Value of U.S. Meat and Poultry Exports to U.S. Soybean Producers: 2015-2026

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Contents

Executive Summary

The growth of U.S. meat and poultry exports has implications for the well-being of the soybean industry. As changes in meat and poultry exports occur, domestic soybean meal (SBM) will follow correspondingly, having an impact on the prices of SBM and soybeans. In light of this relationship, this research seeks to address two questions with regard to historical (2004/05 to 2014/15) and projected (2015/16 to 2026/27) time periods:

1. What is the quantity of SBM exported as meat and poultry?
2. What is the value derived by the soybean industry from these meat and poultry exports?

Additional analysis related to various scenarios with implications for the quantity and value derived from meat and poultry exports to the soybean industry is also included.

The United States exports significant amounts of meat and poultry. Depending on type of meat, these exports are substantial. In 2014 the following was exported:

- 2.203 million MT, or 21.2% of 2014 pork production
- 1.167 million MT, or 10.5% of 2014 beef production
- 3.312 million MT, or 19.1% of 2014 broiler meat production
- 0.366 million MT, of 14.0% of 2014 turkey meat production

U.S. meat and poultry exports grew substantially from 2004/05 to 2014/15. However, throughout the years the relative importance of some export destinations has changed considerably. Mexico, Japan, Canada, South Korea, and China are currently key market destinations for U.S. meat and poultry. Since 2010 Mexico has become a very important market for all U.S. meat and poultry included in this study. On average, from 2010 to 2014, the U.S. has exported to Mexico 17% of its broiler meat exports and 26% of its pork exports. During the same period, 17% of the total U.S. beef exports and 56% of the total U.S. turkey meat exports were shipped to Mexico.

Using USDA reports and other data collected for other United Soybean Board (USB) projects ("Economic Analysis of Animal Agriculture" and "Market Competitiveness of SBM in Livestock Rations"), DIS determined the amount of SBM needed to produce, pork, beef and poultry (broilers and turkeys). Results indicate that during the past eleven years, 40.1 million tons of SBM worth $13.8 billion to the soybean industry were exported as meat. By type of meat, this amounts to:

- Pork: 15.818 million tons, worth $5.5 billion to the soybean industry
- Beef: 2.786 million tons, worth $1.0 billion to the soybean industry
- Broilers: 18.885 million tons, worth $6.4 billion to the soybean industry
- Turkey: 2.589 million tons, worth $0.9 billion to the soybean industry

Results also indicate that the same trend is expected for the projected period, as the volume of broiler meat exports are projected to surpass the volume of pork, beef, and turkey exports. Overall, it can be expected that SBM exported as meat and poultry will experience further expansion for the period this study covers. Results indicate that during the upcoming 12 years, 58.1 million tons of SBM worth $18.9 billion to the soybean industry will be exported as meat and poultry. This amounts to:

- Pork: 23.674 million tons, worth $7.7 billion to the soybean industry
- Beef: 4.869 million tons, worth $1.6 billion to the soybean industry
- Broilers: 25.649 million tons, worth $8.4 billion to the soybean industry
- Turkey: 3.874 million tons, worth $1.3 billion to the soybean industry

From 2004/05 to 2014/15, the annual average value derived from meat and poultry exports to the soybean industry was estimated to be $1.253 billion. The value derived by the soybean industry from meat and poultry exports breaks down to an annual average high of $143.9 million, or 11.5% of U.S. total, in Iowa to a low of $0.1 million in the states of Alaska and Hawaii. See Table 6 on page 25 for state-by-state results for the historical period.

Looking forward from 2015/16 to 2026/27 the annual average value derived from meat and poultry exports to the soybean industry is projected to be $1.576 billion. The projected value derived by the soybean industry from these exports breaks down to an annual average high of $180.9 million (11.5% of U.S. total) in Iowa to a low of $0.1 million in the states of Alaska and Hawaii. See Table 7 on page 26 for state-by-state results for the projected period.

In addition, DIS analyzed five interesting scenarios for market policy shocks to U.S. export demand. If there is a global recession in the coming 10 year time period, the broiler exports have the most potential to have a significant negative impact compared to pork, beef, and turkey. An increase in real exchange rate with the trading partners, due to a strong dollar, is more likely to have a stronger impact on pork exports compared to broilers, beef, and turkey. If passed and implemented, the prospects of the Trans-Pacific Partnership has the potential to increase SBM indirectly exported as meat and poultry by 12 percent over the next 12 years. These impacts are based on the estimated income and exchange rate elasticities available in the applied economics literature.

Expansion and promotion of U.S. meat and poultry exports for all four meats included in this study is important to U.S. soybean growers because our findings confirm that a large amount of SBM, and by extension, soybeans are exported as meat. Based on valid assumptions, global meat and poultry consumption will continue to increase throughout the projection period, with poultry meat consumption increasing the fastest since poultry meat is the lowest priced meat in the world.

SBM indirectly exported as meat and poultry will rise during the projected period. Overall, U.S. soybean producers will benefit from the expected increase in U.S. meat and poultry exports. Promoting new export markets is in the best interest of U.S. soybean producers.

Background

The U.S. is a strong competitor in the increasing world trade for meat (pork, beef, chicken, and turkey). U.S. soybean producers benefit from U.S. meat and poultry exports as soybean meal (SBM) is used as a major protein and essential amino acid (i.e., lysine, threonine, and methionine) source in the production of livestock and poultry. Over the last ten years (2005-2014), on average, the U.S. has exported 18.7% (1.914 million MT CWE) of U.S pork production and 7.6% (0.903 million metric tons (MT) carcass weight equivalent (CWE)) of U.S. beef and veal production. During the same 10-year period, on average, the U.S. has exported 18% (2.983 million MT ready to cook equivalent (RTC)) of broiler production, and 11% (0.296 million MT RTC) of turkey production (see Figure 1).

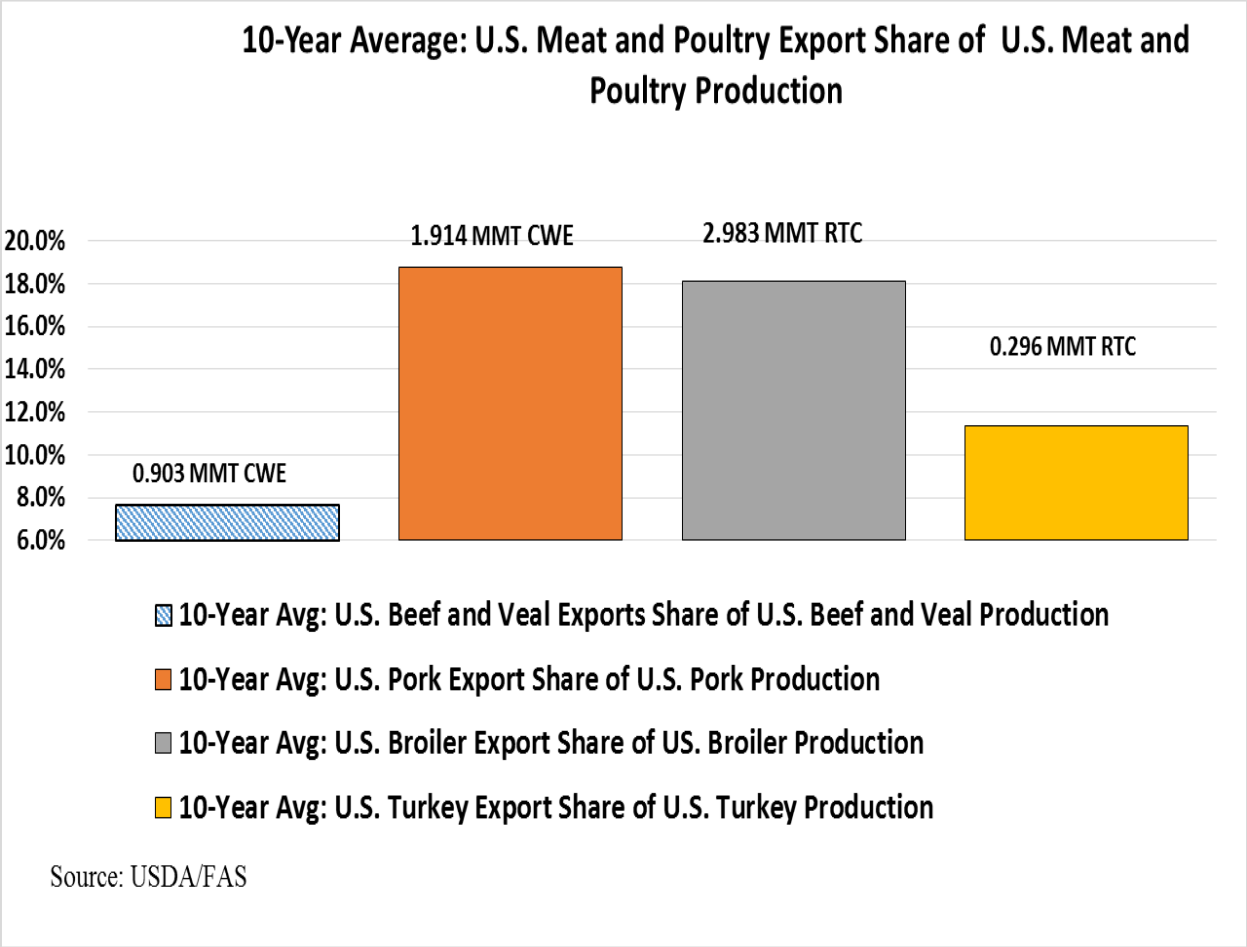


Figure 1. 10-year Average: U.S. Meat and Poultry Export Share of U.S. Meat and Poultry Production

From 2005 to 2014, the U.S. has supplied, on average, 30.8% of world pork exports and 11.1% of world beef (and veal) exports. During the same time, on average, 34.6% of the world broiler exports and 47.7% of world turkey exports, have been supplied by the U.S.

Pork

The U.S. is the world's third-largest pork producer (after China and the European Union (EU)). U.S. pork production reached 10.370 million MT CWE in 2014, representing about 9.4% of world pork production (110.566 million MT CWE). Figure 2 (next page) shows the U.S. exported 21.2% (2.203 million MT CWE) of its total pork production in 2014, ranking the U.S. as the top pork exporter in the world. The

volume of U.S. pork exported in 2014 represented 32.1% of world total volume of exports last year (6.873 million MT CWE) (see Figure 3 on page 7). On average, the volume of U.S. pork exports has represented about 32.9% of global pork exported for the last four years (2011 to 2014).

