

Patterns of World Poultry Consumption and Production

Economic analysis of demand reveals how household expenditure patterns can change in response to changes in income. Empirical evidence shows that, as countries become wealthier, expenditures on food, education, health, and durable goods rise. However, income has the greatest influence over dietary changes, as it provides the means needed to convert desired demand for goods into effective demand for goods. For example, McDowell et. al. analyzed food expenditures for selected food items and determined that expenditures for selected food items vary by income [21]. Initial impacts of per capita income rising from low to middle income levels start with higher demand for food and foods of greater variety and higher quality. This means that the composition of food consumption changes as income rises. Consumers follow a general pattern to improve the nutritional level of the food they consume by upgrading their daily diet from basic grains and tubers toward high-protein items such as poultry, beef, pork, and dairy products, as well as more fruits and vegetables.

Engel's law states that the percentage of family income spent on food declines over time as income rises [29]. Analysis by Theil, Chung, and Seale confirmed that the budget share allocated to food is inversely correlated with income, and that high-income countries are less responsive to changes in food prices [37]. Generally speaking, when countries move from poor to middle income levels, food demand elasticities usually rise, but as income increases toward higher levels, elasticities decline.

Changing trends in food consumption patterns and income levels are described in a recent Economic Research Service publication estimating income elasticities of demand for food for three income groups [31]. From this study, income elasticities of demand for food in middle-income countries are estimated at 0.58, compared with 0.73 in low-income countries, and 0.29 in high-income countries. These differences reflect middle-income countries' rising demand for meat and other livestock products, and are supported by empirical evidence in individual countries. For example, Mergos and Donatos found that Greek consumers purchased more meat and dairy products, and less bread, as their incomes grew [23]. A high expenditure elasticity of meat demand indicates the dominant position of meat in the diet of middle-income countries. Hossain and Jenson found high expenditure elasticities for beef, pork, poultry, dairy products, sugar, milk, butter and

cheese, fruits, and vegetables, and lower ones for grains and eggs in Lithuania during the 1990s [14].

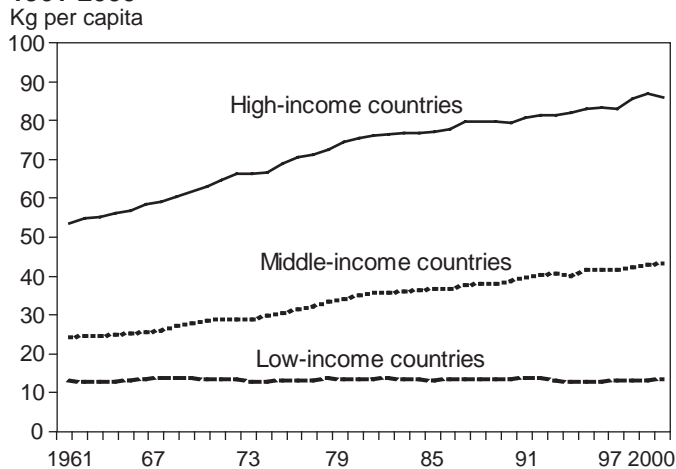
Two additional factors help explain changes in food consumption when per capita Gross Domestic Product (GDP) rises. First, as populations move from low to middle income brackets, demand for livestock products and food in general will increase. Increased food consumption is further enhanced when both political and economic forces unite to reduce disparities in income distributions. Second, higher rates of economic growth will likely lead to a reduction in rural population and rising urbanization in middle-income countries, which affects food consumption patterns [30]. Rural populations usually produce a large proportion of household food requirements in their own back yards. These food items include poultry meat, meat of small animals (pork, sheep, goat, rabbit), milk, cheese, eggs, yogurt, vegetables, and sometimes fruit. However, when people move to urban centers, they begin to buy their food from retail market outlets already dressed, packed, and/or processed. In some countries, newly urbanized migrants with a strong taste for fresh meats may prefer to shop at a wet market, if they exist, where animals are freshly slaughtered and dressed. Over time, however, urban dwellers are more likely to own refrigerators for preserving perishable commodities such as meat, poultry, fruits, and vegetables.

Middle-income countries, including Egypt, are characterized with increasing populations and large rural-to-urban migration as individuals seek better job opportunities in industrial and trade sectors. Their citizens' ultimate motivation is to improve their incomes, and move to higher-income classes. As they make this shift, they will probably buy most of their food items from grocery stores.

Meat Consumption in Middle-Income Countries

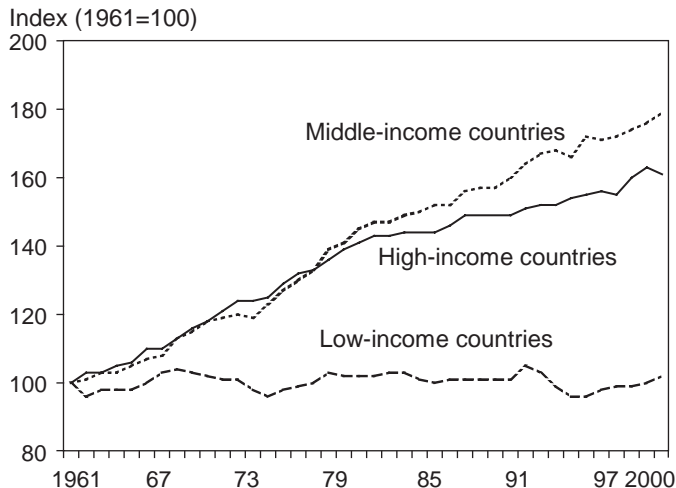
As indicated above, per capita meat consumption varies widely among countries according to GDP income levels. In general, per capita consumption in high-income countries is double that of middle-income countries and nearly six times the amount consumed in low-income countries (fig. 1a). Between 1961 and 2000, per capita meat consumption increased nearly 61 percent and 79 percent, in high- and middle-income countries respectively, compared with only 2 percent in low-income countries (fig. 1b).

Figure 1a
Per capita total meat consumption by income group, 1961-2000



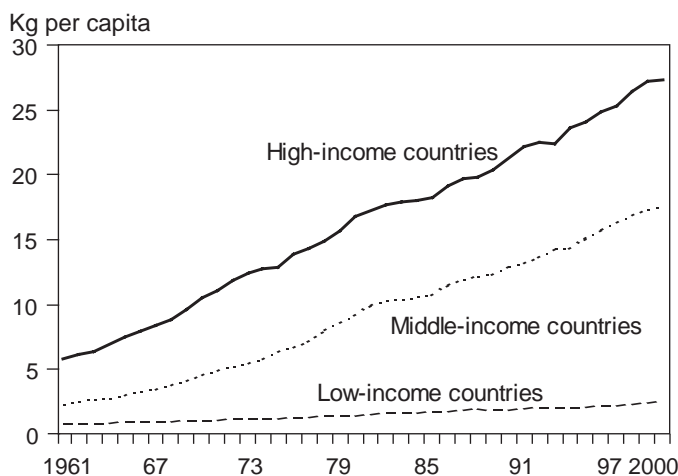
Source: Economic Research Service/USDA.

