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B807: A Study of the Maine Lamb Industry

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George K. Criner and Russell C. Parker*

INTRODUCTION

The interest in the Maine lamb and sheep industry is increasing. Two factors contributing to this are the increase in the number of lamb and sheep producers and the attention the Maine Department of Agriculture, Food and Rural Resources (MDAFRR) is giving to the industry. There has been much discussion as to whether sheep and lamb production is viable in Maine. The purposes of this paper are to examine the economics of the Maine lamb industry and comment on the possibility and feasibility of its expansion.

This study is concerned not only with farm level sheep and lamb production but also with all aspects of the marketing chain - from the farm to the consumer. Although this study relies primarily upon Maine data the set of opportunities and constraints discussed are generally representative of those found throughout New England.

The lamb industry, like other livestock industries, is composed of firms which produce, firms which process, and firms which distribute. Research which focused on lamb producers, processors, and distributors operating outside of New England was utilized freely in this study. This reliance on secondary data was prompted by time and resource limitations. Issues involving livestock other than lamb and sheep were investigated when relevant to the lamb industry.

BACKGROUND AND DESCRIPTION

U.S. Production and Consumption

Table 1 presents the estimated percentages of U.S. lamb production, slaughter, and consumption by region. Figure 1 shows the states included in the various regions used in Table 1. Note that while the North Atlantic region produces an estimated 2.13 percent of the U.S. lamb total its estimated consumption is 52.9 percent. That region's high consumption level is attributed to its concentration of population and "also Mediterranean and Middle Eastern ethnic groups that consume relatively large quantities of lamb" (U.S.D.A. 1982a, p. 9). In 1982 the U.S. Department of Agriculture reported that the "Boston-New York-Philadelphia-Washington corridor consumes about 50 percent of all lambs produced in the United States" (U.S.D.A. 1982a, p. 9).

This vast difference between Northeast lamb production and consumption has been a source of optimism for Northeast lamb producers. At

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TABLE 1

Regional Percentages of U.S. Lamb Production, Slaughter, and Consumption

Region	U.S. Percentages		
	Production	Slaughter	Consumption
North Atlantic	2.13	4.46	52.9
South Atlantic	3.29	.80	7.2
North Central	28.41	31.55	15.5
South Central	15.34	14.33	1.7
Mountain	36.98	23.41	3.6
Pacific	13.85	25.45	19.1

Source: Production and Slaughter from American Meat Institute, "Meatfacts: 1983"; Consumption from Lupien and Dowling, "Sheep: Food and Fiber Planning Report of Coastal Enterprises, Inc."

least, the producers reason, they should have an absolute cost advantage in transportation. Unfortunately for the Northeast lamb producers the transportation of the processed lamb is only a small portion of the total cost of lamb when it reaches the consumer. The close geographic relation between production and slaughter is due to the tendency for slaughter to follow production (McCoy). Since slaughtering is a weight-loss activity it is more economical to slaughter at the point of production. Over time production has moved west in response to lower feed costs and inexpensive and often free grazing lands.

Another encouraging sign for lamb producers is the turn around in the long decline in U.S. per capita lamb consumption. Table 2 presents the 1968 through 1982 U.S. consumption levels for various meats. The decline in per capita lamb consumption bottomed out in 1979 and has since been increasing. The authors believe that this stabilization and slight increase in per capita lamb consumption is at least partially due to the changing population distribution. It is felt that the relative decrease in younger Americans and relative increase in older Americans will result in higher lamb consumption as the latter are thought to consume more lamb. A young family with children may choose more economical meats such as chicken over lamb. Since the proportion of older Americans will continue to grow, and if the assertion that older Americans eat more lamb is true, then this is an encouraging development for lamb producers.

An additional demographic factor is the so-called YUPPIE movement: the increase in young upwardly mobile professionals who as eaters are described as "grazers." Grazers eat a little here, a lot there, and do

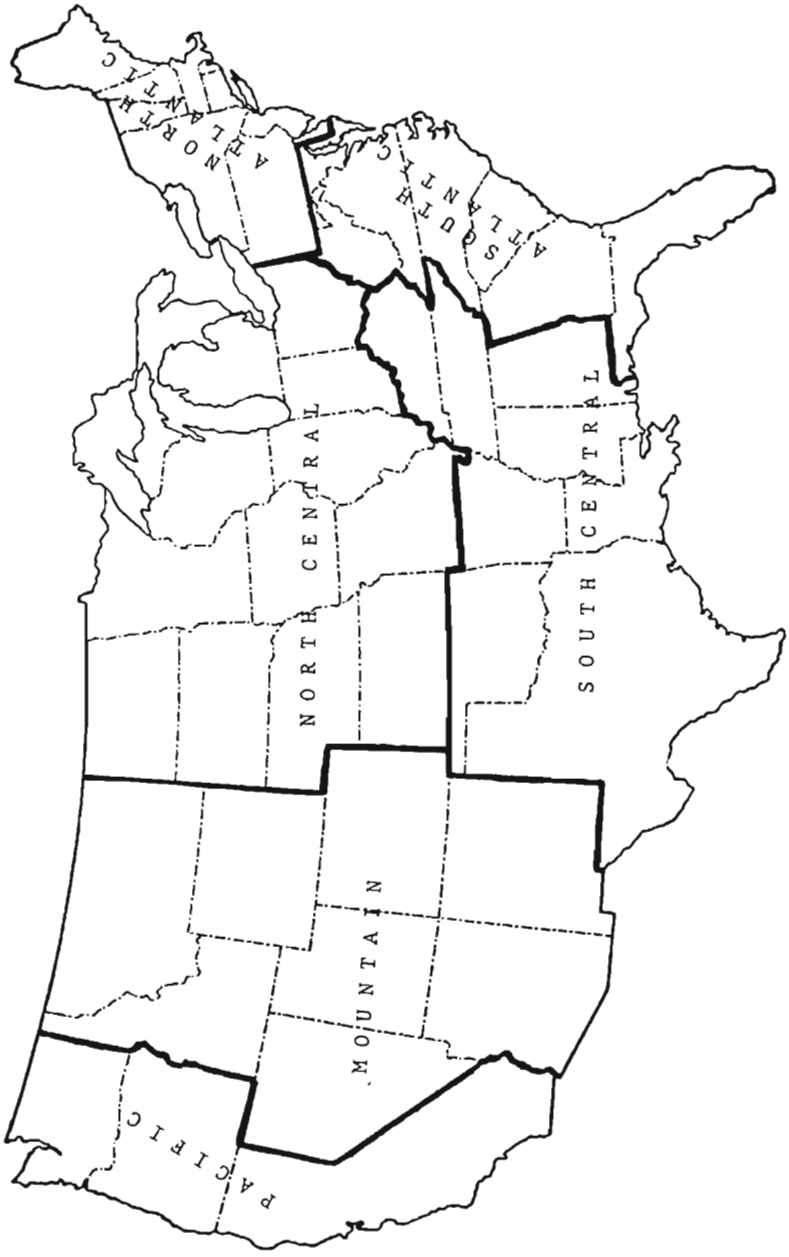

Figure 1. United States Regions for Table 1 Lamb Statistics

TABLE 2

U.S. Per Capita Consumption of Various Meats, Retail Cut Equivalents, 1960-82

	Pounds						
Year	Beef	Veal	Pork	Lamb & Mutton	Total Red Meat	Total Fish	Poultry
1960	64.2	5.2	60.3	4.3	144.0	10.3	34.4
1961	65.8	4.7	57.7	4.5	142.6	10.7	37.7
1962	66.2	4.6	59.1	4.6	144.4	10.6	37.2
1963	69.9	4.1	61.0	4.4	149.5	10.7	38.0
1964	73.9	4.3	61.0	3.7	153.3	10.5	38.9
1965	73.6	4.3	54.7	3.3	145.8	10.8	41.1
1966	77.0	3.8	54.4	3.6	149.0	10.9	43.8
1967	78.8	3.2	60.0	3.5	156.0	10.6	45.3
1968	81.2	3.0	61.4	3.3	159.6	11.0	45.0
1969	82.0	2.7	60.5	3.1	158.9	11.2	47.1
1970	84.0	2.4	62.3	2.9	162.3	11.8	48.8
1971	83.4	2.2	68.3	2.8	167.6	11.5	49.0
1972	85.4	1.9	62.9	2.9	163.6	12.5	51.1
1973	80.5	1.5	57.3	2.4	151.4	12.8	49.3
1974	85.6	1.9	61.8	2.0	161.8	12.1	49.9
1975	87.9	3.4	50.7	1.8	153.8	12.2	49.0
1976	94.4	3.3	53.7	1.6	163.6	12.9	52.2
1977	91.8	3.2	55.8	1.5	162.7	12.7	53.6
1978	87.2	2.4	55.9	1.4	156.4	13.4	56.3
1979	78.0	1.7	63.8	1.3	155.3	13.0	60.9
1980	76.5	1.5	68.3	1.4	157.2	12.8	61.0
1981	77.2	1.6	65.0	1.4	154.6	12.9	62.8
1982	77.3	1.6	59.0	1.5	148.0	12.3	64.1

Source: U.S.D.A., "Food Consumption, Prices, and Expenditures: 1960-81," and U.S.D.A., "Food Consumption, Prices, and Expenditures: 1961-82."

not really follow any pattern. One characteristic about the grazers is that they will not balk at a relatively high price tag (such as the price of lamb relative to the price of chicken).

Imports and Exports

Selected U.S. import and export information concerning sheep and lamb is listed in Table 3. The U.S.D.A. category which includes lamb and mutton also includes goat except canned (the goat import is probably a very small component). Between 1978 and 1982 the net import of this meat

category (imports minus exports) peaked in 1979 at 19,152 metric tons and has decreased fairly rapidly since. In 1982 the net import equaled 7,973 metric tons. Of the total 8,649 metric tons of 1982 U.S. imports New Zealand accounted for 82.1 percent, Australia 16.4 percent, and all other countries accounted for the remaining 1.5 percent. If one assumes the 1982 net import to be all lamb and mutton in retail cuts, then imports composed roughly 5 percent of U.S. lamb consumption in 1982.[1]

TABLE 3

U.S. Imports and Exports of Lamb, Mutton, and Goat Except Canned, 1978-82

Year	Import From Origin			Total Imports	Exports	Net Imports
	New Zealand	Australia	Other			Metric Tons
1978	13,416	3,832	199	17,447	1,375	16,072
1979	13,904	5,625	185	19,714	562	19,152
1980	13,108	2,249	125	15,482	595	14,887
1981	12,630	1,565	189	14,384	972	13,412
1982	7,097	1,416	136	8,649	676	7,973

Source: U.S.D.A. Agricultural Statistics: various issues.

Maine Lamb and Sheep Farm and Producer Characteristics

Due to changes in farm definitions and enumeration techniques the various U.S. Department of Commerce agricultural census data between 1969 and 1982 are not wholly comparable. The Bureau of Census information included in this section is from the 1982 agricultural census which includes for comparisons 1978 data which have been adjusted to be on a comparable basis with the 1982 data (U.S. Department of Commerce).

For many years there had been a downward trend in Maine lamb and sheep farms. This downward trend ended around 1977 and in 1978 the census information showed Maine lamb and sheep farm numbers increasing. Using the comparable data the Bureau of Census lists 396 lamb and sheep farms in 1978 and 623 farms in 1982. Table 4 presents the number of

[1]The 5 percent approximation was calculated in the following manner: net imports divided by U.S. population and this quantity divided by the U.S. per capita consumption of lamb and sheep.

sheep and lamb farms and numbers of sheep and lamb for Maine counties for 1978 and 1982.

TABLE 4

Number of Sheep and Lamb Farms and Population of Sheep and Lamb by Maine Counties for 1978 and 1982

County	Population of Sheep and Lamb, 1978	Population of Sheep and Lamb, 1982	Number of Sheep and Lamb Farms, 1978	Number of Sheep and Lamb Farms, 1982
Androscoggin	366	1,144	17	38
Aroostook	204	613	19	34
Cumberland	490	1,610	44	54
Franklin	222	412	23	34
Hancock	306	581	16	32
Kennebec	496	1,404	34	52
Knox	706	1,034	21	25
Lincoln	881	1,215	27	43
Oxford	422	576	22	43
Penobscot	782	976	28	47
Piscataquis	638	904	13	14
Sagadahoc	1,228	842	13	23
Somerset	528	1,648	26	43
Waldo	1,807	2,263	40	52
Washington	431	715	14	33
York	789	1,371	39	56
Total	10,296	17,308	396	623

Source: U.S. Department of Commerce, "1982 Census of Agriculture: Maine".