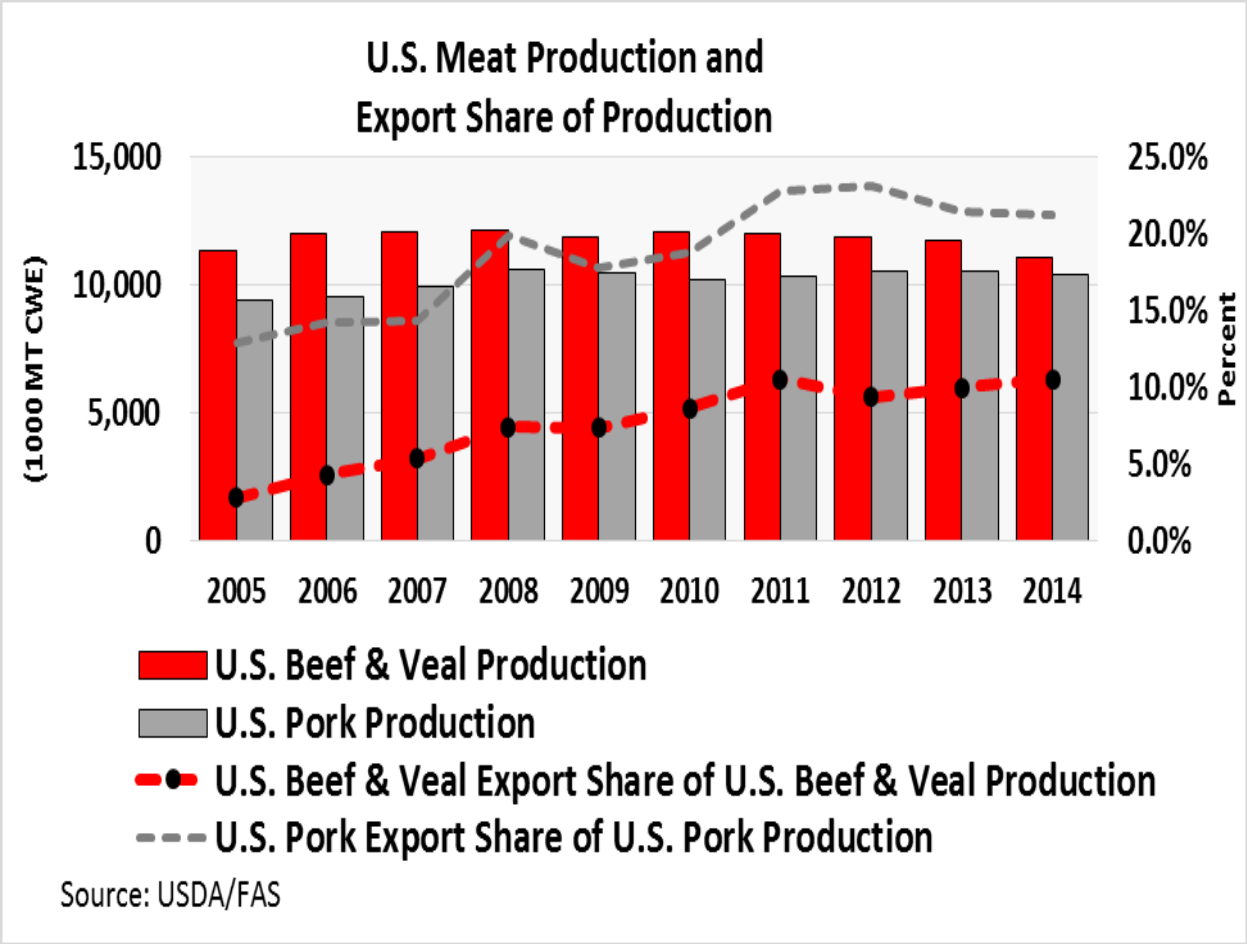


Figure 2. U.S. Meat Production and Export Share of Production

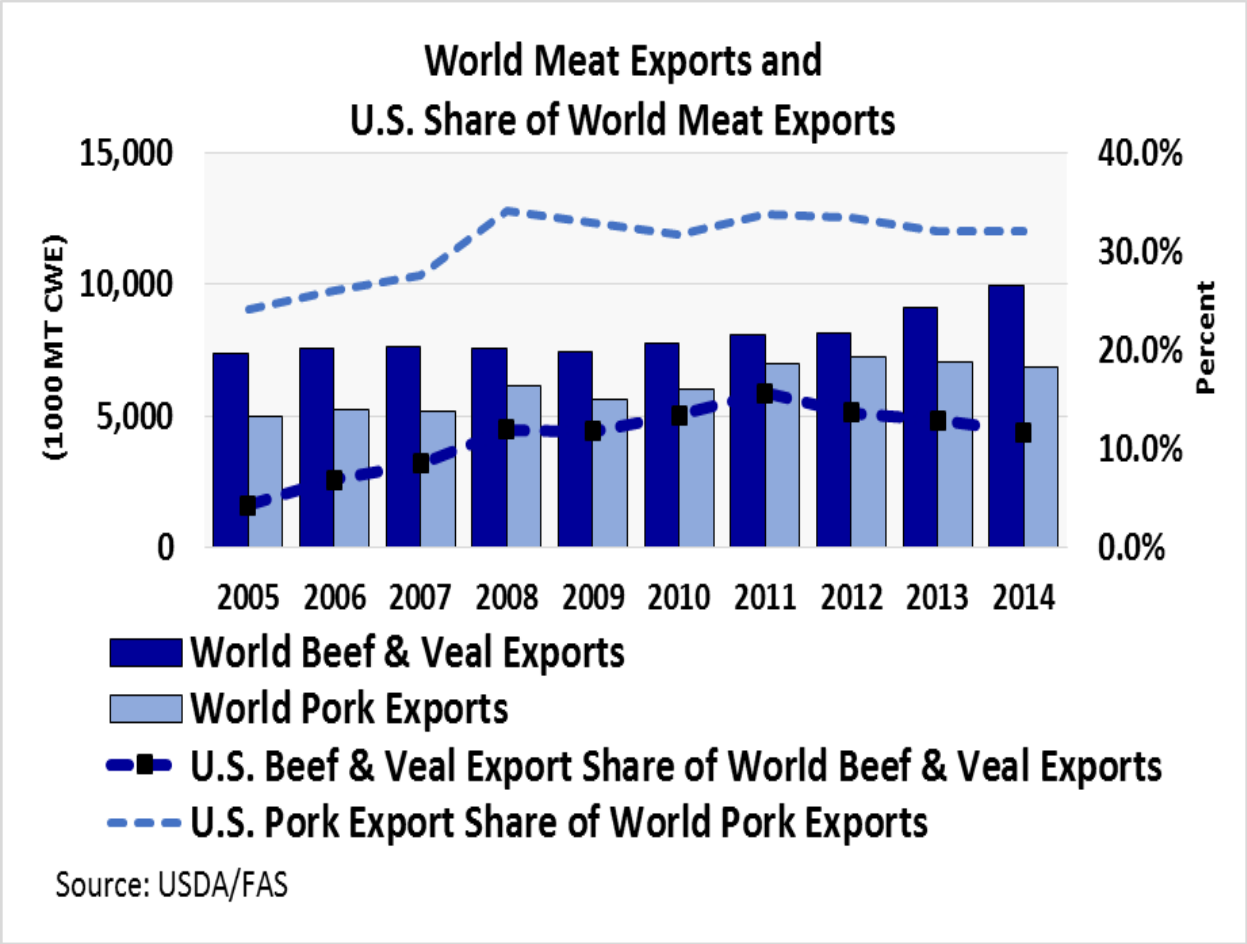


Figure 3. World Meat Exports and U.S. Share of World Meat Exports

Beef

The U.S. is the world's largest beef producer, followed by Brazil. In 2014 the U.S. produced 18.5% (11.076 million MT CWE) of the world total beef and veal (59.746 million MT CWE). The U.S. is also a major player in world beef trade. About 10.5% (1.167 million MT CWE) of 2014 U.S. beef production was exported (see Figure 2 on page 6). The 2014 volume of U.S. beef and veal exports represented about 11.7% of the 2014 world total beef and veal exports (9.990 million MT CWE) (see Figure 3). According to the October 2015 USDA/FAS Livestock and Poultry World Markets and Trade (LPWMT) report, the U.S. is currently ranked fourth in beef and veal exports after Australia, while India and Brazil are ranked number one and two, respectively.

Poultry

As the number one broiler meat producer in the world, the U.S. exported 3.312 million MT RTC of broiler meat in 2014, representing about 19.1% of last year's total U.S broiler meat production (17.299 million MT RTC) (see Figure 4 on next page). As Figure 5 (page 9) indicates, in 2014 the U.S. supplied 31.6% of the world broiler meat export volume (10.470 million MT RTC). The U.S. is ranked second in broiler exports after Brazil.

In addition, the U.S. is the largest turkey producer and exporter in the world. Fourteen percent (0.366 million MT) of total U.S. turkey production (2.600 million MT) was exported in 2014. This volume of

U.S. turkey exports represented 56.6% of the global volume (0.647 million MT) of turkey exported last year (see Figure 5 on page 9).

The U.S.'s increasing importance in international meat and poultry markets is evident. Expanding demand for U.S. meat and poultry by capturing the growing global demand for meats can boost profits for U.S. soybean farmers. For every pound of U.S. meat and poultry exported there is also an implied amount of U.S. SBM exported. Estimating the amount of SBM exported as meats will enable us to quantify the value of U.S. meat and poultry exports to U.S. soybean producers.

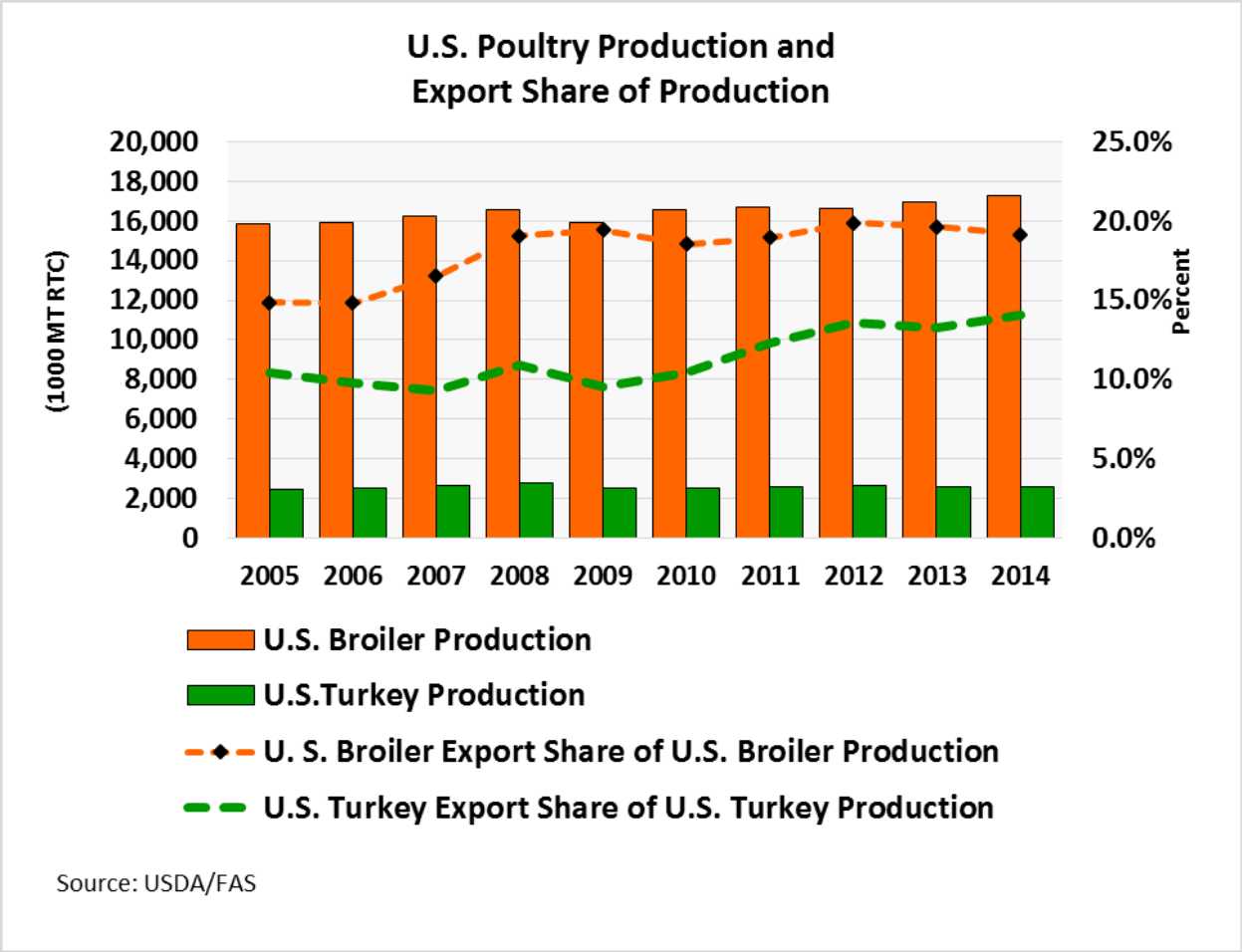


Figure 4. U.S. Poultry Production and Export Share of Production

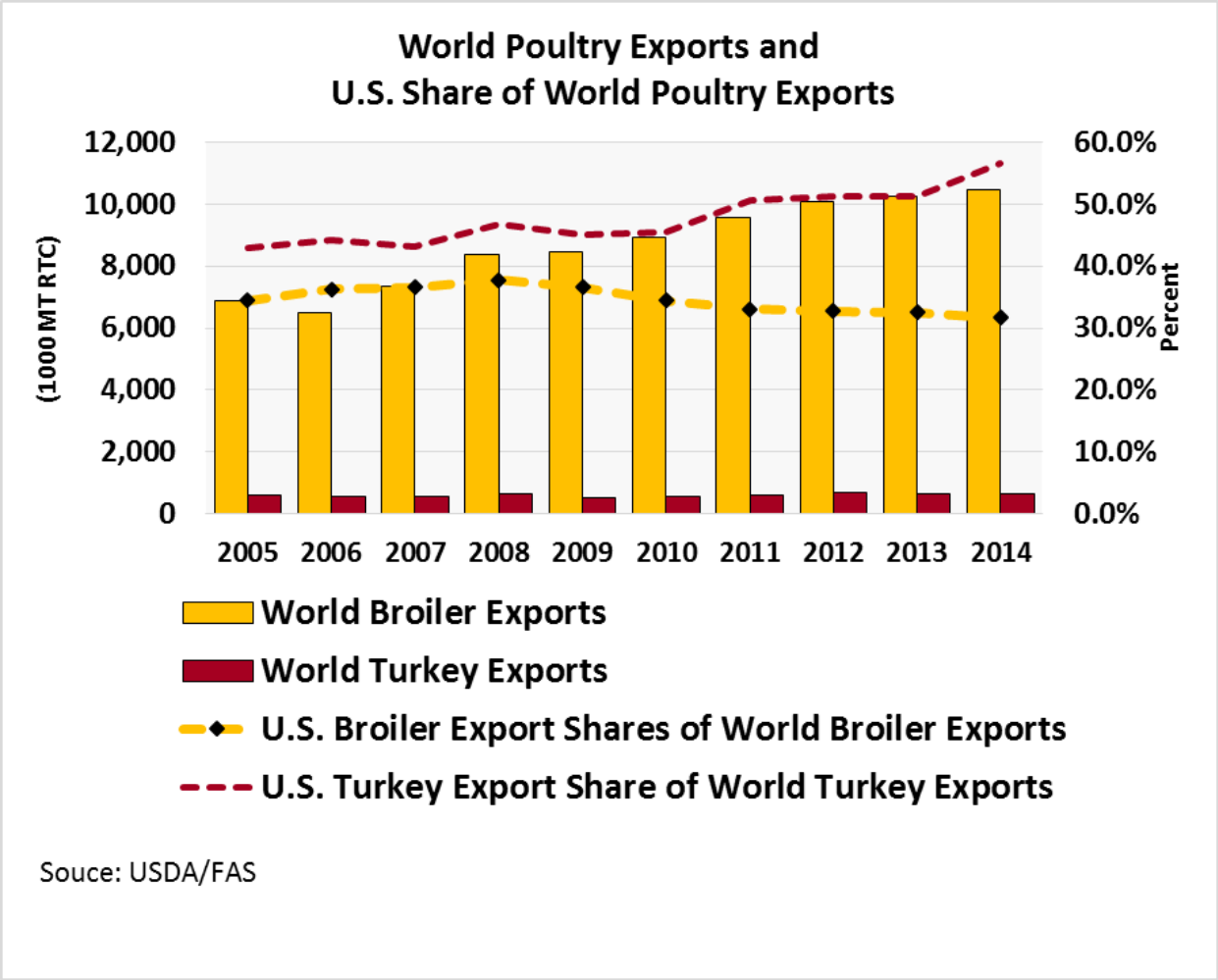


Figure 5. World Broiler Exports and U.S. Share of World Broiler Exports

Methodology

Estimation of Quantity of SBM Exported as Meat

Knowing how much SBM is needed to produce pork, beef[1], broilers, and turkey allow us to estimate the amount of SBM exported as meat and poultry. We identified a procedure used by Hayes (D. Hayes, CARD Briefing Paper 95-BP 9, 1995), which is the basis for estimating the quantity of SBM exported as meat and poultry. Upon adopting this base methodology, we made a few adjustments/allowances for changes in production practices, namely:

- Hayes originally included beef, pork, and broiler meat. Given the importance of world turkey trade, we added turkeys to the analysis. These four species of livestock and poultry comprise the vast majority of world meat and poultry trade, particularly for the U.S.
- Inclusion rates of SBM for U.S. meat and poultry production have changed since the Hayes report was written (1995). We leveraged other work undertaken for USB (i.e., FY15 projects: Economic Analysis of Animal Ag and Market Competitiveness of SBM in Livestock Rations (Market Competitiveness)) with relevance to this particular project. Updated inclusion rates were needed to take into account the increasing amounts of distillers grains in animal diets which substitute, in part, SBM in livestock and poultry rations.

The specific information necessary for these estimates for each animal species was: feed used per pound gain, SBM inclusion in the rations (Inclusion Rate), and conversion factors from live weight (LW) to CWE (for cattle and hogs) or RTC (for broilers and turkeys).

Calculating the amount of SBM exported as meat and poultry included the following steps for each animal species:

1) Pounds SBM per Pound of Live Gain = Feed Used per Pound Gain * Inclusion Rate
2) Pounds SBM per One Pound of CWE (or RTC)= Pounds SBM per Pound of Live Gain / Conversion Factor from LW to CWE (or RTC)
3) Pounds of SBM per Metric Ton of CWE (or RTC)= Pounds SBM per One Pound of CWE (or RTC) * 2,204.623
4) Pounds SBM content exported as U.S. meat and poultry exports = Pounds of SBM per Metric Ton of CWE (or RTC)* Meat exported (CWE or RTC)

To express resulting SBM in tons instead of pounds, one more step was necessary:

5) SBM content exported as U.S. meat and poultry exports (short tons) = ((Pounds SBM exported as U.S. meat and poultry exports) / 2,204.623) * 1.102

Note: 1 MT = 2,204.623 pounds, 1 MT= 1.10231131 short ton.

[1] Totals presented for beef cattle include the use of soy hulls. For purposes of this analysis we have included the use of soy hulls as part of overall estimates. In 2014, soy hulls represented an estimated 1.2 million tons (80%) of total usage of soybean products (soy hulls and SBM) by beef cattle throughout the U.S.

Meat and Poultry Export Data and Prices for SBM

Historical and Projected Meat and Poultry Export Data

We estimated the pounds of SBM content indirectly exported as U.S. meat and poultry exports (step 4 in Methodology) for the soybean marketing year for historical (2004/05-2014/15) and projected (2015/16-2026/27) periods. DIS built an annual historical (2004/05-2014/15) meat and poultry export database for the soybean marketing year (Sep-Aug) based on the historical monthly export data for pork, beef, broilers, and turkeys. The source of these data was USDA's meat export trade data (Livestock & Meat International Trade Data).

Data for the projected period (2015/16-2026/27) were obtained from three different sources.

- 2015 and 2016 calendar years: USDA's October 2015 World Agricultural Supply and Demand Estimates (WASDE) meat export projections.
- 2017-2024 calendar years: USDA's long term Agricultural Projection to 2024.
- 2025-2027 calendar years: DIS projected meat and poultry export data for the remaining three projected years.

Using the above calendar year meat and poultry export projections, DIS then converted calendar year projected meat and poultry export dataset to the soybean marketing year (Sep-Aug).

2015 and 2016 Meat Export Projections:

We used October 2015 WASDE meat and poultry export projection data for 2015 and 2016 instead of the USDA's long term Agricultural Projection to 2024. This was because as Table 1 indicates, there were some reductions across all meat export projections for these two years, particularly for broiler and turkey projections. This reflects a more accurate picture of current expectations for meat and poultry exports.

Several factors reduced the 2015 pork export projection, among them is the slower growth in global demand during 2015. Also, at the beginning of 2015 U.S. pork exports were negatively impacted by severe traffic congestion in the West Coast ports caused by a labor dispute, which hampered shipments to Asian markets. Another important factor negatively impacting U.S. pork exports to all major markets in 2015 is the loss of U.S. pork price competitiveness in foreign markets due to a stronger U.S. dollar. In addition, increased competition from other exporters, particularly the European Union (EU), which in spite of last year's Russian ban on meats imposed on the EU and the U.S., among other countries, is projected to maintain pork production and exports in 2015. The EU is diverting its EU pork supply to other markets, bringing strong competition to U.S. pork.

The beef export projection for 2015 was reduced due to relatively high U.S. prices and the strong dollar. In addition, on the beef supply side, due to herd rebuilding, beef production in 2015 has been projected lower year-over-year, limiting the volume of beef exports this year.

