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Analysis of Waste Disposal Problems Related to Maine Poultry Processing Plants

By F. Richard King and Forest M. French



Life Sciences and Agriculture Experiment Station

University of Maine at Orono

FOREWORD

This study is a contributing sub-project to Hatch Project 258, Synthesis and Evaluation of Procedures for Improving the Economic Structure, Community Facilities and Services, and Quality of Living in the Lower Penobscot River Area of Maine. The objectives of Hatch Project 258 are to develop a socio-economic profile of the studied area; to gauge the adequacy of present levels of private and public services within the area; to synthesize procedures whereby the professional resources of the University Community, working with local people, can make an impact upon the area; to implement research, education, and action programs and to evaluate the effects of the cooperative efforts of University professionals and inhabitants of the area. The objective of this sub-project is to contribute information about the possible impact of solutions to the problem of waste disposal from the poultry processing plants which are the first and second largest source of employment in the Lower Penobscot River Area.

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ANALYSIS OF WASTE DISPOSAL PROBLEMS RELATED TO MAINE POULTRY PROCESSING PLANTS

F. Richard King and Forest M. French*

INTRODUCTION

The Maine poultry industry makes a very large contribution to the economy of the state. One estimate of the direct contribution is cash receipts from farm marketings. In 1972, poultry and eggs contributed \$100,575,000, or 41 percent of total cash receipts from Maine farm marketings. Broiler chickens alone contributed 20 percent of the total, or \$49,013,000.

A complete inventory of broiler housing capacity was conducted by the Cooperative Extension Service in 1969. This study indicated that broiler production in the state is quite concentrated with over half found in Waldo and Kennebec counties. Another 30 percent is found in Penobscot, Androscoggin, Somerset and Cumberland counties. The farms and the five processing plants are thus concentrated in the mid-coastal and central areas of the state.¹ The solution to the problem of waste disposal from the poultry processing plants and the implications of more stringent pollution abatement regulations are matters of great concern to the Maine poultry industry.

This study was a part of a more comprehensive research project dealing with the economic structure, community facilities, community services, and quality of living in the Lower Penobscot River Area of Maine. This area was chosen as an area of concentrated study and consists of the area approximately bounded by the towns of Belfast, Searsport, Stockton Springs, Prospect, Frankfort, Winterport, Verona, Bucksport, Orland, Penobscot, Castine and Brooksville. Therefore, for this sub-project, the Lower Penobscot River Area data were isolated whenever possible.

Belfast is the largest municipality located in the Lower Penobscot River Area; therefore, whatever happens to sources of employment in

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¹Reed, Frank D., "The Maine Poultry Industry—Its Impact, Growth and Competitive Position," University of Maine, Cooperative Extension Service Circular 394, revised July, 1970.

Belfast has a large effect upon the whole area. The first and second largest sources of employment are two poultry processing plants located in this city.² The economy and quality of living of the area are directly affected by the economic viability of these two plants which are the only poultry processing plants located in the Lower Penobscot Area. The secondary influence encompasses a wider geographic area due to broiler growers who contract to grow birds for the processing plants. If, as might well be the case, even stricter pollution abatement requirements are put into effect, will the competitive position of these plants deteriorate? These plants are not new and the costs of modification for pollution abatement already incurred may have been higher than those borne by plants in other areas of the country. When the present disadvantage due to high freight rates and feed costs is also considered, the competitive position of Maine in the market may be weakened further.³ This study was designed to provide information which could be used to assess the economic impact of pollution abatement requirements upon the Lower Penobscot River Area.

Objective

This Maine study is a contributing sub-project to a comprehensive project entitled Synthesis and Evaluation of Procedures for Improving the Economic Structure, Community Facilities and Services, and Quality of Living in the Lower Penobscot River Area of Maine. This study contributes to one objective of the more comprehensive project: to implement research, education, and action programs which will significantly affect the economic structure, community facilities and services, and the quality of living of the selected area and to stimulate the several towns to work together for common goals.

Specifically, this sub-project contributes knowledge concerning problems involving the first and second largest sources of employment in the area, the possible impact of solutions to the problem of waste disposal from the poultry processing plants, and the implications of imposition of more stringent pollution abatement regulations on the firms involved.

²*Maine Buyer's Guide and Directory of Maine Manufacturers*, 6th edition
Maine Department of Economic Development, 1970-71.

