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ESTIMATING COMPARATIVE COSTS OF PRODUCING MILK AMONG THE SOUTHERN STATES

Blair J. Smith

INTRODUCTION

The farm price of much of the milk produced in the South has been under government regulation for a long time. Two principal economic criteria have been used as bases for setting minimum producer prices: (1) costs of production in the regulated area, and (2) the costs of obtaining milk from sources outside the area. Which of these criteria was paramount at any particular time and location was related to the effectiveness with which barriers to the inflow of milk could be maintained, and the political power of milk producer groups relative to other interests.

The degree to which states are allowed to exercise control over interstate movements of milk has been diminished in recent years by the federal courts. At the same time, milk producers have improved their bargaining position, collectively, through the emergence and growth of the several large regional cooperatives now in existence. These developments magnify the concern that has always existed under the Federal Milk Marketing Order program, that of individual market and individual producer equity in the pricing and distribution of returns for the production of milk.

The Problem and Prior Research

Producer equity may be judged on the basis of how any particular producer fares relative to his level of return in some prior time, and how his level of return compares to that of other producers at a given point in time. Inasmuch as returns are a function of both milk prices and costs of production, it is important to know how costs of production vary both spatially and temporally in all markets of

interest. The difficulty has been that there are no uniformly derived estimates of the cost of producing milk, in all markets of interest, for the same point in time, that can serve as the basis for assessing the equity effects of changing producer prices.

Wells [14] reported estimates and comparisons of the costs of producing milk for Wisconsin, New York, Virginia, North Carolina, and Florida. The data he used were from accounting firms, and the problems of representativeness and differences in accounting procedures were recognized. Cummins and Buxton [2] reported estimates of costs for nine regions in the United States using 1969 Agriculture Census data. Their computational procedures were similar to the ones used in this study, but alternative methods were employed in the present study to resolve differences in reported data for the three census years so that all the estimates could be made on a common basis.

This paper reports estimates of the cost of producing milk in 13 southern states¹ which can be used to compute changes in net returns to southern dairymen for any assumed change in the price of milk. These estimates are based on observations at three different times over a 10-year period, and should provide a more reliable basis for comparing costs than estimates based on observations at a single point in time.

The Data

The primary sources of data on which this report is based are the 1959, 1964, and 1969 Censuses of Agriculture [7]. Important supplemental data sources are Farm Real Estate Historical Series Data:

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¹This particular delineation of the South includes those states which ordinarily participate in Southern Regional Dairy Marketing research projects.

1850-1970 [1]; Agricultural Prices [9] and Farm Labor [11].

The census data used are for commercial dairy farms, economic Classes I-V.² Key information describing these farms is given in Table 1.

COMPUTATIONAL PROCEDURES

General

The items included in the computation of costs of production were:

1. Feed;
2. Purchases of livestock and poultry;
3. Seed, bulbs, plants, and trees;
4. Gasoline, fuel, and oil;
5. Machine hire, custom work, and contract labor;
6. Hired labor
7. Fertilizing and liming materials;
8. Repairs and maintenance of buildings, machinery, and equipment;
9. Real estate taxes;
10. All other cash expenses (25 percent of items 1-9, above);
11. Depreciation on buildings, machinery, and equipment;
12. (-) Farm-related income;
13. (-) Income earned by operator off the farm;
14. (-) Appreciation in value of real estate, and
15. Interest on total capital investment.

Items 1 through 7 are reported in approximately comparable form in each census. Farm-related income (item 12) is reported only in the 1969 census, but is estimated for the other censuses by assuming it was the same percentage of the value of all products sold in 1959 and 1964 as it was in 1969. The remaining items were computed in the manner shown below.

Income earned by the operator off the farm is treated as a negative cost, because if the farmer had spent full time on the farm, the costs of hired labor (presumably) could have been reduced by an amount equal to farmer off-farm earnings. Appreciation in

land values also is shown as a negative cost, as it is a form of return to the farm business that has as much substance and reality as opportunity costs on equity capital (included in item 15), and should be explicit in computations of costs for the same reasons.

