,710	224	3,464	185	3,553	182	3,749	28	1,612	24	856
Lincoln	87	754	101	1,358	61	1,648	29	399	-	-	10	644
Oxford	22	113	17	125	18	179	8	115	3	60	-	-
Penobscot	15	62	6	42	7	153	13	143	-	-	6	142
Piscataquis	24	93	15	248	7	185	11	467	-	-	-	-
Sagadahoc	6	12	4	4	2	6	2	2	-	-	-	-
Somerset	13	84	7	44	2	6	1	-	-	-	-	-
Waldo	100	1,315	78	1,358	96	2,203	57	684	20	1,092	14	471
Washington	621	9,705	461	11,278	444	10,392	378	11,348	82	9,674	96	13,453
York	47	283	18	57	21	84	12	57	-	-	-	-
Others not specified by county									17	632	11	665
State Total:	1,643	22,440	1,441	26,500	1,235	24,970	956	21,864	192	15,344**	243	18,640**

* All figures are from the Census of Agriculture and represent, for each census year, estimates of farms and acreage harvested rather than total farms and acreage in blueberries.

** The 1969 and 1974 editions of the Census of Agriculture report only those farms with sales of $2,500 or more. Additionally, as noted above, the Census shows harvested acreage rather than total acreage. These figures are therefore not consistent over time and give only a very general indication of trends in total farms and acreage. Both acreage and number of farms are significantly higher than shown for 1969 and 1974 (see text).

It is difficult to document changes in the number and size of farms producing blueberries in Maine due to the extensive nature of production and the fact that only a part of the state's total blueberry acreage is harvested each year. A general indication of the changing structure of blueberry farming may be obtained from periodic data published in the Census of Agriculture regarding the number of farms and acres producing blueberries in any given year. Table 1 shows Census figures by county for 1949, 1954, 1959, 1964, 1969, and 1974. The Census data, despite its faults, bears out several important trends in the industry. The number of farms harvesting blueberries each year has dropped and the acreage harvested has also declined - although not as rapidly as the number of farms. This reflects a consolidation of smaller farms into larger holdings as well as an abandonment of less productive land. A 1973 survey by the University of Maine indicates that of 344 growers identified, approximately 55% manage less than 25 acres. Almost a third of the growers managed less than 10 acres. Average acreage according to the survey was 67 acres, and total acreage identified by survey respondents was 23,000. This is probably a better indication of annual acreage harvested than total acreage. As a cross-reference, Maine's Board of Pesticides Control records show that about 25,000 acres of blueberry land are sprayed annually with guthion - a chemical used to control maggot infestations. This is a good indication that close to 25,000 acres are harvested annually. A large portion of Maine's total blueberry acreage is owned by just a handful of large producer/processors located mostly in Washington County. It is estimated Maine's eight producer/processors own up to 15,000 acres of blueberry land or approximately one-third or more of total acreage. Yields vary widely from year to year and from field to field but have averaged 800-1000 pounds per acre in the past few years. This is a substantial increase over earlier years when management, particularly pest control, was less intensive.

Census data in Table 1 also indicates that the geographical distribution of blueberry farms and acreage has changed significantly in the past 25 years. Washington County acreage in the past several years has accounted for more than 70% of annual acreage harvested compared with only about 40-45% during the fifties. During the same period, Washington County's share of total production volume has gone from 50-60% to more than 80%, apparently indicating higher yields in that area. Other counties including Hancock, Knox, Waldo, Lincoln, and Cumberland have experienced substantial declines in their share of blueberry production and acreage since the 1950's. The shares of total 1974 harvest acreage (on farms with sales of $2,500 or more) for each of these counties was as follows:

Cumberland	1.0%
Hancock	9.4%
Knox	4.6%
Waldo	2.5%
Lincoln	3.5%
Washington	72.2%
Others	6.8%

Blueberries are harvested in Maine from late July to early September. The primary harvesting method is hand-raking, although a growing number of mechanical harvesters are being used. Approximately 1,500 workers have been employed in harvesting the Washington County blueberry crop in each of the past few years. Most workers are Washington County residents; there is only a limited use of imported labor. Labor disputes over wages and working conditions have become common in the blueberry industry. During the 1978 harvest, a major dispute developed over the size of containers used for harvesting. Workers, who are paid on a piece-work basis, claimed that a Washington County blueberry grower and processor was supplying larger harvesting containers without increasing wages paid per container harvested. An estimated 300 workers organized to form the Maine Blueberry Workers Association (MBWA). The Association was eventually successful getting the grower/processor to increase wages paid per box, discontinue use of the larger boxes, pay fired workers workdays lost as a result of the dispute, and make information available on pesticide spray schedules and their safe use.

Labor disputes may give further impetus to the growing use of mechanical harvesters. Two types of mechanical harvesters have been developed - one is a modified cranberry picker and the other was designed by the University of Maine. Currently about 80 of these machines are in service in Maine but their labor-saving impact is not great due to rocky and uneven field conditions and the fact that each machine can only harvest about one acre per day.

Most of Maine's blueberry fields are burned after every harvest on a two or three year cycle in order to prune off undesirable growth and encourage new stem growth on which the following year's crop will be produced. Burning is done in several ways: free-burning; spreading hay over the fields in the fall and lighting it the following spring (so-called heavy burning); or by utilizing either oil or propane gas burners (light-burning). The drawback to heavy burning is that it often destroys a substantial amount of organic matter in the topsoil. Light burning destroys a lesser amount of organic matter but has the additional drawback of being very costly due to rising petroleum prices. Future pruning may depend more heavily on mowing machines similar to field grass or grain mowers but designed for the rugged conditions encountered in most of Maine's blueberry lands. Although initial capital investment in such machines would be relatively high, long term benefits to the quality and composition of topsoil and the avoidance of energy-related burning costs make these mowing machines look increasingly attractive.

Other important factors in blueberry production include weed and pest control, and irrigation. The fertilization of blueberry fields has been kept at a very low level in the past to prevent rapid weed growth - the most serious problem in blueberry land management. New developments in weed control are expected to make greater yields possible in the future. These developments include several new fungicides and a herbicide effective in controlling grasses and sedges which could increase yields up to 50%. The most common pest problem in blueberry production is infestation by small maggots. Blueberry fields are sprayed with a number of toxic pesticides to control maggot infestations. There is concern among workers in blueberry fields that their exposure to such chemicals be minimized. In regard to irrigation, the vastness of the blueberry barrens is a deterent to improved irrigation. However, 1,000 or more acres in Washington County are currently irrigated and as the better blueberry fields are cultured more intensively in the future, irrigation is expected to become more common.

PROCESSING AND MARKETING

Nearly all of Maine's blueberry production goes to processors for canning or freezing. Only a very small volume is fresh marketed. In 1976, 20.8 million pounds were fresh frozen in Maine plants and 7.1 million pounds were canned. Of this total, approximately 3 million pounds were imported from Canada for processing in Maine plants. The trend in processing in the past decade has been clearly toward increased freezing of blueberries rather than canning which was the prevalent form of processing twenty years ago. Last year only two canners operated compared to more than 25 prior to the adoption of frozen processing methods.

Maine has a total of 8 blueberry processing plants most of which are freezer operations in Washington and Hancock Counties. In most cases these processors are also large growers, with just two processors accounting for a large proportion of Maine's total blueberry acreage. Employment in processing as in harvesting is relatively seasonal, traditionally lasting for two months at the longest. At least one firm has recently extended the length of its processing cycle by freezing berries in bulk as they are harvested and then processing them in small lots on nearly a year-round basis as an ingredient for blueberry muffin mix. In 1977, blueberry processors employed 2,115 workers or more than 10% of the civilian labor force in Washington County for their relatively short processing season.

Most of Maine's processed blueberries are exported from the state to be used as ingredients for further processed food such as blueberry muffins, pies, or other products. According to a survey several years ago, most processors export at least 70% of the product they produce - with some processors exporting nearly all of their product. Most of Maine's blueberries go to the U.S. market, while Canada has begun to concentrate its marketing efforts on the European market. This should serve to improve the standing of the Maine blueberry in the U.S. market.

GOVERNMENT PROGRAMS AND INDUSTRY COORDINATING MECHANISMS

Federal Programs

There are no federal commodity-specific programs affecting Maine's blueberry industry. The U.S. Department of Agriculture does provide general agricultural funding and technical assistance which impacts the blueberry industry through a number of divisions including the Farmers Home Administration, the Economics, Statistical and Cooperative Service, the Science and Education Administration and the Soil Conservation Service.

State Programs

The Maine Department of Agriculture provides limited assistance to the blueberry industry of Maine. The Divisions of Plant Industry and Markets and Promotions provide services to to growers and processors, plus inspection and licensing of processors. The Maine Blueberry Commission is a 5-member board appointed by the Commissioner of the Maine Department of Agriculture. The purpose of the Commission is to promote Maine blueberries and enhance the welfare of Maine's blueberry industry. The Commission is funded through a tax levied on blueberries produced by processors.

The University of Maine provides research and technical assistance to the blueberry industry as well as the other agricultural industries through the Cooperative Extension Service and the Agricultural Experimental Station in Machias. The Cooperative Extension Service has 1 full time blueberry specialist in Orono who works with a small research staff at the Experiment Station's Blueberry Hill Farm in Washington County. In addition to information on marketing, production and handling, they initiate research projects and advise growers on new technological devices, pesticides and fertilizer usage, and new varieties of blueberries. The Experiment Station has a research budget of approximately $110,000. The research program is carried out primarily through the Department of Plant and Soil Sciences. The University also appoints a seven-member Maine Blueberry Advisory Committee. This Committee is only advisory to University research and extension staff in their efforts to improve the culture of blueberries with the aid of funds secured through a tax on blueberry growers.

Trade Associations

The North American Blueberry Council is an industry organization representing all blueberry growers in North America. Members are, however, primarily large growers. The function of the group is exclusively promotion.

Integration, Cooperatives, and Contracting Arrangements

The predominant form of integration in the blueberry industry is between production and processing. All eight processors are large producers of berries accounting for as much as one-half of annual production. The two largest processors are also the two largest growers with 7000-8000 acres of the state's blueberry fields. Although there are no formal contractual arrangements between independent growers and processors, there are in many cases long standing marketing arrangements and loyalties which usually involve other matters such as field management arrangements and harvesting assistance. According to several processors, however, there is an increasing amount of shopping around by growers at harvest time to secure the most attractive marketing offers.

There are three grower cooperative associations in the Maine blueberry industry. Pleasant River Growers, an association of 25 growers, was formed in 1916 to assist small independent

growers in marketing their blueberries. Prior to 1965 the co-op operated a canning plant. Since then its functions have been limited to negotiating with processors for prices. Annual volume marketed by the co-op in recent years has averaged about one-half million pounds. Two additional cooperative associations are part of the National Farmers' Organization (NFO). One is centered in Knox County with about 20 grower-members. The other is centered in Washington County with more than 40 members. Both serve as a bargaining and marketing association for their members and assist in production matters through the arrangement of bulk purchases of farm supplies, joint field spraying efforts, and a certain amount of joint equipment purchases. Both organizations were formed 8 to 10 years ago and market their blueberries to processors both within and beyond Maine. The Knox County group's annual sales average approximately one-half million pounds. The Washington County group's sales are slightly lower.

Because there is no significant amount of fresh marketing, processor marketing and price clout is strong. Recent price increases, however, indicate that competition between processors is still strong and grower influence is increasing. Processors also have the ability to import supplies from Canada when needed. In summary, coordination in processing and processed-product marketing appears to be very good with the result being successful marketing efforts and relatively advance processing methods and technology. Coordination in production, while traditionally less developed, is becoming stronger.

FRESH VEGETABLES, DRY BEANS, AND SMALL FRUITS

The three commodities - fresh vegetables, small fruits, and dry beans - are discussed as one commodity area because they have a number of characteristics in common. First, in some cases they are raised on the same farms. This is particularly true of the first two commodities. Secondly, acres cultivated have declined precipitously since 1950 while this has not necessarily been the case for the other commodities profiled here, and for unique reasons. Third, in most cases they are or could be processed by the same food processors. Finally, their regarded importance by agencies mandated to educate and support farmers has been relatively low in recent years, leading to very little institutional support for such production efforts. 1977 cash farm receipts, however, were nearly $8 million.

As production has declined, data and analyses on these commodities declined also. Primary sources of data and information used in this profile include Extension Agents (including a questionnaire sent to County offices), several studies done on small farms and organic farms over the last several years, Census data, and discussions with farmers and all identified food processors. Starting with the 1969 Census of Agriculture, information by farm type was compiled only for farms with greater than $2,500 in gross sales. This included, in 1974, 359 of the 572 farms growing vegetables. As a result, much information is not available on the small, part-time vegetable farmer. Where possible, information is presented separately for dry beans, small fruits, and vegetables. Since many studies and the Census use only the major classification for vegetable farms (which as noted above, can grow all three commodities) much of the discussion just refers to this general category.

PRODUCTION TRENDS

Production Quantities and Locations

Mixed vegetable farming in Maine is concentrated in the southern and midcoastal portions of the State, including York, Cumberland, Androscoggin, Kennebec, Sagadahoc, Knox, Lincoln, and Waldo Counties. Oxford County and parts of Penobscot are noted for bean production while most vegetable farming in Aroostook County is pea production. These specialized production areas (for beans and peas) have the largest total acreage of production (about 1,000 and 5,000 acres respectively) while each of the areas where mixed vegetables are grown have 150 to 250 or so acres in vegetable production.

The major factors characterizing vegetable farming in Maine have been the pronounced drop in the number of farms in all areas of the State and the decline in cultivated acreage in most areas. Table 1 (showing number of farms and acres in production by county) summarizes these events. Declines of 80% and 90% between 1950 and 1974 are commonplace for the number of farms, with only Hancock and York Counties showing a less than 70% decline.

The decrease in acreage has generally been less than the decrease in number of farms, although this varies a great deal among commodities. The smallest acreage declines were in Hancock, Knox, and Lincoln Counties, while Aroostook and York Counties actually posted approximately 20% increases in acreage in vegetable production. Since the decline in the number of farms is, in all cases, equal to or greater than the decline in acreage, those farms that have survived are, on the average, larger than the farms of 1950.

Note should be made of why so many didn't survive. As agriculture moved to the far west, subsidized irrigation waters and inexpensive hydroelectric power allowed for production of fresh vegetables and food processing where it was otherwise environmentally and economically unfeasible. Vast tracts of still unsettled land (unlike in the east with numerous small landowners) allowed the western farms to be large. With relatively

TABLE I

NUMBER OF MAINE VEGETABLE FARMS AND TOTAL ACRES IN VEGETABLE PRODUCTION BY COUNTY
1950 - 1974

Year	Androscoggin		Aroostook		Cumberland		Franklin		Hancock		Kennebec		Knox		Lincoln	
	Farms	Acres	Farms	Acres	Farms	Acres	Farms	Acres	Farms	Acres	Farms	Acres	Farms	Acres	Farms	Acres
1950	284	1039	330	4162	409	2582	220	1309	68	120	498	1883	92	190	78	146
1954	108	512	411	7769	217	2078	91	621	57	70	198	734	49	126	46	130
1959	88	490	177	4489	157	1697	66	586	36	73	126	760	36	103	55	387
1964	45	384	167	10603	122	1592	22	356	15	74	100	574	62	689	33	141
1969	41	316	158	8671	93	1482	27	69	27	69	50	421	27	162	23	81
1974	36	210	85	4985	69	710	14	189	22	92	53	427	21	141	16	114
% Change 1950 - 1974	-87%	-80%	-74%	+20%	-83%	-72%	-94%	-86%	-68%	-23%	-89%	-77%	-77%	-35%	-79%	-21%

Year	Oxford		Penobscot		Piscataquis		Sagadahoc		Somerset		Waldo		Washington		York	
	Farms	Acres	Farms	Acres	Farms	Acres	Farms	Acres	Farms	Acres	Farms	Acres	Farms	Acres	Farms	Acres
1950	493	2280	463	2212	61	354	57	354	502	3073	385	1737	118	331	196	454
1954	237	1278	239	1362	27	702	34	364	227	1772	186	862	87	163	123	383
1959	129	1582	140	1321	9	89	17	458	90	1488	45	675	55	139	136	364
1964	77	1157	91	492	9	82	24	416	27	239	41	354	16	44	81	294
1969	35	786	33	160	6	2	12	219	26	145	18	226	15	38	68	276
1974	39	1110	58	284	5	37	11	156	25	163	27	171	31	51	60	542
% Change 1950 - 1974	-92%	-51%	-87%	-87%	-92%	-90%	-81%	-56%	-95%	-95%	-93%	-90%	-74%	-85%	-69%	+19%

	Totals	
	Farms	Acres
1950	4254	22,226
1974	572	9,382
% Change	-86%	-58%

inexpensive transportation, the larger western farms have flooded eastern markets with cheaper vegetables on a year-round basis. So fresh vegetable production in the east withered in the face of such competition. The apparently greater survival rates of vegetable farming in Hancock, Knox, Lincoln, and York Counties may be a result of large numbers of affluent tourists visiting those areas each summer, willing to pay premium prices for fresh vegetables. In Aroostook County, vegetable (other than potato) production is primarily peas for processing, some of which are raised by farmers also raising potatoes. A ready market, and cultivation by potato farmers, has continued the survival of pea production.

Table 2 shows most vegetable farms (71%) cultivate less than 10 acres, while 18% cultivate less than one. Almost all farms with less than $2,500 gross sales cultivate less than 5 acres while 52% of the greater than $2,500 sales do. With only 29% cultivating over 10 acres, vegetable farming is clearly in the small farm sector.

TABLE 2

VEGETABLE FARMS BY ACRES IN PRODUCTION BY GROSS SALES
1974

Acres in Production	Farms with Gross Sales less than $2500	Greater than $2500	Total
Less than 1 acre	73	27	100
1-2.9	109	56	165
3-4.9	18	53	71
5-9.9	8	60	68
10 and over	2	163	165

Source: 1974 Census of Agriculture. Maine

In addition to these commercial vegetable farms, home gardening is becoming increasingly recognized for its important role in vegetable production. Wilfred Earhardt of Maine's Cooperative Extension Service estimates about half the households in Maine have gardens with the average size being about 1,000 square feet. This works out to a total of 3,500 to 4,000 acres in vegetable production, not quite half the acreage cultivated on commercial vegetable farms. These gardens are significant sources of vegetables for both fresh consumption and home processing.

Table 3 provides information on major vegetable crops grown in the State; the number of farms growing them; and total acreage cultivated. Again, the decline in the number of farms growing many of the different crops has been 80%-90% since 1950. The somewhat lesser declines for tomatoes suggest the summer demand for fresh tomatoes encourages more farms to continue growing small amounts of this crop. It should also be noted that many farms in 1974 had reduced the diversity of what they grow, following the trends in the nation toward crop specialization. This specialization would contribute to a decrease in the number of farms growing any given crop. While the local production of some vegetables such as head lettuce, tomatoes and cabbage has almost disappeared completely, over 1,000 acres are still cultivated in several commodities, namely snap beans, dry beans, sweet corn, and peas. These are primarily crops that still have a market with Maine's few remaining local canneries. The 80% decline in vegetable acreage is expressive of the almost complete eradication of canneries in Maine in the past 30 years.

Recent work by Wilfred Earhardt, the State's Extension Vegetable Specialist indicates that vegetable production is a farm sector that increased in cash receipts from 1962 to 1969 from about $3.8 million to about $4.5 million. In 1974 he estimated the sector to have

generated about $5 million in annual farm receipts, a 32% increase since 1962 which is greater than the cash receipts increase of other major agricultural crops in the State. Extension Service specialists estimate the 1977 value to be about $8 million. Thus, while receipts rose 78% between 1969 and 1977, the farm value of food prices rose 62% suggesting most of this increase is a result of inflation, while about 16% an increase in productivity. (U.S.D.A. 1977)

TABLE 3

TOTAL FARMS AND TOTAL ACREAGE FOR SELECTED VEGETABLE AND SMALL FRUIT CROPS FOR THE STATE BY US CENSUS YEAR 1949-1974

No. Farms Crops	Years 1950	1954	1959	1964	1969[1]	1974	% 1950-74
Beans, Snap	1550	861	521	289	106	118	92%
Beans, Dry	3283	871	453	180	-	61	98%
Corn, sweet	2570	1049	806	506	219	244	90%
Lettuce, head	189	168	190	105	-	22	88%
Peas	1147	883	592	435	-	165	86%
Carrots	382	302	277	133	-	49	87%
Squash, Winter	664	453	575	412	-	127	81%
Tomatoes	453	320	415	279	121	143	68%
Cabbage	395	305	282	188	-	70	82%
Strawberries	798	655	546	398	105	68	91%
Total Farms In Vegetable Production[2]	4,254	2,337	1,362	932	644 (421)[1]	572 (359[1])	-86%
Acreage	1950	1954	1959	1964	1969	1974	%
Crops							
Beans, snap	2469	2347	2109	1608	901	1021	59%
Beans, dry	6850	2731	1415	1862	-	1437	79%
Corn, sweet	9807	4485	4914	2443	1503	1746	82%
Lettuce, head	675	760	449	352	-	66	90%
Peas	6016	8496	4616	10805	-	4643	23%
Carrots	249	426	241	139	-	211	15%
Squash, winter	1107	902	1018	1070	-	696	37%
Tomatoes	175	155	149	112	74	82	53%
Cabbage	388	329	321	255	-	97	79%
Strawberries	393	422	346	289	147	246	37%
Total Acreage in Vegetable Production[2]	22,225	18,926	14,701	17,491	12,711 (13,189)[1]	9,382	-58%

1 Only reported for farms with sales of $2500 and over. This represents 64% of the vegetables farms and 97% of acreage in vegetable production.
2 Doesn't total in columns as farms raise more than one crop.
3 Does not include dry beans and small fruits
Note: Total acreage may be inaccurate as this is often difficult for farmers to estimate.

Production Practices

Most vegetable growers in Maine raise a variety of crops, including the vegetables and small berries, but also sometimes including livestock of all kinds, and pulp and fire wood. In many cases a wide variety of vegetables are grown, with specialization on one or several types. Such a mix is often required by the available marketing patterns (shoppers at farmstands and farmer's markets are attracted by variety) or the income mix where more lucrative products can support less lucrative ones. Table 4 shows the percentage of Maine vegetable farms surveyed in 1971 that grow each of the crops listed. The four most popular crops are grown on over 80% of the farms. The top 10 or so are probably those that most vegetable farmers with a direct marketing outlet feel they need to grow to attract customers. It is important to note both the high popularity and good climatic suitability of most of the crops raised by less than 20% of the farms. As a further indicator of the diversity of crops on vegetable farms, the 1974 Census data notes the number of farms classified as primarily raising "other commodities" that also raise more than $2500 of vegetables and so are classified also as vegetable farms. This list includes 32 poultry and egg farms, 35 dairy, 89 potato and other field crops, 12 livestock, 19 fruit, 17 horticultural specialties, and 26 general farms. These farms account for 5,976 acres, or 63% of acreage in vegetable production in the State.

There are two sides to the diversity issues: the advantage in direct marketing with a diverse selection of vegetables must be weighed against the advantage in simplification of farm management with less diversity. There are also advantages in livestock/produce diversity such as having available on site soil amendments such as animal manure and green manure crops. A study published in 1977 by the University of Maine (Metzger and Flanders, 1977) discusses the importance of crop diversity in making the farm an economically successful enterprise. They examined, by land and labor resource availability, optimal product mixes for farms. In all cases they included both vegetables and livestock. The general suggestions included growing mixed vegetables on several acres (for those with more available labor), larger acreage of squash or blueberries for the wholesale market, growing replacement pullets and having a cow or chickens for home consumption. Such mixes might satisfy both sides of the diversity issues. The importance of product mix can be seen not only for available soil amendments, but also for an economically viable enterprise.

In terms of capital equipment, an appropriate mix of equipment with diverse capabilities, use of contract work, and an ability to properly use and care for that equipment have been shown to be important to vegetable farms with small operations and mixed production. It has been noted that a typical farm has two tractors, a pick-up truck, manure spreader, and several pieces of field equipment. (Vail, 1978, #11) In most cases, the majority of this equipment is fairly old - 10 years old on the average. In many cases this equipment isn't diverse enough for the work on diversified vegetable farms or is too large for economical use on small vegetable farms. Other studies have shown that value of equipment/acre is no higher on the very small farm than on larger farms, with farms in the $2,500 to $4,999 gross sales range having the lowest value of equipment per acre. (Metzger, 1973) David Vail, a Bowdoin College professor, noted in a study on 31 organic farms the pivotal importance of equipment sharing and purchase of custom service in making efficient use of machinery. His respondents also felt their ability to fix their equipment rather than having to wait and pay for services was of substantial importance in their farming effort.

Management Issues

Only a very limited amount of information is available regarding labor and employment on vegetable farms in Maine. The 1974 Census shows that for vegetable farms with greater than $2,500 sales, 52 workers are employed on 22 farms for 150 days or more per

TABLE 4

PERCENTAGE OF SURVEYED VEGETABLE FARMS GROWING EACH VEGETABLE

	%
W. Squash	84.6
Cucumber	84.6
S. Corn	83.6
Tomato	82.7
S. Beans	78.8
Peas	68.3
R. Beets (Greens)	66.3
Cabbage	62.5
S. Squash	59.6
Pepper	50.0
Carrots	50.0
Pumpkin	49.0
Cauliflower	48.1
Potato	44.2
Lettuce	36.5
Strawberry	34.6
Field Beans	32.7
Swiss Chard	25.9
Radish	25.0
Rutabaga	21.2
Spinach	19.2
Onion	18.3
Melons	16.3
Asparagus	6.7
Rhubard	3.8
Parsnips	3.8
Eggplant	1.9
Celery, Dill	1.0
Beans, Broccoli & Raspberry	

Source: Earhardt, W., Maine Vegetable Industry. Fact Sheet

year, 211 are employed on 35 farms for 25 to 149 days, and 369 work on 41 farms for less than 25 days. This is clearly not a large amount of employment, particularly on anything near a full time basis. Winter work may include wood-cutting and delivery, or non-farm work such as snowplowing. Such diversity is required for the farmer/manager who wants to keep responsible help available. Labor demand for mixed vegetable market gardeners occurs from July through early September, with a fresh supply of produce needing to be picked several times a week. The simultaneous demands for labor, for weeding, harvesting, and marketing almost requires the hiring of some assistance. Since children can be hired in agriculture, labor-intensive vegetable harvesting, such as peas, often utilizes child labor. These arrangements have generally been of importance to farmers and considered of value to the children and their parents.

On vegetable farms, particularly the small ones, the owner-operators and farm family members play the crucial role in labor availability. Most vegetable farms in Maine (90% in 1974) are family-owned, resulting in the intimate involvement of all family members in their success. Even the 7% that are owned as partnerships and 3% as corporations may represent families that have chosen those forms to do business for administrative reasons. Forty-six of the 59 farms in the Sagadahoc and Lincoln County studies had a family member other than the principal operators working on the farm, although most (29% of the farms) had only one other member than the principal operator working. Since vegetable farms are primarily small operations, off-farm labor in the off-season becomes crucial to the survival of the vegetable sector and the farming family. Census data shows that in 1974, 70% of farmers with gross sales less than $2,500 considered some other work their major occupation, while 22% of those with sales over $2,500 did. Metzger and Flanders emphasized the importance of this off-farm work in bringing farm families above poverty income levels.

The average vegetable farm in Maine in 1974 had a capital investment of $65,000. Although the level of investment in buildings and machinery for vegetable farming is not as great as other farm sectors such as dairy and poultry, it is substantial for operations with income limited by the seasonal nature of the business. The cost of land relative to returns in income has been a particularly important factor in limiting expansion of the vegetable sector. Loans to vegetable farms as a proportion of total agricultural loans have declined as the industry has declined. Major current sources of credit are Farmers Home Administration, The Farm Credit Administration, several of Maine's larger commercial banks, and private sources of trade credit. Detailed information on sources of financing to vegetable farmers is not available. The larger more established growers, as expected, appear to have little trouble in securing adequate financing. Newer and marginal farmers have considerable difficulty with credit. These difficulties are aggravated by the small and part-time nature of many vegetable farming operations, and by the deterioration of native vegetable wholesale markets over the past two decades.

PROCESSING

Processing has historically been a very important market outlet in Maine. Maine was one of the first states where food canning occurred in the U.S. in the mid 1800's. By the early 1930's Maine was packing 50,000 tons of sweet corn, 3,500 tons of beans, and 3,000,000 tons of peas. Maine was particularly well known for corn packing, ranking third in the nation for the amount of corn packed with approximately 75 plants. In 1937 Maine had the first vegetable freezing plant in New England freezing the products of 800 acres of peas, 600 acres of corn, and 100 acres of string beans. In 1941 they canned 90% of all corn canned in New England.

In the late 1800's agriculture spread west. The development of hybrids that were more productive in midwestern and western conditions priced some Maine produce out of the market. In addition, many of the small operations, unable to make a go of it using processing equipment for only one season of the year, had to close entirely down. Many plants that remained productive were bought out by national corporations and later shut down when raw products or cheaper power could be found elsewhere. Those plants which have survived are primarily locally owned and adequately diversified to utilize their large capital investments on a two-season or even year-round basis.

Presently there are 9 food processors handling beans and fresh vegetables in Maine. No small fruits (excluding blueberries) are being processed on a commercial scale. Six of the processors are relatively large and diversified operations while 2 primarily prepare salads and coleslaw for the restaurant market and 1 processes only sauerkraut for the wholesale and mail order trade. Most of the larger commercial operations are diversified so they can keep equipment and employees busy through several seasons. An essential element in this is the processing and subsequent canning or freezing of storable products, including potatoes, dried beans, and frozen blueberries, which can be stored at harvest time for processing in the winter and spring months. Except for the Burnham and Morrill plant in Portland (which primarily processes beans from out-of-state) most processing plants are located in the areas where primary agricultural production occurs. Bean processors are located in Vassalboro and South Paris, while vegetable (non-potato) processors are located in Portland and the mid-coastal area with one in Aroostook County.

Table 5 provides a very rough and probably conservative estimate of the products processed in the state from Maine-grown products. Product volume is quite small compared to years ago, and the variety of vegetables is quite limited. Most operations today are based on freezing. The plants processing beans buy the large majority of their raw products from out-of-state (primarily from Michigan and several other midwestern states) except for the small quantity of Jacob's Cattle and Yellow Eyes which are purchased solely from Maine farmers. The two companies preparing salads for the restaurant trade buy only cabbage locally despite the fact that almost all their items can be produced within state, bought seasonally and stored. The relatively large production of peas and dry beans indicated in Table 5 are purchased from a large number of farmers, many of whom also grow other field crops. Squash is also somewhat widely raised but cabbage and turnips are not. In spite of the dramatic decline of food processing from the 1940's to 1960's, what little remains appears to be stable. All food processors surveyed reported that they felt their industry had a promising future.

Purchase arrangements for the raw food products processed locally vary from product to product. Beans are purchased primarily on the open market while peas are marketed under contract arrangements with the processor providing seeds. Most of the rest of the vegetables are bought on contract or, more commonly, by verbal agreement where the processor agrees to buy all the product from a given acreage raised by a farmer. Contract agreements in a low production year such as 1978 often leaves the processor with a raw product shortage. The personal nature of many of the buying arrangements have allowed processors to make special allowances in hard times to farmers they depend on for their product. With the

TABLE 5

MAINE VEGETABLES AND BEANS PROCESSED BY MAINE COMPANIES - 1978[1]

Products Purchased for Processing	Approximate Quantity Processed (tons/year)	Approximate Farmers Supplying	Number of Firms Processing	Primary Product	Quantity Change In Last 10 Years
Peas	2,200	37	1	Frozen Peas	Stable to slight decline
Cabbage	480	4	3	Cole Slaw Sauerkraut	Increased
Squash	3,975	17	2	Canned Frozen	Stable
Turnip	600	1	1	Frozen	Stable
Snap Beans Shell Beans	1,500 2,625	10-12	1	Canned	Stable Increased
Dry Beans (Yellow Eye, Soldier, Pea, Red Kidney)	625 plus @ $62,000	45-65	3	Baked Beans Pork/Beans Canned	Slight decline to slight increase

[1] These figures in some cases are for average year since 1978 yields, due to dry weather, were unusually low.

Source: Survey of all 9 processors undertaken specifically for this study.

exception of a tomato sauce canning operation in Portland, all the food processors in the state buy some local produce and appear willing to buy more. Bean processors noted, as their main reason for not buying more local product, that larger farms and more suitable terrain in Michigan results in lower prices and more dependable supplies. It was also noted that Maine farmers tend to grow low yielding beans, principally Yellow Eye and Jacobs Cattle. Plants processing salads for the restaurant trade report that they would be glad to purchase more Maine grown products if they were available.

It is difficult to characterize in a general way the state of technology and equipment employed by Maine vegetable processors. Most of the equipment used by the larger vegetable processors in Maine is of mixed age and slowly being replaced as it goes out of service or becomes obsolete. Most of the operations depend on electricity for their power source, while actual canning processes generally utilize oil to produce steam. While all processors noted the importance of price rises for electricity costs the largest canner noted that oil price increases were the largest price increase they experienced.

Waste disposal has been a serious issue also for food processors. Wastewater disposal regulations have required processors to control their discharge quality, either through the use of settling basins, or other water treatment with either their own system or use of a community's sewage system. The cost of meeting water discharge regulations has been cited as a cause for plants closings in several cases. Most of the large canneries are connected with community waste disposal systems while one pumps wet wastes into a tank truck, which are then spread on the field of a neighboring farmer. Solid vegetable wastes of all these operations are either given or sold to local farmers as livestock feed.

A third important element in the processing operation is labor. In all cases of food processing there is a peak season, with more labor required for that specific period. In some cases plants shut down entirely for a period, while in others labor may be reduced to one fifth. With dried bean and salad processing work force remains almost the same year round. Most fresh vegetable. The peak processing season for snap beans start in late July, for squash in September, and for turnips from October to December. Because of the diversity of products processed it is difficult to come up with any meaningful figure for employment in vegetable processing. At peak season, the larger plants employ 300 to 400 people and may run double shifts. Several small operations may have just 5 or 6 workers. Most production workers are paid minimum wage or slightly more.

Management Issues

Food processing operations in Maine are not highly vertically or horizontally integrated into other operations. One notable but small exception is a family sauerkraut operation in Waldoboro which processes and markets only the cabbage it produces. Other exceptions include B & M which is owned by Underwood, the A & P plant processing peas, and Medomak which is owned by a family also involved in chicken processing. Except for B & M and A & P, all vegetable (non-potato) processing plants are owned as family operations by Maine residents. B & M started that way in the 1840's. As a result, all are located where they are because that is where the owners lived and wanted to remain. In this sense, these producers are uncommon in the food processing industry of highly integrated corporate giants with plants optimally located for economic efficiency.

Markets for processed mixed vegetable products are primarily local and regional. The salad processing operations in the state produce for the Maine restaurant market. B & M produces for a national market. The other operations produce primarily for a New England market. This local or regional marketing pattern is due largely to volume limitations. Future growth in processing would be an important factor in expanding vegetable production in Maine. While there may be potential for expansion in the fresh vegetable market, the development of food storage and processing facilities is important in meeting year-round food consumption patterns and needs. There are presently models of successful food processing operations in the state and a number of areas for expansion - including greater production of dry beans. Investigation of specific opportunities in this regard are called for.

DIRECT MARKETING

With the dramatic decline in the number and diversity of vegetable processors in Maine and the advent of supermarkets with their regionally centralized purchasing practices, direct marketing outlets have become the primary marketing form for local fresh vegetables and small fruits. The roadside stand has been the most common form of direct marketing during at least the past 25 years. According to a 1974 University of Maine study, the largest number of roadside stands in Maine are found in counties with the greatest population centers - Cumberland, Kennebec, and York - and are located primarily on primary and secondary highways for maximum exposure. Maine roadside stands operated on an average of 120 days per year with the sale of diversified products (early rhubarb and asparagus, late apples) extending the season. Some stands sell wholesale produce from out-of-state to round out their offerings and extend their season. Diversified offerings of vegetables, fruits,

and specialty items (seedlings, jellies, honey, etc.) are important in attracting customers. The best selling vegetables, according to the study, are primarily warm weather crops, including corn, tomatoes, and cucumbers, while strawberries and rasberries were the most popular small fruits. Gross sales for farms in the study averaged $13,856 for 1974, and ranged from $100 to $65,000. Thirty percent had sales of less than $3,000 while 15% had sales of over $30,000. 75% of the value of these sales were vegetables, 20% from fruit, and 5% from other items.