³Seaver, S. K., "Alternatives in Feed Transportation—The Shell Game,"
University of Connecticut. (Speech given at Open House, University of Maine,
April 5, 1972.)

Procedure

Relevant data were collected from other studies. A major source was the U.S.D.A. report entitled, "Poultry Processing Industry: A Study of the Impact of Water Pollution Control Costs."⁴ This report was used as a prime source of comparison of characteristics of Maine poultry slaughtering plants with the North Atlantic region plants and South Atlantic region plants. The objectives of this U.S.D.A. study were to: 1) identify, describe and quantify waste disposal and treatment practices of the poultry processing industry, including sources and volumes of water used, volumes of waste loads generated, production and disposition of by-products, and sources and types of wastewater treatment, 2) estimate present industry wastewater treatment costs and additional costs incurred in using the current best practicable and best available control technologies and determine the potential economic impact of these costs on the industry.

Where gaps in the U.S.D.A. study were noted, additional primary data were collected for the study. Questionnaires were prepared for a mail survey to the five poultry slaughtering plants located in Maine and also to the municipalities in which they were located. Interviews were held with poultry slaughtering plant managers in the Lower Penobscot River Area and tours were made of poultry plant operations. Responses were received from four of the five poultry slaughtering plants and from all municipalities involved. Copies of the mail questionnaire forms to the poultry slaughtering plants and municipalities are attached in Appendix A.

Water Pollution Control Laws

The Federal Water Pollution Control Act of 1972 has implications for the poultry sector of the economy. Basically, the law states that point sources of pollution must apply the "best practical" control technology by July 1, 1977 and the "best available" technology, economically achievable, by July 1, 1983.⁵ For purposes of this study, the best practicable and best available technology are defined as they were in the U.S.D.A. study.⁶ The best practicable control technology is considered to be a well operated anaerobic lagoon and shallow (aerobic) polishing lagoon system identified by the Environmental Protection Agency as an

⁴"The Poultry Processing Industry: A Study of the Impact of Water Pollution Control Costs," Marketing Research Report No. 965, U.S.D.A., E.R.S., Washington, D.C., June 1972.

⁵Federal Water Pollution Control Act of 1972, Public Law 92-500, Title III, Section 301.

⁶Marketing Research Report No. 965, loc. cit., p. 2.

example of present technology. The best available control technology is an extended aeration system identified by the Environmental Protection Agency as providing higher quality effluence.

In the State of Maine, the Department of Environmental Protection has the responsibility for carrying out federal laws and supplemental state laws relating to water quality and the pollution of waterways. The Maine law relative to the discharge of materials into classified waters indicates that in order to discharge such materials, a license must first be obtained. The applicant for the license must show that the applicant's discharge will be receiving the best practicable treatment and that either of itself or in combination with existing discharges to the waterway, such discharges will not lower the quality of any receiving body of water or tidal waters below classification. In other words, the first criterion to be met is that any discharge must not degrade the classification of the watercourse. The law further states that any establishment producing a waste discharge must treat this waste by providing best practicable treatment. Best practicable treatment, as used in the Maine law, means the method of reduction, treatment, and handling of waste best calculated to protect or improve the quality of receiving waters. In determining the best practicable treatment for a particular discharge, the following shall be considered: 1) the then existing state of technology, 2) the effectiveness of the available alternatives for treatment of the type of discharge being considered, and 3) their economic feasibility for the type of establishment involved.⁷

Presently, only one of the five poultry slaughtering plants in Maine is licensed to discharge treated plant waste and another is operating under a consent decree in cooperation with the U.S. Justice Department. Those plants which are provided municipal waste treatment services may have their wastes treated in that system; however, that degree of treatment must be in accordance with the interim guidelines of the Environmental Protection Agency. In the event the municipal system will not reach these levels, the poultry slaughtering plant must provide the necessary pre-treatment facilities so the guidelines are followed.

The water into which the poultry processing plants in the Belfast area discharged their effluent is classified as Class SC. This classification is the fourth highest classification and indicates that the water is of such quality as to be satisfactory for recreational boating, fishing, and other similar uses except primary water contact.⁸

⁷Maine Revised Statutes, 1964, Title 38 (as amended). Chapter 3: Protection and Improvement of Waters, Department of Environmental Protection, pp. 7-8.