The 2015 broiler export projection was lowered on weaker demand due to weak economic growth in some important markets, the impact of a strong dollar this year, and the restrictions brought by the 2015 U.S.-wide highly pathogenic avian influenza (HPAI), even though broilers were not widely affected by the virus. The 2015 turkey export projection was also reduced due to HPAI restrictions from a number of countries, as well as tightened turkey supplies caused by HPAI, and the strength of the dollar.

WASDE (October 2015) 2016 meat and poultry export projections for all meats were higher than those for 2015 but remained below the projection made during November 2014.

Table 1. USDA Meat Export Projections

2015 and 2016 USDA'S Long Term Meat and Poultry Export Projections and USDA's WASDE October 2015 Meat Export Projections

	Pork*		Beef*		Broilers*		Turkeys*	
	2015	2016	2015	2016	2015	2016	2015	2016
Feb 2015 USDA LT projections **	5,250	5,375	2,525	2,543	7,400	7,629	820	825
WASDE Oct 2015	4,999	5,225	2,282	2,425	6,593	7,100	537	740
Change	-4.8%	-2.8%	-9.6%	-4.6%	-10.9%	-6.9%	-34.5%	-10.3%

* Pork, beef, broilers, and turkeys export data are expressed in million pounds
**Feb 2015 USDA long term projections were based on the November 2014 WASDE projections

2017 to 2024 Meat and Poultry Export Projections:

USDA's 10-year agricultural projections for the food and agriculture sector covers major commodities as well as agricultural trade, including U.S. exports of livestock and poultry. The agricultural baseline database provides long-run, 10-year projections from USDA's annual long-term projections report, which is published in February each year.

Meat and poultry export data for 2017 to 2024 was from the USDA's 10-year Agricultural Projections to 2024. The long term projections to 2024 were prepared during October through December 2014 and published on February 2015.

According to the USDA, long-term assumptions are made for U.S. and international macroeconomic conditions, U.S. and foreign agricultural and trade policies, and growth rates of agricultural productivity in the United States and abroad.

The USDA's assumptions underlying the most recent long-term projections (February 2015) indicate that the world population is projected to increase at an average of about 1.0% per year relative to an average annual rate of 1.2% during 2001 to 2010. Even though population growth in developing countries is expected to slow, it will remain above those in the rest of the world. The combination of population growth with increased urbanization and improvement of the middle class in developing countries strengthens the projected growth in world food demand.

Trade projections assume the same sanitary and phytosanitary restrictions and trade agreements existing in November 2014. Currently the U.S. has free trade agreements (FTA) with twenty countries. The U.S. is in negotiations of the Transatlantic Trade and Investment Partnership (T-TIP) with the EU, that aims to implement high-standard, broad-based regional pacts. In addition, on October 5, 2015 the U.S., together with eleven countries that make up the Trans-Pacific Partnership (TPP), completed negotiations on this trade agreement. According to the Office of U.S. Trade Representative (USTR), this agreement covers more than 40% of world GDP.

With the completion of the TPP negotiations, further agricultural export opportunities are expected to open to U.S. agricultural products. According to USTR, if approved and implemented, TPP will remove import taxes which are as high as 40% on U.S. poultry products. Japan, the second largest volume market for U.S. pork, will remove 80% of its pork tariff over the course of eleven years. Japan is also the largest market for U.S. beef and currently places 38.5% tariffs on beef. Under the TTP agreement these tariffs will eventually decrease to 9%. All these benefits on U.S. meat and poultry products will have a positive impact on the quantity and value of U.S. meat and poultry exports.

The U.S. dollar is expected to further appreciate for the next decade, but the dollar is assumed to remain relatively weak compared to the past two decades.

Global real economic growth is expected to average 3.5% per year during the next decade, with developing countries experiencing the strongest growth. The U.S. economy is projected to increase at a rate of 2.6%, on average, during the next decade.

According to the long-term projection report published in February 2015, global meat and poultry consumption continues to increase throughout the USDA projection period. Poultry meat consumption increases the fastest at 2.2 percent annually. Note that poultry meat, particularly broiler meat, is the lowest priced meat in the world.

Over the long-term projection period, pork consumption increases by 1.2 percent annually and beef grows at 1.3 percent annually. Developing countries account for about 81 percent of the projected increase in global consumption of meat and poultry due to a growing middle class within those countries. As a result, meat and poultry consumption in developing countries increases at a faster rate than their respective production, resulting in increasing imports for meat and poultry products. Increasing global demand for meat and poultry will lead to higher production and exports by major exporting countries such as the U.S. throughout the projection period.

As a result of U.S. pork production efficiency, U.S. pork exports are assumed to increase over the next decade. Propelling the long term growth in U.S. pork exports is import demand from key markets such as Mexico and the Pacific Rim nations.

U.S. beef exports expansion will continue to Japan and South Korea, with the ongoing restoration of the effect brought by the first U.S. case of bovine spongiform encephalopathy (BSE) in December, 2003 which prompted these markets to ban U.S. beef imports from the U.S. It is expected that one-fifth of the increase in world beef import will be from the combined regions of African and Middle East.

Foreign demand for broiler meat will continue strong due to its lower cost advantage compared to beef and pork. Broiler meat exports will continue to go mainly to Mexico while expanding to other countries. It is expected that about two-fifths of the growth in global poultry imports will be from Africa and the Middle East regions combined. Strong competition from other countries, mostly Brazil, will continue for U.S. poultry producers during the projected period. Nonetheless, poultry exports will rise during the period.

USDA's projections assumed Russia will continue using policies to encourage its own pork industry and restrain imports, which will mainly affect pork exports from the U.S. and Brazil.

The U.S. meat export projection from the USDA assumes that there are no domestic or external shocks that would affect global meat and poultry supply and demand. Moreover, normal weather patterns are assumed. If actual experience diverges from any of these assumptions, projections will be affected.

Based on continued world economic growth, projections indicate that global food demand and world agricultural trade will increase during the next decade. Despite projected strong trade competition, U.S. agricultural exports are expected to rise and will be aided by a continued weakness of the dollar (relative to the previous two decades).

By the time the USDA's long term agricultural projections were published (February 2015), USDA indicated that some macroeconomic indicators had changed. In particular, the economic outlook for Europe, Russia, China, Argentina, Brazil, and Japan deteriorated with the consequence of less short-term

global growth. Moreover, due to the U.S. economic situation compared to the rest of the world, a faster than previously projected short-term strengthening of the dollar seems to be in place. In addition, in August 2014 Russia imposed restrictions on agricultural imports (including pork, beef, and poultry) from Western countries (such as the EU, United States, and Canada), which was assumed to last until August 2015. However, the ban is still in force.

Because the nature of the agricultural projections is in the long-term, USDA indicated that these near-term macroeconomic changes are not expected to substantially modify the long-term trend of the agricultural projections up to 2024. Most recently (August 2015) China implemented changes in policy which allow the Chinese yuan to be more responsive to market forces, with the result of a 3% devaluation of the yuan against the U.S. dollar. The yuan is expected to continue depreciating, but it is also expected that Chinese authorities will step in to avoid a quick devaluation of their currency.

2025 to 2027 Meat and Poultry Export Projections

The U.S. meat and poultry export projection through 2027 is a conditional, long-run scenario about what would be expected to happen under a continuation of current farm legislation and other micro- and macro-economic assumptions. We use appropriate projection methods (i.e. moving average, exponential smoothing, etc.) that theoretically fit into each meat category analyzed here.

Calendar Year to Soybean Marketing Year

Since projected meat and poultry export data (2015/16 to 2026/27) from USDA (i.e., Oct 2015 WASDE and Agricultural Projection to 2024) and our own projected data (i.e., DIS's projections for 2025, 2026 and 2027) were originally on a calendar year basis, we transformed the data to a soybean marketing year basis. We used historical monthly meat and poultry export data from September 2012 to August 2015 to estimate a three-year average proportion of contribution of each month to the annual meat and poultry exports. For example, to estimate meat and poultry exports for the 2015/16 soybean marketing year, we applied the three-year average proportion from September to December to the 2015 calendar year meat and poultry export data and added the applied three-year proportion from January to August to the 2016 calendar year meat and poultry export data. We followed this procedure for the four types of meats included in the analysis using their particular proportions.

Historic and Projected Prices for SBM

In order to estimate the dollar value of the SBM exported as meat and poultry exports, DIS built an annual historical (2004/05-2014/15) SBM price database based on the soybean marketing year (Sep-Aug) using average USDA's monthly SBM price data ($/Ton, 48% (rail) Central Illinois).

For the projected period from 2015/16-2024/25, DIS used annual (Oct-Sep) projected SBM price data ($/Ton). The first two years of annual price projections (2014/15 and 2015/16) were from USDA's WASDE (October 2015). Subsequent price projection data were from USDA's 10-year Agricultural Projections (published on February 2015). DIS projected SBM annual price data for the remaining of the projected years (2025/26 and 2026/27) based on moving average methods.

Since the quantity of SBM exported as meat and poultry export (step 4 from Methodology) was estimated for the soybean marketing year (Sep-Aug), annual projected SBM price (Oct-Sep) was transformed to correspond with the soybean marketing year (Sep-Aug).

Results

Meat & Poultry Exports

Figure 6 on page 16 shows historical (2004/05-2014/15) and projected (2015/16-2026/27) U.S. meat and poultry export data on a soybean marketing year basis. The historical export data indicate that exports increased for all types of U.S. meats from 2004/05 to 2014/15. U.S. pork exports reached a volume of 2.155 million MT CWE in 2014/15 compared to 1.157 million MT CWE in 2004/05, up 86% during this period. Despite the overall upward trend in U.S. pork exports, for the last three years, pork exports have been plummeting, reaching in 2014/15 the lowest level since 2010/11 (2,151 million MT CWE). Record high U.S. pork exports occurred in 2011/12 (2.487 million MT CWE) propelled mainly by very strong Asian demand. Some contributing factors for decreasing pork exports in 2014/15 were reduced domestic pork supplies from PEDv and a high-valued U.S. dollar. Mexico is the leading destination of U.S. pork followed by Japan, Canada, and South Korea.

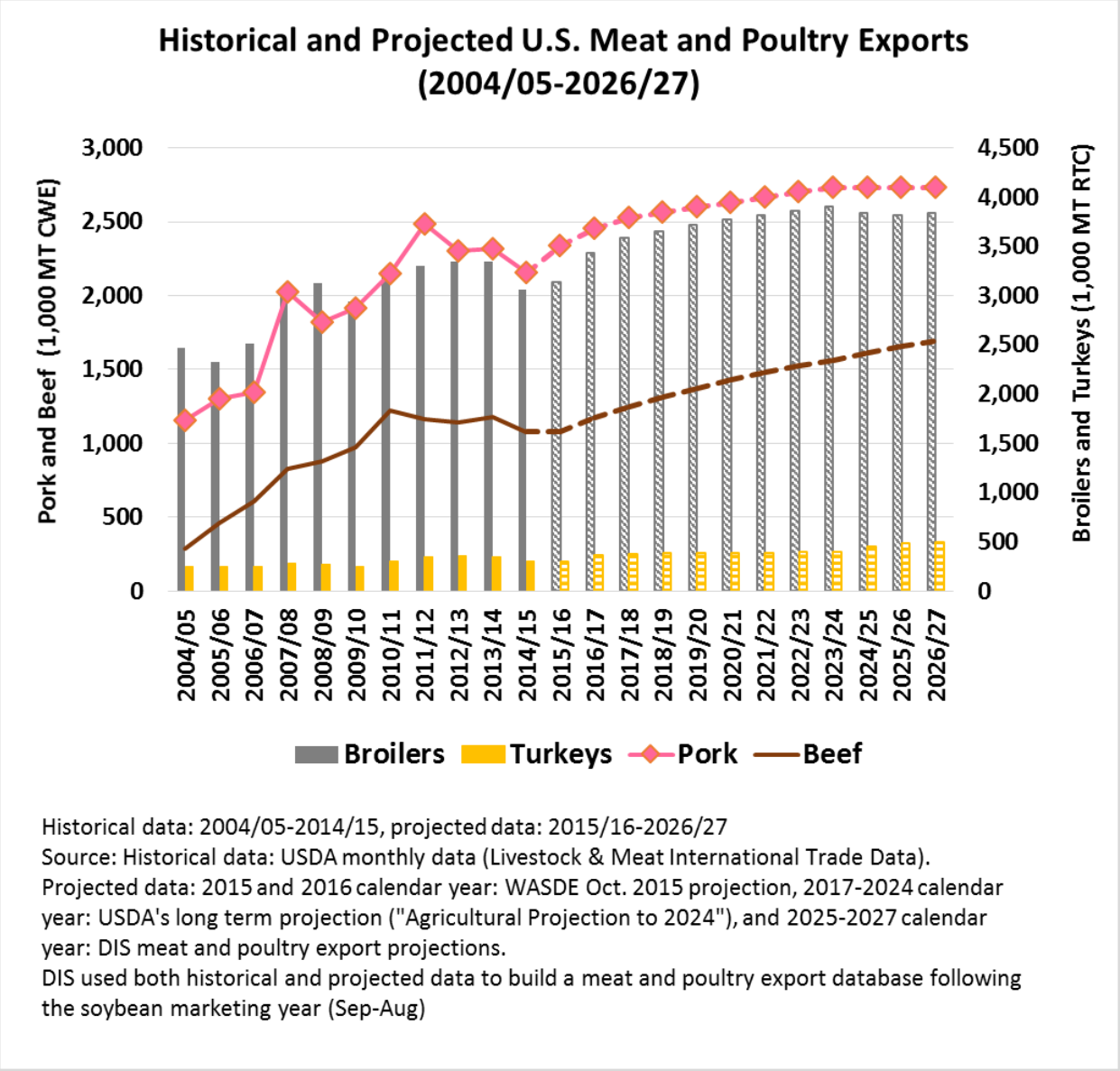
U.S. beef exports increased from 0.288 million MT CWE in 2004/05 to 1.076 million MT CWE in 2014/15, representing an increase of 274% over the eleven-year period; however U.S. beef exports in 2014/15 lagged behind the record high in 2010/11 (1.224 million MT CWE) and year-over-year export levels (1.180 million MT CWE). The strong U.S. dollar mainly contributed to the decline in U.S. beef exports this year. Since 2013, Japan has been the leading market for U.S. beef exports, yet beef export to Japan in 2014/15 slumped relative to the previous year. Two factors were limiting U.S. beef exports to Japan. First a weak Australian dollar relative to the U.S. dollar, which was making Australia's beef prices more competitive than U.S. beef prices. Second, lower duties on Australian beef due to the Japan-Australia Economic Partnership Agreement implemented earlier this year. Other important U.S. beef export destinations during 2014/15 were Canada, Mexico, and Korea.

U.S. broiler exports in 2014/15 (3.057 million MT RTC) were up 24% from the volume exported at the beginning of the decade (2.464 million MT RTC in 2004/05). In spite of this substantial increase, 2014/15 broiler exports experienced a decline of about 8.7% year-over-year (3.349 million MT RTC). Trade restrictions due HPAI in 2015 were among the factors adversely impacting broiler exports in 2014/15. Exports to Mexico, the main U.S. broiler export market, were also down in 2014/15.

The U.S. has exported an average of 0.291 million MT RTC of turkey per year during last the decade. Ranging from 0.249 in 2004/05 and 2005/06 to 0.299 million MT RTC in 2014/15. The volume of U.S. turkey exports rose 20% from 2004/05 to 2014/15. U.S turkey exports dropped 15% compared to the volume of turkey exported the previous year (0.351 million MT RTC). Low turkey production in 2015 due to HPAI likely brought down turkey exports in 2014/15.

Figure 6 (page 16) also shows an upward trend for all meat and poultry exports during the projected period. According to USDA, projected global economic growth, sustained weakness of the U.S. dollar compared to the previous two decades, and international demand for selected meats produced in the U.S. support U.S. meat and poultry export growth.

Based on projections, pork exports are expected to rise 17% from 2.335 million MT CWE at the beginning of the twelve year period to 2.733 million MT CWE by the end of the projection. Beef exports will increase 57% during the projected period (2015/16-2026/27) from 1.078 million MT CWE in 2015/16 to 1.692 million MT CWE in 2026/27. Broiler meat exports on the other hand, are predicted to grow 22% from 3.142 million MT RTC in 2015/16 to 3.838 million MT RTC in 2026/27. Turkey meat exports are expected to experience the most growth (65%), yet the level of turkey meat exports by 2026/27 (0.496 million MT RTC) will remain below the level of broiler meat, pork, and beef exports.