Figure 1b
Growth of per capita total meat consumption, 1961-2000



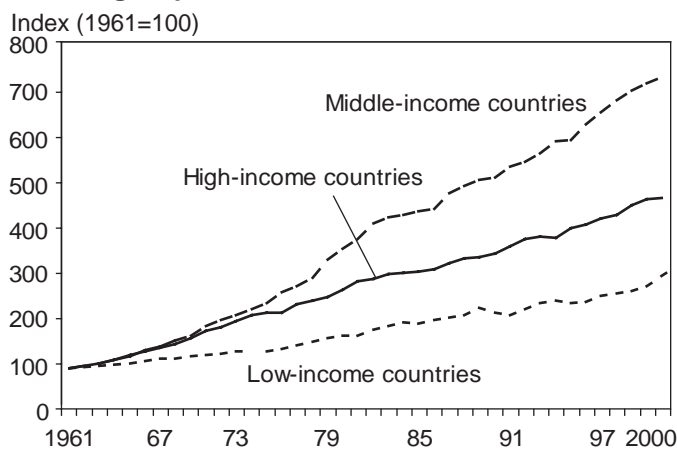
Source: Economic Research Service/USDA.

Figure 2a
Per capita poultry meat consumption by income group, 1961-2000



Source: Economic Research Service/USDA.

Figure 2b
Per capita growth of poultry consumption by income group, 1961-2000



Source: Economic Research Service/USDA.

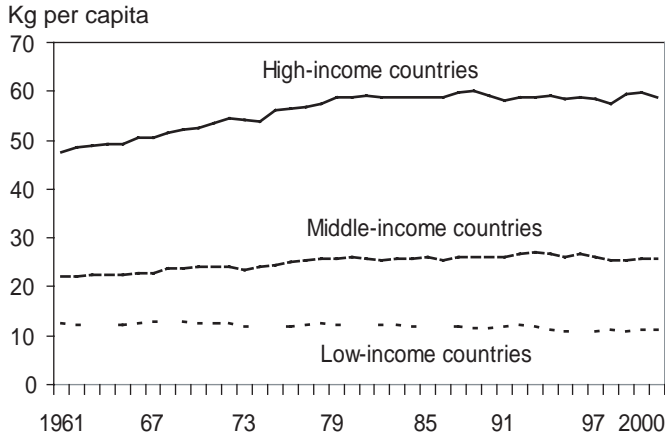
Per capita poultry meat consumption grew faster than pork, bovine (beef and water buffalo), lambs, goat, and other meat consumption in all of the three income groups. Poultry meat consumption increased faster in middle-income countries than in high- and low-income countries (fig. 2a). Between 1961 and 2000, per capita poultry meat consumption in middle-income countries grew by 635 percent compared with 370 percent in high-income countries and 201 percent in low-income countries (fig. 2b).

Per capita red meat consumption rose only 23 percent in high-income countries and 18 percent in middle-income countries, but declined 11 percent in low-income countries over the same 1961-2000 period. Per capita consumption in high-income countries was

nearly 5.2 times higher than low-income countries and 2.3 times higher than middle-income countries. Between 1980 and 2000, per capita consumption of red meat was nearly unchanged at about 59 and 26 kilograms per year in high- and middle-income countries, respectively, but dropped from 12 to 11 kilograms per capita in low-income countries (fig. 2c). These trends indicate a widening gap in consumption levels across income groups, with low-income countries lagging over time (fig. 2d).

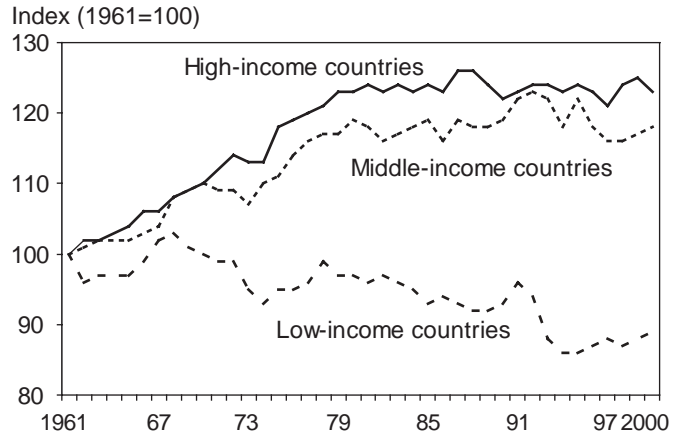
Disaggregating red meat into its main components indicates that only pig meat showed a rising per capita consumption trend during 1961-2000 (fig. 2e). Per capita consumption of bovine meat rose during the 1960s and 1970s, but declined in the 1980s and 1990s

Figure 2c
Per capita red meat consumption by income group, 1961-2000



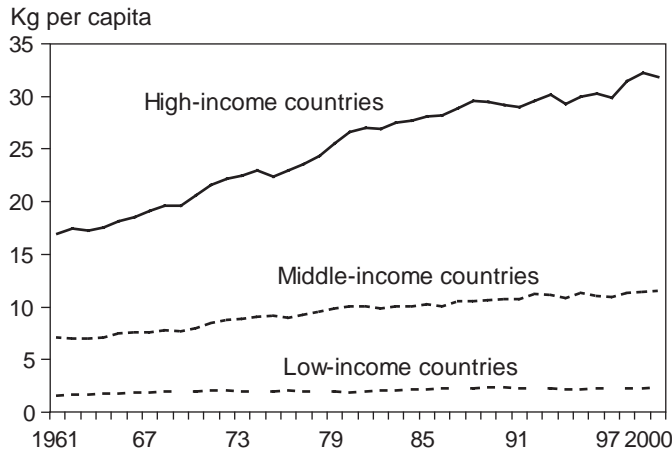
Source: Economic Research Service/USDA.