Since census data lack the detail necessary for separately determining costs and returns to other enterprises that may exist on commercial dairy farms, a modified "whole farm" approach for estimating costs of producing milk was used.³ The principal assumption is that the costs of producing the milk that is sold bear the same relationship to all farm costs as receipts from the sale of milk bear to all farm receipts. For example, if the value of the milk sales were 80 percent of the value of all farm sales, then the costs chargeable to the production of that milk are 80 percent of all the costs incurred by the entire farm business. Thus, all profits and losses are shared proportionately between the milk and non-milk producing activities.

Table 1 shows the value of milk sales as a percent of total farm sales for the 13 southern states. These are the percentages that were applied to the 15 items listed above to arrive at the share of costs that were charged to the production of milk reported (or computed⁴) to be sold each year.

Estimating Values, Depreciation, and Costs of Repairs of Capital Items

Land and Buildings. Only the combined values of land and buildings are reported in the Census. In order to estimate building depreciation and costs of repairs, the value of buildings was estimated separately from the value of land. This was done by applying the average of the value of buildings as a percent of the value of land and buildings⁵ for the 13 southern states to the total value of land and buildings in each state.

Depreciation on buildings was computed as the present value of buildings divided by 20. This computation is based on the assumption that the aggregate of all buildings has an initial life of 40 years

²These farms were defined in the same way in all three censuses. In order to be classified as a dairy farm, it was necessary that the value sales of dairy products be at least 50 percent of the total value of all farm products sold. Or, if less than 50 percent, then the value of sales of dairy products must account for more than 30 percent of the total value of all farm products sold; at least 50 percent of all cows must be milk cows, and the value of dairy products sold plus the value of cattle and calves sold must equal at least 50 percent of the total value of all farm products sold. Commercial dairy farms are all dairy farms in economic classes I through VI. Included in classes I through V are all farms with \$2,500 or more in total value of farm products sold.

³This appears to be the same method used by Cummins and Buxton [2].

⁴In the 1959 Census whole milk and the milk equivalent of butterfat sold were reported as a single figure. In 1964 they were reported separately. Pounds of butterfat were therefore converted to milk equivalent by multiplying by 25, and the result added to whole milk sold to get a figure for 1964 comparable to the one for 1959. No estimates of quantities of milk and cream or butterfat sold were provided in the 1969 Census. To get an estimate of these quantities, the value of sales of dairy products reported in the census was divided by the prices estimated for 1969 as listed in Table 2 of the text.

⁵Value of buildings as a percent of the value of land and buildings taken from [1].

Table 1. NUMBERS, SIZES, IMPORTANCE OF MILK SALES, AND TOTAL NET RETURNS TO THE FARM FAMILY ON CLASSES I-V DAIRY FARMS FOR THE SOUTHERN STATES, THE SOUTHERN REGION, AND THE UNITED STATES, 1959, 1964, AND 1969

State and Year	Number of farms	Size of farm			Specialization in milk sales ^a	Total net returns to the farm family ^b
		Acres per farm	Milk cows per farm	Milk sold per farm pounds		
Alabama						
1959	1,480	414	52.2	289,640	77.5	- 434
1964	1,321	435	67.0	433,170	84.2	5,025
1969	1,348	378	61.6	483,564	79.7	6,093
Average	1,383	409	60.0	398,344	-	3,426
Arkansas						
1959	2,929	235	26.5	139,279	78.2	- 794
1964	2,525	242	28.6	184,972	83.4	1,202
1969	1,872	233	35.3	260,749	82.4	730
Average	2,442	237	29.5	186,067	-	298
Florida						
1959	763	630	224.0	1,410,194	89.8	12,692
1964	574	684	289.0	2,151,703	91.5	9,467
1969	547	699	322.0	2,395,186	88.2	18,203
Average	628	666	272.0	1,922,093	-	13,455
Georgia						
1959	2,229	396	50.0	296,775	80.1	- 653
1964	1,594	454	63.6	473,210	83.4	1,041
1969	1,551	422	71.2	607,725	81.8	7,718
Average	1,791	421	60.2	438,852	-	2,238
Kentucky						
1959	6,884	169	20.9	130,735	59.2	327
1964	8,985	172	21.9	152,568	61.2	595
1969	8,080	176	25.9	195,923	65.2	1,234
Average	7,983	172	23.0	160,919	-	740
Louisiana						
1959	2,594	198	42.4	196,841	85.3	- 551
1964	2,394	227	56.3	314,109	90.9	2,419
1969	1,840	235	64.7	474,228	88.7	3,367
Average	2,276	218	53.3	387,488	-	1,937
Mississippi						
1959	4,324	249	35.6	162,263	78.1	-1,412
1964	3,538	253	41.3	220,750	82.4	1,214
1969	2,811	265	44.2	306,620	81.1	2,116
Average	3,558	255	39.8	219,671	-	395
North Carolina						
1959	4,037	221	29.7	199,681	79.0	-1,518
1964	3,280	243	36.7	300,155	80.3	570
1969	2,536	255	44.7	436,529	81.5	3,841
Average	3,284	237	35.9	294,089	-	559