Pick-your-own operations, according to the same University study, are a relatively new phenomenon with over 50% of these operations in Maine having started business between 1969 and 1974, and over 80% between 1964 and 1974. Most of these operations are located in Kennebec, Cumberland, and Androscoggin counties, while at least four are located in each of eight other counties. While 27 farmers in the study had both farm stands and pick-your-own operations, 7 had only pick-your-own. The average acreage for these 7 was 3.5 acres of fruit and .2 acres vegetables. Strawberries were the most popular fruit while peas, string beans, and corn were the most popular vegetables. Pick-your-own operations offer prices considerably below retail and result in labor saving to farmers. While gross sales ranged from $250 to $30,000, the average was $6,142 with almost half reporting sales of less than $1,000.

The University study estimated that there were in 1974 a total of 204 roadside marketing outlets in Maine producing 3,000 acres of berries and vegetables, with 82% of total acreage devoted to vegetables. Nearly half are located in Oxford and Androscoggin Counties and south. Gross sales were probably in the area of $3,000,000. Assuming an overall similar proportion of roadside sales in 1977 as 1974 ($3 million/$5 million or 60%), we could assume a 1977 total of $4,685,000 for direct marketing out of the estimated $7,808,000 total Maine grown vegetable sales.

There are several factors which may limit the expansion of roadside stand operations. Many parts of the state have reached a saturation point for the number of stands, while it has been estimated that the Bangor area and some southern coastal areas could use more. Vegetable varieties available at individual stands are often a limiting factor in marketing. Prices, including the cost of getting to a farm stand, are also a factor and can only be offset by consumer perceptions of the greater value of fresh produce. Of importance also is the labor required to operate a farmstand. The 1974 University study indicated that half of respondents had no plan to expand their stand operations due in many cases to labor difficulties. Direct sales require most attention at the same time of maximum weeding and harvesting, producing a labor problem on the farm. Availability of reliable help has also been a problem and farmers and their families usually staff roadside stands. In spite of these factors, farmstands appear to be a growingly popular and profitable form of marketing for vegetable farmers.

Farmer's markets, although one of the oldest forms of direct marketing, almost completely died out in this area until recently. While there were few in 1974 when the University direct marketing study was done there were 10 in 1976 and 21 by 1978. With this increase came several surveys of the markets. The number of total farmers' market participants in 1976 was estimated by some sources to be about 200. By 1978 the number of participants was estimated by the Department of Agriculture to be as high as 250 or so - a number equal to nearly half the vegetable farmers in the state. In some cases, however, members are not really commercial vegetable farmers but are selling surplus from a large gardening operation or are selling livestock products. The estimated $100,000 in sales in 1976 may have risen to $150,000 or so by 1978, still a small amount compared to total direct marketing sales. As indicated in Table 6, the markets are located in population centers mostly in the southern coastal area. They market a variety of products, including vegetables, seedlings, dairy products, meats, baked goods, seafood, flowers, and crafts. Vegetables were the largest element of the sales, with corn and salad ingredients (cucumbers, lettuce, and tomatoes)

being most popular. Since the markets are held in downtown areas, rental space with rental fees to vendors have often been charged. In other cases free space has been allocated by the town. In all cases, adequate near-by parking is a crucial factor. The participation of town councils and boards of selectmen in solving these problems has made these local governmental units largely supportive of such efforts by local farmers. In several cases markets received grants from downtown businessmen.

One unique factor of farmers' markets is that they require farmers to organize and communciate more than they commonly have in the past. According to the Department of Agriculture, 6 farmers' markets in Maine appeared in 1978 to be well organized associations while the rest were loosely structured. Substantial interest appears to exist among farmers in strengthening the organizations with by-laws, record keeping, and permanent structures. Such organizations could well lead to other group efforts such as sharing of equipment and the placing of cooperative orders for seeds and fertilizer. Some markets have received government support, primarily in the form of personnel from Extension Service offices and CAP agencies helping to organize and find a location for the market. The Maine Organic Farmers and Gardeners performed this service for several mid-coastal markets. The location of farmers markets operating in 1978 are given in Table 6 below:

TABLE 6

Location of Farmers Markets in Maine
1978

Auburn	Ellsworth
Augusta	Houlton
Bangor	Lewiston
Bath	Machias
Belfast	Portland
Bethel	Presque Isle
Blue Hill	Rumford
Brunswick	Saco
Camden	Skowhegan
Damariscotta	South Paris
Dover-Foxcroft	

Wholesale Markets

Wholesale markets for produce are characterized by the fact that they pay a wholesale price, buy in quantity, charge for their distribution or preparation services, and then, in most cases, resell to consumers. They include restaurants and institutions that prepare large quantities of food, wholesale produce outlets in Maine and Chelsea, Massachusetts retail stores throughout the state, food processors, and food cooperatives.

As produce distribution has become regionally centralized in the Chelsea, Massachusetts market, and as that market has become dominated by relatively cheap western produce, New England farmers have lost ground in regional wholesale produce marketing. The virtual flood of Maine trucks carrying produce to the Chelsea Market years ago has been reduced to the dribble shown in Table 7. Maine wholesalers, at the same time, started buying almost exclusively from Chelsea or southern and western wholesalers as they could be guaranteed a year-round supply of fresh vegetables from these large sources, greatly simplifying the purchase effort. Faced with this situation, many Maine vegetable growers have discontinued or scaled down their operations and sold farmland for commercial development. This, in turn, has given further impetus to wholesale produce purchasing patterns which rely strongly on production in distant areas such as California, Texas, Florida and other large-scale vegetable farming areas.

TABLE 7

TOTAL NUMBER OF TRUCKLOADS OF MAINE PRODUCE UNLOADED IN CHELSEA, MASSACHUSETTS*

Vegetable	1977	1976
Beans	0	1
Carrots	1	0
Cabbage	0	1
Cauliflower	2	5
Iceberg Lettuce	2	0
Green Peas	1	0
Spinach	3	4
Squash	0	5
Turnips/Rutabagas	1	5
Misc. Herbs	0	1
Parsnips	5	17

* There were no rail unloads. Other than potatoes, no Maine vegetable commodities were shipped to any other major regional markets.

Source: USDA Agricultural Marketing Service. Fresh Fruit and Vegetable Unloads in in Eastern Cities. 1977. Washington, D.C. June 1978.

The current quantity of local produce sold to local wholesalers is very small relative to total consumption and past production in Maine. Recent studies, however, suggest that wholesale outlets may again become part of a marketing mix that can provide sustained income for Maine vegetable farmers. A recent study of 31 organic growers showed 80% doing some wholesale marketing with wholesale outlets being the principle outlets for 35% of the farmers. A study of vegetable farmers in the Lincoln-Sagadahoc area also showed that wholesale outlets are important to farmers, with retail markets being used by 50%, wholesalers being used by 30%, and food co-ops by 15%. These three outlets, along with

farmers' co-ops, were listed as outlets farmers would most like to use. Wholesalers and retail markets were also noted as giving better returns than every other marketing outlet except roadside stands.

Wholesalers, scattered around the state in the larger population centers, have proved good options for farmers who have approached the wholesalers to buy relatively large quantities of one or two products. Importantly, these relationships have nearly always been initiated by farmers rather than wholesalers. Vegetables are much more commonly sold this way rather than beans or small fruits. One wholesaler noted the desirable qualities of freshness and "buying local" and would generally buy whenever approached by a local farmer who presented good quality produce. The wholesaler deals with 3 or 4 farms and buys up to 75% of certain vegetables locally. Particularly lucrative in marketing with wholesalers was winter squash and other so-called "hardware" items including other squashes, carrots, turnips, cauliflower, etc. Retail stores are desirable outlets according to farmers, but can often be costly in terms of transportation and distribution costs for the small quantities sold individual stores. In most cases, retail stores have offered local farmers the Chelsea market price for produce or some discount from this price despite the fresher quality and store-door delivery of local produce.

Sales to food preparers, particularly restaurants, are most amenable to farmers growing diverse crops for direct marketing outlets. Demand for fresh, high quality produce is particularly strong in such outlets. Sales here tend to be small and scattered but can be important for individual farmers. Purchases by large institutions hold promise for both diversified and specialized vegetable producers, depending on the size of the institution. These include public school feeding programs, hospitals, and state institutions such as vocational schools and prisons. A study of institutional buying, done by the Maine Organic Farmers and Gardeners Association in 1978 showed that fresh food purchased by state institutions is bought by each institution rather than by central buyers, and must be bought from the lowest bidder. Canned and frozen foods are purchased quarterly through a centralized purchasing office for all state institutions, again buying from the lowest bidder. Data for 6 major state institutions show a total of $29,000 spent on fresh vegetables in 1978 with only $5,000 of that locally grown. In many cases, locally grown fresh produce could replace some of the much larger quantities of frozen and canned vegetables used. Benefits might include both better food to institutional consumers and greater growth in Maine's farm economy. The University of Maine produce buyer, who makes a concerted effort to buy locally grown food, will on request inform farmers of the lowest wholesale price offered at a given time and they can choose to match it or not. This arrangement appears to be working adequately at least at that scale. State institutions, overall, offer a large market that is susceptable to public policy which can be altered to provide greater support to local agriculture.

Consumer food co-ops, many of whom purchase fresh vegetables on anywhere from a weekly to monthly basis, are now found in all areas of the state and include about 25% to 30% of Maine households as members. Many co-ops have an explicit policy of purchasing as much of their produce from Maine growers as possible. These efforts have been practiced for 3 or 4 years and have expanded significantly. Generally, verbal agreements have been used by co-ops to guarantee farmers a market. Prices offered to co-ops have generally been based on Chelsea market prices with a percentage added on to reflect additional qualities of organic culture, freshness, and specific needs of the farmers. Many of these consumer co-ops buy natural foods from the state-wide cooperative warehouse - the Maine Federation of Cooperatives (FEDCO).

An important element of wholesale purchasing in an environment with very few farmers is the guarantee of supply. Wholesale buyers with orders or menus to fill need a dependable supply. Individual farmers, in an environment of uncertain production quantity, and quality of their product can rarely guarantee a supply. This has been a major factor in discouraging purchasing of food from local farmers by wholesalers. Wholesale purchasing by processors

is an extremely important outlet for larger producers or those with hopes of supporting themselves from direct farm sales. Marketing demand, particularly where contracting is involved,is assured. At the same time, raising just a limited number of crops simplifies farm management. Contracts for acreage produced protects the farmers from having to fulfill day to day quotas, but low yields will certainly hurt both the farmer and the processor who can produce much less of the processed product. Wholesale values to farmers can also be enhanced by any processing or value-added that the farmer can provide. Vegetables that are appropriate for this are beans that are dried, cleaned, and bagged and onions, root crops, and cabbage that can be stored and washed. These foods can then be sold in the winter months when prices are higher. Several experiments are presently under way to determine the viability of such efforts.

GOVERNMENT PROGRAMS AND INDUSTRY COORDINATING MECHANISMS

Maine Department of Agriculture

The Divisions of Promotion and Marketing have several functions relating to mixed vegetables. The most important of these in terms of time and budgeting requirements is the inspection and grading program for vegetables destined for canning such as peas, snap beans, and dry beans. Other mixed vegetables for the fresh market are also inspected occasionally on request. Imported fresh vegetables are inspected on a more frequent basis than local vegetables. Another function of the Department is the advertising and promotion of Maine produce - primarily at trade shows. During the summer of 1978 the Department undertook a survey of farmers' markets in the state to determine the characteristics, needs, and prospects of these markets. Further activities related to direct marketing of vegetables are anticipated.

The University of Maine

The Cooperative Extension Service employs one vegetable specialist in Orono. His work involves the conducting of vegetable variety trials, consulting with farmers on soil quality and amendments, and providing other information to growers on an individual or group basis. County extension agents also play a small role in the vegetable economy by providing literature and consulting services to growers. Unlike the vegetable extension specialist, county agents tend to be generalists with limited technical or specialized expertise in vegetable matters. In several cases, county agents have been instrumental in the establishment of farmers'markets. The Agricultural Experiment Station plays a very minor role in the vegetable economy in Maine. Its budget in this area in 1977-78 was approximately $13,000, or 0.6% of the total budget for commodity programs.

Trade Associations

Several trade associations in the state play a significant role in the vegetable economy. The Maine Vegetable Growers Association is a loosely knit organization of vegetable growers that has several meetings a year. It is administered on a state-wide basis by volunteer officers. Members receive informational mailings from the organization and the Cooperative Extension Service, but pay no dues. Meetings during the year are sparsely attended while the meeting during the Trade Show attracts more interest. The Maine Dry Bean Growers' Association consists of over 40 dues-paying members who grow dry beans in Maine. Their primary product is yellow eye beans for the dry and canning trade. Because they primarily grow one bean variety, they put resources and energy into improving the productivity of yellow eye beans. They are presently working with test trials in Idaho which have shown good results in increased productivity. The organization holds several meetings a year and receives funding not only from membership dues but also from associated industry donations. The Maine Organic Farmers' and Gardeners' Association was formed in the early 1970's with a broad interest in organic agriculture including vegetable production. Their farming constituency is primarily small vegetable farmers. MOFGA has an office, a full-time staff of several members, 24 local chapters, and a bi-monthly newspaper. The primary work of the staff has been organization building, education, advocacy for organic farming, and farmer services. In addition to their newspaper, MOFGA's educational efforts include a day of speakers and workshops at the annual Agricultural Trade Show, and monthly informational meetings at the local level. Advocacy efforts include direct contact with government agencies and University officials, and participation in public policy development efforts. MOFGA has been particularly active in promoting direct marketing activities. Farmer services include certifying farms as organic, running a farm apprenticeship program, and working with government agencies to adopt policies to the needs of organic producers.

A large number of produce trade associations exist at the national level. Product Marketing Association is a national trade association whose members are growers, shippers,

receivers, brokers, packagers, equipment and machinery suppliers, wholesalers and retailers of fresh fruit, vegetables, and floral products. The Association provides public liaison functions for members at the national level and keeps members appraised of changing conditions in the produce industry through meetings and a variety of publications. Its annual budget is about one-half million dollars. The United Fresh Fruit and Vegetable Association is another national trade assocation representing particularly the larger produce growers in the west and south. Processing associations include the National Canners' Association and the Food Processors' Institute.

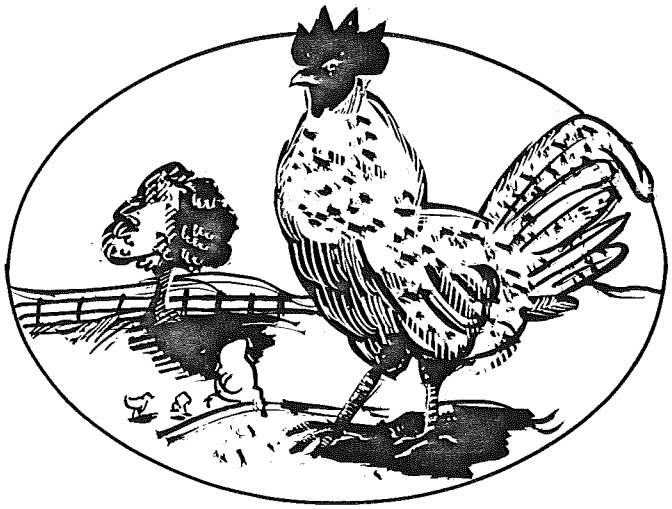
Integration, Coordination, and Cooperation

There are several instances of integration of vegetable production, and marketing, and processing. The most important form is contractual integration. Processors who purchase large quantities of cabbage, squash, turnips, and peas generally contract with growers for a specific number of acres to be grown, with all the produce from that acreage being sold to the processor for the contracted price. In only one case does the processor own farm land and raise the crop that is processed. Morse's Sauerkraut, a family operation, grows their own cabbage, makes the sauerkraut, and markets it. Some food cooperatives, before the summer season, have developed letters of intention to buy estimated quantities of produce from local growers and this has provided a certain amount of production/marketing coordination.

Instances of formal cooperation are very limited among vegetable growers. Currently, there are no marketing or supply cooperatives as they are conventionally defined. There are, however, a number of cooperative-like organizations. Foremost among these are the farmers market associations which are loosely organized collective marketing associations. These associations usually have bylaws regarding marketing practices, in some markets more formally stated than others. Very little coordination of production and marketing occurs. None of the 22 farmers markets have incorporated associations although several have established written bylaws. One farmers market group has progressed beyond the loose cooperation of the typical farmers market. The Somerset Growers Association operates a farmers market in addition to cooperatively supplying a farm stand.

Several coordinating organizations have emerged over the last several years. The most active of these is Coastal Enterprises, Inc. (CEI), an economic development organization based in the midcoast area. CEI has worked with vegetable farmers to establish farmers markets and is continuing its efforts to establish a wholesale marketing cooperative. The organization has farm training programs and provides advice on financing and marketing to vegetable farmers. Another midcoast organization is the Midcoast Agricultural Resource Center centered in Warren. The organization provides educational services to small growers in the area. The Soil Conservation Services Resource, Conservation, and Development districts have performed some coordinating roles, once again in the midcoast area as well as in Cumberland County.

Livestock Commodities



POULTRY

Maine's largest agricultural industry in recent years has been the production of poultry products: broilers, eggs, farm chickens, and turkeys. Total cash farm income for poultry in 1977 was over $187 million, more than twice cash income ten years ago and almost three times poultry farm income in the early 1950's. Broilers and eggs are Maine's most important poultry products accounting for roughly 97% of poultry cash receipts. Farm chickens, primarily fowl from table egg operations, and turkeys account for the remaining 3%. Poultry production is concentrated in the mid-coastal and central part of the state with more than half of production occurring in Kennebec, Waldo, and Cumberland Counties. Broiler production has become concentrated close to each of the five major processing plants in Belfast (2), Winslow, Augusta, and Lewiston. Egg production is concentrated in Androscoggin, Kennebec, Somerset, Knox, and Waldo Counties with a trend toward increasing concentration in several areas, especially Androscoggin County.

The primary reasons for the growth of Maine's poultry industry since World War II have been: 1) the availability of low-cost and productive labor; 2) the availability of low-cost land relatively close to urban centers; 3) the availability of financing from the Farmers' Home Administration; and 4) the successful development by local entrepreneurs of highly integrated and concentrated production, processing and marketing systems. The major impediments to further growth are higher feed grain transportation costs and the increasing costs of building poultry housing relative to southern competitors.

The feed grain situation deserves special attention here. Maine chickens consume nearly a million tons of processed feed grain, mostly corn and soybean meal, per year. Feed is the most substantial cost in poultry production - for both eggs and broilers. Unlike the dairy industry, the poultry industry produces very little of its feed requirements and consequently utilizes only a very small amount of farmland in the state. Because corn and soybeans have never been raised in Maine in large volume, Maine poultry producers import more than 97% of their feed from the Midwest. By comparison, major competing poultry areas in the mid- and south-Atlantic states import only about 40% of their feed, and the Delmarva (Delaware, Maryland, and Virginia) region imports less than 15% of its feed. The primary method of shipping grain is by rail. Depending upon the exact point of origin, grain for Maine is hauled up to 1,000 miles or more - a distance significantly greater than shipments to competing poultry areas. However, even on a ton/mile basis other areas enjoy favorable rail freight rates compared to Maine primarily as a result of the existence of alternative methods (barge traffic and truck back-hauls) of transporting feed grain to those areas. The northeast has failed to develop viable alternative transport modes to induce railroads to offer lower rates and more efficient multi-car service. Nine across-the-board percentage rail-rate increases since 1972 have further increased the absolute dollar disparity between freight costs to Maine and to its competitors. In the last two general rate increases the Interstate Commerce Commission recognized this problem and has ordered holddowns on grain freight rates to New England, an action which has been greeted well by Maine poultrymen but viewed unfavorably by the northeast railroads. The importance of this issue is due to the substantial impact and competitive implications of increased grain costs on the final cost of poultry in the marketplace - estimated in 1975 to be an additional two cents per dozen of Maine eggs and an additional cent per pound of Maine broilers.

A closely related industry is the grain milling business. In the 1950's and early 1960's most of the feed consumed by Maine poultry was imported in finished form. In 1964, however, a change in rail rates made it cheaper to import grain in unprocessed form and mill it into various feed mixtures in Maine. Since 1964 the number of feed milling firms has nearly doubled - from 8 to 15. Sales have tripled (from $25 million to $75 million) and employment has risen from 160 to 225 jobs.

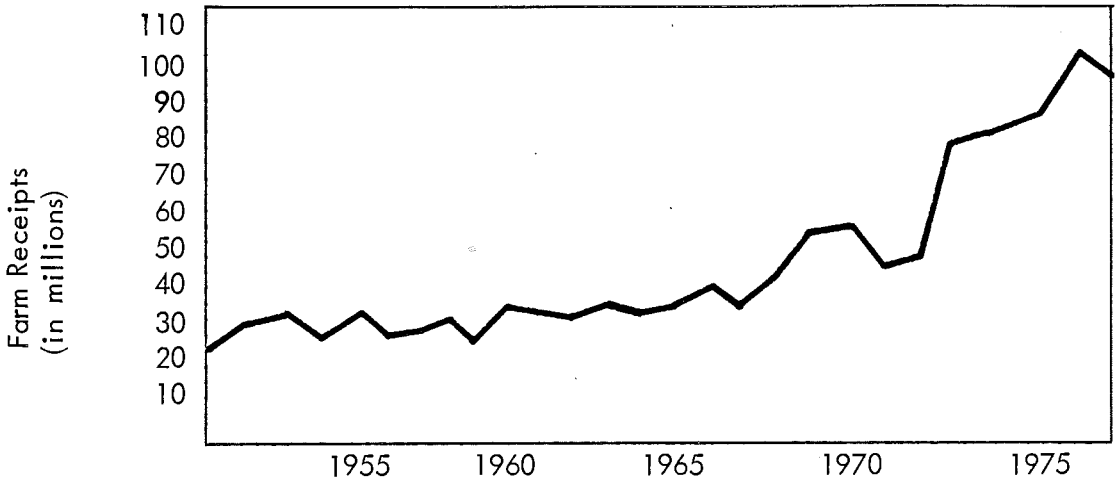
PRODUCTION AND PROCESSING

Eggs

The production of eggs in Maine has increased substantially in the past 30 years from about 400 million eggs in the mid-1940's to about 750 million in 1960 and then to nearly 1.8 billion by 1976. At the same time the number of laying birds has increased from less than 2 million to more than 8 million, and cash farm income has risen rapidly - particularly in the rapid growth years of the 1960's and 1970's. Figure 1 illustrates the increasing trend in cash farm income from eggs since 1950. Increases since 1973 reflect strong prices for eggs in the past 5 years.

FIGURE 1

MAINE CASH FARM INCOME FROM EGGS, 1951-77



This trend of increasing production has coincided with significant changes in the structure of the egg industry. As indicated in Table 1, most egg farms (76%) 15 years ago had an inventory of less than 1,600 hens and pullets of laying age. The predominant inventory size per farm was less than 100 birds with only one farm having more than 100,000 birds. Farms with 1,600 - 50,000 birds accounted for 85% of total inventories. By the most recent agricultural census in 1974, the farm structure for egg production had shifted strongly to larger production operations with a dramatic increase in production from farms with more than 100,000 birds. Although more than half of Maine's egg farms still have an inventory of less than 1,600 laying birds, the number of farms in this size range declined by 85% from 1964 to 1974. At the same time, farms with more than 100,000 birds became the most important factor in egg production with the 10 farms in this size class accounting for nearly 60% of Maine's inventory of laying hens and pullets. The total number of egg farms in Maine in 1974 was 444, an 80% decline from 2,256 in 1964. As indicated above, the number of laying birds as well as the volume and value of egg production increased dramatically since the mid-sixties.

TABLE 1

DISTRIBUTION OF EGG FARMS BY SIZE OF FLOCK: 1964 and 1974

Hens and Pullets of Laying Age	1964 Number of Farms	1964 Number of Birds (Thousands)	1974 Number of Farms	1974 Number of Birds (Thousands)	% of Total Inventory 1964	% of Total Inventory 1974
1 - 1599	1707	183	251	18	4	-
1600 - 9999	441	2021	44	253	47	3
10,000 - 49,999	102	1642	134	2597	38	36
50,000 - 99,999	5	465	5	277	11	4
100,000 and Over	1		10	4091		57
Total	2256	4311	444	7236	100	100

As egg production has become more concentrated, the extent of integration between production and processing has also increased with the small number of dominant producers also owning hatcheries, feed mills, and egg processing and packing equipment. These large integrated firms produce a large proportion of the state's eggs in their own facilities and also contract with independent egg farmers for additional production. One of the largest independent egg producing forces is a 13-member cooperative in the Belfast area with about 1/2 million laying birds. Contractors generally provide started pullets, feed, medication, management assistance, and a certain amount of financing. Farmers furnish buildings, equipment, power, and labor and are paid based on the number of birds kept for production plus, in some instances, bonuses for high yield and low mortality rates. Most eggs produced in Maine by either contract producers or integrated firms are processed at one of six highly automated processing plants owned by the integrated firms. Just one of these plants processes and ships more than 50% of Maine's eggs roughly representing a 25% share of egg production in New England. At the processing plants eggs are washed, sanitized, candled to check for imperfections, sized, packed, and cooled for shipment. All processing plants utilize a voluntary USDA grading program.

Maine currently ranks 13th among the states in terms of the annual number of eggs produced with a 2% to 3% share of national production in recent years. Table 2 shows egg production in Maine, in selected competing areas, and nationally for the decade from 1965 to 1975. Of the regions shown, Maine is the only area that has experienced relatively consistent increases in egg production during the period. It is apparent that Maine has had a marked impact on egg production and consumption in New England. Between 1965 and 1975 Maine increased production by 628 million eggs while the region as a whole increased by 497 million, indicating an actual decline in production in the rest of the region. Maine currently accounts for approximately 50% of egg output in New England. As production has declined in mid-Atlantic states, Maine has gained a greater foothold in that market as well.

TABLE 2

ANNUAL EGG PRODUCTION IN SELECTED AREAS AND THE U.S.
1965-1975

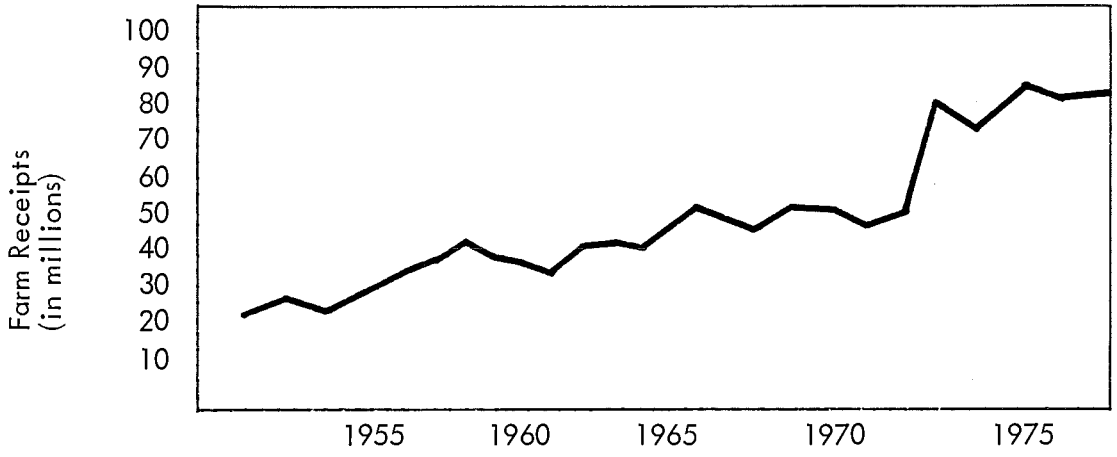
Year	Maine	New England	Mid-Atlantic	Georgia	North Carolina	U.S.
			- Millions -			
1965	1,022	2,950	7,027	4,042	2,632	65,558
1966	1,043	3,007	6,698	4,501	2,717	66,207
1967	1,085	3,012	6,715	4,986	2,949	69,328
1968	1,102	2,940	6,528	4,992	3,035	68,156
1969	1,217	3,035	6,457	5,246	3,295	67,548
1970	1,303	3,127	6,357	5,415	3,439	68,530
1971	1,369	3,185	6,685	5,585	3,385	70,155
1972	1,443	3,400	6,616	5,965	3,433	69,879
1973	1,549	3,525	6,384	5,534	3,213	66,551
1974	1,656	3,500	6,256	5,827	3,037	66,083
1975	1,650	3,447	5,903	5,284	2,802	64,362

Broilers

Like the egg industry, Maine's broiler industry has expanded rapidly in the years since World War II - from approximately 1.5 million birds produced in 1945 to more than 86 million in 1976. Much of this growth occurred in the late 1940's and 1950's with production leveling off in the 70 to 80 million range until the mid-seventies and then increasing significantly again in the past few years. Cash farm income has increased dramatically since 1973 due to increased demand for broilers and high prices within the region. Previous to that, as in the case of eggs, prices had declined slowly for several decades. Figure 2 illustrates the trend in cash farm income from broilers in the past 25 years.

FIGURE 2

MAINE CASH FARM INCOME FROM BROILERS,
1951-77



Maine's broiler industry is more highly concentrated and integrated than the egg industry. As indicated in Table 3, 15 years ago broilers and meat chickens were raised on more than 900 farms with a significant number of these, nearly 80%, selling less than 100,000 birds annually. By 1974, 64% of broiler and chicken farms had sales of more than 100,000 birds. During that same time the number of farms dropped to 379 with attrition rates very high in small farms.

TABLE 3

DISTRIBUTION OF BROILER AND CHICKEN FARMS BY SALES,
1964 and 1974

Broilers and Meat Chicken Sold	1964		1974		% of Total Sales	
	Number of Farms	Number of Birds Sold (Thousands)	Number of Farms	Number of Birds Sold	1964	1974
1 - 29,999	222	3,486	25	291	6	-
30,000 - 59,999	250	10,540	48	2,144	18	3
60,000 - 99,999	238	17,869	62	4,826	30	8
100,000 And Over	201	27,124	244	57,196	46	89
Total	911	59,019	379	64,457	100	100

In the early days of Maine's broiler industry as many as 13 companies processed broilers. Today there are just 5 firms, all vertically integrated, which dominate production as well as processing. Each of the firms contracts with independent farmers to grow broilers. The processors furnish chicks, feed, fuel, litter, medication, and management and financial assistance. Growers, as in egg production, furnish buildings, equipment, power, and labor. Contract payments are based upon the square footage of building space used with, in most cases, bonuses for production above specified averages. In addition to contract production, the integrated firms also have their own production facilities. At the processing plant broilers are slaughtered, dressed out, inspected, and packaged for shipment. About 60% of the broilers are then sold as whole birds and the rest as parts with this product form becoming increasingly common. Employment in Maine's five broiler plants totals well over 1,500, and the value of product from these plants has been approximately 20% of the total product value of food manufacturing in Maine in recent years.

It is important to note that the economic success of Maine's broiler industry has been due in large part to its efficiency as an integrated commodity system. Because of technological developments by integrated broiler operators, it now takes only seven weeks and sometimes as little as six pounds of feed to produce a $3\frac{1}{2}$-4 pound chicken ready for market. In 1960 it took at least 13 weeks and more than ten pounds of feed to produce a smaller market-sized chicken. As a comparison in feed conversion efficiency, it takes 4-5 pounds of feed to make one pound of pork and up to 12 pounds of feed to produce a pound of beef. A result of these technological changes has been reduced costs and increased consumption of poultry meat.

Maine is currently the 11th largest broiler producing state in the nation, accounting for between 2% and 3% of national production and 99% of New England production in recent

years. Major competing states in eastern markets are Delaware, Maryland, Virginia, North Carolina, Georgia, Arkansas, New York and Pennsylvania. Maine is the only state in New England whose production has increased over the past decade. Broiler production in Connecticut dropped from almost 12 million birds in 1965 to about one million in 1975. Production in other New England states is insignificant. Growth in broiler production in Maine has not been as great as in competing areas beyond New England and this has resulted in a loss of important New England and New York markets to mid-Atlantic and southeastern producers.

TABLE 4

NUMBER OF BROILERS PRODUCED IN SELECTED AREAS AND THE U.S., 1965-1975

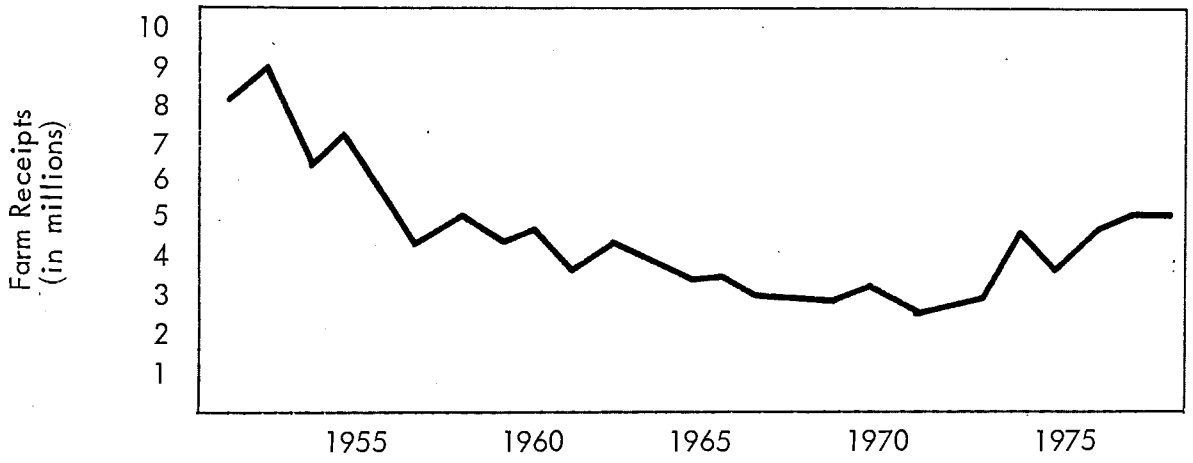
Year	Maine	New England	Delmarva	Georgia	North Carolina	Arkansas	U.S.
			- Millions -				
1965	69	89	302	403	235	320	2,334
1966	72	91	331	456	260	362	2,571
1967	74	91	330	447	263	365	2,592
1968	72	88	330	437	263	391	2,620
1969	73	84	371	442	281	415	2,789
1970	76	85	392	454	309	450	2,987
1971	72	78	378	431	290	476	2,945
1972	71	75	386	443	302	532	3,075
1973	76	78	409	413	290	502	3,009
1974	77	79	414	427	287	482	2,992
1975	81	82	394	417	284	482	2,933

Farm Chickens and Turkeys

The production of farm chickens and turkeys accounts for less than 3% of Maine cash farm receipts from poultry products. In the case of farm chickens, production has been largely replaced by broiler production since World War II. Most farm chickens are currently fowl from table egg operations. Figure 3 below indicates the declining trend in farm income for farm chickens over the past 25 years. As in eggs and broilers, strong prices for poultry in the years since 1972 have been an important factor leading to increased income in recent years.