Figure 2d
Growth of per capita red meat consumption by income group, 1961-2000



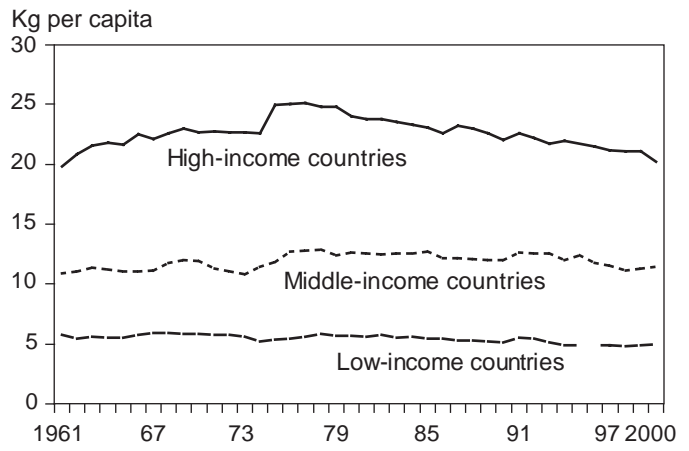
Source: Economic Research Service/USDA.

Figure 2e
Per capita pigmeat consumption by income group, 1961-2000



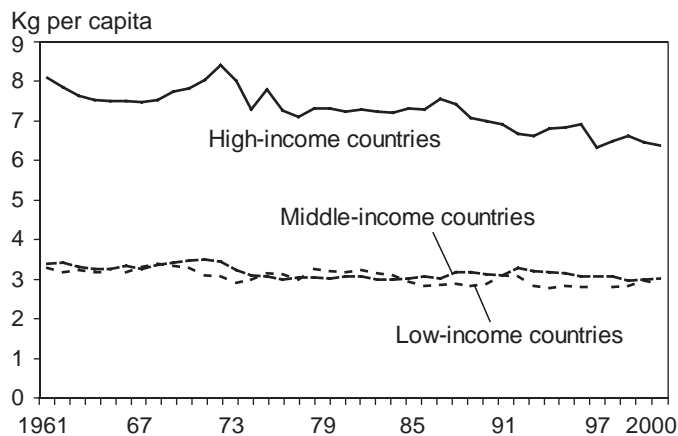
Source: Economic Research Service/USDA.

Figure 2f
Per capita bovine meat consumption by income group, 1961-2000



Source: Economic Research Service/USDA.

Figure 2g
Per capita sheep and goat meat consumption by income group, 1961-2000



Source: Economic Research Service/USDA.

in all three income groups (fig. 2f). Likewise, consumption of lamb and goat meat declined sharply in all three income groups during 1961-2000 (fig. 2g).

Meat Production is Rising, Especially in Middle-Income Countries

Worldwide, total meat production more than tripled from 71.2 million tons in 1961 to 237 million in 2001 (table 1), although growth rates slowed over time (fig. 3a). Middle-income countries showed the highest annual growth rates, while high- and low-income countries grew at slower rates in all four decades (fig. 3b). More importantly, in the 1990s poultry meat production had the fastest annual growth rates—nearly double that of pigmeat, 3.4 times that of sheep and goat meat, and 6 times that of bovine meat (table 2).

Table 1—World meat production by type, 1961-2001

Year	Bovine	Pigmeat	Poultry	Lamb & goat	Others	Total
<i>Million tons</i>						
1961	28.76	24.74	8.94	6.03	2.70	71.2
1962	30.31	26.05	9.20	6.17	2.74	74.5
1963	31.98	28.01	9.74	6.16	2.75	78.6
1964	32.44	28.67	10.13	6.16	2.80	80.2
1965	33.05	31.28	10.95	6.21	2.77	84.3
1966	34.76	32.41	11.67	6.32	2.76	87.9
1967	36.51	33.86	12.37	6.49	2.82	92.0
1968	38.24	34.40	12.77	6.68	2.91	95.0
1969	39.22	34.12	13.72	6.64	3.04	96.7
1970	39.67	35.79	15.09	6.83	3.06	100.4
1971	39.42	39.41	15.71	6.95	3.07	104.6
1972	39.91	40.62	16.83	7.01	3.17	107.5
1973	40.26	40.47	17.61	6.78	3.17	108.3
1974	43.31	42.43	18.29	6.56	3.19	113.8
1975	45.20	41.66	18.66	6.79	3.24	115.6
1976	47.59	40.75	20.01	6.82	3.28	118.4
1977	47.99	42.94	21.21	6.88	3.31	122.3
1978	48.52	45.64	22.68	7.04	3.34	127.2
1979	47.37	50.08	24.54	7.04	3.43	132.5
1980	47.17	52.67	25.91	7.34	3.34	136.4
1981	47.62	52.99	27.50	7.62	3.33	139.1
1982	47.71	53.19	28.45	7.71	3.28	140.3
1983	48.98	55.47	29.19	7.99	3.35	145.0
1984	50.37	57.48	29.76	8.07	3.41	149.1
1985	51.25	59.96	31.17	8.26	3.49	154.1
1986	53.09	61.51	33.33	8.33	3.38	159.6
1987	53.18	63.62	35.90	8.66	3.48	164.8
1988	53.67	67.10	37.69	9.06	3.54	171.1
1989	53.98	68.19	38.67	9.38	3.54	173.8
1990	55.70	69.86	41.03	9.69	3.50	179.8
1991	56.35	70.91	43.14	9.88	3.56	183.8
1992	55.52	72.84	45.25	9.91	3.83	187.4
1993	55.10	75.09	48.13	10.13	3.82	192.3
1994	55.95	77.58	50.85	10.34	3.91	198.6
1995	56.93	78.56	54.64	10.55	4.15	204.8
1996	57.43	78.44	56.32	10.29	4.28	206.8
1997	58.26	82.17	59.96	10.59	4.18	215.2
1998	58.11	87.62	62.28	10.68	4.24	222.9
1999	59.36	89.70	65.32	11.11	4.27	229.8
2000	59.67	89.41	68.07	11.44	4.32	232.9
2001	59.82	91.19	70.36	11.29	4.33	237.0

Source: FAO data, <http://www.faostat.fao.org/July 2002>

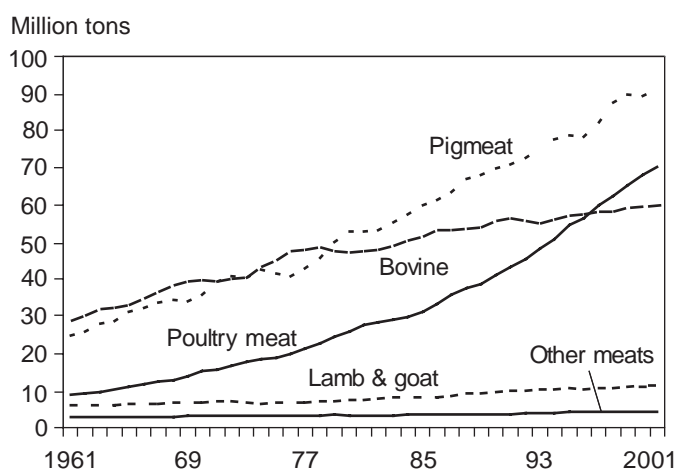
Table 2—Annual growth rates of world total meat production, 1961-2001