⁸Maine Revised Statutes, loc. cit., p. 11.

IMPACT OF POLLUTION CONTROL LAWS

Comparison of Industry Characteristics

Some structural and physical data concerning the Maine poultry industry are provided in order to gain further perspective of the Maine poultry slaughter industry and thus focus on the pollution problems associated with the industry.

One major factor which provides some perspective to the problem is the number and size of poultry slaughtering plants. Table 1 shows this information for Maine, for the North Atlantic region in which Maine is included, and for the South Atlantic region. The South Atlantic region is Maine's chief competition in the marketplace for broilers.

In 1970, Maine ranked tenth in the United States in the production of broilers and is the dominant producing area in the North Atlantic region (Table 2). With its four large and one medium size plants, 54 percent of the broilers produced (live weight basis) in the North Atlantic region came from Maine (Table 3). The remaining production was divided among 33 plants.

Table 1
Number and Size of Surveyed Poultry Slaughtering
Plants, by Region, 1970

Size of Plant	Region		
	North Atlantic	South Atlantic	Maine
 Number of plants		
Small ¹	19	6	0
Medium ²	13	51	1
Large ³	6	34	4
TOTAL	38	91	5

¹Less than 10 million pounds live weight slaughter in 1970.

²Ten to 49.9 million pounds live weight slaughter in 1970.

³Fifty million pounds or more live weight slaughter in 1970.

Source: Marketing Research Report Number 965, U.S.D.A., E.R.S., Table 1, p. 3.

Within the State of Maine, production is also very concentrated. Forty-eight percent of the broiler production is located in Waldo County. The impact on the area then becomes quite important. Furthermore, the broiler industry is vertically integrated to a large degree. Firms involved in poultry slaughtering very often control or own breeding flocks, hatcheries, feed mills, and growing operations. This is true nationwide and is the structure by which the industry has been able to become very efficient and provide the consumer with very low cost poultry meat.

Table 2

Leading 10 States in Production of Broilers, Mature Chickens, and Turkeys, 1970

Broilers		Mature chickens		Turkeys	
State	Production (live weight) (1,000 lbs.)	State	Production (live weight) (1,000 lbs.)	State	Production (live weight) (1000 lbs.)
Georgia	1,557,149	California	46,037	California	302,834
Arkansas	1,539,126	Georgia	44,144	Minnesota	302,677
Alabama	1,313,981	Arkansas	42,441	North Carolina	175,959
North Carolina	1,137,295	North Carolina	72,026	Texas	169,150
Mississippi	892,660	Pennsylvania	63,558	Missouri	158,979
Maryland	722,452	Alabama	61,265	Arkansas	143,081
Texas	662,591	Mississippi	51,006	Iowa	122,015
Delaware	521,535	Texas	102,824	Indiana	93,374
California	338,922	Florida	100,546	Utah	85,294
Maine	321,510	Indiana	84,582	Virginia	77,451
TOTAL	9,027,221	TOTAL	668,429	TOTAL	1,630,814

Source: Based on data from Statistical Reporting Service, U.S.D.A.

Table 3

Production of Broilers, Mature Chickens,
North Atlantic Region, 1970¹

	Broilers	Mature Chickens	Total
	1,000 pounds live weight		
North Atlantic	594,356	167,156	761,512
Maine	321,510	23,250	344,760
Maine's Share	54%	14%	45%

¹States in region: North Atlantic—Maine, New Hampshire, Vermont, Massachusetts, Rhode Island, New York, Connecticut, New Jersey, and Pennsylvania.

Source: Marketing Research Report Number 965, U.S.D.A., E.R.S., Table 7, p. 11.

This type structure also means that whatever affects the poultry slaughtering industry has very broad implications. All other sectors of the poultry industry are also very much affected.

Figure 1, Appendix, is provided to enable the reader to grasp the general operation of a poultry processing firm. There is much organic waste which is often transported throughout the processing plant by water. The process, under existing technology, uses large volumes of water. The slaughtering process in the five Maine plants is typical of that in the U.S. as a whole.

One purpose of this study was to compare the effect which more stringent pollution abatement regulations might have on Maine plants.

Since one alternative method for disposal of waste is through municipal sewage disposal plants, the location of plants relative to municipal limits and size of municipality are factors to consider. The four large plants in Maine are all located within municipal limits (Table 4). The single medium size plant is not.

