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Trends in the U.S. Sheep Industry

Keithly G. Jones

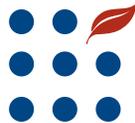


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Abstract

The U.S. sheep industry has changed greatly since the end of World War II. Both sheep meat and wool production have seen rapid declines. So, too, have revenues and the number of sheep operations. The wool industry has suffered from increased use of synthetic fibers, which were found to be less expensive than wool and, when blended with natural fibers, more attractive to consumers. Historically, lamb meat was a byproduct of the wool industry, but wool's decline has changed that. Lamb meat production became the emphasis of the sheep industry, but lamb prices have been unable to support a recovery in the sheep industry. U.S. lamb production continues to decline, but with lamb meat imports filling in, expansion and diversification of demand for this meat offers hope for recovery of the U.S. sheep industry.

Keywords: Sheep, lamb, mutton, wool, Australia, New Zealand.

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Summary

The U.S. sheep and wool industries have contracted since the end of World War II and especially since the mid-1970s. Over the past 200 years, the sheep population has come full circle. From 7 million head in the early 1800s, sheep numbers peaked at 56 million head in 1945, then declined to less than 7 million head in 2003. At the same time, the industry emphasis has switched from wool production to meat production.

As the sheep and wool industries continue to contract, so too have sheep operations. Medium-sized to large operations have declined most. A few of the large operations now own most of the animals, with an increasing number of smaller operations mainly located in the Northeast, a major lamb-consuming region. Larger sheep operations are primarily in the Western States. The regional distribution has remained fairly constant over the past 25 years.

Wool, lamb, and mutton are joint products. Wool production is heavily influenced by prices for lamb, mutton, and wool. High wool prices often result in lower supplies of lamb and mutton since lambs will be held for increased shearing. Even though the depressed wool market appears to be a direct cause of the liquidation in the U.S. sheep industry, several other factors have contributed to its decline.

- Lamb prices have been unable to support industry recovery. Meatpacker concentration is often alleged to be another cause of the industry decline. While the gap between live lamb prices and wholesale prices seems to have grown, many factors beyond degree of packer concentration affect the price spread.
- Lamb consumption is very low compared with other meats, and its consumers are culturally and ethnically distinct. Competing meats such as beef, pork, and poultry tend to be consumed everywhere by people of all ages and ethnicities buying a wide variety of cuts.
- Attempts to promote and differentiate U.S. lamb from other meats have met with limited success. The U.S. sheep industry focuses on high-value cuts for the domestic market, and has neither capitalized on market segmentation nor developed export markets. Much of the lower value meat is rendered or goes into pet food. What little is exported is mainly to Mexico in the form of whole mutton carcasses.
- Disease and predator losses continue to raise production costs and erode farm profitability.

Introduction

The U.S. sheep and wool industries have contracted since the end of World War II and especially since the mid-1970s. Over the past 200 years, the sheep population has come full circle. From 7 million head in the early 1800s, sheep numbers peaked at 56 million head in 1945, then declined to less than 7 million head on January 1, 2003. At the same time, the industry emphasis has switched from wool production to meat production.

Historically, the lamb meat industry was developed as a byproduct of the wool industry. Over time, conditions in the wool industry have heavily influenced the direction of the U.S. sheep industry. Demand for wool declined after World War II due to the reduction in use by military service personnel. In addition, by the mid-1960s, synthetic fibers were less expensive than wool, and synthetic/natural fibers blends were more attractive to consumers. Despite government support for wool, prices have been unable to sustain the sheep industry. Real prices for wool have trended downward, declining at a much faster rate since the mid-1990s.

Wool and lamb are joint products and are produced in fairly fixed proportions, although some sheep tend to produce more wool while others produce more meat. Wool breeds still dominate the U.S. sheep flock, but with the new emphasis on meat production, meat breeds may begin replacing wool breeds.

Meat produced by young sheep (typically under 14 months) is referred to as lamb (a young sheep is also called a lamb), while meat from mature sheep is referred to as mutton. The emphasis on wool prior to World War II resulted in a higher proportion of meat production being less expensive, less desirable mutton, as animals were raised to an older age for successive shearing. Now, the proportion of young sheep slaughtered has increased as meat quality has gained importance.

The decline in wool use was accompanied by a subsequent decline in lamb and mutton consumption. U.S. per capita consumption dropped from 4.5 pounds per capita (retail weight) in the early 1960s to around 1.1 pounds over the past two decades. Although this total has been fairly stable, more than two-thirds of the population does not consume lamb at all. Consump-

tion is mostly confined to ethnic niches and small segments of the population who eat mainly high-value cuts. As a result, the remainder of the carcass is difficult to market.

Reaching out to more consumers would help the sheep industry to increase revenue by marketing different cuts at different prices. Survey data indicate the lack of a broad consumer base. The Northeastern and Western States are the largest markets for lamb products. The typical lamb consumer is older, relatively well established, a member of the immigrant population, and an urban resident. In contrast, beef, pork, and poultry tend to be consumed everywhere by people of all ages and ethnicities buying a wide variety of cuts.

Attempts to promote and differentiate U.S. lamb from other meats have failed. The U.S. sheep industry focuses on high-value cuts for the domestic market, and has neither capitalized on market segmentation nor developed its export markets. Much of the lower-value meat is rendered or goes into pet food. What little is exported is mainly to Mexico in the form of whole mutton carcasses.

Over the years, Australia and New Zealand have adjusted to low wool prices and the shrinking wool industry by restructuring their sheep industries to focus on lamb meat and mutton production. Genetic improvement initiatives have reconstituted much of their sheep flock either to dual-purpose animals (wool breeds with good meat producing ability) or primary meat breeds. With most of their lambs grass-fed, the problem of high fat content is not an issue. As a result, Australia and New Zealand's sheep meat exports have grown by more than 20 percent over the past decade. Much of the increased exports go to the United States.

The U.S. live sheep trade exists mainly within North America, with the United States generally a net exporter of live animals. Imports of live animals, however, have increased steadily since 1975, primarily from Canada.

Wool price support and other policy programs have long been a part of the sheep industry. Wool price support programs date back to 1938. Since then, they have been modified on several occasions to include direct payments, support tied to production, and support tied to quality. Through the years, weaker

demand for wool and the subsequent decline in wool production has even resulted in a temporary phase-out of wool support. Other policy options, including the implementation of Section 201 of the Trade Act of 1974, have been granted to the sheep industry to stimulate a recovery.

This report reviews the economic trends in the U.S. sheep industry. It chronicles significant historical and economic developments in the U.S. sheep industry from both market and policy perspectives and cites prospects for the industry's survival.

Industry Overview

The U.S. sheep and wool industry is in a long-term contraction marked by declining farm numbers, declining inventories, and shrinking revenues. Rates of return have been insufficient to maintain industry stability. Per capita U.S. lamb and mutton consumption has held fairly steady (1.1 pounds) for the past decade, but that is satisfied mainly by the increase in imported lamb meat. While the lamb meat industry has registered productivity gains, domestic supply has fallen because the decline in inventory far outpaces increases in output per animal. In addition, productivity gains in wool production have been negligible, and use of wool has dropped significantly since 1945.

Sheep Operations and Sheep Inventory

In 2002, there were 64,170 sheep farms in the United States versus 105,640 farms in 1974. This represents a decline of 39 percent (fig. 1). Between 2001 and 2002, 950 sheep operations exited the industry, and the dropoff is expected to continue. The decline in U.S. sheep operations calls into question the viability of the industry, which is beset by shrinking revenues and low rates of returns.

The sheep industry, like the rest of the livestock industry, is dominated by a few large operations with a majority of the animals. However, the proportion of small farmers with sheep operations is on the rise. In

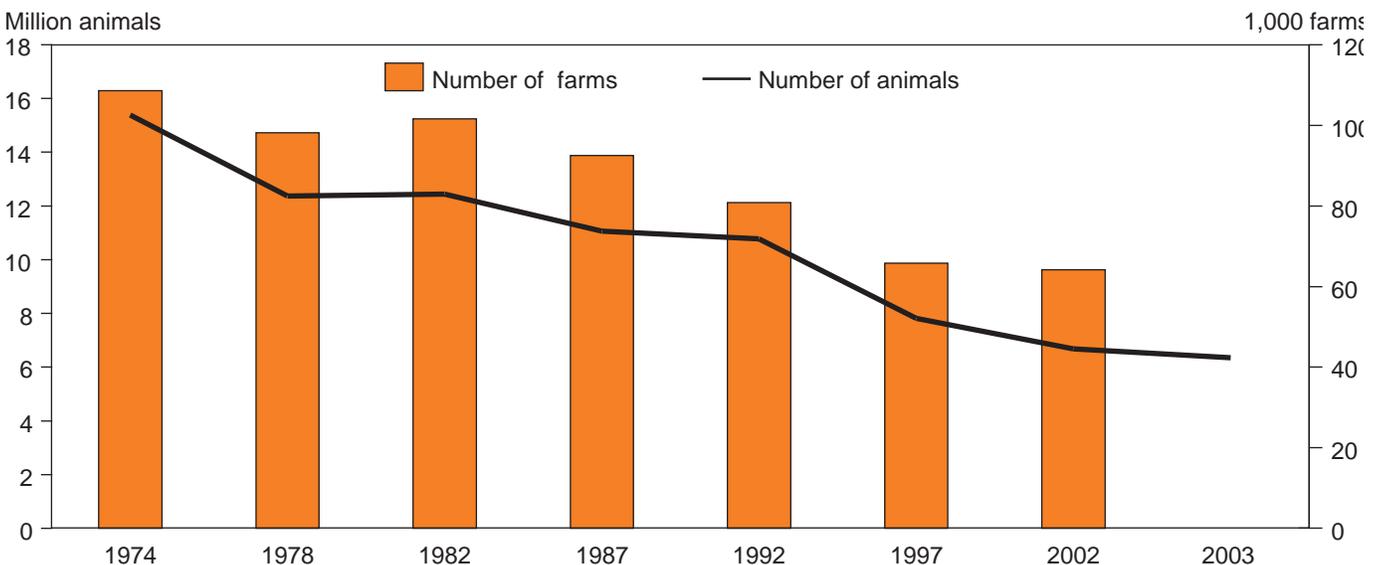
1974, 77 percent of all farms owned fewer than 100 head of sheep. By 1997, 85 percent of all farms owned fewer than 100 head of sheep (table 1). This phenomenon is typical of other livestock sectors, especially beef, where a large percentage of farm operators are small farmers. The relatively low investment costs and the ability of sheep to thrive on marginal lands make sheep farming ideal for beginning and small part-time producers. Most large operations, which own 80 percent of the sheep, are in the Western and Plains States, while small farm flock operations are mostly in the Midwestern States (14 percent), and the Southern and Eastern States (6 percent).

Although small producers (fewer than 100 head) make up most of the operations, they own less than 17 percent of all sheep. Since 1974, just above 55 percent of all sheep have consistently been located on farms with 1,000 head or more (table 1). Larger farms likely benefit from economies of size and are thereby more likely to be profitable than smaller producers.

Not only are farm numbers decreasing, but sheep numbers are declining as well. In 1942, the sheep inventory peaked at 56 million head, but dropped to 15.4 million in 1974 and has declined almost every year since. By January 1, 2002, the inventory had shrunk to 6.7 million head, 4 percent below a year earlier in 2001 and more than 50 percent below the 1975 total. Breeding sheep inventory also declined—down 1 per-

Figure 1

Number of sheep farms and sheep and lamb inventory, U.S., 1974-2003



Source: U.S. Department of Agriculture, National Agricultural Statistics Service (NASS), Compiled by Economic Research Service.

Table 1—Distribution of sheep and lamb farms by size, 1974-97

Item	1974	1978	1982	1987	1992	1997
	<i>Percent</i>					
Farms with:						
Under 25 sheep and lambs	41.6	51.2	50.2	49.5	49.9	54.1
25-99 sheep and lambs	35.4	32.1	32.7	33.8	32.7	31.1
100-299 sheep and lambs	13.9	10.4	10.9	10.5	10.7	9.1
300-999 sheep and lambs	5.8	4.0	4.0	4.0	4.4	3.7
1,000 or more sheep and lambs	3.3	2.2	2.2	2.1	2.4	2.0
Distribution of sheep and lambs on farms with:						
Under 25 sheep and lambs	2.7	4.1	4.2	4.4	3.8	4.5
25-99 sheep and lambs	10.2	12.2	12.8	13.5	11.7	12.3
100-299 sheep and lambs	13.2	13.2	14.2	14.0	12.9	12.3
300-999 sheep and lambs	17.4	16.4	16.2	16.7	16.5	15.8
1,000 or more sheep and lambs	56.6	54.2	52.6	51.3	55.1	55.1

Source: U.S. Department of Agriculture, Census of Agriculture.

cent from the previous year as of January 1, 2002—though the rate of decline was much slower than previous years.

Throughout the long-term decline in sheep inventory, periodic reductions in the rate of decline and occasional stabilization in inventory resemble the typical livestock cycle. A typical sheep production cycle has three phases: expansion when sheep numbers increase for 3 to 4 years, followed by 1 to 2 years in which the numbers are consolidated, followed by another 3 to 4 years of declining numbers before the next expansion. A full cycle lasts 8-10 years. The sheep cycle results from biological lags in adjustments initiated by producers in response to economic stimuli, such as price increases.

Typically, a producer's response to price changes entails first adjusting the size of the breeding herd by breeding or culling. Due to the biology of the sheep, it takes approximately 2 years for the full impact of the adjustment to be felt through a change in production (fig. 2). Lambs are bred at around 6-8 months of age, bear lambs after a 5-month gestation, and after 8 to 12 months on a combination of pasture and feeding, are slaughtered for food. This does not take into consideration the time needed for infrastructural adjustments, should that be needed. Economic factors such as prices or natural factors such as drought may shorten or lengthen the whole cycle or any of its phases. In addition, because sheep yield multiple products (lamb meat, wool, and pelt) with varying demand structures, these

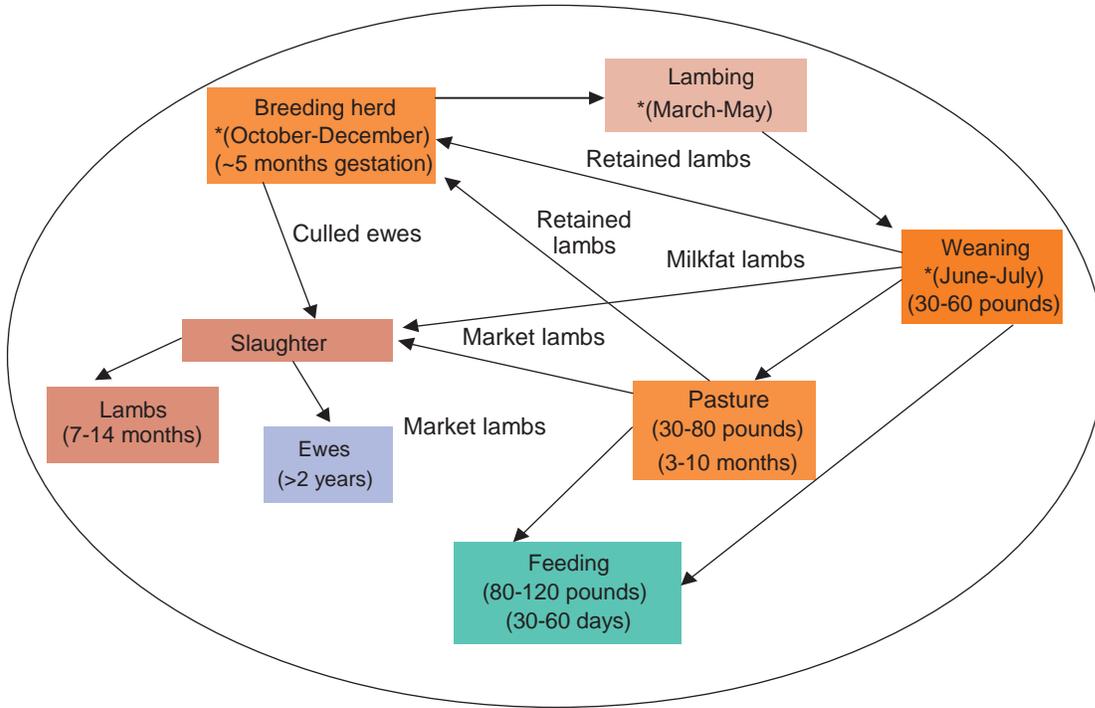
also affect production decisions and the cyclical pattern in the industry.