FIGURE 3

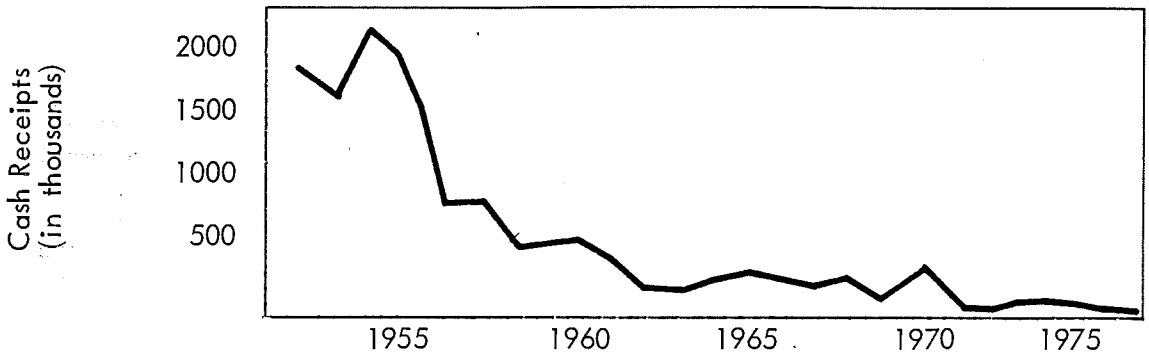
MAINE CASH FARM INCOME FROM FARM CHICKENS, 1951-77



Turkey production has also declined rapidly in Maine in conjunction with the rapid expansion of broiler production and consumption. Sales of up to $2 million annually prior to 1955 have since dwindled to less than $100,000 during the most of the seventies. This trend is indicated in Figure 4 below. It is important to note that turkey production and consumption at the national level has increased substantially during this period.

FIGURE 4

MAINE CASH FARM INCOME FROM TURKEYS, 1951 - 77



Despite the sharp decrease in turkey production in Maine since the early 1950's, there were still 60 turkey farms in the State in 1964 producing about 45,000 birds. By 1974, as indicated in Table 5, Maine had only 7 farms producing a total of less than 1,400 turkeys.

TABLE 5

SIZE DISTRIBUTION OF MAINE TURKEY FARMS, 1964 and 1974

Number of Turkeys Raised For Slaughter	1964		1974		% of Turkeys Raised	
	Number of Farms	Turkeys Raised	Number of Farms	Turkeys Raised	1964	1974
1 - 2499	56	7,287	7	1,390	16	100
2500 - 4999	1	2,500	0	0	6	-
5000 - or more	3	34,500	0	0	78	-
Total	60	44,287	7	1,390	100	100

MARKETS AND MARKETING

The major markets for Maine broilers and eggs are Maine, other New England states, and the mid-Atlantic states. Well over half of the eggs produced in Maine go to New England states exclusive of Maine. Maine on the average is a market for a little more than 10% of locally produced eggs, and an increasing number of shipments are going to New York and to mid-Atlantic states beyond the New York market. In the past few years several million eggs, or about 2-3% of Maine's eggs, have gone to export markets primarily in Canada and the Far East. An important factor in egg marketing is the fact that Maine is primarily a producer of brown eggs with up to 75% of annual production of this type. Traditionally there has been a preference for brown eggs in the New England market. Maine, as the largest producing area for brown eggs and with transportation advantages over competitors to New England markets, is in a very favorable marketing position in this area. However, there is a delicate supply/demand balance associated with meeting the region's brown egg needs and a surplus of brown eggs greatly affects price relations between brown and white eggs. The major sources of market competition for Maine egg producers are mid-Atlantic states, Georgia, and North Carolina.

Up to 60% of Maine-produced broilers are marketed in New England with the rest going to New York City, major metropolitan markets in the mid-Atlantic states, and several export destinations. Market competition in the eastern broiler industry is very keen with a high degree of brand name and price competition. As production in New England has lost ground relative to local consumption as well as production in competing areas, northeast market centers continue to be penetrated more successfully by mid-Atlantic and southeastern producers. According to USDA, the principal origins for broiler sales in Boston are Delmarva, Maine and North Carolina. In New York, Georgia is also a strong competitor. In Baltimore and Washington Maine's market is no longer substantial as competition from southeastern states increases. It appears that in the next ten years southeastern producers will continue to expand their market shares in the northeast.

Maine broilers have traditionally commanded a premium price in the market due to consumer perceptions of greater quality. This premium has eroded in the past few years and Maine average prices for 1976 were slightly below the national average. Relatively high transportation costs to markets outside of New England put additional pressure on narrow retail profit margins to Maine poultry producers. In the case of eggs, prices have held strong relative to competitors and expanded market opportunities seem probable. The prices for both eggs and broilers declined slowly through the fifties and sixties and then experienced a sharp price increase in 1973 which in general has tended to hold since that time. Figure 5 below illustrates this trend.

FIGURE 5

PRICE TRENDS FOR MAINE EGGS & BROILERS, 1950-1976

Recent trends in per capita consumption of poultry products are shown in Table 6. Obviously increasing per capita consumption of broilers has been a major impetus behind growth in the broiler industry in Maine and elsewhere. Total per capita consumption of ready-to-eat poultry was almost 41 pounds in 1975 compared to about 33 pounds in 1965 and only 25 pounds in 1945. Total annual egg consumption has declined since 1965 from 314 eggs per capita to only 278 in 1975. Most of this decrease was in the consumption of shell eggs due to the high cholesterol level of eggs. Processed egg consumption has also decreased steadily since 1971. Continued declines in per capita consumption of eggs will inevitably have an adverse impact on the egg industry in Maine and elsewhere in the U.S.

TABLE 6

Year	Poultry, ready-to-cook		Eggs		Turkey
	Broilers	Farm Chickens	Shell eggs	Processed (1)	
	Lbs.	Lbs.	No.	No.	Lbs.
1965	29.6	3.8	285	29	7.4
1966	32.0	3.6	283	30	7.8
1967	32.4	4.1	285	45	8.6
1968	32.8	3.9	284	32	7.9
1969	34.8	3.6	279	31	8.3
1970	36.9	3.6	277	34	8.0
1971	36.7	3.7	278	36	8.4
1972	38.4	3.6	272	36	9.0
1973	37.4	3.3	262	32	8.5
1974	37.5	3.6	254	34	8.9
1975	36.9	3.4	247	31	8.6

GOVERNMENT PROGRAMS AND INDUSTRY COORDINATING MECHANISMS

Federal Programs

Although a number of federal programs provide technical support and regulatory constraints to poultry operations, the Farmers' Home Administration (FmHA) is a major federal program influencing the development and operations of Maine's poultry industry. FmHA has financed approximately 90% of Maine's poultry houses - a highly significant factor in the expansion of both the broiler and egg industry. Changing investment criteria at FmHA and a resulting lack of capital for the building of new poultry houses has constrained the development of poultry production, particularly broiler production, in the past few years.

Maine Department of Agriculture

Three divisions of the Department have a substantial impact on the poultry industry. The Division of Animal Industry has two poultry programs; disease control, and pullet production and testing. The disease control program provides technical assistance to prevent and control the outbreak of disease in broiler, egg, and other poultry operations. Pullet production and testing is done at the Division's Monmouth Farm to research various aspects of poultry production including egg size, feed efficiency, mortality and disease problems, and to evaluate vaccine effectiveness. Current work involves research in the restriction of light days to see if energy savings can be achieved with no loss in production or profitability. The Division of Markets conducts several poultry grading and inspection programs. More than 40 state graders are employed on a fee basis in voluntary U.S. standard grading programs at egg and broiler processing plants. Also, under the Branding Law and the federal Egg Products Act, state employees carry out an egg surveillance program for quality and accuracy of labeling. The Division of Promotions participates in a variety of promotional programs for poultry including the Maine Egg Festival, The Maine Broiler Festival, several chicken cooking contents, and a number of food and agricultural trade shows. The Division also publishes weekly egg inventories and market information as part of a market news program supported in part by USDA.

University of Maine

Four poultry extension specialists are employed by the University through the Cooperative Extension Service. One specialist based in Lewiston works primarily with contract growers to improve business management practices. Another specialist based in Rockland conducts field research in technical production and handling problems and provides assistance to the industry in these matters. Two specialists in Orono work primarily with poultry companies and on educational programs regarding poultry through the College of Life Sciences and Agriculture.

The Life Sciences and Agricultural Experiment Station maintains a poultry research program which was funded at a level of $192,000 in 1977. The Department of Animal and Veterinary Sciences is responsible for nearly all of the research work in poultry. Recent research activities have been primarily in the area of poultry management and nutrition including the testing of potential local sources of feed protein such as potato products, conifer mucha, and various marine products. The Department maintains a number of poultry production and incubation facilities for its research program.

Trade Associations

The Maine Poultry Federation is Maine's only statewide poultry trade association. It was organized several years ago by both broiler and egg producers to promote poultry products and improve public liaison functions for Maine's poultry industry at the state and national levels. The Federation has a full time executive director. Additionally, there are poultry associations in Somerset and York County which serve a fraternal, educational, and, to a limited extent, promotional purpose.

There are several regional and national poultry associations. The Northeast Marketing Association in Durham, New Hampshire is an association of egg producers in the northeast which was organized to keep its members informed of egg market conditions and to represent producers in various legislative and governmental matters. The National Egg Board is a nationwide association of egg producers organized to promote the consumption of eggs and egg products. The Board does not get very involved in legislative matters and is funded by a tax on egg production in the U.S. A comparable national trade association for broilers is the National Broiler Council. The Council's functions include both promotion and lobbying on behalf of processors. Funding comes from membership dues.

Integration, Cooperatives and Contractual Arrangements

As indicated previously, both the egg and broiler industries in Maine are highly integrated in production, processing and marketing. In the case of eggs, there are still a number of independent producers, including a producer's cooperative, who are not actually integrated into processing through ownership. In most cases, however, these producers operate under contracts with the large processors. In the case of broilers, vertical integration of production and processing is complete with 5 processing firms controlling all broiler production from the hatchery to ultimate retail markets. Broiler producer/processors as well as the large egg operators are in most cases integrated into related poultry functions such as feed milling and transportation.

The high level of integration and concentration found in Maine's poultry industry is also the pattern throughout the United States. According to USDA, the 20 largest broiler operations in the country account for about 55% of the total market share of broiler production. This has increased from 43% in 1972. The 20 largest table egg production firms account for 22% of national production - somewhat less concentrated than broilers but still highly concentrated considering that there are approximately 244 million laying birds in the U.S. for an average of more than two and a half million birds for each of the top twenty firms. As noted earlier, the high level of integration in the poultry industry has been a major factor in the increase in poultry production and consumption in the U.S. in the past 20 years.

In cases where ownership integration does not exist in the poultry industry, there is nearly always contractual integration. A producer cooperative in Belfast provides further business coordination to growers in that area. Commodities futures trading is also available for both broilers and eggs as well as important poultry inputs such as corn and soybean meal. While the trading of feed grain futures to ensure supplies and fix supply prices is done widely in Maine, there is no indication that egg or broiler futures are traded in large volume by Maine producers or processors.

An additional form of business coordination is the Egg Clearinghouse in Durham, New Hampshire. In 1970, the major commodity exchanges discontinued cash egg trading and the egg industry was left without a day to day competitive price discovery mechanism. Nearly all of the uncommitted eggs traded privately were sold in relation to the latest market quotations which became very difficult to determine. The Egg Clearinghouse, Inc. (ECI) was established to provide a mechanism for open market price determination and trading. ECI is a manually operated telephone auction system which accepts bids and offers for gradeable nest-run eggs and matches trades between members anywhere in the United States. In performing the clearinghouse function, ECI acts as a credit agent and enforces product quality standards. Because credit and product responsibilities are involved, trading is limited to ECI members who have demonstrated an ability to act responsibly. Once trades are completed, ECI arranges direct shipment and billing. It also serves as a convenient source of up-to-date market information for the industry.

PRODUCTION TRENDS

Maine's dairy industry is located primarily in a central corridor of the State extending from York to Bangor. Three regions within this corridor are particularly important in dairy farming: 1) the Androscoggin River Valley from Livermore to Auburn; 2) Waldo, northern Kennebec, and southern Somerset Counties; and 3) lower Penobscot County between Charleston-Bradford and Bangor. Except for several towns in Aroostook and Hancock Counties, there is little dairy farming east of the Penobscot River. The current location of the dairy industry is more concentrated than in earlier days due largely to transportation and other cost advantages for both farmers and processors in being close to urban market areas.

The dairy industry plays an important role in Maine's agricultural economy accounting for 88.4% of cash receipts for livestock and livestock products other than poultry, and 17.2% of all cash farm income in Maine in 1976. Maine is the second largest producer of milk in New England with about 15% of regional milk cash receipts. Vermont is largest with 47%. Nationally, Maine ranks 35th among all states in milk production with only one-half of one percent of total U.S. production of nearly 123 billion pounds. The states with the largest shares of U.S. production are Wisconsin (16.7%), California (9.6%), New York (8.1%), Minnesota (7.5%), and Pennsylvania (6.2%). A large amount of milk produced in Maine is exported and consumed out-of-state. Of Maine's 6.3 million cwt. of milk production in 1976, 58.5% was sold in-state and 41.5% was sold out-of-state on the New England Federal Milk Market Order to large processor/distributors in the New England area.

As indicated in Table 1, the volume of milk production in Maine has remained relatively stable since 1950 ranging between 6 and 7 million hundredweight (cwt.) annually. The value of milk production has increased substantially over the past 25 years from $5.54 per hundredweight in 1950 to $10.91 per hundredweight in 1977. During the same period cash farm income has increased steadily to almost $70 million annually - nearly three times the 1950 figure. At the national level, the retail price of dairy products has increased 85% in the past ten years.

TABLE 1

Maine Milk Production - Volume & Value 1950-1976

	Volume (cwt.)	Value (per cwt.)
1977	6,327,000	$ 10.91
1976	6,330,000	10.87
1975	6,190,000	9.83
1974	6,150,000	9.78
1973	6,130,000	8.46
1972	6,370,000	7.45
1971	6,290,000	7.21
1970	6,190,000	7.08
1965	6,600,000	5.45
1960	7,030,000	5.77
1955	6,820,000	5.60
1950	6,210,000	5.54

The number of dairy farms in Maine has declined by about 75% in the past 30 years. The 1974 Census of Agriculture shows 1,200 commercial dairy farms in the state compared to 5,100 in 1945. As indicated in Table 2, the number of non-commercial dairy farming operations has also declined rapidly over the past thirty years - from more than 21,000 to less than 400.

The decline in number of commercial farms, however, has occurred at a slower rate than the decline of all farms in Maine. In 1974, 27% of all commercial farms were dairy operations compared with 12.6% in 1945. During this same period the number of cows has dropped to approximately 60,000, about half the number in Maine in the early 1940's.

TABLE 2

Number of Maine Dairy Farms and Milk Cows, 1945 - 1975

Year	Number of Dairy Farms		Number of Milk Cows	Number of Replacements
	Commercial	All		
1974	1200	1591	60,000	37,000
1969	1900	2246	69,000	43,000
1964	2050	5414	75,582	58,261
1959	3250	8926	89,290	72,367
1954	4600	14820	106,513	88,735
1950	4950	18337	101,861	81,971
1945	5100	26209	116,814	-

The size distribution of dairy farms has also changed considerably with the average herd size increasing from approximately 20 head in 1950 to over 50 milk cows per farm today. Table 3 illustrates changes in the size distribution of dairy herds since 1964. As in other commodities there has been a dramatic decline in the number of small farms and the production shares of farms in the smaller size classes. Currently about 25% of Maine's largest dairy farms own nearly 60% of Maine's dairy herd. The stability of milk production in Maine in recent years despite the declining number of milk cows is attributable to greater yields per cow. The average annual production per cow has risen from 8,680 lbs. in 1963 to almost 11,000 lbs. in 1977. Major factors in improving yields have been heavier feedings, improved rations, improved breeding practices, and better herd management including the early removal of low production animals.

TABLE 3

Distribution of Maine Dairy Farms by Size

Number of Milk Cows	1964		1974*		% Total Inventory	
	Number of Farms	Number of Cows	Number of Farms	Number of Cows	1964	1974
1 - 9	3336	8094	326	1004	11	2
10 - 49	1765	46002	826	23419	61	39
50 - 99	288	18194	352	22823	24	38
100 - 199	22	2538	78	9965	3	17
200 or more	3	754	9	2773	1	4
Total	5414	75582	1591	59984	100	100

* 1974 figures are for farms with sales of $2500 and over.

Most Maine dairy farms are sole proprietorships or family partnerships. As farm size increases there are an increasing number of corporate dairy farms usually still organized along family lines. In some cases, however, non-family managers are becoming more common especially where a smaller dairy farm has been assimilated into a larger operation. The average age of dairy farm owners and managers in Maine is mid-fifties with only a limited number of younger farmers entering the business. Farm acreage has increased significantly as the size of dairy herds have grown. The average dairy farm today typically consists of at least 150-200 acres of productive crop and pasture land compared with only about 60 acres per farm 25 years ago. Feed production is the major force behind increasing acreage in dairying and is also a major activity and expense of dairy farmers. It has been estimated that about 3 acres of productive cropland per cow is required to produce an adequate supply of all feed except grain which must be imported to Maine by rail from the midwest. Feed raised on Maine dairy farms is primarily corn silage, legume crops, mixed hay, and some amount of oats, rye, and other grain producing grasses.

Capital investments and operating costs involved in dairy farming are relatively high and constitute a significant barrier to entry or expansion in this business. Government regulations promulgated in the late 1950's to improve sanitary conditions in milking and milk storage were a major factor in increasing dairy capital requirements. The conversion in the 1950's from five and ten gallon cans cooled in ice to the modern bulk tank which retains a constant temperature represented a major increase in capital for dairying requirements. The conversion from hand milking to milking machines and then to milking parlors has further increased capital costs. Farmers had to modernize to participate in the current marketing system or go out of business. An indication of current capital investments may be obtained from the ELFAC program, a dairy record keeping program sponsored by the Land Grant Universities of the Northeast. 37 or about 3% of Maine dairy farms, with an average of 69 cows, were used in a 1977 summary study - although more than this number use the service. ELFAC figures from the 1977 summary indicate that the average investment per cow is slightly over $3,000 with about $635 for the purchase of each animal, $875 for equipment and miscellaneous supplies, and slightly over $1,500 for land and buildings. The total investment for a farm with 69 milking cows would be almost $210,000. The highest operating cost, as in other livestock industries, is feed. The purchase of feed grains accounts for nearly one-third of dairy operating costs. Hired labor is the second highest single cost. Current estimates from ELFAC on operating costs for a farm sample averaging 69 cows is approximately $100,000. The average gross income per cow for milk is $1,465 for a net of about $265 per cow per year. Farmers using the ELFAC system are apt to be above average in total investment, production, and return per cow. The above figures should be viewed accordingly.

PROCESSING, MARKETING, AND UTILIZATION

The processing of fluid milk began in great volume with the development of pasturization in the 1800's. Since then technology has advanced to a point where fluid milk may be kept for up to two weeks from the day it is produced. Changes in refrigeration methods, disease and bacteria control, and transportation methods have all had a significant impact on the production, processing and marketing system for milk. Continued centralization of these activities has resulted in high attrition among small local dairy production and processing operations which made economic sense in earlier times.

Most milk produced in Maine today is shipped in bulk by truck to 29 processing plants in the state or to several large regional processors. In either case, government regulations are the major factor in determining prices. The wholesale and retail price of milk processed and sold in Maine is governed by the Maine Milk Commission. The New England Regional Federal Milk Market Order regulates wholesale prices for milk in the general New England area. New England prices affect Maine producers directly since a substantial amount of Maine's milk production is sold out-of-state. These prices also have a strong indirect impact on Maine producers by influencing prices set by the Maine Milk Commission for in-state sales. These government price setting systems are discussed in more detail later in this section. In 1977, Maine milk processors handled 374.5 million pounds of milk while firms operating under the New England Market Order bought another 265.3 million pounds of Maine milk through local branch plants or through "city" plants.

Milk marketed by processors is purchased from the farm according to a two-part classification system that is based on what the milk is used for. Class I products include whole milk, skim milk, and related fluid milk products. Class II products include processed foods such as butter, cheese, cottage cheese, yogurt, powdered milk, ice cream, and ice cream mix. Dairies are required to give priority to meeting consumer demand for fluid milk and then divert excess supplies to Class II products. Approximately 83% of milk consumed in Maine sold by Maine dairies is sold in fluid form as Class I milk. For larger companies operating in the Boston market region the proportion of fluid milk sold is substantially lower - about 67%. Payments by dairies to milk producers are based on the volume of milk purchased, the quality of the milk in terms of butter fat content, and the overall proportion or blend of the dairy's usage of milk for Class I and Class II products. Because of the higher prices paid for Class I product, a higher proportion of Class I usage means a higher blend price to producers. Milk quality, as mentioned above, is measured in terms of butter fat content. Milk with 3.5% butter fat is considered "whole milk". Milk with higher butter fat content brings a higher price than milk with less than the 3.5% standard.

Another factor involved in milk pricing is the distance of a farm from processing plants. Milk production areas are zoned according to their distance from a processor's central plant with more distant farms getting lower returns due to higher transportation costs born by the producer. Even in cases where a processor is purchasing milk for a satellite plant, prices to farmers are often based on zone prices from the central plant. This system works against Maine farmers in cases where large regional processors are involved. Most in-state processors, however, have only one plant.

In Maine and in most other areas of the U.S., large dairy producer cooperatives play a major role in milk marketing. Yankee Milk, a large New England regional cooperative, is estimated to handle approximately two-thirds of the milk marketed by Maine producers. The other third of Maine's milk production is handled by independent producers and local cooperatives. Beginning as a bargaining cooperative to secure higher milk prices for the dairy farmer, Yankee has greatly expanded its role in the marketing area. Today Yankee offers full service contracts with processors in which Yankee agrees to handle surplus milk and the dairy agrees to buy milk only from Yankee members. Under this arrangement when a dairy's supply exceeds demand, Yankee assumes responsibility for transporting milk to another contract dairy where a shortage

exists or to a dumping station. Surpluses that cannot be used elsewhere are eventually processed into Class II products by Yankee at one of several plants it owns in New England. The price of Class II products purchased by Yankee or other processors is supported at an 80% parity level (minimum) through the purchase of such products by the Federal Commodity Credit Corporation.

The bulk of milk and milk products marketed in Maine are processed by a relatively small number of the 29 processors audited by the Maine Milk Commission. Another 18 unaudited producer dealers account for 6.1% of milk purchases in Maine in 1977. Table 4 shows milk purchase volumes by the 29 audited dealers. Two processors accounted for 37% of purchases in Maine for 1977. One of these is headquartered out-of-state. The 15 largest processors, or about half of those audited, accounted for 92% of purchases. These figures would indicate a moderately high degree of concentration in milk processing in Maine. Furthermore, only a handful of firms are responsible for the purchase of Maine milk sold out-of-state. Indications are that the trend towards concentration in processing is continuing. The number of people employed in Maine dairy processing plants in 1977 was approximately 760, with average wages of $10,690 and a total payroll of more than $8.2 million. Most of Maine's dairy processing plants employ less than 30 people while 3 firms employ 60 to 80 people and one plant has more than 100 employees.

TABLE 4

Size Distribution of Maine Milk Processors
by Producers Receipts (lbs.), 1977*

Amount of Milk Purchased (millions of lbs.)	Processors		Total Milk Purchased	
	Number	% of Total	Amount (millions of lbs.)	% of Total
Less than 5	14	48.3	28.4	8.1
5 - 9.9	6	20.7	41.4	11.8
10 - 19.9	4	13.8	56.6	16.1
20 - 39.9	3	10.3	95.1	27.0
40 and over	2	6.9	130.0	37.0
Total	29	100	351.5	100

* These figures are for processors audited by the Maine Milk Commission and include 62% of the processors involved in marketing Maine milk, and 93.9% of Maine-produced milk.

The marketing system for fluid milk (Class I dairy products) is dominated by retail supermarket sales. In the past, home delivery routes dominated sales but these routes have been phased out as expenses have increased and consumer shopping patterns have changed. Class II products are produced both by Class I processing plants and by a lesser number of specialty processing plants who do not buy milk directly from producers. Manufactured milk products produced in Maine include half-and-half, butter, cottage cheese, and ice cream. No powdered milk is produced in the state although some surplus Maine milk is occassionally shipped to out-of-state dehydrating plants. Currently there is no hard cheese and very little butter made in Maine. There is, however, substantial production of frozen deserts and cottage cheese. In 1977, 7,394,000 gallons of ice cream, ice milk, sherbert and other frozen desert products were produced in the state as well as 18 million pounds of cottage cheese produced largely in a single plant.

Table 5 shows per capita consumption figures for milk in a number of recent years. Maine figures are from the Milk Commission, New England figures are from the Market Administration for the New England Market Order, and national figures are from the Milk Industry Foundation. It is apparent that Maine consumption has been increasing slightly compared to a slight downward trend in New England and the U.S. Higher figures for Maine may be due in part to milk consumed seasonably by vacationers in Maine. Despite this reporting difficulty, an increasing trend is still apparent. Overall the consumption of milk and other dairy products appears to be under competitive pressure from a growing number of non-dairy substitutes such as margarine, non-dairy creams, and soy milk substitutes. A general desire to reduce the level of cholesterol and calories in diets has been a major impetus behind this trend.

TABLE 5

Per Capita Consumption of Milk
(quarts per person)

Year	Maine	New England Region	National
1977	170	-	122
1976	163	-	123
1975	154	138	124
1974	145	136	121
1973	153	140	125
1972	154	142	126
1971	152	142	125
1970	151	145	126

GOVERNMENT PROGRAMS AND INDUSTRY COORDINATING MECHANISMS

Federal Programs

The major influence of the federal government on the dairy commodity system is through market order and price support programs. The Federal Milk Market Order System was established during the depression years of the 1930's to create more orderly marketing conditions for milk and thereby promote the welfare of both the dairy industry and the milk-consuming public. Traditionally, poor marketing conditions for milk have been caused primarily by the fact that milk, because of its relatively perishable nature and the constant level of consumer demand, is used by processors at a very fixed and steady rate regardless of production prices and volumes. In the absence of price controls or other coordinating mechanisms, fluctuating levels of milk production cause great changes in prices to dairy farmers. In the early 1900's this periodically led to extremely depressed market conditions, and the marketing of low quality milk. As early as 1910 producer cooperatives bargained with processors for pricing systems which would overcome some of these marketing problems. During the depression this system broke down and government intervention was sought. For the past 40 years, the market order system and large regional producer cooperatives had been the primary market coordinating mechanisms in the U.S. industry. Numerous Federal milk market orders have been established nationally. The law provides for milk orders to be established only in regions where a majority (usually 2/3) of the producers request it.

As in the case of other milk market orders, the New England Federal Market Order sets minimum prices which processors must pay to dairy farmers for raw fluid grade milk. Minimum prices established under the New England Federal Order are based on a regional variation from Class II prices in the Minnesota-Wisconsin area where it is felt that manufacturing grade milk prices are competitively determined. Producers who ship in the New England market minimally receive the blend prices for their milk that is set by the Federal Order. When a surplus of milk develops the Federal Commodity Credit Corporation (CCC) is the underlying mechanism for the Market Order price system. The CCC purchases Class II dairy products in sufficient volume to maintain the Class II price at 80% of parity thereby supporting the blend price. Although Maine is not covered by a Federal Order, much of Maine's milk (more than 40%) is purchased by processors who are under the jurisdiction of the New England Order. The New England Federal Order therefore has a direct effect on milk prices in Maine and an additional indirect effect since the Boston prices are used as a benchmark by the Maine Milk Commission in setting minimum wholesale and retail milk prices in Maine.

Several other federal programs have an important influence on the dairy industry. The Farmer's Home Administration has been a major source of financing for dairy farming as capital investment requirements and operating costs have increased in the past 20 years. There are also a number of health and safety regulations promulgated by the federal government (including OSHA) which have had a strong influence on dairy operations.

Maine Department of Agriculture

The most important dairy program at the state level is the Maine Milk Commission. The Milk Commission was established in 1935 by the Maine Milk Control Law in response to perceived threats to the stability of the milk industry in the state. It is made up of the Commissioner of Agriculture and four other members with no ties to the dairy industry. Funding comes from a tax of 3 cents per hundred weight of milk levied on all milk purchased or sold by licensed dealers. The burden of the tax is born equally by the producers and dealers. The goal of the Commission is to provide a plentiful supply of wholesome milk to the public and to ensure an adequate return to Maine milk producers and processors. The Commission has two mechanisms for doing this: the setting of minimum producer, wholesale, and retail prices;

and the enforcement of licensing, auditing and other regulations to supervise industry operations. Minimum producer prices, as previously mentioned, are based on prices established under the New England Regional Market Order. Minimum wholesale and retail prices are established in an effort to limit retail milk price competition in Maine and prevent large scale competition and deterioration of milk quality. The Milk Control Law provides individual municipalities the option of being "controlled" by Milk Commission's price regulations or remaining "decontrolled" and exempt from minimum wholesale and retail price controls. About half of Maine's towns are currently controlled. Changes in price controls are made periodically by the Commission following studies and public hearings. The Commission licenses all milk dealers in the state, audits dealer's records, and requires periodic information on milk trading finances and activities to aid it in its general responsibilities for supervising the industry.

The Maine Dairy Council Committee was established in 1949 as a vehicle for providing a program of nutritional education, and conducting research and experimentation for the benefit of Maine's dairy industry. The Council's primary program is nutritional education in public schools. The activities are funded by an assessment of 3 cents per hundredweight of milk paid equally by producers and processors.

The Maine Milk Tax Committee is an advertising entity of the milk industry which focuses on promoting the consumption of milk and milk products. The Committee was established by the Legislature in 1953 and incorporated into the Department of Agriculture. The Committee is financed totally by producers through a 5 cent per hundredweight charge on all production regardless of where the milk is sold. Since 40% of Maine's milk is shipped to the Boston market, this same proportion of funds are used for promotional activities in that market.

The Division of Inspections also has an important impact on the dairy industry through the enforcement of health and sanitation regulations at dairy farms and processing plants and annual licensing requirements and milk testing and sanitary regulations are enforced for interstate milk shipments.

University of Maine

The Cooperative Extension Service (CES) is a joint program of the U.S. Department of Agriculture and the state land grant university system. CES has a significant dairy program in Maine. Its primary services are to the producers and consist largely of training, technical assistance and educational programs. The CES employs 4 dairy specialists who provide direct field assistance throughout the state, and three additional specialists with expertise in plant and soil sciences and agricultural engineering. Area specialists are knowledgeable in economics, mechanical engineering, animal care and health, animal nutrition, and related areas.

The Life Sciences and Agricultural Experiment Station maintains a dairy research program which is funded at the level of $300,000 from federal, state, and industry sources. The program is conducted primarily by the Department of Animal and Veterinary Sciences. Projects undertaken in this program focus largely on improving dairy feed and nutrition systems, developing greater milk production efficiency, and otherwise improving technical aspects of dairy farm management. This program includes the operation of the ELFAC dairy accounting and record keeping system sponsored by the Department of Agriculture and Resource Economics. ELFAC not only provides dairy farmers with an automated accounting system but also provides the University with valuable data for its dairy research program.

Trade Associations

The Maine Milk Dealers Association is the only non-producer dairy association in Maine at the state level. The Dealer's Association plays an important role in representing its members in regulatory matters before the Maine Milk Commission. At the national level, the

National Milk Producer's Federation represents milk cooperatives across the country and plays an important role in legislative and administrative matters affecting the dairy industry. The Milk Industry Foundation, another national organization, represents milk processors and Class II manufacturers in national dairy issues including regulation.

The Dairy Herd Improvement Association (DHIA) is an organization of dairymen concerned about improving the quality and quantity of milk production. The organization functions through use of a computerized record keeping system of production quantity and butter fat levels for each individual cow. Butter fat tests are performed by the Maine Department of Agriculture on a contract basis with DHIA. The DHIA program consists of individual county associations and a statewide association. About 43% of Maine's dairy farmers are members of the Association.

Breeding Cooperatives. The change from pasture breeding to artificial insemination has led to the rise of a number of breeding services, distributors, and breeding cooperatives. The largest cooperative, Eastern AL Cooperative is based at Cornell University in Ithaca, N.Y., and serves New England and New York. Eastern AL is one of the larger breeding cooperatives in the country and is involved in providing sires for greater genetic improvement of dairy cow breeds as well as providing technician services and sales of breeding supplies.

Breed Associations. There are several breed-specific associations that are active nationally, with state and regional chapters. Most dairy cows in Maine are Holstein-Friesian, Jersey, Guernsey, Ayrshire, Brown Swiss, or Milking Shorthorn. Each type has its own breed association. Breed associations perform two major functions for producers, centering on improvement and promotion of the breed. They provide a registration service for purebred animals and promote animal type classification. This classification system enables farmers to analyze the strengths and weaknesses of each individual cow and pick complimentary traits in bulls in order to produce superior offspring.

Integration, Cooperatives, and Contractual Arrangements

Vertical integration by ownership between production, processing, and retail functions in the dairy industry is not prevalent in Maine with the exception of 18 producer/dealers (including several cooperatives) and one large regional processing firm which operates retail outlets in Maine and other parts of New England. It is important to note, however, that cooperatives as well as contractual arrangements and government price programs provide a high degree of integrated operations in Maine's dairy industry.

Three dairy producer cooperatives exist in Maine; Yankee Milk which is a large regional cooperative in New England; MPG Dairy which is a subsidiary of Maine Potato Growers, Inc., in Aroostook; and Hancock County Creamery in Ellsworth which is a 17-member cooperative established in 1960 producing fluid milk and certain processed products - primarily ice cream. As mentioned earlier, Yankee is estimated to control up to two-thirds of the milk produced in Maine. It is one of three federations which control 80% of New England's milk supply. This type of market dominance by producer cooperatives is common throughout the U.S. dairy industry. One federation controls 70 percent of New York-New Jersey area production. The largest federation, Associated Milk Producers, Inc., made up of over 100 coops with milk sales well over one billion dollars annually, controls more than 70% of the market in 14 midwest federal market order areas including most of the Minnesota-Wisconsin area. Federations influence regional milk supplies and prices in a number of ways. One way is through the establishment of a standby pool fund with which to pay outside producers not to deliver milk into their area when there is a deficit. Another way of limiting supply is to assign producers base plans under which they may not produce more than an historical average. A third way is through the negotiation of full supply contracts whereby the cooperative becomes the sole source of supply to a dairy. Cooperatives further influence milk supply and prices by processing milk into Class II products for sale to the consumer marketplace or to the

Commodity Credit Corporation. In some dairy cooperatives, members are paid through a cooperative pooling arrangement where returns are based on overall milk prices over a period of time. Yankee Milk does not use the pool method but pays members according to returns from each individual sale. Dues paid by member farmers to Yankee Milk are currently 12¢ per hundredweight of sales plus $25 per month.

With the exception of full service contracts by cooperatives, forward contracting is extremely limited in the dairy industry due to the constant nature of production and marketing. In addition to the obvious ties of producers to cooperatives, agreements of sorts do exist in some cases between independent producers and some of the smaller dairies. There are no futures traded formally for dairy products.

The National Farmers' Organization (NFO) plays a role in the dairy industry. About 100 farmers participate in NFO's milk program in Maine which consists largely of price negotiation. NFO members may truck product to one of the milk reload stations in Maine where processors in Maine or out-of-state may purchase supplies as necessary. Cost of production contracts are sometimes negotiated with processors. A current NFO effort involves a feasibility study of developing a hard cheese plant in Maine to process surplus milk.

BEEF, SHEEP, SWINE, AND GOATS

PRODUCTION TRENDS

Beef

Beef production has not played a major role in Maine's agricultural economy in the past. Cash receipts from the sale of cattle and calves amounted to $7,521,000 in 1976 - only 1.6% of total cash farm receipts. As indicated in Table 1, the number of cattle and calves produced in Maine declined from 40,450 in 1950 to a low of only about 25,000 in 1973. 1978 production is estimated at 30,000 head compared with a dairy herd of approximately 60,000 head. Farm prices over this same period have fluctuated from a low of 9.4 cents per pound in 1955 to a high of over 33 cents per pound in 1973. The average price in the 1970's has been 25 cents per pound. It is estimated that about 80% of beef animals in Maine are sold for meat while another 20% are purebreds sold for breeding stock.

