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Approved For Release 2008/04/19 : CIA-RDP85T00875R001700050061-8

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# Intelligence Memorandum

*World Beef Supply and Demand:  
Recent Trends and Some Projections*

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**World Beef Supply and Demand:  
Recent Trends  
and Some Projections**

World beef production has leveled off since 1970, while demand has continued to climb rapidly. The result has been a sharp rise in world beef prices to historic highs. During the period 1971-September 1973, wholesale prices increased nearly 100% in the United Kingdom, 60% in the European Community, and about 45% in the United States. Major consuming countries have had to increase beef imports and liberalize import controls in order to meet the growth in demand. Although the beef production cycle has caused periods of stagnation in the past, market uncertainties, increasing cattle prices, and worldwide shortages of animal feeds have prolonged the period of cattle herd expansion and low output.

Because the cutback in slaughtering has produced an unprecedented worldwide buildup in cattle herds, sharply higher beef output can be expected over the next few years, primarily in the United States, Latin America, Australia, and New Zealand. US output could increase by as much as 30% and that of Australia-New Zealand by 50%.

Demand for beef, buoyed by sharply rising incomes in major consuming areas, will continue to grow rapidly, but less than production, and cattle prices consequently should soften over the next couple of years. The result should be lower world beef prices and a large potential for US exports of high-grade beef, particularly to Japan.

Expanding US production coupled with rising world demand should lead to a fall in US net imports in 1974 and a rise in Japanese and West European imports. These developments will have a favorable impact on the US balance of payments. The major US policy concern over the next few years will be to promote exports of high-grade beef to Europe and Japan. European protectionist policies will hinder US exports in that area, but exports to Japan should face fewer problems.

Note: This memorandum was discussed with analysts in the Foreign Agricultural Service and the Economic Research Service of the US Department of Agriculture who are in general agreement with its findings. Questions on this memorandum may be addressed to and documentation for the calculations may be obtained from [redacted] the Office of Economic Research [redacted]

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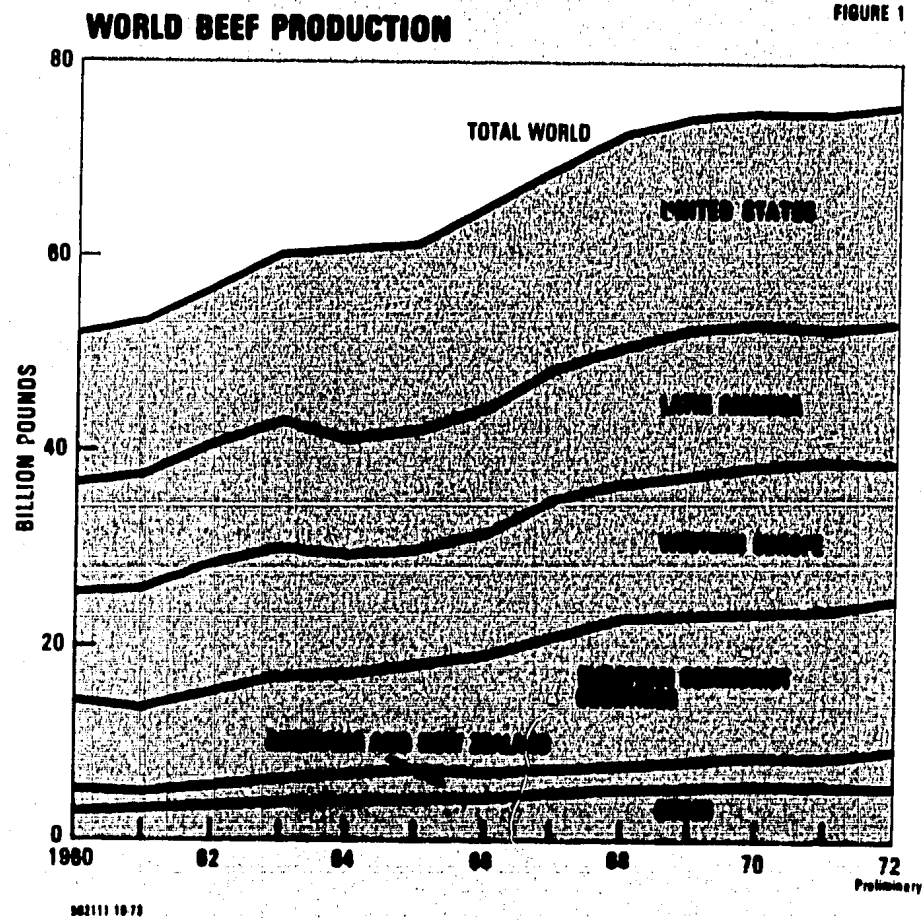
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**DISCUSSION**

**Past Trends in Production, Consumption, and Trade**

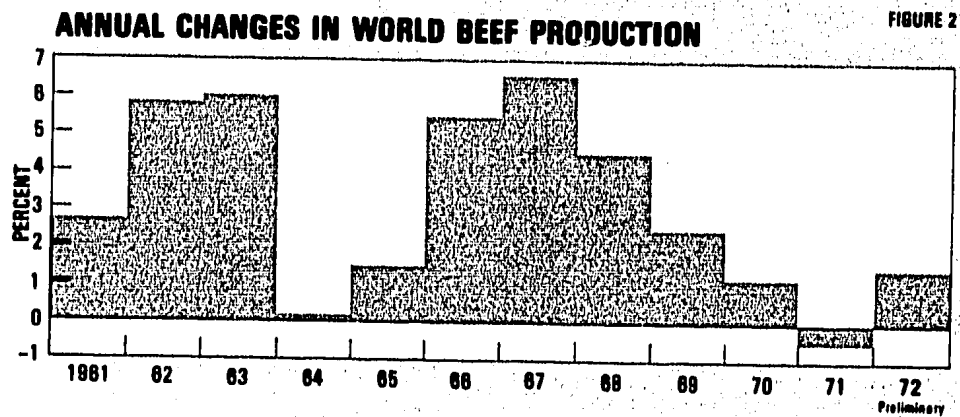
1. World beef production increased almost constantly during the 1960s, but has leveled off at about 75 billion pounds since 1970 (see Figure 1).<sup>1</sup> The United States currently accounts for about 30% of total world output. Western Europe, Japan, and the United States account for the bulk of world imports, while Latin America and Australia-New Zealand supply most of the exports. Communist countries supply a small, but growing, amount of beef to Western Europe.