Historical data: 2004/05-2014/15, projected data: 2015/16-2026/27
Source: Historical data: USDA monthly data (Livestock & Meat International Trade Data).
Projected data: 2015 and 2016 calendar year: WASDE Oct. 2015 projection, 2017-2024 calendar year: USDA's long term projection ("Agricultural Projection to 2024"), and 2025-2027 calendar year: DIS meat and poultry export projections.
DIS used both historical and projected data to build a meat and poultry export database following the soybean marketing year (Sep-Aug)

Figure 6. Historical and Projected U.S. Meat and Poultry Exports (2004/05-2026/27)

Pounds of SBM per Metric Ton of CWE or RTC

Table 2 on page 17 shows how much SBM it takes to produce pork, beef, broiler meat, and turkey meat (steps one to three in Methodology section). Column four indicates that given the pounds of feed used per pound of gain (column 2) and the SBM inclusion rate (column 3) for the corresponding animal species, it takes more pounds of SBM to produce one pound of live turkey (0.59 pounds of SBM/live gain) than for any of the other animal species. In second place is pork production, requiring 0.51 pounds of SBM/live gain, follow by broiler meat production (0.39 pounds SBM/live gain), and last is beef production with 0.16/live gain. Once conversion factors from live weight to CWE or RTC were applied, the table shows that it takes 1,618 pounds of SBM to produce one MT turkey meat (RTC), it takes 1,508 pounds of SBM to produce one MT of pork (CWE), and 1,156 pounds of SBM to produce one MT of broiler meat (RTC). Beef production uses the least amount of SBM pounds per MT of beef (CWE) produced (568 pounds of SBM per MT produced of beef).

Table 2. Amount of SBM Used to Produce One MT (CWE or RTC) of Meat or Poultry

Amount of SBM Used to Produce One MT (CWE or RTC) of Meat or Poultry

	Lbs. of Feed Used per Lb. of Gain	SMB Inclusion Rate	Lbs. of SBM per Lbs. of Live Gain	Convertion Factors: LW to CWE or LW to RTC	Lbs. of SBM per One Lb. of CWE or RTC	Lbs. of SBM per MT of CWE or RTC *
Pork	2.7 (2.7:1)	19.0%	0.51 (2.7 X 19.0%)	0.75	0.68 (0.51 / 0.75)	**1507.96** (0.68 X 2,204.623)
Beef	6.19 (6.19:1)	2.5%	0.16 (6.19 X 2.5%)	0.61	0.26 (0.16 / 0.61)	**568.24** (0.26 X 2,204.623)
Broiler	1.8 (1.8:1)	21.6%	0.39 (1.8 X 21.6%)	0.74	0.52 (0.39 / 0.74)	**1156.18** (0.52 X 2,204.623)
Turkey	2.53 (2.53:1)	23.2%	0.59 (2.53 X 23.2%)	0.80	0.73 (0.59/0.80)	**1617.53** (0.73 X 2,204.63)

*One metric ton (MT)=2,204.623
Hogs feed conversion data and SBM inclusion from Jason Woodworth (KSU)
Cattle (beef) feed convertion ration and rate DIS estimate.
Broiler feed conversion ratio and SBM inclusion rate from Justin Fowler from UOG
Turkeys feed conversion and SBM inclusion rate from Jim Mitchell (FE)
Convertion factors from live weight (LW) to carcass weight (beef and pork) were estimated based on USDA's weekly live weight and weekly dressed weight data.
Convertion factors from LW to ready-to-cook weight (broilers and turkeys) were estimated based on USDA's monthly live weight and monthly ready to cook weight data.

SBM Exported as Meat and Poultry

Multiplying the pounds of SBM it takes to produce 1 MT of carcass weight or ready-to-cook meat (pork, beef, broilers, and turkeys) by the corresponding U.S. meat export data (see step 5 in Methodology section), Figure 7 (page 18) shows that SBM exported as U.S. meat (pork, beef, broilers, and turkey) exports increased throughout the last decade, from 2.580 million tons in 2004/05 to 3.939 million tons in 2014/15.

During the historical period, a record high volume (4.395 million tons) of SBM exported as meat (pork, beef, broiler meat, and turkey meat) was reached in the 2011/12 soybean marketing year (see Table 3 on page 19). This was on account of the record high volume of pork exported (2.487 million MT CWE corresponding to 1.875 million tons of SBM) and the third largest volume of broiler meat (3.305 million MT RTC equivalent to 1.910 million ST of SBM) exported during that year. One interesting result is that, compared to pork, beef, and turkey, broiler production is third in usage of SBM (pounds per MT of RTC equivalent). However, it is from broiler meat exports that the most SBM is exported as meat and poultry (32.668 million MT RTC corresponding to 18.885 million tons of SBM in total) in the 11 historical years (see Table 4 on page 20). This occurs because the volume of U.S. broiler meat exported exceeds each of the other U.S. meat categories exported during the entire period. The second largest export of SBM as meat and poultry through the eleven years is pork (20.980 million MT CWE corresponding to 15.818 million ST of SBM). SBM exported as beef (9.807 million MT CWE or 2.786 million ST of SBM) and turkey (3.201 million MT RTC corresponding to 2.589 million tons of SBM) compete for third and fourth place, respectively (See Table 4).

The pounds of SBM per MT of carcass weight equivalent for beef is 35% of the amount of SBM used in the production of one MT of turkey meat (RTC), yet in terms of SBM exported as meat and poultry, SBM indirectly exported as beef is slightly above the amount of SBM as turkey meat. The reason is because the U.S. exports much more beef than turkey meat. As indicated above (see Meat & Poultry Exports section), U.S. beef exports increased 274% during the last eleven years (from 0.288 million MT CWE in 2004/05 to 1.076 million MT CWE in 2014/15), whereas U.S. turkey exports grew 20% during the same period (from 0.249 in 2004/05 and 2005/06 to 0.299 million MT RCT in 2014/15).

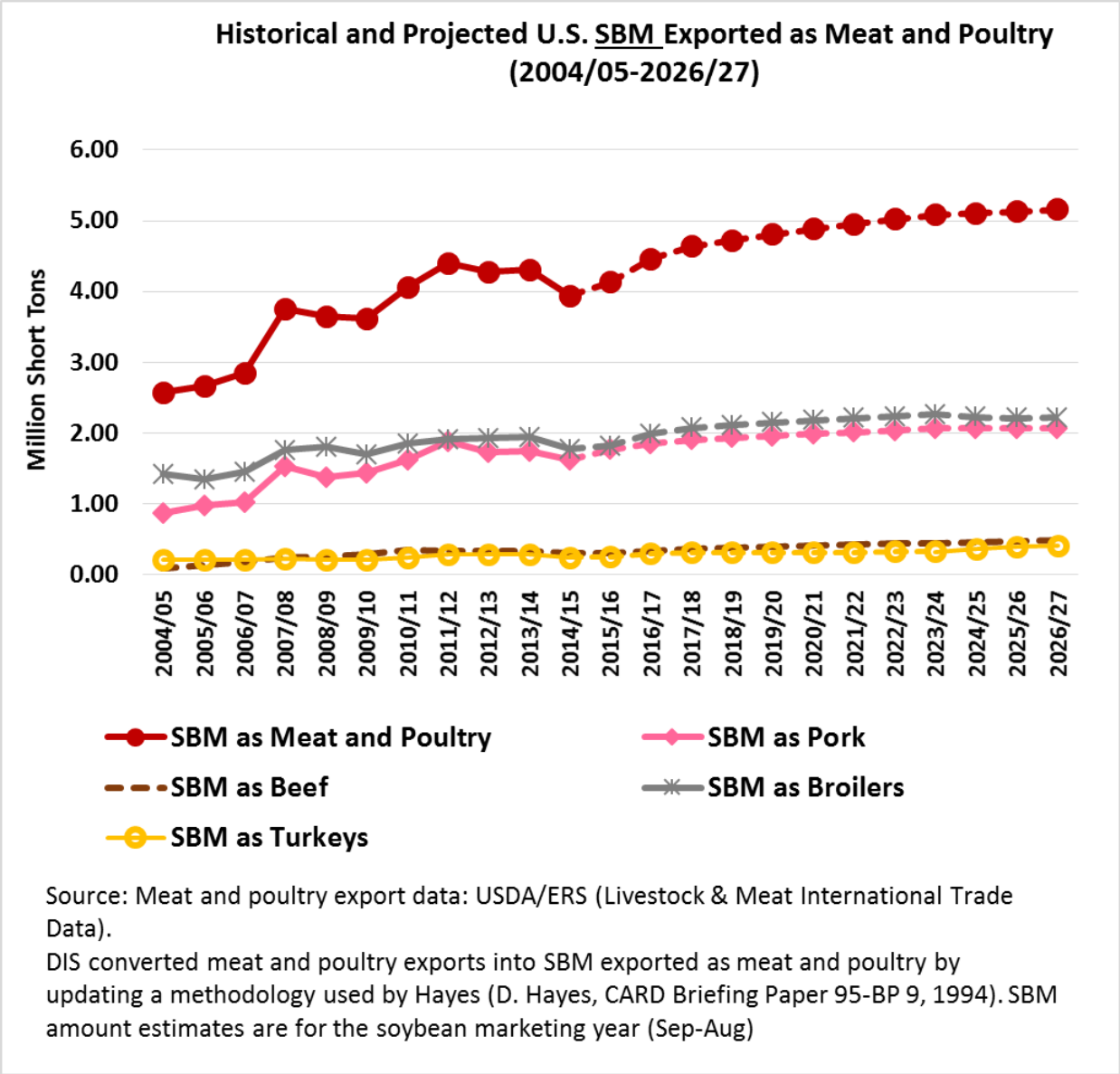


Figure 7. Historical and Projected U.S. SBM Exported as Meat and Poultry (2004/05-2026/27)

As Table 3 (page 19) indicates, the U.S. exported a total of 40.1 million tons of SBM as meat and poultry from 2004/05 to 2014/15, valued at $13.783 billion. Forty-seven percent (18.885 million tons) of the total SBM exported as meat and poultry during the historical period was from SBM exported as broiler meat, 39.5% (15.818 million tons) from SBM exported as pork, 7% (2.786 million tons) from SBM exported as beef, and 6.5% (2.589 million tons) from SBM exported as turkey.

SBM exported as meat and poultry during the projected years indicates an upward trend (see Figure 7 above) given that meat and poultry exports are projected to increase during the next twelve years (see Figure 6 on page 16). This is based on USDA's long term projection assumptions of favorable global economic growth, a dollar which is expect to appreciate but remain weak relative to the previous two decades and the assumption of global food demand (including meats) expansion. It is important to mention that the projected SBM exported as meat and poultry has been estimated based on the current feed usage and SBM inclusion rates for all species as shown in Table 2 on page 17.

Table 3. Historical and Projected SBM Prices; Quantity and Value Estimates of SBM Exported as Meat and Poultry

Historical and Projected SBM Prices and Quantity and Value Estimates of SBM Exported as Meat and Poultry

Soybean Marketing Year (Sep-Aug)	SBM prices (Sep-Aug) ($/ST)	SBM Exported As Meat and Poultry (Sept-Aug)									
		Pork		Beef		Broiler Meat		Turkey Meat		Total Meat and Poultry	
		Volume (M ST)	Value (USD)	Volume (M ST)	Value (USD)	Volume (M ST)	Value (USD)	Volume (M ST)	Value (USD)	Volume (M ST)	Value (USD)
Historical											
2004/05	182.76	0.872	159.427	0.082	14.933	1.424	260.322	0.202	36.843	2.580	471.525
2005/06	174.62	0.983	171.627	0.131	22.789	1.344	234.757	0.201	35.104	2.659	464.277
2006/07	199.12	1.017	202.448	0.172	34.270	1.452	289.210	0.202	40.226	2.843	566.155
2007/08	329.56	1.529	503.952	0.235	77.456	1.764	581.233	0.229	75.502	3.757	1,238.144
2008/09	332.36	1.371	455.565	0.249	82.625	1.810	601.589	0.215	71.489	3.645	1,211.268
2009/10	316.37	1.444	456.706	0.277	87.625	1.700	537.855	0.202	63.867	3.623	1,146.053
2010/11	345.06	1.622	559.564	0.348	119.984	1.844	636.141	0.245	84.592	4.058	1,400.281
2011/12	377.16	1.875	707.095	0.329	124.257	1.910	720.518	0.281	105.843	4.395	1,657.713
2012/13	469.36	1.734	814.066	0.324	151.878	1.932	906.920	0.287	134.805	4.277	2,007.668
2013/14	489.66	1.747	855.683	0.335	164.141	1.936	948.136	0.284	138.921	4.303	2,106.881
2014/15	384.33	1.625	624.411	0.306	117.442	1.767	679.285	0.242	92.855	3.939	1,513.992
Total		15.818	5,510.544	2.786	997.400	18.885	6,395.966	2.589	880.046	40.079	13,783.957
Projected											
2015/16	333.77	1.761	587.737	0.306	102.194	1.816	606.144	0.242	80.898	4.126	1,376.973
2016/17	301.13	1.849	556.891	0.333	100.145	1.983	597.173	0.292	87.807	4.457	1,342.016
2017/18	312.43	1.904	594.774	0.355	110.831	2.072	647.332	0.306	95.481	4.636	1,448.418
2018/19	323.92	1.932	625.888	0.372	120.585	2.110	683.567	0.307	99.586	4.722	1,529.626
2019/20	325.90	1.958	638.071	0.390	126.992	2.147	699.659	0.309	100.792	4.804	1,565.514
2020/21	326.90	1.984	648.414	0.407	132.930	2.179	712.338	0.311	101.716	4.880	1,595.398
2021/22	327.90	2.009	658.808	0.421	137.999	2.207	723.701	0.314	102.990	4.951	1,623.497
2022/23	328.90	2.035	669.253	0.433	142.380	2.233	734.421	0.318	104.503	5.018	1,650.558
2023/24	329.90	2.060	679.750	0.444	146.500	2.258	745.045	0.322	106.065	5.084	1,677.360
2024/25	331.35	2.061	682.784	0.458	151.870	2.220	735.560	0.361	119.672	5.100	1,689.887
2025/26	331.50	2.061	683.065	0.471	155.995	2.205	730.821	0.391	129.749	5.127	1,699.630
2026/27	331.50	2.061	683.076	0.481	159.347	2.219	735.454	0.401	132.890	5.161	1,710.767
Total		23.674	7,708.511	4.869	1,587.768	25.649	8,351.215	3.874	1,262.148	58.066	18,909.643

Note: Volume is in million ST, value is in Million USD. Prices, volume and value of meat and poultry exported are for the soybean marketing year (Sep-Aug)
Source: DIS

Table 3 indicates that SBM exported as meat and poultry will increase 25% from 4.126 million tons ($1.377 billion) in 2015/16 to 5.161 million tons in 2026/27 ($1.711 billion). Broiler meat exports will continue leading in the export of SBM as meat and poultry, increasing from 1.816 million tons ($606.144 million) in 2015/16 to 2.219 million tons in 2026/27, for an increase of $129.3 million.

As in the previous eleven years, SBM exported as pork during the projected years will closely follow SBM exported as broiler meat. SBM exported as pork will increase from 1.761 million tons ($587.737 million) to 2.061 million tons, up 17% ($683.076 million) during the projected period (see Table 3). SBM exported as beef and turkey meat will remain in a distant third and fourth place. Overall, projections indicate that 58.066 million tons of SBM will be exported as meat and poultry valued at $18.9 billion from 2015/16 to 2026/27 (see Table 4 on page 20).