Table 4
Location of Surveyed Poultry Slaughtering Plants
Relative to Municipal Limits,* by size of Plant
and Region, 1970

Plant Size and Location	Region		
	North Atlantic	South Atlantic	Maine
 Number of plants		
Small:			
Within	10	2	0
Outside	9	4	0
TOTAL	19	6	0
Medium:			
Within	5	29	0
Outside	8	20	1
TOTAL	13	51 ¹	1
Large:			
Within	5	22	4
Outside	1	11	0
TOTAL	6	34 ¹	4
ALL	38	91	5

¹Differences in total and components exist because some plants did not indicate location.

*Municipal Limits = Urban Compact Area.

Source: "The Poultry Processing Industry: A Study of the Impact of Water Pollution Control Costs," Marketing Research Report No. 965, U.S.D.A., E.R.S., Washington, D.C., June 1972, Table 9, p. 18.

The size of the municipality in which the poultry slaughtering plant is located appears to have direct relationship to the ability of the municipality to offer waste treatment services. In this study, the size of the municipality was measured on the basis of population. Two large size plants and one medium size plant are located in municipalities with a population of 5,000 to 9,999 as indicated in Table 5. These two large plants have installed private treatment facilities and provide 100% treatment; the one medium size plant provides no treatment and the municipality in which it is located also provides no treatment for sanitary or industrial waste. One of Maine's four large size plants is located in a municipality with a population of 20,000 to 29,999. The plant is serviced by a municipal

treatment plant. Another of Maine's large poultry slaughtering plants is in a municipality with population in excess of 40,000. This municipality is in the process of developing its waste treatment plant to accommodate industrial and poultry waste. Since larger municipalities are more likely to have available treatment facilities, Maine's position relative to location

Table 5
Location of All Surveyed Poultry Slaughtering Plants, by Size of
Population Center and by Region and Size of Plant, 1970

Region and Plant Size	Size of Population Center						ALL
	Under 5,000	5,000- 9,999	10,000- 19,999	20,000- 29,999	30,000- 39,999	40,000 & Over	
	Number of plants						
North Atlantic:							
Small	16	1	1	—	—	1	19
Medium	10	—	2	—	—	1	13
Large	2	2	—	1	—	1	6
TOTAL	28	3	3	1	—	3	38
South Atlantic:							
Small	4	—	—	2	—	—	6
Medium	27	7	9	1	—	7	51
Large	18	3	7	1	—	5	34
TOTAL	49	10	16	4	—	12	91
Maine:							
Small	—	—	—	—	—	—	—
Medium	—	1	—	—	—	—	1
Large	—	2	—	1	—	1	4
TOTAL	—	3	—	1	—	1	5

Source: "The Poultry Processing Industry: A Study of the Impact of Water Pollution Control Costs," Marketing Research Report No. 965, U.S.D.A., E.R.S., Washington, D.C., June 1972, Table 11, p. 21.

of plants by size of municipality compares favorably with the North Atlantic region as a whole and the South Atlantic region where the majority of the plants are also located in the municipalities under 20,000 population.

As indicated by Table 6, two of the large poultry plants in Maine provide their own private treatment of plant waste. One of the large plants provides none but the municipality in which it is located is in the process of installing adequate facilities. One medium plant provides no treatment of plant waste. The balance between private, municipal, and no treatment in Maine seems to be similar to that of the rest of the plants in the North Atlantic region and South Atlantic regions. In the Lower Penobscot River Area, however, the two large plants are pro-

Table 6
Waste Treatment Source for Surveyed Poultry Slaughtering Plants
by Size of Plant and Region, 1970

Plant Size and Source of Waste Treatment	Region		
	North Atlantic	South Atlantic	Maine
Small:			
Private	14	3	—
Municipal	2	1	—
Private-municipal	1	1	—
None	2	1	—
TOTAL	19	6	—
Medium:			
Private	9	25	—
Municipal	2	23	—
Private-municipal	1	1	—
None	1	2	1
TOTAL	13	51	1
Large:			
Private	2	12	2
Municipal	2	16	1
Private-municipal	—	5	—
None	2	1	1
TOTAL	6	34	4
ALL	38	91	5

Source: "The Poultry Processing Industry: A Study of the Impact of Water Pollution Control Costs," Marketing Research Report No. 965, U.S.D.A., E.R.S., Washington, D.C., June 1972, and Maine questionnaires.

viding their own private waste treatment in recently constructed facilities.