TABLE 1

Beef Production: Volume and Value*

Year	Volume No. of Cattle & Calves	Farm Price for Beef Cattle (cents per lb.)
1978	30,000	-
1976	27,640	25.80
1975	29,410	22.40
1974	26,680	27.30
1973	25,095	33.10
1972	27,820	24.20
1971	29,520	21.10
1970	33,630	21.00
1965	32,775	14.50
1960	36,685	15.20
1955	N/A	9.40
1950	40,450	N/A

* Data is for animal breeds that are raised for beef production and does not include dairy-beef types.

There are two major types of meat animals used for beef production in Maine: standard beef cattle and cull dairy stock. The standard breeds of beef animals such as hereford, shorthorn, angus and charolais are raised specifically for table meat. Most of these animals are raised in small numbers by part-time operators, slaughtered and packaged at custom slaughterhouses, and utilized for home consumption. Only a limited amount of larger scale production in standard cattle breeds occurs in the state. According to the Department of Agriculture, there is one large herd in Maine with more than 300 animals, and several herds of between 100 and 300 animals. These large operations with 100 head or more account for about 10% of Maine's beef cattle. As indicated in Table 2, the great majority of standard beef herds consist of less than 10 animals. A smaller number of herds are in the 10 to 50-animal range and are used as a supplemental income source for farmers with adequate grazing land. Cull

dairy cows (milk cows which are poor producers, dairy bull calves, and cross-breeds between utility milk cows and beef bulls) constitute another substantial source of beef production in Maine. Some meat from these sources is used for home consumption but most is sold to slaughterhouses for use in processed meat products.

TABLE 2

Distribution of Farms by Number of Beef Animals

(1974 farms with sales of $2500 and over)

Size	Number of Farms	Number of Animals
1-9	410	1565
10-19	102	1375
20-49	111	3083
50-99	10	615
100-199	3	708
200-499	2	
Total	638	7346

Raising beef animals on a small scale requires relatively small amounts of capital and time. The typical small beef cattle operation in Maine utilizes a small amount of idle farmland to raise one or two head of beef per acre. Simply constructed buildings for shelter are needed for young animals; larger animals spend most of their time grazing. Hay, corn silage, or other roughage crops must be stockpiked for winter feed. Grain, the largest cost item for dairy farming, is required only during the last two or three months for finishing before the animal is sent to market. There has been a certain amount of experimentation with alternative feed sources which might be substituted for expensive grain concentrates. Poplar trees and cull potatoes have been used as dietary supplements. Seaweed and foliage have also been utilized on an experimental basis. Most common breeds of beef animals are raised to the age of 18 - 24 months or until they weigh about 1000 pounds.

It is important to note that while meat production is the primary reason for raising or marketing beef animals in Maine, the production of hides is an important by-product of the beef industry. Some beef animal growers find private markets for their hides but the majority of hides are handled by slaughterhouses who retain the hides as part payment for their services and sell them to local tanneries.

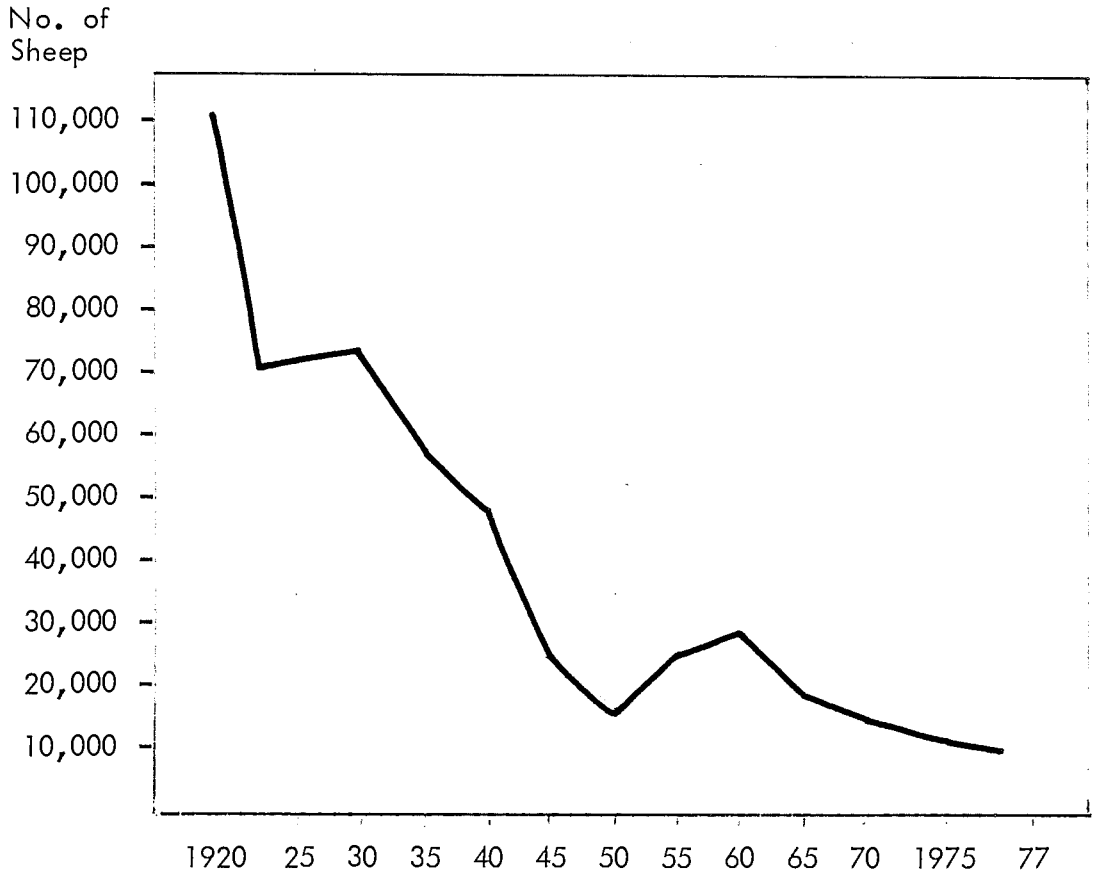
Sheep

USDA estimates that there were slightly over 11,000 sheep in Maine in 1977, about 35% of the total number of sheep in New England. Cash receipts from the sale of sheep and wool in 1977 were $169,000, accounting for only 0.1% of total cash receipts for Maine livestock products. As indicated in Figure 1, the number of sheep and lambs raised in Maine has fluctuated greatly since 1920 with the current population being only 10% of the 1920 population and the lowest level since that time. The number of farms with sheep has also declined dramatically from more than 7,000 in 1920, to 1,200 in 1950, to only about 400 in 1977. According to the 1974 Agricultural Census, more than 90% of Maine farms with sheep have flocks of less than 100 animals with most of these farms (over 70%) having less than 25 animals. Only 5 farms have more than 300 sheep but these farms account for up to

20% of Maine's sheep population. As in other agricultural industries, the greatest decline in production has been in smaller farms. The number of farms with more than 300 sheep has not changed since the early 1960's but their share of total production has nearly doubled due largely to attrition in smaller farms rather than an increased scale of operations on the larger farms.

FIGURE 1

Sheep Kept on Maine's Farms: 1920-1977



Meat production patterns for sheep operations are highly reliant on seasonal consumer demands. Meat lambs are raised for two types of markets: young lambs under 40 lbs., and older lambs at 100 lbs., or more. A heavy demand at Easter-time for young lamb has boosted production of 40 lb., lambs. Animals that do not achieve this approximate weight are finished out and sold as 100 lb. lamb later in the year. There is a great variation in the price received for meat, with prices for young lamb being almost 3 times as high as the price per pound for 100 lb. sheep.

TABLE 3

Volume and Value of Meat

Year	Volume Sheep & Lambs (in cwt.)	Value Sheep (per cwt.)	Value Lambs (per cwt.)
1977	5,620	-	-
1976	6,750	$24.00	$66.00
1975	7,850	22.00	62.00
1974	8,700	15.00	36.00
1973	7,850	12.00	38.00
1972	7,700	10.00	30.00
1971	8,150	9.00	25.00
1970	9,250	8.60	24.00
1965	11,550	6.40	20.70
1960	18,420	6.30	18.70
1955	N/A	6.00	18.80
1950	8,980	N/A	N/A

Sheep produce an average of 7 to 8 pounds of wool per animal each year. 11,500 sheep were shorn in Maine in 1974, producing over 86,000 lbs. of wool. Wool production in the state has declined as much as 87% during this century, dropping from 665,453 pounds in 1920 to only 86,000 pounds in 1974 (see Table 3).

The invention of synthetic fabrics and their positive features such as shrink resistance, non-allergic qualities, and reduced cost has played a major role in the decline of wool production nationwide. It is speculated, however, that the market demand for wool may increase due to technological improvements in wool processing (such as shrinkage prevention), and increases in synthetic material costs due to petroleum price increases.

The farm price for wool has also had a role in decreasing production. The value of wool today is about the same as it was in 1920 (57¢ per lb. vs 62¢ per lb. in 1920). Farm income from wool production reached its lowest point in 1940 when wool brought only 24¢ per pound. Imports were a major factor in depressing wool prices domestically during the 1940's. In 1954 the National Wool Act created income supports to wool producers in the form of direct payments. The Act is still in effect today. The 1979 support price will be $1.15 per pound.

Wool production had become secondary to meat production until a decade ago. Today it has regained its importance due to the combination of price supports and a revitalized demand by the consumer.

TABLE 4

Volume & Value of Wool Production in Maine

Year	Lbs. Wool Shorn	Total Value	Value Per Lb.
1974	86,000	$ 49,000	$0.57
1969	110,000	50,000	.45
1964	138,090	84,235	.61
1959	200,460	98,224	.49
1954	159,341	84,451	.53
1950	104,503	40,047	.38
1945	184,990	81,021	.44
1940	222,188	53,323	.24
1935	345,437	86,359	.25
1930	445,283	173,469	.40
1925	459,152	174,478	.38
1920	665,453	412,581	.62

Raising sheep requires little overhead investment and far less land than do larger meat and dairy animals. An average of 6 or 7 sheep may be kept per acre of land. Since the sheep's diet is 90% roughage with only 10% of the rations as concentrates, the cost of feeding a sheep is relatively low. Due to the dietary needs of the sheep and their size and grazing patterns, sheep can utilize land other animals can't. It is calculated that the minimum expense involved in raising a sheep is $25-30.

Fencing and predators have long been the two biggest problems for sheep raisers. Many strands of wire are needed because of the sheep's smaller size and electric fencing has not generally been effective due to the insulating effect of the wool. Currently a new type of electric fencing is being tried that costs about half the price of conventional fencing and is expected to keep predators away as well as keep the sheep in the pasture.

Hogs and Pigs

It is difficult to determine exactly how many hogs and pigs are raised in Maine since many are raised by non-farm households for home consumption. Census data reveals that the number of farms reporting pigs and the number of pigs being raised to be declining steadily. As indicated in Table 5, the number of farms raising pigs has declined from nearly 28,000 in 1920 to less than 800 in 1974. During the same period the number of pigs raised dropped from 91,000 to approximately 6,500. According to the Crop Reporting Service this declining trend may have changed in the past several years. 7,100 pigs were reported in Maine at the beginning of 1977 and 7,200 were reported at the end of the year. It is estimated that another 11,000 to 12,000 pigs were raised and slaughtered during the year. Table 6 shows the total production of pigs and their farm value since 1950. Production of pork today accounts for only 0.2% of Maine cash receipts from livestock products other than poultry. Cash receipts have increased from $681,000 in 1974 to $892,000 in 1977.

TABLE 5

Swine Production and Number of Farms in Maine

Year	Number of Farms	Number of Pigs
1920	27,996	91,204
1925	18,057	54,435
1930	12,166	34,166
1935	15,168	44,340
1940	10,714	34,780
1945	12,034	44,465
1950	6,293	27,813
1954	6,371	24,427
1959	4,134	24,646
1964	4,662	13,117
1969	609	7,350
1974	769	6,480

TABLE 6

Volume & Value of Pork Production in Maine

Year	Volume Hogs (cwt)	Value Cents per Pound
1977	30,130	-
1976	26,790	45.00
1975	24,810	45.00
1974	23,700	32.00
1973	22,960	36.00
1972	22,150	24.50
1971	29,310	18.00
1970	29,750	18.50
1965	33,306	18.60
1960	69,080	15.10
1955	N/A	16.30
1950	101,440	N/A

Most pigs are raised in small scale operations with a farm or homestead raising one or two for home use. According to the Census of Agriculture, only 6 farms in Maine had an inventory of more than 100 pigs in 1974, compared with 23 in 1964. In 1974, these large farms accounted for only one-quarter of Maine's total inventory of pigs compared to nearly one-half in 1964. In both years, farms with less than 10 pigs were by far the most numerous but, because of their small inventories, accounted for only a little more than 25% of total inventories. The larger litters are usually found near urban areas where easy access to large volumes of garbage reduces feeding costs. In 1974, 47 farms in Cumberland County (6% of Maine's pig farms) accounted for 23% of Maine's pig inventory (1,474 pigs). Other counties with large inventories of pigs in 1974 were: Waldo (716), Aroostook (805), Penobscot (611), Oxford (591), York (532), and Kennebec (404). These 7 counties accounted for 80% of Maine's pig inventory in 1974.

Raising pigs for home use is becoming more attractive to many rural Maine residents in the face of rising food costs because initial investments and cost of maintaining a pig are low. Pigs convert feed into meat relatively efficiently, requiring only 300-400 pounds of feed to produce a 100 pound weight gain. Pasturing pigs can be used as a means of supplying roughage for their diet. Clover pastures used in a crop rotation program on farms with other production programs is a good protein source. Other major low cost sources of food are waste milk and milk by-products, cooked potatoes, and table scraps, and garbage from schools, institutions and other public eating places. Garbage is usually high in fat, fiber, and protein and moisture. Commercial grain concentrates and minerals are used as supplements.

Goats

Goats are raised for milk, meat, and to a lesser extent - mohair. Mohair, according to the Census, has not been commercially produced in Maine since 1940. Goat production in Maine has been relatively stable since 1945 with about 1,000-1,500 farms keeping 2,400-3,000 goats. A survey by the University of Maine recently indicated that 40% of Maine goat population is located in Hancock, Waldo, and Cumberland Counties. Hancock County is the most important goat area with 15% of the goats and 20% of the farms with goats. Four major breeds are found in Maine: Nubians, Alpine, Toggenberg, and Laanes, with Nubians the most numerous. Herd sizes are samll, usually a half dozen or so goats per farm. A handful of producers have between 50 and 100 goats. According to the 1974 Census, nearly 99% of Maine farms with goats have sales of less than $2,500, indicating that goats are not involved in more than several commercial farming operations.

Feed is the major cost in raising goats. Goats require grain, beet pulp or a substitute, and hay. They are usually raised to the age of one year before breeding although earlier breeding, as in the dairy industry is becoming more common. Milk production averages close to 1,500 pounds per animal per year compared to 11,000 pounds per dairy cow. A milk goat may be productive for 8 to 12 years. Most Maine goats are purebred stock and breeding is frequently done on a lend-lease basis among keepers of herds.

PROCESSING AND MARKETING

There are 13 slaughterhouses, 22 meat processors, and 35 establishments which perform both functions in Maine. In addition there are 65 custom slaughterhouses which are not permitted to sell meat to the public but are restricted to cutting and wrapping meat on an individual basis for home users. The number of such establishments has been increasing in recent years. All commercial slaughterhouses and processors employ full time inspectors while custom slaughterhouses are inspected on a periodic basis. An average of 700 animals per month are killed for meat in Maine slaughterhouses. The total volume of meat processed by inspected slaughtering and processing firms in Maine (excluding custom operations) in 1977 was 38.5 million pounds. Most of this volume was beef with a lesser amount of sheep and hogs. Employment in Maine slaughterhouses and processing plants ranges from one employee to almost 170 employees. The payroll for these establishments in 1977 was more than $6,000,000.

In the case of beef, many producers sell meat directly to consumers and engage a custom slaughterhouse for slaughtering, cutting, and wrapping the meat. In other cases, particularly for utility grade beef, animals are sold by the producer to slaughterhouses who in turn sell to either local meat processors and retailers or, in several instances, directly to the public. Another local marketing option for beef producers is to sell in one of 5 weekly livestock auctions in Maine. Animals sold by auction are purchased primarily by cattle dealers who will re-sell to other producers or to meat processors and slaughterhouses. Cattle dealers act as an important link between farms and markets in both the dairy and beef industries by performing transportation and marketing functions. Very little Maine beef is sold out-of-state or even in major retail meat operations in-state. Maine imports approximately 85% of its beef requirements and nearly all beef sold in supermarkets is imported from other regions of the U.S. - primarily the midwest. The primary reason supermarkets and other sizable commercial food outlets do not sell locally produced beef (or other meat) is that it is not produced in sufficient quantity to constitute an adequate and dependable supply. It is apparently easier for most outlets to get volume shipments from large beef production areas.

In contrast to beef, most of Maine's lamb is exported from the state. Most sheep sold for meat are trucked live to large processors in either Boston, Connecticut, or Pennsylvania and then slaughtered and marketed in northeast metropolitan markets. Most sheep raisers in Maine and New England organize transportation pools to assist in marketing their animals. Of the 4,000 or so animals marketed for meat in 1977 about 76% were 40 pound lambs. These "hot house" lambs are raised to about 8 weeks and marketed heavily around Easter time. Approximately 25% of the commercial sheep and lambs produced in New England each year are marketed during the months of March and April to the Easter market. Lambs that are not ready for the Easter market are sold largely for the frozen food trade, by auction, cattle dealers, or utilized for home use. It is estimated that home use accounted for as many as 1,000 animals, both hot house and larger animals, in Maine in 1977.

Most Maine grown wool is marketed in the Maine Wool Pool, which operates in conjunction with the Maine Sheep Dealers Association and the Department of Agriculture. Most of the wool is sold through the Boston National Wool Marketing Cooperative. The wool is shipped to Chelmsford, Connecticut where it is blended to create uniform quality and then shipped south to be spun.

As noted earlier, a large proportion of the pigs raised in Maine are for home use and are slaughtered in custom slaughterhouses. The exact number of pigs utilized in this way is not know but may approach 25% of total production. 2,257 pigs were slaughtered in inspected, commercial slaughterhouses in Maine during 1977. Three major processing firms accounted for nearly all of this amount. All three rely entirely on local producers for supplying pigs, and all three market most of the pork they process in local outlets. About

half of the pigs marketed in Maine each year are shipped from the state live to a consolidation point in Littleton, Massachusetts and then trucked to processors in Pennsylvania or further west. Expansion of slaughtering and processing operations in Maine to accommodate the volume of pigs currently exported from the state is expected to occur if and when the scale of local pig production increases sufficiently to justify these investments.

The marketing of goats for meat is not widespread in Maine - less than 50 farms sell meat and only one or two appear to have a significant volume of sales. Most goats used for meat are slaughtered and packed in custom slaughterhouses for local consumption. A small number of goats are shipped out-of-state live to meat markets elsewhere in New England. In the past, meat from young goats was often sold as lamb to obtain higher prices but recently demand for chevon (goat meat) has brought prices to over $1.00 per pound. Goats are also used for breeding purposes and increasingly for shows. Nearly a dozen country fairs have goat shows. Goat sales for breeding purposes are made both in-state and throughout New England - particularly to Vermont. Current prices for milk goats are a minimum of $75-100.

The most important product from goats is milk. Most goat milk is consumed at home or by selected customers and is used raw. According to a University survey of 145 goat raisers in Maine, 10% sell milk to the general public and 39% sell to selected customers. About half of the goat raisers surveyed feed goat milk to their livestock, with about half of these using more than 60% of the milk for livestock. There are no middlemen as processors in the goat milk market system. A handful of people who sell goat milk to the public pasturize their own milk. Several attempts have been made to develop commercial dairy operations for goats but, due to the small scale of the industry, none have yet succeeded.

GOVERNMENT PROGRAMS AND INDUSTRY COORDINATING MECHANISMS

Federal Programs

The federal government's primary role in the livestock system involves 1) the inspection of processing plants and slaughterhouses to ensure sanitary conditions and the humane treatment of animals, and 2) the inspection and grading of meat for human consumption. Federal regulations apply directly to operations involving the interstate shipment of meat. There are 3 slaughterhouses and 5 markets in Maine which are federally regulated at present. These operations involve the manufacture and sale of processed meats.

The production of wool is affected strongly by the 1954 National Wool Act. The Act established a system of direct payments to producers of wool. It was created in response to the fact that wool prices were being depressed by imports rather than by surplus domestic production, as is usually the case in other agricultural commodities. Income supports of between 60% to 110% of parity were allowed by the Act. Direct payments under the 1954 Act have been used up to the present. The program is administered locally by the Agricultural Stabilization & Conservation Service. Under the program, payments for wool (and mohair) are based on the percentage needed to bring the average return received by producers up to the support level. Once the average percent is figured it is applied to all sheep raisers who market wool without regard to the actual price the farmer received. This is intended to serve as an incentive to producers to improve the quality of wool and marketing practices. Thus if the difference between the average price received and the support level calculated to be necessary for that year is 25%, for example, each grower would get 25% more money than his/her actual market price.

Maine Department of Agriculture

Several programs in the Department have a direct effect on large livestock industries. The Division of Animal Industry plays an important role in disease prevention and control for beef, sheep, pigs, and goats as well as other livestock industries. The Division of Inspections is charged with maintaining an inspection program for all slaughterhouses and meat processing operations in Maine. Commercial operations require fulltime inspection during any slaughtering or processing operations while custom establishments are inspected periodically for sanitary purposes. The Division also supervises goat milk inspection as necessary. The Division of Promotions provides services to the livestock industry by promoting livestock products and publishing news and prices in a weekly newsletter. Additionally, the Department assists the sheep industry through joint sponsorship of the State Wool Pool which establishes a minimum price for wool produced in the state. The price is established based on the best market price at any given time for exported wool. A grower has the option of selling at the current price, holding back the wool in hopes that the price will be better at some later date, or selling to a local woolen mill. Wool from the pool is purchased by the National Wool Marketing Corporation, a private organization owned by wool producers.

University of Maine

The Cooperative Extension Service currently has one livestock specialist for beef, sheep, pigs, and goats. This specialist is also involved in other livestock industries, particularly dairy. The most important current function of the Extension Service is educational, primarily in doing field meetings with growers to discuss management, nutrition, and health concerns. There is currently no research work being done on these commodities at the Agricultural Experiment Station except as a by-product of the dairy research program.

Trade Associations

The Maine Beef Producers Association provides a certain amount of coordination and public liaison for Maine beef producers. Two associations are important to the sheep industry

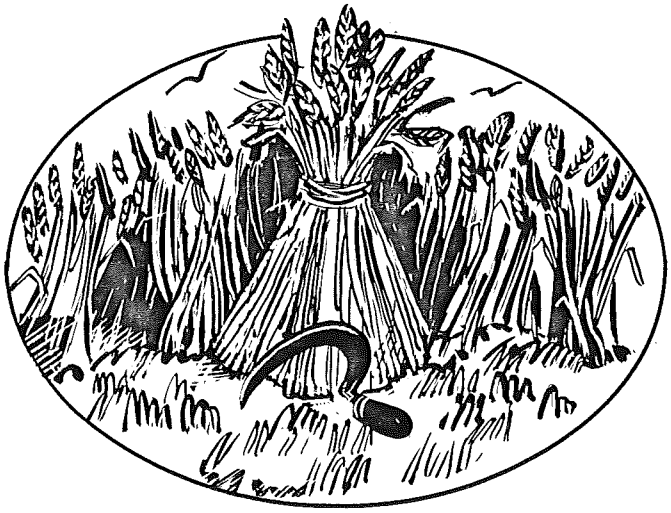
at the state-level. The Maine Sheep Breeders Association is a private corporation of sheep raisers. It operates the Maine Wool Pool and assists raisers in the cooperative purchasing of supplies and equipment. A temporary association, the Sheep Task Force, was recently organized by the Department of Agriculture to promote the expansion of the sheep industry in Maine. It is expected to analyze a number of issues and opportunities in the sheep industry including education, financial needs, production techniques, leadership opportunities, marketing, and feed issues.

There are four local goat associations in Maine: the Southern Maine Goat Association, the Central Maine Dairy Goat Association, the Acadia Goat Association, and the Blue Hill Goat Association. All function primarily as promotional entities with their main activity being the coordination of goat shows at state fairs. The Maine Dairy Goat Council is a private statewide organization made up of members of the four regional associations and any other raisers or persons interested in goat raising. The Council has about 50 members. The Maine Dairy Goat Council functions as a promotional entity and also as a vehicle for information and education for both the public and for goat raisers. Its primary service is the sponsorship of a classification program, which is in its third year. Maine is the first state to develop such a program for goats. The classification program for goats is similar to the dairy herd classification program. It serves to improve breeding practices by classifying strengths and weakness of both bucks and does and thereby providing a mechanism for matching breeding traits in order to produce superior offspring. There are two National dairy goat associations, the American Dairy Goat Association and the American Dairy Goat Society. Their functions center around herd improvement practices and as such sponsor national programs such as the registration of purebred animals, classification for breeding, and health improvement programs. There are also associations for specific breeds of goats.

Integration, Cooperatives, and Contracting Arrangements

Coordination in these livestock industries comes primarily from trade associations. The very limited amount of integrated operation is largely in the form if direct marketing of small amounts of meat or milk by small producers. There are no cooperatives and contracting is not an important coordination method between producers and processors. Auction arrangements play a role in marketing by providing an open market mechanism for several kinds of livestock sales. In some areas telephone or electronic auction systems have been developed to further facilitate marketing coordination. Such systems have not been developed in Maine however.

Grains & Other Commodities



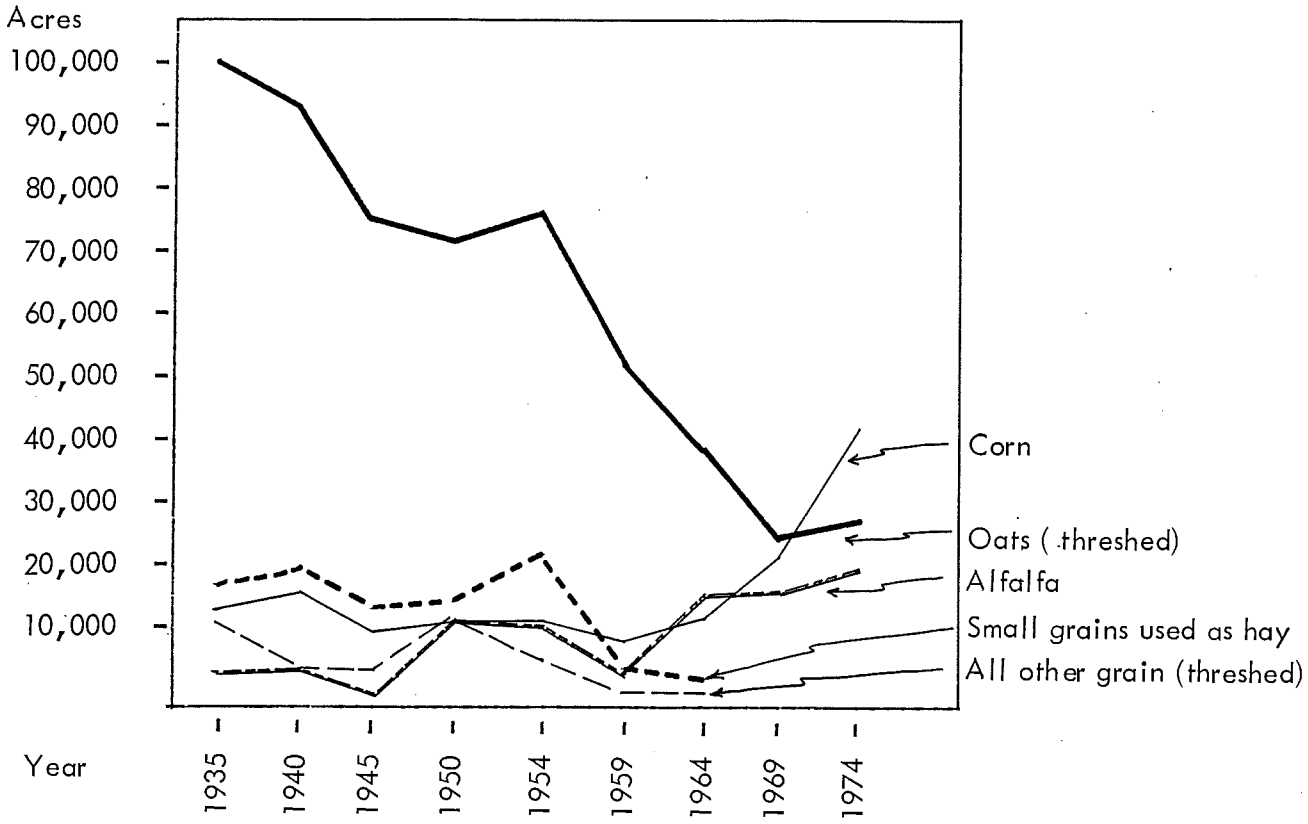
GRAINS AND FEED CROPS

In terms of both production volume and acreage, grain and forage crops are an important part of Maine's agricultural economy. Acreage for major feed crops in 1976 were as follows: hay/haylage, 220,000 acres; feed corn, 46,000 acres; oats, 27,000 acres; and alfalfa, 20,000 acres. Up to 10,000 acres of miscellaneous small grains for feed or threshing were raised, bringing the total acreage for such crops to approximately 320,000 acres. As indicated in Figures 1 and 2, there has been a significant overall decline in acreage in these crops in the past 40 years. Total production in 1935 was on more than one million acres. Reduced production of hay and oats has accounted for most of the decline. Among the major crops, only alfalfa and feed corn have increased signficantly in acreage in the past several decades. Both crops are important to livestock industries in Maine, with alfalfa primarily used as dairy feed, and corn used for both dairy and poultry.

FIGURE 1

Acreage in Animal Feed (except Hay) in Maine

1935-74

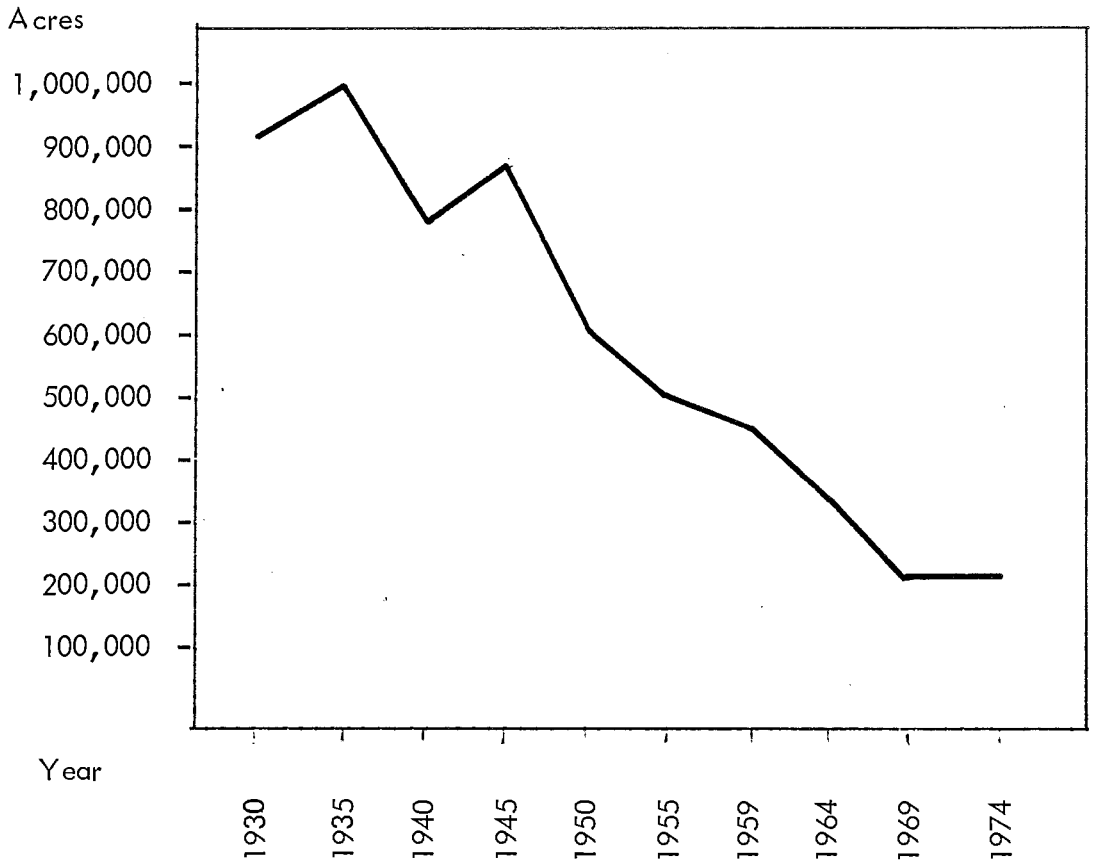


Source: U.S. Cenus of Agriculture

FIGURE 2

Acreage in Hay Production in Maine

1935-74



Hay is the largest source of locally grown animal feed. Virtually every farm with livestock produces some amount of hay, be it sparce grazing land cover or cultivated hay cured for winter storage and use. While there is some amount of wild hay in Maine, hay is generally a cultivated crop with hay fields being re-seeded periodically and the land treated with lime, animal manures, and other fertilizers. The most common variety of hay is a timothy and clover mixture. Alfalfa, a legume crop is also increasingly used as hay in Maine. Alfalfa is usually grown as a single crop although it may also be grown in combination with various grasses including bromegrass, birdsfoot trefoil, and orchard grass.

In past years, hay was typically cut and cured in the field, raked, and hauled loose in hay wagons to barns for storage. Due to technological changes in the past three decades including the development of hay balers, hay is now usually packed very densely and handled more efficiently. Improved efficiency in the handling of hay helped increase production on farms and was a factor in the increase of dairy herd sizes. Most hay produced in Maine is stored in the form of bales. Another storage method frequently used

is as haylage. In this case the hay is cut and stored immediately in a silo while still wet, rather than after sun-drying as in the case of baled hay. By eliminating the curing process fewer nutrients are lost. Hay is frequently stored in this manner at the first cutting or in a late fall cutting when the climate for curing is poor. Some farms store all their hay as haylage as a matter of preference. Alfalfa is often used as silage. It is a particularly attractive feedcrop due to its high protein value as well as high yields per acre. Because it is a legume, with nitrogen-fixing qualities, it is also valuable as a rotation crop. Table 1, indicates recent production figures for hay (including alfalfa) in Maine.

TABLE 1

Hay Production in Maine, Including Alfalfa

1971-76

Year	Acres Harvested (1000s)		Production (1000's Tons)		Tons per Acre	
	All Hay	Alfalfa	All Hay	Alfalfa	All Hay	Alfalfa
1976	212	20	433	74	2.04	2.45
1975	214	20	354	75	1.65	2.60
1974	218	18	371	75	1.70	2.25
1973	215	18	376	41	1.75	2.28
1972	235	18	362	36	1.54	2.00
1971	237	20	421	52	1.78	2.60

Corn is Maine's most important annually cultivated feed crop. It is used primarily as a silage crop and fed to dairy and beef animals. Total acreage has risen dramatically in the past decade despite a decline in the number of farms reporting feed corn production. Production has grown from approximately 10,000 acres in 1964 to more than 42,000 acres in 1974, an increase of about 300%. Yields per acre have also increased steadily. in addition to utilization as silage, some corn used for grain - usually of the high moisture corn type. Local production of high moisture corn has also been increasing in recent years with 4,600 acres reported in 1974, the highest acreage since 1940. The 1974 yield was 318,000 bushels, a significant increase over the 1940 yield of about 207,000 bushels. Recent figures on corn production in Maine are given in Table 2.

Corn is grown primarily by dairy farmers for use an an energy source in milk production, and for fattening animals for market. Some corn is grown as a rotation crop by potato farmers who sell the corn for animal feed and plow the stalks under as fertilizer. As a silage crop the entire stalk is chopped and stored for later consumption. High moisture corn is also stored in silos, but only the ears are ground up.

