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COSTS OF MILK PRODUCTION IN SEVEN MAJOR MILK PROTEIN EXPORTING COUNTRIES AND THE UNITED STATES

by

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September 1981

ERS Staff Report No. AGES810922

North America and Oceania Branch
International Economics Division
Economic Research Service
U.S. Department of Agriculture
Washington, D.C. 20250

COSTS OF MILK PRODUCTION IN SEVEN MAJOR MILK PROTEIN EXPORTING COUNTRIES AND THE UNITED STATES. By Lynn A. Austin, International Economics Division, Economic Research Service, U.S. Department of Agriculture, Washington, D.C. 20250, September 1981. ERS Staff Report AGES810922.

ABSTRACT

This study informs public policymakers of the relative costs of producing milk in countries which export casein to the United States. A budgeting technique was applied to secondary data. Only New Zealand, Australia, and Ireland had discernibly lower costs than the United States. Cost levels in Argentina, France, West Germany, and the Netherlands were similar to those in the United States.

Keywords: casein, cost of production, milk

Acknowledgements

The author acknowledges the unusual efforts of Alan Maurer, Richard Fallert, Linda Bailey, Lynn Bryan, and reviewers George Frick and Robert Olson. Other contributors were Rob Bain (Bureau of Agricultural Economics, Australia), Peter Chudleigh (Agricultural Economics Research Unit, Lincoln College, New Zealand), James Lopes, John Dunmore, and Steve Sposato.

CONTENTS

SUMMARY

The cost of producing milk in 1978 in New Zealand, Australia, and Ireland was substantially lower than in Argentina, France, West Germany, the Netherlands, or the United States. The reasons for this situation are related to the location and resource base of each country. New Zealand is endowed with yearround grass and moderate temperatures. The remoteness of its agricultural land from major markets and the hilly terrain keep land costs, and therefore feed costs, low. Moreover, New Zealanders have been specializing in milk production for many years and through much research and extension have developed efficient management systems.

Australia presents a picture similar to New Zeland except that the former's climate is less favorable and rapid economic development in nonagricultural sectors has caused greater increases in the cost of labor and materials.

Ireland shares the topography and, to a certain degree, the climate of New Zealand. However, being part of and close to Europe has both advantages and disadvantages. The advantages are lower transport costs and trade preferences. The disadvantages are high taxes on inputs and more competition for land.

Despite costs of production similar to or even above that of the United States, Argentina, France, West Germany, and the Netherlands export substantial quantities of milk protein to the United States. This strongly implies the presence of subsidies in those countries which may be prejudicial to the U.S. dairy price support program.

COSTS OF MILK PRODUCTION IN SEVEN MAJOR MILK PROTEIN EXPORTING COUNTRIES AND THE UNITED STATES

This report estimates the relative economic efficiency of milk production in seven countries. The countries selected were major exporters of dairy protein products to the United States during the past 10 years.

The first section discusses the theory upon which the empirical analysis rests. The second section explains the method of data collection and manipulation. The third section presents and discusses the results. The final section draws conclusions relating to efficiency and notes implications for U.S. dairy policy.

Background

U.S. taxpayers are concerned about the cost of subsidizing the dairy industry. Manufacturers are interested in buying milk and milk products at the lowest cost; U.S. milk producers want a stable, "fair" return on their output. These concerns are tied up in a seemingly incongruous environment of a $1.3-billion milk support program (88 million hundredweight milk equivalents in 1980), rising U.S. government stocks of dairy products (68 million hundredweight milk equivalents on September 1, 1980), and substantial imports (21 million hundredweight milk equivalents in 1980). Of particular interest is the substitution of foreign milk protein, especially casein (table 1), for U.S. non-fat dry milk (18). 1/

It is commonly believed by dairy manufacturers that U.S. milk producers are inefficient and are getting protection from efficient foreiqn producers in the form of a government price subsidy. Dairy farmers, on the other hand, claim that foreign producers only appear to be efficient; in actuality they receive large subsidies which give them an 'unfair' advantage in the marketplace. The support price of milk in the United States, in combination with miniscule quotas for most dairy products, is an attempt to neutralize the effect of foreign subsidies and encourage efficient domestic production.

If dairy products were admitted freely into the United States, then a change in the subsidies overseas could cause a drastic change in U.S. domestic retail prices. This in turn would affect the federally-supported dairy program. On the other hand, if milk is produced more efficiently overseas, then a policy to gradually replace our price supports with trade and stocks agreements might be indicated.

1/ Underscored numbers in parentheses refer to literature cited at the end of this report.

Table 1--U.S. imports of casein and casein mixtures

Country	1970	1971	1972	1973	1974	1975	1976	1977	1978	1979	1980
					Thousand tons						
New Zealand	28.6	17.2	13.5	14.3	15.2	6.7	22.8	43.7	38.2	41.8	34.8
Australia	15.6	14.4	12.4	10.8	8.3	4.5	15.1	10.3	10.6	9.9	8.1
Argentina	5.4	4.5	7.4	4.6	2.7	3.4	4.6	3.2	1.4	0.7	1.0
Ireland	1/	0.4	2.0	6.2	3.3	2.6	1.5	2.0	4.2	6.7	10.9
France	5.1	3.8	3.9	4.7	10.4	2.4	0.1	1/	1/	0.9	4.0
West Germany	0.1	1.0	1.4	1.1	2.5	1.6	0.5	0.2	0.1	0.1	0.2
Netherlands	0.1	0.7	2.1	0.8	1.2	1.0	0.5	0.3	0.7	1.2	1.1
Others	6.5	6.1	5.2	8.7	7.7	4.4	5.7	5.8	7.0	7.3	8.8
Total	61.4	48.1	47.9	51.2	51.3	26.6	50.8	65.5	62.2	68.6	68.9

1/ Less than 50 tons.
Source: U.S. Department of Commerce, Bureau of the Census.

Theory

Production efficiency is measured by output per unit of input. A production formula is used which relates all the inputs to a certain output. Each input's efficiency can be calculated by holding all the other inputs constant, and varying the one input. But production formulas for agricultural products are not often available. Moreover, total production efficiency is difficult to estimate due to the different units of inputs, such as acres of land, dollars of capital, and hours of labor.

Economic efficiency is similar but is defined as the change in total output per change in input cost. It, too, requires a production formula relating all inputs to one output. But since each input is expressed in the same terms (money), total economic efficiency can be calculated as the costs of all inputs required to produce one unit of output. The most efficient production process would have the lowest cost per unit. For this reason, total cost per unit of output is used in this report to show relative efficiency of average dairy farms between countries. The country with the lowest cost would possess an absolute advantage over the other countries. 2/

This type of analysis makes several assumptions. The most important is that of free competition in the input markets. That is, it is assumed that all inputs are priced in the free market. There are no government subsidies nor taxes. Since subsidies and taxes are not required for production, they are distortions of economic costs and must be removed.

The author is not suggesting that milk is produced in a completely competitive system. However, to understand an industry, economists must rely on certain theories. The free competitive theory is the most appropriate one for the milk industry since it more nearly conforms to competitive assumptions.