In 1978 there were 10,296 lamb and sheep on Maine farms and by 1982 the number had increased to 17,308. The 1978 Maine average flock size equaled 26 while in 1982 it equaled 27.8. The average gross sales of sheep, lambs, and wool from those reporting totaled $823.70 per farm in 1978 and $1,303.03 per farm in 1982.[2] The average number of lamb and sheep farms per county equaled 38.9 and while there do seem to be more lamb and sheep farms in the southern part of Maine (Figure 2), all but one county had between 25 and 56 farms. Piscataquis County was the exception and had 14 sheep and lamb farms in 1982. Figure 3 shows the number of lamb and sheep on farms by Maine counties in 1978 and 1982. Lamb and sheep numbers increased between 1978 and 1982 in every county except Sagadahoc County. The average increase per county over the four year period was 68 percent.

[2]Inferences based on combinations of aggregate statistics may be misleading since the Bureau of Census aggregate statistics may be obtained from different population subsets.

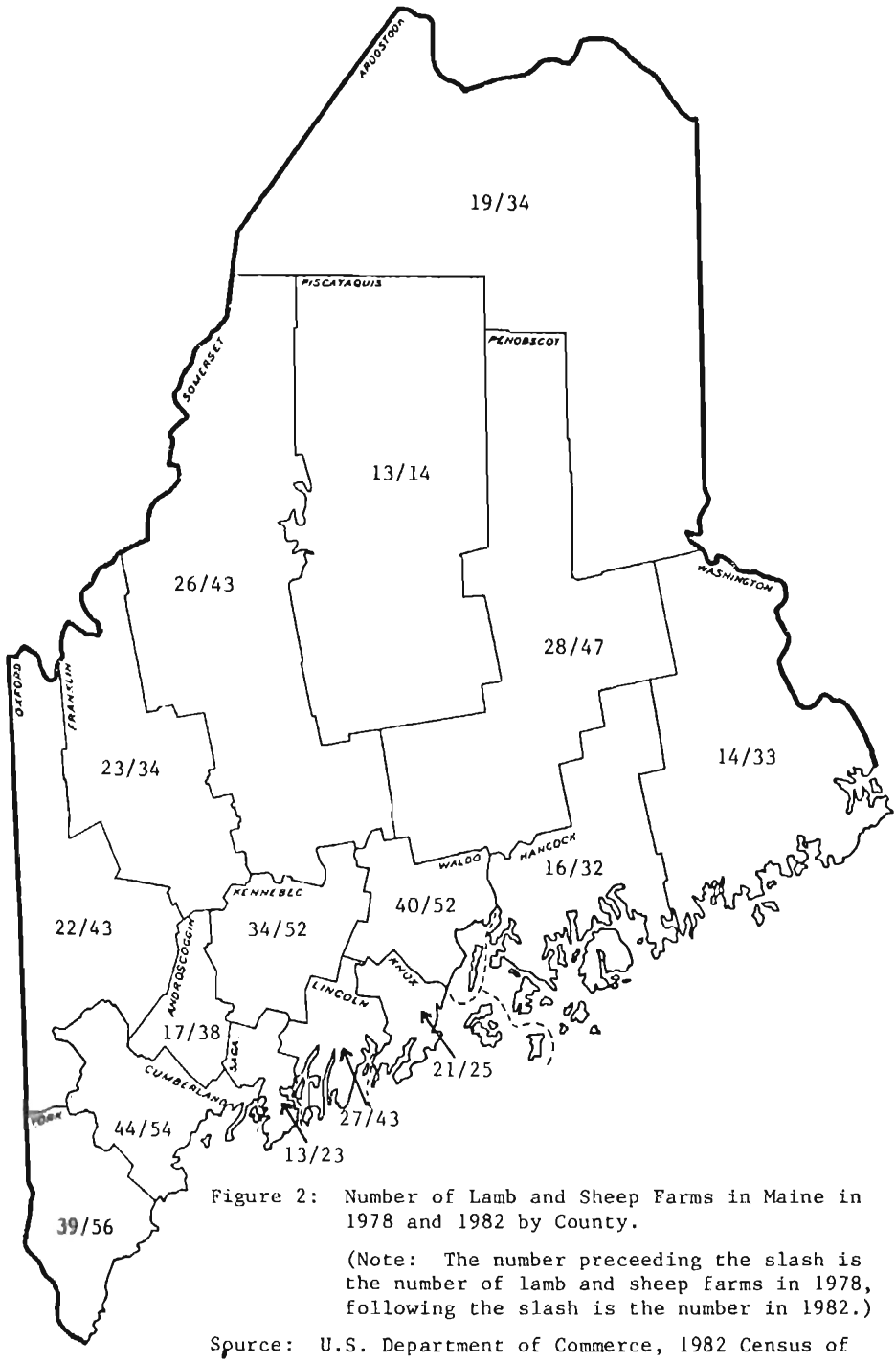

Figure 2: Number of Lamb and Sheep Farms in Maine in 1978 and 1982 by County.

(Note: The number preceeding the slash is the number of lamb and sheep farms in 1978, following the slash is the number in 1982.)

Spurce: U.S. Department of Commerce, 1982 Census of Agriculture: Maine.

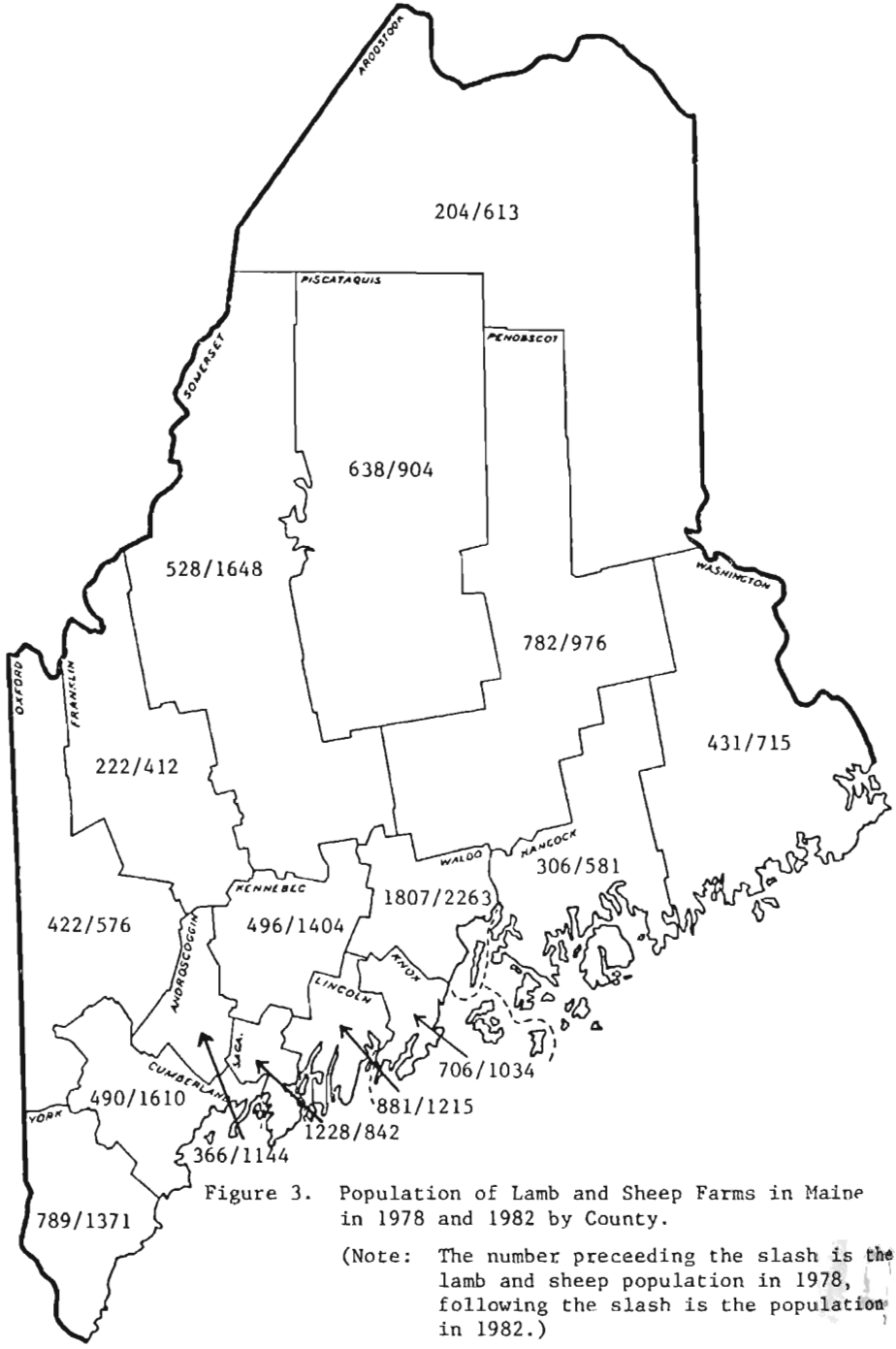

Figure 3. Population of Lamb and Sheep Farms in Maine in 1978 and 1982 by County.

(Note: The number preceeding the slash is the lamb and sheep population in 1978, following the slash is the population in 1982.)

Source: U.S. Department of Commerce, 1982 Census of Agriculture: Maine.

The Bureau of Census uses the following lamb and sheep size classifications: 1 to 24 lamb and sheep, 25 to 99, 100 to 299, 300 to 999, and 1,000 and more. In Maine in 1982 there were 425 farms in the first classification, 164 in the second, 27 in the third, 7 in the fourth, and none in the largest category. Based on this distribution, over two-thirds of Maine's lamb and sheep farms (68.22 percent) have fewer than 24 lamb and sheep and 94.54 percent of the farms have less than 100 lamb and sheep.

Table 5 lists lamb and sheep January 1 inventories, lamb crop, and lamb and sheep disposition for 1971 through 1982. This source has a January 1, 1982 sheep and lamb inventory of 15,000 which is slightly more than 10 percent under the 17,308 reported for 1982 by the Bureau of Census. The Maine lamb and sheep January 1 inventory between 1971 and

TABLE 5

Maine Lamb and Sheep: January 1 Inventory, Lamb Crop, and Lamb and Sheep Disposition for 1971 through 1982

	1,000 Head					
Year	January 1 Sheep and Lamb Inventory	Lamb Crop	Sheep Marketings	Lamb Marketings	Farm Slaughtered Lamb & Sheep	Deaths of Lamb & Sheep
1971	15	11.0	3.0	6.0	1	2
1972	14	9.5	2.8	5.7	-	2
1973	13	9.6	2.2	4.4	1	2
1974	13	9.4	2.5	4.9	1	2
1975	12	8.8	3.0	3.8	1	2
1976	11	7.7	2.0	2.7	1	2
1077	11	8.0	1.0	3.0	1	2
1978	12	9.0	2.0	3.0	2	2
1979	12	9.0	1.0	4.0	1	2
1980	13	10.0	2.0	5.0	1	2
1981	13	12.0	1.0	6.0	1	2
1982	15	12.0	3.5	6.9	0.7	1.9

Source: Maine Department of Agriculture, Food and Rural Resources, Maine Agricultural Statistics: 1982.

1982 declined, then flattened out, and then began an increase. By 1982 the inventory was at 15,000 head, up from its 1977 level of 11,000 head.

Additional information on Maine lamb and sheep producers is available from two farm surveys. One survey was conducted by the Maine

Department of Agriculture, Food and Rural Resources in 1983 (Buitenhuys, 1983). The MDAFRR survey received 274 usable responses from producers and contained information on flock sizes and marketing practices and needs. It was found that 50 percent of producers had 1 to 10 ewes while the 11 largest producers raised 31 percent of all sheep. The survey showed that the most common method of marketing for all size classifications was the freezer market and that only the larger producers marketed their production out-of-state.

In the summer of 1982 the Maine Agricultural Experiment Station conducted a Maine small farm inventory. An extensive questionnaire concerning production, marketing, socioeconomic characteristics and perceived needs was mailed to 1,200 individuals. Of the 498 usable small farm responses 86 small farmers raised sheep. The data from this survey are certainly not representative of the Maine lamb and sheep producer population. First, the survey specifically excludes large farming operations, and secondly there may be some nonresponse bias. In a study of nonrespondents Klein found that respondents had more education and were more interested in the subject being considered than did nonrespondents. While the information from these respondents may not be representative of the total population or even of all small lamb and sheep producers it does provide important information concerning a very vocal subset of Maine lamb and sheep producers.