Because corn is a cultivated row crop requiring annual planting, much of Maine's farmland is not suitable to corn production due to shallow topscils, small field acreage, and relatively steep terrain. Forage crops are found to be much more suitable to Maine circumstances since they act as a deterrent to erosion and are less dependent on good topsoils. High fertilizer, pesticide, and herbicide requirements are another deterrent to greater corn production in some cases. As noted previously, corn production has increased in recent years despite such difficulties. The tremendous demand for feed corn in dairy and poultry operations in Maine is largely responsible for this increase. The poultry industry in particular imports well over half a million tons of feed corn from the midwest each year. At least one large poultry operation has been increasing local corn production recently and in 1978 provided for almost 7% of its needs via local production. It would

take 200,000-300,000 acres of corn, however, to satisfy current feed corn needs in Maine's poultry industry.

TABLE 2

Corn Production in Maine: 1971-76

Year	Acres Planted (in thousands)	Production (thousands of Tons)	Yields per Acre (Tons)
1976	46	621	13.5
1975	44	572	13.0
1974	40	500	12.5
1973	37	444	12.0
1972	36	525	14.6
1971	32	528	16.5

The production of oats in Maine, as indicated in Figure 1, has declined dramatically in the last 40 years. During the 1970's, as indicated in Table 3, acreage planted has ranged between 44,000 and 51,000 acres with production ranging from 1.5 to 2.5 million bushels. More than 90% of Maine's oats production is in Aroostook County where oats are important as a rotation crop to potato farmers. As potato acreage has declined, acreage in oats has increased slowly. Oats are harvested and threshed largely for livestock feed - largely for beef cattle and horses although some amount is used for poultry, dairy, sheep, and also human consumption. A considerable volume of oats raised in Aroostook are shipped to the New York area for use as horse feed. Total sales in 1976 amounted to about $2 million. Table 3 shows oats production data in Maine for 1971-76.

TABLE 3

Oats Production in Maine: 1971-76

Year	Acreage		Production (in bushels)	Yield Per Acre (in bushels)
	Planted	Harvested		
1976	51,000	37,000	1,924,000	52.0
1975	49,000	42,000	2,268,000	54.0
1974	45,000	40,000	2,480,000	62.0
1973	44,000	34,000	1,564,000	46.0
1972	46,000	32,000	1,984,000	62.0
1971	45,000	33,000	1,848,000	56.0

Small amounts of other grains are produced in Maine. These include wheat, barley, rye, and buckwheat. As in the case with oats, these are grown in rotation with potatoes in Aroostook County. 1977 acreage figures show less than 1,000 acres of wheat and barley, about 1,300 acres of rye, and several thousand acres of buckwheat. Acreage in all of these grains appears to be increasing slowly as potato acreage decreases. Buckwheat, in particular, is viewed as a crop with expansion potential due to increasing demand for buckwheat flour. Most buckwheat sold off farms in Maine is sent to New York for milling. A large amount is also plowed under as green manure by Aroostook farmers. A relatively small amount of these grains are used as seed.

While grain production is important as a rotation crop with potatoes, it is important to re-emphasize the importance of grain and feed crops to Maine's livestock industries - especially the dairy industry. Because of the high cost of feed, dairy farmers produce as much of their feed as possible. The type of feed raised is determined by cost and preference as well as soil types and topography on individual farms. Good farmland is usually used to produce corn while poorer, steeper acreage is used for forage crops. Various crops meet various nutrition requirements for livestock with corn and grasses important as a source of carbohydrates and certain minerals, and alfalfa and clover important for protein. Purchasing needs regarding feed concentrates on individual livestock farms are dependent on feeds produced on the farm. It is good management for dairy and other livestock farmers to raise as much of the more costly feeds as possible in order to limit the need for purchasing such feeds. While dairy farmers have been able to satisfy a substantial portion of their feed requirements with local feeds, the poultry industry, due to problems of climate and availability of suitable farmland, must rely almost exclusively on feeds imported from the midwest. The production of grains to meet this feed deficit would require several hundred thousand acres of farmland with a quality of soils, terrains, and climate unavailable in Maine.

GOVERNMENT PROGRAMS AND INDUSTRY COORDINATING MECHANISMS

Federal Programs

A number of USDA commodity programs for grains and feed are administered in Maine by the Agricultural Stabilization and Conservation Service (ASCS). These programs are as follows:

(1) Commodity support operations through loans to farmers, through direct purchases of commodities from farmers and processors, and through payments on certain commodities when prices fall below specified support target prices.

(2) Administration of a farmer-owned Grain Reserve Program, authorized by the Food and Agriculture Act of 1977 and effective March 1, 1978.

(3) Production adjustment to balance supply and demand for specified commodities, through cropland set-aside and other acreage diversion as determined by the Secretary of Agriculture, and acreage allotments and marketing quotas, when applicable.

(4) Management of Commodity Credit Corporation (CCC) inventories when acquired under commodity programs - through sales, donations, storage, and related processing and shipping arrangements.

(5) Disaster activities to augment feed supplies for farmers and ranchers in areas where natural disasters have reduced feed, and to provide emergency conservation assistance in restoring farmlands seriously damaged by flood, drought, or other natural disaster; and emergency preparedness activities to assist in planning for civil defense.

State Programs

The Maine Department of Agriculture conducts an inspection program for grains to determine quality for ASCS loans proposals.

The University of Maine provides assistance to farmers in feed production via one feeds specialist and several areas specialists with part-time grain responsibilities in the Cooperative Extension Service. These activities primarily involve assistance to dairy farmers in the selection of corn seed, erosion control, and related feed crop management issues. The Agricultural Experiment Station has an annual budget of approximately $60,000 for research activities related to forage, small grains, and corn. This budget supports the equivalent of 2 man-years of salaries and related expenditures involving such matters as varietal testing, no-till production techniques, and greater home-grown production of feed for protein. Like the Extension program, this research tends to be focused on dairy needs.

BEEKEEPING

PRODUCTION

There are currently more than 5,000 registered colonies of bees in the state, owned by nearly 450 beekeepers. The Department of Agriculture estimates that this amounts to about 80% of the beekeepers and most of the bees in Maine, since all larger operations are registered. By comparison, the Census of Agriculture indicates that there were nearly 14,000 colonies and 4,000 keepers in 1920, and nearly 6,000 colonies and 2,000 keepers in 1950. A bee colony contains between 40,000 and 60,000 bees depending upon the condition of the hive. Historically, bee keeping in Maine has been largely an auxilliary activity rather than a livelihood. Up to the present day many farms raising crops that depend upon bees for pollination keep several hives. As indicated in Table 1, 84% of the beekeepers kept less than 10 hives in 1978 while 9 beekeepers own 52% of the colonies registered in the state.

TABLE 1

Distribution of Beekeeping Operations in Maine by Size

	Keepers		Colonies	
Size Class	Number	Percent of Total	Number	Percent of Total
1-4	275	65	550	11
5-9	80	19	560	11
10-19	28	7	420	8
20-49	18	5	600	13
50-99	4	1	280	5
100 or more	9	2	2,640	52
Totals	425	100%	5,050	100%

Income from beekeeping is derived from the sale of honey and the rental of bees for pollination. The production of wax was also a significant income producer in the past but is very limited today. Maine is an importer of bees during the pollination season. It is estimated that Maine beekeepers provide about half of the pollination services required by large Maine crop growers.

Of the dozen large beekeepers in the state, most winter their bees in Florida and neighboring states. They work their way north in the spring, arriving at the Maine orchards and blueberry barrens. Most of the bees imported from non-Maine keepers come from neighboring states and southern areas along the eastern seaboard. Bees are trucked from one pollination site to the next. Migration is also undertaken to provide a warmer climate for bees during the winter. A hive of bees will consume 60 lbs. of honey through the winter in Maine, whereas in warmer climates they will consume less. Work is currently being done to develop an air-conditioned building in which bee hives could be stored through the cold months. Results show that bees kept under these conditions consume only about 20 lbs. of honey during the dormant period.

Non-migratory bees tend to be kept in areas of the state where there is a large amount of agricultural land in production or fields. This is primarily because honey production is

dependent on a large volume of plant pollen. Hobby raisers with just a few hives each are located throughout the state. The counties with the largest number of hives are Oxford (1,085), Penobscot (1,064), and Kennebec (786). Secondary counties include York, Cumberland, Androscoggin, and Waldo.

There are no accurate figures on honey production in the state. A hive may produce between 25 and 35 lbs. of honey per year in Maine. The short pollination season and the lack of abundance of crop vegetation are primary limiting factors to large scale honey production in the state. In the cropland of the midwest a colony of bees can make about 150 lbs. of honey per year. The amount of honey produced by bee colonies which are moved to successive crops for pollination is much higher since the pollination season is extended by following the season from Florida to Maine. Honey production within the state requires beekeepers to move their hives from crop to crop as different crops reach pollination stage. The honey business, then, is highly dependent upon the kinds and volumes of crops raised. Blueberries, apples, buckwheat, and raspberries are primary crops which provide good honey yields.

MARKETING AND UTILIZATION

The sale of bees in Maine is very limited but the rental of bees for pollination of crops is a growing business. Rental fees paid for pollination service range from $18 to $30 per colony with an average of about $25 per colony. In addition to the rental fees the keeper gets revenue from the production of honey.

Most honey produced in Maine is consumed locally. Exports of honey tend to occur only when there is an exceptionally good production year. Most small producers utilize their honey solely for home consumption or market it either by direct sales to other individuals or through roadside stands. Large producers market honey on supermarket shelves. Some honey is also sold in bulk (61 lb. containers) to cooperatives and health food stores. The current retail price for honey in Maine is $1.30 to $1.50 per pound. Wholesale prices range from .46 to .52 cents/pound.

While much honey sold is blended honey, some prime quality honey is identified by the crop from which the honey was produced. Such honey is often sold in specialty and gift stores where returns are higher. Strong varieties of honey are frequently sold to bakeries where they are used along with sugar. Since Maine bees are sent to many other states for pollination, much honey from Maine-based colonies is produced out of state. As a general rule the honey is marketed where it is produced rather than being brought back to Maine. One large producer in Maine sends his bees to South Dakota once the blueberry season is over since there are thousands of acres of wild sweet clover there.

The major factors affecting the marketing of honey are production volume and cost. Since Maine is not a good state for honey production both in terms of climate and vegetation cover, honey cannot be produced as cheaply as it can be in the midwest. Because of the great volume produced in those regions a beekeeper can operate with a profit margin as low as 2 or 3% while the Maine operator must have a 5-10% margin. The difference in cost makes competition with out-of-state producers very tough. It has also been estimated that as much as 75% of the honey consumed in the state is imported. Most imported honey is packaged in its state of origin and imported through wholesalers. Most honey is sold in 8 oz. and 1 lb. bottles. Just 3 or 4 large beekeepers account for most of the honey packaged in Maine. Many of the smaller producers sell to larger producers for packaging. As a rule, imported honey has been charcoal filtered, a process which removes many of its natural impurities and much nutritional content. Maine-produced honey is usually only strained.

GOVERNMENT PROGRAMS AND INDUSTRY COORDINATING MECHANISMS

The Maine Department of Agriculture requires registration of all bee colonies in the state for disease control purposes. American and European Foulbrood is a highly contagious disease that effects bee colonies. The MDA inspects and certifies that colonies are disease-free. Laws governing the interstate movement of bees requires that colonies be certified before they leave the state. There are no specific research or assistance programs available to the bee industry through the University although several Extension Agents are knowledgeable about this industry.

The Maine Beekeepers Association is the only statewide organization of beekeepers. It has a membership of about 300 beekeepers, most of whom are hobbyists. The Association is a non-profit organization whose primary function is education of beekeepers in industry procedures and laws, and also education of the public with respect to the art of beekeeping and its role in agriculture.

There are no cooperative or contracting arrangements in the bee industry. Integration exists to the extent that the large beekeepers are also involved in packaging and marketing operations for their honey and the honey of other producers. Smaller producers also do a certain amount of direct marketing to co-ops and retail outlets.

MAPLE SYRUP

PRODUCTION

Between 1969 and 1974, maple syrup production fluctuated between 7 and 10 thousand gallons, with the highest yield occurring in 1970 and the lowest in 1974. This general level continued through 1978. About the same quantity of syrup was produced around 1950 while considerably larger quantities were produced around the turn of the century. Maine is the ninth largest producer of maple syrup in the country. Vermont and New York by far the largest producers, followed by other states in New England and the upper midwest.

There are few large producers in Maine and as the existing large producers retire, no one appears to be replacing them. The numerous small producers provide for their own needs and those of a few other neighbors, friends, and local retail trade. There are presently about 50 producers who are on the mailing list of the Maine Maple Producers Association. A significant number of producers are dairy farmers seeking to augment their farming income. Most Maine maple syrup producers are located in the north central part of the state - Franklin, Somerset, and Penobscot counties - although there are a number of producers in areas bordering on Canada that produce significant quantities.

Given the Maine climate and availability of trees, there is probably substantial potential for expansion of maple syrup production. Improved forest management could bring many abandoned stands back into production. Many of the new producers are people who have recently moved into Maine and produce on a small scale.

MARKETING AND UTILIZATION

Since Maine is surrounded by 3 larger syrup producers (Vermont, New Hampshire, and Massachusetts), most Maine syrup is marketed within the state. Some of the producers in the Canadian border area sell their bulk sap to Canadian processors but some of the finished syrup finds its way back into Maine as well as elsewhere in the northeast. Most sap is boiled down to syrup and marketed in the liquid form. Production of maple candy in Maine is extremely limited.

Most syrup is either direct marketed to consumers or through retail stores. Most is consumed by Mainers except that which is marketed in specialty and gift stores and purchased by tourists. One major wood products manufacturer buys good quantities of syrup to send to major customers as complimentary gifts.

GOVERNMENT PROGRAMS AND INDUSTRY COORDINATING MECHANISMS

The Maine State Branding Law, administered by the Maine Department of Agriculture, governs the processing and sale of maple syrup. It must be graded, sealed, and labeled with the name and address of the packer.

The Maine Maple Producers Association, formed in the late 1940's, has about 50 dues-paying members who meet 4 to 5 times per year. Their major activities consist of promoting the quality and sale of their product. They are assisted in this effort by the Maine Department of Agriculture which has a display "Maple House on Wheels".

GREENHOUSE AND NURSERY OPERATIONS

PRODUCTION

According to Maine Department of Agriculture estimates, there are somewhere between 700 and 800 greenhouses in the state selling plants of all types. These consist primarily of owner-operated businesses selling cut flowers, potted plants, and annual and perennials seedlings. Some of these operations, particularly those selling only garden seedlings, are seasonal. While most (95%) primarily sell cut flowers and potted plants, a small number do upwards of 25% of their business in seedlings for farming and gardening. Some vegetable farmers start seedlings for sale as well as for their own use. It has been estimated that these greenhouse activities supply some $3 million in cash income for Maine growers.

Many nursery (as opposed the greenhouse) operations buy their stock out-of-state for resale in the same season. A few grow limited amounts of their own stock, while there is one large commercial nursery selling evergreen transplants. The nursery industry probably accounts for approximately $500,000 in grower sales in the state.

There is only one commercial seed-producing operation in the state. Other than seed potato operations, this operation uses 15 acres of their own fields for vegetable, bean, and grain-seed production, and contracts another 15 acres of seeds from other Maine farmers. Some seeds they sell are also grown out-of-state. The unique feature of this company is that it sells primarily organically-raised seeds. The company started in 1972. For 20 years prior to that there were no commercial seed production operations in Maine.

There has been a steady increase in production and sales in all greenhouse/nursery items recently. Of most note is the increase in potted plant sales. USDA estimates that the nursery and greenhouse industry generated slightly more than $2 billion in cash farm receipts on a national scale in 1977. This is a very significant increase from receipts of approximately $1.2 billion five years ago. The ten largest states in terms of production of nursery/greenhouse products are (with 1977 cash receipts in millions in parenthesis): California ($571); Florida ($249); Pennsylvania ($114); Ohio ($104); New York ($87); Illinois ($67); Michigan ($67); Oregon $58); New Jersey ($56); and North Carolina ($55). In some of the smaller northeast states, particularly Connecticut and Rhode Island, this industry is a major sector of the agricultural economy.

MARKETING AND UTILIZATION

Most of the market outlets for the greenhouse and nursery business are within the state. Most items are grown directly for retail sales although a few businesses grow for wholesale marketing to other retail establishments. This is particularly true since grocery stores and discount stores have started selling flower and vegetable seedlings and some nursery stock. Primary outlets for all these items include owner-grower operations, garden centers and large outlets such as grocery and discount stores.

There has been a substantial increase in the number of sales outlets in recent years providing much greater accessibility to consumers of these products. Much of the increased interest in plant materials can be attributed to newcomers to Maine bringing with them their varied familiarity with, and taste for, different plant materials. Homeowners are incorporating more and more plantings that either bear fruit or are attractive to wildlife. Dwarf fruit trees have become particularly popular recently. There is a potential for a steady increase in all types of sales as income and leisure increase.

While Maine's one local seed production company sells to a large number of instate customers, its sales are primarily mail-order which results in easy access to out-of-state

markets as well. The company sells directly to consumers and also fills cooperative or farmer orders in bulk quantity.

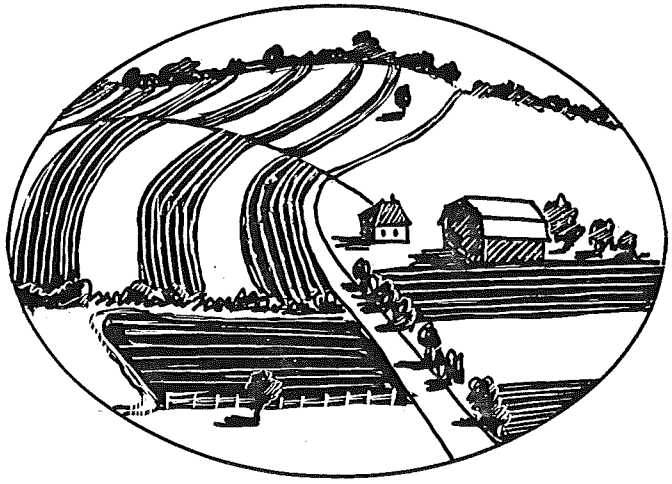
GOVERNMENT PROGRAMS AND INDUSTRY COORDINATING MECHANISMS

Because of disease considerations, all outlets selling plants have to be licensed by the Maine Department of Agriculture. New growers selling vegetable seedlings will have to comply with this licensing procedure, particularly since the green peach aphid was discovered on vegetable seedlings in Aroostook County. It is known to spread viruses to potatoes.

The Maine Nurseryman's Association is composed of some greenhouse but mostly nursery operations within the state. There are approximately 100 dues-paying members. Although most have mixed nursery/landscape operations, some specialize in fruit trees and plants. The organization was founded to educate its members and has 4 educational meetings per year as well as a number of short courses. They also undertake joint promotion programs and market their own label fertilizer.

II.

Issues & Recommendations



FARMLAND PRESERVATION AND CONSERVATION*

National Issues

Each week the United States loses 35,000 acres of valuable cropland to rural development as well as urban, industrial, and public works uses. This represents a current rate of loss of more than 1.8 million acres each year, of which about one million acres are estimated to be "prime" farmland. This loss is permanent and cumulative.

Although the loss of croplands to other uses has been a concern for many years, recent concern has intensified for a number of reasons. Increasing worldwide demand for food has put pressure on our agricultural resources to meet expanding food export needs for humanitarian reasons and for economic purposes related to the improvement of a poor balance of trade situation. Food exports are increasingly playing an important role in national diplomacy and in counteracting rising costs of imported oil.

At the same time that we are feeling the increased importance of maintaining high levels of agricultural productivity, we have experienced a leveling-off of yields-per-acre due to climatic changes, increasing costs of farm inputs, declining cropland fertility, and other reasons. This leveling-off of yields may not, of course, be permanent. In the past several decades technological developments have continually expanded the amount of food we are able to produce per acre of land. During this century agricultural production has doubled in the U.S., while the amount of land under cultivation has stayed roughly the same. Moreover, land now under cultivation producing unprecedented volumes of food may not be as inherently good as previous acreage due to current production acreage dependent on irrigation and various other technological modifications. It is important to note, however, that recent yield declines have re-established a direct relationship between the volume of food production and acreage which in the short run, and perhaps in the long run, could put substantial additional pressure on our croplands.

A recent nationwide study by the Soil Conservation Service (SCS) has added an additional dimension to the farmland issue. The study found that actual cropland reserves in the U. S. are approximately 111 million acres - only one-third of the reserve estimated in 1967. The reduction was caused by various irreversible development forces as well as revisions in the projected productive ability of various lands. Of the 111 million acres of reserve, SCS estimates that only about 24 million acres could be farmed immediately. The rest would have to be cleared, drained, and otherwise modified (often expensively) to sustain farming.

Integrally related to the farmland preservation issue are the issues of farmland conservation (maintaining land fertility and productivity), and open space. In the U.S. and in agricultural areas around the world many pasturelands have been degraded by generations of overgrazing; marginal croplands have been cultivated which are barely productive; fertile croplands have been impoverished of nutrients by poor agricultural practices; large tracts of agricultural lands have been lost to erosion and desertification.

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*This section was written with assistance from Kathy Sage

The United Nations estimates that 3.6 hectares around the world, supporting 250 million people, are subjected to severe resource depletion from such forces. Additionally, in many populated areas in the U. S. and elsewhere, the preservation of open space for aesthetic and recreational purposes is closely related to the farmland preservation issue. From this point of view, it is not only important that farming requires open space but also that open space may be maintained productively and compatibly by farming.

Maine: An Historical Perspective

An assessment of current farmland preservation and conservation issues in Maine benefits from a brief historical perspective of agricultural trends in this state. The history of agriculture in Maine is one of constant change and adaptation to outside forces. When Maine became a state in 1820, farming was the major occupation of its residents. Food production for self-sufficiency rather than commercial sale was the primary objective of most farmers in those early days. Other pursuits such as lumbering, fishing, and various forms of commerce produced extra cash income. By 1860, however, a number of forces had begun to shift farming towards commercial rather than self-sufficient agriculture. Small farms on marginal lands were abandoned first as competition from western agriculture increased and as food production and other forms of commerce became more specialized. Improved transportation networks set the stage for expanded commercial agriculture. Expanding industrial centers began to draw away many marginal and subsistence farmers, and also provided a concentrated market for food. Nevertheless, in 1860 most of Maine's 55,000 farmers were still farming for a living and not a profit.

By 1940, the shift to commercial agriculture was in full swing. Because of their proximity to large Northeast markets, and because of increasing competition from western producers in traditional agricultural products (beef cattle, sheep, grains), Maine farmers began to specialize in relatively more perishable commercial crops such as potatoes, dairy products, poultry, and a variety of canned foods such as corn. Agriculture was shifting not only from subsistence to commercial, but from extensive to intensive. About half of Maine's 39,000 farmers in 1940 were commercial, a few thousand were self-sufficient, and the rest were part-time. Average farm size remained at close to the 1860 level - slightly over 100 acres. Acreage had dropped significantly - from 5.7 million acres in 1860 to 4.2 million acres in 1940.

Since 1940, the trend toward specialized commercial farms, larger farm units, less total farmland acreage, and more intensive farming has continued at an accelerating rate. By 1974, four commodities (potatoes, eggs, broilers, and milk) accounted for about 80% of Maine's total cash farm income. Apples, blueberries, and cattle accounted for another 10%. Between 1940 and 1974: the number of farms in the state dropped drastically from 39,000 to less than 7,000; average farm size increased from 108 acres to 237 acres; total acreage dropped from 4.2 million acres to 1.5 million acres; subsistance and part-time farmers dropped from roughly 18,000 to 1,000 or less; the total number of dairy farms dropped by 95%; acreage in hay dropped by 700,000 acres; acreage in vegetables dropped by nearly 13,000 acres and the number of vegetable farms declined by about 3700. The forces behind such changes have included improved transportation systems, changing production technology, and increasing competition from highly productive areas. These same forces have shaped the history of Maine agriculture from its earliest beginning - although the pace of change has accelerated. The results have been specialization, mechanization, and intensification.

Future Farmland Needs in Maine

Recent concerns regarding future farmland needs in Maine are associated with an awareness that some of the forces which have changed our agricultural economy in recent years may be in a state of change themselves. As noted earlier, a leveling-off of yields may make agriculture more extensive rather than intensive in the future. Expanded food production in response to increased population pressures and demand for food would then call for increases in acreage over current totals.

Demand for food produced or potentially producable in Maine might be affected by a number of factors. Increasing development pressures in major agricultural areas may begin to limit productive capacity in these areas at some point in the future. California, perhaps our largest supplier of general produce items, is reportedly losing up to 1000 acres of farmland per day to urban pressures. Furthermore, increasing populations in such areas may slowly begin to limit exports to such distant markets as the Northeast, as more and more food production is consumed in markets closer to its source.

Natural and climatic patterns may have a further influence on our competitive position. For instance, in many western areas of the U. S. where a great percentage of our fruit and vegetable as well as grain crops are produced, agriculture is dependent on irrigation. In several recent years severe drought has taken a toll on these areas. In areas where groundwater mining is used for irrigation, serious long-term problems appear to be developing. The largest such area - including portions of New Mexico, Texas, Oklahoma, Eastern Colorado, Western Kansas, and Nebraska - is based on groundwater from the underlying Ogallala Aquifer. Current studies predict a depletion of economically available groundwater from this aquifer by the year 2000. The resulting reversion to dry-land farming is expected to be associated with a 75% decline in crop yields. This, in turn, would put pressure on farmland in other areas of the country.

According to the USDA, the annual increase in irrigated land in the U.S. is 700,000 acres per year. 90% of this land is in the 17 western states where major new energy sources dependent on water utilization are located. Competition is expected to become extremely intense for scarce water resources. All available surface water is expected to be fully appropriated within 25 years or less. Again, the effect of this water scarcity may be to put food production pressure on farmlands less dependent on dams and pipelines, and more dependent on surface water and simple rain.

An additional factor to be considered in assessing possible future farmland needs in Maine is the increasing cost of energy. As energy costs inevitably continue to increase, producing corresponding cost increases in transportation, fertilizer, fuel for farm machinery, and related agricultural factors, Maine may gain some modest competitive advantages for raising and selling certain products in nearby markets. A recent manifestation of this potential cost advantage is the increase in corn production in Maine since the mid-1960's due to increased usage of corn for poultry feed and increasing transportation costs for importing corn from the Midwest. Such factors have served to slow the rate of decline of land in farms in Maine from 32% between 1964 and 1969, to 13% between 1969 and 1974.

A final factor worth noting here is the possibility that the energy situation will develop in such a way as to make greater fiber production on Maine farms very attractive. We would then be faced with another "crop" production need, in addition to food, from our farmlands. Continually narrower price margins between food and energy utilization for various crops suggests that this may be a very realistic use of farmland in the future.

Farmland Availability Trends in Maine

Maine does not have an abundance of farmland in relation to major agricultural areas in the country. It does, however, have approximately one-third of the land in farms in New England. According to the Soil Conservation Service (SCS), about 1 million of Maine's 19 million acres are considered to be prime farmland. SCS is currently preparing a map of these prime farm lands for all counties with published soils surveys. These maps along with Geological Survey maps, land use maps, and the recently published Study of Non-Point Agricultural Pollution maps (SNAP) show us generall where Maine's best croplands are, both in terms of soils quality and economic factors. These lands are predominantly in Eastern Aroostook County where approximately 82% of Maine's currently tilled cropland is found. Other important areas include: the Fryeburg flood plains area; Southern Franklin County; northeastern sections of Oxford County; western Penobscot County; and the Bowdoinham area in Sagadahoc County.

Evidence indicates that much of the recent loss of land in farms in Maine is due to abandonment. In 1976 a study was conducted by the Southern Kennebec Valley Regional Planning Commission to analyze shifting land use pressures in the greater Augusta growth area. The study noted changes in developed lands and farmlands during the period from 1966 to 1974 using air photo interpretation. In a 20 town area, a shift from both active and abandoned framlands to developed lands was clearly evident. Agriculture and reverting fields represented 20% of the land area in 1966 (14% active 6% abandoned), but declined to 14.5% by 1974 (10% active and 4.5% abandoned). Developed areas increased from 5% to 9.5% in that period. Other land uses, primarily forests and wetlands remained constant. The report notes that for the most part agricultural lands are being abandoned and then developed. Only occassionally was there an instance of conversion of active agricultural land directly to development.

Further evidence supporting abandonment as the most important factor in declining land in farms is an analysis of farmland trends in growth counties versus non-growth counties in Maine. Non-growth counties (Aroostook, Piscataquis, Washington, Somerset, Franklin, Hancock, and Oxford) have experienced declines in total farmland of 26% in the 1964-69 period and 16% in the 1969 - 74 period. Counties in Maine's growth corridor (York, Cumberland, Androscoggin, Sagadahoc, Lincoln, Knox, Kennebec, Waldo, and Penobscot) experienced a decline in total farmland of 39% in the 1964-1969 period, and a loss of 39% in the 1964-1969 period, and a loss of 9.5% in the 1969-74 period. These figures indicate that declining acreage in farmland has been greater overall in non-growth than in growth areas. Since growth pressures are known to be relatively stronger in southern Maine where population increases in rural and suburban areas have been dramatic in recent years, these figures also indicate that agriculture has been relatively prosperous in that part of the State in the past decade or so. Further research currently underway at the State Planning Office should provide further insights into the extent and source of development pressure on farmland in a broad sampling of Maine's communities.

The Farmland Conservation Issue

Equally important to farmland preservation in Maine is the issue of land and soil conservation. Maine farmland suffers from misuse leading to soil erosion and infertility. According to a recent SCS study, Maine's 303,000 acres of cropland are losing an estimated 6 tons per acre per year, and generate over 1.8 million tons of eroded soil annually. This is approximately twice the rate acceptable by USDA criteria. The most extensive erosion is found in Central Aroostook County while the highest rate of erosion is found in Knox and Lincoln Counties. Various factors are causing these extensive soil losses. The major factor is the steep grade of slopes of Maine's crop fields. Other factors include long slopes, poor rotations, and up-and-down-hill planting.

Additionally, soil fertility has been declining on much of Maine's cropland. A major fertility decline has been evident in Aroostook County where potatoe yields have declined steadily for years. This reduction in productivity is largely due to the lack of organic matter in these soils due to poor soils management. High levels of soil compaction is also a significant factor. It makes little sense to embark on any kind of program to preserve Maine farmland without an equally strong and effective program to improve soil management and conservation practices.

Summary

Although many other parts of the country, including agricultural areas in southern New England, are experiencing strong development pressure on increasingly scarce farmland, Maine does not appear to have an immediate crisis in losing land to irreversable uses. The bulk of our best farmland, fortunately, is not currently under any intense development pressure. But with the certainty that demand for food and fiber will continue to increase, we can't afford to risk future squandering of good land — despite current farmland surpluses in both Maine and the nation. As previously discussed, our food and cropland situation is a volatile one and there are indications that agricultural demand for our croplands may increase substantially in the future. It would seem wise to be prepared for long term future needs in this regard.

In areas where cropland loss has been significant, the process is not always easily detectable or immediately worrisome. As a nation we lose a million acres of prime farmland each year, but we lose it 2 acres, 10 acres, and 50 acres at a time. Each individual loss may seem insignificant, but the cumulative impact may, in the long run, be catastrophic. As agricultural activity is diminished in an area, the farm infrastructure of supply and market outlets, financial assistance, and other agricultural services is slowly eroded. As this critical mass of farm activity and infrastructure is diminished, remaining farms find it more difficult to survive. The cycle is a familiar one — especially in suburban growth areas.

It would seem prudent for the State of Maine to take steps at this time to protect good farmland before increased development pressures begin to take their toll, and before irreversable and undesirable losses occur. Although it is often noted that increased profitability in farming is a good way to pressure farmland, the evidence indicates that, except in very rural areas with the best soil, urban uses can almost always out-bid agricultural uses no matter how efficient and productive these uses may be. Indirect measures such as taxes are rarely

sufficient to influence development decisions in suburban growth areas. Both indirect and direct measures are needed, and these are proposed as recommendations in this report. Also proposed are recommendations to address serious soil erosion and infertility problems on as much as 60% of Maine's cropland. The following recommendations are proposed as a coordinated public sector approach to solving farmland conservation and preservation problems in Maine as they are perceived at this time.

RECOMMENDATIONS

1. State Policy to Preserve Farmland

Because of the importance of agriculture to the state's economy and in view of present and potential threats to the farmland base needed to support this industry indefinitely in the future, it is recommended the State Legislature officially promulgate a policy encouraging the preservation of agricultural lands, especially those containing soils classified as prime, unique or of statewide significance. This broad definition would include provisions for protecting lands important to Maine's agricultural industry but not necessarily classified as "prime". Such provisions would be important to Maine's blueberry and apple industries, among others. Furthermore, this policy statement should specifically acknowledge:

a.) the need for predictable growth patterns which will allow farmers to continue investments in the farm without the fear that escalating real estate taxes, increased regulation and loss of support services will ultimately drive them out of business;

b.) the need to maintain the viability of whole farm regions so as to ensure a "critical mass" needed to support an infrastructure of agricultural suppliers and services;

c.) the need to prevent speculative development pressures from causing excessive real estate taxes which could force farmers to sell off small parcels of land or ultimately the entire farm; and

d.) the public benefits which accrue from farmland preservation such as reduced costs to communities which might arise from urban sprawl; maintenance of open space; preserving the local economic base; and maintaining a rural lifestyle.

2. State Growth Policy

A great variety of public programs, policies, and investments influence growth patterns in Maine. For example, infrastructure investments such as roads may encourage growth in some areas and discourage it in others by influencing accessibility. The viability of farming and the nature of development pressure on farmland is affected by such actions. In order to coordinate and direct public sector actions toward the achievement of well planned and desirable growth patterns, it is recommended that the State Planning Office be charged with coordinating the formulation of a state growth policy. An important element of this policy should be the protection of high quality agricultural lands from undue and irreversible development pressure. This objective would benefit greatly from the development of positive urban and suburban growth incentives and strategies to make more prudent use of these resources. Positive urban planning, in other words, is an important prerequisite to maintain farmland and open space.

3. Agricultural Districts

It is recommended that enabling legislation be adopted to give soil and Water Conservation Districts the power to enter into agreements with farmers which would restrict conversion of farmland to non-farm uses in return for the following benefits: a) current use taxation on all qualifying lands; b) accordance of special

review procedures regarding the use of eminent domain; c) protection from the power of special districts to impose benefit assessments or special ad valorem taxes on farmland in the program for sewer, water, lighting, and non-farm drainage.

Restrictions imposed on the farmers should include an agreement to avoid conversion to a nonfarm irreversible use for a period of ten years, under penalty of full repayment of tax benefits derived from the program plus interest at the average annual cost of state funds.

Criteria for qualification for the program would have to be defined and should include: (a) A minimum of 5 acres in production; (b) a residency requirement to avoid qualification of land speculators who hire out or lease the farm to keep it active temporarily; (c) evidence that the farmer is making a reasonable effort to correct any serious soil erosion problems or animal waste disposal problems identified on the farm by Section 208 Water-Quality Plans, the Soil Conservation Service or the Department of Environmental Protection.

Agricultural districts are proposed as a major element of a farmland preservation program for Maine because these mechanisms offer a maximum amount of flexibility to meet local and regional circumstances on a decentralized basis. It is expected that, beyond their role in making preservation agreements, these districts will serve as a focal point for the monitoring and resolving of a great variety of land use and related agricultural economic issues in various regions of the state.

Implementation of this recommendation would require increased funding for these districts and increased technical support at the state level as recommended later in this section. Consideration will also need to be given to the repeal of the Farmland Open Space Tax law in order to provide an incentive for the formation of districts.