Method of Cost Estimation

There are many methods for estimating costs of milk production. The reader is referred to Smith (13) for a thorough discussion. The methods used here were chosen based on a balance between theoretical rigor and ease of application.

All costs of production were found in secondary sources or derived from them. Data were taken from sample surveys, censuses, and typical farm budgets of university, industry, and government research reports, as well as from reports of agricultural attaches.

2/ "Comparative advantage" is sometimes erroneously used in place of "absolute advantage to describe the cost differences between two producers of the same commodity. For further explanation, see (10).

There was possible respondent bias in the data due to the sensitivity of the subject. That is, the respondents may have feared that certain answers might cause increased taxes or lowered subsidies. However, the amount of such bias was not knowable, and it was assumed to be relatively constant between countries.

All data were adjusted to reflect costs in 1978 U.S. dollars. First, indexes of prices paid by farmers were used to update the costs. Then 1978 exchange rates were employed to convert the estimates to U.S. dollars. All costs were per hundred weight (cwt.) of milk produced. Conversions were at 0.0227 cwt. per liter. No adjustment was made for varying milkfat content, although milkfat content varied from approximately 3.7 to 4.8 percent.

The method of allocating costs between enterprises used for all countries is what Smith (13) called the "whole farm approach" with a "proportional treatment of sideline revenue." This assumes that costs associated with generating non-milk revenue bear the same relationship to total costs as the non-milk revenue itself bears to total revenue. Sideline enterprises are presumed to be no more nor less profitable than milk production. Smith cities this method as "the simplest and most common" way to account for joint products when farms are highly specialized. But he also notes that "the more highly specialized a dairy farm is . . ., the more accurately estimates of the cost of producing milk can be made" (13, p. 23).

The cost categories were divided into cash and imputed costs. Cash costs included feed, both purchased and grown; breeding expenses; health; utilities; repairs; hired labor; and miscellaneous. Imputed costs included family labor, depreciation, interest, management, and land.

Cash costs were taken more or less intact from the secondary data. Purchased feeds and homegrown grains fed were valued at market prices. Some silage, hay, and pasture costs were inextricably embedded in other costs of production. Family labor, when not given, was computed as family units used on the farm multiplied by the average wage rate. Depreciation was 10 percent of the value of the machinery and buildings, equal to the straight line method with a useable life of 10 years and no salvage value.

Depreciation of livestock was not considered. A cow's rate of depreciation depends partly upon the intensity of use. But culling often is a function of beef cow prices and income tax policies, so a cow's life span is not an accurate measure of productive life. By not including an estimate for herd depreciation, it was assumed that cow depreciation per unit of output is equal in all countries.

To calculate the interest charge, it was assumed that all dairy capital was borrowed. Due to lack of data to calculate the real interest rate by country, an estimated rate of 3 percent was used for non-land capital in all countries. The author was applied to the total value of non-land capital to yield an interest charge. Management costs were

assumed to be a function of the size of the responsibility involved; 10 percent of all cash costs were assessed as management costs.

Subsidies on inputs were then added to costs because subsidies represent costs of production paid by the government, not by dairy farmers. Only "first-round" subsidies were included, that is, subsidies paid on inputs used directly in milk production as opposed to subsidies on inputs used in dairy-related industries. Taxes, on the other hand, were subtracted because they are cash transfers from the dairy farmers to the government, not purchases of materials for production.

Land was treated as a special capital input. Normally capital has costs associated with depreciation, maintenance, and alternative uses. In this study, it was assumed that the maintenance costs of the land were part of cash costs and that the quality of the land remained the same; there was no depreciation. The unique aspect of land is its ability to increase in value, or appreciate. The rate of appreciation is difficult to ascertain, however. It would normally be slightly higher than guaranteed interest rates since land appreciation has some risk. But land price changes often lag behind changes in the general price level since the demand for land is derived from the demand for consumer products. The rate of change in consumer prices was generally rising during the study period, implying a positive gap between the inflation rate and the rate of land value increase. The author assumed that the opportunity cost of land was equal to the inflation rate and exceeded the appreciation rate by 1 percent. Simply stated, the cost of land was equal to one percent of the total value of the land per year.

Results

The results are shown in table 2. Each cost item by country is explained in detail in Appendix 1. The costs are further elaborated in Figure 1. As expected, the costs in New Zealand and Australia were the lowest of all the major exporting countries. The costs in the United States were slightly above those in the other countries in the study, except the Netherlands.

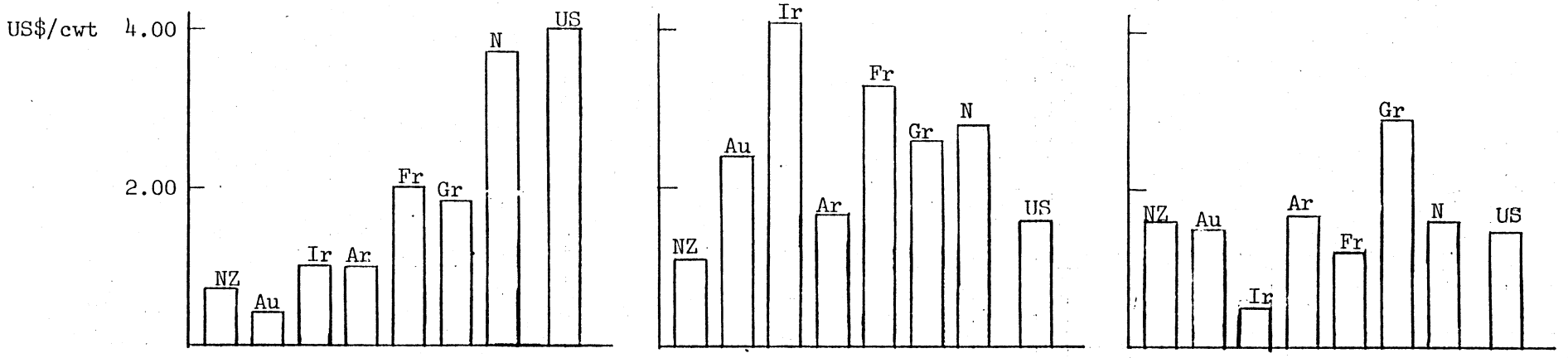
An index of the total costs of production is given below with the average cost of production in the exporting countries ($7.20 per cwt) equal to 100.