The strong downward trend in the sheep industry appears to have masked the typical livestock cycle exhibited by sheep. However, a distinct sheep cycle of 8-10 years can be seen over time. A cyclical, though irregular, pattern in the rate of change to sheep inventories is evident (fig. 3). Even though the trend had been downward, the sheep inventory showed signs of stabilizing in the late 1970s, only to resume the downward trend in 1982. A slight recovery in 1986 was again short-lived (USDA, NASS Sheep and Goats). Most of the stabilization/recovery periods were when wool prices were fairly attractive to producers. The current stage of the cycle suggests a slowing in the rate of decline over the next 5 years (2003-2007). The rate of decline has slowed since 1995 and, based on the cyclical pattern, may slow for 5 more years.

Location of the Sheep Industry

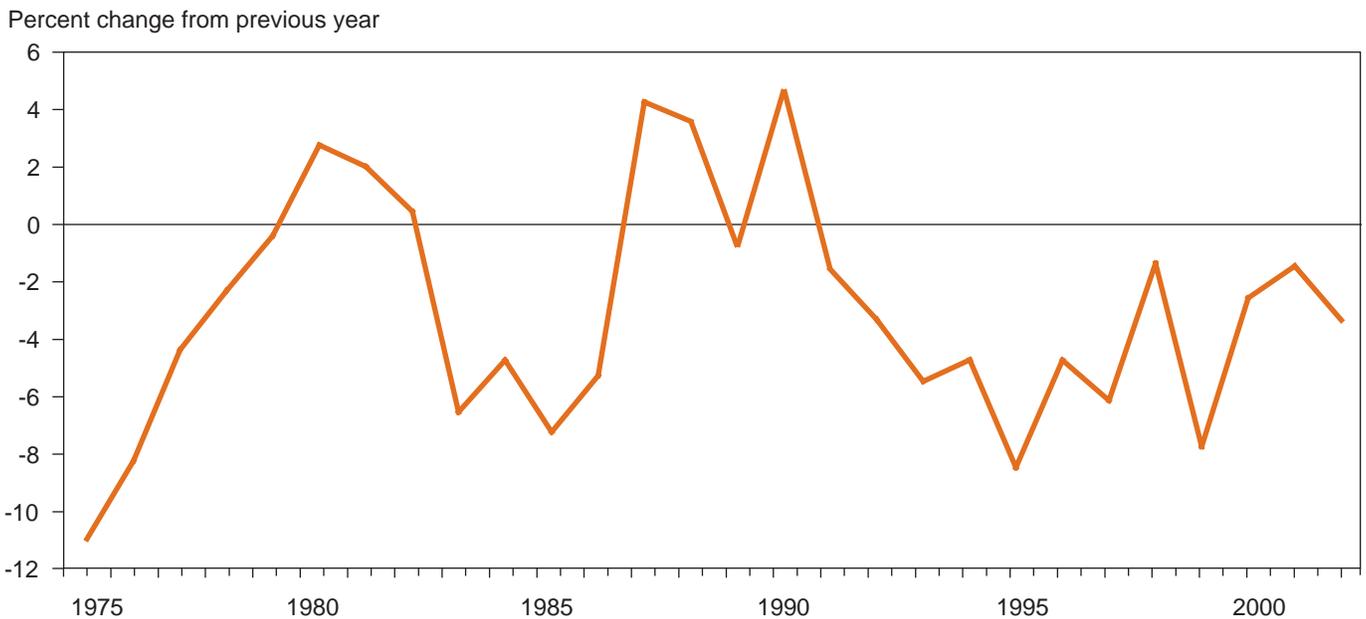
More than two-thirds of U.S. sheep production are produced in the Southern Plains, Mountain, and Pacific regions (fig. 4). The number of farms and the number of animals on farms in all regions (except New England) have declined significantly since 1975 (fig. 5). Still, several States have registered slight gains in recent years, mainly due to the preponderance of small hobby-type farms and the ease with which sheep can be integrated into these types of operations. Other major producing States have registered losses, primarily due to the exit of medium-size and large

Figure 2
Typical sheep production cycle



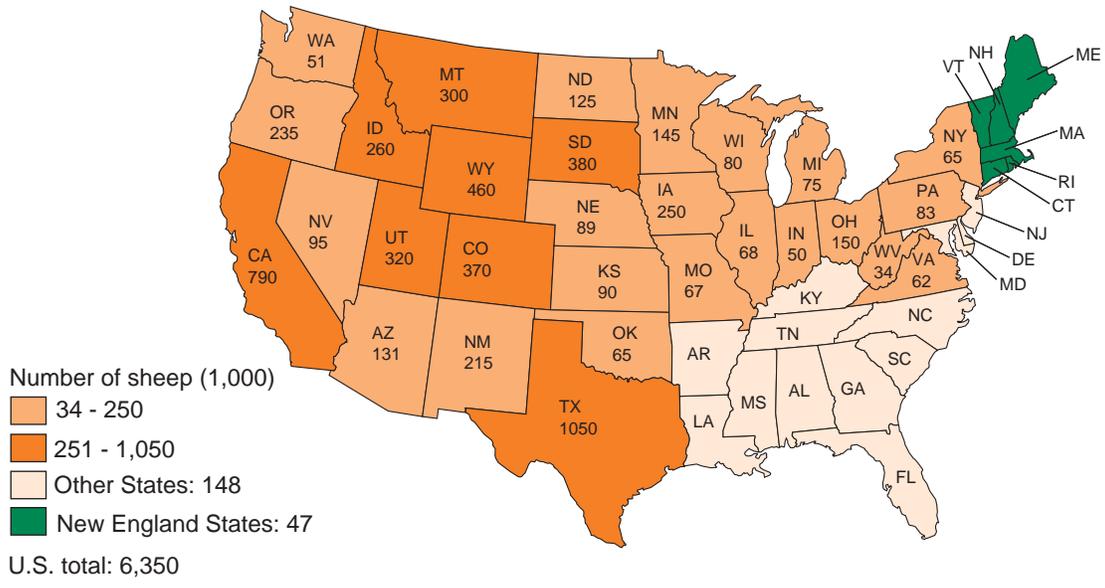
*Months indicate peak periods.

Figure 3
Changes in sheep inventory, 1975-2002



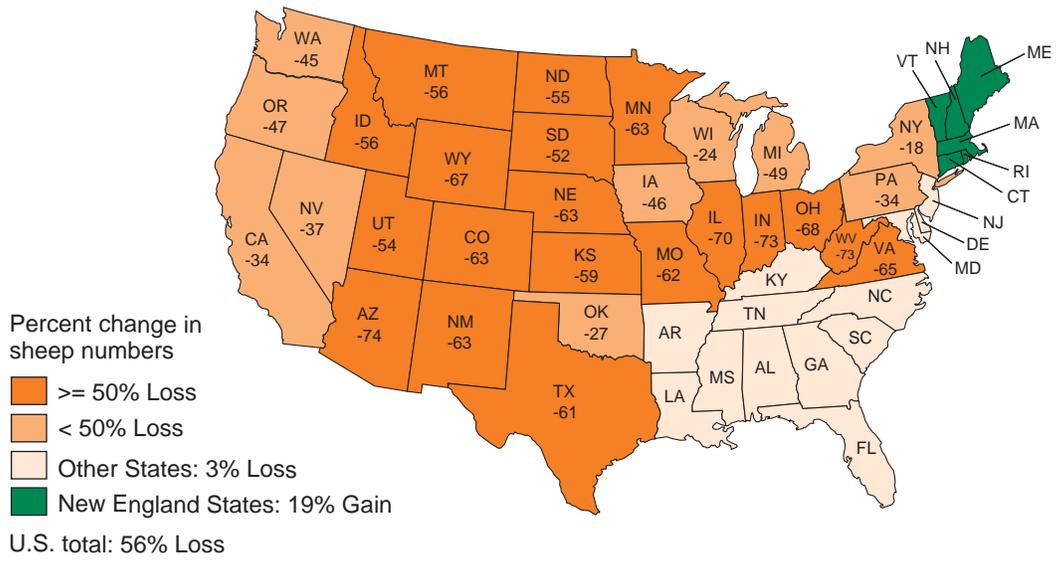
Source: U.S. Department of Agriculture, National Agricultural Statistics Service (NASS), compiled by Economic Research Service.

Figure 4
Distribution of U.S. sheep by State, January 1, 2003



Source: U.S. Department of Agriculture, National Agricultural Statistics Service (NASS).
 Compiled by Economic Research Service.

Figure 5
Change in U.S. sheep numbers by State, January 1, 1975 to January 1, 2003



Source: U.S. Department of Agriculture, National Agricultural Statistics Service (NASS).
 Compiled by Economic Research Service.

operations. Texas, California, and Wyoming remain the leading sheep-producing States.

The regional distribution of sheep operations has remained fairly constant over the past 25 years, due in part to the availability of large tracts of land suitable for sheep grazing. Public lands form about 30-40 percent of the sheep grazing lands in the West (Stillman et

al., 1990; and Williams and Davis, 1998). These are government lands controlled by either the Bureau of Land Management or the Forest Service, USDA. Grazing these lands is more cost effective than grazing on prepared pastures. Most of these lands are arid lands that are quite conducive to sheep grazing. The ability of sheep to thrive in arid environments and on marginal lands where they are more efficient than

other competing enterprises contributes to the heavy distribution of sheep in the West.

Markets for Sheep Products

Wool and lamb/mutton are joint products in the sheep industry. They are produced in fairly fixed proportions, although some sheep tend to produce more wool while others produce more meat. Because of this, the performance of the wool market can influence the performance of the lamb and mutton market. Wool demand and wool prices have sunk so low for the past few decades that the cost of adding value to wool (shearing, cleaning, and storing) sometimes exceeds the value of producing the wool. As a result, the viability of primary wool producers—and by extension lamb and mutton producers—has been threatened.

Wool Production and Use

Wool production is heavily influenced by prices. High wool prices often result in lower supplies of lamb and mutton since lambs will be held for increased shearing. Depressed wool prices tend to cause producers to liquidate their flocks, which often increases the supply of lamb and mutton to the market and reduces wool supply. Flock liquidation also results in a reduction in breeding stock. As U.S. wool use has declined, so too have wool prices, sheep numbers, and domestic wool production.

In 1975, U.S. wool production was 55.1 million clean pounds; by 2002, it had declined to less than 22 million clean pounds. Unaccounted wool use has equaled and exceeded U.S. wool production in recent years. Meanwhile, raw wool imports have also equaled or exceeded U.S. domestic production since 1975. (Raw wool is imported to satisfy domestic milling needs.) Although wool imports increased during the 1980s, the general trend has been a decline. Declines in domestic wool production and wool imports both reflect weakening U.S. demand for wool.

The decline in U.S. wool use began as far back as the end of World War II, when domestic wool use averaged 650 million clean pounds. The sagging demand for wool can be attributed to widespread consumer acceptance of non-cellulose manmade fibers such as nylon, polyester, and acrylic in formerly all-wool products.

The Australian wool market collapse of 1989/90—when reserve prices were removed from Australian wool and their stockpiles were in excess of 5 million bales—contributed to a further collapse of international wool prices. Stocks worldwide continued to grow due to lack of demand. Although lower prices created the potential for new market opportunities to replace synthetic fibers, low energy prices kept synthetic products competitively priced. The increased competition from synthetic fibers and the growing trend toward lighter weight, casual clothing weakened wool demand and led to even further declines in wool prices and herd liquidation. This disadvantage was compounded by the fact that U.S. wool does not sell into the high-priced apparel grades.

While lamb meat production has shown a significant gain in output per animal over the past two decades, wool production has remained fairly constant at about 8 pounds per animal over multiple shearings.

Lamb and Mutton Production

Lamb and mutton meat production has traditionally been closely linked to wool production. Through the years, commercial production has trended down (table 2) as a result of declining inventory. Productivity gains (output per animal) have been far outweighed by declining inventories. The average live weight of sheep and lambs (at slaughter) has increased from 104 pounds in 1975 to 141 pounds in 2002. Much of the gains have been achieved through new feed rations, improved feed efficiency, and an increase in the proportion of animals finished in feedlots.

Lamb and mutton production has consistently exhibited distinct seasonal patterns directly related to the seasonal differences in the number of animals slaughtered. Lamb generally accounts for 93 to 96 percent of total lamb and mutton production. Lamb production has consistently peaked in the spring of each year, for two reasons. First, biology requires that most lambs are born in the early spring and they typically are marketed within a 14-month period (lambs are classified as yearlings at about 14 months of age and as sheep at about 24 months). Second, lamb slaughter is highest in March or April, to coincide with the dates of the Easter/Passover holidays when demand for lamb meat is highest. Mutton production has consistently peaked in the fall due to increases in slaughter of older, non-producing, mature ewes. Producers typically make culling and retention decisions in the late summer and

Table 2—Lamb and mutton supply, utilization, and per capita consumption, 1975-2002¹

Year	Production ²			Total	Beginning stocks	Imports	Total supply	Exports	Ending stocks	Total disappearance ³	Per capita disappearance			Population ⁴ (mid-period)
	Commercial	Farm	Farm								Carcass weight	Retail weight	Retail boneless	
<i>Million pounds</i>														
1975	400.0	11.0	411.0	13.7	27.0	451.7	3.1	11.8	436.9	2.0	1.8	1.3	216.0	
1976	361.0	10.0	371.0	11.8	36.3	419.1	3.8	14.5	400.7	1.8	1.6	1.2	218.1	
1977	340.0	10.0	350.0	14.5	22.5	387.0	4.6	10.1	372.3	1.7	1.5	1.1	220.3	
1978	301.0	9.0	310.0	10.1	39.3	359.4	3.2	11.7	344.5	1.5	1.4	1.0	222.6	
1979	282.0	9.0	291.0	11.7	44.3	347.0	1.4	10.8	334.9	1.5	1.3	1.0	225.1	
1980	310.0	8.0	318.0	10.8	33.2	362.0	1.5	9.1	351.3	1.5	1.4	1.0	227.7	
1981	328.0	10.0	338.0	9.1	31.1	378.2	2.4	10.5	365.3	1.6	1.4	1.0	230.0	
1982	356.0	9.0	365.0	10.5	21.0	396.5	1.7	8.7	386.2	1.7	1.5	1.1	232.2	
1983	367.0	8.0	375.0	8.7	18.1	401.8	1.4	10.7	389.7	1.7	1.5	1.1	234.3	
1984	371.0	8.0	379.0	10.7	20.0	409.7	1.9	7.1	400.7	1.7	1.5	1.1	236.4	
1985	352.0	7.0	359.0	7.1	36.5	402.5	1.0	12.8	388.7	1.6	1.5	1.1	238.5	
1986	331.0	7.0	338.0	12.8	41.1	391.9	1.2	12.6	378.1	1.6	1.4	1.0	240.7	
1987	309.0	6.0	315.0	12.6	44.0	371.6	1.5	7.9	362.2	1.5	1.3	1.0	242.8	
1988	329.0	6.0	335.0	7.9	51.2	394.1	1.4	6.1	386.7	1.6	1.4	1.0	245.1	
1989	341.0	6.0	347.0	6.1	46.4	399.5	4.8	7.6	387.0	1.6	1.4	1.0	247.4	
1990	358.0	5.0	363.0	7.6	40.8	411.4	5.7	8.4	397.3	1.6	1.4	1.0	250.0	
1991	358.0	5.0	363.0	8.4	41.1	412.5	9.4	6.3	396.8	1.6	1.4	1.0	252.7	
1992	343.0	5.0	348.0	6.3	49.9	404.2	7.8	7.9	388.5	1.5	1.4	1.0	255.4	
1993	329.0	8.0	337.0	7.9	52.8	397.7	8.3	8.4	381.0	1.5	1.3	1.0	258.1	
1994	304.0	4.0	308.0	8.4	49.4	365.8	8.6	10.9	346.3	1.3	1.2	0.9	260.6	
1995	281.0	4.0	285.0	10.9	63.5	359.5	5.9	7.6	345.9	1.3	1.2	0.9	263.1	
1996	264.0	4.0	268.0	7.6	72.5	348.1	5.7	8.9	333.5	1.3	1.1	0.8	269.5	
1997	257.0	3.0	260.0	8.9	83.0	351.9	5.8	13.7	332.4	1.2	1.1	0.8	272.8	
1998	248.0	3.0	251.0	13.7	112.3	377.1	5.8	11.7	359.6	1.3	1.2	0.9	276.0	
1999	244.0	4.0	248.0	11.7	112.0	372.2	5.3	8.7	358.2	1.3	1.2	0.9	279.2	
2000	230.0	4.0	227.0	9	130.0	372.0	5.0	13.0	354	1.3	1.1	0.9	282.5	
2001	223.0	4.0	227.0	13	146.0	386	7.0	12	368	1.3	1.1	0.9	285.9	
2002	219.0	4.0	223.0	12	162.0	397	7.0	7.0	383	1.3	1.1	0.9	287.5	

¹Totals may not add due to rounding.

²Cold storage data converted to carcass weight equivalent basis.