1. Throughout this memorandum, data on production and consumption are given in carcass weight equivalents.

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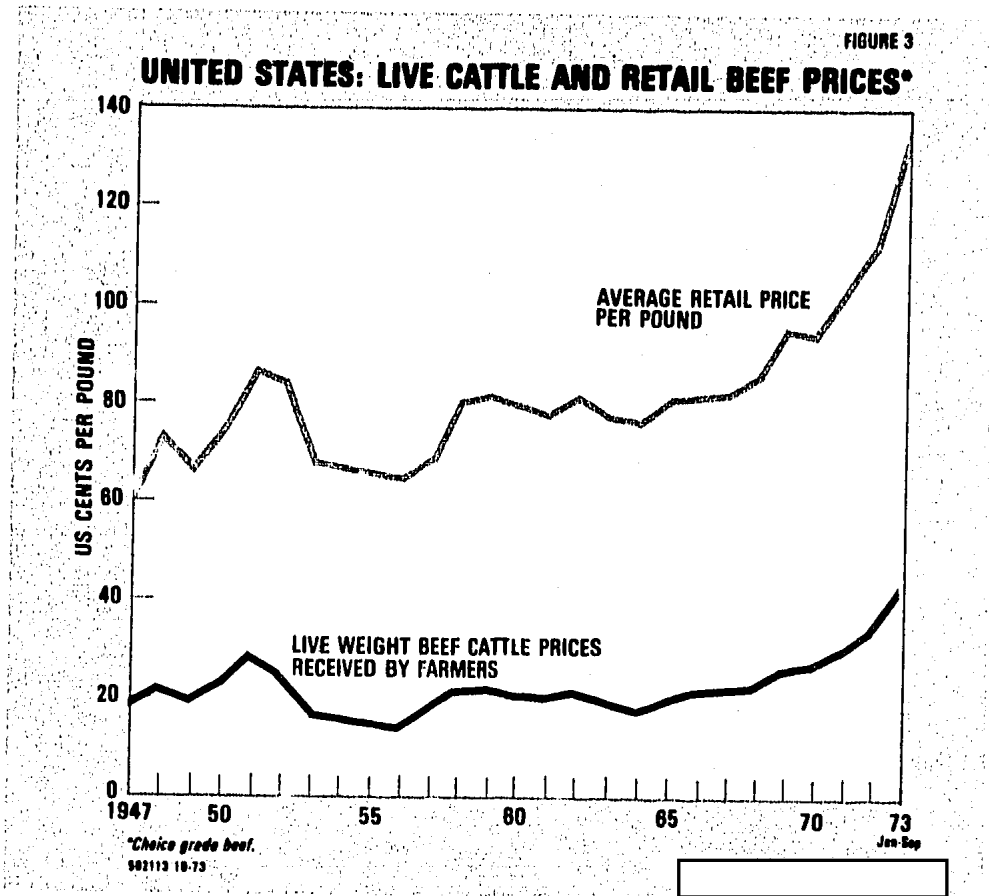
2. Although output increased in 1972, following a drop in 1971, it was only marginally above the 1970 level (see Figure 2). US output dropped as the trough of the beef production cycle was reached, while higher milk prices in the European Community (EC) induced West European farmers to build up dairy herds and reduce slaughter rates. Latin American output continued to grow through 1969, but then fell as Argentine cattle slaughtering dropped sharply. Only Australia and New Zealand continued to boost output vigorously during the late 1960s and early 1970s.



3. Beef production is an unusual industry, particularly because, to a large extent, its capital stock and output are interchangeable. Output increases sharply when breeding animals are sold for slaughter and drops when producers hold back more animals for breeding purposes. Thus periods of disinvestment alternate with periods of investment. As a result, beef producers' expectations can have a major impact on output, and the production response to price changes is often the reverse of that for normal products – at least in the short run. These factors largely explain the cyclical nature of beef production and are likely to dominate production trends over the short run.

4. At the same time, the beef industry is peculiar in that it is typically small scale and oriented to local and regional markets. Commercial production of beef in feedlots is an industry of this century and is only now beginning to become significant outside the United States. Because grain prices were generally stable until recently, the increased efficiency of beef production in feedlots offset increasing pressure on pasturelands, and prices for live cattle remained remarkably stable over the past 25 years (see Figure 3). Wholesale and retail beef prices rose sharply, however, as this increased