In addition to the physical location of the slaughtering plant, there are other important considerations relating to poultry plant waste treatment. One overriding factor is the source and the availability of water for the poultry processing plant. All of Maine's poultry slaughtering plants have municipal water supplies and this access to adequate water supplies is an asset. Table 7 indicates that Maine plants enjoy an advantage in this respect, as most small and medium plants in the North Atlantic and South Atlantic regions utilize private water sources. In these regions, approximately two-thirds of the large plants have access to municipal water sources. Further study would be necessary to determine the adequacy of private sources.

Another factor is the type of waste treatment facility provided either by the firm or the municipality. The waste from the one Maine plant with access to municipal facilities is receiving primary treatment. In regard to private treatment of poultry waste, of the two large Maine

plants that have their own treatment facilities, one is providing primary screening with air flotation and chlorination and the other is providing primary screening with diffused air and chlorination.

Table 7
Water Source for Surveyed Poultry Slaughtering Plants,
by Size of Plant and Region, 1970

Plant Size and Water Source	Region		
	North Atlantic	South Atlantic	Maine
 Number of plants		
Small:			
Municipal	3	1	—
Private	16	5	—
Other ¹	—	—	—
TOTAL	<u>19</u>	<u>6</u>	<u>—</u>
Medium:			
Municipal	3	29	1
Private	9	16	—
Other ¹	<u>1</u>	<u>6</u>	<u>—</u>
TOTAL	13	51	1
Large:			
Municipal	4	19	4
Private	2	8	—
Other ¹	—	7	—
TOTAL	<u>6</u>	<u>34</u>	<u>4</u>
ALL	<u>38</u>	<u>91</u>	<u>5</u>

¹Includes plants with both private and municipal sources and plants purchasing water from other sources.

Source: "The Poultry Industry: A Study of the Impact Water Pollution Control Costs," Marketing Research Report No. 965, U.S.D.A., E.R.S., Washington, D.C., June 1972, and Maine questionnaires.

Based upon the limited information reported on the firm questionnaires and from municipalities reporting total water use, Maine plants appear to use greater average quantities of water in their operations than the average use reported in other regions. However, there is no indication that the wastewater characteristics in terms of water quality, BOD, and suspended solids differ from the average in plants located in the North Atlantic and South Atlantic regions although the average size of Maine plants is greater.

Cost of Compliance

Maine's average replacement cost of poultry slaughtering plant wastewater treatment facilities was compared with the average replacement cost for plants on a national basis. From information provided by

those Maine firms who reported replacement cost, it appears that Maine's average replacement cost of \$450,000 is considerably higher than the estimates shown in the U.S.D.A. national study which indicated an average of \$104,000. Operating and maintenance costs of these treatment facilities also seem higher than would be expected, based on national averages. These differences may be due to the fact that it is a comparison between actual reported expenditures data and estimates of anticipated costs.

The U.S.D.A. study also estimated an average cost (replacement value) per hundred pounds live weight slaughter of 22, 38, and 64 cents for wastewater treatment plant and equipment costs at the low, expected and upper levels, respectively. In Maine, the average replacement cost for wastewater treatment plant and equipment per hundred pounds live weight reported per plant was 57 cents. Maine costs are therefore between the expected and upper values estimated in the U.S.D.A. study. This comparison, based upon replacement value and production volume, may present a more equitable comparison than average replacement cost alone.

Potential Economic Impacts

National

The U.S.D.A. study assessed as severe the potential impact of adjustment by poultry slaughtering plants from the "best practicable technology" in plant waste treatment to the "best available technology." The 141 plants studied would need an estimated \$21 to \$60 million to reach this level.⁹

The study states that the relatively narrow profit margins in poultry meat production and processing restrict capital accumulation potentials of poultry firms, especially small, single-plant, specialized firms. Integrated or multi-plant firms such as specialized poultry firms, feed manufacturers, meat packers, cooperatives, or conglomerates might be expected to acquire capital with less difficulty than other firms in the industry. However, decisions to invest capital in wastewater treatment systems would involve such factors as plant location, age of plant, profit margins, the importance of the specific plant to the multi-plant firm and access to municipal treatment.