	Index of total cost of production
New Zealand	59
Australia	79
Ireland	93
Argentina	107
France	108
West Germany	118
Netherlands	136
United States	122

Table 2--Milk: costs of production in major exporting countries and the United States, 1978 1/ 2/

Costs	New Zealand	Australia	Ireland	Argentina	France	Netherlands	West Germany	United States
				U.S. dollars per hundredweight				
Cash Costs								
Feed								
Purchased	.38	0.42	0.98	0.15	2.02	3.53	1.85	3.98
Grown	.30	3/	.39	.83	.60	.52	.52	3/
Breeding	.06	.04	4/	4/	4/	4/	4/	.07
Health	.11	.06	4/	.21	4/	4/	4/	.14
Utilities	.09	.21	4/	.15	4/	4/	4/	.22
Repairs	.35	.52	.11	.39	.45	.39	.93	.24
Hired labor	.61	.25	.12	1.24	.21	.32	.13	.59
Miscellaneous	.73	.48	.19	.57	.41	.65	1.47	.25
Total	2.63	1.98	1.79	3.54	3.69	5.41	7.90	5.49
Imputed Costs								
Family labor	.45	2.11	3.95	.42	3.09	2.47	2.46	0.97
Depreciation	.35	.80	.34	1.66	0.65	0.66	0.57	0.70
Interest	.19	.40	.20	1.02	0.39	0.40	0.33	0.86
Management	.26	.20	.18	.35	0.37	0.54	0.49	0.55
Total	1.25	3.51	4.67	3.45	4.50	4.07	3.85	3.08
Subsidies	.19	.20	.00	.00	.00	.00	.00	.04
Less Taxes on Inputs	.00	(.19)	(.36)	.00	(.64)	(.33)	(.53)	.00
Total	4.07	5.50	6.10	6.99	7.55	9.15	8.22	8.61
With land Cost	.20	.18	.63	.69	.20	.63	.29	.16
Total	4.27	5.68	6.73	7.68	7.75	9.78	8.51	5/8.77

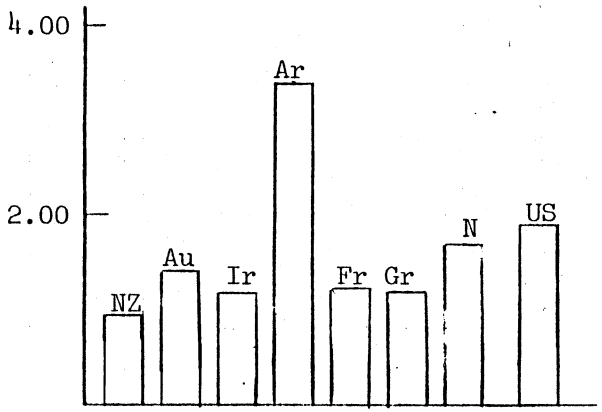
1/ Calendar year except for New Zealand (June-May) and Australia (July-June).
2/ Details and sources are given in Appendix.
3/ Included in "Purchased Feed."
4/ Not given separately.
5/ The difference between this amount and that given in the USDA Congressional Committee Print for 1978 ($9.34/cwt) is due to two factors. One is a new data base for cost of production estimates; a survey was conducted in 1980 and these data were adjusted to 1978. The second factor is the omission of depreciation on livestock, an omission made in all countries.



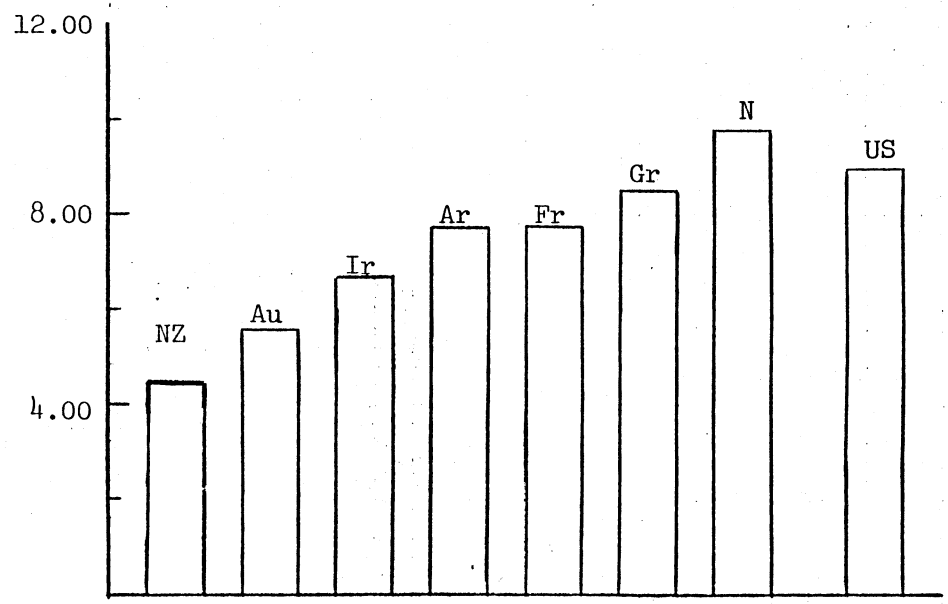
Feed: Purchased, Grown (less Taxes for EC)

Labor: Hired, Family

Other Variable: Breeding, Health, Utilities, Repairs, Misc, Management



Fixed: Depreciation, Land, Interest Subsidies (less Taxes for Australia)



T O T A L

Figure 1. Details of Average Costs of Milk Production in Seven Major Exporting Countries and the United States 1978

The range in costs was from $4.27 to $9.78 in the major exporting countries; the U.S. cost of production was $8.77 per cwt. The coefficient of variation (the standard deviation divided by the average) was 25 percent for the seven countries, indicating that costs were extremely different. The United States had a cost of production only 1 deviation above the mean.

Explanation of the cost differentials are given in terms of the subgroups. Costs were divided into feed, labor, other variable costs, and fixed costs (figure 1). 3/

The most outstanding feature of the cost details is the relatively high average cost of feed in the Netherlands and the United States. Average feed costs per cwt. of milk in the seven exporting countries was $1.52; in the United States, it was $3.98, about one-half of total costs. This very likely reflects two key elements Dutch and U.S. dairy farmers feed more per cwt of milk produced than any other country. Consequently, the average product of feed is lower 4/. The price of feed is higher in the Netherlands and the United States than in Australia or Argentina, causing an even greater disparity between the average feed costs of these countries.

On the other hand, feed costs were very low in Australia, New Zealand, and Ireland, and Argentina. This was due partially to the low opportunity costs for land. The low opportunity cost resulted from a combination of location, population density, and poor agricultural environment. Land in New Zealand, Australia, and Argentina is remote from main markets, and alternative enterprises such as grain, yield much lower net revenues. Although Ireland is not remote, low population density and a poor agricultural environment reduce alternatives.

3/ The reader is cautioned that the cost per unit of output for a given input is not a measure of productivity. Input productivities are discernable only from production functions, which were not available for this study. For example, the average cost of labor per cwt in Ireland being greater than the average cost of labor per cwt in the United States is not sufficient to infer that the average product of labor is different. That would only be true if wages were equal in both countries. Average cost per input is

$$AC_j = P_jX/Q = P_j/Q/X = P_j/AP_j$$

where AC_j = Average cost of input j per cwt.

P_j = Price per unit of input j

X = Level of input
Q = Level of output

AP_j = Average product of input i

4/ The high feeding level does result in a high rate of output per cow--112 cwt. on the average (table 3).

A second outstanding feature is the cost of labor per cwt. of milk in Ireland ($4.07). Over one-half of the total milk cost was in family labor. Although there were only 12 cows per farm, on the average, 46 percent of gross farm output was for milk production. Assuming at least one full time family worker was involved, four labor hours per day were used to tend the herd, in which cows yielded an average of only 66 cwt. of milk per year. Labor costs per cwt. in other countries were between $1.06 and $3.30 per cwt. It was noteworthy that the labor cost in the United States was the second lowest behind New Zealand.