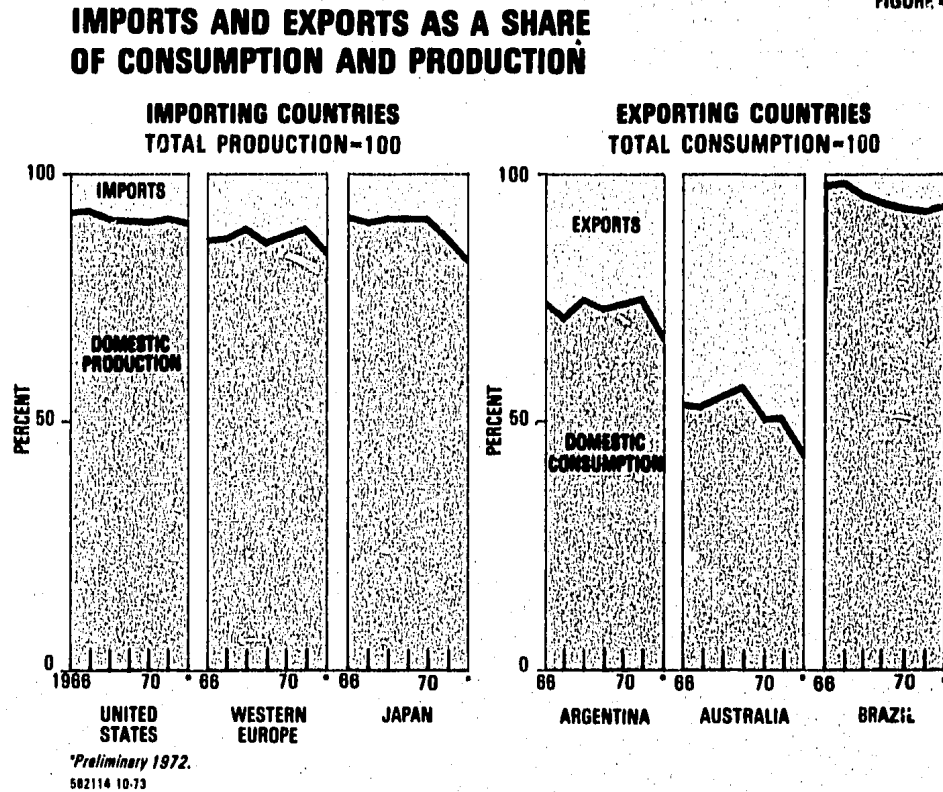


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efficiency of production was not matched in distribution and processing. The trend toward greater use of feedlots for fattening cattle will continue in the future, but efficiency in these operations probably will grow more slowly. This means that the price of beef will become increasingly dependent on the price of grain and other inputs.

5. Most of the world's beef is consumed in the country of origin. Imports account for only a small portion of total consumption even in countries most dependent upon imported supplies, while exporting countries generally consume most of their own output (see Figure 4). Argentina, Brazil, Uruguay, Australia, and New Zealand provide more than 85% of world exports, while the United States, Western Europe, and Japan account for nearly 85% of total world imports. Sluggish domestic production and rapidly rising beef prices during the past several years, however, have caused Western Europe and the United States to rely even more heavily on imports and to liberalize beef import controls. The United States suspended quotas on imports in mid-1972. The EC halved its tariff to 10%, and rising prices

FIGURE 4



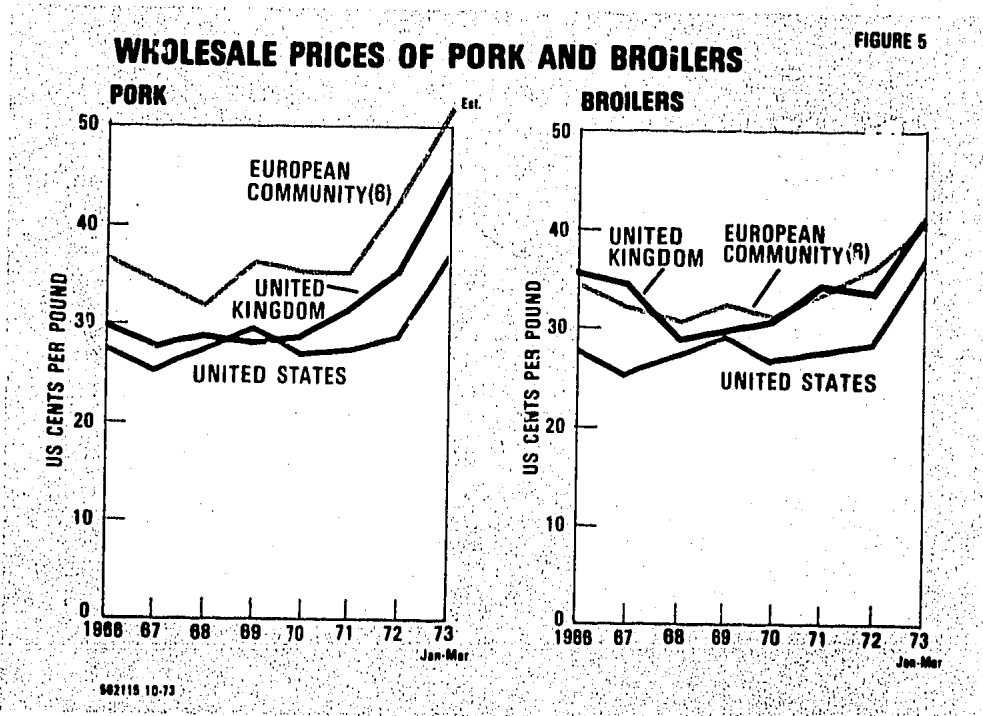
caused a phasing out of the variable levy. As a result, EC imports shot up 50% in 1972. US purchases also rose. At the same time, Japan—not yet a major consumer of beef—increased its imports dramatically, primarily from Australia and New Zealand.

6. The United States, the world's largest importer, buys almost 10% of domestic needs from abroad, including about one million head of live cattle from Mexico and Canada for finishing and slaughtering. The United States also imports inexpensive frozen or chilled boneless beef from Australia and New Zealand, and canned, cooked, and frozen beef from Latin America. South American fresh beef, barred from the United States because of the danger of hoof and mouth disease, is sent mostly to Western Europe. West European countries have slowly increased their imports, which now account for more than 15% of their total beef consumption. Most of the Continent's beef imports come from Argentina, Brazil, and Uruguay and include a growing amount of special cuts, mainly for restaurants. Western Europe also imports more than one million head of live beef and dairy cattle from Eastern Europe.

### Rising Demand and Prices

7. Until the early 1970s, demand for beef grew only slightly faster than supply, supplies of beef substitutes were ample, and beef prices remained fairly stable. Beef consumption in most countries rises nearly as fast as real income over the long run. In the United States, a 33% rise in real per capita income and a 12% rise in population over the last 10 years was accompanied by a 41% rise in beef and veal consumption. Beef consumption in Europe grew by 30% over the same period. Japanese beef consumption is rising sharply because of rising incomes and changing tastes. Other nations also are increasing their consumption. During the past two years, world incomes, particularly those of the industrial nations, which consume most of the world's beef, have increased at exceptionally high rates. The combined real GNP of OECD countries rose 5.8% in 1972 and will rise about 7% in 1973, compared with an average of only 5% since 1960.