³Shipments to U.S. territories are included in total disappearance.

⁴Source: Department of Commerce, Bureau of Economic Analysis; 1995-2000 data reflect revisions released 8/1/00.

Source: Economic Research Service, National Agricultural Statistics Service, USDA.

fall after lambs are weaned and before animals are bred for the next season. Apart from demand for lamb meat being lowest in the summer and fall, retention of lambs for new breeding stock further reduces the number of marketable lambs.

Lamb and Wool Prices

Prices are central to determining consumer demand and farm-level production, but they are not the only factors governing these decisions. Retail prices, the prices seen by consumers, are a function of retail-level supply and demand conditions. For most animal products, an intricate set of marketing activities takes place from the time the live animal leaves the farm to when it reaches its final consumer. The extent of these marketing activities will both facilitate movement of the product and influence the difference between the farm price and the retail price.

Lamb and wool prices have been unable to fully support a recovery in the sheep industry. Market prices (deflated by the consumer price index) for both wool and meat have trended downward since 1975, with real wool prices declining at a much faster rate. The ratio of lamb price to input price has also declined. At the same time, international traders are competing effectively in the U.S. lamb and wool market.

Figure 6 shows indexes of lamb and wool prices received by producers deflated by the consumer price index. Clearly, real slaughter lamb prices have declined since 1975. However, slaughter lamb prices have exhibited great variation, suggesting that prices have moved with market forces and have varied with the typical livestock cycle. Jones and Purcell (1993) have argued that slaughter lamb prices are influenced more by supply than consumer demand. Ward (1998) supports this finding by graphing slaughter lamb prices and domestic lamb production for the same time period, resulting in a near-mirror image. When lamb production increased, slaughter lamb prices typically decreased.

Figure 7 shows the trend in real wholesale lamb price. Here, the wholesale carcass price is represented by the East Coast prices for choice and prime lamb. Wholesale carcass price for lamb also exhibits a high degree of cyclical variation, though slightly less than slaughter lamb price. It also shows a strong correlation with the slaughter lamb price. Again, the trend shows a decline in real wholesale lamb prices.

In 1999, Congress passed the Livestock Mandatory Price Reporting Act. With the changes from a voluntary price reporting system to a mandatory price reporting system, a number of alterations were made in how USDA data were aggregated and reported. These have made year-to-year comparisons of slaughter and wholesale lamb prices difficult since some of the information is either no longer available, or is redefined.

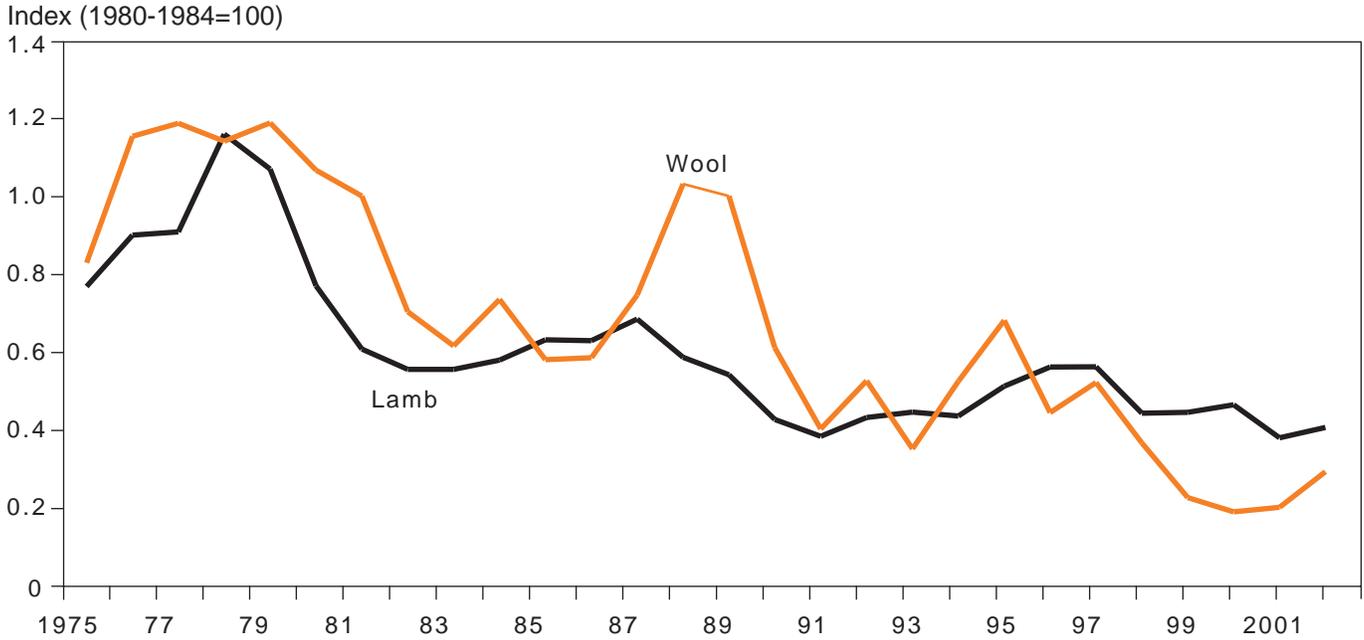
Since 1975, real wool prices have also trended downward (fig. 6), and at a much faster rate than lamb prices. A cyclical pattern can also be seen in wool prices. The wool price support program, which was in effect from 1954 to 1995, played a key role in reducing the impact of the wool industry's decline. The decline was most dramatic during the mid-1990s to late 1990s when the wool support programs were removed. Wool prices have seen dramatic declines, especially throughout 2001, although a slight recovery occurred in 2002.

Concentration in the Meatpacking Industry

Packer concentration is another issue facing sheep producers. Many producers believe that their share of the price received for lamb meat is too small. Market power exerted as a result of packer concentration is suggested as one of the main causes of the small share of retail price that producers receive. Price spreads are one way of measuring performance of the meat marketing sector. The increasing spread between farm and retail price has been cited as evidence that changes in market structure have eroded prices to farmers. Meat price spreads show how the value of an animal and the resulting meat products changes as the animal moves from farm to packer to retailer (Hahn, 2002).

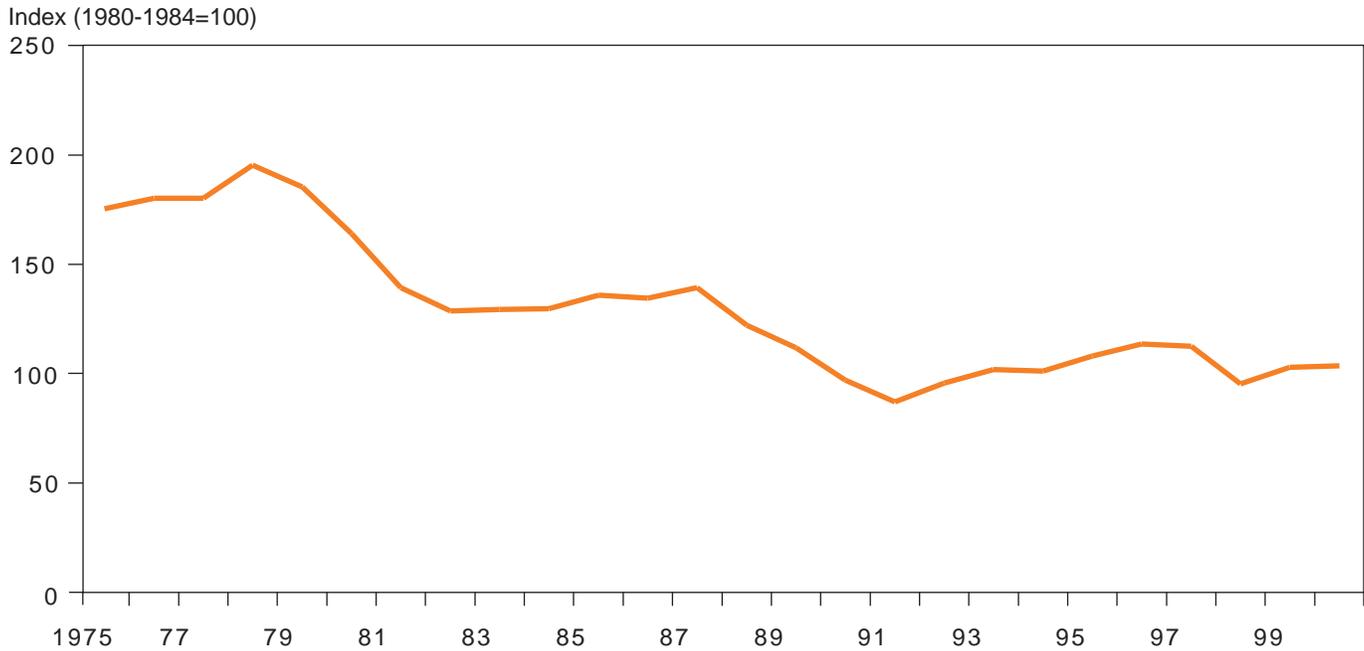
The trend shows a continued divergence of the farm-to-wholesale price spread for live lambs (fig. 8). The price spread gives an indication of the marketing margin. The live-to-wholesale price spread measures the changes in marketing cost (Mathews Jr., et al., 1999). Changes in price spread include changes in cost efficiency for transporting, slaughtering, and converting the live lamb to a carcass. With everything else held constant, increased cost efficiency suggests reduced price spread while inefficiency results in a widening of price spreads. However, if industries become more

Figure 6
Real prices received by farmers for lamb and wool, 1975-2002



Source: U.S. Department of Agriculture, National Agricultural Statistics Service (NASS). Compiled by Economic Research Service.

Figure 7
Real wholesale price for lamb, 1975-2000



Source: U.S. Department of Agriculture, National Agricultural Statistics Service (NASS). Compiled by Economic Research Service.

Livestock Mandatory Reporting Act

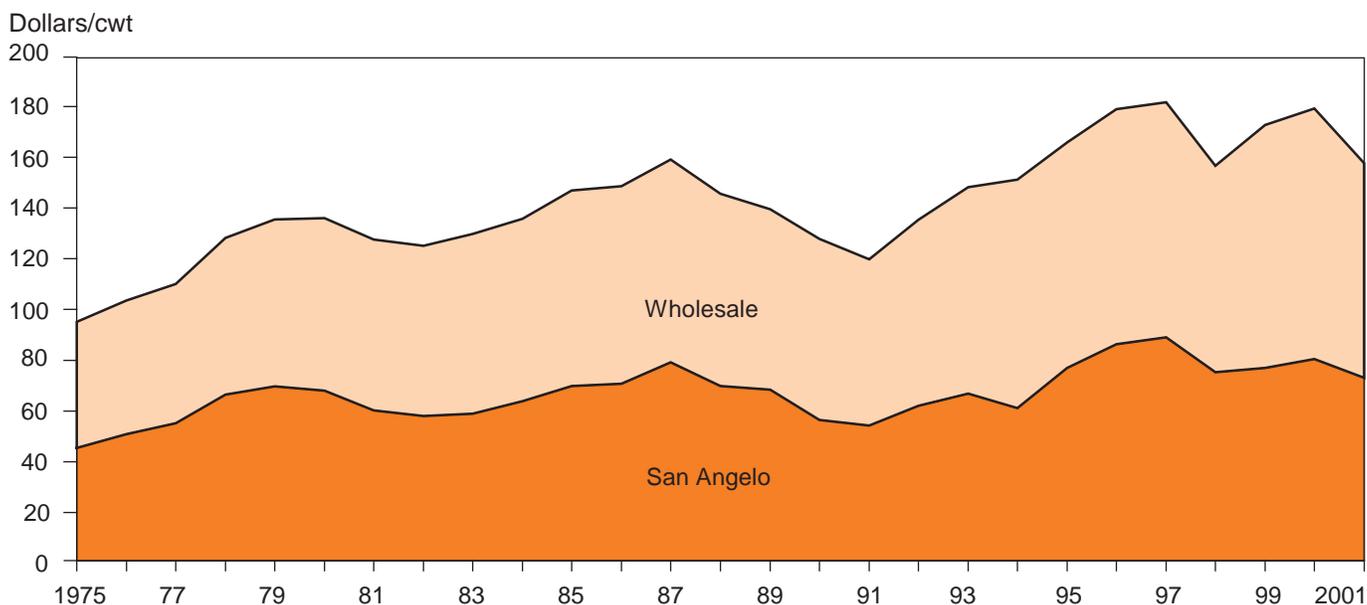
The Livestock Mandatory Reporting Act (LMRA) of 1999 requires USDA to publish mandatory data on livestock and meat markets in a manner that protects the identity of reporting entities and preserves the confidentiality of proprietary transactions. As a result, portions of the daily lamb prices were withheld from publication for reasons of confidentiality when mandatory reporting commenced in April 2001. Under what is called “the 3/60 guidelines,” data were published in a report only if at least three reporting entities had supplied the data, and no single entity was responsible for reporting 60 percent or more of the data. Due to the small number of reporting packers in the lamb market, several reports had to be withheld during the second and third quarters of 2001. This resulted in no available data for calculating live lamb-to-wholesale spreads during this period.

On August 3, 2001, USDA announced new reporting guidelines that adopted “3/70/20 confidentiality guidelines,” which resulted in an improvement in the percentage and frequency of market information released to the public. The following guideline elements have been adopted:

- At least three entities must provide data at least 50 percent of the time over the most recent 60-day time period;
- No one entity may provide more than 70 percent of the data for a report over the most recent 60-day time period — to ensure that no single entity is providing such a large proportion of the data that its identity might be revealed; and
- No one entity may provide data more than 20 percent of the time, as the only entity, over the most recent 60-day time period — to protect the identity of an entity when it is the only plant providing data.

Other safeguards were also used to prevent one reporting entity from dominating market activity during individual reporting periods.

Figure 8
U.S. slaughter lamb and wholesale spread, 1975-2001



Source: U.S. Department of Agriculture, Agricultural Marketing Service (AMS). Compiled by Economic Research Service.

Table 3—U.S. wool production and supply, 1975-2002

Year	Stock sheep, Jan. 1	Unshorn lambs	Sheep shorn	Yield	Million greasy lbs			Beginning stock, Jan. 1	Production	Imports	Unaccounted supply	Total
					Shorn wool	Pulled wool	Million clean lbs					
1975	10.5	4.0	12.9	8.0	102.9	1.05	8.4	55.1	78.1	7.4	191.6	
1976	11.4	4.2	13.2	8.0	106.1	1.04	7.5	62.2	57.5	-2.8	164.4	
1977	11.3	4.5	13.5	8.1	109.8	1.24	1.6	58.5	52.0	-2.7	150.4	
1978	11.1	4.1	13.3	8.0	105.4	1.14	2.0	55.1	50.4	-16.7	164.2	
1979	10.8	3.9	13.1	8.0	104.9	0.94	8.5	56.1	42.3	17.2	164.1	
1980	11.1	4.1	13.3	8.0	105.4	1.14	6.8	56.4	56.5	9.9	169.6	
1981	11.3	4.5	13.5	8.1	109.8	1.24	5.9	58.8	74.3	9.7	188.7	
1982	11.4	4.2	13.2	8.0	106.1	1.04	9.8	56.8	61.4	7.5	175.5	
1983	10.4	4.8	12.9	8.0	102.9	1.05	8.4	55.1	78.1	8.9	200.5	
1984	9.8	4.6	12.3	7.8	95.5	1.05	8.9	51.1	94.2	-10.0	194.2	
1985	8.8	4.7	11.2	7.9	87.9	1.05	1.6	47.2	79.5	-9.6	168.7	
1986	8.7	4.6	10.8	7.8	84.4	1.05	0.6	45.3	97.0	-8.6	184.3	
1987	9.1	4.8	10.9	7.8	84.5	1.04	6.8	45.3	105.1	-8.1	189.1	
1988	9.4	4.6	11.5	7.8	89.5	1.04	5.3	48.0	96.7	-0.2	189.8	
1989	9.2	4.4	11.3	7.9	89.2	1.05	5.9	47.8	106.9	-5.4	205.2	
1990	9.6	4.9	11.2	7.8	88.0	0.58	9.2	46.8	71.7	7.1	214.8	
1991	9.4	5.1	11.0	8.0	87.7	0.57	9.4	46.7	86.5	7.1	219.7	
1992	8.9	4.8	10.5	7.9	82.9	0.56	4.3	44.1	89.3	4.5	202.2	
1993	8.1	4.4	10.0	7.8	77.5	0.54	8.0	41.2	100.3	7.0	196.5	
1994	7.2	3.9	8.9	7.7	68.6	0.43	7.2	36.5	91.7	42.5	207.9	
1995	6.4	3.6	8.1	7.8	63.5	0.35	1.7	33.7	88.8	30.0	204.2	
1996	6.2	3.3	7.3	7.8	56.7	0.25	6.2	30.0	75.4	30.0	191.6	
1997	5.9	3.1	7.0	7.7	53.9	0.24	4.1	28.4	76.4	30.0	178.9	
1998	5.6	3.0	6.4	7.7	49.3	0.23	0.9	26.1	70.5	25.0	152.6	
1999	5.3	2.8	6.2	7.6	46.6	0.23	6.2	24.8	43.1	20.0	124.1	
2000	5.2	NA	6.1	7.6	46.4	NA	42.9	24.5	45.0	20.0	132.4	
2001	5.0	NA	5.7	7.6	43.0	NA	48.6	22.8	35.6	20.0	127.0	
2002	5.0	NA	5.5	7.5	41.2	NA	54.5	21.8	24.6	20.0	120.0	

Source: U.S. Dept. Comm., Bureau of the Census, and U.S. Dept. Agriculture, Economic Research Service, *Cotton and Wool Situation and Outlook*.

competitive, spreads can also decline as excess profits are eliminated.