Table 4. Historical and Projected U.S. Meat Exports and SBM Exported as Meat

Historical and Projected U.S. Meat and Poultry Exports and SBM Exported as Meat and Poultry

	Meat and Poultry	SBM		
Soybean Marketing Year	**Million MT CWE/RTC**	**Million MT**	**Million ST**	**Million USD***
2004/05-2014/15				
Pork	20.980	14.350	15.818	5,510.544
Beef	9.807	2.528	2.786	997.400
Broiler Meat	32.668	17.132	18.885	6,395.966
Turkey Meat	3.201	2.349	2.589	880.046
Total	66.657	36.359	40.079	13,783.957
2015/16-2026/27				
Pork	31.398	21.476	23.674	7,708.511
Beef	17.139	4.417	4.869	1,587.768
Broiler Meat	44.368	23.268	25.649	8,351.215
Turkey Meat	4.790	3.515	3.874	1,262.148
Total	97.695	52.676	58.066	18,909.643

Historical and projected data correspond to the soybean marketing year (Sep-Aug)
*Million USD is the value of SBM (ST) exported as meat and poultry
Source:DIS

State Allocation of Value of Meat and Poultry Exports

Having estimated the historical and projected value of meat and poultry exports to soybean producers, it now becomes possible to allocate this value amongst producers of livestock and poultry. In order to estimate how much SBM is exported as meat and poultry by state we will begin with the U.S. value of meat and poultry exports estimate as reported previously in Table 3 (page 19). The U.S. estimate was factored against the share of total SBM consumed in each state for the production of livestock and poultry. This allocation framework is possible because of other projects completed on behalf of USB ("Economic Analysis of Animal Agriculture" and "Market Competitiveness of SBM in Livestock Rations"). These results rely upon the following assumptions:

1. The location of the production of soybeans and livestock and poultry are positively correlated.
2. The share of meat and poultry exports is positively correlated with the consumption of SBM within each state.
3. SBM for use in livestock and poultry rations, on the whole, is generally sourced within the same state.

The data requirements for this state analysis are:

1. Quantity of SBM indirectly exported as meat and poultry for each of the historic (2004/05 to 2014/15) and projected years (2014/15 to 2026/27), which is contained in Table 3.
2. Historic (2004/05 to 2014/15) and projected (2014/15 to 2026/27) U.S. value of SBM indirectly exported as meat and poultry, which is contained in Table 3.
3. State level livestock and poultry SBM consumption (for calculating share of U.S. total), which is drawn from other projects completed by DIS on behalf of USB.

SBM consumption is concentrated where a combination of soybean production and livestock and poultry are present. Below are a few maps. Figure 8 (next page) depicts total animal units (AUs) by state. Using

data generated in other projects for USB, Figure 9 (page 22) depicts SBM consumption by species. Figure 10 (page 22) depicts SBM consumption by state for the four species relevant to this project (pork, beef, broiler, and turkey). As shown in the combination of these three figures, livestock and poultry are concentrated in the Midwestern, Southern Plains, Southern, and to a certain extent, Western states.

Depending upon location and species, SBM is used extensively in most of the four species of livestock and poultry under study for this analysis. This is particularly true for broilers and hogs, and to a lesser extent, turkeys. During 2014, SBM usage by beef was constrained, in part, due to better quality range and pasture and availability of more competitively placed ration ingredients (i.e., DDGS).

In terms of SBM usage by species, the combination of pork, beef, broilers, and turkeys consumed about 22.6 million tons (80.9%) of SBM in 2014. This breaks out to 7.890 million tons for hogs (28.3%), 1.448 million tons for beef cows (5.2%), 11.198 million tons for broilers (40.2%), and 2.020 million tons for turkeys (7.2%).

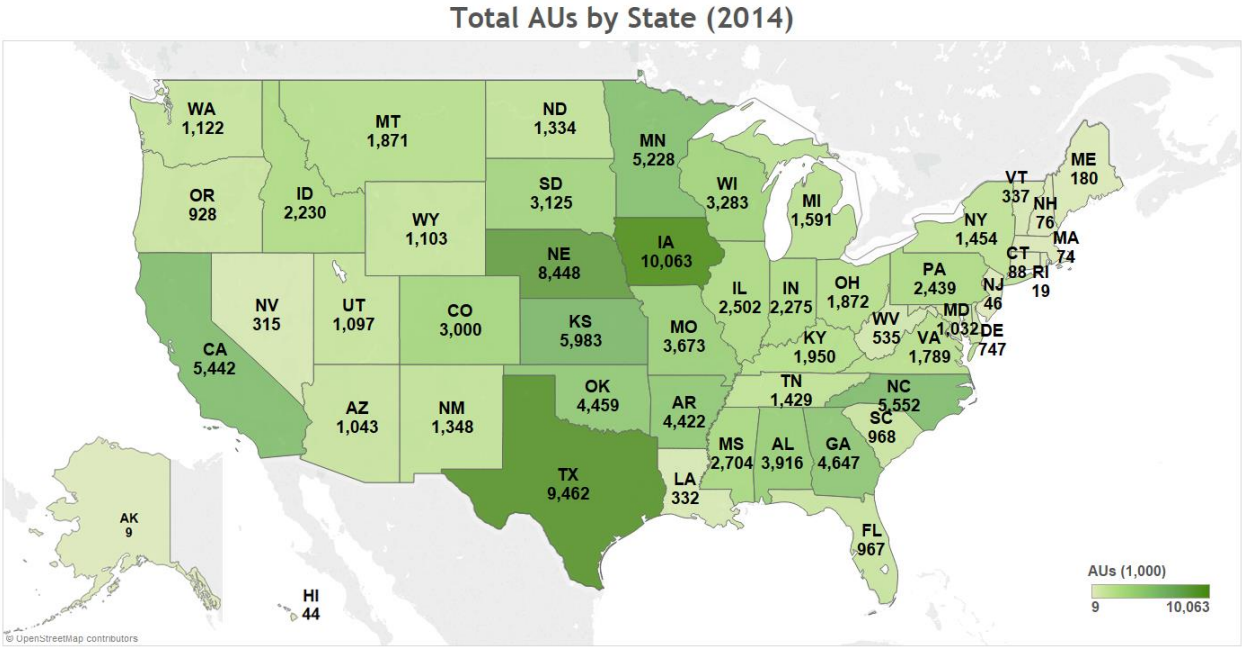


Figure 8, Total Animal Units by State (2014)

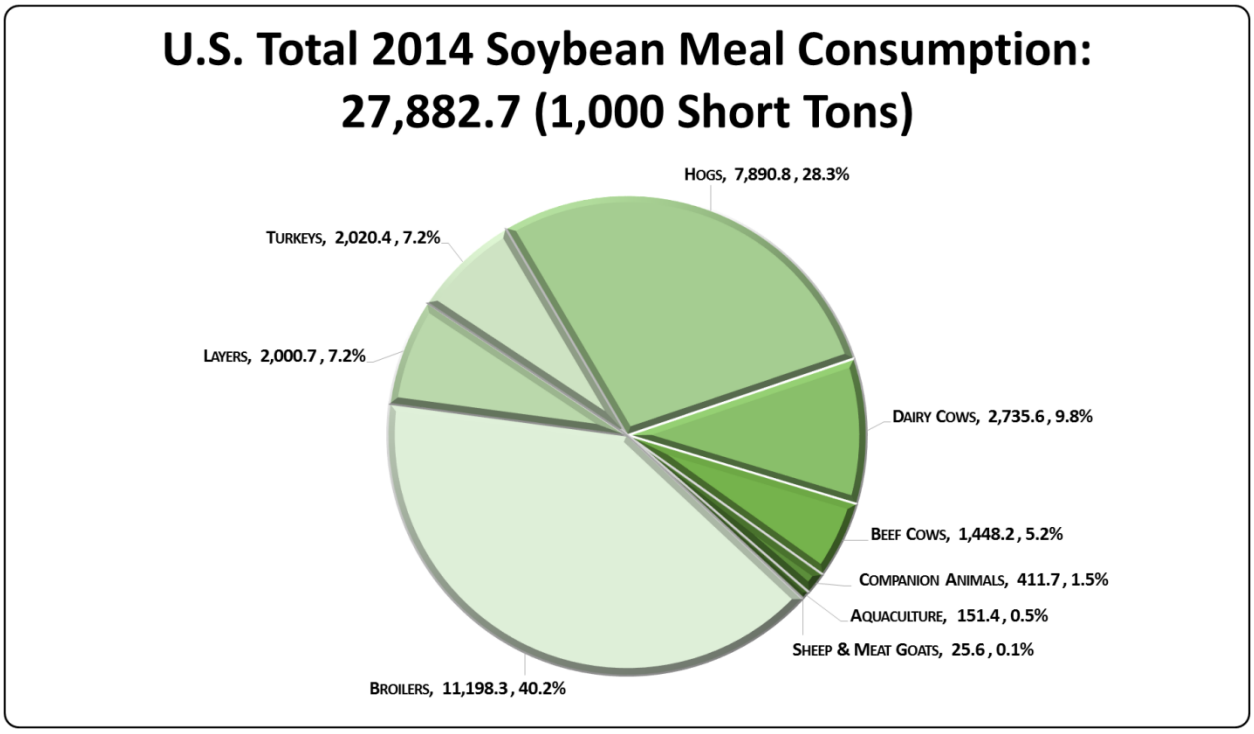


Figure 9, Estimated 2014 SBM Consumption by Species

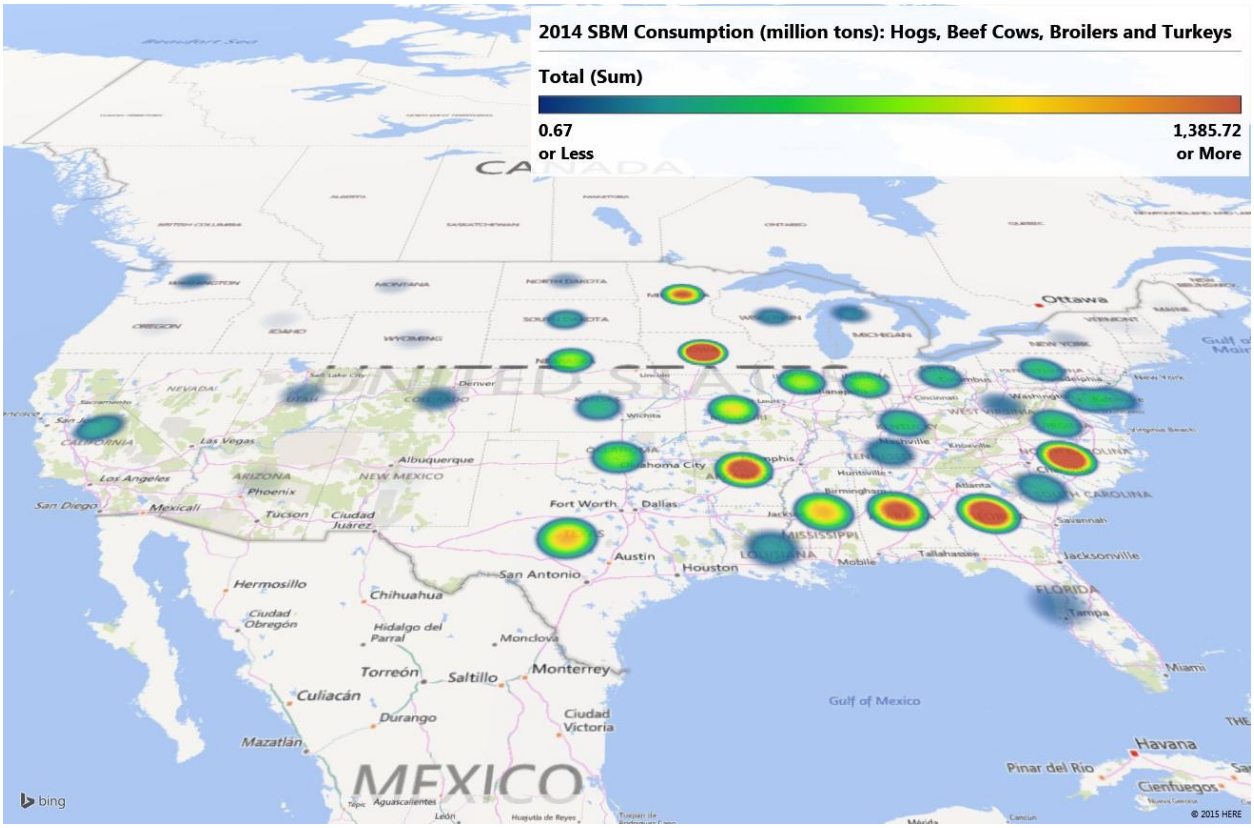


Figure 10, Estimated 2014 SBM Consumption by State: Hogs, Beef Cows, Broilers, and Turkeys

Having estimated SBM consumption by state by species for 2013/14 for separate USB projects, allocation of the value of meat and poultry exports becomes possible.

Table 5 on page 24 shows the total SBM consumption by state by relevant species for 2013/14. The quantities in this table are then expressed as a share of U.S. total and then factored against the national total value of meat and poultry exports for both historical and projected periods presented in Table 3 (page 19).

Table 6 on page 25 shows the result of factoring the annual average for the historical time period in Table 3 (page 19, value of SBM derived from meat and poultry exports) against state share of U.S. total by species consumption of SBM (Table 5 on page 24). On average, during 2004/05 to 2014/15, the annual average value derived from meat and poultry exports to the soybean industry was $1.253 billion. As shown, this value breaks down to a high of $143.9M (11.5%) in Iowa to a low of $0.1M in the states of Alaska and Hawaii.

Table 7 on page 26 shows the result of factoring the annual average for the projection time period in Table 3 (page 19, value of SBM derived from meat and poultry exports) against state share of U.S. total by species consumption of SBM (Table 5 on page 24). On average, during 2015/16 to 2026/27 the annual average value derived from meat and poultry exports to the soybean industry is projected to be $1.576 billion. As shown, this value breaks down to a high of $180.9 M (11.5%) in Iowa to a low of $0.1M in the states of Alaska and Hawaii.

Table 5, Estimated 2013/14 SBM Consumption (1,000 tons) by State by Major Species Exported

State	Hogs	Beef Cows	Broilers	Turkeys	Total
Alabama	18.4	10.7	1,491.6	4.7	1,525.3
Alaska	0.1	0.0	-	1.3	1.4
Arizona	15.7	7.0	-	2.5	25.3
Arkansas	51.3	15.5	1,379.2	254.2	1,700.3
California	11.1	25.1	163.4	93.2	292.8
Colorado	128.3	22.8	-	10.2	161.4
Connecticut	0.3	0.1	-	6.5	6.9
Delaware	0.8	0.0	276.9	0.3	278.0
Florida	2.1	9.2	93.1	6.7	111.1
Georgia	26.8	6.9	1,872.1	4.1	1,909.9
Hawaii	1.1	0.2	-	-	1.3
Idaho	2.6	10.4	-	7.0	20.0
Illinois	650.2	30.8	72.4	9.6	762.9
Indiana	413.8	25.3	75.5	161.0	675.6
Iowa	2,332.0	165.6	3.4	89.0	2,590.0
Kansas	184.8	157.4	-	4.5	346.7
Kentucky	39.7	13.7	362.9	7.8	424.1
Louisiana	0.7	6.2	230.0	2.3	239.2
Maine	0.5	0.2	-	12.6	13.3
Maryland	3.1	0.5	344.8	6.2	354.6
Massachusetts	1.2	0.1	-	7.7	9.0
Michigan	120.5	14.4	-	43.2	178.1
Minnesota	879.9	57.3	55.6	385.6	1,378.4
Mississippi	49.0	6.8	1,028.6	2.0	1,086.4
Missouri	363.9	82.9	335.4	144.1	926.3
Montana	24.9	17.5	-	3.6	46.0
Nebraska	397.9	334.2	15.0	5.3	752.4
Nevada	0.5	2.2	-	2.7	5.4
New Hampshire	0.4	0.1	-	8.2	8.7
New Jersey	1.2	0.1	1.2	3.8	6.3
New Mexico	0.3	9.0	-	2.7	11.9
New York	7.2	5.0	12.5	22.8	47.5
North Carolina	833.3	7.7	932.3	241.5	2,014.9
North Dakota	34.5	53.8	-	1.7	90.1
Ohio	222.4	17.5	86.9	43.2	369.9
Oklahoma	396.9	48.6	241.8	4.6	691.9
Oregon	0.9	4.5	-	14.5	19.9
Pennsylvania	121.7	7.1	209.5	67.0	405.3
Rhode Island	0.2	0.0	-	2.2	2.5
South Carolina	16.2	2.2	271.4	11.7	301.5
South Dakota	214.6	43.6	-	38.1	296.3
Tennessee	22.4	11.7	213.1	5.8	253.0
Texas	129.7	119.4	842.5	20.2	1,111.9
Utah	74.7	4.4	-	33.9	113.0
Vermont	0.4	0.7	-	11.7	12.9
Virginia	16.8	4.5	303.9	142.4	467.7
Washington	4.9	3.6	108.9	15.9	133.3
West Virginia	0.5	2.3	112.5	26.3	141.5
Wisconsin	43.2	69.3	62.1	21.3	195.9
Wyoming	27.1	10.2	-	2.5	39.7
U.S. Total	7,890.8	1,448.2	11,198.3	2,020.4	22,557.7