The average number of years in farming (not necessarily raising sheep) for the sheep producing respondents equaled 6.4 years with 87 percent having farmed 10 years or less. Of the respondents 75 percent considered themselves part-time farmers and roughly 6 percent have ever farmed full-time.

The following information from the 1982 survey reveals that a segment of the Maine lamb and sheep producers are financially well-off, well educated, and raise lamb and sheep at least partly in order to have a rural living lifestyle:

1. The average years of education equaled nearly 16 years with 42.3 percent of respondents having more than 17 years of education (greater than four years of college).

2. Over one-third of the respondents had household incomes of $25,000 or more.

3. On average off-farm income accounted for 83.2 percent of total income.

4. Fifty-seven percent of producers had total agricultural sales (may include agricultural products other than lamb and sheep) of $1,000 or less.

5. Average gross lamb and sheep sales equaled $1,354.

6. Slightly more than 75 percent stated that one motivation for farming was the rural living lifestyle.

In summary, the 1982 agricultural census, the 1983 MDAFRR survey, and the 1982 Maine Agricultural Experiment Station survey reveal that there are many small lamb and sheep operations. Further, many of these small operations have operators who are highly educated and whose family income is fairly high. The average per farm gross sales of sheep, lamb and wool from reporting farms in the 1982 agricultural census was $1,303.03. This reported gross average per farm sales is $90 less than what one person would make working eight hours each Saturday for a year at the minimum wage of $3.35 per hour. This, of course, supports the other evidence that many, if not all, Maine lamb and sheep producers are in the business at least partially for reasons other than profit motivation, such as lifestyle considerations.

Marketing Chain Situation and Trends

A market chain for an agricultural product is a simplified concept that is sometimes defined as all activity between the farm gate and the purchase of the product by the consumer. For lambs this can include several transports, slaughter, wholesaling, retailing, etc. For many products there is more than one market channel for the product to take between the producer and the consumer. For the consumer of lamb in Maine he or she might buy lamb "direct," that is agree to buy a frozen lamb from a producer. From the farm that lamb would be taken to a local processor who might slaughter, fabricate, and freeze the lamb and then the frozen lamb would be delivered to the consumer.[3] Another market channel might be for a lamb to be fattened in Colorado under contract for a packer who slaughters, breaks and boxes the lamb and ships it to a retail chain warehouse. The lamb would then get shipped to individual retail stores and sold to consumers.

In 1865 the Illinois legislature incorporated the Union Stockyards and Transit Company which when completed had physical facilities for handling stock, slaughter and processing facilities, and available rail transportation and credit sources (McCoy).[4] This was the beginning of a trend toward the centralization of red meat marketing near terminal markets. McCoy states that although the centralized terminal markets remained the dominant red meat market channel until after World War I, "even before that, other factors were at work which were to verify the proposition that, in the world of economics, 'things never stay put for long.'" With the introduction of improved varieties corn production moved northwestward and livestock production and slaughter soon followed.

As with many economic units there has been a trend in meat packing

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[3]Appendix A, Table 1 consists of some meat industry related definitions. For example: "Fabrication: Breaking and cutting of meat from carcasses into retail cuts, wherever done and whether done partly or entirely."

[4]The brief discussion of the meat marketing infrastructure and its history is included to generally inform those readers unfamiliar with the topic. For more indepth discussion see McCoy, Duewer, and Nelson among others.

towards fewer but larger units. Nelson (p. 5) states that "... meat packing has moved away from multistory, multispecie (sic) plants near terminal markets ..." and the "... shift has been toward fewer but larger, single-story, specialized plants located farther west, nearer supplies ...". Accompanying this packing facilities movement is the trend for meat packers (those who slaughter and may do some fabrication) to use boxed meat. Boxed meat is meat "cut into primals, subprimals, or both; vacuum-wrapped, and placed in cartons by the packer" (Duewer p. v). Nelson (p. 6) points out that the advantages of boxed meat include:

1. Economies of size in assembly line techniques
2. Less fat and bone shipped
3. Allows buyer to order specific cuts
4. Product shrinkage is reduced
5. Increases shelf life of product
6. Fat and bone can be more efficiently salvaged
7. Product can be shipped and stored in less space

From the retailer's standpoint one should highlight the fact that boxed meat allows them to purchase specific cuts and not a whole, half, or quarter carcass. The retailer may also be able to eliminate some inefficient personnel and equipment and basically concentrate on the primary retail mission of selling a finished product to the consumer. The retail store is very interested in satisfying consumer's demand for meat as efficiently as possible since meat sales "generate approximately 25 percent of the total gross retail sales" (McCoy, p. 223).

As meat packers began using boxed meat there was less of a need for third party wholesaling between meat packers and retailers. Duewer (p. 6) states that more "... retailers are making direct purchases from packers, which means either slaughterer or retailer performs wholesaling functions". As a result meat packer branch offices and merchant wholesalers who physically handle meat have declined (Table 6). "Agents, brokers, and commission agent firms operate like packer sales offices ..." according to Duewer (p. 7) as they "... sell meat for packers without taking ownership of or physically handling the meat ...". These third parties are paid according to their sales and their number has risen.

For the most part the large meat packing and processing plants are federally inspected which have on location federal employees who "make various checks and tests designed to provide the consuming public with wholesome meat and meat products" (McCoy, p. 174). Non-federally inspected meat packers are only permitted to ship meat within the state where they are located. In 1982 there were 986 federally inspected plants in the U.S. which slaughtered sheep and lamb. New England had 38 federally inspected plants slaughtering sheep and lamb. The 1982 total

TABLE 6

Number of U.S. Establishments and Dollar Volume of Shipments and Sales of Packer Branch Offices, Merchant Wholesalers, and Merchandise Agents, by Census Year

Census Year	Establishments			Shipments and Sales		
	Packer Branch Offices	Merchant Wholesalers	Merchandise Agents	Packer Branch Offices	Merchant Wholesalers	Merchandise Agents
	- Number -			- Million Dollars -		
1929	1,157	2,225	*	1,923	690	*
1939	940	2,552	*	1,091	520	*
1948	756	3,200	*	2,810	1,977	*
1954	664	4,357	*	2,697	2,866	*
1958	522	4,482	154	2,263	3,891	609
1963	577	5,170	134	2,446	5,371	810
1969	616	5,041	163	2,811	7,395	853
1972	464	4,847	245	4,251	12,611	1,471
1977	435	4,443	247	5,843	17,487	1,681

*Not available.

Source: Duewer, L.A. "Changing Trends in the Red Meat Distribution System".

slaughter for New England and the U.S. equaled 21,000 and 6,448,700 head, respectively. Table 7 shows federally inspected sheep and lamb slaughter plants by size for 1982. Note that in 1982 93.4 percent of all slaughtered sheep and lamb were slaughtered in the 23 largest plants and that 97.3 percent of all sheep and lamb slaughtered were slaughtered in federally inspected plants.

Table 8 presents Maine federally inspected plant slaughter by livestock type for fiscal years 1979 through 1983. Cattle and calves typically make up the majority of the animals slaughtered, for example, in 1983, 90 percent of animals slaughtered in Maine were cattle and calves. This high proportion is, of course, due to the prominence of dairying in the state. According to the U.S. Census of Agriculture Maine in 1982 had stocks of 57,173 milk cows, 17,308 sheep and lamb, 13,242 beef cows, 8,586 hogs and pigs, 55,720 heifers and heifer calves, and 15,111 steers, steer calves, bulls, and bull calves. The large number of bull calves and cull dairy cows coming from the dairy operations make up a large portion of all animals slaughtered in Maine.

Given the large number of dairy animals being slaughtered in Maine, one could say that the Maine slaughter industry is somewhat dependent upon those dairy cows. If there were no dairy industry in Maine, there would certainly be fewer slaughterhouses in Maine. While the volume of

TABLE 7

Federally Inspected Plants Slaughtering Sheep and Lambs by Size, 1982

Slaughter Volume	Plants		Slaughter	
	Number	Percent of Total	1,000 Head	Percent of U.S. Total
Under 100	688	69.8	18	0.3
100- 999	223	22.6	62	1.0
1,000-9,999	48	4.9	165	2.6
10,000 & Over	27	2.7	6,020	93.4
Total	986	100.0	6,265	97.3

Source: American Meat Institute, "Meat Facts: 1983".

TABLE 8

Federally Inspected Livestock Slaughtered in Maine, Fiscal Years 1979-1983

Fiscal Year	Number of Plants[1]	Cattle	Calves	Hogs	Sheep	Total Animals
1979	5	35,478	21,422	1,661	398	58,959
1980	4-10	32,931	22,376	3,333	626	59,266
1981	12	28,142	28,142	15,668	1,313	73,285
1982	11	33,438	31,005	4,556	1,770	70,769
1983	12	36,744	31,168	3,706	3,269	74,887

erage number for year 1980 split by first and second half of year due o elimination of state inspection.

Source: Buitenhuys, Neil "An Analysis of Maine's Slaughterhouse Facilities".

dairy livestock being slaughtered is good for the Maine slaughter industry, much of this livestock goes into hamburger production for which there is limited need for federal grading. While many of the slaughterhouses in Maine are federally inspected (a free service), no slaughterhouses in Maine currently employ a federal grader. There are two types of grading; quality grading and yield grading. Quality has to do with subjective characteristics such as tenderness and palatability. Yield grading is primarily determined by more objective measures and estimates the quantity of retail cuts from the carcass. Retailers prefer

a graded product of choice or prime qualilty. Yield grading gives the retailer some idea of the quantity of retail cuts he can expect from the carcass. At present, however, there is no yield grading of lambs in the U.S.

In early 1984 the MDAFRR conducted a survey of slaughterhouses in Maine concerning their 1983 operations (Buitenhuys, 1984). Table 9 shows plant and slaughter numbers by livestock type and slaughter as reported by survey respondents. Also presented by livestock type is the percent of animal slaughter by plant type (federal versus non-federal). The non-federally inspected slaughterhouses are often referred to as custom-exempt slaughterhouses. The custom designation relates to the fact that

TABLE 9

Federally and Non-Federally Inspected Plant Numbers, Livestock Slaughter, and Percent by Slaughter as Reported by Survey Respondents, Maine, 1983

Specie and Type of Slaughter	Number of Plants	Number of Animals	Percent of Animals by Slaughter
Cattle			
Federal	7	31,497	88.7
Non-Federal	23	4,017	11.3
Total	30	35,514	100.0
Calves			
Federal	6	26,360	97.0
Non-Federal	18	805	3.0
Total	24	27,165	100.0
Hogs			
Federal	6	2,541	26.0
Non-Federal	21	7,225	74.0
Total	27	9,766	100.0
Sheep			
Federal	7	2,665	55.2
Non-Federal	21	2,159	44.8
Total	28	4,824	100.0

Source: Buitenhuys, Neil C. 1984, "An Analysis of Maine's Slaughterhouse Facilities".

with the custom-exempt plants the animal is always sold to a customer before it is slaughtered. The customer usually has some say in how the carcass is cut up. This does not mean that all direct from producer purchases of livestock come from non-federally inspected plants as some federally-inspected plants also do custom slaughtering. Note in Table 9 that a much larger proportion of hog and sheep (which includes lambs) are slaughtered in non-federally inspected plants than cattle and calves.

In the U.S. as a whole, 97.3 percent of all lambs and sheep slaughtered are slaughtered in federally inspected plants (Table 7) which is a much higher portion than Maine's 55.2 percent of sheep and lambs slaughtered under federal inspection. In his analysis Buitenhuys determined that the costs charged by federally and non-federally inspected slaughterhouses for slaughtering and processing (cutting and freezing) were not significantly different. Table 10 presents the average slaughter and processing costs for livestock type as reported by survey respondents.