8. During the late 1960s and until 1973, ample pork and poultry provided ready substitutes for beef and thus moderated the rise in beef prices, as beef supply did not increase as fast as demand. US and EC pork and poultry prices in 1971 were below 1966 levels (see Figure 5). However,

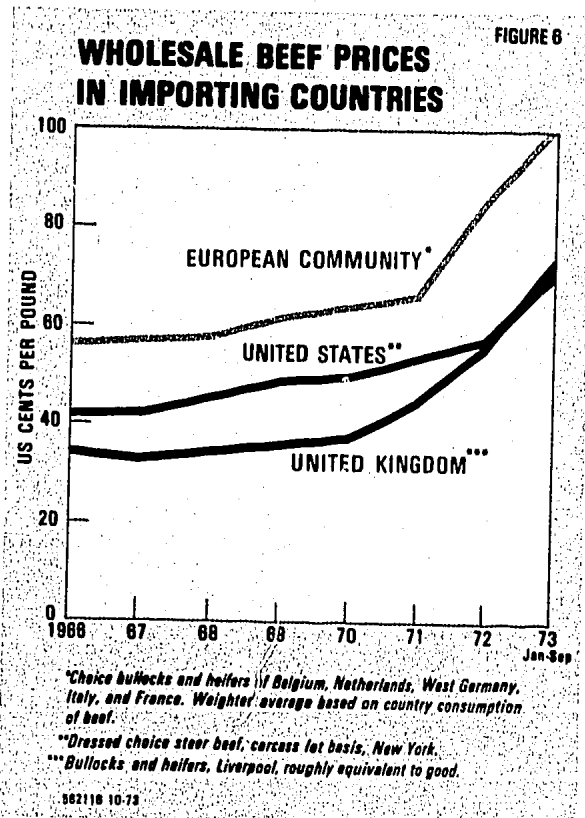


prices of these beef substitutes increased dramatically at the end of 1972 and in early 1973, when fishmeal and soybeans, used primarily for hog and

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poultry feed, became scarce and their prices skyrocketed<sup>2</sup> and there was also a large increase in the prices of feed grains.<sup>3</sup> In fact, higher prices for beef substitutes intensified the demand for beef.

9. Rapidly rising demand caused by rising incomes and sharply rising prices for substitutes combined with a slowly increasing supply have caused an unprecedented worldwide rise in beef prices. After increasing only gradually during the late 1960s, beef prices subsequently began to rise sharply in the United States and Western Europe (see Figure 6). Largely



because of the higher export prices, world beef exports jumped from US \$2.8 billion in 1971 to about \$4 billion in 1972. US beef imports in 1972 totaled \$1 billion, replacing sugar as the second largest US agricultural import (following coffee).

#### The Outlook for Supply

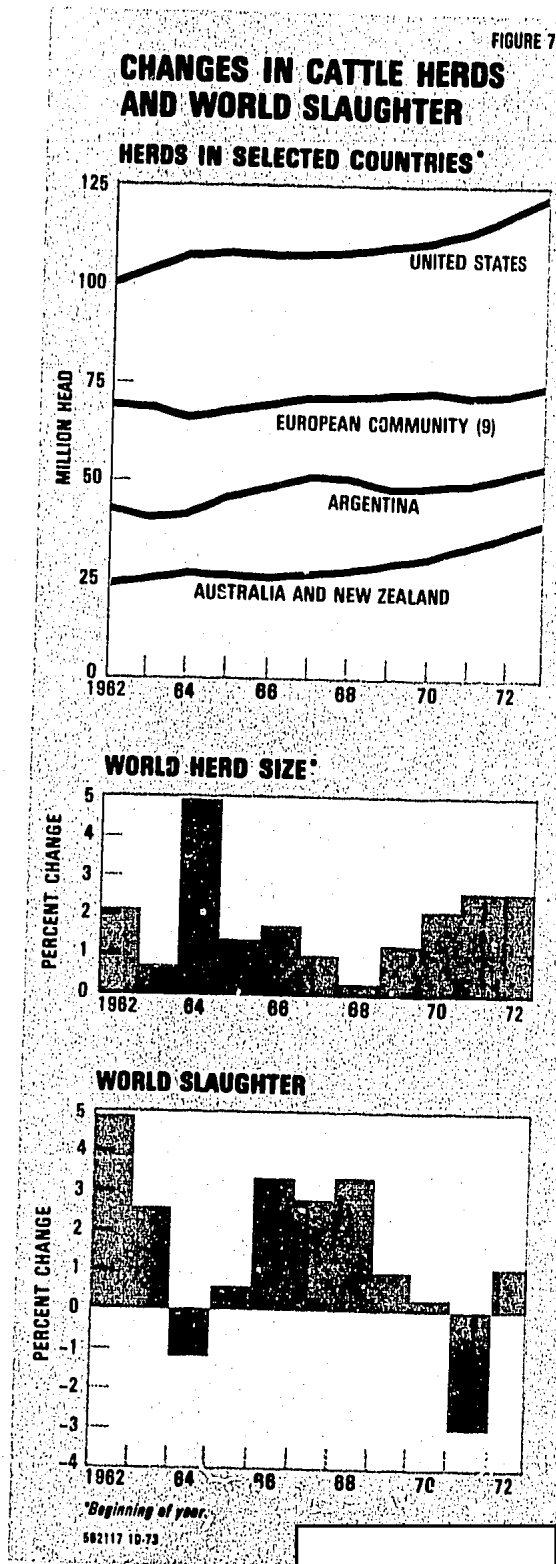
10. World beef production has the potential to grow much more rapidly during the mid-1970s than in the past three years. Paced by the United States and Australia-New Zealand, cattle herds in most major beef producing areas except Western Europe have grown substantially since the late 1960s, and slaughter rates are expected to increase

rapidly (see Figure 7). Beef output should also benefit from larger supplies of animal feeds, as prospects are that the 1973 grain and soybean harvests will be markedly larger and that Peru's fishmeal output will likely recover by late 1974. High feed prices coupled with retail price controls in the United States have retarded beef output since late 1972 by reducing feedlot operators' purchases of feeder cattle in the United States, while also

3. Unlike other major beef producers, the United States fattens its cattle mainly with feed grains, the price of which rose sharply after large export sales in 1972 had largely exhausted surplus stocks.