Other variable costs, which accounted for about one-fifth of total costs, were extremely low on Irish milk farms. These costs are rough indicators of the level of technology and revealed one reason for the low yields in Ireland. The other countries and the United States had costs per cwt. similar to each other.

Fixed inputs (which included subsidies) per cwt. of production were highly variable. They were the highest in Argentina where farmers strove to minimize cash costs due to high interest rates and tended to have more fixed inputs per unit of output. The other exporters and the United States had similar fixed costs.

Projections

Whether these countries will continue to produce milk at current levels is debatable. New Zealand, the leading exporter, will undoubtedly attempt to capture as much of the export market as possible. Productivity per cow has been growing at a rate of 1 percent per year and the herd size, already the largest in the world, has been growing at a rate of 4 percent per year (table 3).

Australia has been withdrawing from dairying over the past decade and plans to continue; its total dairy herd is dropping 1 percent per year. The government is assisting farmers undergo the decline. The Netherlands is second only to Ireland in its rate of growth in milk production. Output per cow has grown at only 1 percent per year, but when calculated on a base of 112 cwt, it is significant. Ireland is also a strong contender for international dairy trade and has the fastest growing industry; its milk production and small herds are growing at a rate of 4 percent compounded annually. Enlarging and specializing will likely lead to reductions in Ireland's costs of production.

West Germany's dairy industry, like Ireland's, suffers from extremely small herd size (11 head in 1978). But it, too, is enlarging its herds and increasing productivity per cow; the total herd is not growing, however. Argentina's dairy industry is increasing slightly. Production growth has been entirely tied to herd enlargement because output per cow is extremely low and unchanging. Increased production in the future will likely be small. France has shown deliberate growth in productivity. Herds are being consolidated and output per cow is increasing. France, the largest world producer of non-fat dry milk, figures as a strong competitor in the future.

Table 3--Production data for seven major dairy exporters and the United States, 1978

	Unit	New Zealand 1/	Australia	Ireland	Argentina 2/	France 3/	Netherlands	West Germany	United States
Total production	million hundredweight	143	128	125	115	704	258	518	1,215
wholemilk	percent change 4/	1	0	4	1	2	3	1	0
Total dairy cow herd	thousand head	2,040	2,155	1,513	5,000	7,450	2,308	5,487	10,803
	percent change	0	-1	4	1	0	2	0	-2
Milk produced per cow	hundredweight	70	64	66	23	95	112	94	112
	percent change	1	2	2	0	2	1	1	2
Number of dairy farms	thousand farms	17	30	120	60	548	75	519	375
	percent change	-4	-5	2	n.a.	-5	-7	-6	-8
Average cow herd size	head	122	72	12	83	14	30	11	29
	percent change	4	4	9	-2	6	8	6	2
Farm Area per cow	hectares	0.78	1.59	1.18	1.79	1.14	0.56	0.35	1.94
Production of main milk subproducts:									
Butter	thousand tons	192	105	119	29	605	211	564	451
	percent change	1	1	4	-4	2	4	2	-1
Cheese	thousand tons	63	142	50	239	1,165	426	713	1,597
	percent change	-1	4	14	4	5	4	5	6
Non-fat dry milk	thousand tons	120	75	174	55	710	223	603	417
	percent change	8	8	18	7	1	8	12	-6
Casein	thousand tons	67	17	11	2	35	13	15	0
	percent change	3	6	35	-16	10	11	6	0
Dried whey	thousand tons	2	0	n.a.	n.a.	300	148	109	416
	percent change	n.a.	n.a.	n.a.	n.a.	15	11	11	-6

n.a. = not available
1/ 1978/79
2/ 1979
3/ 1980
4/ All percent changes are compound rates of change over a recent period of ten or more years.

Sources: Association argentina de consorcios regionales de experimentacion agricola (AACREA), Buenos Aires.
Australian Bureau of Statistics, Canberra.
Milk Marketing Board, Survey, United Kingdom.
Ministry de l'Agriculture, Paris.
New Zealand Dairy Board, Wellington.
New Zealand Department of Statistics, Wellington.
U.S. Department of Agriculture, Washington.Service, Washington, D.C.

Conclusions and Implications

The three most efficient producers are New Zealand, Australia, and Ireland with costs of $4.27, $5.68, and $6.73 per cwt., respectively. The other countries have average costs that range from $7.68 to $9.78 per cwt; the analysis is too imprecise to conclude that the United States (at $8.77 per cwt) is less efficient than these.

The advantage that New Zealand, Australia, and Ireland have over other producers is low feed cost, a consequence of a near-perfect climate, remoteness from population centers, and to some degree, few alternatives for the use of the land. Although the United States has the highest output per animal--nearly twice that of New Zealand and Australia--feed costs were five times as high as in those countries.

Limitations

In preparing this report, the author was aware of a tendency of readers with vested interests to extend the expected results beyond their logical limits. The above analysis deals with the cost of producing fluid milk on the farm in seven major dairy exporting countries and the United States. It does not cover all countries that produce milk products for export. Neither does this report address the question of processing costs and transportation. The costs of production have been put on a U.S. dollars per cwt. of milk basis for comparison only. The form is liquid milk; the place is an "average farm gate" in the country studied.

Another major concern is in subsidization. This study's concern was only for input subsidization, a rather insignificant amount in most countries. Subsidies on output are believed to be considerable in most countries. Output subsidies may have dramatic effects on the competitiveness of each of the countries studied, resulting in costs of dairy products which are not related to the costs shown in this report.

A criticism of the methods used for this analysis can be levelled against excluding a depreciation allowance for the cow herd and for using any one of several interest and land cost allocation methods. The reason for this approach was already discussed. Even so, the general conclusions of three low-cost countries, and four medium-cost countries, along with the United States would likely remain unchanged since these costs are believed to be similar and relatively small in all countries.

Finally, the costing method employed was specifically designed to make the costs comparable, while providing a rough estimate of absolute costs. In particular, the cost of production for U.S. milk is slightly less than that found in other USDA publications because of the different method of calculation.

The results were surprisingly consistent with a USDA report published in 1975 (16). A summary is shown below.

Total Cost of Production

	1975 Report		This Report	
	Index (Average=100)	Rank	Index (Average=100)	Rank
New Zealand	62	1	59	1
Australia	72	2	79	2
France	114	3	108	3
Netherlands	123	4	136	6
United States	126	5	122	5
Germany	129	6	118	4

Of the five exporters and the United States covered by both reports, four kept their ranking. West Germany's cost of production was higher than that of the United States' in the 1975 report and the Netherlands' was lower. The opposite was true in this report. The magnitude of difference between the U.S. and New Zealands cost of production was about the same in both studies.

References

1. Agricultural Economics Research Unit. An Economic Survey of New Zealand Town Milk Producers 1976-77. Research Report No. 93, July 1978, Lincoln College, Canterbury, NZ.

2. Asociacion Argentina de consorcios regionales de experimentacion agricola (AACREA). Convenio ANO 1, No. 4 Informacion Economica. Buenos Aires, January 1979.

3. Bureau of Agricultural Economics. Industry Economics Monograph No. 10. Canberra, 1975.

4. Commission of the Europe Communities. Farm Accountancy Data Network for the EEC, Results "1976". Brussels, 16 November 1978.