4. Statewide Coordination of Farmland Preservation Efforts

It is recommended that the Department of Agriculture be charged with responsibility for initiating, coordinating, and facilitating statewide efforts to preserve farmland. This responsibility would include research efforts to identify farmland ownership patterns and trends, document changes in farmland usage (including development), evaluate land assessment and taxation practices for farmland, and investigate related subjects. The Commissioner of Agriculture should report the results of these studies to the Governor and Legislature on a biannual basis. This report should include recommendations for new farmland preservation actions and policies as needed. The first of these reports should include an analysis of the effects of current state tax policy on farmland preservation. It is further recommended that the Department of Agriculture be funded to undertake increased responsibilities in the area of farmland preservation.

5. Policy Consistency/A-95 Review

It is recommended that the Commissioner of Agriculture utilize the proposed state growth policy, the A-95 review process, technical assistance, and other means to ensure that state and federal policies and programs are consistent with the goal of preserving valuable farmlands in Maine.

6. Technical Assistance to Local and Regional Levels

It is recommended that the Department of Agriculture and State Planning Office develop a joint program for providing competent technical assistance to towns, regional planning commissions, Soil and Water Conservation Districts, and other appropriate agencies in matters regarding farming, farmland trends and issues, and preservation mechanisms.

7. Local Initiatives

It is recommended that local units of government be encouraged to adopt comprehensive plan endorsing the preservation of prime agricultural lands and the continuation of farming. Tools to protect agricultural operations and farmlands from uncontrolled development should include both positive measures to encourage growth in areas which do not conflict with agricultural uses, and controls to restrict development specifically from agricultural areas. Use of agricultural zoning, easements, transferrable development rights, deed restrictions, and other planning and regulatory tools should be considered. Technical assistance to support local efforts to preserve farmland should be provided by the Department of Agriculture, Regional Planning Commissions, and the State Planning Office.

8. Amend Subdivision Law

It is recommended that the Municipal Subdivision Act (30MRSA§4956) be amended to specifically allow towns to consider impacts upon highly productive farmlands in their subdivision review and approval process.

9. Amend Site Law

It is recommended that the Site Location Development Act (Title 38MRSA Section 484) be amended to specifically enable the Board of Environmental Protection to consider development impacts on productive farmland as an important criteria in the review process for development proposals.

10. Acceleration of Farmland Mapping

It is recommended that the Soil Conservation Service be encouraged to accelerate the publishing of prime farmland maps in the I-95 corridor where growth pressure is greatest. This mapping should be completed within the first quarter of 1980 in order to be available as a basis for many of the farmland preservation actions proposed here. When completed, the Department of Agriculture should modify these maps with information on growth patterns, farming patterns, topographic, and other pertinent data.

11. Public Education of Farmland Issues

It is recommended that the Department of Agriculture in conjunction with the Cooperative Extension Service be charged with developing a program for increasing public awareness and appreciation of farmland conservation and preservation issues in Maine.

12. Farmland Conservation

The severity of erosion problems in Maine and declining soil productivity in many important agricultural areas suggests that current conservation efforts need to be increased in magnitude and effectiveness. The following specific actions are recommended as elements of a concerted program to improve this situation:

a) The Soil Conservation Service, the Agricultural Stabilization and Conservation Service, and the Soil and Water Conservation Districts should give high priority to conservation efforts on farmlands participating in preservation programs, and in other cases should allocate resources on a "worst first" basis.

b) Sound soil conservation and management practices should be made an important prerequisite of programs providing public credit for farming activities - most importantly, the Farmer's Home Administration.

c) The Department of Agriculture should be charged with addressing soil conservation matters in conjunction with farmland preservation responsibilities previously recommended.

d) The University of Maine should expand research and extension activities related to soil conservation matters to:

- encourage less soil compaction
- develop viable rotation crops for Aroostook County and other areas
- encourage the development of local sources of soil amendments.

MARKETING*

Few issues are as diverse, complex, and crucial to the prosperity and profitability of Maine's agricultural economy as those issues which may be addressed under the general heading of marketing. In a very broad sense, agricultural marketing issues involve everything from the identification and even manipulation of consumer needs to the production and distribution of products to satisfy those needs. As such, marketing considerations play a very important role in every aspect of agriculture and surface as issues and problems in a great variety of forms ranging from milk price regulations and potato quality control, to the development of farmers markets and the distribution of livestock to various market outlets.

Many agricultural marketing issues and problems are centuries old. Problems of market access, lack of buyer competition, inadequate market information, distribution difficulties, lack of coordination among growers and other agribusiness entities, extreme price fluctuations, and other marketing issues have never been totally absent in our agricultural economy. It would be naive to under-estimate the deep-seated nature of many of these issues or to expect to find solutions to all such issues through public sector actions. It is important, however, to periodically re-examine agricultural marketing problems in Maine in the light of changing agricultural circumstances to see what opportunities may exist for improving strategic aspects of our agricultural marketing systems.

Fewer, larger, more specialized farms

A number of recent trends and changing circumstances should be considered in addressing current agricultural marketing issues in Maine. The decreasing number and increasing size and specialization of farm units is a particularly important influence on the dynamics of our marketing systems. In many cases larger size eliminates much of the need for intermediate handlers, assemblers, and shippers in agriculture. Furthermore, larger size and specialization often goes hand in hand with increased expertise in technical production matters and with increased interest and leverage in marketing. These factors also tend to increase market risk and sensitivity to price swings.

Increasing integration and coordination

Another important factor is the increasing importance of integration and coordination in most of our important commodity systems. Decision-making in poultry, dairy, potatoes, apples, blueberries and other commodity systems in Maine is becoming increasingly concentrated, with fewer producers, processors, and marketing entities controlling more products than ever before. Contract growing, integrated production/marketing operations, large centralized retailing systems, production and marketing cooperatives, agribusiness trade associations, and other arrangements are providing greater coordination in all aspects of agriculture and altering the economic structure of the industry.

In some products, agricultural handlers and processors have developed such extensive product acquisition and marketing systems that the managerial role of farmers has been sharply curtailed. Poultry farming is an extreme example of this in Maine. While such coordination may optimize the efficiency of food production and marketing, it is taking a toll on small, independent farm operations in Maine and elsewhere.

Cooperatives have provided many farmers across the country with a mechanism for remaining independent while gaining market influence and the benefits of integration,

* Parts of this section were based on a report to the State Planning Office by Food Business Associates, Inc. of Temple, Maine. Copies of that report are available upon request.

particularly those parts regarding small farm marketing issues, into other agribusiness activities. While cooperatives are a powerful agricultural marketing force across the country they have not, with the exception of the dairy industry and several other instances, realized their potential in agricultural marketing in Maine.

More processing and concentration in marketing

Still another important trend has been toward greater processing of food and increasing consumption of convenience foods. Tremendous consumer demand for processed foods has made processing the great growth area in agriculture in recent years. Because of the substantial investments and economies of scale involved in processing and marketing processed food, this industry both in Maine and elsewhere is increasingly dominated by large corporations. The importance of large processors in the food system is apparent in nearly all of Maine's important agricultural commodities including potatoes, blueberries, poultry, dairy, dry beans, and other vegetables. Just a half dozen or so potato processing firms have utilized as much as 30-40% of Maine's potato crop in recent years. Well over half of potato consumption in the U.S. is in the form of processed products and the trend towards greater consumption of processed potato products rather than fresh potatoes is increasing. Virtually all of Maine's blueberries and poultry products are handled and marketed by processors. In both cases processing and marketing is concentrated in the hands of a very few firms. The dairy industry represents another instance of the great importance of processing in the marketing system.

Clearly the trend is toward increased use of agricultural products for processed foods. This has provided greater stability and value-added activities to Maine's agricultural economy and, for better or worse, has meant greater concentration, integration, and coordination in our food system.

Concentration in the wholesaling of food to Maine consumers is also increasing. One major wholesale distributor dominates the Maine scene, with a wholesale volume roughly three times that of its nearest rival among independent Maine wholesalers. Market penetration by large southern New England wholesalers has quickened in recent years, to make wholesaling more competitive. Maine has two retailer-owned wholesale distribution centers, the larger operating at $7\frac{1}{2}$ times the volume of the smaller, plus several small independent wholesale distributors. Scale-of-operation is highly important in wholesale food distribution efficiency. Large distribution centers operate at small fractions of the operating cost ratios of small ones. Thus a wholesale price check of 12 typical branded grocery products in Maine shows, small retailers pay unit prices (for wholesale quantities provided by a small scale source) that for most items exceed the retail prices charged by supermarkets in Maine cities. Customers of smaller stores using smaller wholesalers are hit particularly hard, first by the high costs paid by the stores and secondly by the higher profit margins smaller stores must charge to stay alive.

Government policies and programs

The changing role of government in the agricultural system is another factor of great importance in shaping today's agricultural marketing environment. In general, government involvement in agriculture has increased in recent years. Government technical assistance provided through the Cooperative Extension Service and Agricultural Experiment Stations has played a vital role in the development of the modern farm complex. Health and safety regulations have had a significant impact on many aspects of food production and marketing. The revolution in dairy production and processing techniques and equipment over the past two decades is a clear example of this trend. Government's role in agricultural employment matters has also increased. Regulations regarding minimum wages, employment security, importation of harvest labor, and related matters had had a significant impact on many aspects of our agricultural marketing system.

Government participation in farm financing has had a dramatic impact on Maine agriculture. More than 50% of farm real estate debt in this state is financed by the Farmers' Home Administration (FmHA). Emergency financing to potato farmers in the 2978 crop year was responsible for the planting more than 20,000 acres of the total 120,000 acres planted. Government price supports through the Commodity Credit Corporation, while not especially important to Maine except in the case of dairy products, have played an important role in agricultural marketing in recent years.

Government programs aimed at the preservation of prime agricultural lands from both development and poor soils management will undoubtedly play an increasingly important role in the agricultural economy. Other government programs related to agricultural research, promotion, quality control, and other areas combine to make government factors crucial in the agricultural marketing picture.

Special circumstances of small farms

Small farmers (those with gross receipts under $20,000) have an average net income from farming at the poverty level. If the Maine farm population distribution is comparable to the national norm, about 64% of all farm people live on small farms with net income averaging $4,278. There are about 3,500 small farms in Maine, 55% of the state's total. Many, if not most, small farm families supplement their farm income with off-farm jobs when work is available. Many, however, aspire to earn from farming pursuits a satisfactory family income. Marketing know-how and facilities are so seriously lacking that the modern food economy openly defies the ability of the typical small farmer to find a niche where his farm production can be converted into cash representing a worthwhile return over production costs. To whatever extent that the small farmer is ushered out of his marketing dilemma, Maine's unemployment pressures will be eased, welfare costs will be trimmed and the tax base will be improved.

All types of small farmers tend to be entrapped in small scales of operation. Limited capital, land and management resources prohibit realization of any dreams of leap-frogging into large commercial scales of operation. Large scales of commercialized agriculture often are contrary to family life style aspirations anyway. To be practical, solutions to the small farm problem must be tailored expressly to their small scale operations. Admonitions to "get big - or get out" are pointless, neither one a viable alternative for a typical small farm family. A few small farmers eventually will get big, however, but only by first becoming successful at farming on a small scale.

Despite the overall trend towards increased consumption of processed foods, consumer preferences trends have recently been increasing in the direction of buying and using more fresh food, more natural food and more food that is sold in bulk instead of fancy, expensive packaging. This means a new predisposition toward purchasing certain kinds of food closer to its source, with fewer frills. Our mature food marketing system now offers unprecedented rewards for specialization, in the forms of both new products and marketing innovations. Enterprising small farmers come back strong when they respond to these opportunities. They leave the production of broilers, milk, potatoes, and other basic commodities to the big guys, re-establishing themselves as the specialists in things that are profitably produced only on a small scale. These include: gourds, ground artichokes, sprouts, dried flowers, potted herbs, parsnips, prepared salads, homemade jams, banana squash, organically-grown vegetables, watercress, baby carrots, chard, local tree-ripened pears, herb seasonings, Indian corn, exotic breeds of poultry, beets, specialty (local) cheeses, cucumbers, eggplants, peppers, and scores of other products. Reviving also are some of the fruit and vegetable varieties of yesteryear, marketed to a receptively nostalgic public, like the old favorites among apple varieties and flower seedlings.

The best marketing program for a particular farmer depends on many variables. Either alone, or in concern with other small farmers, the small scale producer can be quite successful with one or more of these options:

* on-farm selling
* roadside marketing
* curb marketing and farmers markets
* store-door delivery selling
* mail/UPS marketing
* mobile retailing.

Often the foregoing opportunities serve to build a base of capital and experience from which large scale commercial farming activities can be pursued. Intermediate marketing programs sometimes aid that evolution, cooperative packing/marketing affiliations, contract production for fruit and vegetable processors and other medium-scale agricultural activities. Plants, nursery stock, firewood, and other forest products market developments merit special attention along with food products.

Context for action

The above trends and circumstances, together with a great number of other factors, provide an important context for the recommendations presented in this section for improving agricultural marketing practices and opportunities in Maine. These recommendations are made with the belief that government can provide foresighted leadership, technical assistance, and information helpful in solving existing marketing problems and preventing the development of future problems. A practical goal of such government efforts should be to encourage Maine's agricultural economy to excel at what it can do best, exporting maximum quantities of those specializations to other states, and importing from other states whatever can be produced at less cost there, allowing for transportation adjustments...if the public interest is to be well served. This goal is somewhat different from the goal of greater food self-sufficiency for Maine. However, it still allows for encouragement of more seasonal market vegetable production for intra-state consumption where cost and economic advantages are achievable. The rationale for encouraging greater local production of certain commodities consumed in Maine is relatively simple. Take, for example, two heads of lettuce, one grown in California, the other grown in Maine, each of good quality and carrying a price tag of fifty cents, used by a state institution in Maine. The fifty cents spent for the California lettuce pays for transportation across the country and for land, rent, fertilizer, equipment, labor, and other inputs all purchased in California. The fifty cents spent for Maine lettuce pays for the rent of Maine land, for fertilizer and equipment purchased through Maine distribution, and for the labor of Maine workers. All of these activities generate economic benefits to Maine. Therefore, while the two heads of lettuce may look and cost the same, the one grown in Maine benefits our economy a lot more for the money in terms of tax revenue, jobs, and other benefits. The same is true with milk, beef, fish, and other commodities.

It is important to note that the recommendations presented here should not be viewed as addressing every important marketing issue in Maine agriculture. In many cases the entrepreneurial nature of marketing makes direct government assistance inappropriate or ineffective. The following findings and recommendations should be viewed as reflecting those issues and areas where a clear set of public sector actions are apparent, potentially affective, and politically realistic.

RECOMMENDATIONS

Quality Control

One of the most fundamental factors involved in food marketing is quality. American consumers have high standards of food quality - particularly in regard to fresh produce. They expect high quality produce and respond positively to produce promotion based on quality. Conversely, American consumers tend to respond very negatively to poor quality food and poor food values. It is therefore recommended that high quality standards be considered the central theme and prerequisite of any public sector marketing support activities.

The major quality control problems in Maine agriculture involve Maine potatoes. Other major commodities appear to have relatively high quality standards and adequate control mechanisms. However, potato tablestock quality standards, based on U.S. No. 1 specifications appear to be clearly inadequate in controlling the quality of Maine potatoes sold in the fresh marketplace. Although most potato packs shipped from Maine are high quality and exceed minimum U.S. No. 1 standards, the proportion of poor and inconsistent quality packs is significant enough to give Maine potatoes a generally poor image and often price discount in the marketplace. The high and consistent quality standards and generally high image of potatoes marketed from competing areas such as Idaho, Oregon, and California are important factors in the erosion of traditional markets for Maine potatoes - most dramatically, the New York market. The production of poor quality potatoes is a result of both climatic and cultural factors. Once poor quality potatoes have been produced, the marketing of such potatoes is an important economic matter to individual growers and shippers. Low prices in the processing market for potatoes acts as an incentive to put a maximum volume of potatoes into the fresh market. The improvement of potato quality in Maine involves an improvement in cultural and production practices as well as improvement in marketing practices. The following recommendations address these issues:

1. Exclusive use of certified potato seed

   It is recommended that legislation be adopted to require the exclusive use of certified seed or seed meeting certification standards in the planting of all commercial potato crops (one or more acres) in Maine.

2. Inspection of imported potato seed

   It is recommended that legislation be adopted which requires that all potato seed imported into Maine be inspected to ensure that Maine certification standards are met.

3. Competitive potato quality standards

   It is recommended that regulations be adopted which: a) increase the minimum size of Maine tablestock potatoes to $2\frac{1}{4}$ inches; b) permit a maximum size range of $1\frac{1}{2}$ inches for potatoes in any one package; and c) permit a maximum of 2% off-grade potatoes per pack. All of these specifications should be subject to reasonable tolerance variations specified by the Commissioner of Agriculture. It is estimated that 8-12% of Maine's normal potato crop may be affected by such improved standards.

4. Enforcement of standards

   It is not recommended that there be compulsory inspection of all potato tablestock shipments. It is recommended, however, that quality control provisions and penalties of Branding Law and shipping point regulations be rigorously enforced.

5. Improvement of cultural and management practices

It is recommended that the University of Maine in cooperation with the Maine Department of Agriculture, industry representatives, and various sources of farm financing (including FmHA) adopt and administer strong policies and programs to improve cultural and management practices in the Maine potato industry and thereby improve potato quality on farms where quality is consistently poor or marginal. It is particularly important that public and private farm financial assistance be predicated on the utilization of good management and cultural practices.

6. Alternative markets

It is recommended that efforts be expanded at the University of Maine, Department of Agriculture, and other agencies to develop and expand viable markets for undersize and off-grade potatoes.

Promotion

Many sectors of Maine's agricultural economy have very successful promotional programs. There appears to be little need for additional public sector promotional programs in the more highly concentrated agricultural industries in Maine such as blueberries, broilers, eggs, and dairy. Other commodity sectors, however, have not developed product or commodity promotional programs as successfully. One problem, for example, is that promotional programs seem to be aimed disappropriately at consumers as opposed to efforts aimed at wholesale volume buyers to win favorable decisions on specifying Maine sources and promoting purchases from those sources for maximum volume in retail stores.

1. Trade promotion

It is recommended that the Department of Agriculture, in its promotional activities, emphasize the promotion of quality Maine food products to wholesale buyers and other trade representatives. Such trade promotion should get priority over consumer promotion due to higher returns and better utility on dollars invested in promotional activities. While this type of promotion should emphasize various products by source, i.e., "Maine" potatoes, etc., they should also strongly emphasize more substantive product attributes, i.e., potatoes.

2. "Buy Maine" Program

It is recommended that the Maine Department of Agriculture develop a very active "Buy Maine" program to promote quality native produce. This program should include point of purchase displays and media promotion. A prerequisite of such a program should be the development and enforcement of high quality standards for all Maine produce. A component of this program should be designed to address specific needs and opportunities for native organic produce.

3. "Product of Maine" Program

It is recommended that the Department of Agriculture continue to use and promote the blue, white, and red logo as part of its existing "Product of Maine" program. This program would apply to any food products, including processed products and meats, produced in Maine and would include rigorous quality control standards. The program would be distinct from the "Buy Maine" program oriented toward promoting fresh Maine produce. This program is also distinct from the "Product of Maine" program being developed by the State Development Office, and the Committee recommends that agricultural products be excluded from that program.

4. Potato Promotion

It is recommended that Maine potatoes be promoted as "Maine Potatoes" only if stricter quality control measures as recommended earlier are instituted and enforced. Source oriented promotions of Maine potatoes without stricter quality control can be counter-productive. If stricter control measures are not forthcoming, it is recommended that a promotional program be developed for a high quality subset of Maine tablestock potatoes such as the now-defunct Super-spud grade.

5. Potato Promotion Target Markets

It is recommended that potato promotional efforts be concentrated in the New England and Greater New York marketplace to get maximum benefit from promotional expenditures and make best use of natural advantages for Maine in these markets. The gradual erosion of the Greater New York marketplace to competitors poses a serious threat to Maine's potato industry.

Direct Marketing

Direct marketing arrangements offer the potential for supplying fresh and reasonably priced food to consumers while providing good returns to farmers. For this reason, many states have recently initiated a variety of direct marketing support programs. To the extent that such programs encourage greater consumption of native products, they benefit the state's economy through the generation of economic activity which might otherwise take place in the major produce and meat exporting states. In order to further encourage activities in this area, the following recommendations are offered:

1. Fund direct marketing specialist

The Maine Department of Agriculture should designate specific responsibility for the coordination, liaison, and training regarding direct marketing activities in Maine. Immediate efforts should be made to fund this position through state or federal sources.

2. Direct-buying directory

The Department of Agriculture should prepare a direct marketing directory for Maine which will include a list of direct produce and livestock outlets such as farmers, roadside stands, farmers' markets, pick-your-own operations, and processors. The directory should be available to consumers, wholesalers, retailers, and other interested parties as a guide to direct food purchasing in Maine.

3. Institutional buying

A public commitment and concerted effort should be made by the State of Maine to utilize a maximum amount of local produce and livestock products in public institutions provided that these products are competitive in terms of price and quality.

Coordinating arrangements and mechanisms

A great variety of coordinating arrangements and mechanisms may be developed to improve the efficiency and effectiveness of various agricultural marketing activities by reducing uncertainties in pricing, improving market leverage, pooling financial and technical resources, or other means. The following recommendations address a diversity of issues in this area:

1. Maine Produce Commission

It is recommended that a Maine Produce Commission be established to act as a publicly sanctioned trade association for both growers and agribusiness involved in various aspects of Maine's produce economy. The Commission would consist of two bodies; a growers' council, and an agribusiness council with representatives from wholesaling operations, processors, and related industries. The purpose of the Commission would be; to improve coordination in various aspects of produce production, marketing, and processing in Maine; and to make recommendations for public policies and programs effecting this sector of the agricultural economy including quality control, direct marketing, promotional activities, storage facilities and strategies, extension and other sources of technical assistance, and related matters. Although no funding scheme is recommended at this time for the Commission, it is anticipated that funding may eventually be desirable through a small tax on growers and agribusiness operations, or through other public or private sources.

2. Maine Livestock Commission

It is recommended that a Maine Livestock Commission be established to act as a continuing force for the development of various livestock industries in Maine and the promotion of policies and practices which will then improve production of livestock in Maine and the marketing, processing, and consumption of Maine livestock products. As in the case of the proposed Produce Commission, the Livestock Comm. would consist of a growers' council and agribusiness council. It is expected that such a commission could be instrumental in expanding livestock agriculture in Maine by providing a mechanism for surfacing and exploring development opportunities and problems in regard to beef, sheep, hogs, or other red-meat livestock raised for meat. Potential matters for investigation and discussion include: inspection and grading regulations; feed and nutrition needs; marketing opportunities including auctions, direct marketing, and wholesaling; processing opportunities and grower-processor coordinating arrangements; production and market information needs; and related matters. Although no funding scheme is recommended at this time, it is anticipated that funding may be desirable through a small tax on livestock operations, or through other public or private sources.

3. Agricultural Advisory Council

It is recommended that the Maine Agricultural Advisory Council be re-activated. Although currently defunct, this Council has served an important policy development and review function to the Department of Agriculture in the past. The Council should consist of representatives of production, marketing, processing, finance, and related agricultural areas for important commodity systems in Maine. Membership might be based largely on representation from existing agricultural organizations in Maine and, as such, the Council could serve as a federation of agricultural organizations in Maine. Reactivation of the Council should be accomplished by Executive Order.

4. Development of Cooperatives

It is recommended that the development of cooperatives be considered a matter of highest priority in Maine agriculture and that funding be secured to provide staff support to the Maine Cooperative Council, an existing association of cooperatives in Maine. The purpose of this funding support would be to improve the ability of the Council to conduct training programs, technical assistance programs, and other activities directed toward assisting in the development of production, marketing,

and purchasing cooperatives in Maine. It is further recommended that the State support efforts to resist changes in the Capper-Volstead Act which provides incentives to the development and operation of agricultural cooperatives.

5. Consolidation of Potato Organizations

Encouragement is given to the abolishment of the Maine Potato Commission, Maine Potato Council, and Maine Potato Sales Association and the establishment of a Maine Potato Board made up of a broad base of industry representatives including growers, shippers, processors, creditors, and related groups. The new Board would provide a broad-based and simplified structure for handling all industry matters including market promotion programs.

6. Mercantile

This study finds that the trading of potato commodity futures provides a very important mechanism for improving coordination in Maine's potato industry. It is recommended, however, that the State support a study currently underway at the U.S. Department of Agriculture to determine whether any modifications may be desirable to guard against possible price manipulation on the Mercantile due to low contract volume, inadequate regulation, or other reasons.

7. Maine Department of Food and Agriculture

Agriculture is an integral part of the total food complex which encompasses a broad range of activities ranging from the farm supply industry to final food consumption. It is increasingly important for production agriculture to be viewed in the context of this integrated food complex for profitability as well as policy reasons. In order to reflect the broad range of issues and opportunities in this system, it is recommended that the State consider renaming the Department of Agriculture the Department of Food and Agriculture, and that appropriate internal actions be taken within the Department to reflect this more comprehensive outlook.

TRANSPORTATION*

Although local food self-sufficiency was common many years ago, most agricultural products today are handled by extensive transportation systems in order to meet distributional demands between production and consumption. All of the best efforts in food production can be lost if this transportation system becomes too inefficient or too costly. Maine's agricultural economy is particularly sensitive to transportation considerations because of its relatively isolated geographical location and low-density of economic activity. It is important, therefore, to review transportation issues and circumstances in Maine to see where problems may exist and where improvements may be made. As the following discussion will indicate, the two major practical, day-to-day transportation problems in Maine agriculture are: 1) the high cost and total reliance on railroads for importing grain for poultry and other livestock industries in Maine; and 2) the increasing difficulty that potato shippers are having in obtaining adequate trucks to transport potatoes and potato products to market.

Highways and Trucks

Maine has nearly 22,000 miles of highways including 318 miles of Interstate highway (I-95). Nearly 90 percent of Maine's highways are rural, 17.5 percent are part of the State primary system, and approximately 9 percent are part of the Federal Aid primary system. This highway system is vital to Maine's agricultural economy. With the exception of feed grain imports, most of Maine's agricultural products are transported by truck. Nearly all truck shipments are by exempt commodity carriers, with close to 90 percent of the hauls by truckers based out-of-state. The volume hauled by regulated carriers is low because the exemption of unprocessed farm commodities from pricing regulations under the Interstate Commerce Act acts as an incentive to attracting many small, unregulated carriers into this market.

The farming community has long pushed for a more adequate highway system not only to gain ready and safe access to markets, but to help stimulate new agricultural enterprises. However, the development and improvement of Maine highways is rarely in response to economic need. Traffic volume, accident patterns and other safety factors are the normal criteria. A case in point is the long-recognized need for an extension of I-95 north of Houlton. There are not only safety concerns with respect to U.S. 1 through the Aroostook potato region, but general highway limitations - two lane traffic, narrow widths, hills and curves - discourage needed potato truckers from traveling into the County. Distance is, of course, a major factor, but distance can be modified by time - which is one of the exempt truckers' prime considerations. The absence of adequate east-west highways within the State is also a concern. Roads have been built to reflect north-south traffic flow. But to rural citizens in both eastern and western sections of the State, the old saying is true that "you can hardly get there from here". What is said of U.S. 1 in Aroostook is every bit as true for such routes as U.S. 2 and Maine State 6 and 9. This concern for east-west intra-state routes does not carry over to a major regional east-west interstate highway. A direct Bangor to Amsterdam, New York throughway, often proposed, does not appear to offer significant advantages for either the farm or non-farm population.

The hauling of Maine potatoes accounts for a great amount of recent increases in the importance of truck traffic in Maine agriculture. Truckers share of fresh potato shipments has increased from only 15 percent in 1955 to 99 percent for the 1977-78 crop year. Perhaps because of the past role of the railroads, there seems to have been an abundance of trucks to handle potato and frozen food traffic until recently.

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* This section was prepared with the assistance of Daniel Harlan of the Maine Department of Agriculture, and William Fernald of the Maine Department of Transportation.

Apparently, however, the cost of operating trucks and the distances that they have to operate to reach Northern Maine, essentially distances which are empty non-revenue miles from at least Boston, has become so high that the truckers have become less willing to make the trip or have been able to find more lucrative traffic near the points where the vehicle is made empty in New York or Southern New England. This problem is compounded by the fact that the Bangor & Aroostook Railroad (BAR), who used to handle over 80 percent of this traffic in refrigerator cars, is now faced with the decision of either scrapping or replacing its present refrigerator car fleet. The BAR is reluctant to invest in new refrigerator cars which it has no real belief will be used by either the potato or frozen food shippers due to increased truck traffic. The present fleet is made up of cars that are too small and therefore too expensive to operate; and in addition, many of them are simply worn out.

This problem is not only related to the movement of potatoes to the domestic market but is also extremely important if there is to be another large potato export through a Maine port. Export traffic has traditionally moved by rail to Searsport and the BAR's car fleet was ideally suited for this kind of movement. The potato shippers, therefore, are concerned that the BAR is removing some of its private cars sidings in the County and is also considering scrapping the existing fleet. Both moves are amply justified by current experience; however, it is a matter of increasing concern by some of the more thoughtful growers and shippers in the County. They view rail as a necessary alternative, not only to retain some reasonableness in the rates the truckers charge them but also to have a viable alternative to reach present and future markets.

Despite such concerns with maintaining rail transport options, and despite periodic problems regarding the availability of trucks, it seems likely that trucks will continue to be the major factor in transportation of potatoes and other produce commodities in the foreseeable future. An improved highway system north of Houlton could be expected to improve conditions regarding the truck transportation of potatoes. Because of existing regulatory exemptions for agricultural commodity carriers, however, there would seem to be no real benefit to Maine agriculture in total truck deregulation. This might, in fact, be a further blow to maintaining future options for rail transportation.

Railroads

Maine is served by three major rail lines; the Boston and Maine, the Maine Central (MEC), and the Bangor and Aroostook (BAR). The first two interchanges at Rigby Yards in South Portland, and the latter at Northern Maine Junction near Bangor. In addition, there are 300 miles of Canadian lines in Maine. Maine Central has about 800 miles of track, Bangor and Aroostook nearly 550, and Boston and Maine less than 50. Compared to many other railroads in the U.S., the MEC and BAR are small lines and have survived primarily due to specialized traffic - largely pulp, paper, and until recent years, potatoes. They differ from other railroads, also, in that they are primarily originating rather than terminating lines.

The major agricultural products now hauled by the Maine railroads are corn and soybean meal for use in Maine livestock industries. The poultry industry, our largest user of livestock feed - consuming more than two-thirds of a million tons of feed each year - is almost wholly dependent on rail imports from the mid-western grain belt. Ninety-eight percent of our grain is imported, more than 90 percent of which is shipped by rail. For this reason Maine poultrymen are highly sensitive to all factors affecting transportation, especially rail rates. The poultry industry experiences periodic shortages of rail cars, and unreasonable transit times. Since local storage facilities do not permit more than three to five days of reserve grain supply, any disruption of rail shipments can have a disastrous effect. During recent winters, grain cars from the midwest have sometimes been enroute 20 to 30 days - three to four times the normal transit time. And the very survival

of our broiler and layer flocks is extremely vulnerable to inconsistencies in the availability of feed.

The State has, for years, strongly protested to the Interstate Commerce Commission (I.C.C.) concerning disparaties in rates which Maine feed grain users pay compared to those paid in the Southeast. The 3-car rail rates for corn to Augusta, Maine and to Atlanta, Georgia (a competing poultry region), as of December, 1978 were $23.02 a ton here and $9.21 in Georgia - a difference of $13.81. This has had an adverse impact on the competitive ability of Maine poultry products in the marketplace. Since 1972 the disparity in 3-car rates between the two regions has widened alarmingly, almost doubling. Nearly six years ago, in response to this situation the New England Grain and Feed Council (through its agency RATES, Inc.), the New England Governors, the Northeast State Departments of Agriculture and regional farm organizations initiated a case before the ICC charging the unlawfulness of feed grain rates to New England. Following lengthy testimony the ICC presented its preliminary decision in early 1976. This was appealed to the full Commission. In February, 1977, a final decision was made which acknowledged that "with respect to broiler, egg, and milk production trends generally, the Northeastern states have faired poorly when compared with the Southeast". The ICC, thereupon, found it "unjust and unreasonable" for the Eastern Railroads to not establish 10-car shipments of corn and ordered such rates "at levels sufficient to provide adequate revenue for service while also furnishing an inducement to movements in larger shipments". The Commission also declared that "future across-the-board increases could become harmful to the Northeast". In two of the three general rate increases since this decision the ICC has placed a hold down on feed grain rates to New England. While the 1977 decision was a step forward, the New England petitioners felt it did not address many issues in the case, and so in April, 1977, appealed to the U.S. Court of Appeals for the District of Columbia. A decision in that appeal is still pending.

Two other rail regulatory issues deserve mention here. The first issue involves "market dominance" provisions of the 1976 Railroad Revitalization and Regulatory Reform Act. These provisions provide limitations on otherwise liberal rate-making authority of the railroads in situations where 70 percent or more of a specific commodity is hauled by a transportation mode in a given area. Clearly the railroads do have market dominance in feed grain transportation into Maine and this regulatory provision is therefore significant in ensuring against discriminatory behavior in rate-making. Efforts have been made to remove the market dominance provision but, to the benefit of Maine livestock industries, have thus far been unsuccessful.

The second issue involves agricultural exemptions for rails. Trucks have been exempt from rate regulations on agricultural commodities since the 1930's. The ICC proposed recently to extend this exemption to railroads. The Maine Departments of Agriculture and Transportation supported this action except for feed ingredients. They cited a 1977 DOT-Manalytics report which documented the steady decline in produce shipments by rail and unless innovative steps are taken, all fresh produce traffic will disappear from the rails by early 1980's. In a preliminary decision released December 6, 1978, the ICC gave notice of such deregulation for fruits and vegetables, but not feed grains. It is difficult to tell whether, in a deregulated situation, the railroads will develop sufficient renewed interest in agricultural products to recapture this traffic from motor carriers. It might, however, prove helpful in negotiating intermodal "piggy-back" traffic as the potato industry is presently considering.

No discussion of rail transportation would be complete without mention of energy. A great deal has been written in recent years concerning the relative energy efficiency of the railroads and trucks. As noted elsewhere in this study, transportation represents three percent of the energy used in the total "food cycle" (from production to consumption) which, in turn, is just five-tenths of one percent of the total energy used in the United

States. Trucks consume more than five times the BTU's per ton-mile than the railroads. Other things being equal, it would therefore seem prudent to consider efforts to upgrade rail service to the Maine agricultural sector.

Water

There are periodic studies and proposals for transporting farm commodities - especially feed grain - into Maine by water. Perhaps the most ambitious was that by the Water Transport Association (WTA) in 1971. It envisioned the hauling of grain on the Great Lakes from Toledo to NY State on self-unloading ships and "exploding" unit trains into New England. The WTA maintained such a system could reduce rates at the time by as much as 35 percent. An informal hearing was held by the ICC, but no action taken. Current proceedings regarding "Feed Grains to New England" grew out of the frustration which the feed mixers of the region felt following the water hearing. In 1976, a further proposal was made for utilizing the St. Lawrence with unloading at Riviere du Loup and railroading to Southern Maine. Extensive rate investigations have found this route to be uncompetitive.

It is true that the lack of competition for the railroads have worked against a more reasonable feed grain rate for Maine. The Eastern Railroads have, themselves, conceded that lower rates in the South are due to inland waterways. And in the early 1960's Lipman of Augusta brought grain up the Kennebec by barge - and soon received lower rail rates, thereby negating the brief barge advantage. To date, however, no permanent water alternative has been found for the importation of feed grain by rail.

RECOMMENDATIONS

Many of the issues involved in the transportation of agricultural products are complex, often due to the "public utility" nature of transport service. Remedies to many transportation problems, because of high capital costs in developing transportation infrastructure, tend to be very costly. However, a number of transportation issues have an important bearing on Maine's agricultural prosperity, and the following recommendations are made with agricultural interests, rather than broader considerations, in mind.