Table 6, 2004/05 to 2014/15 Annual Average Value ($M) of SBM Exported as Meat and Poultry

State	Hogs	Beef Cows	Broilers	Turkeys	Total	Percent of U.S. Total
Alabama	$ 1.0	$ 0.6	$ 82.9	$ 0.3	$ 84.7	6.8%
Alaska	$ 0.0	$ 0.0	$ -	$ 0.1	$ 0.1	0.0%
Arizona	$ 0.9	$ 0.4	$ -	$ 0.1	$ 1.4	0.1%
Arkansas	$ 2.8	$ 0.9	$ 76.6	$ 14.1	$ 94.5	7.5%
California	$ 0.6	$ 1.4	$ 9.1	$ 5.2	$ 16.3	1.3%
Colorado	$ 7.1	$ 1.3	$ -	$ 0.6	$ 9.0	0.7%
Connecticut	$ 0.0	$ 0.0	$ -	$ 0.4	$ 0.4	0.0%
Delaware	$ 0.0	$ 0.0	$ 15.4	$ 0.0	$ 15.4	1.2%
Florida	$ 0.1	$ 0.5	$ 5.2	$ 0.4	$ 6.2	0.5%
Georgia	$ 1.5	$ 0.4	$ 104.0	$ 0.2	$ 106.1	8.5%
Hawaii	$ 0.1	$ 0.0	$ -	$ -	$ 0.1	0.0%
Idaho	$ 0.1	$ 0.6	$ -	$ 0.4	$ 1.1	0.1%
Illinois	$ 36.1	$ 1.7	$ 4.0	$ 0.5	$ 42.4	3.4%
Indiana	$ 23.0	$ 1.4	$ 4.2	$ 8.9	$ 37.5	3.0%
Iowa	$ 129.5	$ 9.2	$ 0.2	$ 4.9	$ 143.9	11.5%
Kansas	$ 10.3	$ 8.7	$ -	$ 0.3	$ 19.3	1.5%
Kentucky	$ 2.2	$ 0.8	$ 20.2	$ 0.4	$ 23.6	1.9%
Louisiana	$ 0.0	$ 0.3	$ 12.8	$ 0.1	$ 13.3	1.1%
Maine	$ 0.0	$ 0.0	$ -	$ 0.7	$ 0.7	0.1%
Maryland	$ 0.2	$ 0.0	$ 19.2	$ 0.3	$ 19.7	1.6%
Massachusetts	$ 0.1	$ 0.0	$ -	$ 0.4	$ 0.5	0.0%
Michigan	$ 6.7	$ 0.8	$ -	$ 2.4	$ 9.9	0.8%
Minnesota	$ 48.9	$ 3.2	$ 3.1	$ 21.4	$ 76.6	6.1%
Mississippi	$ 2.7	$ 0.4	$ 57.1	$ 0.1	$ 60.4	4.8%
Missouri	$ 20.2	$ 4.6	$ 18.6	$ 8.0	$ 51.5	4.1%
Montana	$ 1.4	$ 1.0	$ -	$ 0.2	$ 2.6	0.2%
Nebraska	$ 22.1	$ 18.6	$ 0.8	$ 0.3	$ 41.8	3.3%
Nevada	$ 0.0	$ 0.1	$ -	$ 0.2	$ 0.3	0.0%
New Hampshire	$ 0.0	$ 0.0	$ -	$ 0.5	$ 0.5	0.0%
New Jersey	$ 0.1	$ 0.0	$ 0.1	$ 0.2	$ 0.3	0.0%
New Mexico	$ 0.0	$ 0.5	$ -	$ 0.1	$ 0.7	0.1%
New York	$ 0.4	$ 0.3	$ 0.7	$ 1.3	$ 2.6	0.2%
North Carolina	$ 46.3	$ 0.4	$ 51.8	$ 13.4	$ 111.9	8.9%
North Dakota	$ 1.9	$ 3.0	$ -	$ 0.1	$ 5.0	0.4%
Ohio	$ 12.4	$ 1.0	$ 4.8	$ 2.4	$ 20.5	1.6%
Oklahoma	$ 22.0	$ 2.7	$ 13.4	$ 0.3	$ 38.4	3.1%
Oregon	$ 0.0	$ 0.2	$ -	$ 0.8	$ 1.1	0.1%
Pennsylvania	$ 6.8	$ 0.4	$ 11.6	$ 3.7	$ 22.5	1.8%
Rhode Island	$ 0.0	$ 0.0	$ -	$ 0.1	$ 0.1	0.0%
South Carolina	$ 0.9	$ 0.1	$ 15.1	$ 0.6	$ 16.7	1.3%
South Dakota	$ 11.9	$ 2.4	$ -	$ 2.1	$ 16.5	1.3%
Tennessee	$ 1.2	$ 0.6	$ 11.8	$ 0.3	$ 14.1	1.1%
Texas	$ 7.2	$ 6.6	$ 46.8	$ 1.1	$ 61.8	4.9%
Utah	$ 4.2	$ 0.2	$ -	$ 1.9	$ 6.3	0.5%
Vermont	$ 0.0	$ 0.0	$ -	$ 0.7	$ 0.7	0.1%
Virginia	$ 0.9	$ 0.3	$ 16.9	$ 7.9	$ 26.0	2.1%
Washington	$ 0.3	$ 0.2	$ 6.0	$ 0.9	$ 7.4	0.6%
West Virginia	$ 0.0	$ 0.1	$ 6.2	$ 1.5	$ 7.9	0.6%
Wisconsin	$ 2.4	$ 3.9	$ 3.4	$ 1.2	$ 10.9	0.9%
Wyoming	$ 1.5	$ 0.6	$ -	$ 0.1	$ 2.2	0.2%
U.S. Total	$ 438.3	$ 80.4	$ 622.1	$ 112.2	$ 1,253.1	100.0%

Table 7, 2015/16 to 2026/27 Annual Average Value ($M) of SBM Exported as Meat and Poultry

State	Hogs	Beef Cows	Broilers	Turkeys	Total	Percent of U.S. Total
Alabama	$ 1.3	$ 0.7	$ 104.2	$ 0.3	$ 106.6	6.8%
Alaska	$ 0.0	$ 0.0	$ -	$ 0.1	$ 0.1	0.0%
Arizona	$ 1.1	$ 0.5	$ -	$ 0.2	$ 1.8	0.1%
Arkansas	$ 3.6	$ 1.1	$ 96.3	$ 17.8	$ 118.8	7.5%
California	$ 0.8	$ 1.8	$ 11.4	$ 6.5	$ 20.5	1.3%
Colorado	$ 9.0	$ 1.6	$ -	$ 0.7	$ 11.3	0.7%
Connecticut	$ 0.0	$ 0.0	$ -	$ 0.5	$ 0.5	0.0%
Delaware	$ 0.1	$ 0.0	$ 19.3	$ 0.0	$ 19.4	1.2%
Florida	$ 0.1	$ 0.6	$ 6.5	$ 0.5	$ 7.8	0.5%
Georgia	$ 1.9	$ 0.5	$ 130.8	$ 0.3	$ 133.4	8.5%
Hawaii	$ 0.1	$ 0.0	$ -	$ -	$ 0.1	0.0%
Idaho	$ 0.2	$ 0.7	$ -	$ 0.5	$ 1.4	0.1%
Illinois	$ 45.4	$ 2.1	$ 5.1	$ 0.7	$ 53.3	3.4%
Indiana	$ 28.9	$ 1.8	$ 5.3	$ 11.2	$ 47.2	3.0%
Iowa	$ 162.9	$ 11.6	$ 0.2	$ 6.2	$ 180.9	11.5%
Kansas	$ 12.9	$ 11.0	$ -	$ 0.3	$ 24.2	1.5%
Kentucky	$ 2.8	$ 1.0	$ 25.3	$ 0.5	$ 29.6	1.9%
Louisiana	$ 0.1	$ 0.4	$ 16.1	$ 0.2	$ 16.7	1.1%
Maine	$ 0.0	$ 0.0	$ -	$ 0.9	$ 0.9	0.1%
Maryland	$ 0.2	$ 0.0	$ 24.1	$ 0.4	$ 24.8	1.6%
Massachusetts	$ 0.1	$ 0.0	$ -	$ 0.5	$ 0.6	0.0%
Michigan	$ 8.4	$ 1.0	$ -	$ 3.0	$ 12.4	0.8%
Minnesota	$ 61.5	$ 4.0	$ 3.9	$ 26.9	$ 96.3	6.1%
Mississippi	$ 3.4	$ 0.5	$ 71.9	$ 0.1	$ 75.9	4.8%
Missouri	$ 25.4	$ 5.8	$ 23.4	$ 10.1	$ 64.7	4.1%
Montana	$ 1.7	$ 1.2	$ -	$ 0.3	$ 3.2	0.2%
Nebraska	$ 27.8	$ 23.3	$ 1.0	$ 0.4	$ 52.6	3.3%
Nevada	$ 0.0	$ 0.2	$ -	$ 0.2	$ 0.4	0.0%
New Hampshire	$ 0.0	$ 0.0	$ -	$ 0.6	$ 0.6	0.0%
New Jersey	$ 0.1	$ 0.0	$ 0.1	$ 0.3	$ 0.4	0.0%
New Mexico	$ 0.0	$ 0.6	$ -	$ 0.2	$ 0.8	0.1%
New York	$ 0.5	$ 0.3	$ 0.9	$ 1.6	$ 3.3	0.2%
North Carolina	$ 58.2	$ 0.5	$ 65.1	$ 16.9	$ 140.8	8.9%
North Dakota	$ 2.4	$ 3.8	$ -	$ 0.1	$ 6.3	0.4%
Ohio	$ 15.5	$ 1.2	$ 6.1	$ 3.0	$ 25.8	1.6%
Oklahoma	$ 27.7	$ 3.4	$ 16.9	$ 0.3	$ 48.3	3.1%
Oregon	$ 0.1	$ 0.3	$ -	$ 1.0	$ 1.4	0.1%
Pennsylvania	$ 8.5	$ 0.5	$ 14.6	$ 4.7	$ 28.3	1.8%
Rhode Island	$ 0.0	$ 0.0	$ -	$ 0.2	$ 0.2	0.0%
South Carolina	$ 1.1	$ 0.2	$ 19.0	$ 0.8	$ 21.1	1.3%
South Dakota	$ 15.0	$ 3.0	$ -	$ 2.7	$ 20.7	1.3%
Tennessee	$ 1.6	$ 0.8	$ 14.9	$ 0.4	$ 17.7	1.1%
Texas	$ 9.1	$ 8.3	$ 58.9	$ 1.4	$ 77.7	4.9%
Utah	$ 5.2	$ 0.3	$ -	$ 2.4	$ 7.9	0.5%
Vermont	$ 0.0	$ 0.1	$ -	$ 0.8	$ 0.9	0.1%
Virginia	$ 1.2	$ 0.3	$ 21.2	$ 9.9	$ 32.7	2.1%
Washington	$ 0.3	$ 0.3	$ 7.6	$ 1.1	$ 9.3	0.6%
West Virginia	$ 0.0	$ 0.2	$ 7.9	$ 1.8	$ 9.9	0.6%
Wisconsin	$ 3.0	$ 4.8	$ 4.3	$ 1.5	$ 13.7	0.9%
Wyoming	$ 1.9	$ 0.7	$ -	$ 0.2	$ 2.8	0.2%
U.S. Total	$ 551.2	$ 101.2	$ 782.3	$ 141.1	$ 1,575.8	100.0%

Alternative Scenario Analysis

USDA's 10-year projections for the food and agriculture sector cover major agricultural commodities as well as agricultural trade. The agricultural baseline database provides long-run, 10-year projections from USDA's annual long-term projections report, which is published in February each year.

USDA's long-term agricultural projections presented in its February 2015 report covers the U.S. exports of livestock products (pork, beef, and poultry) from 2015 to 2024. DIS has extended these projections through 2026. These projections provide a starting point for our discussion of alternative outcomes for the meat and poultry sectors. According to the USDA, critical long-term assumptions are made for U.S. and international macroeconomic conditions, U.S. and foreign agricultural trade policies, and growth rates of agricultural productivity in the United States and abroad.

The U.S. meat export projections from 2015-2026 assumes that there are no domestic or external shocks that would affect global meat and poultry supply and demand. Current public policy in force is assumed to continue for the duration of the projection. Moreover, normal weather patterns are assumed. If there are any changes in any of these assumptions, this can affect the projections and associated scenario results.

In our analysis, we assumed USDA's projection as our baseline numbers. Then we developed simulation scenarios which in turn became counterfactual outcomes. We then compared the counterfactual outcomes with baseline outcomes, thereby delivering comparative statistics. We adopted a static simulation technique.

Alternative Scenario 1: Disruption of Poultry Trade to China and South Korea

China is a major importer of U.S. poultry. Starting from the spring of 2015, China and South Korea banned poultry from the U.S. due to high pathogenic avian influenza detection, mostly in the upper Midwest. Poultry producers in the U.S. are now preparing to avoid its return again in fall 2015. Further arbitrarily imposing the ban is a possibility in the future while the U.S. is expecting to regain its market share after official trade is reestablished with China and South Korea.

This scenario assumes that the U.S. will lose all the market share with China and South Korea with respect to broilers and turkey trade. This will shift the export demand curve downward and the results will be 1) the quantity of the U.S. broiler and turkey export is lower than the baseline (i.e. a negative shift on the long term export projection trend line) and 2) the price of broiler and turkey is also lower in the U.S. compared to the baseline prices.

According to the USDA, the U.S. broiler and turkey export share of China and South Korea was 9.5 percent during 2013-2014. Therefore, we assume that the total ban of the U.S. broiler and turkey export to China and South Korea will reduce U.S. poultry exports by 9.5 percent. According to the Food and Agricultural Policy Research Institute (FAPRI- http://www.fapri.iastate.edu/tools/elasticity.aspx), the own-price elasticity of broiler supply is 0.13 indicating that 10 percent decrease in broiler price will decrease the broiler supply by 1.3 percent. Using a standard static simulation method, we simulate the impact of a broiler and turkey ban from China and South Korea on the U.S. export. We then compare the changes in quantity with the baseline projection (see Figure 11 on page 28).

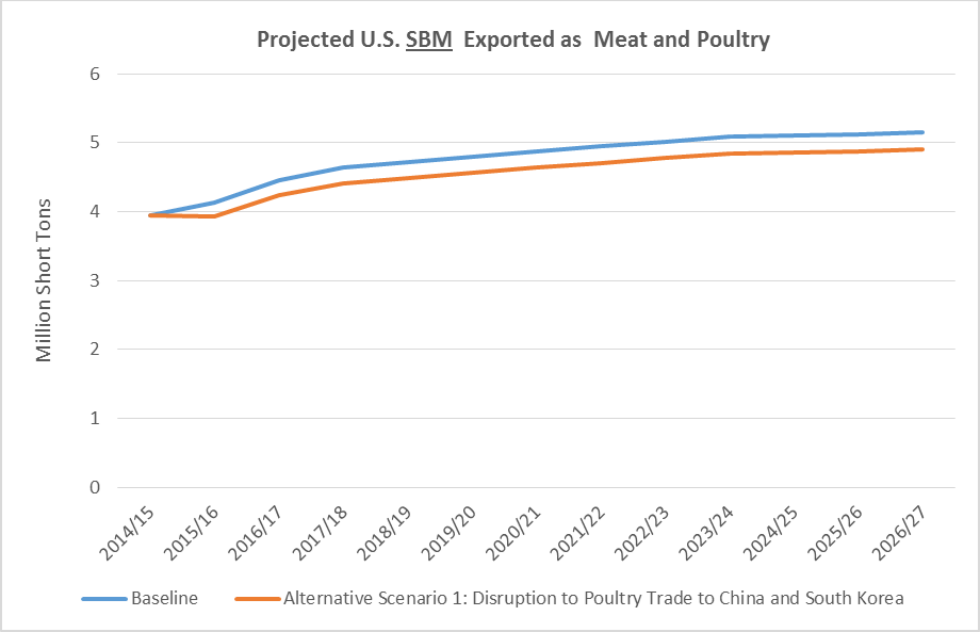


Figure 11, SBM Exported as Meat and Poultry: Baseline to Alternative Scenario 1

Results of this scenario suggest that total SBM exports as meat and poultry drop from 58.1 million tons to a total 55.3 million tons during the 2015/16 to 2026/27 soybean marketing years (see Figure 12). This represents an average 5% reduction in the SBM exported as meat and poultry from the U.S over the projection time period.