Several other factors may affect price spread. Though transportation has become more efficient, the cost of slaughtering and converting the live lamb to a carcass has increased. As a result, the trend shows a widening price spread. In 1975, the live-lamb-to-wholesale price spread averaged less than \$50 per cwt. By 1980, the price spread had increased to \$68.02 per cwt, a 37-percent increase (table 4). In 2000, the live-lamb-to-wholesale price spread was \$98.83 per cwt, a 99-percent increase since 1975. But in 2001, the spread fell 14 percent to \$84.57 per cwt. (In 2002, due to requirements of confidentiality in the Livestock Mandatory Price Reporting Act and the thinness of the lamb market, prices were not reported on a regular basis.)

The reduced price spread in 2001 suggests two possible reasons. Either packers had to reduce margins to move larger quantities of overfinished lambs, or the change from a voluntary to a mandatory price reporting system—and alterations made in how USDA aggregates and reports its data—may make year-to-year comparisons difficult since the information is no longer from the same sources.

While the price spread may give some insight into the potential effects of concentration, it is not definitive since it does not directly relate to the efficiencies from transporting, slaughtering, and converting from live animal to carcass. Concentration refers to the inequality in which a particular attribute is distributed among members of a group or population (McBride, 1997). As such, an indication of the changes in size and distribution of meatpacking plants over time will

shed light on the degree of concentration in the lamb and mutton industry.

The lamb and mutton industry mirrors the structure of the rest of the livestock industry. A large number of producers sell to a concentrated industry where fewer packers handle the animals (Paarlberg and Lee, 2001). The Herfindahl index (HHI) weighs firms by the square of their market share and is commonly used to measure concentration. According to Paarlberg and Lee, Herfindahl indexes and concentration ratios calculated from federally inspected slaughter data indicate that concentration in the sheep industry increased in the 1990s. However, USDA's Grain Inspection, Packers and Stockyards Administration (GIPSA) Statistical Report indicates that HHI increased from 1,580 in 1990 to 1,917 in 1995, but decreased to 1,416 in 1999.

Data on annual slaughter show that, since 1985, the number of plants with annual slaughter of less than 1,000 head has declined steadily. At the same time, more than four-fifths of all sheep are slaughtered and processed in plants with annual slaughter of 100,000 head or more. However, in 1994, the 8 largest plants slaughtered just over 83 percent of all animals and, in 2000, the 8 largest plants slaughtered 85 percent of all sheep and lambs (table 5). This indicates that while high concentration exists in the industry, recent increase in concentration has been negligible.

A review of federally inspected plants in the United States between 1990 and 1999 also suggests no significant change in the degree of concentration. Instead, plant location was found to be a function of the location of the producers as well as the type of product that was needed by the consumer (tables 6 and 7).

Table 4—Live lamb and wholesale price, selected years, 1975-2002

Year	San Angelo price	Wholesale lamb price	Live to wholesale spread
		<i>Dollars/cwt.</i>	
1975	44.45	94.0	449.60
1980	67.00	135.0	268.02
1985	68.80	145.9	377.13
1990	55.42	126.8	471.43
1995	75.86	164.8	588.99
2000	79.40	178.2	398.83
2001	72.04	156.6	284.57
2002	72.31	N/A	N/A

Source: Economic Research Service and Agricultural Marketing Service, USDA.

Table 5—Sheep and lambs: Federally inspected plants and head slaughtered annually, by size, United States, 1980-2000

Year	Plant slaughtering capacity:												Total	
	Less than 1,000		1,000 - 9,999		10,000 or more ¹		25,000 - 99,999		100,000 - 499,999		500,000 or more		Plants No.	Head 1,000
1980	793	60	32	95	24	5,250						849	5,405	
1985	923	79	57	172	28	5,695						1,008	5,946	
1990	726	72	59	180	30	5,203						815	5,455	
1994	567	57	58	191	11	170	8	377	4	1,046	4	652	4,756	
1995	541	50	51	169	10	164	7	331	5	1,234	3	617	4,388	
1996	521	50	48	139	10	160	7	327	4	962	3	593	4,061	
1997	498	45	50	160	9	150	5	215	6	1,351	3	571	3,817	
1998	487	40	47	152	8	136	6	266	6	1,614	2	556	3,657	
1999	488	44	51	172	9	148	5	177	6	1,635	2	561	3,554	
2000	471	48	50	163	8	121	4	160	3	490	5	541	3,308	

¹Size limits are 10,000 - 24,999 beginning in 1994.

Source: U.S. Department of Agriculture, National Agricultural Statistics Service (NASS), *Sheep and Goats*, various years, 1980 - 2001.

Table 6—Regional distribution of federally inspected plants that slaughter sheep, by plant size, 1990

Region	Size of plant (head)				Share of total
	<100	100 - 999	1,000 - 4,999	5,000+	
	<i>Number</i>				<i>Percent</i>
Northeast	1,275	147	49	12	33.27
Lake States	431	10	4	10	10.21
Corn Belt	490	16	12	91	1.82
Northern Plains	248	8	2	4	5.88
Appalachian	171	14	4	1	4.26
Southeast	321	1	1	0	0.76
Delta States	76	2	1	0	1.77
Southern Plains	203	13	2	4	4.98
Mountain	651	59	8	16	16.47
Pacific	372	53	5	4	9.74
Other	36	1	0	0	0.83
<i>Percentage of total plants</i>					
Percentage by plant size	89.41	7.27	1.97	1.35	100.00

Source: U.S. Department of Agriculture, Food Safety and Inspection Service.

Table 7—Regional distribution of federally inspected plants that slaughter sheep, by plant size, 1999

Region	Size of plant (head)				Share of total
	<100	100 - 999	1,000 - 4,999	5,000 +	
	<i>Number</i>				<i>Percent</i>
Northeast	697	113	38	93	2.15
Lake States	259	6	4	8	10.39
Corn Belt	318	12	6	10	12.96
Northern Plains	93	4	1	1	3.71
Appalachian	129	18	5	1	5.74
Southeast	67	4	1	0	2.70
Delta States	27	0	0	0	1.01
Southern Plains	165	5	3	6	6.71
Mountain	341	27	5	9	14.33
Pacific	210	23	9	5	9.26
Other	27	0	0	0	1.01
<i>Percentage of total plants</i>					
Percentage by plant size	87.51	7.95	2.70	1.84	100.0

Source: U.S. Department of Agriculture, Food Safety and Inspection Service.

Nearly 4,000 federally inspected plants in the United States slaughtered sheep and lambs in 1990. Larger plants tended to be near large numbers of sheep. However, most slaughter facilities are near high-population areas, reflecting both consumer preferences for fresh meat and the location of consumers preferring

mutton and lamb meat. Thirty-four percent of these plants were in the Northeast—one of the largest consuming regions for lamb and mutton. Almost 90 percent of plants were small (annual slaughter of less than 100 head), while less than 5 percent had annual slaughter of 1,000 head or more.

By 1999, the number of plants in the United States that slaughtered sheep fell to 2,666 (table 7). The location of plants did not change significantly. However, plant size grew—those with annual slaughter of 1,000 head or more increased to almost 5 percent.

Lamb and Mutton Consumption

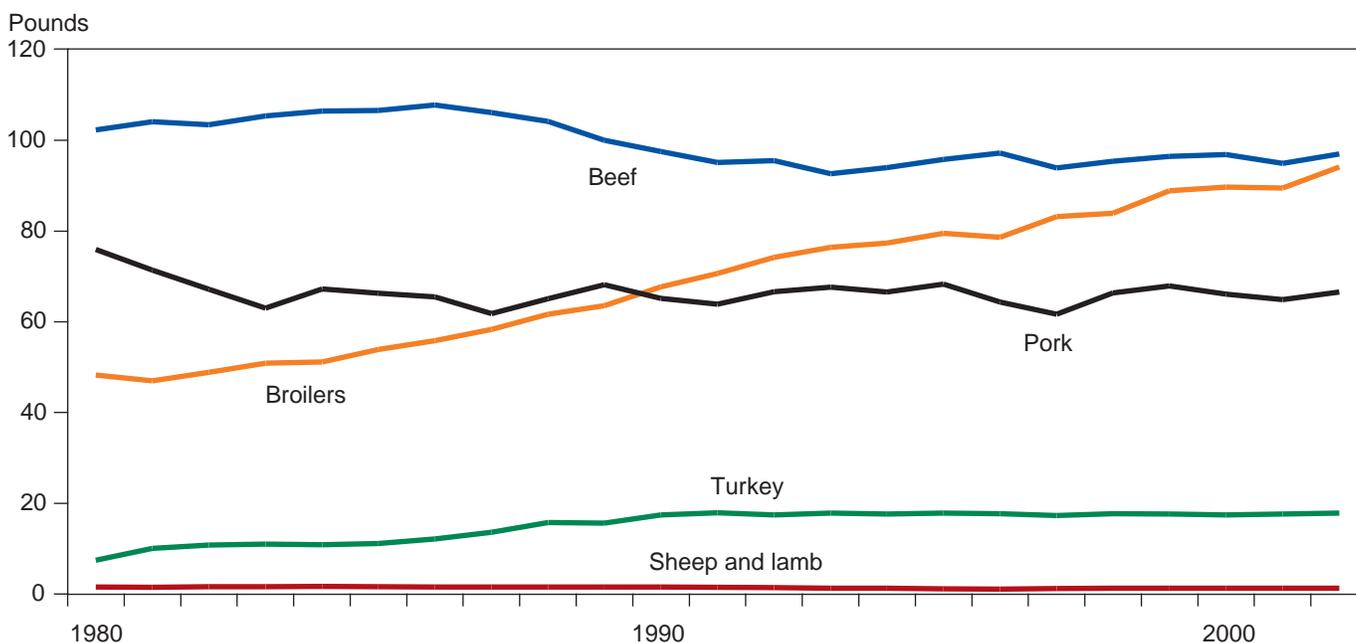
As wool use has declined, so too has U.S. lamb and mutton consumption. The markets for both lamb and mutton have weakened as stock sheep inventories have declined. Consumption has declined from 4.5 pounds per capita (retail weight bone in) in the early 1960s to 1.1 pound in 2002. While information on lamb consumer behavior is limited, survey data indicate the lack of a broad consumer base. Consumption has hovered just above 1 pound for the past decade.

In reality, most Americans eat no lamb at all, while some consume much more than a pound. In two national cross-sectional surveys reported by the National Research Council, conducted in 1977 and 1985, 1.3 percent of U.S. women and 1.9 percent of men ate lamb. The Nationwide Food Consumption Survey (NFCS) indicates that average weekly expenditures on lamb are about 5 percent of beef, and that lamb is purchased by fewer than 5 percent of households on a weekly basis.

While per capita consumption of other major meats has grown or held steady since the early 1980s, sheep and lamb consumption has not (fig. 9). Lamb consumers prefer the high-value cuts such as legs and loins, while producers (farmers), or processors, and retailers struggle to sell the remaining cuts. U.S. sheep growers are less inclined to produce when the returns from the whole carcass are based primarily on a few desirable cuts, causing domestic demand to exceed domestic production. As a result, Australia and New Zealand have been able to penetrate the U.S. lamb market with desirable cuts at a competitive price, while marketing less preferred cuts in their domestic and other markets.

Total lamb and mutton consumption has generally declined since 1975, though there has been some cyclical pattern in consumption (fig. 10). In 1975, the U.S. market demand for lamb totaled 437 million pounds. Consumption increased from 333 million pounds in 1996 to 383 million pounds in 2002 due to a rapid increase in imports. However, population increases have matched or outweighed increases in total lamb and mutton consumption, for steady per capita consumption (carcass weight) of 1.3 pound (fig. 11).

Figure 9
U.S. annualized per capita meat and poultry disappearance, 1980-2002

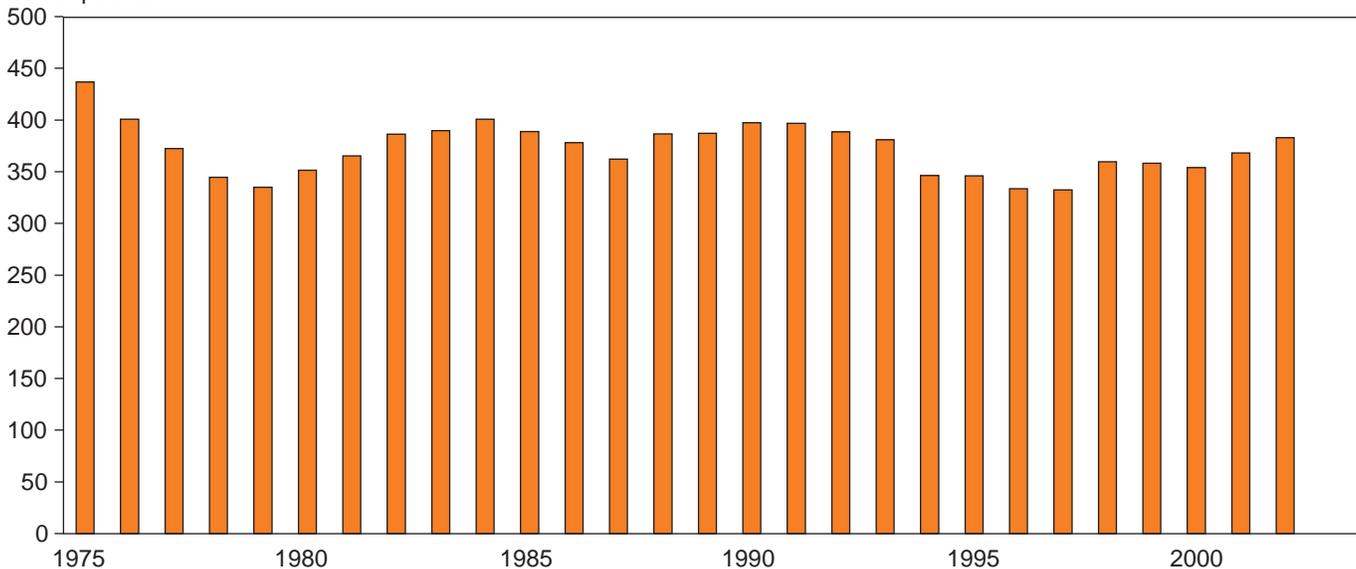


Source: U.S. Department of Agriculture, National Agricultural Statistics Service (NASS). Compiled by Economic Research Service.

Figure 10

Total lamb and mutton disappearance, 1975-2002

Million pounds

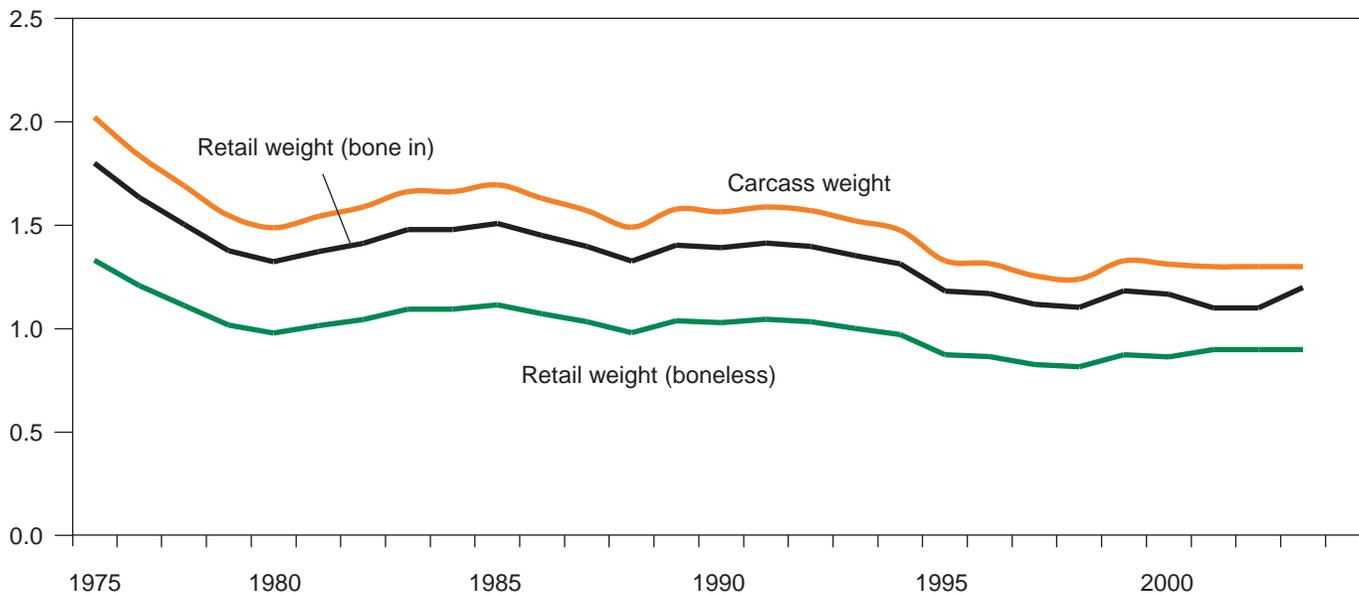


Source: U.S. Department of Agriculture, National Agricultural Statistics Service (NASS). Compiled by Economic Research Service.