5. Department of Statistics. New Zealand Official Yearbook. 1979, 84th ed. Wellington, September 1979.

6. _____., Monthly Abstract of Statistics. Wellington, October 1980.

7. Directorate-General for Agriculture of the European Communities Commission. Land Tenure in the European Community. Division for Agricultural Information, European Communities. Brussels, March 1977.

8. Eurostat. Agricultural Prices. N. 3-1980, Rapid Information, 20 October 1980.

9. International Monetary Fund. International Financial Statistics. Vol. XXXII, Number 11. November 1979.

10. Kindleberger, Charles P. International Economics. Irwin: Homewood, IL, 1973.

11. Lanbouw Economisch Institut. The Netherlands, June 1975.

12. Ministry of Agriculture and Fisheries, Economics Division, Economic Review of New Zealand Agriculture 1979. Wellington, January 1980.

13. Smith, Blair J. Critique of Cost of Production Studies and Their Use in Pricing Milk. Staff Paper 39. Pennsylvania State University, Agr. Economics and Rural Sociology Deptartment. College of Agriculture. December 1980.

14. U.S. Department of Agriculture, Crop Reporting Board. Agricultural Prices - Annual summary 1979, June 1980.

15. U.S. Department of Agricultural, Economic Research Service. Costs of Producing Milk in the United States - Final 1978, Preliminary 1979, and Projections for 1980. July 1980.

16. _____, Economic Research Service. The Impact of Dairy Imports on the U.S. Dairy Industry. AER No. 278. January 1975.

17. _____., Economics, Statistics, and Cooperatives Service. Farm Real Estate Market Developments. CD85. August 1980.

18. U.S. International Trade Commission. Casein and Its Impact on the Domestic Dairy Industry. Report to the Committee on Ways and Means of the U.S. House of Representatives. December 1979.

Appendix 1: Details of cost estimation

New Zealand

All costs for New Zealand were taken from a study completed by The Agricultural Economics Research Unit of Lincoln College, Canterbury, New Zealand in July 1977 (1). A sample of 152 farms were surveyed. 1/ About 88 percent of total farm revenue was from the sale of milk (6). Production per farm was 9,846 cwt. (1).

A coefficient, k1, was calculated to transform the data as given into 1978 U.S. dollars per cwt. of milk produced. The data were recorded in 1976/77 New Zealand dollars per farm. To adjust the costs for inflation, the dairy farming costs price index (DFCPI) for various inputs were used (12).

$$k1 = \frac{1978\ US\$1.0666\ (9)}{1978\ NZ\$1.0000} \times \frac{1}{9{,}846\ cwt./farm} \times 0.88 =$$

$$0.000095$$

Purchased feed (categories "Feed," "Grazing Exps.")

$$1976\ NZ\$3{,}484 \times k1 \times \frac{2261\ (DFCPI\text{--}Feed)}{1989} = US\$\ 0.38$$

Grown feed (categories "Fertilizer and Seed," "Weed and Pest Control," "Irrigation Exps.")

$$1976\ NZ\$2{,}691 \times k1 \times \frac{2037\ (DFCPI\text{--}Seeds\ and\ Fertilizer\ 1978/79)}{1748} =$$

$$US\$\ 0.30$$

Breeding (category "Breeding and Herd Testing")

$$1976\ NZ\$586 \times k1 \times \frac{3159\ (DFCPI\text{--}Breeding\ Expenses)}{2795} =$$

$$US\$\ 0.06$$

Health (category "Animal Health")

1/ These data applied to fresh milk producers only; similar information for manufacturing milk--approximately 90 percent of total milk produced and the relevant costs for this study--were not available. Fresh milk producers must operate year-round, while others are able to take advantage of the climate, reducing output during the dry season. Therefore, the costs given here may be slightly biased upward.

1976 NZ$845 x k1 x $\frac{2372 \text{ (DFCPI--Animal Health)}}{1806}$ =

US$ 0.11

Utilities (category "Power")

1976 NZ$761 x k1 x $\frac{2323 \text{ (DFCPI--All Groups)}}{1872}$ = US$ 0.09

Repairs (category "Repairs and Maintenance")

1976 NZ$2,830 x k1 x $\frac{2625 \text{ (DFCPI--Repairs and Maintenance)}}{1997}$

= US$ 0.35

Hired Labor (categories "Contracting," "Non-Family Permanent and Casual Labour," "Labour Accommodation")

1976 NZ$4,761 x k1 x $\frac{3075 \text{ (DFCPI--Wages and Rations)}}{2281}$

= US$ 0.61

Miscellaneous (categories "Shed Expenses," "Vehicle Exps.," "Administration," "Insurance," "Rent")

1976 NZ$6,176 x k1 x $\frac{2323 \text{ (DFCPI--All Groups)}}{1872}$ = US$ 0.73

Family Labor (categories "Family Labour," "Family Casual Labour," "Unpaid Family Labour")

1976 NZ$3,503 x k1 x $\frac{3075 \text{ (DFCPI--Wages and Rations)}}{2281}$

=US$ 0.45

Depreciation (categories "Plant and Equipment," "Farm Vehicles," "Improvements," "Farm House (1/4)," "Other Farm Houses," "Farm Buildings")

1976 NZ$29,363 x k1 x $\frac{2323 \text{ (DFCPI--All Groups)}}{1872}$

x 10% =US$ 0.35

Interest (Total Farm Assets less Land)

1976 NF $54,894 x K1 x $\frac{2323}{1872}$ x 3% = US$ 0.19

Management (10% of all cash costs)
US$ $2.63 x 10% = US$ 0.26

Subsidies (5)

Subsidies included all of the Grants to Dairy Products Development Centre (1978 $2.6 million) and the Sharemilkers' Suspensory Loan Scheme ($0.4 million). But since dairy production was only 20 percent of total agricultural output in 1978, only 20 percent of the following general agricultural subsidies were charged to dairying:

	Allocated to dairying
	$NZ million
Fertilizer and lime transport subsidy	4.800
Flood and drought relief	0.680
Agricultural pests control	1.250
Subsidies to rassella tussock boards and county councils under the Noxious Weeds Act	0.349
Noxious plants control scheme	1.700
Herd Improvement Council	0.042
Veterinary Services Council	0.012
Fertilizer price subsidy	12.240
Livestock Incentive Scheme	0.520
Fertilizer and lime bounty	0.900
Lucerne establishment grant	0.040
Artificial breeding incentive	0.024
Land development loans; interest subsidy	0.036
	NZ$ 22.593
Plus full dairy subsidies (see above)	3.000
	NZ$ 25.593 million

Total milk production for 1978 was 146.3 million cwt., so the per cwt. subsidy was

$$\frac{\text{NZ \$25.593 million}}{\text{146.3 million cwt.}} \times \frac{\text{US\$1.0666}}{\text{NZ\$ 1.000}} = \text{US\$ 0.19}$$

Taxes
No input taxes were found.

Land Cost

$$\text{1976 NZ\$185,353} \times \text{kl} \times \frac{\text{1236 FLSPID 1978 1/}}{\text{1073 FLSPID 1976}} \times 1\% = \text{US\$ 0.20}$$

1/ FLSPID = Farm Land Sales Price Index for Dairy (12).