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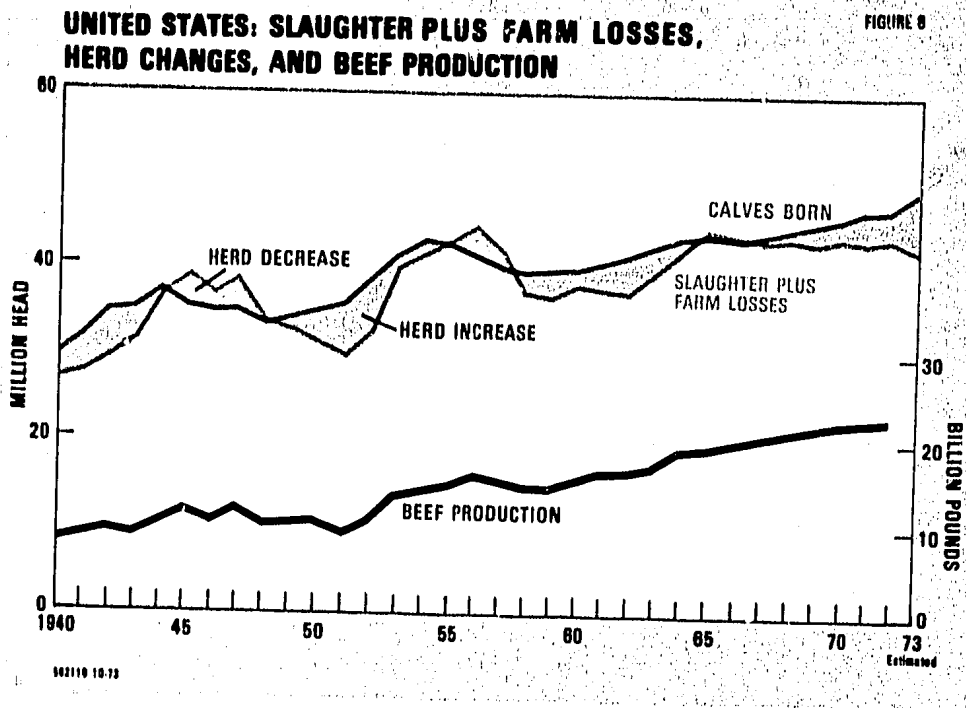
causing more European animals to be slaughtered for veal rather than fattened. Thus, with US prices no longer controlled, not only is the slaughter rate likely to increase markedly, but the beef yield per animal also is likely to improve.

11. US beef production should account for most of this large increase. The potential for increases in US output is larger now than at any time since the close of the Korean War, when production rose 60% in five years. US cattlemen have been building herds since 1967 and have decreased slaughtering (see Figure 8). Beef production increased through 1972 because of a rise in the average slaughter weight per animal.<sup>4</sup> The large herd buildup in the United States seems certain to lead to increased beef output—as much as a 30% increase could be achieved during 1974-76 without cutting into herd size. The assumption of increased beef production, however, depends on ample feed supplies. If disappointing crops should keep feed prices high relative to beef prices, feedlot operators would then find it more profitable to feed a higher roughage diet which would cut the weight of slaughter animals and the growth in beef production.

12. Australian and New Zealand production also should increase substantially during the 1970s. Herds have risen 55%

4. This continues a trend which began in the mid-1950s of slaughtering fewer calves. Calves now account for only about 8% of total slaughter, and future increases in US beef output will depend almost entirely on increases in the number of animals killed. Because Western Europe and Australia-New Zealand still kill a large number of calves, future declines in calf slaughter and higher slaughter weights should add to beef output in these areas during the 1970s.

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since the mid-1960s and should continue to increase throughout this decade.<sup>5</sup> Beef output probably could be boosted by as much as 50% over the next two years without stopping the growth in herd size. Because about one-half the region's output is exported and domestic consumption is increasing only slowly, the volume available for export should continue to rise dramatically.

13. Latin America's herds, especially in Argentina and Brazil, also have grown to record levels in recent years (see Figure 10), and the region could increase beef supplies substantially. But this need not lead to larger exports, as Argentine and Brazilian beef consumption has been held down by controls in recent years, and much of the potential increase thus may go to satisfy increased domestic demand.

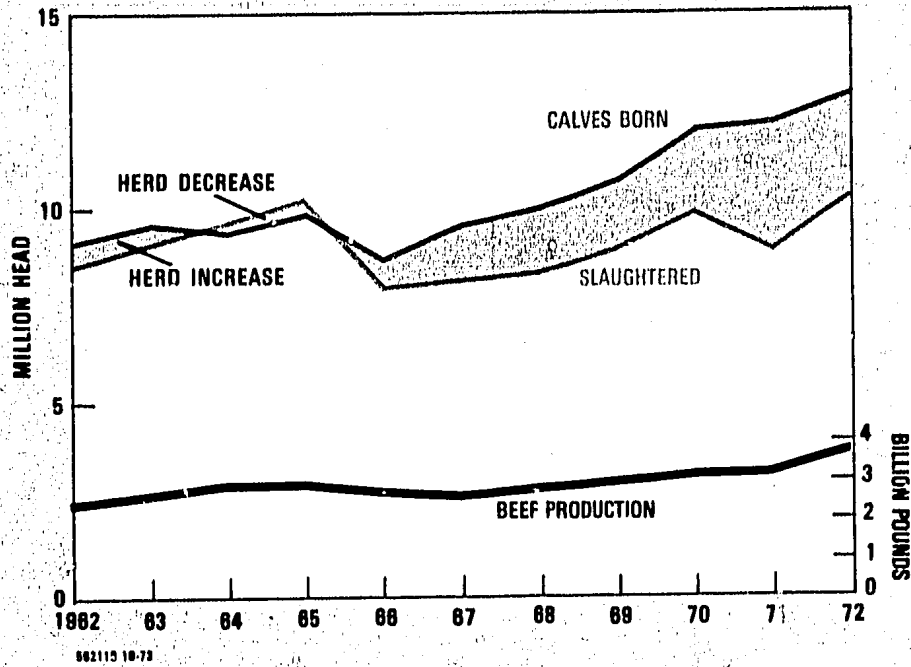
14. Output in Japan and Western Europe is unlikely to expand rapidly. Growth in West European herds has been minimal, and substantial