Year	Bovine	Pigmeat	Poultry	Lamb & goat	Others*	Total
<i>Percent per year</i>						
1961-70	3.63	4.1	5.77	1.34	1.31	3.80
1971-80	2.49	2.84	5.41	0.52	1.03	3.00
1981-90	1.78	3.34	4.64	2.66	0.78	3.00
1991-2001	0.83	2.64	4.99	1.44	1.79	2.70

* Others include game, horse, rabbit, and camel meats.

Source: FAO data, <http://www.faostat.fao.org/July 2002>

Figure 3a

World total meat production, 1961-2001

Source: Economic Research Service/USDA.

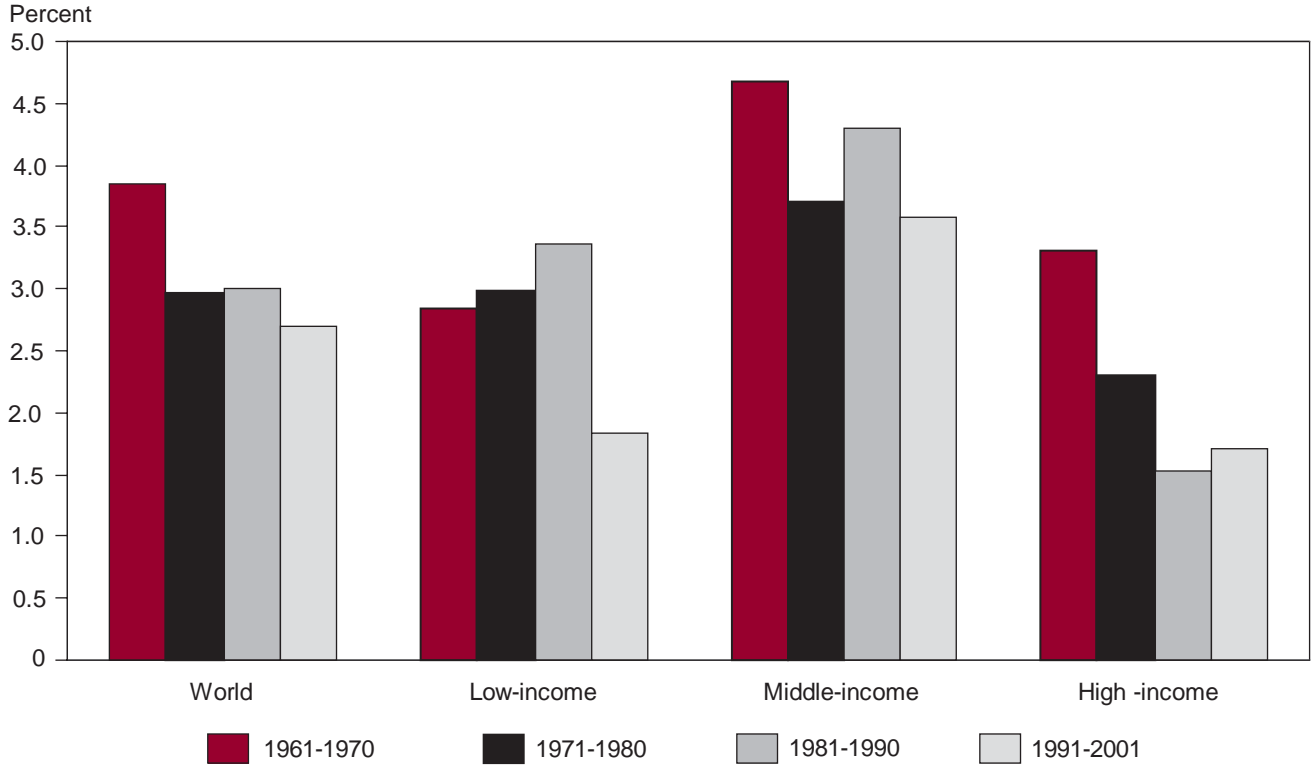
In middle-income countries, meat production showed similar trends (fig. 3c). Poultry meat rose from 10.7 percent of total meat output in 1961 to 29 percent in 2001. The shares of bovine, sheep and goat, and other meats decreased sharply, while that of pigmeat grew from 38.6 to 45.1 percent over the same period.

By 2001, middle-income countries were the largest producers of poultry, bovine, pigmeat, and sheep and goat meat compared with the other two groups (fig. 4a-d). High-income countries dominated poultry production until 1994 (fig. 4a). In aggregate, middle-income countries' poultry output exceeded that of the high-income countries in 1995 and reached 37.2 million tons compared with 29.3 million tons in high-income countries in 2001. Only 3.8 million tons of poultry meat was produced in low-income countries in 2001. The output increase was mainly due to accelerated production in China, Brazil, Mexico, and other middle-income countries.

Until 1988, bovine meat production was consistently largest in high-income countries, when it slipped below that of the middle-income countries (fig. 4b). Production in high-income countries exceeded that of