Figure 11

Per capita consumption of lamb, 1975-2002

Pounds



Source: U.S. Department of Agriculture, National Agricultural Statistics Service (NASS). Compiled by Economic Research Service.

The location of lamb and mutton consumers has changed very little over time (Bastian and Whipple, 1998). Unlike other meats and poultry, where consumption is evenly dispersed throughout the United States, the East and West Coast markets are the primary consumers of lamb.

In the past two decades, the low volume and lack of trend in U.S. lamb consumption is more apparent when compared with major consuming countries such as Australia and New Zealand. Since lamb is generally a higher priced product than beef, pork, or poultry, consumers will likely substitute these products for lamb unless they have other strong preferences. Also, consumers tend to substitute lower priced goods for higher priced lamb when economic conditions dictate. Whipple and Menkhaus (1988) found that significant shifts in lamb demand occurred in the 1980s (when compared with previous years), and that the decline was probably due to nonprice (example, health and convenience) and income effects.

Lamb as a staple seems more typical of Middle Eastern, African, Latin American, and Caribbean consumers. Consumption has remained constant within these groups. The typical lamb consumer is an older, relatively well-established ethnic minority who lives in a metropolitan area like New York, Boston, or Philadelphia in the Northeast or San Francisco or Los Angeles on the West Coast, and who prefers to eat only certain lamb cuts (TAMRC, 1991). In contrast, beef, pork, and poultry buyers tend to be geographically dispersed, younger, less ethnically oriented, and accepting of a wider variety of meat cuts.

Grades and Standards

Grading is often used to differentiate products and to satisfy consumer demand based on their willingness to pay for different meat cuts. Under the Agricultural Marketing Act of 1946 (60 Stat. 1087; U.S.C. 1621-1627), grades and standards for lamb and mutton carcasses were promulgated by the Secretary of Agriculture. However, official standards for grades of lamb and mutton carcasses were first initiated in February 1931. Through the years, several amendments have been made to more appropriately represent the grading designation with the most significant amendment for U.S. producers in 1992.¹

¹ Amendments were made in 1940 to change the designation from medium and common to commercial and utility. A 1951 amend-

This amendment, in July 1992, represented the sheep industry's attempt to meet consumer preferences for lean meat by revising grading standards to couple quality and yield grades. Quality relates to palatability, indicating characteristics of the lean. Yield is determined by the percentage of closely trimmed (0.01 inch fat or less) semi-boneless and boneless, the major retail cuts derived from the carcass. The aim of these changes was to alert producers to consumer preferences. The amendment required that carcasses be identified for both their quality and yield when officially graded. This eliminated the leg conformation score as a yield grade standard, and narrowed or shifted the allowable fat thickness in each yield grade. Lamb feeders, slaughterers, and processors fought this amendment because fed lambs—with intrinsically higher fat content—will normally score out at lower grades and therefore fetch lower prices. It was felt that this disadvantaged U.S. lamb feeders versus New Zealand and Australian exporters who produce a leaner, grass-fed lamb. (Detailed information on the USDA, AMS official grades and standards are available online at: www.ams.usda.gov/lsg/stand/standards/lamb-car.pdf.)

International Trade

Australia and New Zealand dominate global lamb and mutton trade. This suggests that these countries have a comparative advantage in producing lamb. Imports from Australia and New Zealand continue to make up a growing share of total U.S. consumption of lamb meat. The U.S. comparative advantage appears to be in the live sheep trade. Though the U.S. has generally been a net exporter of live animals, trading mostly with Canada and Mexico, imports of live animals have increased steadily since 1975.

Lamb and Mutton Trade

Meyer and Anderson (1998) report that the history of U.S. lamb and mutton imports has been one of ups and downs, with a seasonal component. Imported lamb increases in the spring, peaking in March–May, then

ment designated prime and choice as Prime, and the good grade was designated as Choice. At the same time, choice also became the highest grade for mutton. A 1957 amendment reduced the quality requirements for prime and choice grades for more mature lambs but maintained the quality requirements for young lambs. In 1960, both the conformation and quality requirements for prime and choice were amended. In 1969, grades and standards were again revised by adopting yield grade standards to use with the quality grade. The amendments made in 1980 and 1982 allowed for grading in carcass form in establishments where animals were slaughtered or initially chilled.

declines over the rest of the year, save for small increases in September. In the four decades since 1960, lamb and mutton imports have come full circle, from 153 million pounds in 1969 to 18.1 million pounds in 1983 to 162 million pounds in 2002. Net imports (total imports minus total exports) as a percent of disappearance have ranged from a low of 4.3 percent in 1983 to a high of 40.5 percent in 2002.

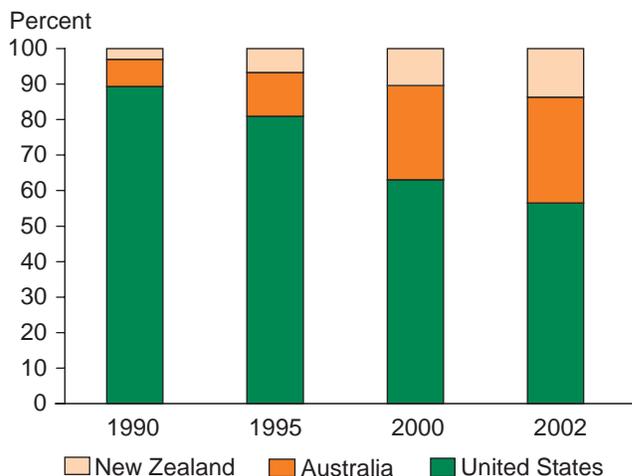
Lamb imports rise when declines in domestic production cause prices to increase, and vice versa. Nearly all lamb and mutton imports come from Australia and New Zealand.

Population-driven stability in U.S. lamb and mutton consumption (per capita) in the face of declining U.S. production has led to increased imports, especially in the 1990s. In 1975, lamb and mutton imports were 27 million pounds, only 6 percent of U.S. lamb and mutton consumption. Imports fluctuated between 1975 and 1985, increasing to 46 million pounds in 1979, but falling beneath 20 million pounds in 1983. Lamb and mutton imports have surged since the mid-1980's, with very sharp increases since 1994. In 2002, lamb and mutton imports were 11.2 percent higher than in 2001, and 500 percent higher than in 1975.

The share of imports from New Zealand and Australia has remained fairly constant since 1988. Imports, which currently account for 40 percent of U.S. consumption, are nearly all from Australia (59 percent) and New Zealand (39 percent) (fig. 12). Australia and New Zealand account for more than 70 percent of world lamb and mutton exports. Over the years, Australia and New Zealand have adjusted to low wool prices and the shrinking wool industry by restructuring their sheep industry to focus on lamb and mutton meat production. Producers there undertook genetic improvement initiatives that have shifted a significant portion of their sheep flock to either dual-purpose animals (wool breeds with good meat-producing ability) or primary meat breeds. With most lambs grass-fed, high fat content (carcass needs to exhibit fat streaking to grade Choice or Prime) was not a problem. This has helped fuel the growth in exports for both Australia and New Zealand. U.S. producers have recently embarked on similar initiatives, but research and breeding have yet to boost lamb exports.

Figure 12

Share of total lamb and mutton consumption



Following the rapid rise in lamb imports in the mid-1990s, U.S. lamb producers felt economic conditions threatened their existence (U.S. International Trade Commission, 1999). Inventories and the number of sheep producers had declined rapidly, especially between 1992 and 1997. Farm prices and live slaughter-lamb prices had dropped 31 percent between March 1997 and October 1998 alone. While federally inspected sheep and lambs slaughtered in U.S. plants dropped well below 4 million head, the number of live animals imported and slaughtered in U.S. plants increased significantly over 1992-2002.

Threatened by the surge of low-priced, imported lamb meat, many U.S. producers felt they could not remain competitive and sought temporary protection. This led to Section 201 of the Trade Act of 1974, which is geared toward providing temporary import relief (discussed in the next chapter).

Lamb and Mutton Exports

The U.S. sheep industry has never been a significant international meat trader. Exports have consistently been below 3 percent of production. U.S. lamb and mutton exports in 1975 were 3 million pounds. During the early 1990s, exports rose rapidly, increasing to 9 million pounds in 1992. This was mainly as a result of the ongoing liquidation in the 1990s. As such, and because the U.S. consumer prefers high-value lamb legs, racks, and loin cuts, increased exports were mainly in the form of the lower-value mutton.

Since 1992, exports have trended downward, and are still mostly low-value mutton. In 2002, more than 75

percent of U.S. lamb and mutton exported went to Mexico. Should the U.S. sheep industry recover, Mexico is considered one of the fastest growing markets for lamb, now supplied by Australia (Boal, 2001). The other major purchaser of U.S. lamb is Japan (7.2 percent), but as with other Asian countries, lamb is a niche product there (Boal, 2001).

Live Sheep and Lamb Trade

U.S. live sheep trade occurs mainly within North America. The U.S. Department of Commerce does not distinguish between sheep and lamb imports, or between slaughter and breeding imports. However, the U.S. has generally been a net exporter of live animals, trading mostly with Canada and Mexico. Imports of live animals have increased steadily since 1975. Live imports (mainly lambs) are primarily from Canada, while exports (primarily cull ewes) are mainly to Mexico (table 8).

Most live sheep and lambs from Canada appear to cross in order to use excess capacity in U.S. slaughter plants. The United States has a greater demand for lamb than for mutton, and this justifies an increased demand for Canadian live lambs. Mexico has a greater demand for mutton, thus importing U.S. cull ewes.

Weather conditions and the availability of adequate pasture in the respective countries often influence live sheep movements. Exports tend to increase during drought conditions when forage is inadequate and herd liquidation is necessary. Live exports have fluctuated widely over the past two decades (table 8), with no clear pattern emerging.

Disease is often a barrier to trade. Many countries require that imported animals be certified disease-free. The absence of scrapie from sheep in Australia and New Zealand has enhanced their competitiveness.

Diseases and Predator Losses

Disease and predator losses also affect the sheep market. These problems continue to complicate attempts to right the industry from its rapid decline. A range of diseases affect the feed conversion capability of animals and reduce their productivity. Predator losses (mainly coyotes) have also been ongoing concerns to the sheep industry, affecting both production costs and farm profitability.

Diseases

Sheep suffer from a range of disease problems, most of which can be controlled with good management practices. Scrapie is an especially important disease

Table 8—U.S. live sheep trade, 1975-2002

Year	Live sheep imports			Live sheep exports		
	Canada	Mexico	Total	Canada	Mexico	Total
		<i>Head</i>			<i>Head</i>	
1975			3,000			339,000
1980			21,000			124,000
1985			22,000			363,000
1990	25,241	0	25,247	2,2421	2,868	15,705
1991	22,506	617	23,217	1,6322	2,654	24,554
1992	27,257	0	27,258	13,350	814,621	834,602
1993	27,631	0	27,662	12,196	827,041	843,963
1994	28,357	0	28,564	19,178	767,872	788,255
1995	38,979	1,661	40,816	24,900	236,408	288,004
1996	44,471	3,110	47,648	27,177	292,152	319,705
1997	46,183	40	46,233	10,053	1,394,978	1,406,939
1998	46,061	42	46,119	14,114	580,415	595,353
1999	51,960	39	51,999	9,017	434,890	445,307
2000	51,523	23	51,546	2,732	377,922	380,862
2001	85,023	17	85,042	930	383,079	384,254
2002	139,161	0	139,161	852	403,529	404,381

Source: U.S. Department of Commerce, Census Bureau, Foreign Trade Statistics.

affecting the U.S. sheep industry. Scrapie is a degenerative neurological disease in sheep that belongs to the transmissible spongiform encephalopathies (TSE) family. Scrapie has been recognized for nearly 250 years in the United Kingdom (UK) and is not known to be transmitted from sheep or sheep meat to humans. The previous lack of a validated live-animal diagnostic test for scrapie, combined with the long incubation period and variable expression of clinical signs in affected sheep, has made it difficult to control this disease with regulation (Smit et al., 2002).

Scrapie has been endemic in U.S. sheep for over 50 years, but it was not until the outbreak of BSE (bovine spongiform encephalopathy), mad cow disease, in the UK that all TSEs came under increased scrutiny. One hypothesis for the origin of BSE was that it was the result of a change in rendering processes for animal proteins that eventually were utilized in ruminant feeds. The UK has a relatively large population of sheep (35 million) vs cattle (10 million) which equates into a relatively high percentage of rendered animal proteins originating from sheep vs other animal species. The change in rendering practices was shown to reduce its degradation of the scrapie infectious agent. It was hypothesized this resulted in scrapie crossing over the "species barrier" to produce BSE in cattle. As a result, some U.S. renderers and packing plants avoided sheep for fear the scrapie infective agent would persist in rendered carcasses and packing plant offal thus producing a BSE risk for cattle consuming feeds containing rendered animal proteins.

In 1997, this issue was resolved with the U.S. Food and Drug Administration (FDA) ban on the inclusion of ruminant proteins in ruminant feeds. The net result to the sheep industry was a reduction in the value of ruminant origin rendered proteins and a diminished market for and increased costs to dispose of dead stock and packing plant offal products.

USDA regulations prohibit the importation of live ruminants from countries that have identified cases of BSE in native animals. In some instances, live ruminants had been imported from countries prior to the confirmation of BSE in that country. In these cases, the USDA has generally tried to trace any previous ruminant imports from these countries and monitor these animals for any occurrence of BSE or other TSE. Sheep had been imported from some European countries in 1996, and after these countries identified native

cases of BSE, the USDA traced these imported sheep to Vermont and monitored them. During this monitoring process, four of the sheep were confirmed through laboratory testing to have an atypical transmissible spongiform encephalopathy. As a result of this finding, the USDA ordered the flocks to be destroyed and paid fair market value as an indemnity.

Scrapie is endemic worldwide, except in a few countries like Australia and New Zealand that took and are taking measures to ensure that TSEs are not introduced into their flocks. Various programs have been initiated in the United States to eliminate scrapie from the U.S. sheep population. Under the National Scrapie Eradication Program (see www.animalagriculture.org/scrapie/Scrapie.htm), producers are responsible for using permanent ear tags or tattoos to identify all breeding sheep over 18 months of age, scrapie-exposed animals and show sheep. Additionally, a Certificate of Veterinary Inspection must accompany all breeding sheep that enter into interstate commerce.

The economic toll of scrapie in the United States is significant. According to the National Institute for Animal Agriculture (2001), the American Sheep Industry Association estimates the cost of scrapie to the industry to be between \$20 and \$25 million annually. These costs are associated with decreased productivity of infected flocks, diminished potential for exports, and increased cost of disposal. Detwiler (1992) estimates that annual mortality in scrapie-infected flocks range from 3 to 5 percent.

Several other diseases (e.g., diseases that affect reproduction, respiratory ailments, and infections of wounds caused during shearing) affect the sheep industry. Without proper management, these additional diseases can reduce the productive capacity of the herd.

Predation

Predator losses deplete sheep numbers, especially in large herds that are not intensively managed. Fewer lambs and sheep to market should mean higher slaughter prices. However, lamb prices are relatively unresponsive to the reduction in supply caused by predation. The net effect of predation in the United States is a reduction in gross sales. Gee et al. (1977) report that in 1974, coyote predation alone may have reduced gross U.S. sales by \$27 million, or 9 percent. In 1999, the direct loss from predation on sheep and lambs was esti-

mated at \$16.5 million, just over 3 percent of gross sales.