This is an example of export demand shock to the baseline projection. The export ban on U.S. poultry from China and South Korea will shift the U.S. export demand curve for poultry downward and as a result, the U.S. poultry price will decrease and the world poultry price will be impacted as well. Here, we assume that the U.S. is a large net exporter and will have a significant impact on the world equilibrium price. As shown in Figure 12 on page 29, broiler meat exports have the highest reduction in export impact compared to turkey meat. Notice also in Figure 12, SBM exported as broiler meat is reduced by 2.4 million tons where turkey meat is reduced by 0.4 million tons.

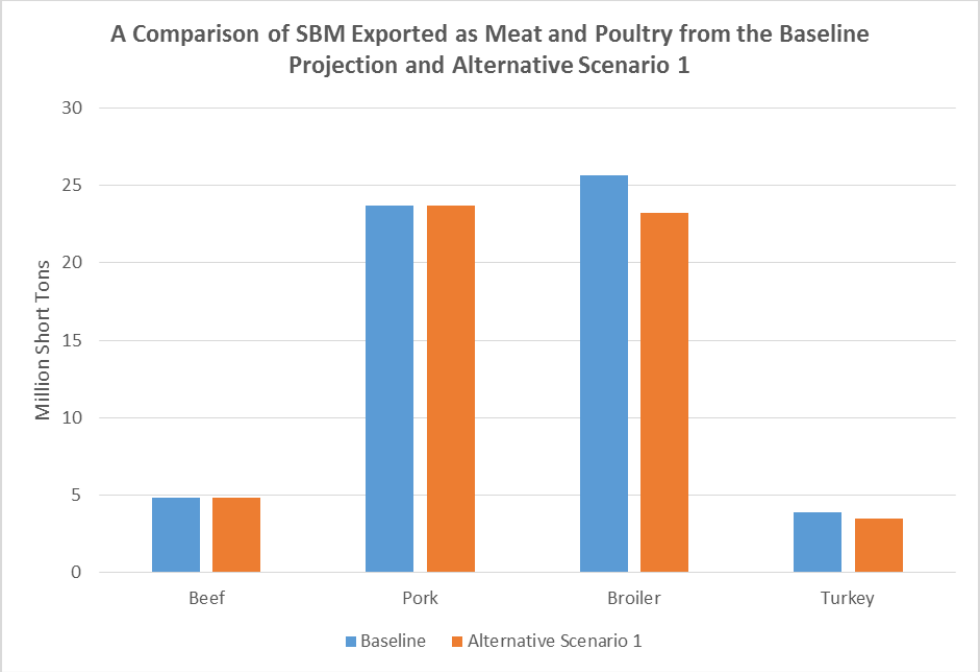


Figure 12, SBM Exported as Meat and Poultry by Species: Baseline to Alternative Scenario 1

Alternative Scenario 2: Three-Year Global Recession 2018-2020

According to the World Bank, the global economy expanded at a rate of 2.47% in 2014. This is below its long-term average of 3.49%. When there is growth in the world economy, consumers spend more on meat and poultry as they demand more commodities. This is due to the increase in household income. When the economy contracts, the opposite occurs.

In this scenario, we look at a case where a temporary three-year slowdown in global GDP growth occurs during the 2018 to 2020 time period. We would expect to see that overall meat and poultry exports from the U.S. will decrease, but then will start to improve at a later date. We also want to note that the total exports in this case will not be on par with the baseline numbers as the recession will have remnant effects on GDP overall growth in the world.

According to our literature review (see https://ideas.repec.org/p/ags/ualbpr/24063.html), the elasticity of demand for pork with respect to real food expenditures (income) was 2.347, implying that a 1 percent change in real food expenditures change pork consumption by 2.347 percent. The elasticity of demand for beef with respect to real food expenditures (income) was 3.355, implying that a 1 percent change in real food expenditures changes beef consumption by 3.355 percent. The elasticity of demand for poultry with respect to real food expenditures (income) was 2.193, implying that a 1 percent change in real food expenditures change poultry consumption by 2.193 percent. Notice that the economic growth impacts on beef demand differs from pork and the poultry meat and vice versa. This is consistent with the hierarchical nature of consumer behavior with regard to meat expenditures (i.e., households are more sensitive to beef prices than poultry prices).

Based on the above elasticity estimates, we developed a static simulation to depict Scenario 2 and compared this with the baseline (see Figure 13 on page 30). Note that the predicted short-term slowdown starts in 2017/18 and continues until 2019/20, but the lingering effects of a slowdown in growth is still realized through the entire projection period, as shown in Figure 14 on page 30.

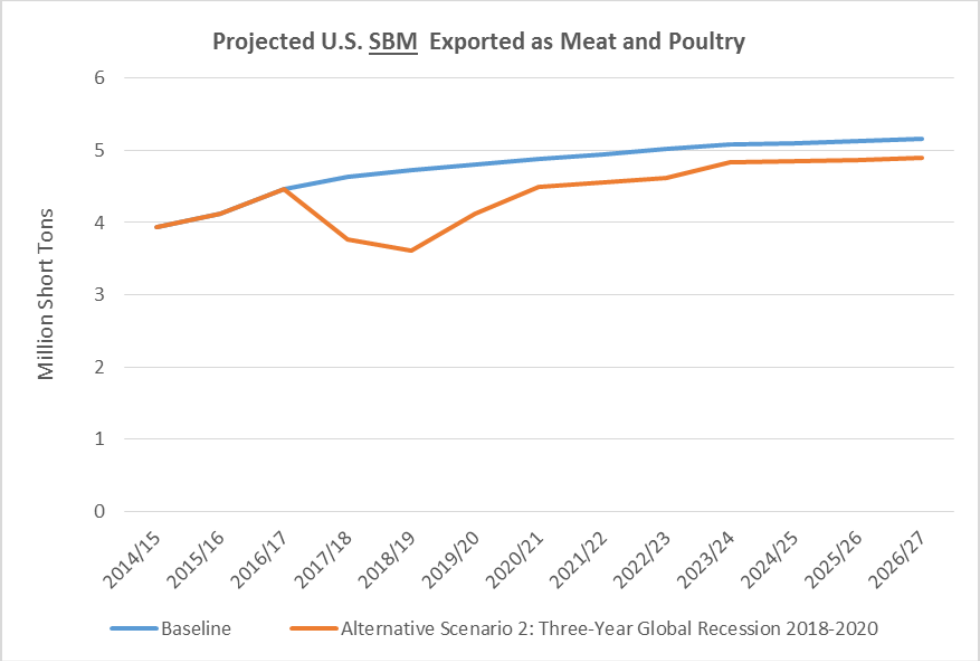


Figure 13, SBM Exported as Meat and Poultry: Baseline to Alternative Scenario 2

Results of this scenario suggest that total SBM exported as meat and poultry drops from 58.1 million tons to a total 53.2 million tons from 2015/16 to 2026/27 soybean marketing year (see Figure 14). This is, on average, an 8% reduction in SBM exported as meat and poultry from the U.S. Notice also in Figure 14, SBM exported as broiler meat is reduced by 2.1 million short tons. SBM exported as pork meat is reduced by 2.0 million short tons. SBM exported as beef and turkey is reduced by 0.5 and 0.3 million tons respectively.

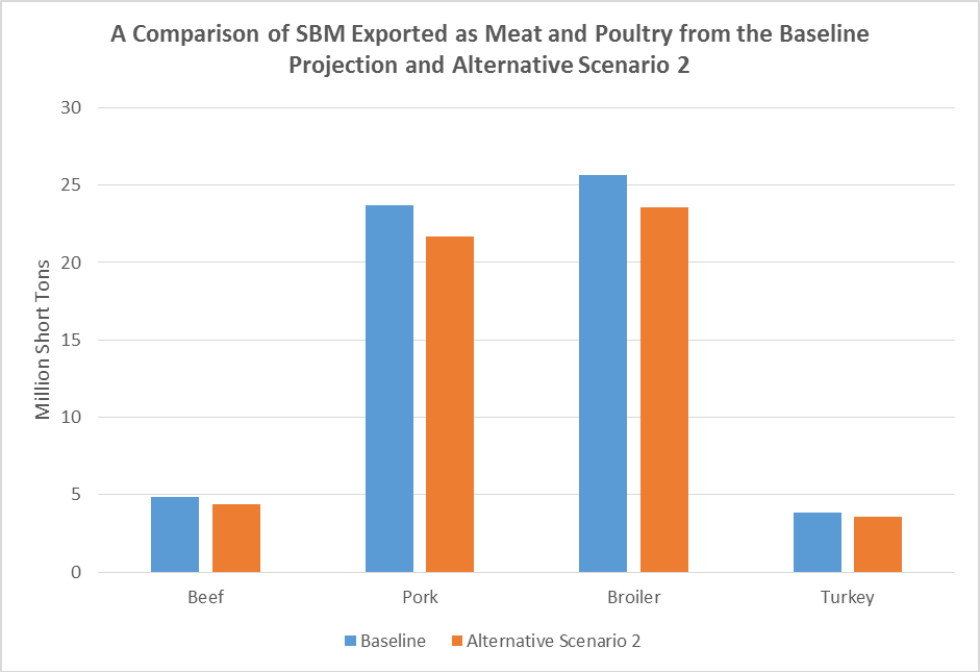


Figure 14, SBM Exported as Meat and Poultry by Species: Baseline to Alternative Scenario 2

Alternative Scenario 3: Exchange Rate Volatility and US Dollar Appreciation

Another macroeconomic factor that affects U.S. meat and poultry exports is the exchange rate. The influence of exchange rates on agricultural trade is well established. Studies have found that exchange rate fluctuations significantly affect trade flows and the impacts tend to be commodity-specific (see http://www.ers.usda.gov/media/1217411/ldpm-231-01-with-keywords.pdf). It is hypothesized that an increase in the value of the U.S. dollar would make U.S. exports more expensive, reducing meat and poultry demand abroad. The exchange rate between the U.S. dollar and the Japanese yen is used as a proxy for the exchange rate with other countries in this analysis.

The U.S. meat industry already had been facing significant challenges due to the strength of the U.S. dollar for much of 2014 and the first half of 2015. The strength of the U.S. dollar against virtually all currencies in the world has caused much more volatility in U.S. exports than any time in the recent past. For example, Japan has been the largest importer of the U.S. beef, with 2014 exports totaling nearly $1.6 billion. However, Australia has gained market share this year mainly due to the weak Australian dollar compared to the U.S. dollar and reduced duties on Australian beef due to the Japan-Australia Economic Partnership Agreement implemented earlier this year.

Changes in the exchange rate will likely have two effects on the exporting country. First, it changes relative prices of exported goods. Second, it changes the volumes traded, which ultimately changes the market share of exported products and resulting SBM indirectly exported as meat.

With respect to poultry meat exports, the elasticity of exports with respect to the exchange rate is assumed to be -0.76 implying that a 1 percent increase in real exchange rate would decrease U.S. broiler exports by 0.76 percent. With respect to beef export, the elasticity of exports with respect to the exchange rate is assumed to be -0.89 implying that a 1 percent increase in real exchange rate would decrease U.S. beef exports by 0.89 percent. With respect to pork export, the elasticity of exports with respect to the exchange rate is assumed to be -2.6 implying that a 1 percent increase in real exchange rate would decrease U.S. pork exports by 2.6 percent (See Journal of Agricultural & Applied Economics 02/2002; 34(3):501-513).

Based on the above elasticity estimates, we developed a static simulation to depict Scenario 3 and compare with the baseline (see Figure 15). There is significant deviation from the baseline projection as the higher value of the dollar inhibits export growth in all four meat categories analyzed here.

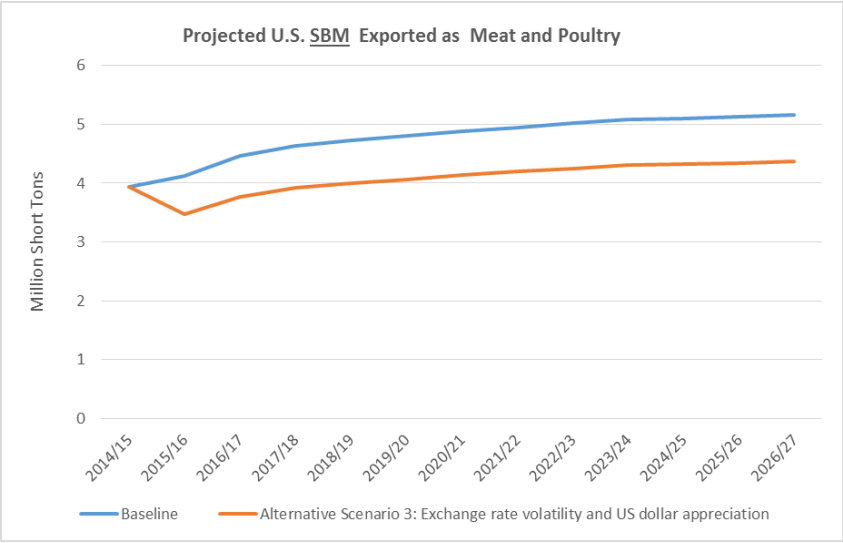


Figure 15, SBM Exported as Meat and Poultry: Baseline to Alternative Scenario 3

Results from scenario 3 suggest that total SBM export as meat and poultry drop from 58.1 million tons to a total 49.2 million tons from 2015/16 to 2026/27, as shown in Figure 16. This is, on average, a 15 percent reduction in the SBM exported as meat from the U.S. The U.S. SBM exported as pork bears the largest burden as it drops 6.2 million tons of total exports from 2015/16 to 2026/27. The SBM exported as broiler meat is reduced by 2.1 million short tons. SBM exported as beef and turkey is reduced by 0.4 and 0.3 million tons respectively (see Figure 16).

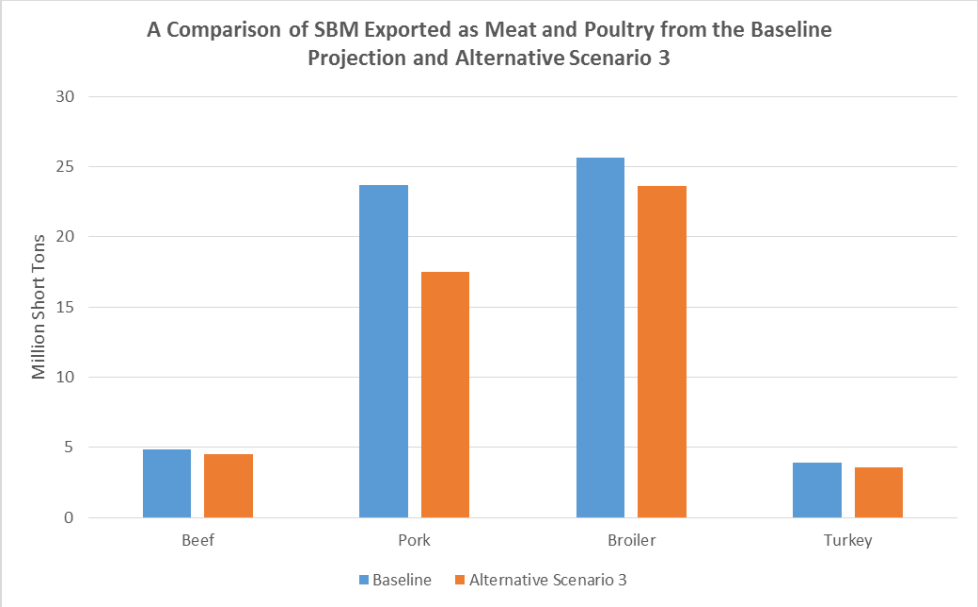


Figure 16, SBM Exported as Meat and Poultry by Species: Baseline to Alternative Scenario 3

Alternative Scenario 4: Import Tariff Rates Increase in a Major Importer Country: Mexico

In this scenario, we look at a case where the Mexican government may impose retaliatory tariffs on U.S. meat imports over the U.S.'s country of origin labelling (COOL) rules for meat and poultry. Mexico has filed a legal case with the World Trade Organization (WTO) against the U.S. and argued that the U.S. COOL rule discriminates against their meat. Mexican authorities may impose up to a 100 percent import tax on the U.S. red meat and poultry products.