Figure 3b

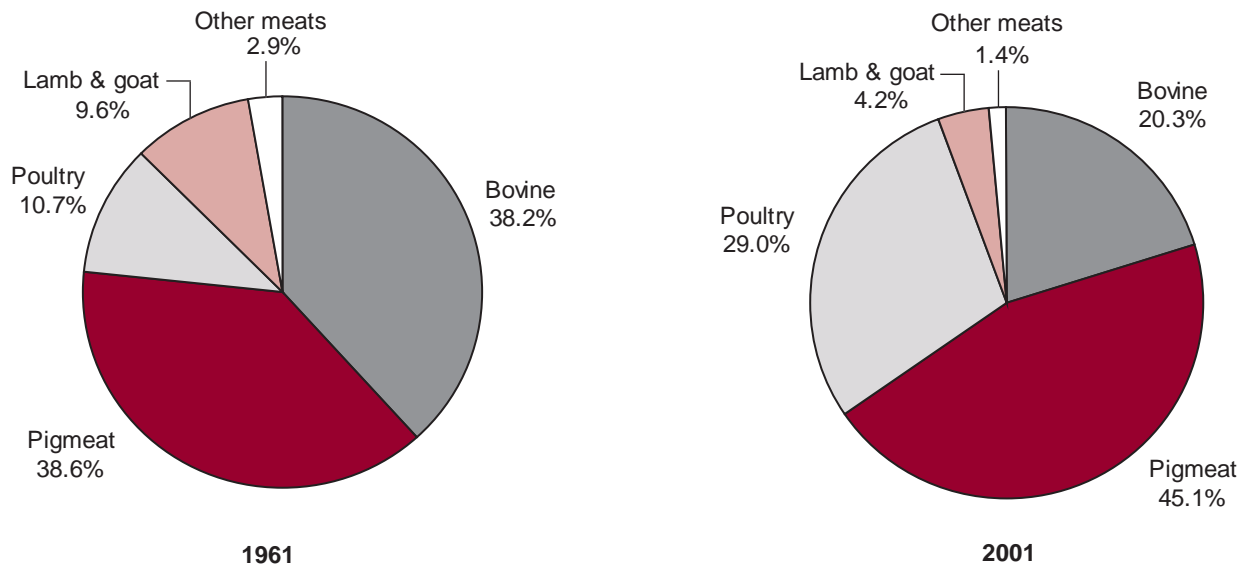
Annual growth rates of total meat production by decade and income group



Source: Economic Research Service/USDA.

Figure 3c

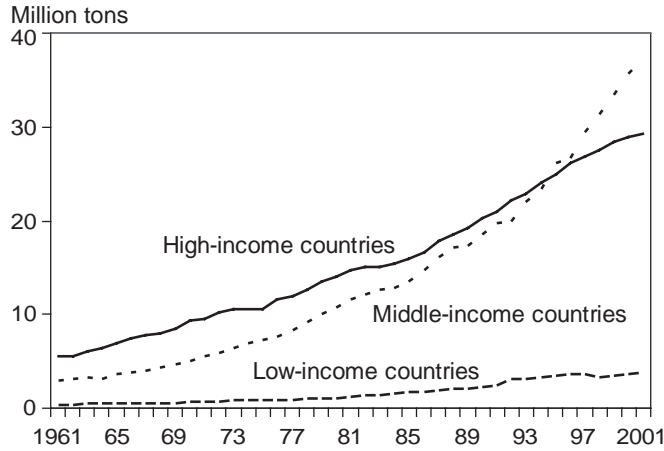
Middle-income countries' total meat production distribution in 1961 and 2001



Source: Economic Research Service/USDA.

Figure 4a

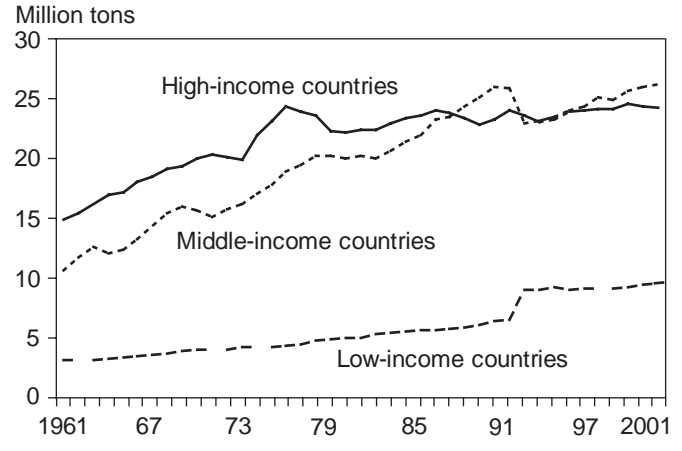
World poultry production by income group, 1961-2001



Source: Economic Research Service/USDA.

Figure 4b

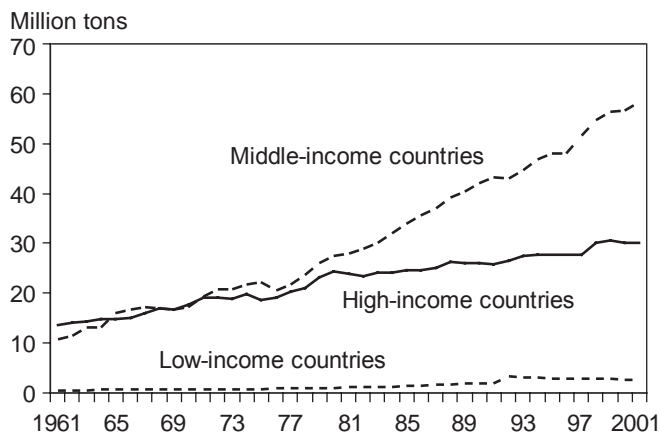
World bovine production by income group, 1961-2001



Source: Economic Research Service/USDA.

Figure 4c

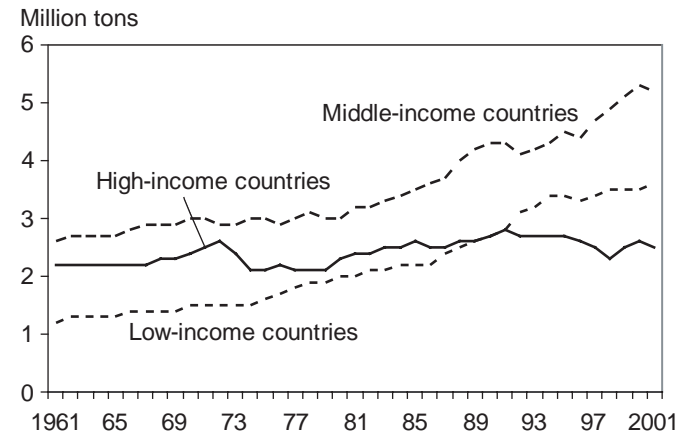
World pigmeat production by income group, 1961-2001



Source: Economic Research Service/USDA.

Figure 4d

World sheep and goat meat production by income group, 1961-2001



Source: Economic Research Service/USDA.

middle-income countries again after the 1992 split of the Former Soviet Union into 15 Newly Independent States (NIS) and the reclassification of 11 NIS as low-income countries. In 1993, middle-income countries' output of bovine meat rebounded to surpass that of the high-income countries after production increases in Brazil and China during the 1990s.

Pigmeat production in middle-income countries started to outpace that of the high-income countries in the early 1960s (fig. 4c). This gap rapidly widened in the mid-1980s, due mainly to China's economic reform. Reform led to accelerated pigmeat expansion, making China the world's largest producer by 2001, accounting for almost half of the world total, compared with the European Union (EU) (19 percent) and the United States (10 percent) [42].