Predator losses also affect production costs. Gee et al. (1977) report that in 1975, the United States spent \$11 million on measures to control animal damage. In 1999, U.S. farmers and ranchers spent \$8.8 million on nonlethal methods to prevent predator loss of sheep and lambs. Predators include coyotes (mainly), domestic dogs, mountain lions, bobcats, foxes, and eagles (fig. 13).

Nearly 4 percent of the animals in the sheep industry are lost to predators each year. In 1974, 61 percent of all sheep predation losses were from coyotes (Gee et al., 1977). According to the National Agricultural Statistics Service, in 1999, the share of all predator losses attributed to coyotes was the same. (USDA, *Sheep and Goats Predator Loss*, 2000).

Predator losses have been consistently higher in the Southern Plains, Pacific, and Mountain regions due to the large concentration of both sheep and predators (fig. 14). The Mountain region contains over 37 percent of all sheep in the United States and registers about half of all predator losses. The Southern Plains also suffer disproportionate predator losses in relation to the number of sheep and lambs. Producers in the Mountain and Southern Plains regions tend to have larger operations and are more likely to graze their animals on open range where exposure to predation is greater.

Lambs are more vulnerable to predators than mature sheep and account for more than three-quarters of

industry losses to predators in the Mountain and Southern Plains regions (fig. 15). Since lambs are usually marketed within 1 year of birth, widespread lamb losses to predators erode producer revenues and profit margins. Many producers use one or more of the following tactics to discourage predation: llamas, donkeys, dogs, lighted corrals, lambing in the barn, regular inspection of the sheep flock, prompt removal and disposal of dead stock, and confinement at night. While this approach may be work well with smaller producers, these practices may not be practical for all producers, especially those with flocks of 500 or more lambing-ewes. As herd size gets larger, the cost associated with nightly confinement becomes higher.

Summary

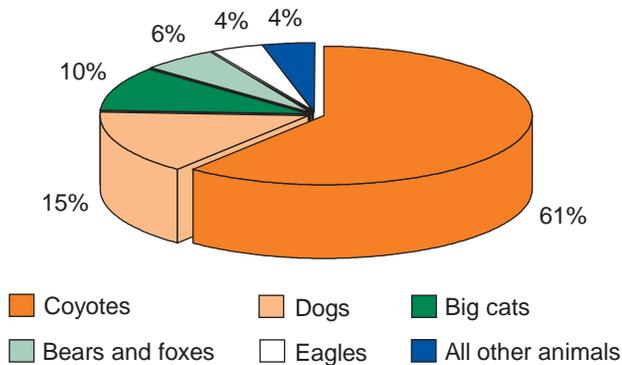
Wool and lamb and mutton are joint products and are often produced in fixed ratio to each other. Wool production is heavily influenced by prices. High wool prices often result in lower supplies of lamb and mutton since lambs will be held for increased shearing. The depressed wool market of late appears to be a direct cause of the liquidation in the U.S. sheep industry. But lamb prices have not been able to support industry recovery.

Packer concentration is suggested as another cause of the sheep industry's decline. Despite a divergence in live-lamb-price-to-wholesale price spread, many factors affect price spread. However, the lamb industry mirrors the structure of the rest of the livestock industry where a large number of producers sell to an industry with few packers, although a review of federally certified plants suggest no significant changes in concentration in the past year.

Lamb consumption is very low compared with other meats, and lamb consumers seem to fit within a few cultural and ethnic niches. Grading is often used to differentiate products and satisfy consumer demand based on their preferences.

Population-driven stability in lamb consumption (per capita) has led to increased imports to offset declining domestic production. U.S. producers feel that increased imports threaten their survival. Import relief was granted under Section 201 of the Trade Act of 1974 and a TRQ (tariff rate quota) was applied to imported lamb from Australia and New Zealand. The TRQ, however, has not uprighted the U.S. sheep industry.

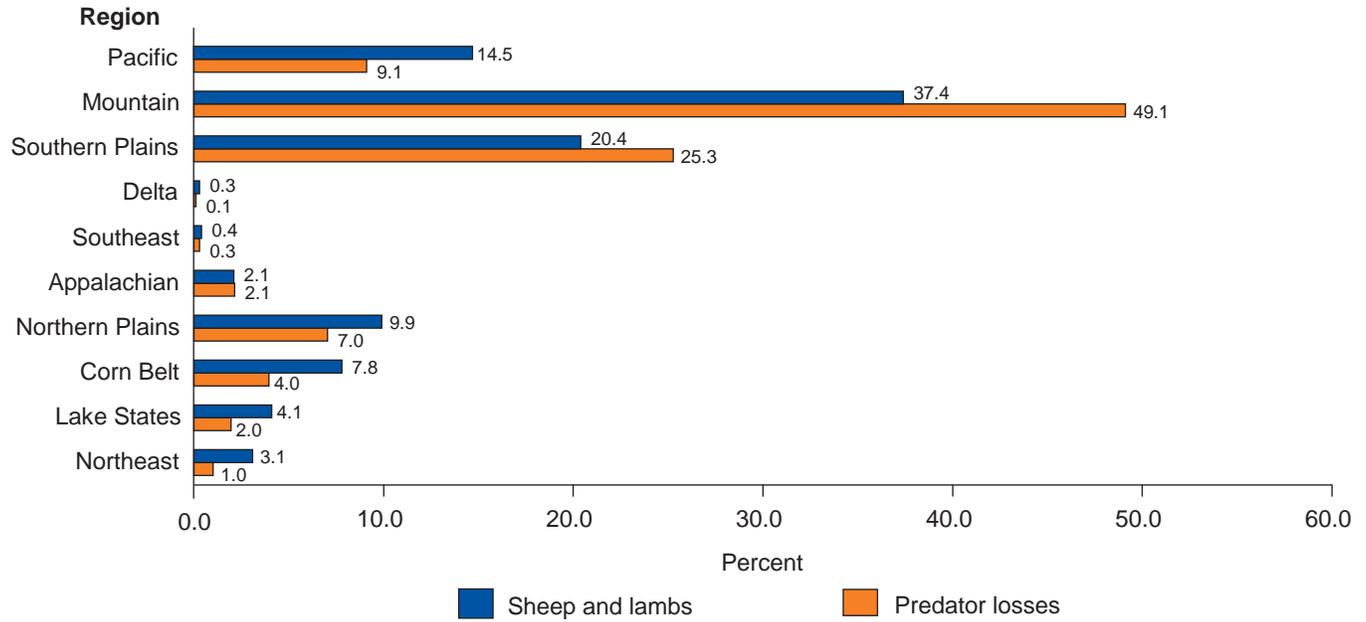
Figure 13
Sheep and lamb losses from predators, 1999



Source: U.S. Department of Agriculture, National Agricultural Statistics Service (NASS), *Sheep and Goats Predator Loss*. Compiled by Economic Research Service, USDA.

Figure 14

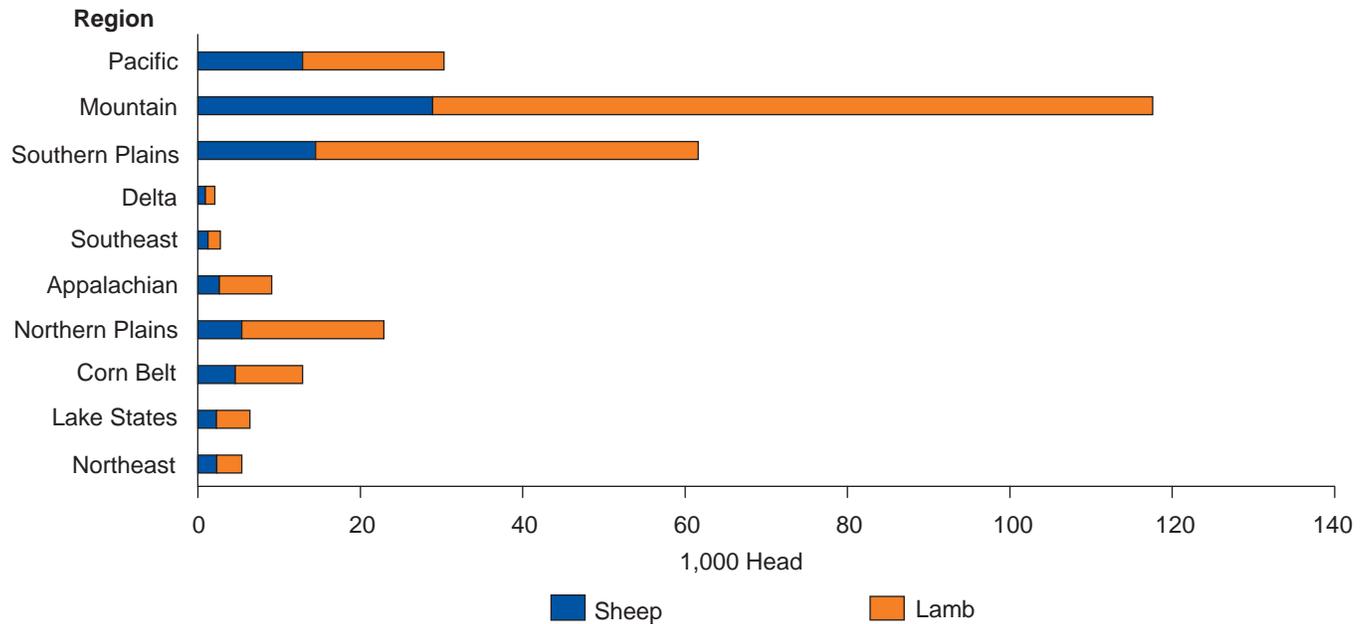
Distribution of sheep/lambs and losses due to predation in the United States, 1999



Source: U.S. Department of Agriculture, National Agricultural Statistics Service (NASS). *Sheep and Goats Predator Loss*. Compiled by Economic Research Service.

Figure 15

Losses of sheep and lambs to predators, number by region, 1999



Source: U.S. Department of Agriculture, National Agricultural Statistics Service (NASS) *Sheep and Goats Predator Loss*. Compiled by Economic Research Service.

Sheep-Related Programs

Other than dairy, sheep is the only animal product that is directly supported by government programs. These support programs have been around since 1938 and are mainly in the wool industry. Recently, support programs have focused on the lamb and mutton industry with the aim of stimulating a recovery in the overall sheep industry.

Wool Programs

Wool price support loan programs and purchases date back to the Agricultural Adjustment Act of 1938. This support became mandatory in 1947, and mohair was added in 1949. The 1949 Agricultural Act set wool support between 60 and 90 percent parity and required support at a level that encouraged production. Instead of receiving a calculated fixed payment on a predetermined farm program yield, wool and mohair producer incomes were supported based on a national average price needed to bring average producer returns up to a parity-based formula target level. This support program continued until 1953.

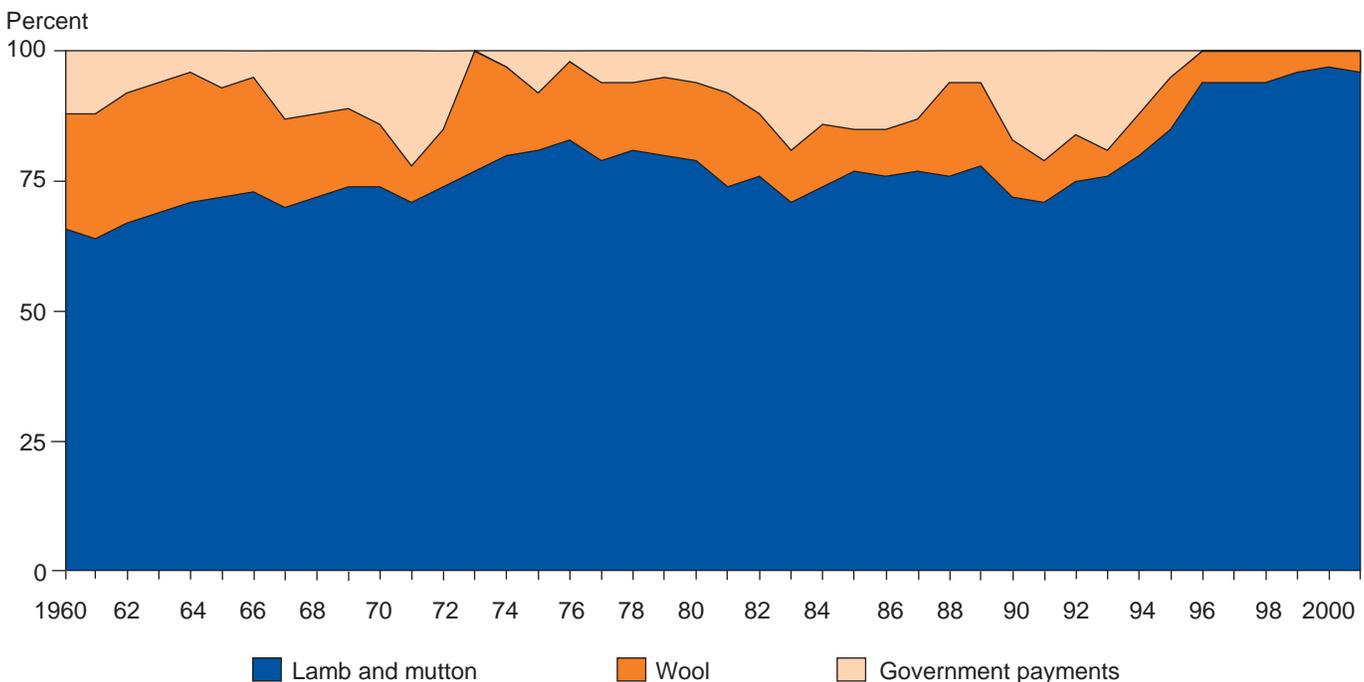
The National Wool Act of 1954 established a new price support. Direct payments were authorized as a

way to support incomes. The 1954 Act set wool support between 60 and 110 percent parity if payments were used. An incentive price well above market price was established. The payment increased as the value per unit of production improved (quality incentive). Wool payments underwrote sheep production revenue for more than four decades.

The Agricultural Act of 1954 provided wool and mohair price support until 1995. An initial base rate of 62 cents per pound was established by law, but the Food and Agricultural Act of 1965 introduced a formula to adjust the base rate by the ratio of the average parity index of the preceding 3 years to the ratio of the average parity index for the base period of 1958. Thus, annual payments to producers depended on the price they received for their wool. The Agricultural Stabilization and Conservation Service (now Farm Service Agency) established payments to wool producers by using a formula that determined the payment rate for wool based on the percentage that the support price exceeds the market price (Stillman et al., 1990).

Between 1990 and 1993, direct payments to producers averaged 230 percent of the market value of wool and mohair produced. Revenues from wool represented about one-quarter of the revenue associated with the sheep, lamb and wool industry (fig. 16). However,

Figure 16
Distribution of income from sheep production, 1960-2001



Public Law 103-130, signed into law on November 1, 1993, mandated the phaseout of the Wool Act program, including direct price support to producers. Since the Wool Act was terminated in 1995, revenues from wool have accounted for less than 10 percent of the total receipts in the sheep industry (Dunmore and Skinner, 1999). U.S. wool production in 2002 was near 20 million pounds, significantly below levels prior to 1995.

In the 4 years prior to termination (1990-93), direct payments to wool producers were based on the quantity produced, and averaged \$122 million per year. The market value of the wool produced in those years averaged \$53 million per year, just 43 percent of the direct payments. In the 5-year period following elimination of the program, wool market value declined from about \$40 million to \$15 million. Wool production and prices have declined consistently since 1975 (USDA, ERS, *Cotton and Wool Situation and Outlook*, various issues).

The Farm Security and Rural Investment Act of 2002 re-instituted Federal support for wool and mohair, but it is a slightly different program from the 1954 wool program. The National Wool Act of 1954 provided for a new and permanent price support program that would encourage increased domestic production through incentive payments. Income support was achieved through incentive payments that provided higher benefits to farmers who had more production. On the other hand, the Farm Security and Rural Investment Act of 2002 provided marketing assistance loans and loan deficiency payments to wool and mohair producers for crop years 2002-2007. These commodity loan programs allow producers to receive a loan from the government at a commodity-specific loan rate per unit of production by pledging production as collateral. The loan rates are \$1.00 per pound for graded wool, \$0.40 per pound for nongraded wool, and \$4.20 per pound for mohair. Unshorn pelts can receive a loan deficiency payment of \$0.40 per pound. The revenue reduction associated with the wool support program could determine the survival of marginal firms in the sheep industry.

Import Relief for Lamb Producers

Lamb-related disputes date back to the early 1980s (Meyer and Anderson, 1998). In 1981, the U.S. sheep industry filed two countervailing duty and/or

antidumping petitions with the U.S. Department of Commerce (USDOC) against New Zealand. At that time, imports were growing (in quantity and market share), U.S. consumption was declining, and profitability was shrinking. The petition was later withdrawn before implementation.