Table 1. continued

State and Year	Number of farms	Size of farm			Specialization in milk sales ^a	Total net returns to the farm family ^b
		Acres per farm	Milk cows per farm	Milk sold per farm pounds		
Oklahoma						
1959	4,190	353	30.3	188,534	69.8	- 245
1964	3,214	399	36.8	277,853	76.2	1,389
1969	2,444	418	44.3	368,631	76.3	3,760
Average	3,283	384	35.9	262,379	-	1,286
South Carolina						
1959	1,353	377	42.6	259,523	77.5	-1,998
1964	929	434	54.6	400,884	77.4	- 441
1969	689	445	68.2	622,773	81.5	5,107
Average	990	411	52.3	387,966	-	155
Tennessee						
1959	7,631	201	24.5	130,995	66.8	- 131
1964	8,672	189	24.7	162,626	71.1	634
1969	6,806	196	30.1	233,451	75.3	1,541
Average	7,703	195	26.2	173,040	-	640
Texas						
1959	6,373	355	50.9	328,354	82.8	- 821
1964	4,821	385	65.0	494,657	87.6	346
1969	4,126	390	70.7	601,349	85.0	4,871
Average	5,107	374	60.7	454,211	-	1,045
Virginia						
1959	4,956	311	35.2	257,168	77.3	-1,414
1964	4,578	297	34.4	296,133	79.4	178
1969	3,658	306	41.2	387,218	79.7	3,291
Average	4,397	305	36.3	306,751	-	460
South						
1959	49,743	274	36.9	221,142	77.4	- 461
1964	46,425	272	40.5	287,197	80.4	986
1969	38,308	277	47.1	382,004	80.1	3,042
Average	44,825	274	41.0	289,771	-	1,188
U. S. (43 states) ^c						
1959	395,551	213	26.9	204,350	72.6	-1,042
1964	347,464	232	31.4	271,053	76.3	- 569
1969	259,754	248	36.3	337,284	76.9	1,619
Average	334,256	229	30.9	261,898	-	- 183

^aThe value of sales of all dairy products as a percent of the value of all farm sales.

^bHundredweights of milk sold per farm multiplied by net returns per hundredweight (Table 2).

^cAlaska, Arizona, Hawaii, Montana, Nevada, New Mexico, and Wyoming not included.

and that they were of average age at the time of each Census.

Costs of annual repairs and maintenance of buildings arbitrarily were assumed to be one-half the annual depreciation.

Machinery and Equipment. Numbers of selected kinds of machinery (mostly the major items) were reported in all three censuses. A weight of 1, 2, or 3 was assigned to each major item reported which reflected its relative cost as reported in [5] and [9].

The products of the weights and numbers of each item were summed, and the sum multiplied by the average cost per unit to get the approximate new value of major machinery on the dairy farms. This value was then doubled to include minor machinery and in-place equipment which were not reported. All machinery and equipment were assumed to be of average age at the time of each census, so its inventory value was set at half its total replacement cost.