TABLE 10

Slaughtering and Processing Average Costs at Maine Slaughterhouse Facilities, 1984

Livestock	Slaughter Cost[1] $/Head	No. Rptg.	Range $/Hd.	Process Cost[2] $/Lb.	No. Rptg.	Range $/Lb.	Total Av. Cost For: Carcass Lb.	Dollars
Cattle	12.73	25	9-25	.181	23	.10-.22	600	$121.33
Calves	10.40	23	5-20	.165	17	.08-.40	100	26.90
Hogs	14.57	24	5-15	.186	17	.05-.25	135	37.82
Sheep	7.84	23	4-20	.189	21	.15-.25	50	17.29

[1]Does not include 1 slaughterhouse charging for cattle on a 6¢ per pound dressed weight basis, and 1 charging for hogs on a 7¢ per pound dressed weight basis.

[2]Does not include 4 slaughterhouses charging a flat rate for hogs (av. = $18.13), 5 slaughterhouses charging a flat rate for sheep (av. = $9.60), and 1 slaughterhouse charging a flat rate for calves ($30.00).

Source: Buitenhuys, Neil C. 1984. "An Analysis of Maine's Slaughterhouse Facilities."

Table 11 presents in both nominal and deflated form the U.S. average sheep and lamb farm level prices and the East Coast carlot price of choice and prime 35-45 pound lamb carcasses. The deflator used was the lamb producer price index (also presented in Table 11). The deflated data were presented in order to remove the effect of general price movements (inflation or deflation). Some of the decrease in the lamb producer price index between 1980 and 1982 resulted from the price decreases in feed. The U.S. average price of soybean meal, cornmeal, and 16 percent protein dairy ration all fell roughly 10 percent between 1981 and 1982 (U.S.D.A. 1983).

TABLE 11

U.S. Average Lamb Producer Price Index and Nominal and Deflated Sheep, Lamb, and Lamb Carcass Prices, 1975-82

Year	Lamb Producer Price Index (1975 = 100)	Dollars Per Cwt.			1975 Dollars Per Cwt.		
		Sheep	Lamb	Lamb Carcass	Sheep	Lamb	Lamb Carcass
1975	100.00	11.30	42.10	94.87	11.30	42.10	94.87
1976	114.63	13.10	46.90	102.51	11.43	40.91	89.43
1977	123.31	13.50	51.30	109.07	10.95	41.60	88.45
1978	147.59	21.80	62.80	127.22	14.77	42.55	86.20
1979	141.29	25.80	66.70	134.50	18.26	47.21	95.19
1980	151.70	21.10	63.60	135.02	13.91	41.92	89.00
1981	132.76	21.20	54.90	126.49	15.97	41.35	95.28
1982	127.88	19.50	53.10	124.09	15.25	41.52	97.04

Note: The lamb carcass is East Coast 35-45 pound lamb carcass, graded choice and prime, on a carlot basis.

Sources: U.S.D.A., Food Consumption, Prices, and Expenditures 1962-82; American Meat Institute, Meatfacts: 1983; U.S.D.A., Agricultural Statistics: 1983.

The nominal price of sheep and lambs was at its highest in 1979 while the lamb carcass price peaked in 1980. Following these peaks the prices have fallen continuously. The only optimistic aspect from the producer's standpoint is that the lamb producer price index has also experienced recent decreases.

Easter Versus Market Lambs

Lambs raised to what is referred to as 'market lamb" size are roughly 100 to 110 pounds liveweight. Many of these lambs in Maine are sold to consumers as frozen whole or half lamb carcasses which have been cut and wrapped. It has been estimated that 75 percent of New England lambs are sold "through direct retail sales from farm to consumers" (Small-Scale Ag. Comm. Report, p. 8). Lupien and Dowling (p. IV 27) report from a Maine survey of midcoast lamb producers that 87 percent of all lamb transactions were direct to the consumers. Although exact data are not available it is thought that this direct trade is mostly composed of market size lambs. Many of lambs sold directly to consumers are slaughtered, cut, wrapped and frozen and are often referred to as freezer lambs.

The bulk of the remaining 25 percent of marketed lambs goes to the Easter market where lambs are generally younger and smaller than market lambs. Lupien and Dowling (pp. IV 24-25) in outlining some of the problems with the Easter market state that under its current structure

"the Easter lamb market is a buyers market" and they list the following as some of the problems:

> A lack of communication about market conditions weakens herders' bargaining positions. Without communication, no one herder can be sure of the strength of Easter demand or the number of lambs being offered in the area. One herder alone has no idea of what price to expect or confidently offer.
>
> In contrast to the disorganization of the herders, the dealers know better what they want and how to get it. Because the dealers are in contact with each other, they do not compete with each other in the same area for lambs. Dealers can find lambs at as many places as there are farms.
>
> Herders do not have contact with further stages of processing. Thus, dealers are their only link to lamb markets.
>
> The weakness of the herder's position on the Easter market is amply documented by the variety of prices accepted by individual herders, the fact that some herders are passed over entirely, or that some are promised a sale and then are "bumped".
>
> At the pools sponsored by the SMSA [Southern Maine Sheepherders Association], despite extensive publicity, only one dealer came on any particular pool date.
>
> Neither herders nor dealers had assurances of what would transpire at the pools. In 1980, no herders consigned lambs to the first scheduled pool, forcing its cancellation. 170 lambs were promised on the second, but only 138 were delivered. Thus the buyer is unsure of the number s/he can confidently expect to purchase at the pool. Herders, on their part, had no assurance as to what price would be offered or even if their lambs would be sold at all.
>
> As at the farms, many herders simply do not bargain aggressively enough.

Much of Easter lamb demand is from "Mediterranean and Middle Eastern ethnic groups that consume relatively large quantities of lamb" (U.S.D.A. 1982a, p. 9). If these groups become less traditional and more assimilated into the U.S. culture, their lamb consumption may decrease. Henceforth, this study concentrates exclusively upon market lambs since there appear to be persistent and potentially worsening problems with the Easter lamb market and since most Maine lambs are raised to market size (100 to 110 pounds liveweight).

MAINE LAMB PRODUCTION ECONOMICS

There are many reasons or motivations for producing lamb. One producer's motivation might be profit while another's may be the rural

living lifestyle. In the 1982 Maine Agricultural Experiment Station survey of small farmers, producers were asked to check which of several motivational forces was most appropriate for them. Respondents could check one or more of several categories. Table 12 presents the motivational information for the 83 usable responses from small scale lamb producers.

Note that slightly over three-quarters of respondents listed rural living lifestyle as an important motivational factor for their farming

TABLE 12

Motivational Factors for Small Scale Farming as Identified by Lamb Producing Respondents, 1983

Motivation	Number Identified as Important Motivation	Percent Which Identified as Important
Rural Living Lifestyle	63	75.9
Best Use of Resources	58	69.9
Supplemental Income	43	51.8
Primary Income	13	15.7
Farming Experience	37	44.6
To Employ Family	9	10.8
Other	19	22.9

NOTE: There were 83 usable lamb producing respondents who were free to check one or more category.

Source: 1982 Survey of Maine Small Farmers by the Maine Agricultural Experiment Station.

while only 67.5 percent listed supplemental or primary income as a motivational force. As was mentioned earlier this small farmer survey is not representative of all Maine lamb producers but does apply to a subset. When discussing producer motivations for raising lamb it is probably helpful to divide the state's lamb producers into groups for discussion. One way lamb producers have been classified is as follows:

1. Hobby or recreational producers
2. Relatively small flocks which are part of diversified farms
3. Larger producers whose main source of income is from their lamb and sheep operations.

If one uses these groupings, which seem to appropriately characterize the Maine lamb producers, then there are many producers in the

first two groups and very few in the last group. According to the U.S. Department of Commerce's agricultural census there were 34 farms in Maine in 1982 which had 100 or more sheep and lambs. Thus, if one considers larger producers, those with a flock of 100 or more, then 34 or roughly 6 percent of Maine's lamb producers are large producers.

The primary purpose of this section is to examine the economics of producing lambs in Maine. Profit and other motivations for raising lambs will also be discussed. Several studies of the economics of producing lambs in Maine and elsewhere will also be discussed.

Lamb Production Budgets

There is some question whether lamb production is profitable in Maine. There are individuals and groups who maintain that lamb production is profitable and that the industry will and should grow. In searching for alternatives to the dairy industry in New England, Agribusiness Associates, Inc. (p. 59) identified lamb production as a "high priority" commodity. In the March, 1981 Maine Sheep Development Plan, it was concluded "that the sheep industry is now and will continue to be economically viable in Maine" (Sheep Industry Task Force Report, p. 8).

The authors found the above and other assertions of the economic viability of the Maine sheep industry interesting since they contradicted several U.S.D.A. reports. In 1973, it was reported that "An estimated 95 percent of all present U.S. sheep flocks did not qualify as 'adequate economic sheep production units' which is defined as one which is likely to return to operator for his labor and management an amount equal to or greater than he can earn from alternative uses of his time and abilities in either on- or off-farm employment" (Hall). In 1982 the U.S.D.A. stated that "Sheep producers are expected to cover cash costs and provide the operator and family with about two-thirds of the value of their time spent in sheep production. There will not be a margin for ownership cost. This situation represents a substantial deterioration from the 1977-1980 period, when returns generally approached or exceeded all costs except for land" (U.S.D.A. 1982d, p. 9).

The authors decided to investigate the apparent discrepency between claims of Maine lamb production economic viability and the U.S.D.A.'s more negative reports. It was felt that those in Maine considering entering lamb production should have this information available. Something which also needs to be defined is "economic viability." To some economic viability is total revenue minus all costs including opportunity costs being positive. Others might not include their own labor and ownership costs as relevant costs in determining economic viability. Another factor which is undoubtedly important to some are the tax implications of farming. Does economic viability apply to the lamb operation exclusively or does the economic viability appear during overall family income tax calculations?

In a well-done, detailed, and comprehensive report by Coastal Enterprises, Inc. a 50 ewe flock budget is presented. Under their

assumptions the net returns to management and owner/operator labor are -$1,008, $693, and $1,542 for lambing rates of 100, 150, and 175 percent, respectively. Under the 150 percent lambing rate scenario the net returns to management and owner/operator labor are $13.86 per ewe.

Two analyses of sheep operations were conducted using 1982 Electronic Farm Accounts Program (ELFAC) data, one in Vermont, and one in Maine. These analyses were not budgets, although they use similar cost categories, but were averages of what the ELFAC sheep producers recorded as expenses, receipts, etc. Both analyses used a fairly small number of participants - seven in the Maine study and 11 in the Vermont study. The results of the Maine study are as follows (Stevens and Micka):

1. None of the sheep producers were full-time farmers.

2. Only 29 percent stated that their sheep operation was their major agricultural enterprise.

3. The average number of lambing ewes equaled 21.9 and the lambing rate equaled 144 percent.

4. Average total sheep enterprise receipts equaled $1,979 while average total sheep enterprise expenses equaled $4,704.[5]

The average sheep producer in the Vermont analysis had 83 ewes with a range of 24 to 164. It was stated that a "close look at a few of the sheep enterprises should indicate that a good return is being made on some enterprises" (Tremblay, p. 2). The results for the average sheep producer were not as encouraging as average total cash receipts equaled $10,498 and average total farm expenses equaled $20,274.

The lamb production budgets presented in the Maine Sheep Development Plan and the Coastal Enterprises, Inc. report are at present several years old. The authors decided to construct new budgets for two lamb operations. The first budget is reflective of the many smaller lamb producing operations in the state with 20 ewes. The lambing rate used equaled 115 percent which was the average lambing rate determined by Coastal Enterprises, Inc. in their survey of midcoast lamb producers. The 50 ewe budget corresponds to producers who are improving their operation. For example, the lambing rate was increased to 150 percent. In both of the 20 and 50 ewe budgets the returns above operating expenses were negative. Appendix B gives a detailed description of the underlying assumptions and the results of the budget analyses.

In an effort to examine the profitability of lamb production in other regions a 1983 lamb production budget from Kansas State University was obtained. This budget separated costs into cash and non-cash costs, for instance, all labor was performed by the owner-operator and his

[5]It was noted that "Insufficient data were obtained to estimate change in sheep enterprise inventory" (Stevens and Micka).

payment for labor is a non-cash cost. The owner/operator also provided a large portion of the capital investment and his opportunity cost of that investment (interest) is a non-cash cost. Costs were also broken into variable and fixed costs, for example, feeds and other inputs used fairly soon after purchase are variable costs while buildings and equipment costs primarily make up the fixed cost component. The Kansas budget analysis estimated that:

1. Returns over variable cash costs equaled $5.50 per ewe.

2. Returns over total cash costs equaled -$10.31 per ewe.

3. Returns over total cash and non-cash variable costs equaled -$9.55 per ewe.

4. Returns over all costs (fixed, variable, cash, and non-cash) equaled -$44.23 per ewe.

In July, 1984, the U.S.D.A. released "Economic Indicators of the Farm Sector: Costs of Production, 1983." Presented in this publication are three U.S. sheep budgets, one each for 1981, 1982, and 1983. Total cash receipts less total economic costs equaled -10.57, -11.11, and -11.93 dollars per ewe for 1981, 1982, and 1983, respectively. However, if one excluded the farm land cost attributed to sheep by the U.S.D.A., the total cash receipts less costs would equal .03, .43, and -.03 dollars per ewe for 1981, 1982, and 1983, respectively (U.S.D.A. 1984a, p. 142).