5. If herds continue to expand at their current rate, and calf slaughter continues to decline, beef output over the next several years would increase as much as 20% annually (see Figure 9). Moreover, if Australia and New Zealand increase their meat processing capacity, they could boost output even more rapidly by increasing slaughter rates and slowing the growth in herd size.

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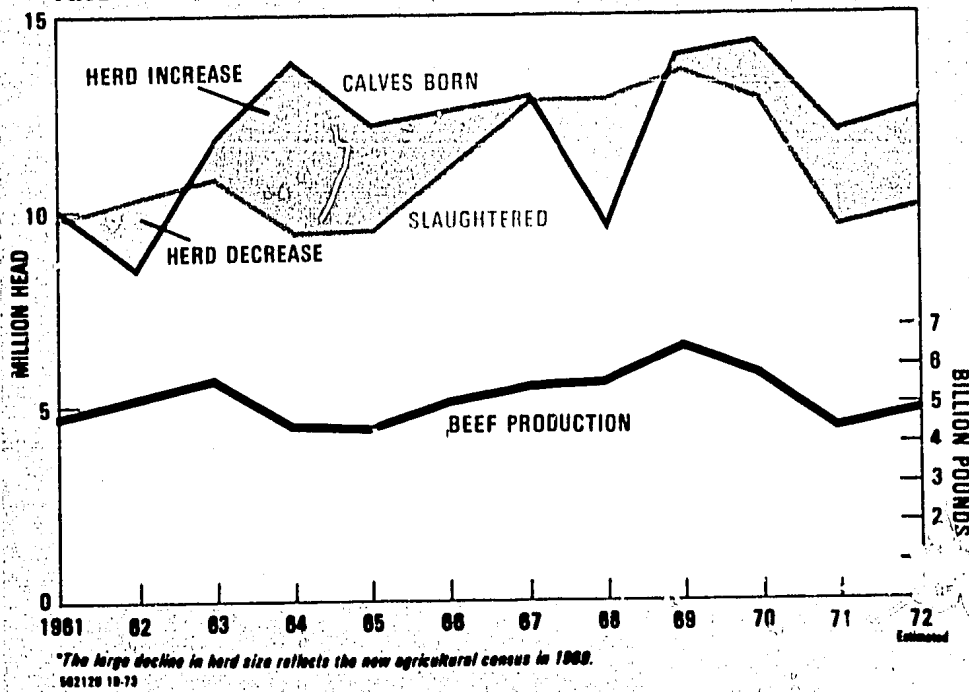
**AUSTRALIA AND NEW ZEALAND: SLAUGHTER, HERD CHANGES, AND BEEF PRODUCTION**

FIGURE 9



**ARGENTINA: SLAUGHTER, HERD CHANGES, AND BEEF PRODUCTION**

FIGURE 10



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rises in slaughter rates are possible only at the expense of breeding stock. A large portion of Western Europe's cattle are dairy animals, and herd sizes are more affected by prices for dairy products than for beef. Thus the sharp rise in beef prices has not produced a corresponding buildup of herds. At the same time, high feed prices have reduced the incentives for fattening calves. Grain prices will remain higher in the EC under the Common Agricultural Policy than in most other areas, and this will restrict the growth of beef output. Entrance of Ireland, the United Kingdom, and Denmark into the EC will raise beef prices in these countries. Initially, such a rise will induce producers to build up their herds and thus reduce output, but eventually will lead to higher beef output. Japan's herds have fallen substantially over the past few years as the lure of high profits induced the slaughter of some breeding stock and dairy cattle. Therefore, little or no increase in Japanese beef output is likely, and Japan's rapidly growing beef requirements will have to be met through increased imports.

#### **Outlook for Beef Demand, Prices, and Trade**

15. Demand for beef will continue to increase rapidly during the 1970s. In the major importing nations, demand is expected to rise by some 30% to 45% by 1980, depending on the rate of economic growth. Figure 11 shows the close relations between income and beef consumption; Tables 1 and 2 in the Appendix project levels of beef consumption in major importing nations.

16. US demand for beef is expected to increase to 123-128 pounds per capita in 1975 and to 127-136 pounds per capita in 1980, depending upon income levels. Demand is expected to rise more rapidly in Western Europe than in the United States, largely because per capita income gains may be more rapid and beef consumption is now at lower levels. Japan's rate of growth in demand for beef probably will be even more rapid.

17. Demand in the East European and less developed countries also will continue to rise as incomes and population increase, but these nations in part will tend to reduce export availabilities rather than to increase beef imports during the 1970s. Beef consumption in Communist areas increased about two-thirds between 1960 and 1970. With adequate supplies, the growth of consumption should continue at a rapid rate during the 1970s. Moreover, these countries are expected to continue to be exporters of live cattle to Western Europe. Latin America probably will remain a significant world exporter despite an expected increase in regional demand.