Sheep and goat meat production was consistently larger in middle-income countries than in the other

two income groups over the entire period due mainly to prevailing climate and topographic conditions (fig. 4d).

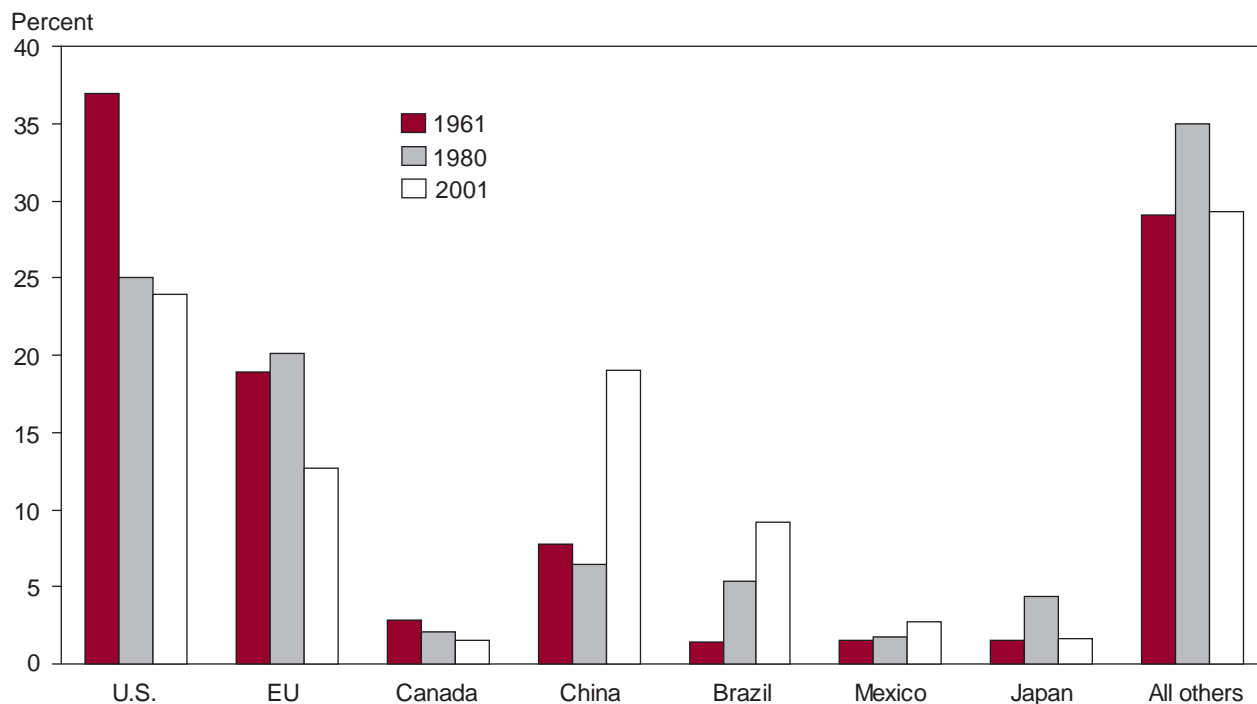
Demand for Poultry Meat Rose Fastest in Middle-Income Countries

World poultry meat output increased nearly eightfold, from 8.9 to 70.4 million tons over 1961-2001, while output in middle-income countries rose more than twelvefold, from 3.0 to 37.5 million tons. The major poultry meat producers are the United States, the EU, China, Brazil, Mexico, Canada, and Japan (fig. 5a). Among middle-income countries, China was the major producer in 2001, followed by Brazil, Mexico, Argentina, Iran, Russia, Egypt, and Poland (fig. 5b).

The combined output of China and Brazil exceeded that of the United States or the EU in the 1990s. In 1961, poultry meat output from China and Brazil, combined,

Figure 5a

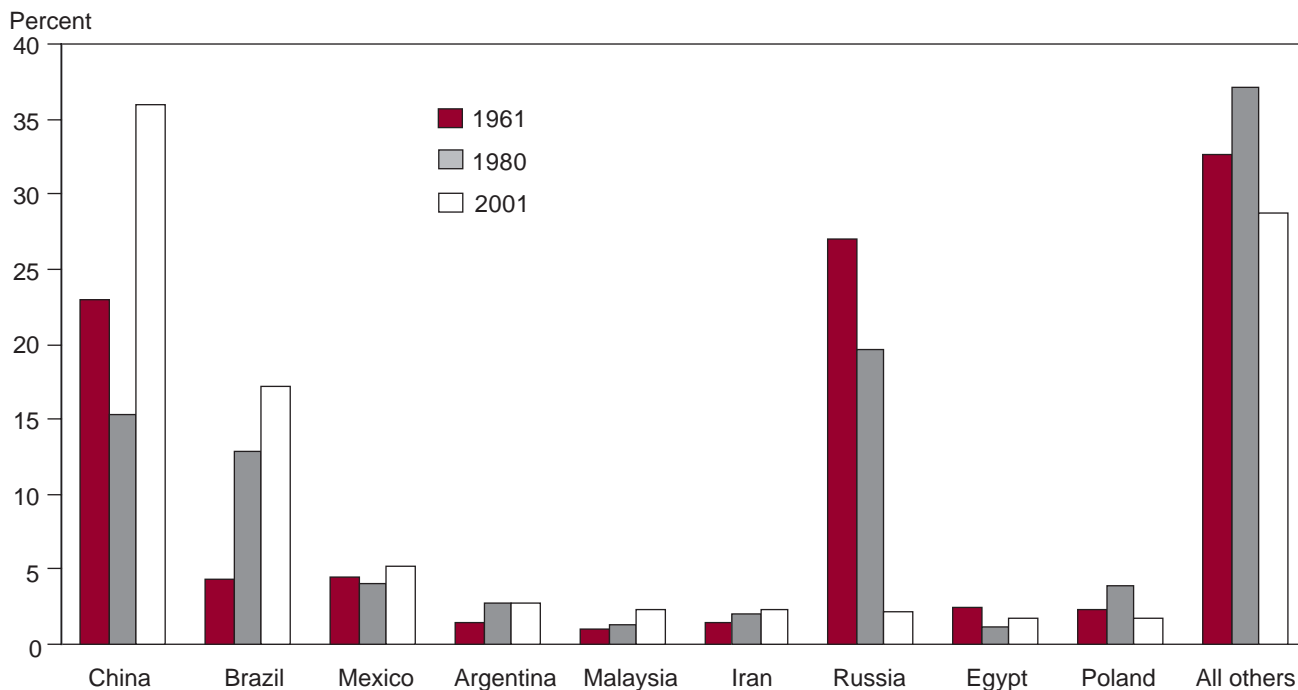
World major poultry producers; percent of world totals, 1961, 1980, and 2001



Source: Economic Research Service/USDA.