Dr. Paul Saenger, Livestock Extension Specialist at the University of Vermont, maintains that it is possible to raise sheep in New England for a profit but that the majority of New England producers are not making profits (Saenger 1984b, p. 16). Saenger presents a break-even selling price for February born lambs with a weaning percentage of 150 at $66.57 per lamb assuming $60 a ton hay and $200 a ton grain (Saenger 1984a, p. 33). The total feed cost associated with this lamb (feed for the lamb and contribution for ewe) is $59.83. Saenger arrives at the break-even price by assuming the feed cost is 75 percent of all costs of production, making all costs of production (per lamb) equal to $79.77 ($59.83/.75). Then, the total cost, $79.77, is reduced by $13.20 which Saenger states represents wool and cull ewe sales. There appears to be an inconsistency at this point, however, since Saenger (1984a, p. 33) states that "wool and cull ewe sales will offset feed cost $13.20 per ewe" but he apparently deducts the $13.20 per lamb.

Continuing with Saenger's analysis the total cost of production excluding feed costs is $19.94 per lamb or $29.92 per ewe ($19.94 times 1.5 (the weaning rate)). What should be pointed out is that included in the total cost of production excluding feed costs are facility and equipment costs (mostly fixed costs) and all non-feed variable costs (veterinarian visits, fuel, electricity, labor, etc.). Saenger (1984a, p. 31) states that a facility and equipment cost per ewe of $25 "may even be a bit low." Thus, if one uses this facility and equipment cost per ewe, then there is apparently only $4.92 ($29.92 minus $25) per ewe left for all non-feed and non-facility and equipment costs in the Saenger ana-

lysis. The non-feed and non-facility and equipment items, normally the non-feed variable costs, would include fuel, electricity, labor, medicine, etc. A charge of $4.92 per ewe for this category of inputs seems to the authors quite low.

Don Mitchell in a handbook entitled "So You Want to Raise Sheep in Vermont..." clearly points out that lamb production in Vermont is not a very wise monetary investment even among farming operations. Mitchell (p. 10) points out that "Sheep need not be raised for profit" and that "'Hobby' farming can be richly rewarding, quite apart from profit-and-loss calculations." Mitchell's handbook was published in an attempt to forewarn those wishing to raise sheep of what they may encounter. In sample budgets for different size flocks, four of five show negative net returns. The one budget in which operating and capital costs were less than returns had either a return on 600 hours labor of $3.21 per hour or a return on a $25,000 investment of 7.7 percent but not both (Mitchell, p. 45).

The evidence concerning lamb production suggests that lamb production is not a very profitable enterprise. The bulk of the presented budgets and surveys had returns to the owner-operator ranging from slightly positive to negative. It should be noted that most of the evidence in the budgets and surveys applies to averages. Some producers are making profits while most are not. Those that are making money are certainly working hard and are being good managers, as Saenger (1984a, p. 30) puts it "A profitable sheep enterprise is usually average or above in most production phases, but is outstanding in one or two areas."

The 1982 Maine Agricultural Experiment Station survey of small farmers revealed that many small farmers do not consider profits as their primary farming motivation. Three-quarters of the responding lamb producers listed the rural living lifestyle as a farming motivation while only 67.5 percent listed primary or supplemental income as a farming motivation.

Two other important factors to consider when discussing Maine lamb economics is what constitutes economic viability and how a family's income taxes and farming relate. Many lamb producers may be covering all cash costs while receiving no return for their labor, management, and capital. If these producers are enjoying what they are doing, then their rewards may not be economic. Rural living which includes part time farming may be a lifestyle which is conducive to low blood pressure. The caring for animals has helped instill basic responsibilities in teenagers (Proctor, p. 5).

The vast majority of lamb producers in Maine have substantial income from non-farm sources. Preliminary research being conducted at the University of Maine's Department of Agricultural and Resource Economics reveals that losses from farm operations can be partially offset by gains in tax deductions. In similar research into part-time cow-calf operations Milligan, et al. (p. 52) found that "investment in a part-time farm business cannot be adequately evaluated using traditional farm income measures. Measures that assess income tax effects on cash flows and pro-

fitability and balance sheet changes over time are more relevant to the part-time investor."

Public Policy and Lamb Production Economics

The production of a given commodity can be influenced by public policy. For instance in the U.S., milk production for the last few years, it can be argued, has been subsidized with the billions of dollars of Commodity Credit Corporation purchases of manufactured dairy products. Canada has recently begun to subsidize lamb production. This information is presented for two reasons; first, it is an example of how public policy can influence the economics of producing a commodity, and secondly, U.S. farmers, politicians, and others need to be aware of the Canadian government subsidy since in a few years the U.S. may become a home for their subsidized lamb production.

The Canadian lamb subsidy is part of a five-year plan to boost local beef and lamb production and admittedly the items which are subsidized will increase production efficiency. To receive subsidy money producers must have a Sheep Flock Efficiency Plan and must identify all sheep in the flock and lamb weights are taken at 50 and 100 days. Producers will receive one dollar for each time each lamb is weighed although some of this money will help pay the person weighing the animals. As reported in the "New England Farmer" by Bill Kruesi (p. 21) those producers with a Sheep Flock Efficiency Plan are eligible for any of seven incentives:

1. ... Synchronization of pregnancy ... Fifty percent of cost of vaginal sponges and pregnant mare serum ... to a maximum of $4 per ewe ...

2. ... Fifty percent of the cost for [pregnancy examination] will be paid for animal examined ...

3. ... A grant of up to 50 percent of the cost of facilities listed below to a maximum of $5,000 ... Materials to build handling facilities such as chutes, gates, pens, fences and 'simple structures'. Scales to weigh and/or feed. Supplies or equipment for pasture renovation ...

4. ... one free forage or feed analysis annually ...

5. ... Fifty percent of the cost [of two flock herd health visits per year] to a maximum of $5 per ewe and lambs of vaccines and parasite control medications will be paid ...

6. ... one dollar per head will be paid on receipt of letter documenting animals graded ...

7. ... One hundred dollars per year will be paid to producers who supply annual [financial and production] records ...

Aside from the above subsidies Canada has also decided to spend more monies on artificial insemination research and also to sponsor a Sheep Marketing Agency Commission. These public policy incentive payments will undoubtedly increase Canadian lamb production and lower individual lamb producer production costs.

MAINE'S LAMB MARKETING SYSTEM

Many lamb producers feel their major problem is a marketing problem. Many producers would like to raise their lambs and ideally have someone buy their lambs at the farm gate. When the prices farmers receive are not adequate in their opinion, they often feel it is a marketing problem since the market is not setting an appropriate price. A given level of profit can usually be obtained by either receiving a high enough price or by lowering costs of production; the point being that inadequate producer returns may not be exclusively a marketing problem. This section concentrates upon federal grading and slaughter facilities since the lack of federal grading in Maine is a major impediment to Maine produced meats entering Maine supermarkets.

Federal Grading

The market structure for Maine market lambs is heavily influenced by the following:

1. The primary livestock in Maine are dairy animals. The primary livestock going to slaughter in Maine are cull dairy cows and bull dairy calves. According to the U.S. Census of Agriculture, there were 167,140 livestock animals in Maine in 1982. Of this total a large portion is composed of dairy animals. A major use of cull dairy cows is hamburger production for which federal grading is not as important as it is for other meat cuts.

2. The bulk of U.S. slaughterhouse production has moved west, for example, with sheep and lambs the states west of the Mississippi River slaughter over 80 percent of the U.S. total. Thus, in Maine the slaughter industry is dominated by dairy animals and the bulk of non-dairy slaughter is in the West.

3. In order to enter many retail markets most meat products need to be federally graded and boxed. In Maine there are currently no slaughterhouses producing federally graded and boxed meats. The lack of federal grading and boxing is a missing link in the marketing chain which might get Maine livestock into Maine retail outlets. This is a problem not only for sheep and lambs but also beef cattle and swine.

Herbert Cowan, a purchaser for Hannaford Brothers Company, feels that the necessary conditions for getting Maine lambs into wholesale

channels which would result in Maine lambs being retailed in Maine supermarkets are:

1. Maine lambs being federally yield and quality graded.
2. The grade quality being choice or prime.
3. An ample supply available.
4. The lamb being boxed (individual cuts, vacuum packed in 50 pound boxes).

Cowan further states that supermarkets would prefer the above conditions plus being able to buy specific cuts such as legs and racks and not the entire, half, or quarter carcass. Ample supply means that enough product is available to serve several stores concurrently.

There is considerable interest for the obtaining of a federal grader in Maine. Two relatively inexpensive options are the training of a federal inspector to be a federal inspector-grader and the training of a state employee to be a part-time grader. The current wage for a federal grader is $26.50 an hour. If any traveling is required by the federal grader, this is also paid by the user of the grading service as well as the labor time in transit. Paul Saenger estimates the cost of training a state employee to be a federal grader would be roughly $10,000 which includes transportation to and from Chicago, per diem during training at Chicago, and salary and fringe benefits while training.

Even without some form of federal grading subsidized by the state or federal government, Maine may in the next few years have a federal grader in one of its private slaughterhouses. While this will be another advancement towards a better lamb marketing system, it will not solve all the problems such as having an ample and continuous supply available.

A major problem which will still exist with a Maine federal grader is that supermarkets can obtain ample and continuous supplies of relatively low-cost western boxed-lamb. Further the supermarkets can obtain the specific cuts they desire. Retailers in the New York/Boston area in mid-July could purchase (less than carlot) lamb carcasses for $1.42 to $1.47 a pound. A large retailer in Maine, during this same period, could obtain boxed, graded lambs for roughly between $1.60 and $1.70 depending on volume. Large western slaughterhouses can more efficiently market the less desirable cuts and ship to supermarkets only the more desired cuts. Since slaughterhouses in Maine do not market less desired cuts of lamb as efficiently as western slaughterhouses, they have higher overall costs of slaughter than slaughterhouses in the west. Maine producers with the current slaughter situation have trouble competing with Western lambs for the supermarkets' lamb trade. This situation is likely to persist.

Maine Slaughterhouse Adequacy

There has been some concern among Maine lamb producers that the slaughter facilities in Maine are somewhat inadequate and perhaps more

capacity is needed. In the Maine Department of Agriculture, Food and Rural Resources 1984 survey of Maine slaughterhouses, among other questions the following was asked "At what percent capacity is your slaughterhouse presently being utilized?" Based on their responses as well as other information the MDAFRR estimates that the excess slaughter capacity in Maine's slaughterhouses in 1983 was at least 21,000 animals. It should be noted that this figure is a quick and rough estimate. It is assumed that survey respondents can correctly assess their excess capacity and that they report this figure. Federal and custom slaughter are combined and the animals to be slaughtered are assumed to be roughly homogeneous in the slaughter process.

Excess slaughter capacity for lamb also exists for the Northeast according to Holder and Hogeland. They give two possible explanations for the region's excess lamb slaughter capacity (p. 12):

1. The packers may not be getting full value for lamb byproducts because they don't have sufficient volume for adequate market development.

2. The efficiency of their plants can also have an effect on their ability to compete with other regions.

Maine lamb producers would thus appear to be able to expand their production level and be able to find available slaughter. For many reasons the lamb producers might find it beneficial to organize. On the state level if Maine lamb producers could arrange a large continuous stream of lambs to a processor it might help that processor lower slaughter costs. For the 15 most northeastern states Holder and Hogeland recommend that lamb producers organize into a cooperative and arrange for slaughter with one or more Northeast slaughterhouses. Holder and Hogeland (USDA 1982a) found in a survey of Northeast (the 15 most Northeastern states) slaughterhouses that the firms in general would be willing to establish lamb kill lines provided they could be guaranteed a minimum and maximum number of lambs per week to be slaughtered.