Australia

The data for most of the cost estimates were taken from a survey conducted by the Australian Bureau of Agricultural Economics (BAE), an agency of the Ministry of Primary Industries. Results of the survey have not been published. A dairy farm was defined as "all dairy farms registered with the Dairy Industry Authorities or State Departments of Agriculture at 1 July 1976." Other requirements were that the farm could not be primarily for breeding nor part of a multiple farm enterprise. A stratified random sample was taken for data covering the year 1 July 1977 to 1 July 1978. The average production per farm was 5,533 cwt.

A coefficient, k2, was calculated to transform the data into 1978 U.S. dollars per cwt. of milk produced. The data were recorded in 1977/78 Australian dollars per farm. In 1977/78, 85 percent of Victorian dairy farms total returns was from milk; this proportion was assumed to be representative.

$$k2 = \frac{1978\ US\$1.1505\ (9)}{1978\ Aus.\ \$1.00} \times \frac{1}{5533} \times 0.85 = 0.000177$$

No adjustment was made for inflation since one-half of the year overlapped the target year, 1978.

Purchased Feed and Grown Feed (categories "Agistment," "Fertilizer," "Fodder," "Seed")

A$2398 x k2 = US$ 0.42

Breeding (categories "A.I.," "Herd Testing," "Stud Fees")

A$205 x k2 = US$ 0.04

Health (categories "Pesticides and Sprays," "Vermin Control," "Veterinary Fees")

A$353 x k2 = US$ 0.06

Utilities (categories "Fuel, Oil, Grease," "Water and Irrigation Charges")

A$1,197 x k2 = US$ 0.21

Repairs (categories "Repairs and Maintenance," "Motor Vehicle Expenses")

A$2,929 x k2 = US$ 0.52

Hired Labor (categories "Hired Labor-Excl. Manager," "Stores and Rations," "Shearing and Crutching," "Payments to Contractors")

A$1,430 x k2 = US$ 0.25

Miscellaneous (categories "Livestock, Materials, and Medicine," "Woolpacks," "Packing Materials," "Protective Clothing," "Sundry Materials," "Accounting, Banking, Legal Expenses," "Telephone," "Other Administrative Expenses," "Advisory Services," "Insurance," "Plant Hire")

A$2,701 x k2 = US$ 0.48

Family Labor (categories "Imputed Family Labor Exc. Operator," "Imputed Operator or Manager's Labor")

A$11,900 x k2 = US$ 2.11

Depreciation (category "Depreciation")

A$4,509 x k2 = US$ 0.80

Interest (6)

$$A\$30{,}937 \times K2 \times \frac{276 \text{ (Index of equipment and supplies w/o Feed and Fodder)}}{114 \text{ (1968-69)}} \times 3\% = US\$\ 0.40$$

Management

US$ 1.98 x 10% = US$ 0.20

Subsidies (categories "Low Interest Loans," "Fertilizer Subsidy," "Other Input Subsidies")

A$1,153 x k2 = US$ 0.20

Taxes on Inputs (category "Taxes on Inputs")

A$1,061 x k2 = US$ 0.19

Land Cost

The average value of land on dairy farms in 1970 was A$40,985 (3). Using an index of prices paid by farmers for all items, published by the BAE, an adjustment was made for inflation.

$$A\$40{,}985 \times \frac{310 \text{ (Price Paid--1977/78)}}{126 \text{ (Price Paid--1970/71)}} \times k2 \times 1\% =$$

US$ 0.18

Ireland

Data for Ireland came from a study completed by the Commission of the European Communities (4) in November 1978. There were 83 farms in the sample selected for this report ("IRLND-380"). The average number of milk cows was 13, grazed on a farm of 14.99 hectares. The accounting year was January-December 1976, and the figures were given in European units of account per hectare. Only 46 percent of the value of gross production was from milk. Based on a work by Lanbouw Economisch Institut

(11), the average milk production per cow in 1974 was 70 cwt. So, farm output was estimated at 910 cwt. To convert the data to U.S. dollars per cwt., a constant, k3, was used.

$$k3 = \frac{14.99 \text{ ha.}}{910 \text{ cwt.}} \times \frac{\text{US\$1.118}}{\text{EUA 1.00}} \times 0.46 = 0.0084$$

But updating to 1978 required the use of price indexes unique to the item (8).

Feed Purchased (category "Misc. Livestock Costs")

$$\text{EUA } 90 \times k3 \times \frac{156.40}{120.80} \text{ (index: Compound feedingstuffs)}$$

$$= \text{US\$ } 0.98$$

Feed Grown (category "Misc. Crop Costs")

$$\text{EUA } 35 \times k3 \times \frac{158.70}{120.10} \text{ (index: Animal feedingstuffs)} =$$

US$ 0.39

Breeding, Health, Utilities
(not given separately)

Repairs (only one-half of category "Machinery Costs" because it included depreciation)

$$\text{EUA } 9.5 \times k3 \times \frac{158.30}{121.00} \text{ (index: Maint. and repair of plant)} = \text{US\$ } 0.11$$

Hired Labor (category "Wages and Soc. Secur.," "Contract Work by Others")

$$\text{EUA } 16 \times k3 \times \frac{141.20}{116.30} \text{ (index: General expenses)} = \text{US\$ } 0.12$$

Miscellaneous (category "General Costs")

$$\text{EUA } 19 \times k3 \times \frac{141.20}{116.30} \text{ (index: General expenses)} = \text{US\$ } 0.19$$

Family Labor (category "Income Family Labor")

$$\text{EUA } 4865/\text{ALU} \times 1.19 \text{ ALU}^{2/} \times 0.46 \times \frac{1}{910 \text{ cwt.}} \times \frac{\text{US\$1.118}}{\text{EUA 1.000}}$$

2/ Annual Labor Unit: the activity of a person who works at least 280 days or 2,380 hours on the farm.

$$\times \frac{141.20}{116.30} \text{ (index: General expenses)} = \text{US\$ } 3.95$$

Depreciation (category one-half of "Farm Capital" - to exclude livestock)

$$\text{EUA } 4{,}377 \times \frac{1}{910 \text{ cwt.}} \times \frac{\text{US\$1.118}}{\text{EUA } 1.000} \times \frac{172.37}{124.96} \text{ (index: Goods and services contributing to agricul. invest.)}$$

0.46 x 10% = US$ 0.34

Interest

$$\text{EUA } 8{,}753 \times 0.46 \times \frac{1}{910 \text{ cwt.}} \times \frac{\text{US } 1.118}{\text{EUA}1.000} \times \frac{172.37}{124.96}$$ (index of goods and services contributing to agricultural investment)

x 3% = US$ 0.20

Management

US$ 1.79 x 10% = US$ 0.18

Subsidies

None.

Taxes on Inputs

There is a considerable tax on feed grians in the EC. The calculations, done for all four countries are shown in Appendix 2.