The average life of the aggregate of all machinery and equipment was estimated to be 12 years [5]. As a result, annual depreciation was one-sixth of the inventory value of machinery and equipment estimated for each year.

Costs of repairs and maintenance over the life of all machinery and equipment were estimated to average 50 percent of the original cost of the item [5]. Allowances for repairs and maintenance were therefore 50 percent of annual depreciation.

Cattle. Inventory values were estimated for milk cows at 1.5 times the price received by farmers for milk cows⁶ because it is felt that such prices are based as much on cows being culled for beef purposes as on cows being sold for milk production. All other cattle on dairy farms were valued at the price received by farmers for milk cows. The supposition here is that most of these other cattle were young dairy livestock and their value would be reflected better in milk cow prices than in prices for beef animals.

Depreciation in the value of cattle is not included as a cost in this study. The rationale for excluding it is that dairy farmers generally provide their own herd replacements, and in doing so, the increase in value of young stock each year approximately equals the decrease that takes place in value of mature cows.

Estimating Other Cash Costs

Taxes on farm real estate were estimated by multiplying the tax per \$100 value reported by years and states in [1] by the total value of land and buildings reported in the census (divided by 100). A distinction between tax rates for dairy farms and rates for other farms was not possible.

A number of other cash expenses generally are incurred by dairy farms but were not included in the seven categories that the census reports. Examples of

such expenses are: veterinary and medicine; breeding fees; insurance; supplies; rent; milk hauling; office expenses; utilities, and farm organization dues. As a basis for estimating these other costs, an analysis was made of cost-of-production studies for three states in the South [3, 4, and 6]. It was found that cash costs other than those enumerated in the census or deduced from census data were about 25 percent of all such costs. This rate was therefore used as the estimate of those costs in this study.

Estimating the Value of Operator Off-Farm Labor

The number of days the farm operator worked off the farm was estimated from census data. Each day was assumed to consist of eight hours. The estimated income earned off the farm by the operator was the product of total hours worked off the farm and the annual average hourly farm wage rate without board or room reported in [11].

Estimating Opportunity Costs and Returns for Capital

Opportunity costs of capital were figured at 4.9 percent for 1959, at 5.3 percent for 1964, and at 5.7 percent for 1969. These are the average interest rates charged for farm mortgages by all lenders [8].

Most cost-of-production studies include land at its market value and consider it only as a cost item. It is well known, however, that land is regularly increasing in value, and this is a form of return to the farm business which, to an extent, offsets the costs of holding land. To estimate the amount of land appreciation, a simple average was computed of the annual percentage change in the per acre value of farm land and buildings as reported by USDA [1, 12] for each state for each census year. The annual change was the average of the four year-to-year percentage changes in the five-year intervals centered on the year of each census, and was applied to the total value of land and buildings to arrive at the dollar value of land appreciation.

RESULTS

Estimates of the prices farmers received for milk⁷, costs of producing milk, and the resultant net returns per hundredweight of milk sold for the 13 southern states are shown in Table 2. Both costs of production and net returns varied widely from state

⁶Prices received by farmers for milk cows of all ages reported by states by years in [9].

⁷Prices received for milk are not reported in any of the three censuses. For 1959, price was estimated by dividing the census values of dairy products sold by pounds of milk and cream sold. For 1964, price received was estimated in the same way except that pounds of butterfat sold had to be first converted to whole milk equivalent and then added to pounds of whole milk sold (see footnote 4). Only the values of dairy products sold were reported in the 1969 Census. Prices for 1969 were estimated by multiplying the average returns per 100 pounds of milk received for combined marketings of milk and cream in 1969 as reported in [13, Table 26] by the proportion that the 1964 price (above) was of the average returns per 100 pounds of milk received for combined marketings of milk and cream in 1964 as reported in [10, Table 7].