Federal grading as well as the ability to box lamb was available from some of the slaughterhouses willing to establish a lamb kill line. One packer "indicated that adding a grader would not be an excessive cost to the plant, so long as the number of lambs was kept fairly constant" (USDA 1982a, p. 27).

The advantage to the slaughterhouse from such an arrangement would be a more fully utilized capacity and a reliable supply of lambs. Most of the problems foreseen by the slaughterhouses stemmed from their belief that the cooperative might not actually guarantee a supply of lambs. The slaughterhouses felt that if lamb producers could obtain a higher price for their lambs outside of the cooperative, then the arrangement would deteriorate.

Other options which lamb producers might consider are the leasing of a slaughter facility or the actual ownership of a facility which could either be an existing or a newly constructed facility. The financial

commitment for these options is so extreme it can basically be ruled out unless some financial aid can be obtained. In 1977 Holder estimated that a new facility which had the capacity to slaughter 250,000 lambs a year would cost between 3.5 and 4.8 million dollars and that operating losses could result in the first few years of operation.

In addition to the financial problems of owning a slaughter facility there are the numerous problems of organizing lamb producers (or any farmer). Interest in the ventures tend to be high while firm financial commitment is low. Concerning a Montana situation it was estimated "that a 10-year educational effort would be necessary to overcome the individuality of Montana cattlemen and get their support for cooperative action" (Hogeland, p. 8).

Feasibility studies have, in general, shown lamb slaughter facilities to be marginally profitable at best. In the late 1960's it was determined that a sheep and lamb slaughter facility in Southeast Iowa was not feasible (Skadberg, Mikes, and Rahn). A hog and lamb facility on the surface did appear feasible but the authors stated that firms "considering this alternative should investigate further the possible difficulties in dual procurement and dual merchandising and the costs associated with them" (Skadberg, Mikes, and Rahn, p. 60). The trend in U.S. slaughter facilities has been away from multi-species plants.

A 1980 study "The Feasibility of Locating a Lamb Processing Plant in Kansas" estimated that the "rate of return on total investment after interest and income tax deductions was 5.35 percent" (Erickson and Heimermann, p. 7). This was under the assumption that all problems could be remedied such as the lack of an even lamb crop over the year. Using the basic model of Erickson and Heimermann the authors determined that constructing such a plant in Maine would not be feasible since the slaughterhouse could not afford to pay lamb producers a price equal to that they could receive from direct market sales. It should be noted that this is just one of many different types of possible slaughterhouses and was not an indepth analysis. Given the large volume of the newly constructed U.S. slaughterhouses it is very unlikely that one of the major meat companies would build a new lamb slaughterhouse in Maine or New England. Presentation of the slaughterhouse model is contained in Appendix C.

Direct to Consumer Marketing

There appears to be room for some expansion of directly marketed Maine lambs. The 1982 U.S. per capita consumption of lamb and mutton on a carcass weight basis equaled 1.7 pounds. If the 1.2 million Maine consumers consumed this average, then they ate roughly 2,040,000 carcass weight pounds of lamb or 40,800 lambs weighing 100 pounds each in 1982. The quantity of lambs consumed in Maine may be less than this amount as the average U.S. per capita lamb consumption rate varies greatly by region. If Maine's per capita consumption is near the U.S. average, then Maine is easily consuming more lambs than it is producing. Thus, there is probably room for replacement of some supermarket purchased lambs with directly marketed lambs.

Problems with the direct marketing of lambs are that it is an inefficient marketing method and many consumers may want less than the whole or half carcass which is the customary quantity sold. Direct marketing requires a considerable amount of "leg-work," maintaining contacts, making many phone calls, hauling small quantities of animals, etc. As a producer expands his production he could easily find himself spending a large portion of his time marketing his lambs and as with the production aspect the returns to this labor are low.

SUMMARY, RECOMMENDATIONS, AND CONCLUSIONS

Summary

In 1982 there were 623 Maine farms with sheep and lambs, up from 396 in 1978. The number of sheep and lambs on these farms increased from 10,296 to 17,308 over the same time period. The January 1 inventory of sheep and lambs in Maine has risen between 1977 and 1982 but there is evidence suggesting that the state's flock has decreased since. The number of farms per Maine county is fairly evenly distributed while sheep and lambs per county are more concentrated in the southern part of the state.

The sheep and lamb producers can be broken into three groups - hobby or recreational producers, relatively small flocks which are part of diversified farms, and larger producers whose main source of income is from their lamb and sheep operations. There are very few of the larger producers; in 1982 it was reported that there were less than 34 flocks in Maine with more than 100 animals. A large portion of the first two groups of producers is well educated and has substantial off-farm earnings. Many of these producers are raising lambs primarily for rural lifestyle reasons.

Maine's slaughter industry is dominated by the large portion of cull dairy cows and bull dairy calves being slaughtered. Many of the cull dairy animals are made into hamburger for which there is little need of federal grading. This is a contributing factor to Maine not having any livestock being federally graded. Most of the large non-dairy slaughter houses have moved west near livestock supplies. There are currently around a dozen federally inspected slaughterhouses and 34 non-federally inspected slaughterhouses in Maine. The federally inspected slaughterhouses are doing the majority of the kill but this varies by livestock type as many hogs and lambs are custom sold and do not require federal inspection.

The weight of evidence provided by the lamb production budgets, surveys, and other related literature, reveals that lamb production is not a very profitable enterprise. While exceptional producers may make money, many will not. It is important to consider a family's income taxes when evaluating the overall economics of raising lambs as farm losses can partially be off-set by gains in tax deductions. There are also non-economic motivations for farming; having a flock of sheep is rather bucolic. Further, it may positively influence children by teaching

responsibility and may have health benefits for adults such as reducing stress. Society also benefits from having fresh lamb available and by having the pastorial scenery which is desirable for all.

The slaughter industry in Maine is not geared for placing Maine lambs in Maine supermarkets. Even if a slaughterhouse did employ a federal grader, there would still be a supply and price problem. Aside from a federally graded meat product supermarkets want boxed specific lamb cuts such as the legs and racks and they may desire not to purchase the shoulders for example. A Maine producer supplying a retailer with specific cuts might have a problem disposing of the less preferred cuts. Western slaughterhouses which deal in much larger numbers of lambs can more efficiently market the less preferred cuts. Another desirable condition is to have a continuous and ample supply available. Supermarkets purchasing Western lambs through the wholesale market can purchase when they desire and whatever amount they desire.

Recommendations

The authors felt it appropriate to draw upon recommendations made by those with experience and knowledge of the Maine lamb industry. The authors' views will be confined to the conclusion section. Lupien and Dowling suggest that Maine producers concentrate on market lambs due to the Easter market's volatility and since they feel that the market lamb market is not saturated. Lupien and Dowling feel that Maine lamb producers should concentrate on in-state institutional buyers and that producers' efforts to enter this market would be enhanced by reducing the seasonality of their production. For the University of Maine at Orono and the Maine Department of Agriculture, Food and Rural Resources Lupien and Dowling have many recommendations including in-state demand analysis and processing studies among others. Finally, they recommend multiple county cooperatives be organized, a teleauction be considered, and that promotional activities be encouraged.

Paul Saenger, who has been a driving force behind advancements in Vermont lamb production and marketing, has the most action oriented recommendations for the Maine lamb industry. Saenger feels that Maine lamb producers must set their goals and proceed through the following steps:

1. Sell Maine lamb which is a good product but also includes substantial image. Maine cannot compete with western prices so the lamb must be defined. The Vermont lamb of the Yankee Shepard lamb marketing cooperative is a lamb on feed in Vermont for at least 45 days and is at least average choice or better. The average choice is a fraction of grade better than Western lamb which enables Vermont producers to claim to have a superior product.

2. Promote the product. This would especially include as much free media exposure as possible. Fairs and trade shows should also be covered.

3. Work out problems of physical distribution.

4. Obtain a uniform product which is guaranteed.

5. Action - move towards goals and see what happens. After several failures success may be likely.

Conclusions

The authors agree with Saenger who feels that gains in lamb production efficiency and improvements in the lamb marketing structure and performance will only come in small steps. There is not one drastic correction which will eliminate all of the perceived problems with the Maine lamb industry. The availability of a continuous and ample supply of quality graded, boxed (and when desired specific boxed cuts), relatively inexpensive Western lamb is and will continue to be a throttle on Maine lamb production expansion. Efforts to lower the costs of producing Maine lambs need to continue since the high cost of producing lambs in Maine relative to the West is a fundamental impediment to Maine lamb production and marketing expansion.

The obtaining of federal grading and boxing of meat products in Maine would help Maine lambs enter retail markets. The industry has yet to test the consumers' demand for Maine lambs in supermarkets. Saenger suggests that Maine lamb producers put up some of the money required to train a state employee to yield grade lamb. This not only would help pay the training cost but would also be a sign of sincere effort and commitment. The authors endorse this suggestion.

The recommended teleauction of Lupien and Dowling failed in Vermont and would probably also not work in Maine. The problem in Vermont was that lamb producers were not willing to accept a wholesale price. Lupien and Dowling also suggest the need for processing studies. The information contained in Appendix C and trends in U.S. meat packing suggest that there will not be a single-species slaughterhouse constructed in Maine to slaughter only lambs. A related area which the authors feel may warrant some research is the following: What inducement from the state and lamb producers would be required in order for some Maine lambs to be slaughtered in Maine under federal inspection and be boxed and sold to Maine supermarkets? It may be possible for a state employee to be trained as a federal inspector. The authors understand that some small scale vacuum packing (necessary for boxing) is also available in the state if required for the lambs to enter the supermarkets. It is believed that this type of research, which may result in a beneficial change in the marketing structure, is more worthwhile than promotion which really does not concern itself with improving the economics of production and slaughtering.

The authors see small but continuous future improvements in the Maine lamb industry. However, it is doubtful that the Maine lamb expansion goals of the Maine Sheep Development Plan (25,000 head flock in 1986) will be attained. The general aging of Americans and the increase

in young upwardly mobile professionals are seen as demand strengthening elements. More negative aspects are that consumers appear to be moving away from red meats and the presence of keen price competition from poultry. Marketings to Maine institutional outlets and direct to consumer sales have been successful and hopefully can be expanded. Entry into Maine supermarkets is an unexplored opportunity but will depend upon federal grading.

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APPENDIX A

TABLE 1

Meat Industry Definitions

Meat Industry Term	Definitions
Beef Breaking	The breaking (cutting) of carcasses into primals, subprimals, or both.
Boxed Beef	Beef cut into primals, subprimals, or both; vacuum-wrapped, and placed in cartons by the packer.
Chain Warehouse	Central plant used by a chain retail firm to assemble, store, and distribute a product to local stores. This facility may also cut or process meat.
Fabrication	Breaking and cutting of meat from carcasses into retail cuts, wherever done and whether done partly or entirely.
Food Service Outlets	Firms that sell food for away-from-home consumption. Includes restaurants and institutions.
Formed Steaks	Steaks formed by a machine into a specific shape. Raw material fed into the machine is usually chunked or flaked.
Meat Distribution	The movement of meat from packer to consumer. Includes fabricating, wholesaling, and retailing functions. Retailers include both grocery and food service firms.
Packers	Firms that slaughter livestock. These firms may or may not fabricate products, process, or perform other functions.
Portion Controlled Product	A cut of meat that has been individually wrapped to meet certain weight (and perhaps other) specifications.
Primals	Major divisions of the carcass. For example, rounds, loins, and chucks are primals from a beef carcass.
Retail Outlet	A store that sells meat for home or away-from-home consumption.

APPENDIX A

TABLE 1 (CONTINUED)

Meat Industry Term	Definitions
Chain Grocers	Retail grocery firms that own 11 or more grocery stores. Meat sold by these stores is usually for at-home consumption.
Independent Grocers	Retail grocery firms that have 1 to 10 stores. Meat sold by these stores is usually for at-home consumption.
Fast Food Restaurants	Firms that sell prepared, ready-to-eat food for consumption on or off the premises and that do not provide table service. These firms may be either part of a chain or independently owned.
Chain Restaurants	Food service firms with more than 10 outlets.
Table Service Restaurants	Firms that have tables or booths and waiters or waitresses providing sit-down service. These firms include the more expensive quality restaurants.
Institutions	Firms that provide meal service as a part of other services--for example, hospitals and college dormitories.
Subprimals	Smaller cuts than primals, but not retail cuts. For example, top rounds, bottom rounds, and knuckles are subprimals from the beef round.
Wholesaling	The broad operation in which firms buy and sell meat to other firms.
Packer Sales Offices	The local sales organizations for packers that do not physically handle meat but that act as salespeople and troubleshooters.
Direct Sales	Sales packers make directly to retail firms with one or the other or both assuming wholesaling roles or functions.
Purveyors	Firms that buy meat, do some fabricating, and resell to other firms. Some cutting distinguishes these firms, but they may also handle other product lines and perform other services.