Land Cost (7)

$$\text{British Pounds } 1{,}261 \text{ /ha.} \times 14.99 \text{ ha.} \times \frac{1}{910 \text{ cwt.}} \times$$

$$\frac{\text{US\$2.3232}}{\text{BP } 1.0000} \times 0.46 \times (1 + 36.7\% \text{--annual rate of price increase } 1970/73) \times 5 \text{ years} \times 1\% = \text{US\$ } 0.63$$

Argentina

Data were not found for average dairy farms, so the costs of production for Argentina were based on a study using model farm budgets (2). The model most similar to the estimated national average (Model D) was selected. Data were for December 1979. The output of milk from the 130-hectare, 75-cow farm was 2088 cwt. per year. About 75 percent of

farm income was from milk sales. The data were converted from Argentine pesos per hectare to U.S. dollars per cwt. using a constant, k4.

$$k4 = \frac{130 \text{ hectares}}{2088 \text{ cwt.}} \times \frac{\text{US\$1.00}}{\text{Argentine pesos } 1003.5} \times 0.75 =$$

0.000047

Feed Purchased (category "Reservas y Suplementacion")

P3,269 x k4 = US$ 0.15

Feed Grown (category "Produccion de Forraje")

P17,938 x k4 = US$ 0.83

Breeding
(not given separately)

Health (category "Sanidad")

P4,536 x k4 = US$ 0.21

Utilities (category "Consumo de energia")

P3,231 x k4 = US$ 0.15

Repairs (categories "Gastos de Maquinaria," "Conservacion de Majoras")

P8,398 x k4 = US$ 0.39

Hired Labor (category "Mano de obra")

P26,751 x k4 = US$ 1.24

Miscellaneous (categories "Vehiculo," "Asesoramiento Contable," "Gastos Administrativos")

P12,307 x k4 = US$ 0.57

Family Labor (assumed to be one labor unit per year at the 1978 labor rate)

P9,026 x k4 = US$ 0.42

Depreciation ("Mejoras Fundiarias," "Capital Fijo Inanimado")

P35,600 x 10% x k4 = US$ 1.66

Interest

$$P\ 71{,}192{,}900 \times \frac{1}{2088\ \text{cwt.}} \times \frac{US\$\ 1.00}{P\ 1003.5} \times 3\% = US\$\ 1.02$$

Management

US$ 3.54 x 10% = US$ 0.35

Subsidies

None.

Taxes

None.

Land Cost (category "Tierra")

P1,476,923 x 1% x k4 = US$ 0.69

France

Data for France were taken from the same source as for Ireland (4). The method used was also similar. The sample selected was "FRANCE"; 166 farms owners were interviewed. The average number of milk cows was 14 on a farm of 15.72 hectares. About 49 percent of the value of gross production was from milk. The average yield per cow was 82 cwt. (11) in 1976, so farm output was approximately 1,148 cwt. To convert the data to U.S. dollars per cwt., a constant, k5, was used.

$$k5 = \frac{15.72\ \text{ha.}}{1148\ \text{cwt.}} \times \frac{US\$1.118}{EUA\ 1.000} \times 0.49 = 0.0075$$

Updating to 1978, as in the case of Ireland, required various price indexes (8). (See "Ireland" for specific indexes).

Feed Purchased

$$EUA\ 234 \times k5 \times \frac{122.90}{106.60} = US\$\ 2.02$$

Feed Grown

$$EUA\ 70 \times k5 \times \frac{123.10}{107.30} = US\$\ 0.60$$

Breeding, Health, Utilities
(not given separately)
Repairs

$$EUA\ 49 \times k5 \times \frac{137.30}{112.40} = US\$\ 0.45$$

Hired Labor

EUA 23 x k5 x $\frac{137.40}{113.50}$ = US$ 0.21

Miscellaneous

EUA 45 x k5 x $\frac{137.40}{113.50}$ = US$ 0.41

Family Labor

EUA 3,328/ALU x $\frac{1.61 \text{ ALU}}{1148 \text{ cwt.}}$ x 0.49 x $\frac{\text{US\$1 118}}{\text{EUA 1.00}}$ x $\frac{137.40}{113.50}$

=US$ 3.09

Depreciation

EUA 11,729 x $\frac{1}{1148 \text{ cwt.}}$ x $\frac{\text{US\$1.118}}{\text{EUA 1.00}}$ x $\frac{129.30}{110.30}$ x 0.49

x 10% = US$ 0.65

Interest

EUA 23,457 x 0.49 x $\frac{1}{1148}$ x $\frac{\text{US \$1.118}}{\text{EUA 1.000}}$ x $\frac{129.30}{110.30}$ x 0.03 = US$ 0.39

Management

US$ 3.69 x 10% = US$ 0.37

Subsidies

None.

Taxes on Inputs

See Appendix 2.

Land Cost (7)

British Pounds 978/ha. x 15.72 ha. x $\frac{1}{1148 \text{ cwt.}}$ x

$\frac{\text{US\$2.3232}}{\text{BP 1.00}}$ x 0.49 x $\frac{129.30}{100.00}$ (index: Goods and

services contributing to agricult. invest.) x 1% =

US$ 0.20

Netherlands

Data for the Netherlands were taken from the same source as for Ireland (4) and treated similarly (also see "France" above). The sample selected was "NEDERL-360" which had 125 observations. The average farm size was 15.16 hectares with 27 milk cows. About 71 percent of the value of production was attributable to milk. The average yield per cow was estimated at 114 cwt. (11), and farm output was 3,078 cwt. To convert the data, a constant, k6, was used.

$$k6 = \frac{15.16 \text{ ha.}}{3078 \text{ cwt.}} \times \frac{\text{US\$1.118}}{\text{EUA 1.000}} \times 0.71 = 0.0039$$

Various price indexes (8) were used to update the costs. (See "Ireland" for the specific indexes.)

Feed Purchased

$$\text{EUA } 940 \times k6 \times \frac{105.90}{110.40} = \text{US\$ } 3.53$$

Feed Grown

$$\text{EUA } 143 \times k6 \times \frac{104.90}{110.90} = \text{US\$ } 0.52$$

Breeding, Health, Utilities
(not given separately)

Repairs

$$\text{EUA } 85 \times k6 \times \frac{128.00}{108.00} = \text{US\$ } 0.39$$

Hired Labor

$$\text{EUA } 71 \times k6 \times \frac{132.30}{110.80} = \text{US\$ } 0.32$$

Miscellaneous

$$\text{EUA } 140 \times k6 \times \frac{132.30}{110.80} = \text{US\$ } 0.65$$

Family Labor

$$\text{EUA } 5{,}565/\text{ALU} \times 1.44 \times 0.71 \times \frac{1}{3078 \text{ cwt.}} \times \frac{\text{US\$1 118}}{\text{EUA 1.000}} \times \frac{132.30}{110.80} = \text{US\$ } 2.47$$

Depreciation

$$\text{EUA } 22{,}119 \times 0.71 \times \frac{1}{3078 \text{ cwt.}} \times \frac{\text{US\$1.118}}{\text{EUA } 1.000} \times \frac{125.60}{108.80}$$

$$\times \quad 10\% \quad = \quad \text{US\$ } 0.66$$

Interest

$$\text{EUA } 44{,}238 \times 0.71 \times \frac{1}{3078 \text{ cwt}} \times \frac{\text{US } \$1.118}{\text{EUA } 1.000} \times \frac{125.60}{108.80} \times 3\% = \text{US\$ } 0.40$$

Management

US$ 5.41 x 10% = US$ 0.54

Subsidies

None.