Other countervailing and/or antidumping petitions were filed in 1984 and 1985. Some of the benefits to New Zealand producers, processors, and exporters were determined to be bounties or grants as defined within the countervailing duty law, and tariffs were instituted. But the liberalization of New Zealand's agriculture in 1989/1990 resulted in a quick tariff reduction and revocation of the countervailing duty by 1990.

In recent years, U.S. lamb consumption has kept pace with population increases, despite declining domestic production. This has led to increased imports. Lamb and mutton imports have surged and by 2002 were 162 million pounds, 11.2 percent higher than in 2001 and 500 percent higher than in 1975 (fig. 17).

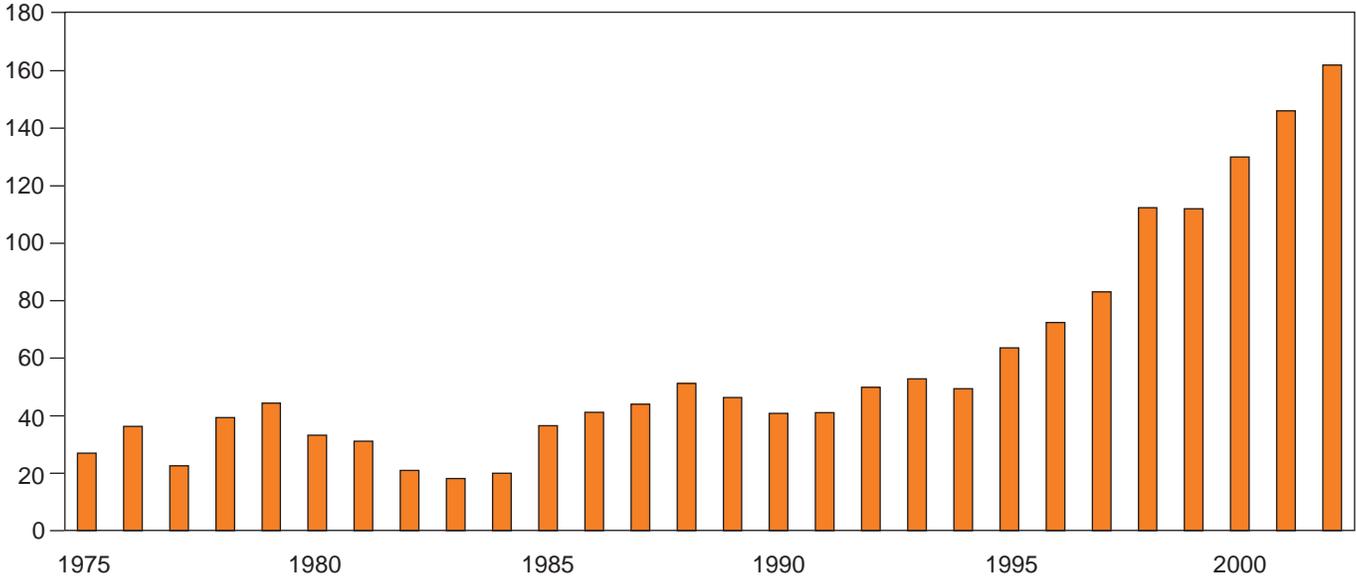
The share of imports from New Zealand and Australia has remained fairly constant since 1988. Imports, which currently account for more than one-third of U.S. consumption, are nearly all from Australia (59 percent) and New Zealand (39 percent) (fig. 18). Australia and New Zealand together account for more than 70 percent of world lamb and mutton exports.

Following the rapid rise in lamb imports in the mid-1990s, U.S. lamb producers felt they had experienced serious economic conditions that threatened their existence (U.S. International Trade Commission, 1999). Sheep producers argued that inventories and the number of sheep producers declined rapidly between 1992 and 1997. In addition, farm prices and live slaughter-lamb prices declined at an even faster rate, down 31 percent, between March 1997 and October 1998. The number of federally inspected sheep and lambs slaughtered in U.S. plants dropped well below 4 million head and at the same time, the number of live animals imported and slaughtered in U.S. plants doubled over a 10-year period. They argued that lamb producers were one of the hardest hit segments of the sheep industry, suffering major losses, primarily during 1997 and 1998, when lamb meat imports reached record highs. Threatened by the surge of low-priced, imported lamb meat, many producers felt they could not remain competitive in the

Figure 17

Lamb and mutton imports, 1975-2002

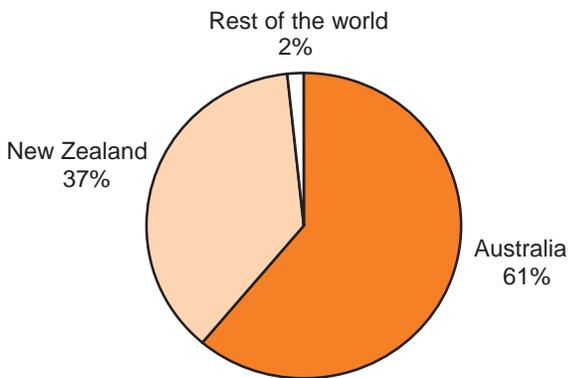
Million pounds



Source: U.S. Department of Agriculture, Foreign Agricultural Trade Statistics, Foreign Agricultural Service (FAS).
Compiled by Economic Research Service

Figure 18

U.S. mutton and lamb imports from major countries, 2001



Source: U.S. Department of Agriculture, Foreign Agricultural Trade Statistics, Foreign Agricultural Service (FAS) Compiled by Economic Research Service

domestic marketplace and would need temporary protection in order to regain competitiveness.

Section 201 of the Trade Act was implemented by President Nixon (1974) to grant temporary import relief for producers. It permits Presidents to raise import duties or impose nontariff barriers on goods entering the United States that injure or threaten to

injure domestic industries producing like goods. This provision is the analog of GATT Article 19, which allows GATT contracting parties to provide relief from injurious competition when temporary protection will enable the weaker industry to make adjustments to meet competition.

Section 201 of the Trade Act of 1974 resulted in the imposition of a tariff-rate quota (TRQ) on lamb meat imported from Australia and New Zealand. Despite the TRQ, the currency exchange rates made the U.S. market profitable for these countries. In 1998, the U.S. dollar appreciated against the Australian and New Zealand currencies by more than 18 and 24 percent. For example, in January 1998, U.S. lamb prices of \$74 per cwt meant an equivalent return to an Australian exporter of \$114 per cwt in Australian currency. By December 1998, U.S. lamb prices had declined to \$71 per cwt, but the return to an Australian exporter was up by 4.3 percent from January. Again in 1999 and 2000, when the TRQ was in effect, further appreciation of the U.S. dollar allowed Australia and New Zealand to effectively manage the TRQ, even at over-quota tariffs of 40 percent in 1999 and 32 percent in 2000.

In light of this, the United States established in July 1999, a 3-year tariff-rate quota (TRQ—see p. 27). The

TRQ essentially rations the supplies among willing domestic consumers by adjusting the price upward by the value of the *ad valorem* duties levied on lamb. The *ad valorem* duty is commonly stated as a percentage of a readily observed international price and is designed to increase the price available to domestic consumers and thereby reduce the supply of imported lamb. *Ad valorem* duties were levied for both in-quota and over-quota amounts of imported lamb (table 9). The TRQ was essentially imposed on Australia and New Zealand since trade from the other countries was negligible.

The TRQ for the first year (July 22, 1999-July 21, 2000) was 70.2 million pounds product weight, with an *ad valorem* duty of 9 percent, and an over-quota duty of 40 percent. During the first year of the TRQ, 76 million pounds of lamb were imported from Australia and New Zealand. During the second year (July 22, 2000-July 21, 2001) the TRQ increased to 72.1 million pounds product weight, and the duties declined to 6 percent and 32 percent. Growth of lamb imports accelerated in the second year—by about 23 percent. According to customs data, over-quota imports from Australia and New Zealand were 22.8 million pounds and 3.2 million pounds, respectively.

An appellate body of the World Trade Organization (WTO) ruled in May 2001 against the U.S. trade measures instituted in 1999 on imported lamb meat. The United States subsequently removed the TRQ on November 15, 2001.

The U.S. sheep industry feared that the removal of the TRQ from imported lamb would lower domestic prices, thereby slowing the recovery. This, they felt, would result in a further increase in imports from strong competitors such as Australia and New Zealand.

However, the TRQ had not contributed to recovery in the U.S. sheep industry, which continued to decline. Despite implementation of the TRQ, imports from Australia and New Zealand did not slow; effects of the tariff were largely offset by the strong U.S. dollar and unusually weak Australian and New Zealand currencies.

U.S. Lamb Meat Adjustment Assistance Program

In December 1999, the USDA embarked on a number of sheep industry improvement efforts. Among these is a 4-year, \$100-million Lamb Industry Assistance Package, instituted in January 2000, to help the industry rebuild herds so as to better compete in the global economy. The package included four major elements:

Table 9—Country allocations and tariff duties for lamb tariff rate quota

Year	Tariff rate quota	Country allocations			In-quota	Over-quota
		Australia	New Zealand	Other countries		
		-----Pounds-----			Percent	
Year 1	70,219,048	37,785,923	31,926,142	506,983	9	40
Year 2	72,109,144	38,803,013	32,785,504	520,627	6	32
Year 3	73,999,240	39,820,100	33,644,864	534,276	3	24

Source: World Trade Organization. 2001. *United States-Safeguard Measures on Imports of Fresh, Chilled or Frozen Lamb Meat from New Zealand and Australia*. Report of Appellate Body. AB-2001-1.

Tariff Rate Quotas

Tariff rate quotas are two-tiered tariffs that charge a low tariff level on a limited volume of imports, termed in-quota imports and a second higher tariff on all additional imports, termed over-quota imports (Skully, 2000). If the over-quota tariff is set so high that imports are not profitable beyond the in-quota import levels, the TRQ functions as a traditional quota. However, unlike traditional quotas, TRQs are not considered quantitative restrictions because they do not limit import quantities. Imports beyond the in-quota levels are always possible by paying the over-quota tariffs. If the difference between the domestic prices and the international prices of competing products exceeds the over-quota tariff, the TRQ often results in import volumes beyond the in-quota import quantities.

Timeline of Events During the TRQ

In July 1999, the United States imposed a 3-year tariff-rate quota (TRQ) on lamb meat. The *ad valorem* duty for in-quota amounts (up to 70.2 million pounds) was 9 percent in the first year (July 1999-June 2000) and was reduced by 3 percentage points for each subsequent year. The over-quota duty was 40 percent in the first year. In the second and third years, in-quota levels rose to about 72.1 million pounds and 74 million pounds, respectively, with over-quota tariffs at 32 percent and 24 percent. These restrictions excluded all other countries, such as Mexico and Canada from which lamb imports are insignificant.

In October 1999, New Zealand and Australia filed complaints to the World Trade Organization (WTO) regarding the safeguard measures imposed by the United States (World Trade Organization, 2001). In December 2000, the WTO panel formed to hear the dispute ruled in favor of New Zealand and Australia, and recommended that the United States bring its safeguard measures on the imports of lamb meat into conformity with its obligations under the WTO agreement on safeguards and the General Agreement on Tariffs and Trade (GATT) of 1994. The United States immediately appealed the ruling to the WTO Appellate Body arguing that the panel erred when they found the definition of the U.S. domestic industry and the data collection method of the United States International Trade Commission (USITC) to be inconsistent. The United States also argued that the panel erred when they ruled that the USITC's causation analysis violated one of the articles of agreements on safeguards. The United States had defined the domestic industry to include growers and feeders of live lambs as well as packers and breakers of lamb meat.

On May 1, 2001, the Appellate Body of the World Trade Organization (WTO) ruled against the U.S. trade measures instituted in 1999 on imported lamb meat. The WTO panel was acting on complaints filed by New Zealand and Australia. It was recommended that the United States bring its safeguard measures on the imports of lamb meat into conformity with its obligations under the WTO agreement on safeguards and the General Agreement on Tariffs and Trade (GATT) of 1994. The United States agreed to settle the dispute over lamb meat imports with Australia and New Zealand and end its tariff-rate quota safeguard on November 15, 2001.

direct payments to producers; animal health initiatives; marketing and promotion; and government purchase of lamb meat. The assistance package was designed to shelter the domestic lamb industry until it could reasonably compete with Australia and New Zealand.

Small and medium-sized operations have been allocated a total of \$30 million in direct payments to improve production practices and pursue quality incentives. Funds will be directed to activities such as genetic selections, lambing facilities, and feedlot improvements. A minimum of \$15 million is made available for assisting with the eradication of scrapie from the domestic sheep population. The USDA will purchase up to \$15 million of lamb meat over the 4-year period. In addition, at least \$5 million will be used to market and improve the competitive position of domestic lamb meat.

Under the agreement to settle the WTO dispute over lamb meat imports, the U.S. will continue to provide adjustment assistance to domestic lamb producers and enhance the initial \$100-million adjustment package by an additional \$42.7 million.

Check-Off Programs

Attempts at demand-side lamb meat marketing and promotional programs are not new (Purcell, 1998). P.L. 103-407 (October 22, 1994) enabled sheep producers and feeders—and importers of sheep and sheep products—to develop, finance, and carry out a nationally coordinated program for sheep and sheep product promotion, research, and information. This law was enacted a year after legislation was passed to phase out the wool and mohair commodity programs. USDA was authorized to issue a sheep and wool promotion, research, education, and information order subject to approval by producers, feeders, and importers. In a

1996 referendum, the sheep producers and importers defeated the proposed check-off program. About 53 percent of nearly 12,000 ballots indicated opposition to the order. This group represented 67 percent of the producers who cast ballots.

The U.S. sheep industry is under increasing pressure to improve its flock and enhance its marketability if it is to compete with other countries and other industries. As a result of the failed referendum, the U.S. sheep industry requested USDA's assistance in developing a lamb check-off program. On April 11, 2002, USDA's Agricultural Marketing Service (AMS) issued a final rule on establishing a national industry-funded lamb program. The program provides for an industry board to carry out promotion, research, and information programs, designed to increase the demand for lamb and lamb products. Lamb producers, seed stock producers, feeders, and exporters will pay an assessment of 0.5 cent per pound when live lambs are sold. The first handlers, primarily packers, will pay an additional 30 cents per head of lamb purchased.

Summary

Sheep is one of the few animal products directly supported by government programs, including wool price support and Section 201 import relief. Wool price support and purchase programs date back to 1938, with the National Wool Act of 1954 the most extensive and far reaching. The National Wool Act lasted for 42 years and it authorized direct payments to support farm incomes. Wool support was terminated between

1995 and 2001, but the Farm Security and Rural Investment Act of 2002 reinstated Federal support for wool and mohair. Despite these wool programs, the industry continues to decline.

More recent programs have shifted to the lamb meat industry. Section 201 of the Trade Act of 1974 was implemented by President Clinton in January 1999 to grant temporary import relief for lamb producers. This resulted in the imposition, in July 1999, of a TRQ on lamb meat imported from Australia and New Zealand. The TRQ was removed in November 2001 after the U.S. decided to settle the dispute with New Zealand and Australia. The impact of the TRQ was minimal due to the strong U.S. dollar relative to Australia and New Zealand at that time. As a result, the TRQ did not contribute to the industry recovery

Accompanying the TRQ were a number of sheep industry improvement efforts designed to create a sheltered period during which the domestic lamb industry can adjust to competition from importers, especially Australia and New Zealand.

Attempts at demand-side lamb meat marketing and promotional programs are not new. This is evidenced by the reinstatement, in 2002, of a previously defeated check-off program. The program mandates an industry board to carry out promotion, research, and information programs designed to increase the demand for lamb and lamb products.

Prospects for the Sheep Industry

Many factors have contributed to the long-term decline in the U.S. sheep industry. These include sagging wool demand, low lamb meat prices, predator losses, the perceived threat of industry/packer concentration, and labor shortage. Demand for lamb meat has remained steady and imports have increased to meet U.S. consumer needs. Expansion and diversification of demand along with measures of quality control through feeding and breeding offer potential for industry recovery.

Purcell (1998) argues that it is imperative that the product offering be modernized and changed. A large segment of the U.S. population has either never tried lamb or tried it only once. Local marketing can be boosted by specialized sales such as prepacked chops. Ground lamb and other cuts may also work locally. A determination of the potential market and some test work on plausible arrangements should precede any such marketing. Then, a means to add value, in a cost-effective way, to the product needs to be found.

Attempts to differentiate U.S. lamb from other meats and from that of its competitors have met with limited success. The U.S. sheep industry focuses on high-value cuts for the domestic market, and has neither capitalized on market segmentation nor developed its export markets. Much of the lower-value meat is rendered or goes into pet food. What little is exported goes mainly to Mexico in the form of whole mutton carcasses. Finding alternative markets for lower end products may help finance the sheep industry's recovery.