Upgrading to "Best Practicable"

Additional costs incurred by the industry to apply the best practical control technology are not likely to be reflected in higher poultry prices to consumers. Only a small share of the federally inspected output is

⁹Marketing Research Report No. 965, loc. cit., p. 43.

produced by small firms and these will probably have to seek external sources of capital to subsidize the upgradings required. Failure of the plants to comply with regulations and potential cessation of operations would have no long-run impact on industry output because of the excess processing capacity and the expansionary nature of the poultry industry. Cessation of operations would cause certain groups to incur economic losses at least for an interim period. Although not important from an industry standpoint, if a small plant goes out of business, it could have an economic impact on the local community due to loss of jobs, trade, etc. In general, however, the potential impact on the industry of upgrading to the best practicable control technology appears relatively small.

Upgrading to "Best Available"

The potential economic impact of the industry upgrading to the best available control technology is great. The required investment of the best available technology was over twice as large as that of the best practicable technology. If the majority of plants upgraded to the best available controlled technology, average annual operating and maintenance cost would range from 1.6 to 5.9 percent of the average total plants' costs for representative broiler and turkey plants. Relative to the 0.5 to 1.8 percent range of the best practicable technology level, these percentages represent a sizable increase. This magnitude of increase in cost would be economically significant because of narrow industry profit margins and would likely be passed on to the consumers when the industry makes the move to best available technology.

Many firms of all sizes would have difficulty in obtaining the necessary large sums of capital; some would have to turn to internal low cost sources of capital. A decision to invest in wastewater treatment would be carefully evaluated because of the 31 percent share of federally inspected output accounted for by this group. The potential ramifications of these plants not meeting effluent limits of the best available controlled technology, and subsequently ceasing operations, would be serious in terms of economic losses to specific groups, including higher product prices passed on to consumers. As the U.S.D.A. has stated, such factors as plant location, age of plant and competitive considerations such as transportation costs, certainty of raw materials and supplies and taxes will be considered and evaluated before a decision to invest in wastewater treatment facilities can be made by plants required to update to the best available controlled technology.¹⁰

¹⁰Ibid, p. 43

Potential Economic Impact in Maine and the Lower Penobscot River Area

Table 8 indicates that Maine's five poultry slaughtering plants, directly employ 1,980 employees. The four Maine poultry slaughtering plants reporting indicated an annual payroll and benefits expenditure of over \$13 million. These same four plants show expenditures of \$66.4 million for raw materials and supplies in Maine and \$4.75 million for contractual services. These four firms reported payment of annual state taxes in the amount of \$106,000 and local taxes of \$293,000. Thus, the four poultry firms generated over \$85 million worth of direct economic activity in Maine.

In the lower Penobscot River Area, poultry firms employed 1,350 employees with the resulting payroll and benefits in excess of \$9.5 million. Expenditures for raw materials and supplies amounted to \$45.4 million with an additional \$3 million for contractual services. Annually \$46,000 are paid in state taxes as well as \$219,000 of local property taxes by firms located in the Lower Penobscot River Area. Thus, sixty-eight percent of the total economic impact in the State (\$85 million) or \$58 million was generated by the two large plants in the Lower Penobscot Area.

Table 8
Economic Impact of Poultry Slaughtering Plants in Maine
and the Lower Penobscot River Area, 1972

	Maine	Firms Reporting
Number of Employees	2,330	5*
Annual Payroll	\$13,120,594	4
Firms Contribution to Fringe Benefits	700,484	3
Expenditures for Raw Materials & Supplies	66,419,518	4
Expenditures for Contractual Services	4,748,000	3
Maine State Taxes	106,109	4
Local Taxes	293,035	4
TOTAL	\$85,387,740	

*Maine Buyers Guide and Directory of Maine Manufacturers, 6th edition, Maine Department of Economic Development, 1970-71.

SUMMARY AND IMPLICATIONS

Summary

This study analyzed waste disposal problems related to Maine poultry processing plants. The problems of the Maine plants are quite typical of those found in the industry outside Maine. Two exceptions to this

generality are amount of water used and cost of replacement and operation of the treatment facility. Maine plants appear to use more water than plants located in competing areas but they are of larger average size and have access to municipal water supplies and therefore are not particularly disadvantaged.