Figure 5b

Major poultry producers in middle-income countries; percent of total middle-income country production, 1961, 1980, and 2001



Source: Economic Research Service/USDA.

accounted for 9.2 percent of the world total, amounting to nearly one-quarter of the U.S. share (37 percent), or half the EU share (18.9 percent). China and Brazil's poultry meat production rose at faster rates than that of the U.S. and EU, due to agricultural economic reforms in China and the influx of foreign investments and technology into both countries during the 1980s and 1990s.

Consequently, between 1980 and 2001, poultry meat production rose 699 percent in China and 358 percent in Brazil, compared with only 158 percent and 70 percent in the United States and EU, respectively. As a result, the combined China-Brazil share of the world total rose to 28 percent, while that of the United States and EU declined to 24 percent and 13 percent, respectively, in 2001 (fig. 5a). In that year, China alone contributed 35.5 percent of total middle-income countries' output, followed by Brazil (17.7 percent), Mexico (5.2 percent), Thailand (3.6 percent), and Argentina (2.6 percent).

Before 1992, the Soviet Union was the largest poultry producer of all middle-income countries. However, after the 1992 split of the Soviet Union into the 15 NIS, Russia's output alone in 2001 declined substantially, to nearly 56 percent of its 1992 level. Production has slowed since the 1991 reforms, which decreased consumers' real income and increased production and marketing costs vis-a-vis the world market. Domestic production could not compete against rising poultry imports, especially from the United States, the Netherlands, and France. Consequently, in 2001, Russia's poultry production share (2.2 percent) ranked below that of Iran's (2.3 percent) and just above that of Egypt (1.7 percent) and Poland (1.7 percent) (fig. 5b).

In 1961, middle-income countries produced 34 percent of world poultry meat, high-income countries 61 percent, and low-income countries the remaining 5 percent. Since then, middle-income country production has been accelerating, equaling the output of high-income countries at about 47 percent by the mid-1990s. By 2001, middle-income countries accounted for the largest share of world poultry production (52 percent) compared with 42 percent in high-income countries and less than 6 percent in low-income countries (fig. 6a)

Major Types of Poultry

Poultry meat consists primarily of meat from chickens. In 1961, chicken meat accounted for 85 percent of world total poultry meat production, turkey meat made up 10 percent, and the rest was composed of ducks, geese, and pigeons. By 2001, world chicken meat production was nearly unchanged at 86 percent, turkey meat decreased to only 7 percent, while ducks, geese, and pigeons together increased to a little over 7 percent. Production of poultry types has a different distri-

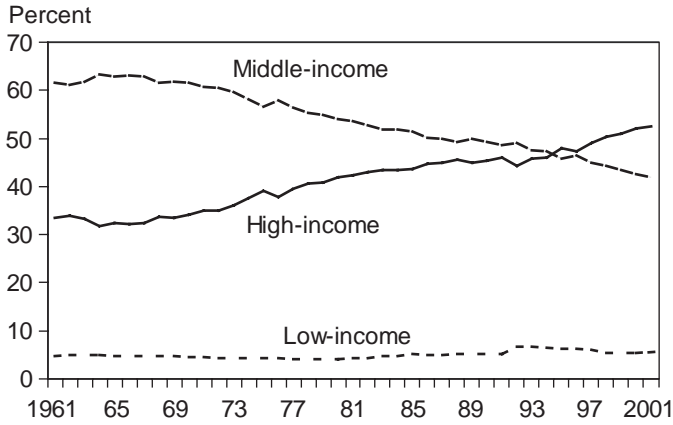
bution in each of the three income groups, depending on climate, costs of production, consumers' taste, and the state of skills, management, and technology available in a country.

Chickens, and more so turkeys, are more sensitive to ambient environmental temperatures than ducks, geese, or pigeons. For example, turkey poultts must be kept in warmer places than baby chicks, but are very sensitive to high temperatures and may die from hot weather stress more quickly than chickens. Turkeys of all weights show an abrupt drop in feed conversion efficiency at temperatures above 86 degrees Fahrenheit, while chickens tolerate that heat [10]. For both chickens and turkeys, moving air is required for them to adequately cool themselves in high temperatures.

During 1961-2001, world chicken production increased nearly 690 percent from 7.6 million tons to about 60 million tons. The largest increase was achieved in middle- and low-income countries, rising by 1,139 percent and 898 percent, respectively, followed by high-income countries at 421 percent. In 1961, high-income countries' share of chicken production was 61 percent of the world total, compared with 34 percent in middle-income countries and only 5 percent in low-income countries. In 1988, however, middle-income countries' share of about 48 percent exceeded that of high-income countries for the first time. Middle-income countries' share stayed within 1 percentage point of high-income countries' share between 1989 and 1992 before beginning a steady rise over high-income countries in 1993. By 2001, the production share of middle-income countries accounted for 54 percent of the world total, compared with 40 percent for high-income countries and 6 percent in low-income countries (fig. 6b). The United States is the world's largest chicken producer, accounting for 23.4 percent of the world total, followed by China (15 percent), the EU (11.2 percent), and Brazil (10.2 percent) in 2001. Other small producers include Mexico at 3.2 percent and Thailand, Japan, India, and Argentina, each at about 2 percent.

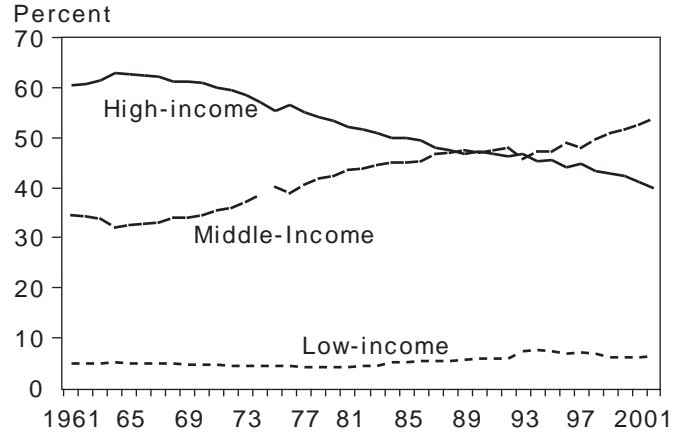
Turkey meat production has been dominated by high-income countries, which accounted for 92 percent of output in 1961. A steady 8 percent were in middle-income countries, and only 0.2 percent was in low-income countries (fig. 6c). Turkey is a native bird of the Americas and is not known in many other countries. Consequently, in 1961, the United States was the world's largest single turkey meat producer, accounting for 75 percent of the world total, but production decreased to 50 percent in 2001. The EU was second