1. De-regulation

There appear to be certain overall benefits to Maine agriculture in the short term in the total deregulation of motor carriers. These benefits would apply particularly to potato transportation and would not necessarily benefit Maine's economy as a whole. A disadvantage of truck de-regulation would probably be the further loss of current rail traffic to trucks - causing a further erosion of railroad activities in Maine. Railroad de-regulation would probably have an adverse effect on Maine agriculture, particularly in the case of grain transportation which is crucial to Maine livestock industries and accounts for the bulk of incoming agriculture traffic by Maine railroads.

In view of these circumstances, we recommend against total de-regulation of both trucking and railroad at this time.

2. Regulatory Reform

It is recommended that research be undertaken by the Department of Agriculture and the Department of Transportation to determine ways in which de-regulation proposals might affect Maine agriculture, and ways in which the Interstate Commerce Act might be amended and modernized to improve agricultural transportation circumstances in Maine.

3. Consolidation of Rail Systems

It is recommended that the State of Maine adopt a position in support of the consolidation of rail systems in Maine into one system. It is expected that such a consolidation would result in improved efficiency and effectiveness in service not only to Maine agriculture but to other current or potential rail users in Maine as well.

4. Facilitation of Inter-modal Service

In order to facilitate improved transportation service to agriculture and other sectors of Maine's economy, it is recommended that the following actions be taken regarding inter-modal service:

a. the State should support the elimination of legal barriers to inter-modal ownership;

b. the Commissioner of Agriculture, on behalf of diverse agricultural interests in Maine, should support the improvement of cargo port facilities in one or several Maine ports;

c. the Department of Transportation, in cooperation with the Department of Agriculture and potato industry representatives, should solicit federal funds to conduct an experimental "piggy-back" transportation program for potatoes.

5. Extension of Modern Highways into Aroostook County

As a result of recent federal legislation, the extension of the interstate highway system north of Houlton seems remote. It is recommended, however, that a modern rural highway system be built from Houlton to Fort Kent in order to improve on the relatively poor transportation conditions existing in Maine's most concentrated agricultural area.

ENERGY

Energy and the U.S. food system

Over the years, the functioning of the U.S. food system has become increasingly dependent on the availability and price of energy - particularly oil and natural gas. Production agriculture on the nearly 400 million acres of farmland in this country now consumes 3% of the total energy used in the U.S. By the time food reaches the consumer's table it has cost approximately 16.5% of the energy used in the U.S. Energy consumption in various stages of our food cycle breaks down approximately as follows:

Function	% of Food Cycle Energy Use
Agricultural Production	18
Food Processing	33
Transportation	3
Wholesale and Retail Handling	16
Preparation and Cooking	30
	100

Although production agriculture accounts for a relatively small proportion of energy consumption in our food system, the impact of energy shortages on primary agriculture could have an extremely severe impact on our food system. Recent studies at the University of Iowa have shown that under current circumstances a 20% shortage in agriculture in the traditional inputs of petroleum products, natural gas, and electricity would result in the need for an additional 11.7 million acres of cultivated land in order to maintain constant production levels. Among many other interesting and pertinent considerations in the agricultural energy situation are the following:

* About one third of the energy input to agricultural production is in the form of natural gas, most of this for fertilizer production, and most of the energy used in fertilizer production is for nitrogen fertilizer. About 3% of all U.S. natural gas is used for agricultural production, including fertilizer.

* When food was produced by a much less mechanized agriculture it was produced for for considerably less energy per unit. For instance almost four times as much energy goes into producing a bushel of corn than was the case a century ago. However, the corn still contains 2.25 times more energy than we expend in producing it. The additional energy in the corn is solar energy fixed by the corn plant through photosynthesis.

* About 40 million acres of agricultural land are irrigated (10% of the total). Energy used for irrigation accounts for about one eighth of all energy used in agriculture, or about 0.4% of total U.S. energy use. While such a high level of irrigation increases energy use, it has also, in the case of fertilizer, greatly increased productivity.

* Meat production is very energy intensive. Meat always provides substantially less energy than was consumed by the animal from which the meat came. Ditferent forms of meat have very different energy input:output ratios:

Animal	Approximate Energy Input:Output Ratio
Range fed sheep	2.3:1
Range fed cattle	4.6:1
Feed lot cattle	15:1
Broiler chicken	5:1

* Many of agriculture's products are perishable and need to reach the consumer quickly, either from the field or storage. Transportation of fresh food products is usually by truck or air because of this. Rail or barge transport is much less energy consuming per unit but is often too slow for food transportation. The relative energy consumption figures for the different transportation modes are:

Transportation mode	BTU/ton mile
Air	42,000
Truck	3,800
Rail	670
Barge	680

* A California lettuce consumed on the East Coast contains about 240 BTU of food energy. Producing it in California expended about 1600 BTU's, while shipping it across country takes as much as 4500 BTU's.

The relationship of energy to soil fertility may be the most important energy issue to be considered in production agriculture. For years we have increasingly extracted the natural fertility of soils in rural areas through food production and deposited it, eventually, in the waterways of our cities. This fertility has been replaced by many non-renewable resources such as natural gas, rock phosphate, and potash. While such practices have made economic sense and lowered the cost of food production in the U.S., this era may be coming to an end. Changing economic as well as environmental considerations appear to be swinging against such energy inefficient practices. Tomorrow's farmers will need to be more precise in using such expensive inputs as fertilizers. This means precision not only in the application of fertilizers but in chosing cultural practices which minimize the loss of soil nutrient, and therefore the need for fertilizer. Tomorrow's farmers will also need to be more resourceful in finding substitute cost-effective substitutes for conventional energy sources. The bottom line in such efforts will be profitability as well as improved agricultural ecology.

Energy Consumption in Maine agriculture

Maine agriculture is primarily oil fueled, compared to the natural gas and electrical based farm economies of many competing agricultural area. While electricity is significantly more expensive than oil, natural gas is significantly cheaper and provides a cost advantage to growers in many other parts of the country. Even in the case of electricity, Maine agriculture is at a disadvantage compared to competitiors, especially potato competitors, in the western part of the country where federal hydropower projects have resulted in relatively inexpensive electricity which is particularly important to food processors. Comparative energy costs for the natural gas, fuel oil, and electricity are shown below. Additionally, estimates of total energy consumption in various agricultural production sectors in Maine are presented in Table 1.

Fuel	Approximate Price/million BTU
Natural Gas	2.50
Fuel Oil	3.70
Electricity	11.70

While climate and other factors tend to be much more important factors than energy costs in the competitive ability of Maine agriculture in most cases, there are many instances where specific energy considerations are substantial. Several livestock industries in Maine, especially the poultry industry, incur extraordinary energy/transportation related costs due to the need to import feed grains from the midwest. Energy/transportation considerations in shipping agricultural products in and out of Maine are also important due to the sometimes great distances to markets. In cases where Maine products compete in eastern markets with agricultural products from the west, Maine has an energy-related

TABLE 1

APPROXIMATE ENERGY CONSUMPTION IN MAINE AGRICULTURE, 1977-78

Field Crops	Acres ($\times 10^3$)	Diesel Equivalent (gal $\times 10^3$)	LP Gas (gals $\times 10^3$)	Elec. (Kwh $\times 10^6$)	Fertilizer & Pesticides (BTU $\times 10^9$)
Potatoes	120+	2900	3	1	1250
Hay/Haylage	192	370	50	1	530
Alfalfa	22	350	74	--*	6
Corn Silage	42	820	36	--*	100
Apples	8.5	580	20	--*	87
Fresh Vegetables	7+	280	15	--*	38
Proc. Vegetables	7.5	360	30	--*	54
Blueberries	50	1000	--	--*	32
Unspec. Crops	--	124	--	--*	
Oats, etc.	38	425	18	--*	46
Unspec. Irrig.	--	22	1	--*	--
		7231	247	2	2143

Livestock

Type	Production or Population (x 1000 head)	Diesel Equivalent Total (gals $\times 10^3$)	Diesel Equivalent Fuel Oil Included in Total	LP Gas (gals $\times 10^3$)	Elec. (Kwh $\times 10^6$)
Layers	7125	345	80	69	22
Pullets	7500	930	480	150	--*
Broilers	87000	3650	3174	--	22
Milk Cows	58	680	--	265	25
Beef Cows & Calves	12	136	72	--	--*
Hogs	10	17	10	4	--*
Sheep & Lambs	13	39	24	--	--*
Turkeys	not known	--	--	--	--*
		5797	3841	488	69

*Less than 500,000 Kwh

advantage. The very low percentage of retail food prices attributable to transportation cost differentials and the great success of western producers in penetrating eastern markets suggests that this energy related cost advantage is not a dominant economic factor. Costs of transporting produce to Maine for marketing from western production areas is, however, substantial - amounting to as much as $10 million annually (transportation costs only). Several additional instances of high energy usage in Maine agriculture relative to other areas include:

* The high cost of heating broiler houses, although not a high percentage of the total cost of producing broilers, is a substantial direct cost in this competitive industry. Approximately $3\frac{1}{2}$ million gallons of No. 2 fuel are used annually for this purpose.

* Approximately 1 million gallons of oil are used each year to burn approximately 20,000 acres of blueberry barrens. Maine agriculture has a relatively high level of utilization of gasoline rather than diesel engines. Energy savings of approximately 25% are possible with diesel engines.

* In some cases, a relatively high level of synthetic fertilizers are used by Maine farmers due to mediocre soils or poor soils management. The potato industry is a particularly heavy user of commercial fertilizers, utilizing more than 100,000 tons annually.

* Potato processing is also very energy intensive. Aroostook County's newest processor ceased operations recently, citing high electricity costs as one reason for the close-down.

Opportunities for improvement

Many of the above findings and considerations emphasize the increasing importance of energy considerations in Maine's and the U.S. food and agricultural systems. While they do not necessarily indicate that energy balance considerations are the driving force in the food cycle today, it is clear that both farmers and consumers would benefit from prudent actions to: 1) conserve energy through improvements in the energy efficiency of food production marketing, and consumption practices; and 2) develop indigenous renewable energy resources which may offer lower costs to agricultural energy users and lessen our dependence on conventional sources as supplies become more scarce. Improved energy practices in Maine's agricultural and food system may include such factors as:

* Increased use of diesel rather than gasoline engines. Energy savings may be as high as 25%.

* Better matching of machinery to tasks both in terms of machinery size and versatility.

* Development of cooperative pools for seldom-used machinery.

* Increased use of animal manures, urban wastes, nitrogen fixing legumes, free-living bacteria and blue-green algae in place of commercial fertilizers. This would improve soil fertility and at the same time reduce dependence on fossil fuels.

* Increased use of animal wastes for direct and indirect energy production.

* Development and increased usage of solar energy systems for space heating, water heating, crop drying, etc.

* Increased use of rail rather than road transport.

* Promotion of greater fresh produce consumption and other energy efficient consumption practices.

* Substitution of present crops with more diversified and less energy-consuming crops where economically feasible.

* Increased usage of other energy production systems such as wind energy, hydropower, energy from biomass combustion, usage of waste heat, and so on.

* Development of minimum tillage farming.

* Utilization of integrated pest management practices.

RECOMMENDATIONS

In view of the circumstances and opportunities discussed above, the establishment of a planning, development, and conservation program for energy-related matters in agriculture is recommended, as discussed below:

1. Energy in Agriculture Task Force

   It is recommended that the Department of Agriculture enlist the cooperation and support of the Office of Energy Resources and the University of Maine in the establishment of a joint task force and program to actively address energy conservation and development issues in Maine agriculture.

2. Continued Energy Planning Efforts

   It is recommended that the task force and program recommended above serve as a mechanism for undertaking and coordinating agricultural energy planning efforts including the collection of better data on agricultural energy consumption, the identification of specific areas of problems and opportunities, and the coordination of policies, research, and expenditures in the public sector. Consideration should be given in this program to planning and development policies and efforts which would result in more self-contained regional agricultural systems, e.g., livestock industry expansion in areas where adjacent farmland would benefit from livestock wastes as fertilizer, and livestock would benefit from local feed production.

3. Demonstration and Research Projects

   It is recommended that agencies in the task force recommended above seek to jointly solicit public and private funds to undertake research work and initiate pilot demonstration projects involving the conservation of energy in agriculture, or the development of local energy resources. Based on current technology and information, these demonstration projects might include: solar assisted heat pumps; solar crop drying systems; the development or improvement of local food processing and storage systems; the development of indigenous fertilizers; and a variety of other energy production or conservation systems utilizing farm, forest, and other wastes.

4. Training and Education Program

   It is recommended that the University, as part of the task force programs proposed above, initiate an active program of technical assistance, training, and education regarding energy matters to assist the farm community in understanding energy issues and maximizing their position in view of increasing energy costs.

5. State Energy Plan

   It is recommended that the Office of Energy Resources ensure that adequate provision is made in the State's Energy Plan to provide energy for food production in Maine in cases of energy shortages.

FINANCE*

Capital and credit needs in agriculture have changed rapidly in the past several decades. Many factors including high rates of inflation, increasing farm size, more capital intensive farming, more complex farm marketing and management issues, rapidly increasing farmland values, more scarce sources of traditional credit, increasingly substantial obstacles to entrance into farming and concern for government assistance in this area, and related considerations make modern agricultural finance issues complex and deserving of public attention. This report identifies and discusses a number of important issues and trends in this area. It also summarizes major sources of farm credit in Maine and the U.S.

Increasing Growth in Farm Debt Relative to Income and Assets

Total capital and credit requirements in U.S. agriculture have doubled since 1970. Total outstanding farm credit in the U.S. is now well over $120 billion. Recent estimates indicate that credit levels will double again by the mid-1980's. In Maine, outstanding farm credit has doubled in the last decade, reaching more than $200 million in 1978. The three major sources, the production in credit systems, Farmers' Home Administration, and commercial banks, account for 75% or more of current total outstanding farm credit in Maine. All three sources have increased their loan levels considerably over the past 28 years, with an overall increase of more than 700%. A more complete breakdown of both national and Maine credit levels and sources is included later in this report.

Rapidly increasing farm credit levels have caused growing concern among farm lenders and investors about the ability of farm income-generating capacity to meet credit requirements inherent in ever increasing agricultural loans secured by rapidly inflating farm real estate values. The increasing value of farmland, upon which most long term farm loans are based, has been unprecedented in recent years. During the past five years the compound annual rate of increase in farmland market prices nationally has been more than 16% - a rate which would double land values every $4\frac{1}{2}$ years. Farm income has not paralleled this rise in farmland values but, rather, has lagged behind increasing farm asset values as well as increasing debt levels.

From a credit point of view, the relationship between income and total debt is highly important. The recent increase in farmland value has reemphasized a long-standing concern about the debt-servicing capacity of high-priced land purchased. There has been a rapid uptrend recently in principal and interest payments in farm debt associated not only with the financing of land, but also with the financing of other capital and operating expenses. Table I presents data on farm debt, net income, and debt to net income ratios for Maine and the U.S. As the Table indicates, financial leverage in farming has increased tremendously from 1950 to 1977 with Maine increasing from 0.63 to 2.34, and the U.S. average increasing from 0.74 to 4.65. Thus, while financial leverage in Maine farming has increased considerably, it is still conservative compared to other parts of the U.S. Erratic net income patterns in Maine make such conservatism a prudent strategy. It is worth noting that agriculture in the U.S. is not a high leverage industry by general industrial standards and real estate loans tend to be high quality. Individual capital requirements, however, are very high compared to other industries.

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* This report is a summary of a more comprehensive report on Farm Financing in Maine by the Maine State Planning Office. Copies of that report are available upon request.

TABLE 1

FARM DEBT*, NET INCOME**, AND DEBT TO INCOME RATIOS MAINE AND THE U.S.: 1950 - 1977

Year	MAINE (dollars in millions)			U.S. (dollars in billions)		
	Total Debt*	Net Income**	Debt to Income Ratio	Total Debt*	Net Income**	Debt to Income Ratio
1977	188.0	80.4	2.34	95.4	20.5	4.65
1976	188.2	127.1	1.48	84.5	18.7	4.52
1975	171.5	57.3	2.99	75.8	24.5	3.09
1970	122.7	52.4	2.34	47.7	14.2	3.36
1965	73.5	106.3	0.69	30.5	12.9	2.36
1960	55.4	81.7	0.68	19.9	11.5	1.73
1955	51.1	72.7	0.70	14.4	11.3	1.27
1950	38.7	61.1	0.63	10.1	13.6	0.74

* Debt figures include loans from all operating banks, Farmers Home Administration, Federal Land Banks, Production Credit Associations, life insurance companies, Federal Intermediate Credit Banks and other government sources The figures do not include loans by non-reporting credit sources such as individuals and trade sources.

** Net income figures represent net income to farm operators after an adjustment for any net change in physical inventories during the year.

Diversity of Credit Services and Needs

Farming is an increasingly complex science requiring a broad range of skills in all aspects of production, marketing, finance. A past chairman of the Agricultural Committee of the Amercian Bankers' Association recently listed the following as some of the many credit needs of farmers:

* Seasonal crop financing
* Seasonal livestock financing for cow-calf, grass or cattle ranchers and feedlot operators
* Medium-term loans for herd improvement, or 1½- or 2-year loans to enlarge laying flocks in table egg operations
* Medium-term loans for land developments such as leveling, addition of soil amendments, and planting of trees and vines.
* Medium-term loans for irrigation installations, terracing of lands, and construction of farm ponds
* Medium-term loans for big-ticket equipment purchases
* Revolving lines of credit for equipment replacement
* Seasonal dairy loans for feed purchases
* Medium-term loans for farm service buildings such as shops, crop storage buildings, grain dryers, livestock and poultry structures, hog parlors and laying and growing houses for poultry operations.
* Loans to buy milk base and quota
* Farm real estate loans for acquisition of additional lands, or to facilitate transfers of estates
* Term loans to acquire interests in cooperative or proprietary agribusinesses
* Loans to permit hedging in future markets
* Loans on stored commodities
* Pre-export commodity financing
* Commodity export financing.

Additionally, farmers have many normal consumer credit needs for student loans, furniture, automobiles, and home improvement loans. There is also an increasing need for financial services in such areas as farm management, estate management, payroll services, enterprise planning, money market and securities investment, credit information. collection or financing of receivables, tax preparation, and relating matters. As farm size and complexity increases, the quality of farm financial management services will become equally or perhaps more important than the quantity of farm credit.

Credit Needs of Small, Part-time, and Entry-level Farmers

Special credit needs exist for small and part-time farmers, as well as people seeking to enter the farming business. A 1977 report of the Small Farm Viability Project in California listed the following as problems that small farmers encounter in obtaining financing:

1. Farmers do not have easy access to information regarding credit availability, application requirements, prudent use of credit and specialized credit sources and practices for agricultural operations.

2. The element of the unknown, peculiar to agriculture, interferes with obtaining financing - many financial institutions don't understand farming.

3. Real estate and development loans for investments characterized by long-delayed income (e.g., for orchards), are difficult for small family farmers to obtain due to low equity resources.

4. Many programs and agencies set up to finance agriculture are unable or unwilling to take risks necessary to finance the beginning farmer.

5. There appear to be no existing programs for funding agricultural production cooperatives or limited-purpose cooperatives such as mechinery pools.

6. The Farmers Home Administration does not have adequate resources to meet the demand for loans under the present program.

7. Financing of small farm units has become synonymous with poor credit.

8. Returns on farm production make it difficult to pay high interest rates or complete with other enterprises for credit.

9. Inflated land prices are a deterent to small farming, especially to the individual trying to enter farming.

A recent draft report of the Committee on Entrance to Farming of the Maine Food and Farmland Study Commission found many of these same problems in Maine, adding that current high interest rates and the lack of financial management assistance are particularly significant problems. The Committee concluded that there is adequate credit available in Maine for persons desiring to enter farming and emphasized a problematic aspect of special programs for marginal or beginning farmers, i.e., such added activity often tends to cause an over-supply of products in the marketplace, depressing prices, creating inequitable competitions, and harming all producers.

Changing Credit Sources and Availability

Historically, individuals have provided the bulk of financing for farm real estate loans while banks and merchants have provided the bulk of operating and medium-term credit.

The role of government in farm financing has traditionally been as a supplemental source for specialized purposes. But as credit and capital requirements continued to expand, other sources are gaining large market shares. In real estate loans the Federal Land Banks and life insurance companies have been expanding rapidly. Among institutional leaders, the Land Banks currently have more than 50% of total real estate loans nationally. Life insurance companies, while holding a smaller share, are expanding aggressively with an increase of nearly 18% in their loan level in 1978. The Farmers Home Administration (FmHA) is also playing an important role, having increased its total agricultural loans from $6 billion in 1976 to $13 billion in 1978. Many FmHA loans recently have been emergency loans and operating loans. Production Credit Associations (PCA) are increasing operating loans at a faster rate than banks, but banks still lead this field nationally.

Meeting future agricultural credit needs will require an increasing amount of sophistication and innovation on the part of both farmers and creditors. Farm credit institutions such as FmHA, the Land Banks, PCA's, and life insurance companies can be expected to continue increasing their shares of the farm credit market because of their specialized expertise in farm matters. Commercial banks, with their wide range of loan activities, will find competition increasingly difficult for the highest quality farm loans. Federal sources will continue to increase in importance, relying more and more on guarantee programs. Most importantly, the key to adequate capital and credit availability for farming will be profitability.

The following sections provide a brief summary of major sources of farm credit in Maine. Table 2 and 3 show outstanding loan levels for these sources from 1950-1978:

TABLE 2

FARM REAL ESTATE DEBT IN MAINE:* AMOUNT OUTSTANDING BY LENDER, JANUARY 1, 1950-78

Year	Federal Land Banks	Farmers Home Administration	Life Insurance Companies**	All Operating Banks	Individuals and Others**	Total Farm Real Estate Debt
1978 Loan Level	30,361	53,734	6,480	9.039	18,327	117,941
% of Total	25.7%	45.6%	5.5%	7.7%	15.5%	
1975 Loan Level	19,927	47,552	1,300	8,274	16,923	93,976
% of Total	21.2%	50.6%	1.4%	8.8%	18%	
1970 Loan Level	7,124	35,602	300	5,643	9,700	58,369
% of Total	12.2%	61%	.5%	9.7%	16.6%	
1965 Loan Level	3,768	20,030	426	3,842	7,953	36,019
% of Total	10.5%	55.6%	1.2%	10.7%	22%	
1960 Loan Level	4,415	10,539	469	2,417	6,232	24,072
% of Total	18.3%	43.8%	2%	10%	25.9%	
1955 Loan Level	4,289	2,400	401	7,092	13,130	27,312
% of Total	15.7%	8.8%	1.4%	26%	48.1%	
1950 Loan Level	3,118	798	15	4,433	12,098	20,462
% of Total	15.2%	3.9%	.07%	21.7%	59.1%	

* Source: USDA Economic, Statistical and Cooperative Service (ESCS).

** ESCS estimate

TABLE 3

FARM OPERATING DEBT IN MAINE:* AMOUNT OUTSTANDING BY LENDER, JANUARY 1, 1950 - 1978

Year		All Operating Banks	Production Credit Associations	Federal Intermediate Credit Banks	Farmers Home Administration	Total
1978	Loan Level	18,674	29,129	0	35,234	83,037
	% of Total	22.5%	35.1%		42.4%	
1975	Loan Level	12,817	30,302	0	34,406	77,525
	% of Total	16.5%	39.1%		44.4%	
1970	Loan Level	13,478	16,329	469	34,026	64,302
	% of Total	21%	25.4%	0.7%	52,9%	
1965	Loan Level	13,574	7,386	860	15,652	37,472
	% of Total	36.2%	19.7%	2.3%	41.8%	
1960	Loan Level	11,759	7,611	2,282	9,656	31,308
	% of Total	37.6%	24.3%	7.3%	30.8%	
1955	Loan Level	11,683	5,050	1,462	5,624	23,819
	% of Total	49.1%	21.2%	6.1%	23.6%	
1950	Loan Level	11,468	3,079	131	3,595	18,273
	% of Total	62.8%	16.8%	0.7%	19.7%	

*Source: USDA Economics, Statistical, and Cooperative Service

1. The Farmers' Home Administration (FmHA)

The objective of FmHA's farm loan program is to provide supervised credit to farmers unable to obtain adequate credit from commercial lenders at reasonable rates and terms. This is done through operating loans, farm ownership loans, and emergency loans. These programs are intended to maintain and strengthen the family farm structure by helping farmers who could not get credit elsewhere and by providing credit to beginning farmers. Farm ownership loans are made to eligible farmers to enlarge, develop, and buy farms not larger than family farms; to refinance debts; and to make capital improvements. Each loan is scheduled for repayment in accordance with the borrower's ability to repay, over a period not exceeding 40 years. The maximum statutory interest rate at the time of this report is $8\frac{1}{2}\%$ with a limit of $200,000 per loan. An FmHA loan may be combined with an unlimited amount of loans from other sources, and, in certain cases, may be subordinated to loans from other lenders. Farm ownership loans currently amount to more than $53 million in Maine or approximately 46% of farm real estate debt in Maine compared to a national share of that market of only 6.3%. FmHA operating loans are made to pay for equipment, livestock, feed, seed, fertilizer, or other farm and home operating needs. Each loan is scheduled for repayment in accordance with the borrower's ability to repay, over a period not exceeding seven years. The interest rate is adjusted from time to time based on U.S. Treasury rates, but is usually lower than rates charged by other farm lenders on similar loans. Loans are secured and loan size limits are set by law with a current maximum of $100,000. More than $35 million of FmHA operating loans were outstanding in Maine on January 1, 1978.

Emergency loans are made to eligible farmers in counties officially declared disaster areas. Loans may be made for the purchase of feed, seed, fertilizer, replacement equipment, livestock, and for other items needed to restore normal operations. Loans are made at an interest rate of 5% with maturities of up to five years. Aroostook County has received substantial sums of FmHA emergency loans in recent years. Emergency loans on the 1977 potato crop totalled nearly $25 million - covering production, harvesting and refinancing needs. An emergency designation has been made again this year but loan levels are expected to be lower, at higher rates, and largely exclusive of refinancing needs.

FmHA farm lending programs have been aimed at "high risk" borrowers - typically young, entry-level farmers and those who do not meet usual credit standards such as equity position or repayment ability relative to loan size. In theory, FmHA is able to service this type of borrower without undue losses by providing technical advice and loan supervision. However, the role of FmHA has not always been according to stated intentions. In Maine, which has highest relative percent of FmHA to total financing of any state in the U.S. (approximately 45% of total credit in Maine from reporting sources), FmHA is clearly not limited to being an entry level program nor does it have the personnel capabilities to provide farmers with sufficient technical assistance to be instrumental in improving farm management. The high level of FmHA financing in Aroostook County has, in fact, been called counter-productive to the potato economy by artificially supporting poor or marginal farming operations. This situation is quite different in many other parts of the U.S. since FmHA's share of total farm financing on a national level is less than 10%. Despite certain criticism, however, FmHA is a highly important credit source to farmers in Maine and the U.S. Also, it is probably quite useful to commercial lenders who, rather than viewing FmHA as competition, are able to either use an FmHA guarantee program or refer applicants to FmHA in marginal or risky credit situations. Perhaps the greatest concern of the farm community regarding FmHA is the rapid expansion of its non-farm programs.

2. The Federal Land Banks (FLB)

The Federal Land Banks are part of the Cooperative Farm Credit System which also includes the Production Credit Associations, Federal Intermediate Credit Banks, and the Banks for Cooperatives. All of these institutions are made up of member-owned non-governmental associations operating under the supervision of the Farm Credit Administration, an independent agency of the federal government. FLB's make loans secured by first mortgages on real estate. Loans may be made to farmers and ranchers for any agricultural purpose and other credit needs of eligible applicants. FLB borrowers must be full or part-time farmers, rural residents, or operators of farm-related businesses. Loans may range from 5 to 40 years. Repayment plans are designed to accommodate borrower's cash flows and are therefore somewhat flexible although most loans specify a fixed number of installments. In no case can the amount of the loan exceed 85% of the appraised value of the real estate security. FLB's have variable interest rates with provisions for raising or lowering rates depending on the average cost of money to the banks.

As indicated in Table 2, FLB's have more than $30 million in real estate secured debts in Maine, about 25% of the state's total farm real estate debt. The farm types receiving the most funds in recent years have been poultry, dairy, and vegetable (mostly potato farmers). It is important to note that the Federal Land Banks are the largest institutional source of farm real estate debt in the U.S. with nearly 35% of the share of this market. The FLB's as well as other institutions in the Cooperative Farm Credit System, are generally known for the high quality and professionalism of their credit and technical assistance services.

3. Production Credit Associations (PCA)

PCA's, another part of the Cooperative Farm Credit System, are credit cooperatives owned and controlled by their members. They were authorized by law in 1933 as a means for providing short and intermediate term credit for the same markets eligible for Land Bank loans. There are more than 400 PCA's operating in the United States, and two in Maine. Funds for PCA loans come from bonds issued by the Federal Intermediate Credit Banks (FICB) which act as a credit discounting mechanism not only for PCA's but also, to a lesser extent, to commercial banks and other financial institutions. PCA loan rates are dependent on the borrowing rates of the FICB's on the money market.

PCA loan terms may range up to seven years in length. Repayment plans are designed to accommodate the borrower's cash flows. While some loans are written with a fixed number of annual, semi-annual, or monthly installments, many PCA's have instituted budget or line-of-credit financing plans. Under these plans, a borrower arranges in advance for a loan to cover all his financial requirements for an entire season or agricultural cycle. Loans may be made to farm-related businesses for working capital, equipment, purchases, or other operating needs. The farm loan volumes of PCA's in Maine as of January 1, 1978, was approximately $29 million, representing about 35% of farm operating loans (exclusive of merchant credit) at that point in time. As in the case of the Federal Land Banks, PCA's are a highly important source of credit in farming with approximately a 26% share of total farm operating loans in the U.S. In addition to offering credit and financial advice, many PCA's provide borrowers with other services including credit life insurance, and farm recordkeeping.

4. Commercial Banks

Commercial banks as a group are the leading source of non-real estate farm loans in the U.S. with 51% of this market. Banks also are important in providing real estate loans with 12% of that market. In Maine, banks' share of non-real estate loans as of January 1, 1978, was 22.5%, and their share of real estate loans was approximately 8%. It is important to note that the market share of banks in both farm real estate and operating loans in Maine has declined dramatically since 1950 despite increasing loan levels by banks. Loans secured by real estate increased from $4.4 million in 1950 to $9 million in 1978 with the market share dropping from 22% to less than 8%. Operating loans increased from $11.5 million to $18.7 million while market share declined from 63% to 22.5%. Dramatic increases in funding from other sources have been responsible for the relative decline in importance of bank financing in agriculture in the past several decades.

TABLE 4

LOANS TO FARMERS BY 30 LEADING BANKS IN MAINE*, LOAN LEVELS AS OF DECEMBER 31, 1977

Bank	Dollars in Thousands		
	Loans Secured by Real Estate	Operating Loans	Total
1. Northern National Bank	270	8066	8336
2. 1st National Bank of Aroostook	613	2613	3226
3. Federal Trust Co.	975	876	1851
4. Depositor's Trust Co.	1099	720	1819
5. Houlton Trust Co.	691	964	1655
6. Washburn Trust Co.	187	1140	1327
7. Aroostook Trust Co.	57	1117	1174
8. Northeast Bank of Lewiston-Auburn	695	321	1016
9. Katahdin Trust Co.	312	654	966
10. Bar Harbor Banking and Trust	754	75	829
11. Skowhegan Savings Bank	705	0	705
12. Depositor's Trust of Bangor	130	547	677
13. Merchants National Bank of Bangor	0	529	529
14. Northeast Bank and Trust	383	93	476
15. Merrill Trust Co.	285	67	352
16. Norway National Bank	44	254	298
17. Waterville Savings Bank	250	0	250
18. First Bank N.A.	120	112	232
19. Northeast Bank of Farmington	153	33	186
20. Norway Savings Bank	179	0	179
21. Camden National Bank	92	73	165
22. Northeast Bank of Sanford	18	133	151
23. Maine National Bank	150	0	150
24. Mid-Maine Mutual	144	0	144
25. 1st National Bank of Biddeford	55	68	123
26. National Bank of Gardiner	91	30	121
27. The Dirigo Bank and Trust Co.	86	32	118
28. Northeast Bank of Lincoln	37	64	101
29. Saco-Biddeford Savings Institution	91	0	91
30. Gardiner Savings Institution	82	0	82

* Sources: Controller of the Currency and Maine Bureau of Banking

Farm loans by commercial banks in Maine are concentrated in the portfolios of a relatively small number of institutions. As indicated in Table 4, two banks in Aroostook County, Northern National Bank (Casco northern affiliate) and First National Bank of Aroostook (Depositor's Trust affiliate) accounted for more than $11 million of the $27.7 million in farm loans held by Maine commercial banks. Three bank organizations, Casco Northern, Depositor's Trust, and Northeast Banks' shares account for more than half of the farm loans made by Maine banks. Only 8 banks have total farm loan portfolios of more than $1 million.

Banks are prominent in providing credit to the farm sector nationally for several reasons. First, banks are readily accessible to farmers since they are located in nearly every town in major farming regions. Banks are able to give prompt credit service at competitive interest rates. They can also provide a full range of financial services including all types of loans, checking and savings accounts, safe deposit boxes, and other services such as farm management counseling and recordkeeping, estate planning, management of trusts, and investment counseling. Although banks can and do make all types of farm loans, shorter term loans are usually prefered due to the source of a large portion of loan funds: demand deposits which can withdraw quickly. A small portion of loand are for intermediate term needs such as machinery, livestock, and buildings.

A number of factors affect the ability of banks to finance farming in Maine. Although banks have been and still are a major institutional source of credit to the farm sector, sharply rising capital and credit needs have made it difficult for many rural banks to accommodate these needs adequately. Farm debts have grown much faster than the resources and deposits of many rural banks. Low per capita income and low per capita bank deposits in Maine have further limited the supply of loan funds. As this trend continues, loan deposit ratios have in many cases reached a maximum level considered prudent by bank management. These ratios are currently significantly higher in Maine than nationally inferring that although bank credit is relatively scarce in Maine versus the national average, banks have been liberal in using available dollars to fund domestic loan activity.

Another limiting factor has developed as rural areas and rural economies have become less farm oriented in recent years. As this trend has continued, and as banks have become more centralized, many banks have lost specialized expertise in farm credit matters and have, in many cases, stopped treating farm loans as a separate and specialized portfolio. This has not only caused a dilution of interest ;in farming but has constituted a significant disadvantage for banks relative to competing organizations such as the Production Credit Associations, Federal Land Banks, and FmHA where farm expertise is increasingly concentrated. Given these circumstances, further increases in farm credit may be difficult.

5. Life Insurance Companies

Life insurance companies play an important role in mortgage financing of both urban and rural real estate. Long-term real estate loans are among the investments best suited for the funds they hold as reserves for policy holders. Generally, reserves as a life insurance policy accumulate over time and provide insurance companies with large sums of money which can be invested for long periods of time to produce income. Life insurance companies currently hold $8.5 billion or more than 13% of total farm real estate loans in the U.S. Only a decade ago they were the single largest institutional source of farm real estate debt in the nation. More recently their relative importance has declined largely due to substantial credit increases by the Federal Land Banks. Increasingly, life insurance companies are concentrating their loans in the larger-than-average farms, The overall size of life insurance company loans made during 1977 was 277% larger than loans made by the FLB's. Relatively few insurance companies are active in the farm market. It is estimated that 21 firms account about 96% of the industry's farm mortgage lending, and just 8 firms account

for 87% of the industry total. Although the life insurance industry is an important lender to the farm sector, the amounts loaned represent less than 3% of the industry's total investment portfolio. Investments by life insurance companies in Maine agriculture currently amount to $6.5 million. Most of the industry's investments, as expected, are located in the large-scale farm states such as Texas, California, Iowa, Illinois, Florida, etc. Very few funds are invested in the northeast because the relatively small scale and low density of agricultural activity in this area makes servicing this market very difficult and less profitable than the larger farm areas.