APPENDIX A

TABLE 1 (CONTINUED)

Meat Industry Term	Definitions
Distributors	Firms that procure a product in large quantities, hold it in a cold storage warehouse, and then distribute it to their customers without cutting or changing the product in any way.

Source: U.S.D.A. ERS-AER No. 509, "Changing Trends in the Red Meat Distribution System.

APPENDIX B

This section considers the costs and returns of lamb production on small, part-time, multiple enterprise farms in Maine. Numerous existing enterprise budgets, survey data, farm interviews, and informed judgement were utilized to prepare two enterprise budgets which reflect 1984 operating conditions in Maine.

The first enterprise budget (Appendix B - Table 1) was designed to represent the traditional or unimproved method of lamb production in Maine. The flock, associated with the budget, is composed of 20 breeding ewes, 4 replacement ewe lambs, and a single ram. Lambs are direct marketed at 240 days of age with an average weight of 73 pounds. An average of 1.15 lambs is born per breeding ewe and 90 percent of these lambs survive.

The second enterprise budget (Appendix B - Table 2) was designed to represent an improved method of lamb production in Maine. The flock associated with this budget is composed of 50 breeding ewes, 10 replacement ewe lambs, and three rams. Lambs are direct marketed at 200 days of age with an average weight of 110 pounds. An average of 1.5 lambs is born per breeding ewe and 95 percent of these lambs survive. This budget reflects attainment of the major goals outlined in the Maine Sheep Development Plan (MDAFRR 1981).

An enterprise budget is essentially a formatted report of costs and returns associated with an economic activity on a yearly basis. The budget format, selected by the authors, is composed of five categories: receipts, operating expenses, livestock investment, opportunity costs, and returns. The receipts category itemizes the payments which are normally received for meat, wool, and government subsidy. The operating expenses category lists the major expenses incurred in lamb production, i.e. feed, medicine, contract labor, fencing, building, and interest on operating capital. The livestock investment category estimates the amount of the producer's money invested in his livestock. The opportunity costs category estimates the amount of income forgone by dedicating money, labor, land, equipment, and building space to lamb production rather than some other economic activity. The returns category sequentially lists the return above cash costs, above cash costs and labor, and above cash costs, labor, and opportunity costs.

In order to assist the reader in evaluating these budgets, the following discussion reviews the origin of data and assumptions which were utilized in their preparation. Reference will be made to the inclusion of an item, the number of items, and the cost of each item.

Twenty Ewe Budget Receipts - The traditional lamb producer receives payments according to the magnitude of meat and wool production. Meat production was estimated according to the lambing rate (1.15), ewe replacement rate (.2), lamb survival rate (.9), and market weight (73 pounds) observed in the Coastal Enterprise, Inc. survey of traditional lamb producers (Lupien and Dowling). Wool production was estimated

APPENDIX B

TABLE 1

Receipts, Operating Expenses, Livestock Investment, Opportunity Costs, and Returns for a Twenty Ewe Maine Sheep Operation

Category	Amount	Value Per Unit (Dollars)	Total Value
Receipts			
Slaughter Lambs	12.41 Cwt.	100.00	1,241.00
Cull Ewes	4 Head	19.80	79.20
Wool	163 Pounds	.63	102.69
Wool Incentive Payment	$102.69	.33	33.89
Unshorn Lamb Incentive	12.41 Cwt.	1.03	12.78
Total Receipts			1,469.56
Operating Expenses			
Pasture	15 Acres	0.00	0.00
Hay	13.5 Tons	80.00	1,080.00
Corn	22.4 Cwt.	11.20	250.88
Oats	58.2 Cwt.	11.85	689.67
Protein Supplement	6.9 Cwt.	16.25	112.13
Salt and Mineral	2.65 Cwt.	6.00	15.90
Veterinary/Medicine	20 Head	2.12	42.40
Shearing	25 Head	1.75	43.75
Fencing	*	*	0.00
Building	*	*	0.00
Interest on Operating Capital	*	*	0.00
Total Operating Expense			2,234.73
Livestock Investment			
Ewes	20 Head	30.00	600.00
Ewe Lambs	4 Head	37.50	150.00
Ram	1 Head	62.50	62.50
Total Investment			812.50
Opportunity Costs			
Land, Building, Equipment	$19,200.00	.10	1,920.00
Livestock	$ 812.50	.10	82.25
Labor	120 Hours	3.35	402.00
Total Opportunity Costs			2,403.25
Returns			
Above Operating Expenses			-765.17
Above Operating Expenses & Labor			-1,167.17
Above Operating Expenses, Labor & Investment Interest			-3,169.42

*No charge included for these items.

APPENDIX B

TABLE 2

Receipts, Operating Expenses, Livestock Investment, Opportunity Costs, and Returns for a Fifty Ewe Maine Sheep Operation

Category	Amount	Value Per Unit (Dollars)	Total Value
Receipts			
Slaughter Lambs	78.1 Cwt.	100.00	7,810.00
Cull Ewes	10 Head	19.80	198.00
Wool	442.5 Lbs.	.63	278.78
Wool Incentive Payment	$278.78	.33	92.00
Unshorn Lamb Incentive	78.1 Cwt.	1.03	80.44
Total Receipts			8,459.22
Operating Expenses			
Pasture	40 Acres	0.00	0.00
Hay	36.23 Tons	80.00	2,898.40
Corn	69.49 Cwt.	11.20	778.29
Oats	297.54 Cwt.	6.00	1,785.24
Protein Supplement	43.86 Cwt.	16.25	712.73
Salt and Mineral	6.63 Cwt.	6.00	39.78
Veterinary/Medicine	50 Head	2.12	106.00
Shearing	63 Head	1.75	110.25
Fencing (Linear Feet)	5,280	0.0632	333.75
Building	1,680 Sq. Ft.	0.8789	1,476.71
Interest on Operating Capital	$4,120.5	.10	412.05
Total Operating Expense			8,653.20
Livestock Investment			
Ewes	50 Head	50.00	2,500.00
Ewe Lambs	10 Head	75.00	750.00
Ram	3 Head	87.50	262.50
Total Investment			3,512.50
Opportunity Costs			
Land, Building, Equipment	$19,200.00	.10	1,920.00
Livestock	$ 3,512.50	.10	351.25
Labor	225 Hours	3.35	753.75
Total Opportunity Costs			3,512.00
Returns			
Above Operating Expenses			-193.98
Above Operating Expenses & Labor			-947.73
Above Operating Expenses, Labor & Investment Interest			-3,218.98

according to an assumed fleece weight of 7 pounds for mature ewes and rams and 4 pounds for replacement ewe lambs. Subsidy payments were estimated according to the wool incentive and unshorn lamb incentive currently in effect. The estimated price received for direct marketed lamb, auctioned cull ewes, and pooled wool were based upon recently observed prices in Maine.

Twenty Ewe Budget Operating Expenses - The traditional lamb producer utilizes pasture, hay, corn, oats, protein, salt, and mineral, or an equivalent ration to meet the feed requirements of his flock. Feed requirements by way of TDN (total digestable nutrients) and CP (crude protein) were based upon NRC (National Research Council) recommendations for ewes weighing 132 pounds at breeding. Lamb rations were adjusted for a .3 ADG (average daily gain) over a 240 day period.

Hay was assumed to be a timothy-clover which provides .54 pound TDN and .12 pound CP per pound. A 50-50 corn-oats mixture was assumed to provide .72 pound TDN and .102 pound CP per pound of mix. A 5 part SOM-26 part oats mixture was assumed to provide .6974 pound TDN and .1642 pound CP per pound of mix. Discrepancies between Maine traditional feeding practices and NRC recommendations were resolved in favor of the higher estimate. The authors received significant assistance in making the final estimates from members of the Animal and Veterinary Science Department at the University of Maine at Orono.

The authors assumed ewes and replacement ewe lambs would be on pasture from July 1 to October 15. Lambs were not pastured to avoid parasite problems. The pasture was assumed to produce no "out of pocket" costs since it was unimproved. The price of hay, corn, oats, and protein supplement, was set, by assumption, at levels recently observed in Maine for feed purchased off the farm.

The price for salt and minerals and the price for veterinary/medicine were set at levels common to existing lamb enterprise budgets (Gee). The price for shearing was based on farm interviews conducted in 1984. Since the traditional producer was assumed to have utilized existing fence and building space and self-financing in his operation, no operating expense was associated with these items in the operating expenses category.

Twenty Ewe Budget Livestock Investment - In order to estimate how much money traditional Maine lamb producers have invested in their flocks, the authors considered the mixed breed nature of the flocks, the tendency to replace breeding stock from within the herd and the variation observed in the prices paid for mixed breed replacement stock in Maine.

The value of each ewe, ewe lamb, and ram, as an item of livestock investment, was set at $30.00, $37.50, and $62.50 respectively. The value for ewes and rams was determined by subtracting the salvage value of the animal ($25) from the initial value of the animal, dividing by two, and adding back the salvage value. Ewe lambs were carried at their initial value. Ewes and ewe lambs were assumed to be obtained from the flock and given an initial value equal to their value as a market lamb

i.e. 75 pounds (liveweight) at 50¢/lb. The initial value of the ram was assumed to be $100.00. Ewes and rams were culled after their fifth production cycle.

Twenty Ewe Budget Opportunity Costs - This budget category attempts to answer the question: What income would a sheep producer receive if he sold off his sheep building, flock, equipment, put the money in the bank, and worked off the farm?

The value of the producer's off farm labor was set at the minimum wage, $3.35. The value of money invested, after liquidating the sheep operation was set at 10 percent. This interest rate assumes a fixed term deposit such as a bank certificate of deposit or long term treasury note.

In order to value only the equipment and labor associated with the sheep operation, the authors determined the proportion of land, buildings, and equipment on the farm devoted to sheep production. A recent study of small farmers (Flanders) and one of sheep producers indicated:

a. an average value of land, buildings, and equipment of $69,250.

b. an average building (excluding residence) space of 4,300 square feet.

c. an average building space for livestock of 1,600 square feet.

d. an average percent of total income produced from lamb production of 8.5 to 15 percent.

These data provide a basis for estimating the opportunity costs of raising sheep according to the percentage of asset usage (building space usage) of 1,600/4,300 or approximately 42 percent; or according to the percentage of total income generated from sheep production or approximately 8.5 to 15 percent. The authors used these figures as bounds and assumed $19,200 of $70,000 worth of assets (land, buildings, and equipment) found on the traditional small farm could be assigned to the lamb production enterprise. The estimate of 120 hours of labor was based upon estimates published in a recent extension publication (Dum).

Theoretically a traditional lamb producer could divest himself of all assets, labor, and stock associated with lamb production. The labor released would provide $402.00 of yearly income. The invested money, obtained from liquidating the lamb enterprise, would according to this analysis roughly provide $2,002.25 of yearly income.

Twenty Ewe Budget Returns - This category reflects the relative profitability of the enterprise being budgeted. The first item, return above operating expenses, indicates the extent to which cash receipts exceed cash costs. The second item indicates returns to the producer's

management and capital -- labor and cash costs have been subtracted out. The final item indicates a return to the producer under the premise that all of his capital was borrowed at 10 percent or a relevant market rate.

Fifty Ewe Budget Receipt - The 50 ewe budget reflects improvements over the traditional producer. Most of these improvements were suggested and outlined in the Maine Sheep Development Plan (MDAFRR 1981):

1. doubling herd size;
2. lambing rate of 1.5 for bred ewes, 1.0 for yearling ewes;
3. 110 pounds market weight;
4. lower feed costs;
5. high lamb survival rate;
6. low fencing cost;
7. marketing at 200 days of age;
8. use of housing to reduce labor requirements;
9. improved blood line and conception;
10. ewes lambing at one year of age;
11. increased wool yield; and
12. early weaning.