Figure 6a
Production shares of poultry meat by income group; percent of world total, 1961-2001



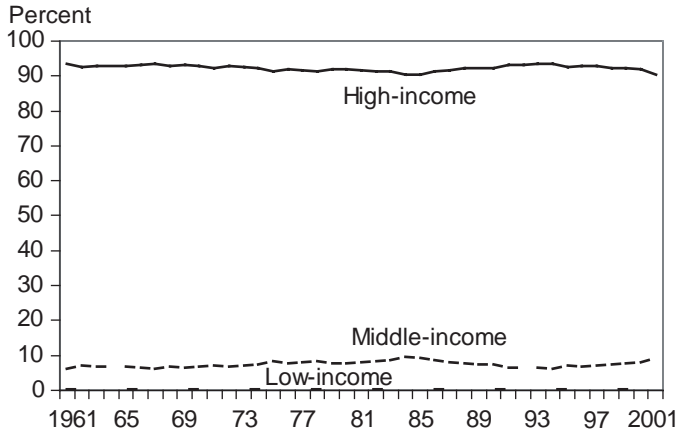
Source: Economic Research Service/USDA.

Figure 6b
Production shares of chicken meat by income group; percent of world total, 1961-2001



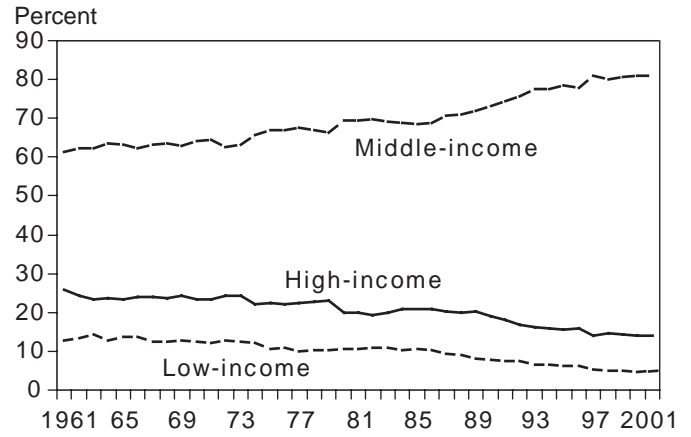
Source: Economic Research Service/USDA.

Figure 6c
Production shares of turkey meat by income group; percent of world total, 1961-2001



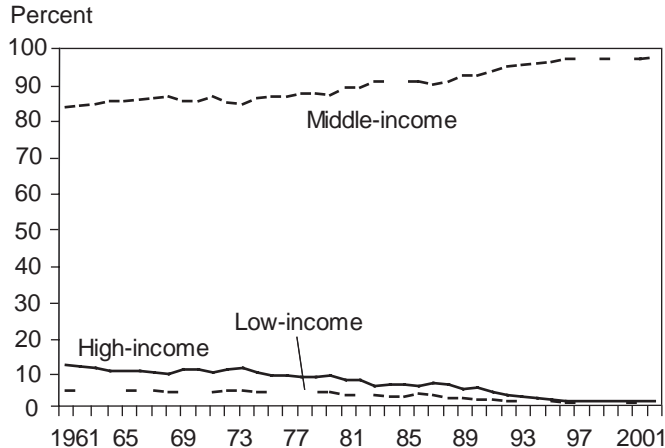
Source: Economic Research Service/USDA.

Figure 6d
Production shares of duck meat by income group; percent of world total, 1961-2001



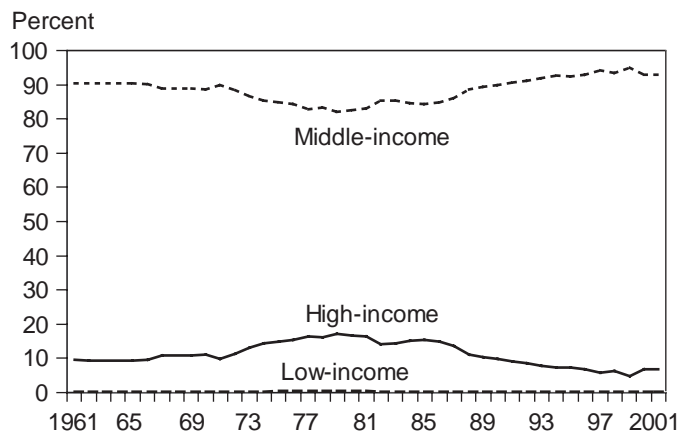
Source: Economic Research Service/USDA.

Figure 6e
Production shares of goose meat by income group; percent of world total, 1961-2001



Source: Economic Research Service/USDA.

Figure 6f
Production shares of pigeon meat by income group; percent of world total, 1961-2001



Source: Economic Research Service/USDA.

at 37 percent, and Canada and Brazil each had 3 percent.

Ducks and geese are more tolerant of heat stress than chickens and turkeys and in many cases are raised around pastures in open areas near water. Pigeons can be reared in a variety of climates with minimal facilities. In some countries, pigeons are domesticated and raised in established roosting houses for marketing in special meat shops, because young pigeon meat is considered a delicacy. They may not feed on a regular basis, depending mostly on scavenging from nearby grain fields and household refuse.

Production of duck, goose, and pigeon meat in the middle-income countries showed the greatest increase over 1961-2001. During this period, middle-income countries' duck meat output increased from 61 to 81 percent of world production (fig. 6d). Most duck meat

was produced by China, followed by the EU, Thailand, the United States, Malaysia, and Egypt. Similarly, goose meat production of middle-income countries increased from 85 to 98 percent of the world total (fig. 6e). China also produces almost all of the world's goose meat, with very small amounts produced in the EU and Thailand. Production of both goose and duck meat in high- and low-income countries decreased as indicated in figures 6c and 6d. Also, world production of pigeon meat was dominated by middle-income countries, where output actually rose from 90 to 93 percent of the world's total (fig. 6f). From 1970 to 1985, pigeon production in high-income countries such as Cyprus and France rose to nearly 20 percent of the world's total, but decreased afterwards. Egypt was the top producer of pigeon meat, with Syria, the EU, and Saudi Arabia producing minor amounts.