Taxes on Inputs

See Appendix 2.

Land Cost British Pounds 2,059/ha x 15.16 ha. $\times \frac{1}{940\text{cwt.}} \times \frac{\text{US\$ } 2.3232}{\text{BP1.0000}}$

$$\text{X } 0.71 \quad \times \quad \frac{125.60}{108.80} \text{ (index: same as in "Depreciation")}$$

$$\times \quad 1\% \quad = \quad \text{U.S. \$0.63}$$

West Germany

Data for West Germany were taken from (4) and treated similarly to Ireland, France and the Netherlands. The sample "D-70" was selected with a sample size of only 10 farms on which the average holding had 10 milk cows--near the national average--on 8.18 hectares. The average yield per cow was 94 cwt. and for the farm 940 cwt. About 62 percent of total revenue was from milk. A constant, k7, was calculated to convert the data to U.S. dollars per cwt.

$$k7 = \frac{8.18 \text{ ha.}}{940 \text{ cwt.}} \times \frac{\text{US\$1.118}}{\text{EUA } 1.000} \times 0.62 = 0.0060$$

Various price indexes (8) were used to update the costs. (See "Ireland" for the specific indexes.)

Feed Purchased

$$\text{EUA } 323 \times k7 \times \frac{106.70}{112.80} = \text{US\$ } 1.85$$

Feed Grown

EUA 92 x k7 x $\frac{106.60}{113.50}$ = US$ 0.52

Breeding, Health, Utilities
(not given separately)
Repairs

EUA 141 x k7 x $\frac{112.40}{103.30}$ = US$ 0.93

Hired Labor

EUA 19 x 87 x $\frac{110.00}{104.20}$ = US$ 0.13

Miscellaneous

EUA 230 x k7 x $\frac{110.00}{104.20}$ = US$ 1.47

Family Labor

EUA 2,231/ALU x 1.40 ALU x 0.62 x $\frac{1}{940 \text{ cwt.}}$ x $\frac{\text{US\$1 118}}{\text{EUA 1.000}}$

x $\frac{110.00}{104.20}$ = US$ 2.46

Depreciation

EUA 6,991 x 0.62 x $\frac{1}{940 \text{ cwt.}}$ x $\frac{\text{US\$1.118}}{\text{EUA 1.000}}$ x $\frac{113.00}{104.50}$ x 10%

= US$ 0.57

Interest

EUA 13,982 x 0.62 x $\frac{1}{940 \text{ cwt}}$ x $\frac{\text{US \$1.118}}{\text{EUA 1.000}}$ x $\frac{113.00}{104.50}$ x 3% = US$ 0.33

Management

US$ 4.90 x 10% = US$ 0.49

Subsidies

None.

Taxes on Inputs

See Appendix 2.

Land Cost British Pounds 2,059 ha x 8.18 ha. x $\frac{1}{940 \text{ cwt}}$ x $\frac{\text{U.S. \$2.3232}}{\text{BP 1.0000}}$ x 0.62

x $\frac{113.00}{104.50}$ (index: same as "Depreciation")

x 1% = US$ 0.29

United States

The method for the United States was taken from the Firm Enterprise Data System (FEDS) of the U.S. Department of Agriculture (15). A new survey has been completed since the publication of (15), and the new data, used herein, are preliminary. Final data will be published in 1981. The average herd size in the sample was three times the national average.

The data were given on a milk-equivalent basis so no constant adjustment was required. The costs were adjusted from 1979 to 1978 using indexes of prices paid by farmers, 1967 = 100 (14) 3/.

Purchased Feed and Grown Feed (category "Feed")

US$ 3.98

Breeding (category "Artificial Insemination")

US$ 0.07

Health (category "veterinary & Medicine")

US$ 0.14

Utilities (category "Fuels & Electricity")

US$ 0.22

Repairs (category "Machinery & Equipment Repairs")

US$ 0.24

Hired Labor (category "Hired Labor")

US$ 0.59

Miscellaneous (categories "Dairy Supplies," "DHIA Fees," "Overhead")

3/ This section was mostly prepared by George E. Frick of the Economics and Statistics Service, USDA, stationed at the University of New Hampshire.

US$ 0.25

Family Labor (category "Operator and Family Labor")

US$ 0.97

Depreciation (a subset of categories "Ownership Costs: Machinery, Buildings, and Equipment")
US$ 0.70

Interest

$31.54/cwt x $\frac{248}{272}$ x 0.03 = US$ 0.86

Management
US$ 5.53 x 10% = US$ 0.55

Taxes

None.

Subsidy

U.S. subsidies consisted of government payments for fertilizer used on pastures for cooperators and dairy research carried out by state and federal government agencies. Based on the recent FEDS survey of the 1979 financial year, dairy farmers reported receiving approximately $3.5 million in fertilizer subsidies. This amounted to about $0.003 per cwt. of milk produced.

The amount spent on government research for milk production was considerably higher. In fiscal year 1978 CRIS 4/ reported $18.4 million of funds handled by USDA and some $25.9 million dispersed by other agencies, mostly at the state level. The total, $44.3 million, resulted in a $0.036 per cwt. subsidy.

Together, government subsidies amounted to about US$ 0.04 per cwt.

Land Allocation

From (17), the average value of farm land was calculated as follows:

Total value of land and buildings	$511.9 billion
Total value of buildings	- 87.1 billion
Total value of land	$424.8 billion

4/ The Current Research Information System of the Technical Information Systems Division, Science and Education Administration, U.S. Department of Agriculture, Beltsville, MD.

$\frac{\$424.8 \text{ billion}}{1.048 \text{ billion acres}}$ = $405 per acre

1979 average land operated (FEDS): 469 acres

Milk sold as a percent of total farm receipts 88%

413 acres for milk production

$\frac{413 \text{ acres}}{94 \text{ average number of cows}}$ = 4.4 acres per cow

$405 per acre
x 4.4 acres per cow
$1,778 land value per cow

Average milk output per cow was 112 cwt.

$\frac{\$1,778}{112 \text{ cwt.}}$ x 1% = US$ 0.16

Appendix 2-Computations for tax on feed in EC Countries

	Ireland	France	Netherlands	West Germany
Gross feed value (US$/cwt. milk)				
- purchased	$0.92	1.86	2.58	1.47
- grown	0.37	.55	0.39	0.41
	1.29	2.41	2.97	1.88
Estimated proportion of grains in feedstuffs (percent)	x 57	x 63	x 21	x 53
Gross value of grains fed (US$/cwt. milk)	0.74	1.52	0.62	1.00
Estimated tax rate on gross value of grains fed (percent)	x 48.3	x 42.3	x 52.8	x 52.8
Estimated tax on grains fed (US$/cwt. milk)	0.36	0.64	0.33	0.53

Sources: Agricultural Markets, Prices-Vegetable Products, Commission of the European Communities, Brussels, March 1979. Feed Balance Sheet-Resources, 1970/71-1977/78, Statistical Office of the European Communities, Brussels, December 1979.