Table 2. ESTIMATED COSTS OF PRODUCING MILK, PRICES RECEIVED, AND NET RETURNS PER HUNDREDWEIGHT OF MILK SOLD, SOUTHERN STATES, 1959, 1964, AND 1969

State and year	Price received	Cost of production	Net returns ^a	State and year	Price received	Cost of production	Net returns ^a
		dollars per hundredweight				dollars per hundredweight	
Alabama				Oklahoma			
1959	5.19	5.34	-.15	1959	4.28	4.41	-.13
1964	5.83	4.67	1.16	1964	4.70	4.20	.50
1969	6.74	5.48	1.26	1969	6.23	5.21	1.02
<u>Average^b</u>	6.02	5.16	.86	<u>Average^b</u>	5.11	4.62	.49
Arkansas				South Carolina			
1959	4.26	4.83	-.57	1959	5.68	6.45	-.77
1964	4.68	4.03	.65	1964	5.89	6.00	-.11
1969	6.25	5.97	.28	1969	6.94	6.12	.82
<u>Average^b</u>	5.12	4.96	.16	<u>Average^b</u>	6.22	6.18	.04
Florida				Tennessee			
1959	6.48	5.58	.90	1959	4.23	4.33	-.10
1964	6.83	6.39	.44	1964	4.35	3.96	.39
1969	8.21	7.45	.76	1969	5.64	4.98	.66
<u>Average^b</u>	7.23	6.53	.70	<u>Average^b</u>	4.83	4.46	.37
Georgia				Texas			
1959	5.53	5.75	-.22	1959	4.92	5.17	-.25
1964	6.04	5.82	.22	1964	5.15	5.08	.07
1969	6.78	5.51	1.27	1969	6.81	6.00	.81
<u>Average^b</u>	6.19	5.68	.51	<u>Average^b</u>	5.67	5.44	.23
Kentucky				Virginia			
1959	3.88	3.63	.25	1959	4.97	5.52	-.55
1964	3.91	3.52	.39	1964	5.02	4.96	.06
1969	5.28	4.65	.63	1969	6.31	5.46	.85
<u>Average^b</u>	4.47	4.01	.46	<u>Average^b</u>	5.46	5.31	.15
Louisiana				South			
1959	5.19	5.47	-.28	1959	4.96	5.17	-.21
1964	5.90	5.13	.77	1964	5.21	4.86	.35
1969	7.02	6.31	.71	1969	6.53	5.71	.82
<u>Average^b</u>	6.19	5.69	.50	<u>Average^b</u>	5.71	5.30	.41
Mississippi				U. S. (43 states)			
1959	4.59	5.46	-.87	1959	4.05	4.56	-.51
1964	5.07	4.52	.55	1964	4.25	4.46	-.21
1969	6.30	5.61	.69	1969	5.67	5.19	.48
<u>Average^b</u>	5.38	5.20	.18	<u>Average^b</u>	4.66	4.73	-.07
North Carolina							
1959	5.37	6.13	-.76				
1964	5.64	5.45	.19				
1969	6.86	5.98	.88				
<u>Average^b</u>	6.03	5.84	.19				

^aEstimated price received minus estimated cost of production.

^bPrices (costs) each year weighted by total quantity of milk sold in each state (region) each year.

to state and from year to year. Generally, costs of production were highest in 1969 and lowest in 1964 for the three years analyzed. Net returns, however, were also highest in 1969, indicating that prices moved upward faster than costs over the 1959-1969 period.

For the most part, states with high

three-year-average costs of production (Florida and South Carolina, in particular) were also high in each of the three census years, while those with low average costs of production (Kentucky, Oklahoma, and Tennessee, in particular) were low each year.

North Carolina and Virginia showed consistent and marked improvement in relative ranking among

the states with respect to cost of producing milk, while Louisiana and Texas steadily became more disadvantaged relative to the other states. The remaining eight states either maintained about the same relative position throughout the three census years or showed changes in standing that appeared to have no consistent pattern. The differences in costs between lowest and highest states in each succeeding year, from \$2.82 in 1959, to \$2.87 in 1964, to \$2.80 in 1969, showed relatively little change.

Table 2 data show marked improvement in net returns in each succeeding census. For the South as a whole, net returns increased by 56 cents from 1959 to 1964 and by 47 cents from 1964 to 1969. Only two states showed positive net returns in 1959, while in 1969 all 13 states had positive net returns.