The location of Maine plants relative to various size municipalities is comparable to that of other regions. The average replacement costs and operation and maintenance costs reported for Maine firms with waste treatment facilities are greater than those reported by the U.S.D.A. study. However, the costs reported in the U.S.D.A. study are average estimated, and the costs reported by Maine firms are actual costs. The U.S.D.A. costs may well be underestimated. Also, when related to a volume basis the costs are within the ranges estimated by U.S.D.A.

All firms must employ the best practicable technology by July 1, 1977. The cost of compliance with the best practicable treatment of waste is likely to be only slightly higher in Maine than in other areas of the country. The competitive disadvantage which already exists in certain markets due to the higher freight rates and higher feed costs is nevertheless enhanced by even a small increase in pollution abatement costs. Poultry processing firms operate on a very small margin and compete in the marketplace with plants from other areas with somewhat greater margins.

For all plants, a movement toward a stricter pollution abatement law and to the "best available" technology by 1983 will be very difficult. The operating margins are small and other competitive considerations may become even more important, such as geographic location of new plants. Fortunately, the two plants located in the Lower Penobscot River Area are presently licensed or operate under a consent decree to discharge treated poultry slaughtering plant waste. Because they are located in a municipality which has waste treatment facilities, they may have additional alternatives in attaining the "best available" technology in 1983.

Implications

If the costs increased sufficiently to cause closing or reduced operation of the poultry processing firms in the state and particularly in the Lower Penobscot River Area, the implications are considerable for the economic viability of the region. In terms of cash receipts from farm marketings, poultry contributes approximately 20 percent. Approximately \$85 million of direct economic benefits accrue to Maine from the operation of the four plants reporting fully in the study. More than half of this is in the Lower Penobscot River Area. The secondary benefits would be considerably greater, especially if the employment and expenditures

of the poultry growing operations, feed mills and hatcheries dependent upon these plants were also considered.

Some plants in Maine have solved their immediate waste disposal problems by building treatment facilities or gaining access to municipal treatment facilities. However, plants which are too small to go this route, or for which municipal facilities are not available, will be facing difficult decisions. The net effect on the Maine poultry slaughter industry of moving to the best practicable technology will not be significantly greater than the effect on other areas of the country and therefore should not work to the competitive disadvantage of the Maine industry. The effect of moving to the best available technology would be greater but the probable effect could not be measured with the data available.

Another issue, not considered in this study and which may be important in the future, deals with pollution abatement in "feedlots." This includes broiler growing operations. Because of the integrated nature of this industry, where some companies have their own growing facilities in addition to hatching flocks, these pollution abatement laws also affect industry decision-making.

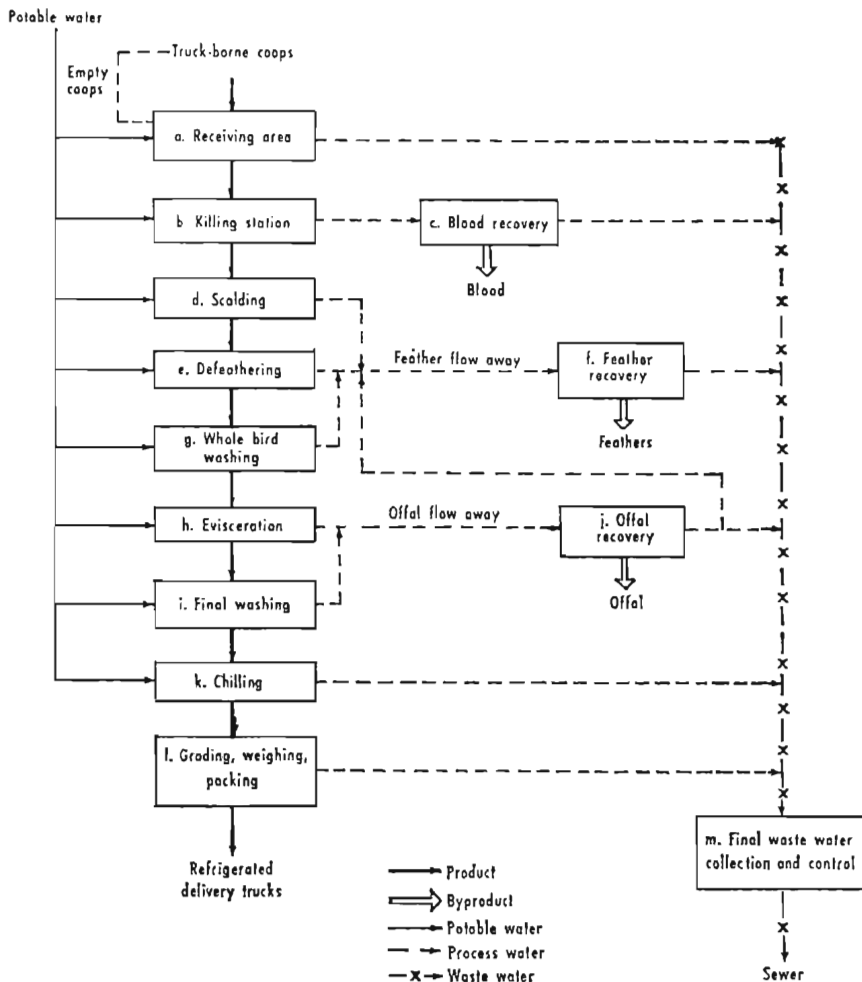
Pollution control is necessary to preserve the environment but there is a cost associated with control. The Maine poultry industry must adopt positive strategies to comply with the law and at the same time maintain its competitive position in this vital food producing industry.