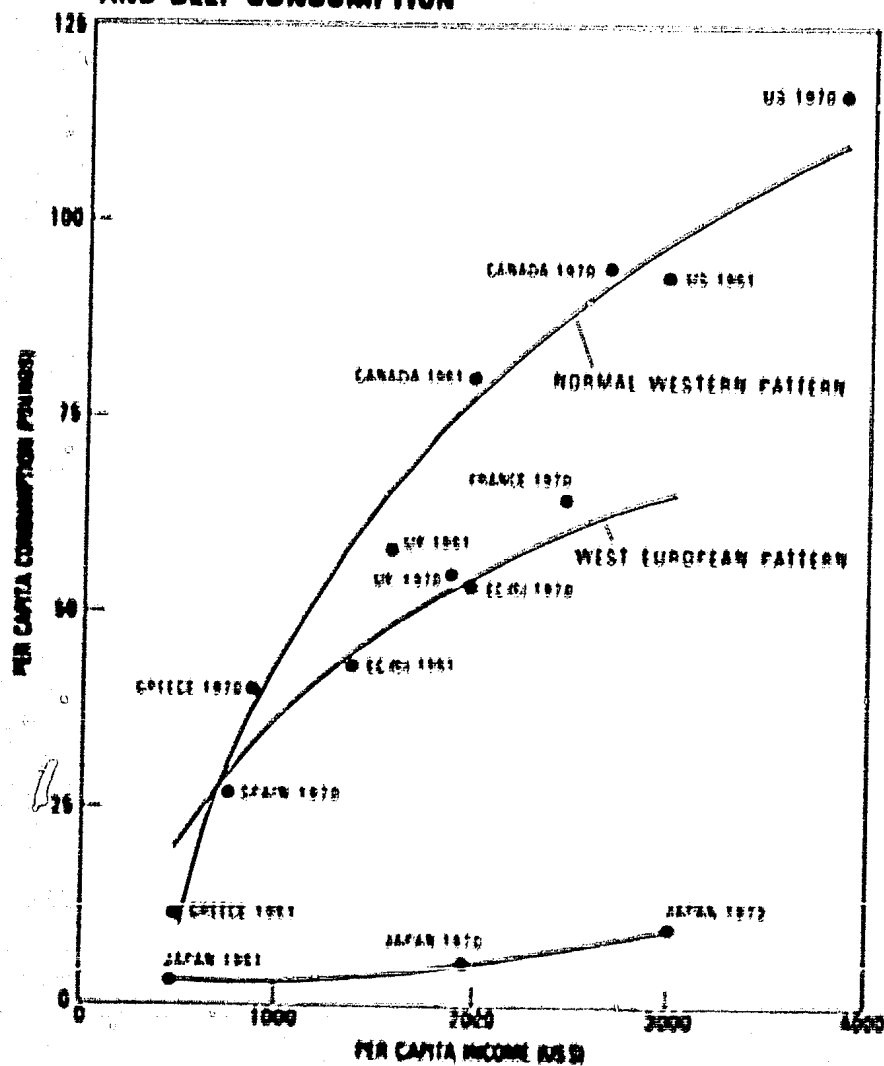
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RELATIONSHIP BETWEEN INCOME  
AND BEEF CONSUMPTION

FIGURE 11

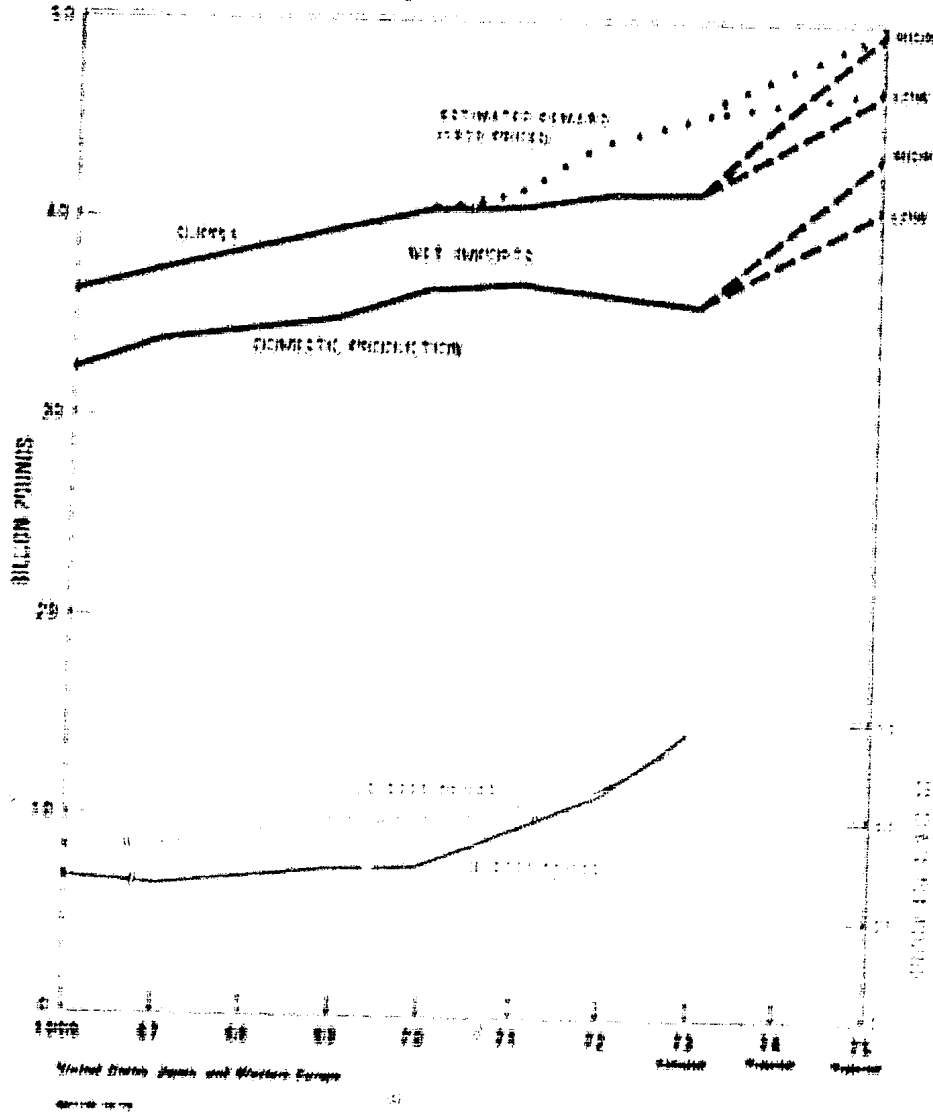


18. With output rising faster than demand over the next few years (see Figure 12), beef prices should decline, although the extent of the drop will depend on many factors, including rates of economic growth and the supply of feed grains. The character of world trade in beef is likely to change in the years ahead. US dependence on imported beef should decline, whereas West European and Japanese imports, largely from the United States and Australia-New Zealand, should rise sharply. Although the United States

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**TOTAL BEEF DEMAND AND SUPPLY OF MAJOR CONSUMERS\***

FIGURE 12



probably will not become a net exporter of beef, it is likely to become a major exporter of high-grade beef, while continuing to import large amounts of low-grade beef for processing.