Other than for increased production levels, the 50 Ewe Budget Receipts were calculated exactly as those of the 20 Ewe Budget. The 50 bred ewes and 10 yearling ewes produce 85 newborn lambs. Four lambs die, 10 are used for replacements, and 71 are marketed.

Fifty Ewe Budget Operating Expenses - Feed requirements were based upon NRC recommendations for ewes weighing 154 pounds at breeding, ewe lambs weighing 97 pounds at breeding, lambs weaned at 60 days and sold at 200 days of age with .5 ADG. The feed analysis assumed was unchanged from the 20 ewe budget. Oats were assumed to be of local origin at a cost of $6.00 per hundredweight.

Three additional cost items were included in the 50 ewe budget. The yearly cost of one mile of fencing was included.

Fencing - "The predominant fencing used by midcoast herders is woven wire, sometimes in combination with barbed wire and boards. Only seven herders used electric fencing, three specifying the New Zealand Type" (Lupien and Dowling, p. II-5). A temporary, easily moved, type of electric fence is also currently utilized in Maine. Due to the extensive use of plastic in the fence, its cost is comparatively low.

To encircle 40 acres requires 5,280 feet of fence. Utilizing woven wire fencing at 50¢/ft. would require an investment of $2,640. The New Zealand type of electric fencing at 30¢/ft., plus $248 for the charger, would cost a total of $1,832. The authors allowed an investment of $2,225 for the 50 ewe flock, depreciated over a ten year period. At a rate of 10 percent interest, the shepherd would experience a yearly cost for fencing of $333.75.

Building - The amount of building floor space available for livestock assumed for the previous budget was 1,600 square feet. The

Midwest Plan Service (Midwest Plan Service) has designed a 56 foot by 30 foot structure which they indicate is sufficient for a 50 ewe flock. The structure includes 480 square feet of hay storage. It is quite likely that many part-time shepherds in Maine have adequate existing building space for 50 ewes.

There is, however, a definite trade-off between building size (configuration) and per ewe labor requirements. As shepherds become more advanced in their management techniques, existing structures will become less suitable. This is because more attention will need to be given to ventilation, insulation, waste management, feed processing, feed storage and fencing (partitions).

Moreover many of the modifications of buildings will not have a significant effect upon the aggregate asset value placed on the farm's land, building, and equipment -- except to a purchaser who is likewise interested in raising sheep. Consequently, it was decided to include a per ewe building cost in the 50 ewe budget which would represent either the cost associated with a major renovation of an existing structure or the purchase of a new structure.

A pole barn was assumed adequate and its cost was estimated with the Building Cost Manual, 1984 published by Craftsman Book Company. Their estimated prices "are for pole barns with a low pitch corrugated or aluminum covered roof supported by light wood trusses and poles 15 feet to 20 feet on center. The gable end is enclosed and the room overhangs about 2 feet on two sides. Wall height is 18 feet. Where sides are enclosed, the wall consists of a light wood frame covered with corrugated metal" (Craftsman Book Co., p. 34).

A per square foot construction cost of $6.24 was extrapolated from tables for totally enclosed structures. This figure is normally adjusted for price variations across the U.S. in any given time period. The adjustment figures for Maine in 1984 are: $1.10 for Augusta, $1.06 for Bangor, $1.10 for Brunswick, $1.08 for Lewiston, $1.09 for Portland, and $1.06 for Waterville. The adjustment listed for Maine as a whole was $1.08. The adjusted cost was $6.74 per square-foot for Maine or a total of 56 x 30 x $6.74 ($11,323.20).

For tax purposes structures were depreciated over a fifteen year period. It was assumed the structure would be financed by Farmers Home Administration, which currently charges 10.75 percent. Insurance must be maintained over the period of the loan at a rate equal to the value of the loan or the building whichever is lower. This insurance was estimated to cost 2 percent of the average value per year. Consequently the yearly charge for the building would be: 11,323/15 + (11,323/2) x (.1075 + .02) or $1,476.71.

The 50 ewe budget also assumes that $4,120.50 of working capital would be borrowed at a 10 percent rate of interest. The 10 percent rate is bounded below by FHA rates and bounded above by commercial lending rates. The principal was determined by summing all other operating expenses and assuming that the producer self-financed one-half.

Fifty Ewe Livestock Investment - The 20 ewe livestock investment estimates were increased to reflect the increased market weights of replacement ewe lambs and better blood lines. Accordingly the initial value of ewes and ewe lambs is set at $75, midway between their $55 value as market lambs and the $100 value of purebred replacement stock. The initial value of tne ram was set at $150 to reflect better bloodlines. The budget value of ewes and rams was determined by subtracting the salvage value of the animal ($25) from the initial value of the animal, dividing by two, and adding back the salvage value.

APPENDIX C

THE LAMB SLAUGHTERHOUSE MODEL

Capital Costs

It was assumed that a new sheep slaughterhouse would locate in an industrial park adjacent to a major city. The site quality, service availability, and ease of access, afforded by such locations, contribute to the minimization of operation costs. The cost of land in the major industrial parks in each of five Maine cities considered is summarized in Appendix C Table 1. The costs include a cleared and leveled site, frontage on a paved access road, and availability of water and sewage service.

Initial analysis revealed that Maine or even New England could not supply the lambs necessary to run a large state of the arts lamb processing plant. Thus, smaller plant sizes needed to be examined. The plant design used in this analysis was from a 1980 Kansas study (Erickson

APPENDIX C TABLE 1

Cost of Land in Industrial Parks by City and Acreage

Acres	Presque Isle	Bangor	Augusta	Lewiston	Portland
3	30,000	27,000	75,000	30,000	45,000
4	40,000	36,000	100,000	40,000	60,000
5	50,000	45,000	125,000	50,000	75,000

Source: Kezis, A.S., M.W. Anderson, and N.C. Buitenhuys, "A Theoretical Assembly, Processing, and Distribution System for the Maine Dairy Industry."

and Heimermann). That plant processes 30 lambs per hour which equals 60,000 lambs per year assuming the plant operates 8 hours a day 250 days a year. Even this plant which is small by modern standards would require at least four times Maine's present lamb crop. Thus, it would make sense if this plant was a Northeast regional facility. While the physical components of the Kansas study were not changed, prices were adjusted to current Maine price levels where possible. A new building cost of $45 per square foot was obtained from a 1983 study (Kezis, Anderson, and Buitenhuys). Since the lamb slaughtering plant was 8,720 square feet the estimated building cost equaled $392,400 ($45 times 8,720). This estimate included the cost of heating, plumbing, ventilation and electrical equipment. A summary of fixed and variable costs is listed in Appendix C Table 2.

APPENDIX C TABLE 2

Analysis of Costs to Operate a 600,000 Head Per Year Lamb Processing Plant

	Annual Cost		Per Head Cost[1]	
Fixed Costs				
Land (5 acres @ $9,000/Acre)[2]				
Building (8,720 sq. ft.)	$13,080		$ .22	
Equipment	11,928		.20	
Subtotal		$ 25,008		$ .42
Interest on Investment Capital @ 10%		67,210		1.12
Property Tax		12,420		.21
Managerial Staff				
Manager	28,080		.47	
2 Foreman	42,717		.71	
Buyer	21,993		.37	
Salesman	21,993		.37	
2 Secretaries	22,323		.37	
Subtotal		137,106		2.29
Total Fixed Costs		**$241,744**		**$ 4.04**
Variable Costs				
Labor				
11 Kill Floor Employees	$159,874		$2.66	
10 Cutters	149,310		2.49	
5 Wrappers	63,845		1.06	
3 Product Movers	38,307		.64	
3 Sanitation Employees	31,230		.52	
Subtotal		442,566		$ 7.37
Utilities	24,672		.41	
Legal Fees	3,600		.06	
Insurance	8,062		.13	
Telephone	3,600		.06	
Travel Expense	7,800		.13	
Office Equipment	3,572		.06	
Miscellaneous Equipment	5,141		.09	
2 Cars and a Truck	9,180		.15	
Packaging	50,502		.84	
Product Boxes	54,000		.90	
Subtotal		170,129		2.84
Interest on Working Capital ($375,000 @ 10%)		37,500		.63
Total Variable Costs		**$650,195**		**$10.84**
Total Fixed and Variable Costs		**$891,939**		**$14.88**

[1]Rounded

[2]The annual and per head costs of land were accounted for as annual interest costs of investment capital.

Investment in equipment was based on the equipment list utilized in the Kansas study. They estimated that slaughterhouse equipment, required for a 30 sheep per hour slaughter rate, cost $146,190 in 1978. This estimate was inflated, for price changes between 1978 and 1984, using the Wholesale Price Index for Capital Equipment. The resulting capital investment estimate is $45,000 for land, $392,400 for building, and $234,697 for equipment.

Other Costs

Property tax was based on the Bangor rate of $24 per thousand with 77 percent of full valuation used. Wage rates were based on rates published in 1980 Maine Occupational Wages in Manufacturing Industries.[1] Each average hourly wage rate was inflated by 25.95 percent on the advice of the Bureau of Employment Security. We assumed a cutter would receive a salary equivalent to a dairy processing equipment operator and gave floormen, wrappers, movers, and sanitation employees proportional wages. Added to all wages was a fringe benefit cost of 19.5 percent. The plant was assumed to operate 2,000 hours annually.

It is difficult to estimate transportation costs without knowing volume shipped, distances, and number of stops. Until a constant source of supply and regular buyers are established, transportation costs are likely to be high. It was assumed in this study that the cost of transporting each lamb from farmer to the slaughterhouse equaled $5.00 and the finished product transportation price equaled $1.00 per lamb.

It was assumed in this analysis that a federal grader would be used at the lamb processing plant. Having the lambs federally graded would encourage Maine and New England wholesale and retail use of the lambs as retailers demand graded cuts. Not having federal grading at present is an impediment to Maine livestock reaching retail outlets. The current rate for a federal grader is $25.60 during regular business hours. The slaughter rate of the lamb processing plant is 30 head per hour which equals a grading cost per lamb of $.85.

Returns

The value of retail cuts of lamb in the U.S. is influenced by many factors. To develop data for this study, the yield and retail price of various lamb cuts was obtained from a representative of a Bangor grocery chain in March of 1984. The respondent indicated that the yield estimates (e.g., how many pounds of loin from a carcass) were consistent and based on a number of tests. The total retail value of the retail cuts from a 50 pound fresh-pack lamb was estimated to equal $97.66 (Appendix C Table 3). It was assumed that the retailer takes a 22.84 percent mark-up making the wholesale value of the retail cuts equal to $79.50. The prices

[1]The 1981 Census of Maine Manufacturers listed an average wage of $11,625 for workers in SIC 2011.

of other products such as the offal and pelt were estimated from the Kansas data and prices furnished by a local slaughterhouse. The non retail products were estimated to equal $5.00 per lamb making the total wholesale value of the processed lamb equal to $84.50 ($79.50 plus $5.00).

Analysis

Appendix C Table 2 presents a summary of the model slaughterhouse's cost information. The per lamb slaughter cost equals $14.88. The amount the firm can afford to pay for a lamb at the farm was derived as the price the slaughter-house will receive for their finished product ($84.50) minus:

1. slaughter costs ($14.88)
2. transportation costs: farm to slaughterhouse ($5.00), slaughterhouse to wholesale or retail $1.00)
3. grading costs ($.85)

Thus the amount the slaughterhouse can pay for each lamb was estimated at $62.77. Currently some lamb producers, marketing their lambs through pools for the freezer trade, are receiving over $80.00 per lamb net of slaughter costs. In comparison to this outlet it appears a slaughterhouse operating in central Maine would not offer a superior marketing alternative for Maine lamb producers. However, it should be noted that considerable expansion of direct market sales may not be possible without price reductions.

APPENDIX C TABLE 3

Pounds of Saleable Products Per Slaughter Lamb

Saleable Pounds/Lamb	Product	Price/Pound	Total Value
Retail Cuts			
13.66	Leg (2)	2.48	33.88
4.16	Loin Chops	4.99	20.76
3.75	Rib Chops	3.29	12.34
3.25	Arm Chops	2.09	6.79
3.73	Blade Chops	1.99	7.42
1.55	Boneless Stew (Breast)	1.79	2.77
2.64	Bone in Neck	1.39	3.67
2.13	Shank	1.97	4.24
2.36	Spare Ribs (Riblets)	1.49	3.52
1.43	Lean Trim (Patties)	1.59	2.27
38.66	Total Retail Cuts		97.66