Australia and New Zealand offer a model for industry success. They have waged very aggressive advertising campaigns to elevate their product above their competitors'. Their international ads tout the fresh, wholesome, free-range, naturally grass-fed products. Imports from Australia and New Zealand now make up more than 40 percent of U.S. lamb and mutton consumption.

Both Australia and New Zealand export to a diverse range of markets, from the traditional markets in the European Union, the Middle East, and Papua New Guinea to newer markets in the United States, southeast Asia, and Africa. With these diverse markets, a clear delineation between three market segments has emerged. High-priced prime lamb products sell in the

developed economies. Lower-value lamb products are marketed in developing economies. Low-priced mutton finds outlets in both developed and developing economies in institutional catering and for further processing.

U.S. exports of sheep products have slipped further since 1992. Although the United States has exported lamb and mutton to 48 countries, quantities are slight and exports consist mostly of mutton, a low-valued product. In 2002, more than 75 percent of the U.S. lamb and mutton exports went to Mexico. Mexico is considered one of the fastest growing markets for the Australian lamb trade and holds promise should the U.S. sheep industry recover. The other major purchaser of U.S. lamb is Japan (7.2 percent). However, as in most other Asian countries, Japan's lamb consumption is mostly by ethnic/cultural niche groups.

Research and development in the sheep industry is also important. Sheep are raised for both meat and wool, but with the recent price of wool being so low, the cost of producing wool (shearing, cleaning, and storage) sometimes exceeds the value of production. Substituting wool breeds for meat breeds is one solution. Research has found that breeds that yield no wool (hair breeds) reduce the overall costs associated with joint production. Work on evaluating hair breeds to increase profits to ranchers is underway.

The Lamb Meat Assistance Package and the industry-funded lamb promotion, research, and information program are the first steps toward reviving the industry, challenging imports, and increasing demand for lamb, mutton, and wool. The industry might be further revived if producers can channel nonrecourse loans into improving farm productivity and marketing. Under the wool marketing program (see www.fsa.usda.gov/dafp/psd/mohair.htm), eligible wool and mohair nonrecourse marketing assistance loans provide eligible producers with interim financing on their production and facilitate the orderly marketing of the commodity throughout the year. Instead of selling the wool and mohair immediately after shearing, a nonrecourse loan allows a producer to store the production, pledging the commodity itself as collateral. The loan helps an eligible producer pay bills when they come due without having to sell the wool or mohair at a time of year when prices tend to be lowest.

What Makes the Australia and New Zealand Lamb Industries Competitive

Better financial performance, increased trade, market segmentation and the reliability of domestic consumers provide distinct competitive advantages for Australia and New Zealand sheep producers over U.S. producers. Australia and New Zealand have also waged very aggressive advertisement campaigns aimed at clearly distinguishing their product from, and defining it as superior to, their competitors, thereby shifting consumer demand in their favor.

Unlike U.S. sheep producers who rely on marginal lands/pastures for the first stage of production then feed-grains for the fattening and finishing stages, sheep in Australia and New Zealand are raised on high-quality pastures for the entire production cycle. The cost of production on strictly pasture-based operations is much lower than that of operations that feed grains (Meyer and Anderson, 1998). In addition, pasture-fed lambs are generally marketed at a lighter weight. Whereas in Australia, the average carcass weight ranges from around 44 to 47 pounds and in New Zealand the average carcass weight ranges from around 36 to 40 pounds, in the United States, average carcass weight ranges from 63 to 67 pounds. Smaller, lighter-weight lambs produce smaller prime cuts which are often more economical to consumers purchasing lamb for a one-time meal. Also, these animals are less likely to suffer from the over-finished problem (excessive fat) that occasionally occurs in grain-fed lamb.

Australia and New Zealand have significant export-based industries. From an international trade perspective, Australia is by far New Zealand's only real competitor. Australia accounts for 29 percent of the world's lamb and mutton exports while New Zealand accounts for 41 percent of the world's lamb and mutton exports. Australia exports 35 percent of the lamb it produces and 80 percent of its mutton, while New Zealand exports 80 percent of its lamb and 84 percent of its mutton. The United States, on the other hand, exports just about 2 percent of its lamb and mutton production.

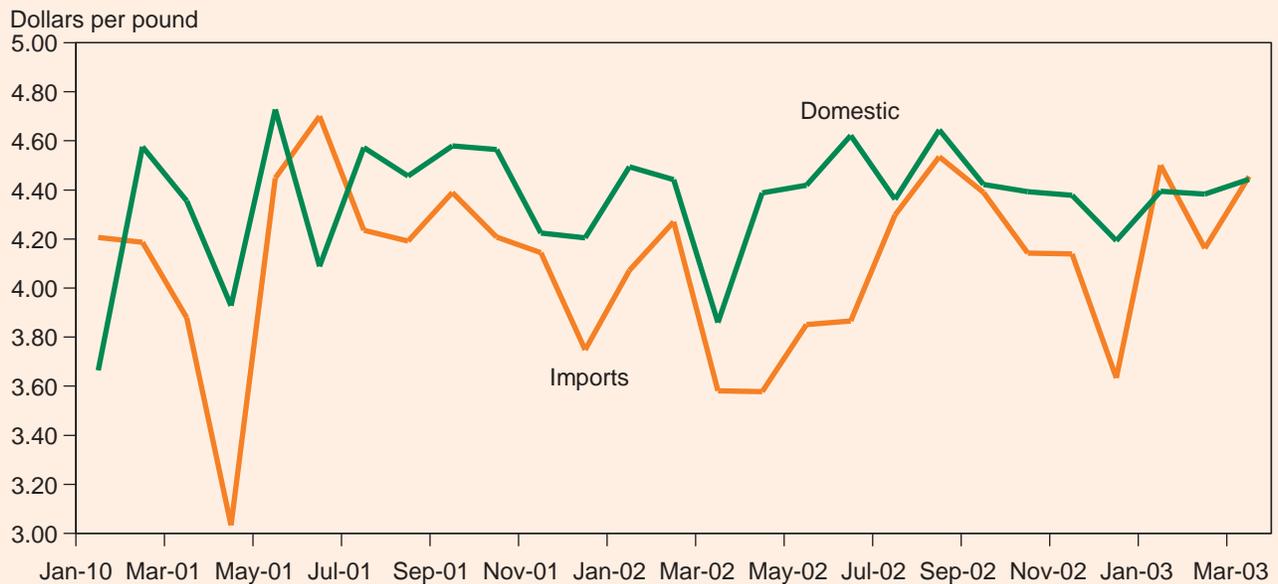
Exports for both Australia and New Zealand have grown by more than 20 percent over the past decade. Both countries now export to a diverse range of markets, from the traditional markets in the European Union (EU), the Middle East, and Papua New Guinea to markets in the United States, southeast Asia, and Africa. With these diverse and broader markets, a clear delineation among three market segments has emerged: (1) high-valued market for prime lamb products in the developed economies of the EU and the United States attract the higher valued legs and loin products; (2) lower valued lamb products are marketed in developing economies; and (3) low priced mutton finds outlets in both developed and developing economies in institutional catering and for further processing. The United States has been unable to capitalize on market segmentation due to its domestic market, which consumes primarily high-value products, and its lack of export markets.

Australia and New Zealand consumers have a greater propensity to consume lamb and mutton than U.S. consumers. New Zealand has the highest per capita lamb and mutton consumption in the world, at around 50 pounds per year, followed by Australia, at around 37 pounds per year. U.S. per capita lamb and mutton consumption is just above 1 pound and declining. This is partly due to the availability of much cheaper protein alternatives such as poultry and pork, and partly due to the declining global trends in mutton and lamb per capita consumption. In addition, there are markets within Australia and New Zealand for all values of lamb while U.S. consumers rely primarily on high-valued cuts.

Australia and New Zealand have also waged very aggressive advertisement campaign aimed at clearly distinguishing their product from, and defining it as superior to, all of its competitors'. Retail price scanner data also show that imported lamb is cheaper than domestically produced lamb (see figure). Advertisements appealing to international consumers portray the fresh, wholesome, free-range, grass-fed

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Retail prices of U.S. and imported lamb



Source: Economic Research Service, USDA

products. Australia, in particular, also appeals to the patriotism of its consumers, encouraging domestic consumption, and promoting lamb as the Australian meat. The advertising campaign aimed at shifting consumer demand toward Australian and New Zealand lamb intensified further after the United States imposed tariff-rate quotas on imported lamb meat in July of 1999.

Despite the TRQ, the currency exchange rates made the U.S. market profitable for Australia and New Zealand lamb producers. In 1998, the U.S. dollar appreciated against the Australian and New Zealand currencies by more than 18 and 24 percent, respectively. For example, in January 1998, U.S. lamb prices of \$74 per cwt meant an equivalent return to an Australian exporter of \$114 per cwt in Australian currency. By December 1998, U.S. lamb prices had declined to \$71 per cwt, but the return to an Australian exporter was up by 4.3 percent from January. Again in 1999 and 2000, when the TRQ was in effect, further appreciation of the U.S. dollar allowed Australia and New Zealand to effectively manage the TRQ, even at over-quota tariffs at 40 percent in 1999 and 32 percent in 2000. As a result, Australia and New Zealand were able to competitively export lamb and mutton to the United States.

The comparative advantage in cost of production, trade, exchange rate, consumer preference, and advertising affords the Australian and New Zealand lamb producer a competitive edge over other producers.

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Glossary of Terms

Carcass weight — The weight of an animal after slaughter and removal of most internal organs, head, and skin. For sheep, the carcass constitutes about 55 percent of the weight of the live animal, for beef about 60 percent, and for hogs about 73 percent.

Concentration (economic) — A measure of the degree to which a few large firms dominate total sales, production, or capacity within an industry or market. The concern is that the more concentrated an industry, the greater the likelihood of price and market manipulation. For example, meatpacker concentration has long been a concern of cattle producers. It is common to express concentration as a ratio, by stating the share held by the top 4, 8, or 12 firms.

Cost of production — The average unit cost (including purchased inputs and other expenses) of producing an agricultural commodity. The Agricultural and Consumer Protection Act of 1973 requires USDA to make annual estimates of the average cost of producing selected commodities. These cost of production estimates have been used by Congress in considering farm policy options.

Creutzfeldt-Jakob Disease (CJD) — A sporadic and rare, but fatal human disease that usually strikes people over 65. It occurs worldwide at an estimated annual rate of one case per million population. About 10-15 percent of CJD cases are inherited. A small number of cases occur as the result of various medical treatments or procedures which inadvertently transferred the CJD agent. In March 1996, the British Government announced a possible link between bovine spongiform encephalopathy (BSE) and a variant form of CJD. The announcement was prompted by the discovery of several atypical cases of CJD in Great Britain.

Direct payments — Payments (usually in cash but sometimes in commodity certificates) made directly to producers in conjunction with participation in commodity support or other programs. Under the FAIR Act of 1996, participating producers receive production flexibility contract payments, which replace deficiency payments. Also, producers receive direct payments under conservation reserve contracts.

Duty, import — A customs duty is a charge assessed by a government on an imported item at its point of

customs entry into the country, and paid for by the importer; the term is now used interchangeably with tariff. In terms of assessing duties there are two basic types: an *ad valorem* duty is assessed in proportion to the value of the imported item, whereas a “specific” duty is assessed on the basis of a measure other than value, such as the quantity of the product imported. In addition, a “compound” or “mixed” duty, which is a combination of an *ad valorem* and specific duty, is occasionally used in the Harmonized Tariff Schedules of the United States (HTSUS). Special duties such as anti-dumping duties or countervailing duties may also be levied on imports to offset the unfair price advantage of an imported article that is sold below normal value or subsidized by an exporting country.

Farm bill — A phrase that refers to a multi-year, multi-commodity Federal support law. It usually amends some and suspends many provisions of permanent law, reauthorizes, amends, or repeals provisions of preceding temporary agricultural acts, and puts forth new policy provisions for a limited time into the future. Beginning in 1973, farm bills have included titles on commodity programs, trade, rural development, farm credit, conservation, agricultural research, food and nutrition programs, marketing, etc. These are referred to as omnibus farm bills. The following is a chronological list of farm bills:

- (1) Food and Agriculture Act of 1965, P.L. 89-321;
- (2) Agricultural Act of 1970, P.L. 91-524;
- (3) Agriculture and Consumer Protection Act of 1973, P.L. 93-86;
- (4) Food and Agriculture Act of 1977, P.L. 95-113;
- (5) Agriculture and Food Act of 1981, P.L. 97-98;
- (6) Food Security Act of 1985, P.L. 99-198;
- (7) Food, Agriculture, Conservation, and Trade Act of 1990, P.L. 101-624;
- (8) Federal Agriculture Improvement and Reform Act of 1996, P.L. 104-127;
- (9) Farm Security and Rural Investment Act of 2002, P.L. 107-171d .

Lamb — Meat obtained from sheep that are generally slaughtered within 12-14 months of birth. Based on the USDA’s Agricultural Marketing Service (AMS) guidelines, lamb is defined by (1) the condition of the break-joint on the foreleg of the animal, (2) the color

and characteristics of the rib bones, and (3) the characteristic of the lean meat. Most of the meat sold is from lamb; most Americans do not have a preference for mutton because of its “strong” flavor. Also, lamb is the name given to the young sheep before it reaches maturity.

Mutton — The meat from the older animals that were once a part of the breeding herd.

National Wool Act of 1954 — Title VII of the Agricultural Act of 1954 was designated the National Wool Act and provided for a new and permanent price support program for wool and mohair to encourage increased domestic production through incentive payments. Wool and mohair commodity programs were in effect through marketing year 1995, at which time they were terminated under the explicit mandate of P.L. 103-130 (November 1, 1993).

Quotas, import — A quantitative limit placed on the importation of specific commodities. The protection afforded by quotas is more certain than can be obtained by imposing import duties, as the effect of the latter will depend on the price elasticities of the imported commodities. Quotas, like tariffs, can also be used to favor preferred sources of foreign supply. Quotas may be specified as an absolute limit or changed from year to year in response to changes in domestic supply and demand.

Safeguards, import — A trade policy tool available to temporarily increase border protection for designated commodities and products. Its purpose is to allow a producing sector to adjust to changed market conditions before facing competition again without such protection. For agricultural products subject to tariffication, the Uruguay Round’s Agreement on Agriculture (Part I, Article 5) establishes a special agricultural safeguard that allows countries to impose an additional duty when sudden import surges (volumes) exceed, or import prices fall below, a trigger level. The United States has announced quantity and price trigger levels for products whose imports were previously restricted using Section 22 fees and quotas and for which tariff-rate quotas are now in place: beef, mutton, 18 dairy products, peanuts, peanut butter and paste, raw cane sugar, refined sugar and syrups, 8 types of sugar-containing products, mixed condiments

and seasonings, animal feed containing milk, and six cotton categories. The North American Free Trade Agreement (NAFTA) includes a special agricultural safeguard to provide added protection against import surges of six seasonal vegetables and fruit from Mexico (until tariffs were completely phased out by year-end 2003). Covered by this safeguard are U.S. imports from Mexico of fresh tomatoes, eggplant, chili peppers, squash, onion and shallots, and watermelon during specified time periods. Comparable safeguards exist on Mexican imports from the United States of 17 categories of goods that include live swine, certain pork products, certain potato products, fresh apples, and coffee extract. NAFTA provides that no such special safeguard may be maintained on a good if it is the subject of an emergency action. Both the Uruguay Round and NAFTA special safeguard provisions differ from broader import relief authority laid out in Section 201 of the Trade Act of 1974.

Section 201 — A section of the Trade Act of 1974 that permits the President to grant temporary import relief, by raising import duties or imposing nontariff barriers on goods entering the United States that injure or threaten to injure domestic industries producing like goods. This provision is the analog of GATT Article 19, which allows GATT contracting parties to provide relief from injurious competition when temporary protection will enable the domestic industry to make adjustments to meet the competition.

Tariff rate quota — A trade policy tool used to protect a domestically produced commodity or product from competitive imports. A tariff rate quota (TRQ) combines two policy instruments that nations historically have used to restrict such imports: quotas and tariffs. In a TRQ, the quota component works together with a specified tariff level to provide the desired degree of import protection. Imports entering during a specific time period under the quota portion of a TRQ are usually subject to a lower, or sometimes a zero, tariff rate. Imports above the quota’s quantitative threshold face a much higher (usually prohibitive) tariff. Currently, TRQs apply to U.S. imports of certain dairy products, beef, cotton, peanuts, sugar, certain sugar-containing products, and tobacco.

Wool Act of 1954 — See National Wool Act of 1954.