19. The United States will be a major beneficiary of these developments in the world beef trade. The prospect of a sharp increase in US beef output, combined with recent changes in exchange rates, should lead to an

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improvement in the US trade balance in beef over the next few years. For the first time in recent history, policy will need to be directed toward developing export markets, rather than protecting domestic producers. With an improved world supply picture, Western Europe probably will revert to its traditional protectionism and impose barriers to US beef exports. Japan, with its preference for high-grade beef, should prove to be a much easier market to penetrate and probably will become the major purchaser of US beef.

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## APPENDIX

## METHODOLOGY FOR THE BEEF CONSUMPTION FUNCTION AND DEMAND PROJECTIONS FOR 1975 AND 1980

A beef consumption function (see Figure 11), which relates consumption with income levels, was derived from combined cross section and time series data. Data covered the 1961-70 period for the United States, Canada, Spain, and Greece, and the 1961-63 period for the EC.

The best least squares fit for the normal Western pattern was a semi-log\* regression equation estimated to be:

$$C = -287.5 + 48.2 \ln Y$$

where

C = Per capita beef (and veal) consumption in pounds per year.  
Y = Per capita real (1963 base year) GNP in US dollars per year.

The standard error of the coefficient was estimated to be 1.63 and the *t*-value was 46.5, significant at the 0.005 level. The coefficient of determination ( $R^2$ ) was 0.98, and there were 47 observations. This  $R^2$  was appreciably higher than the  $R^2$  of the linear relationship between GNP and consumption. GNP figures were used instead of consumption expenditures or disposable income because there appeared to be no measurable increase in predictive power by using the latter two. In addition, beef prices were excluded from the consumption function because real prices were relatively stable during the 1960s and consequently were not statistically significant in explaining consumption levels (this may not be true in the 1970s, when prices rose significantly). Thus the estimated relationship shows the effect of income net of the effect of prices.

Western Europe, particularly the EC countries, deviated from the normal consumption pattern upon initiation of a subsidized cattle industry in the 1960s, supported by high import duties and levies. On the basis of variables covering 1961-70 for all Western Europe (except the Scandinavian countries), the consumption function was estimated to be:

$$C = -131.7 + 24.5 \ln Y$$

\* The semi-log mathematical form was chosen because it gives expected income elasticities  $< 1$  and the elasticity of beef demand decreases as the level of income increases.

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The  $R^2$  was 0.84, and there were 130 observations. Standard error of the coefficient was 0.95 and the T-value was 25.8, significant at the 0.005 level.

Largely because of government policies favoring high beef prices, the Scandinavian countries of Sweden, Norway, and Finland did not increase per capita beef consumption at all during the 1960s, although consumption of other meats increased.

Japan also did not follow the normal Western pattern chiefly because of large differences in tastes and diets. Over the past five years, however, Japan's meat consumption patterns have been changing dramatically. Its consumption function was therefore estimated, according to data from the last six years, to be a power function:

$$C = 0.00141 (Y)^{1.1}$$

The  $R^2$  was 0.95. Standard error of the coefficient was 0.0003 and T-value was 10.2, significant at the 0.005 level.

Annual population growth rates for 1971-80 were estimated by the United Nations' Food and Agriculture Organization, (Agricultural Commodity Projections, 1970-1980), with little intercountry variations for Western Europe. Projected incomes were based on models of high economic (GNP) growth and low economic growth. High growth was assumed to be one percentage point more than the annual average per capita real growth of GNP for 1961-70. Low growth was assumed to be one percentage point less than the annual average for 1961-70 (see Table 1 and 2).

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Table 1

Projections of Beef Demand by Major Importers with High Economic Growth, 1975 and 1980

Importers	Estimated Annual per Capita Real Economic Growth 1971-80	Annual Population Growth Rate 1971-80	1970 Consumption		1975 Consumption		1980 Consumption	
			Total (Billions Pounds)	Per Capita (Pounds)	Total (Billions Pounds)	Per Capita (Pounds)	Total (Billions Pounds)	Per Capita (Pounds)
United States	2.9	1.1	22.5	117	27.2	128	30.7	136
Japan	11.1	1.1	0.6	6	1.2	11	2.1	18
Canada	4.2	1.5	2.0	98	2.5	109	2.9	118
Western Europe (excl. Scandinavia)	5.3	0.9	15.9	59	18.9	57	21.6	63
Scandinavian Countries	4.5	0.7	0.7	69	0.7	42	0.8	45

Table 2

Projections of Beef Demand by Major Importers with Low Economic Growth, 1975 and 1980

Importers	Estimated Annual per Capita Real Economic Growth 1971-80	Annual Population Growth Rate 1971-80	1970 Consumption		1975 Consumption		1980 Consumption	
			Total (Billions Pounds)	Per Capita (Pounds)	Total (Billions Pounds)	Per Capita (Pounds)	Total (Billions Pounds)	Per Capita (Pounds)
United States	1.9	1.1	22.5	117	26.7	128	28.6	127
Japan	2.1	1.1	0.6	6	1.0	9	1.7	15
Canada	2.2	1.1	2.0	98	2.4	105	2.7	110
Western Europe (excl. Scandinavia)	2.3	0.9	15.9	59	17.9	58	19.9	59
Scandinavian Countries	2.1	0.7	0.7	69	0.7	42	0.8	45

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