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APPENDIX

FIGURE 1.--FLOW CHART OF POULTRY PROCESSING PLANT



MAINE POULTRY SLAUGHTERING PLANTS QUESTIONNAIRE

(Confidential)

(Firm name)

(address)

I. Characteristics of production.

What was the firm's production in 1000 lbs. of liveweight in:

	Broilers & Fryers	Mature Chickens	Other
1970
1972

II. *Characteristics of poultry slaughtering plant wastewater treatment.*

1. Did your firm provide wastewater in 1970? () Yes () No
2. Does your firm provide wastewater treatment now? () Yes () No
3. If the answer to question #2 was yes, and treatment is not provided for by your municipality, please answer the following:
 What type of wastewater treatment do you use?
 primary irrigation
 anaerobic—aerobic lagoon extended aerobic
 other lagoon systems other
4. Please fill in the estimated wasteloads from your poultry slaughtering operation.

	Gals. wastewater	Pounds BOD	Pounds sus- pended solids
Gross wasteloads before treatment
Net wasteloads after treatment
5. Water source () Municipal or district () Private
6. Estimate of water quantities used.
 Prior to wastewater treatment.
 With wastewater treatment.

III. *Impact of the best practicable treatment of poultry plant wastewater as employed in Maine.*

1. Estimated replacement value of wastewater treatment facilities plant and equipment
- 2a. Total annual operating and maintenance cost of wastewater treatment facilities (exclude depreciation).
- b. Total annual savings of operating and maintenance costs, if any due to complimentary effects of wastewater treatment.
- c. Total annual returns from recovered wastes materials from wastewater treatment.
 Net annual operating and maintenance costs.

IV. *Economic Impact of the firm in Maine.*

1. Number of employees.
2. Annual payroll.
3. Value of firm's annual contribution to employees' fringe benefits.
4. Estimated annual expenditures for purchases of raw materials, supplies, and equipment in Maine.
5. Estimated annual expenditures for contractual services in Maine.
6. Maine state taxes.
 Local personal property and real estate taxes.

V. *Additional Comments.*

MUNICIPAL QUESTIONNAIRE

1. Does your municipality provide sewage treatment for:
 - a. Municipal wastes yes no
 - b. Industrial wastes yes no

If the answer to question 1a. and 1b. is yes, please answer the following:

2. What type of sewage treatment does your municipality use?

..... primary activated sludge
..... anaerobic—aerobic lagoon irrigation
..... other lagoon systems extended aeration
..... trickling filter other

3. Did your municipality provide wastewater treatment to the following poultry slaughtering plant in 1970?

..... yes no

Are you providing poultry slaughtering plant wastewater treatment now?

yes no

4. If your answer to any of question 3 was yes, please answer the following as applied to the poultry slaughtering plant listed below.

Waste treatment provided was	Total	Partial
.....

5. Please fill in the estimated waste loads from the following poultry slaughtering plant.

	Gallons Wastewater	Pounds BOD	Pounds Suspended Solids
..... Gross wasteland before treatment
..... Net wasteland after treatment

6. The water source of the following poultry slaughtering plant is:

Municipal or District Private

.....