No consistent relationship is evident between costs of production and net returns. Of the two states with the highest average cost for the three years, Florida had the second highest net return, while South Carolina had the lowest net return per hundredweight of milk sold. Of the two states with the lowest average cost for the three years, Kentucky ranked sixth and Tennessee seventh in net returns.

The relationship between prices received and costs of production, on the other hand, was positive and pronounced. That is, high costs were associated with high prices, and low costs with low prices. This finding concurs with that of Cummins and Buxton [2].

DISCUSSION

The net returns per hundredweight of milk sold represent returns to the farm family for the time they spent working on the dairy farm. Returns per hundredweight (Table 2), multiplied by the volume of milk sold per farm (Table 1), yielded the estimates of farm family earnings reported in the last column of Table 1. For the South as a whole, these earnings were \$-461, \$986, and \$3,042, in 1959, 1964, and 1969, respectively. Highest farm family returns among all states in all years were in Florida in 1969 at \$18,203 per farm, and the lowest were in South Carolina in 1959 at \$-1,998 per farm. These two states also ranked highest and lowest, respectively, with respect to average farm family returns for the three years studied. Although by 1969 net returns to the farm family had reached \$1,619 in the United States, the average for the three years was only \$-183. In view of how low net returns were in so many cases, how is it that dairymen survive at all?

The answer is twofold. First, many dairymen haven't survived. In the South there was a loss of over 11,000 dairymen between 1959 and 1969 (Table 1). In spite of this reduction in numbers of Classes I-V

dairy farms, however, there was an increase of over 3.6 billion pounds of milk sold from southern dairy farms during the same period. This increase was due to increases both in number of dairy cows per farm and in yield per dairy cow. It is generally known that costs of production on a hundredweight basis are lower in larger herds with higher levels of production. Thus, southern dairymen did adjust to the situation of low net returns over the 1959 to 1969 period.

The second explanation as to how dairymen survive in the face of seemingly low or negative returns lies in the fact that such returns may not present a true picture. There are shortcomings in all survey data with respect both to completeness in detail and accuracy of estimates. Most of the items added to those reported in the census are expense items, as only land appreciation, farm-related income, and value of operator off-farm income are in the nature of returns to the farm business and family. Few additional omitted items of expense can be listed. One of some probable consequence is interest costs of non-capital short-term operating loans.

On the other hand, there are several likely additional returns to the farm business, including: (1) consumption in the farm home of milk, eggs, chicken, beef, garden vegetables, fruits, etc.; (2) construction or renovation, repair, and maintenance of the farm home and grounds, and/or the rental value of the farm dwelling, and (3) an incomplete separation of the costs of utilities and the operation and maintenance of an automobile which probably tends to charge too much of the costs to business and too little to personal uses.

Information on the total values of omitted items is so limited that estimates of the magnitude of these items were not attempted. It seems highly likely, however, that the value of omitted receipts is much greater than the value of omitted expenses, and so the estimates of the costs of producing milk presented in Table 2 are too high. If such is the case, then net returns have been understated.

In view of the foregoing, more is claimed in this study for the validity of a comparison of the relative costs of producing milk among southern states than of the absolute level of costs. The effect on net returns for alternative producer pricing schemes can be estimated from the data given, however, even if the actual level of returns may remain somewhat in doubt. Three principal alternative bases for pricing milk might be considered: (1) the same price is paid to all dairymen everywhere, (2) dairymen are paid a price equal to their cost of producing milk, and (3) the price paid is some base price plus costs of transportation from a fixed location. A fourth means for pricing milk is at least possible — that of a market

relatively free of collective private or public action where the law of comparative advantage is fully operative. A knowledge of how costs differ among states clearly would be of value in evaluating any of these alternatives.

Under any pricing method the individual dairyman should keep his eye to his "main chance" in a competitive economy — that of assuring profits

through control of costs. In addition to plans to publish estimates of costs and returns for the rest of the United States, further work will be conducted to investigate the relationships between certain factors (number of cows, regional location, and purchased versus home-grown feeds, for example) and the differences in the costs of producing milk that are found to exist among the states.

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