6. Individuals and Other Sources

As noted earlier, individuals are the leading source of farm mortgage loans. Most of this lending occurs when a farmer retires and is willing and able to accept a down payment plus a contract for a deed or mortgage for the sale price of the farm. A much less prevalent private financing pattern is for non-farmers to provide funds for farm real estate debt with bankers sometimes acting as intermediaries. Land contracts are widely used, especially in time of tight credit, and in some areas may account for half or more of the financing of farm real estate transfers. These contracts have the advantage to buyers of allowing for a smaller down-payment than possible with most commercial credit sources. They also allow sellers to dispose of property regardless of mortgage market conditions. Financing by individuals currently amounts to $18.3 million or 15.5% of farm real estate debt in Maine. This represents an increase in the past 20 years but in Maine as well as at the national level private financing has been a very dominant farm financing source in prior times.

Merchants and dealer credit is used extensively by farmers and has long been an essential ingredient in retailing operations. In regard to "hard goods" such as farm machinery, most manufacturers, through their dealers, have financing plans for farmer customers with either a bank or other credit institution. Credit for "soft goods" such as fertilizer, feed, petroleum products, or other operating inputs is frequently extended under relatively informal arrangements such as account credit carried for monthly billing or for billing at harvest. Interest may or may not be charged. Although merchant and dealer credit is known to account for a large share of operating credit in agriculture, little specific data is available on loan levels, terms, and characteristics. Based on volume of farm activity, including equipment and "soft goods" purchases, it is estimated that merchant and dealer credit currently amounts to $25 to 30 million in Maine.

The Small Business Administration (SBA) also plays a role in agricultural financing. In general, SBA loan activities are to agribusiness enterprises rather than directly to farmers. However, a recent broadening of its definition of eligible borrowers has included farmers. It is able to make loans to finance real estate, equipment, capital improvements, operating expenses, and refinancing of debt. As of mid-year 1978, SBA had $1.6 million in farm loans in Maine. This included 18 loans of both long and short terms.

Savings and loan associations have not been an important factor in the farm lending field in Maine or nationally. They can make loans secured by farm real estate for up to 25 years and up to 80% of the value of the property used for commercial farming. Savings and loan associations in Maine have a total of about $1.5 million in farm real estate debt.

RECOMMENDATIONS

1. Family Farms

Because of the current importance and strong desirability of family farms in Maine agriculture, it is recommended that the State, in any actions or policies regarding farm credit, give strongest consideration and support to family farms over other part-time or large farm enterprises.

2. Agricultural Bankers Association

It appears that rural banks are gradually losing specialized interests in agriculture in this area as the economy of rural areas becomes more broad based, and as banking becomes more centralized. Additionally, competition from specialized agricultural credit institutions such as Production Credit Associations, the Federal Land Banks, and the Farmers' Home Administration have eroded traditional market shares of Maine banks in agricultural credit. This erosion of market shares and dilution of agricultural interests has occurred at the same time that greater levels of agricultural financing and more specialized expertise and credit services are increasingly needed to adequately serve Maine's farm community.

It is recommended that the Department of Agriculture and the University of Maine provide encouragement and support to the formation of an Agricultural Committee of the Maine Banker's Association. This Committee would serve as a mechanism for focusing private resources and attention on agricultural credit matters in Maine and could be instrumental as a source of technical assistance, educational programs, and coordination for bankers in modern agricultural credit matters.

3. Farm Credit Management by Bankers

Related to the above proposal, it is recommended that commercial banks be encouraged to treat farm loans as a distinct portfolio of loans. The treating of farm operating loans as consumer loans is becoming more common and may create a poor situation for both banks and farmers. We also encourage that secondary mortgage markets such as the Federal Intermediate Credit Banks, life insurance companies, and correspondent banking systems be explored and their use encouraged as a means for expanding agricultural credit activities of Maine banks. The Agricultural Committee proposed above would seem to be an appropriate mechanism for exploring these and related issues.

4. University Agricultural Credit Specialist

It is important that, within the public sector in Maine, there be a source of technical expertise and information on a broad variety of agricultural finance matters including sources of funds, sources of technical credit-related services, general financial conditions of various farm sectors, credit education and training programs, national and regional trends in agricultural finance conditions and practices, and related matters. As farming becomes more and more complex, the need for such a resource will continue to grow.

It is recommended, therefore, that a full-time specialist in agricultural credit matters be employed within the Department of Agricultural and Resource Economics (UMO). Functions related to this position would include: direct extension work with individual farmers and farm groups regarding credit matters; liaison with various credit agencies in Maine to provide technical assistance and information as needed; liaison with other states, the federal government, and other sources to keep abreast of changing credit needs, circumstances, and practices; and the publication or dissemination of information and analysis on important trends, practices, issues, problems, and conditions in Maine agriculture.

5. Farm Marketing and Management Plans

There is a feeling in many sectors of Maine's agricultural community that inadequate controls have been employed in the use of government agricultural credit in Maine, and that the abundance of such funds have in some cases had the undesirable effect of supporting marginal farmers at an undue cost to the general farm economy. This has been particularly true in regard to potatoes and has contributed to problems of over production, poor production practices, and depressed market conditions.

In an effort to help remedy this situation, it is recommended that FmHA be strongly encouraged to require that sound farm management and marketing plans be a firm prerequisite to these government loans. While the need for government loans to farmers is clear in certain circumstances, it is important that these funds serve a productive purpose. Good cultural practices, proper soil and water management, sound marketing strategies, solid farmer potential, and overall good financial and farm management should be demonstrated in government funding situations.

6. FmHA: More Guaranteed Loans, More Technical Assistance

As discussed earlier, FmHA is the largest source of farm credit in Maine with approximately 45% of farm real estate debt and 42% of farm operating debt in Maine. FmHA was established to assist farmers in start-up and emergency situations, but current loan levels have stretched the agency's ability to provide the special technical assistance that these difficult situations require. It is recommended that FmHA, with assistance from the University and the Department of Agriculture, take steps to improve technical assistance provided to farmers receiving government credit for emergency or entry level purposes. Licensee arrangements should be investigated whereby FmHA could lower its personnel requirements and increase technical assistance and supervised credit by contracting these services to qualified private organizations. It is also recommended that greater use be made of guarantee programs to increase the participation of other credit sources in higher-risk farm situations.

7. National Crop Insurance

One of the greatest risks in farming is the uncertainty of crop production due to a variety of natural factors. This uncertainty has traditionally been the cause of conservative attitudes of creditors toward increasing farm financing activity. This has also been the cause of a variety of government credit programs such as federal disaster payments and emergency loans via FmHA. It is recommended that a program of national crop insurance be developed to replace existing programs in order to reduce risk and uncertainty in farming and improve the credit-worthiness of farmers.

8. Maine Development Foundation and Maine Capital Corporation

The Maine Development Foundation is a non-profit corporation established by the State Legislature in 1978 to help generate economic development in Maine through a variety of research, planning, and technical assistance programs. The Maine Capital Corporation, an affiliated organization, was established concurrently to stimulate capital formation and serve as a new source of investment capital for Maine industries. It is recommended that these organizations be encouraged to play a significant role, as needed and feasible, in improving the viability and diversification of agriculture and agribusiness in Maine.

9. Cooperative Arrangements

Cooperatives, in Maine as elsewhere, have the potential for increasing farm prosperity by pooling the resources of small farmers to undertake more effective efforts in marketing, production, machinery and equipment utilization, purchasing of inputs, technology transfer and development, and other important functional areas of agriculture and agribusiness. It is recommended that farm credit sources give particular encouragement to the development of cooperatives and the initiation of cooperative and coordinated actions among farmers in Maine.

HUMAN RESOURCE ISSUES

A broad range of human resource issues are of crucial importance to production agriculture in Maine and the U.S. The following sections briefly address many issues and circumstances in this area.

Overall farm population trends

The number of farm operations and the size of the U.S. farm population have dropped rapidly since 1900. The total farm population is currently about 8 million, or 3.7% of the U.S. population - down from 8.7% in 1960 and 30% in 1920. Although the farm population has continued to decline, it has declined at a slower rate than in the past. The average annual rate was only 3.1% between 1970 and 1977, compared with 4.8% between 1960 and 1970.

New England has only 1.6% of the country's farm population. Like the rest of the country, we have experienced a decline in farm populations, but our decline has been at a slower rate than the rest of the nation. There are no recent figures on trends in Maine's farm population in terms of total number. Statistics indicate, however, that there are 6,400 farm operations in Maine. The average age of these farmers has increased for several decades but since 1969 has stabilized at age 51-52. Only 3% of all operators are tenant farmers, the rest own all or at least part of their farms. Over $\frac{1}{2}$ of all operators work off the farm to supplement farm income. And, if the Maine farm population distribution is comparable to the national norm, about 64% of all farm people live on small farms with net incomes averaging below $5,000 annually. The average educational level of Maine's farm population is estimated to be less than 11 years. However, the educational gap between farm and non-farm populations has been closing significantly in the past few years.

Comprehensive education and training needs

Farming is both a science and a business, and is continually becoming a more complex enterprise. The future prosperity of Maine's agricultural economy will depend on a population of farmers who are able to meet the increasing complexity of farming with greater knowledge and skills than ever before. Continuing needs for improved abilities will occur in such areas as:

* agricultural machinery and technology
* planting techniques
* cultural practices
* irrigation techniques
* land preparation
* evaluation of land and water quality
* chemical and other inputs
* animal husbandry
* harvesting and delivery systems
* venture planning
* legal considerations
* financial management
* organizational management
* marketing management.

Attaining and maintaining the skills and abilities needed in modern farming requires both formal and informal education and training. It requires great resourcefulness by farmers as well as support from public and private sector institutions. Because of the importance of agricultural prosperity to Maine's economy, it is important that government play a major

role in developing human resources in agriculture. This role can take many forms - from technical assistance programs provided through the extension service, to formalized post-secondary education. These training and education vehicles must vary in accordance with the unique needs and different segments of the farm population: those who are already established as farmers; those who wish to enter farming; those with previous formal education; those with largely or exclusively field experience; etc. The following sections provide brief summaries of sources of education and training in agriculture in Maine.

College of Life Sciences and Agriculture

Educational opportunities for potential or current farmers in Maine are offered by the College of Life Sciences and Agriculture at the University of Maine at Orono. Programs of study currently available are:

1. B.S., M.S., and Ph.D. Programs in:

Animal & Veterinary Sciences including Pre-Veterinary

Agricultural & Resource Economics
- Production Economics
- Business Management
- Marketing
- Sociology of Rural Life

Biological Sciences
- Biology
- Biochemistry
- Botany
- Entomology
- Microbiology

Agricultural Engineering
Agricultural Mechanization
Forest Engineering

Forest Resource
- Forest Management
- Wildlife Management
- Wood Sciences

Human Development
- Food and Nutrition
- Early Childhood Education
- Home Economics Education
- Health and Family Life Education
- Social Service

Plant and Soil Sciences
Natural Resources
Recreation and Park Management

2. Associate Degree (Two-Year) Programs in:

Animal Medical Technology
Animal Agriculture Technology
Landscape and Nursery Management
Forest Management Technology
Merchandising
Resource and Business Management

Vocational programs - secondary and post-secondary

The Department of Educational and Cultural Services is presently involved in the following major agriculture and agribusiness instructional areas:

1. production agriculture
2. agriculture mechanics
3. agricultural products
4. agricultural processing and marketing
5. agricultural supplies and services
6. forestry
7. horticulture
8. animal sciences
9. renewable natural resources

Presently there are 47 agribusiness and natural resource education programs and courses in the above areas being offered in Maine's secondary and post-secondary schools. There are 32 State recognized vocational programs within six schools at the post-secondary level. Student enrollment in these 47 programs and courses is approximately 2,000.

It is important to note that information developed by the U.S. Interdepartmental Committee on Employment Opportunities in Agriculture and Agribusiness for the period 1974-1975 identifies Maine's annual replacement needs for agriculture and agribusiness at over 2,800. It further shows that less than 7% of these needs are being met by people trained in these occupations.

Cooperative Extension Service (CES)

CES is another important source of education and training to the farm community. 80% of the CES staff is located in county offices. The purpose of CES is to help people to help themselves through practical transfer of information. Various methods are used by CES staff and local trained volunteers to inform, instruct, and help interested individuals and groups to adopt new practices that will improve their social and economic conditions. Organizational and training assistance is provided as well as direct dissemination of general and detailed "how to do it" information by publications, newspaper articles, TV, meetings, and personal calls. Live demonstrations of new techniques and practices on individual farms, in the home, and in the community continue to be the most common and, in many cases, most effective educational methods.

Other education and training sources

There are a number of private schools or organizations which also offer special technical training in agriculture. These include:

1. Maine Organic Farmers and Gardeners Association (MOFGA)
2. Maine Audubon Society
3. New England Horse Center (Farrier Course)
4. Hinckley Home School Farm
5. Unity College

The MOFGA apprenticeship program has drawn particular interest lately among those seeking entry experience in permanent agriculture. The purpose of the program has been to bring together those seeking such experience with those already working at it and willing to share their experience in return for labor. 32 apprentices had served in the program by June, 1978.

Farm labor in Maine

According to the Census of Agriculture, Maine farms employed nearly 42,000 hired workers in 1974 on either a part-time or full-time basis. These workers were employed on approximately 3,000 farms and accounted for a payroll of approximately $30 million. Table 1 presents further data on this subject. The overall trend in the farm labor population has been sharply downward. As Table 1 indicates, most farm laborers in Maine are highly seasonal. In 1974, two-thirds worked less than 25 days. The harvesting of potatoes, blueberries, and apples account for a great majority of these workers.

TABLE 1

Farm Labor Data for Maine*

1964, 1969, 1974

Workers and Wages by Number of Days Worked		1974	1969	1964
150 days or more:	farms	1,256	1,526	2,286
	workers	4,350	3,627	5,350
	amt. paid, $1,000	19,468	NA	NA
25 to 149 days:	farms	1,414	NA	NA
	workers	9,774	NA	NA
	amt. paid, $1,000	7,044	NA	NA
Less than 25 days:	farms	2,034	NA	NA
	workers	27,804	NA	NA
	amt. paid, $1,000	4,422	NA	NA
Total:	farms	3,006	4,282	5,457
	workers	41,928	45,459	NA
	amt. paid, $1,000	30,933	22,616	21,594

* farms with sales of $2,500 and over

While the number of farm workers has declined due primarily to increased mechanization, farm wages have increased considerably. Overall wages paid to hired farm workers in Maine increased 30% from 1964 to 1974. The average farm wage in the northeast for 1976 was $2.59 per hour. National piece rates averaged $3.14 per hour, and non-piece rates averaged $2.61 per hour. Farm wages have escalated more rapidly than other farm costs such as machinery, electricity, gasoline, etc. At the same time, farm labor output per man hour has also escalated rapidly. Farm labor in 1978 produced 160% more per hour than in 1967. Non-farm productivity gains were only 112% of the 1967 base. The largest productivity gains nationally occurred in the dairy and poultry industries.

Alien agricultural workers

Problems in securing workers for harvesting have been repeatedly cited as the major development concern in Maine's apple industry. Of the 723 workers employed in the 1978 apple harvest, 57% were aliens. Orchardists claim that the importation of labor is crucial to getting their crop harvested in the short 2-3 week period necessary. The difficulty in securing alien workers is caused by federal laws which attempt to ensure that

foreign workers do not adversely affect the wages and working conditions of U.S. workers. The steps required to recruit and employ aliens are complicated and often referred to as "nightmarish" by local orchardists. Without going into detail on these procedures, it is apparent that the following represent major industry concerns with this situation:

(1) The 80-day advance notice regarding employment need is felt to be too long. Employers feel that estimating labor requirements that far in advance is difficult.

(2) Participation by OSHA in the program precipitates non-housing OSHA violations because OSHA visits to housing sites offer them opportunities to visit the rest of the farm.

(3) Maine's Adverse Effects Rate requires employers to pay the equivalent of $2.84 per hour even though the minimum wage is $2.30 per hour.

(4) Agency responsiveness has been called absurd even by agency representation. Apparently this is due to the number of agencies and special interest groups involved.

(5) The Adverse Effects Rate, like the mimimum wage law, prices certain labor sources out of the market.

(6) The law limits employers from expanding their original request for employees by a maximum of 15%. This apparently will encourage employers to over-estimate their needs.

(7) The process leaves the determination of labor availability to the Regional Administration who can estimate those who are likely to sign work contracts. This speculation causes undue denials of certification.

(8) Many employee groups feel that the U.S. should force employers to use domestic labor by simply not allowing alien laborers in.

Other labor-related government regulations

In addition to the alien worker restrictions discussed above, several other regulations were cited at recent hearings of the Food and Farmland Study Commission as having an adverse impact on Maine agriculture. These included the following:

* Child labor provisions of the Fair Labor Standards restricts child harvest help on farms which use more than 500 man days of labor in any calendar quarter. Provision for exempting 12-16 year olds are provided for non-hazardous jobs under certain conditions. At present, these conditions are so restrictive that child labor is effectively prohibited from this kind of work.

* Maine's liberal workmen's compensation benefits, high risk labor force and diverse agricultural work dictate extremely high rates. Rates for most agricultural enterprises are about $11.00 per $100 of wages. These rates place Maine at a disadvantage compared to other competitive agricultural areas.

* Other regulations cited as causing employment problems were social security taxes, unemployment compensation, minimum wage and O.S.H.A. standards.

This study makes no judgment on these regulations. It is important to point out however, that while the effect of each may be relatively insignificant, the compound effect of a few may be quite significant. For example, the total cost of employment for a minimum wage employee ($120/week) can be as follows:

Workman's Compensation	- $13.20	per week from employer
Social Security	- $14.52	per week (split by employee)
Unemployment Compensation	- $ 4.44	per week (from employer)
Withholding Tax	- $11.50	per week (from employee)
	$43.66	total labor cost

RECOMMENDATIONS

1. Extension efforts

It is recommended that the development of farm management skills be considered the highest priority of the University's extension efforts. Management skills emphasized should include problem identification and anticipation, farm planning, accounting, budgeting, debt management, taxation, etc. Special emphasis should be placed on improving farmers' awareness of the benefits of land improvement, financial planning, and marketing coordination.

2. Integrate practical and classroom training

It is recommended that every effort be made in vocational and University agricultural programs to integrate practical experience and classroom training. Work/study apprenticeship programs should be recognized as having a particularly high value in agricultural education and training programs. Furthermore, these training programs should be integrated between secondary and post-secondary sources to provide continuity in such programs.

3. Continuing education

It is recommended that continuing education courses be viewed as an important means for meeting adult education needs for farmers. These courses, however, should be offered by competent personnel and to a well segmented clientele, i.e., programs should be designed for relatively specialized needs in order to be most productive. It is further recommended that efforts be made at various training and educational institutions to conceptualize agricultural training and education needs as important long term and continuing commitments to be made in the interest of improving the technical competency of Maine farmers.

4. Alien labor

It is recommended that efforts be made by the State of Maine to secure major decision making power for the state in regard to the use of alien labor in agricultural harvesting situations.

5. Government regulations

It is recommended that the Department of Agriculture be charged with making specific recommendations on changes in workmen's compensation laws, child labor laws, and OSHA regulations which have an unduly harmful effect on Maine's agricultural economy without compensating benefits.

FARM SIZE STRUCTURE AND RURAL ECONOMIC ISSUES *

An important trend in agriculture in the past several decades, as noted previously in this report, has been the continuing trend toward fewer and larger farms in Maine as well as the U.S. as a whole. Small scale farming, the traditional mainstay of our agricultural and rural economy, is losing ground at a rapid rate. There are many reasons for this. The transition of our society from a basically agrarian one to a technological one with more specialization and increasingly urban characteristics, has concentrated food production in the hands of a dwindling number of food production specialists, i.e., commercial farmers. Non-commercial or subsistence farming has declined as life styles have changed. Consumer preferences and cultural patterns have increasingly dictated that foods be processed in order to allow for its preservation and convenient consumption. Demand for large, dependable quantities of uniform product have disadvantaged smaller growers in favor of larger and more specialized operations. Increased mechanization and capital intensity in agriculture has also favored large scale production. Small farmers have also found it difficult to exert price leverage in the marketplace and in the purchase of farm inputs, thereby losing a competitive edge to larger growers. It is also important to note that public policies and programs have undoubtedly favored the trend toward larger specialized farming in the interest of maximizing the efficiency and prosperity of the farm sector.

There is, however, growing evidence from many sources that small farms may be as efficient or, in some cases, more efficient than larger farms in certain production circumstances. Additionally, there is growing concern that the loss of small farms may have a detrimental and undesirable impact on rural economic conditions. Before proceeding to address these issues as they relate to Maine, it is important to define what is meant by a small farm or family farm.

What is a small or family farm?

A recent basic study (Sonka and Heady, 1974) defines a small farm as having between $2,500 and $10,000 in gross sales. Metzer, writing about small, low-income farms in Maine also used $10,000 in gross sales or less to define a small farm. In many cases such low gross sales also define a part-time farm for the net income from such sales would tend to be well below poverty level. A family farm may be defined by ownership characteristics and also by the fact that it is capable of supporting a family, with the technical definition added of not utilizing more than 1.5 person years of hired labor per year. It is generally estimated that full family support can be approximated by farms with between $10,000 and $40,000 in gross sales although this can vary greatly among commodities. Farmers such as dairy operations, with high operating expenses and low margins may require higher gross sales to support a family. However, a lengthy discussion of definitions is not necessary here. For the purpose of describing Maine agriculture and drawing conclusions about present and possible future implications of farm size structure, farms with less than $10,000 in gross sales will be considered small farms, farms with sales from $10,000 to $100,000 will be considered medium-sized farms, and farms with sales of $100,000 or more will be considered large farms. All farms of less than $100,000 in gross sales are considered family farms although many farms in this size group may be part-time operations.

Maine: a small farm state

Maine is primarily a family farm state with 91% of all farms with gross sales of over $2,500 being owned by families. For a number of financial reasons, family farms are

* This section was written with the assistance of Carolyn Britt.

sometimes organized as partnerships or corporations. So, although 6% of Maine farms are partnerships and 3% are corporations, it is likely that many of these can be really classified as family operations.

Table 1 gives a distribution of Maine farms by gross sales for 1964, 1969, and 1974. As the Table indicates there has been a trend towards fewer farms and farms with larger gross sales. 13% of Maine farms had sales of more than $100,000 in 1974, compared to 3% in 1964. Although a substantial part of this increase may be due to inflation, a cross-referencing with acreage trends supports the trend toward large farms. While there was a 19% decline in the number of farms between 1969 and 1974, there was a lesser decline in harvested acreage. Average farm size in 1974 was 237 acres with 70 acres of harvested cropland. 1% of Maine's farms, or some 65 farms, now hold more than 1,000 acres each. Most farms (47%) fall in the mid-size range of 50-500 acres, and 14% have less than 10 acres of harvested cropland.

TABLE 1

DISTRIBUTION OF FARMS BY VALUE OF AGRICULTURAL PRODUCTS SOLD PER FARM
1964, 1969, 1974

Value of Products Sold/Farm	Number of Farms			Percent of Farms		
	1964	1969	1974	1964	1969	1974
Less than $2,500	5,969	2,976	1,957	46	37	31
$2,500 - $9,999	2,011	1,268	1,024	16	16	16
$10,000 - $39,999	2,832	2,355	1,425	22	30	22
$40,000 - $99,999	1,624	987	1,182	13	12	18
$100,000 - $199,999	(439	(371	526	(3	(5	8
$200,000 and over	(	(	308	(	(	5
All farms	12,875	7,957	6,422	100%	100%	100%

Source: U.S. Census of Agriculture. Maine.

As indicated in Table 2, larger farms controlled a significantly greater proportion of total agricultural sales in 1974 than they did in 1964. In 1964, farms selling over $100,000 in gross sales accounted for 31% of total product value. By 1974, they were selling over 67% of Maine's farm products by value. So Maine has fewer farms with large farms controlling more and more of our agricultural resources.

TABLE 2

Distribution of Product Sales Value by Farm Size Class:
1964, 1969, 1974

Value of Products Sold/Farm	Total Value of Product Sold 1964 ($1000)	1969 ($1000)	1974 ($1000)	Percent of Product Value 1964	1969	1974
Less than $2,500	3,862	2,248	2,020	2	1	1
$2,500 to $9,999	11,085	7,168	5,461	4	4	2
$10,000 to $39,999	62,379	51,724	33,224	24	26	9
$40,000 to $99,999	99,552	61,459	76,259	39	31	21
$100,000 to $199,999	78,031	74,651	78,288	31	38	20
$200,000 and over			168,638			47
All farms	254,909	197,250	358,602	100%	100%	100%

Source: U.S. Census of Agriculture. Maine.

While the principal farm operators of small Maine farms are 55 years old on the average, operators of large farms average 48 years old. This difference may suggest increasing interest in large farming by younger farmers. Another related consideration is off-farm income. At the national level, fully 60% of total 1977 farm income came from jobs off the farm. 67% of all U.S. farmers make 80% of their income in jobs off the farm. In Maine, more than 95% of operators of farms with over $40,000 in gross sales indicate that farming is their principal occupation. While only 53% of Maine farmers with less than $10,000 in sales consider farming their principal occupation, this proportion jumps to 80% for those with $10,000 - $40,000 in sales.

Size structure by type of farm

A more complete perspective on Maine's farm structure includes a look at farm size by type of farm. Table 3 contains the number of farms in gross farm sales categories for the major farm commodities in Maine. Vegetables, orchards, berries, and laying chickens have the largest proportion of very small farms (gross sales under $2,500). Alternatively, laying chickens, broilers, and potatoes have the largest proportion of very large farms (gross sales over $100,000). Dairy and potato farms have the largest proportion of farms of mid-range size ($10,000 to $100,000 gross sales).

TABLE 3

Distribution of Farms by Value of Products Sold by Major Commodities
1974

Major Commodity	Gross Sales Range: Less than $2,500	$2,500-$10,000	$10,000 - $19,999	$20,000-$39,000	$40,000 $99,999	$100,000-$499,999	$500,000- and over
	(paired figures indicate number of farms, and percent of total)						
Chickens over 3 months:	305	124	57	53	101	145	17
%	37	15	7	6	12	18	2
Broilers:	37	6	5	26	100	239	3
%	9	1	1	6	24	57	1
Milk Cows:	441	240	258	426	488	117	2
%	22	12	12	21	24	9	-
Potatoes:	146	173	146	298	525	270	14
%	9	11	9	19	33	17	1
Vegetables:	209	124	53	49	77	50	6
%	36	22	10	9	13	9	1
Orchard Fruits:	142	47	31	36	31	19	3
%	46	15	10	12	10	6	1
Berries:	250	187	35	20	22	7	1
%	48	36	7	4	4	1	-

Source: U.S. Census of Agriculture

Perhaps even more significant information regarding farm structure is included in Table 4 which gives the proportion of resources for commodity groups that are controlled by farms according to gross sales categories for farms with over $2,500 in gross sales. Two commodities, laying hens and berries (primarily blueberries) have the largest proportion of total resources (in these cases; birds and acres) owned by farms with gross sales of over $500,000. The resources of the poultry industry as a whole are most concentrated in the hands of farmers with over $100,000 in gross sales. The level of resource concentration in such large farms is 92% for laying hens, 76% for starter pullets, and 88% for broilers. Dairying and potato production show most resources in medium sized farms while berries show a bi-modal distribution - a large percentage of resources are owned by a large number of quite small and a small number of quite large farms.

TABLE 4

Distribution of Farm Resources by Value of Products Sold by Major Commodities
1974

Major Commodity		Gross Sales Range $2,500 - $10,000	$10,000 - $19,999	$20,000- $39,999	$40,000- $99,999	$100,000- $499,999	$500,000 and over	Total
Chickens over 3 months:	birds	42,040	22,236	99,505	647,405	3,049,075	5,982,349	9,842,610
	%	-	-	1	7	32	61	
Chickens under 3 months	birds	170	6,450	35,000	260,000	501,100	425,396	1,228,116
	%	-	-	3	21	41	35	
Broilers:	birds	12,928	53,100	755,708	7,235,849	41,787,819	14,611,200	64,456,604
	%	-	-	1	11	65	23	
Milk Cows:	No.	1,381	4,813	13,025	24,466	16,067	229	59,981
	%	2	8	22	41	27	-	
Potatoes:	acres	1,410	3,268	14,054	45,414	54,682	17,864	136,692
	%	1	2	10	33	40	13	
Vegetables:	acres	604	703	755	1,899	2,676	2,425	9,062
	%	7	8	8	21	30	27	
Berries	acres	5,018	2,651	1,052	1,947	85	8,145	18,898
	%	26	14	6	10	-	43	
Orchard Fruits:	acres	632	414	789	1,426	2,368	831	6,460
	%	10	6	12	22	37	13	

In summary, Maine agriculture is dominated in numbers of small and family sized farms. These farms provide some or all of the income for the farmer, the farm family, and some hired workers. As far as total resources are concerned, large farms almost completely dominate resources in the poultry industry while they exert strong control in the berry industry. These two industries, while providing few jobs for managerial workers hire the largest number of farm workers in the state.

Role of farm structure in the rural economy

Within the past several decades, numerous studies have been carried out linking farm size and factors of farm operation with important community and rural economic characteristics. A major and still authoritative study on this subject in the 1940's involved two communities in California; one in the midst of a small farm area, and the other surrounded by much larger

scale farms. The study found that the town surrounded by small family farms had more desirable community characteristics in terms of private and public services, and a broad range of social and recreational activities. Much research since then has built on the findings of that study, producing a considerable volume of findings regarding the relative impacts of large and small farm structures on rural communities and economic conditions. Much of this research is summarized in Table 5 which would further support the results of the California Study.

Unfortunately, no studies have been done in Maine which provide any detailed insights into the effect of changes in the farm structure on any specific communities in the State. On a related subject, however, a 1976 study by two University of Maine professors (Krofta and Harlan) discusses farm size characteristics as they relate to potato production practices and costs. They found that small farms create more overall human labor with large farms creating the least labor in relation to acreage due to mechanization. Most of the small farm labor is family workers and a limited amount of part-time hired labor. Most of the large farm labor is full-time. Fertilizers were used somewhat more heavily and total equipment costs per acre were higher for larger farms. While total costs were somewhat higher for small farms, total investments were relatively lower. The overall sense of the study was that the smaller potatoe farms used more of some resources per acre than larger farms. These resources include many bought from the local community - small production equipment and other production inputs. Fewer community people are hired on small farms as laborers, but overall more work is available to community people when the proprietor and family are considered. A factor also is the larger number of local residents owning a farm under the small farm alternative - with the challenges and satisfactions that come with that.

TABLE 5

Farm Size and Structure, and Characteristic Impacts on Communities

Small and Medium Farm Sectors [1]	Large Farm Sector [2]
Production Practices	
Utilizes more human labor on the farm (39% more than large farm sector)[3]	Utilizes less human labor, more highly mechanized [3]
Uses less fossil fuel per production unit [4]	Uses more fossil fuel /per-production unit in the form of fertilizers, pesticides, irrigation [4]
Numerous skill demands for the single operator/manager require a highly capable and versatile operator, while many fail to use efficient management practices effectively. [6,7]	
Although unable to operate at optimal efficiency, small farms can operate profitable and approximate production costs of large farms. [5] Most economies of size are captured by 1, 2 or 3 person farms. [7]	For levels and sizes of equipment and management used, large farms tend to use them more efficiently. [5]
Family-run farms are the livelihood, not just job of managers so continued investment and production is more likely - more stable food supply. [7]	More capital investment and expansion lead to monoculturing, thus greater susceptability to specific disasters. [7]
Marketing	
Diversified, small quantity marketing can be complex and costly for the farmer.	Can market more efficiently due to large sales to a few large buyers.
Makes greater overall net farm income, less net income/farm	Creates less overall net farm income, more net income/farm
Community Impact	
Creates more employment off the farm in local communities discouraging migration to urban areas and providing more local income (≅ 30% more) [3, 5]	Creates less employment in local communities. [3,5]
Could generate more income off the farm in supply, processing and distribution sectors. [3]	Could generate less off farm income by bulk purchases from regional suppliers and sales to regional processors and distributors. [3]
More off-farm businesses and employment, expanded tax base, result in more and better community services (schools, parks, and recreation), more social activity and greater community stability. [5]	
Prices to consumers could be slightly higher than with a large farm sector (≅ 6%)	Prices to consumers could be slightly lower than for smaller or medium farms.

1. Almost exclusively family-owned and operated, gross sales generally less than $40,000 but may be as high as $100,000. May be part time.
2. Both family and corporation owned, gross sales over $100,000, family manager or hired manager.
3. Heady and Sonka. Farm Size, Rural Community Income and American Journal of Agricultural Economic. LVII, 8/74
4. Buttell, Fred. Energy, Agriculture, and Small Farms. Prepared for National Rural Center. 1976
5. Small Farm Viability Project. The Family Farm in California. 1977
6. Voil, David. The Skill Intensity of Small Farming and the Diversity of Farm Management Abilities. Maine Farm Management and Training Project. F1
7. Congressional Budget Office. Public Policy and the Changing Structure of American Agriculture. Government Printing Office. Sept. 1978.

Support for Small Farms

In summary, there appear to be benefits in community economic activity as well as lifestyle and personal satisfaction considerations involved in maintaining a small farm structure. While small farms have been considered transition farms - a way for new farmers to get experience or a way for retiring farmers to scale down - it is becoming increasingly clear that small farms may be considered ends in themselves by their proprietors. Fifty-four percent of the farmers in a recent eastern coastal Maine study indicated that they intend to keep farming on a part-time basis while 43% said they were going to farm on a full-time basis. No one indicated a desire to discontinue farming.

Since there appears to be both a relatively widespread desire to farm on a small-time basis and also significant benefits to the rural economy in maintaining our small farm structure, it is important that public sector policies and programs recognize special needs of small farmers and assist in the development of opportunities to meet these needs, including such matters as:

- The encouragement of strong organizations to capture economies of scale in various agricultural activities such as marketing, purchasing supplies, equipment usage, etc.
- The development of direct marketing opportunities.
- The improvement of farm management skills through technical assistance.
- The development of training programs to improve off-farm income opportunities.

RECOMMENDATIONS

1. Governor's Rural Development Council

A great variety of rural development issues and public policies have a strong impact on Maine's agricultural economy. Conversely, agricultural activities, as this report has documented, have a very important influence on rural economic conditions and rural lifestyles in the State. In order to coordinate State policies and actions in the area of rural development to determine planning and development needs, and to assist and support local and regional planning and development efforts, it is recommended that the Governor establish a Rural Development Council. The Council would consist of representatives from the Departments of: Agriculture, Human Services, Transportation, Mental Health and Correction, Education and Cultural Services; the State Development Office; the State Planning Office; the Division of Community Services; Office of Energy Resources; Regional Planning Agencies; and other sources as appropriate. Needless to say, issues confronting rural areas are very diverse, with agriculture one of many integral issues.

2. Small Farm Policies and Programs

Previous recommendations made in this report have addressed broad needs for public and private sector actions which might improve agricultural prosperity in Maine. It is recommended that special consideration be given in all public programs and policies to the special conditiions of Maine's small farm structure, and that these programs and policies be implemented in such a way as to enhance the prosperity of family farms. Special efforts to enhance family farm viability might include: the development of producer cooperatives; the encouragement of land leasing arrangements to farmers to minimize initial capital costs; the development of improved direct marketing outlets; the improvement of training and technical assistance programs oriented toward contemporary small farm problems; the establishment of specialized research programs to develop appropriate technology, equipment, storage, processing systems, and crops for diversified small farms; the development of an improved information transfer system for information on small and family farm matters; the development of improved off-farm employment opportunities for Maine farmers.

3. Small Farm Oversight Committee

As a means of implementing the above policy, it is recommended that the Department of Agriculture establish an informal Oversight Committee on Small Farm Circumstances to review policies and programs to insure that proper support be given in these policies and programs to the enhancement of our family farm structure.