Mexico is one of the major current and expanding export markets for U.S. meat and poultry products. The Mexican market represents 63 percent of total U.S. turkey exports. In 2014, Mexico accounted for approximately 28 percent of the U.S. total pork exports. Broiler exports to Mexico represents approximately 21 percent of total U.S. broiler export market. U.S. beef exports to Mexico accounted 17 percent of total beef exports in 2014, which is second only to Japan. (See http://www.ers.usda.gov/data-products/livestock-meat-international-trade-data.aspx). Hence, any import tariff increase by Mexico will have tremendous ramifications on U.S. meat and poultry exports to Mexico.

Suppose Mexico imposes a specific tariff on imports of the U.S. meat and poultry. As a tax on imports, the tariff will inhibit the flow of meat and poultry across the border. It would then cost more to move the product from the United States into Mexico. As a result, the supply of meat and poultry to the Mexican market will fall, inducing an increase in the price in Mexico. The price of the U.S. meat and poultry sold in Mexico will rise sharply. The higher price will reduce Mexico's import demand from the U.S. In this analysis, we assume that Mexican import demand elasticity for U.S. meat is -0.66. This shows that a one

percent increase in the tariff increase corresponds to a 0.66 percent decrease in Mexico's demand for U.S. exports (see http://www.usitc.gov/publications/332/ec200210a.pdf).

Based on the above elasticity estimates, we developed a static simulation to depict Scenario 4 and compare with the baseline as shown in Figure 17. Here we assumed that Mexican authorities impose a 100 percent import tax on the U.S. red meat and poultry products. Again, there is a significant deviation from the baseline projection, which shows how important Mexico is as a trade partner for the U.S. economy.

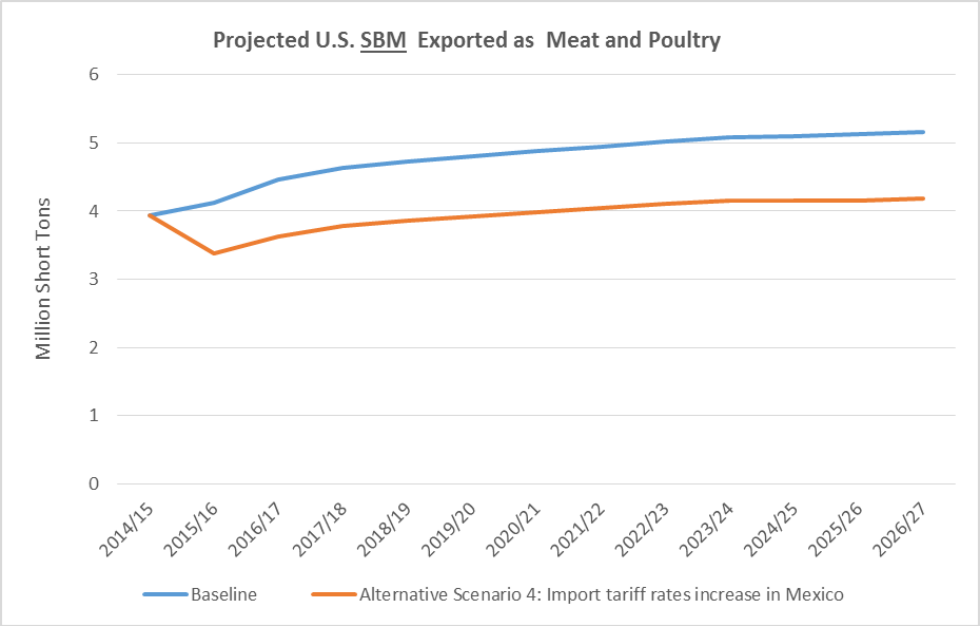


Figure 17, SBM Exported as Meat and Poultry: Baseline to Alternative Scenario 4

Total SBM exports as meat and poultry drop from 58.1 million tons to a total 47.4 million tons from 2015/16 to 2026/27 soybean marketing year (see Figure 18). This is, on average, an 18 percent reduction in the SBM indirectly exported as meat and poultry from the U.S. Again, the U.S. SBM exported as pork bears the largest burden as it drops 4.3 million tons of total exports from 2015/16 to 2026/27. The SBM exported as broilers is reduced by 3.6 million short tons. In addition, the SBM exported as turkey and beef are reduced by 2.3 and 0.5 million short tons, respectively.

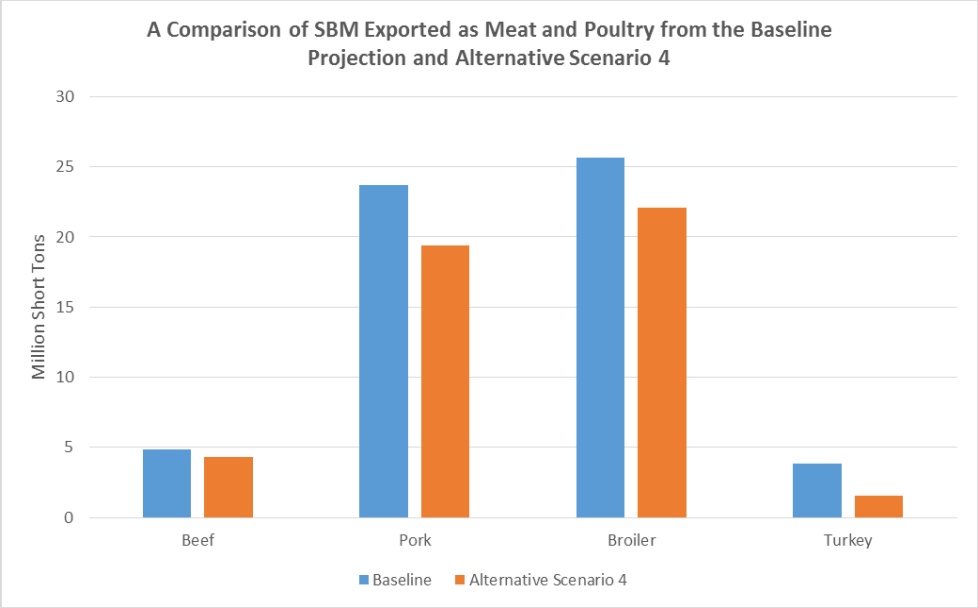


Figure 18, SBM Exported as Meat and Poultry by Species: Baseline to Alternative Scenario 4

Alternative Scenario 5: Export Growth Due to Trans-Pacific Partnership

The U.S. announced in 2009 its intention to participate in the Trans-Pacific Partnership (TPP) negotiations. Through this agreement, the U.S. is seeking to boost American exports to a region that includes some of the world's most robust economies. The proposed member countries represent more than 40 percent of global trade. In addition to the Asia-Pacific region, the U.S. has reached consensus on the addition of Mexico and Canada into the negotiations. The list of all parties can be found in https://ustr.gov/tpp/. Through TPP, U.S meat and poultry industries now have an opportunity to increase exports to rapidly growing Asian-Pacific markets like Malaysia and Vietnam and high value markets such as Canada and Japan. TPP will help to eliminate tariff and non-tariff barriers that have hampered U.S. meat and poultry access to this part of the world market.

In this scenario, we look at a case where the Japanese government eliminates both tariff and non-tariff barriers on red meat exports from the U.S. The Japanese market represented 26 percent of U.S. beef exports in 2014. Japan accounted for approximately 25 percent of total U.S. pork exports in 2014. (See http://www.ers.usda.gov/data-products/livestock-meat-international-trade-data.aspx). According to USDA, if passed and implemented, TPP will eliminate Japan's red meat duties significantly. Hence, the elimination of tariff and non-tariff barriers will have a significant boost on the volume of U.S. red meat exports to Japan.

In this analysis, we assume that the elasticities of Japanese import demand for U.S. beef and pork with respect to import tariffs are -1.89 and -2.01, respectively (see http://ageconsearch.umn.edu/bitstream/14545/1/cp01mi02.pdf). We expect that there would be a 50 percent elimination of current tariffs and non-tariff barriers. Using these assumption, we employed a static simulation to generate the outcome of this scenario as shown in Figure 19 (next page). There is a significantly positive deviation from the baseline projection in meat exports to Japan, which shows how important relaxing restrictions in the trade partnerships with Japan is.

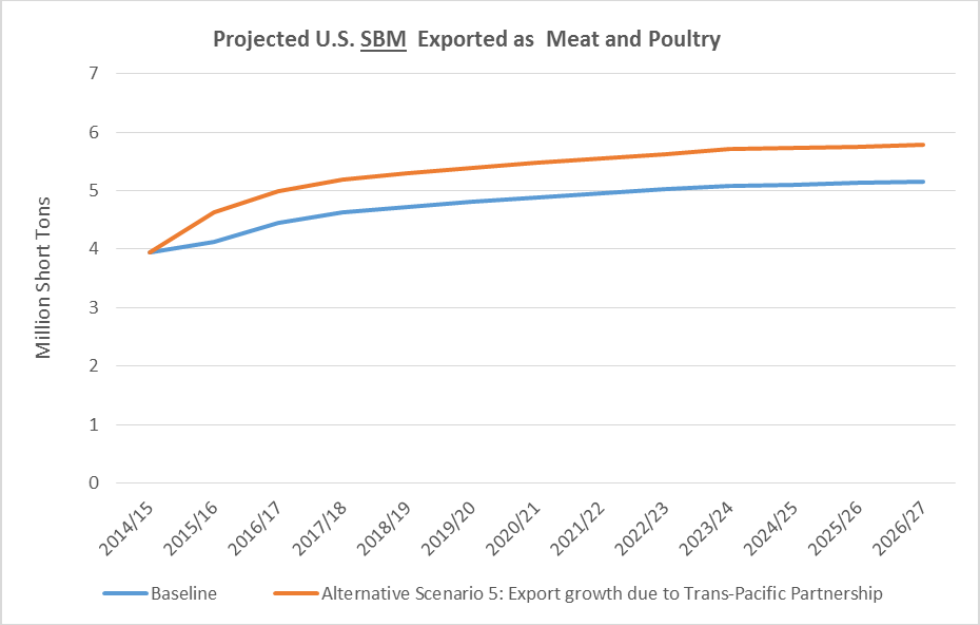


Figure 19, SBM Exported as Meat and Poultry by Species: Baseline to Alternative Scenario 5

Under this scenario, total SBM exported as meat and poultry increases from 58.1 million tons under the baseline scenario to 65.1 million tons during the 2015/16 to 2026/27 soybean marketing years (see Figure 20). This is, on average, a 12 percent increase in the SBM indirectly exported as meat and poultry. U.S. SBM exported as pork bears the largest improvement as it increases by approximately 6.0 million tons from 2015/16 to 2026/27. SBM indirectly exported as beef is increased by approximately 1.2 million tons. Note that there is no change in SBM indirectly exported as poultry since Japan is not a significant trading partner with respect to broiler and turkey meat.

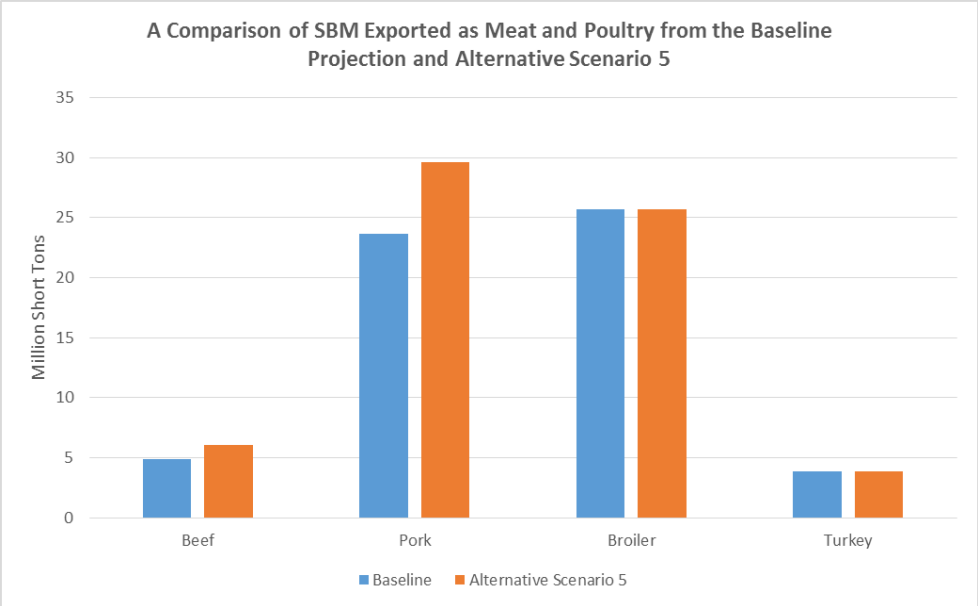


Figure 20, SBM Exported as Meat and Poultry by Species: Baseline to Alternative Scenario 5

Concluding Remarks

The following conclusions are derived from information about the U.S. meat and poultry export situation and updated methodology employed to estimate the amount of SBM exported as U.S. meat and poultry exports. This information is relevant to U.S. soybean producers because soybean producers benefit from U.S. meat and poultry exports as SBM is used as a protein and essential amino acid (i.e., lysine, threonine, and methionine) source in the production of livestock and poultry.

The U.S. is a solid competitor in the growing global trade of meat (pork, beef, broiler, and turkey meats). U.S. broiler production is the largest in the world. Globally, the U.S. is ranked as the number two exporter after Brazil. From 2005 to 2014 U.S. exports experienced substantial increases in meat and poultry exports. So far in 2015, turkey and broiler exports suffered a setback due to trade restrictions brought about by avian influenza. USDA/WASDE broiler export projections for next year shows a rebound from this year.

Results indicate that even though broiler production is third in usage of SBM per pound (pounds per MT of RTC equivalent), broiler meat exports account for the most SBM exported as meat and poultry, compared to pork, beef, and turkey meat. This occurs because the volume of U.S. broiler meat exported exceeds each of the other U.S. meat categories exported during both the historical and projected periods. Closely following SBM exported as broiler meat is SBM exported as pork. In a distant third and fourth place are SBM exported as beef and turkey meat, respectively.

Based on location and species, total tonnage of SBM is used extensively in most of the four species of livestock and poultry under study for this analysis. This is particularly true for broilers and hogs, and to a lesser extent, turkeys. In terms of SBM usage by species included in this analysis, the combination of pork, beef, broilers, and turkeys consumed about 22.6 million tons (80.9%) of SBM in 2013/14. This breaks out to 7.891 million tons for hogs (28.3%), 1.448 million tons for beef cows (5.2%), 11.198 million tons for broilers (40.2%), and 2.020 million tons for turkeys (7.2%).

The volume and value effects of SBM exported through meat trade in individual states show that those states which have higher levels of livestock tend to derive more value from meat and poultry exports. This would seem to be a logical conclusion, but there are dynamics at play that can have an impact on the degree to which value finds its way to individual states. These dynamics are grounded in the quantity of SBM used to produce a pound of meat and poultry and the degree to which a particular meat raised in a given state are exported.

In our analysis for the historical period (2004/05 to 2014/15), we found that annual average value derived by the soybean industry from meat and poultry exports was $1.253 billion. This value breaks down to a high of $143.9M (11.5%) in Iowa to a low of $0.1M in the states of Alaska and Hawaii. In our analysis for the projected period (2015/16 to 2026/27), we found that annual average value derived by the soybean industry from meat and poultry exports is projected to be $1.576 billion. This value breaks down to a high of $180.9 million (11.5% of U.S. total) in Iowa to a low of $0.1 million in the states of Alaska and Hawaii.

In addition, DIS analyzed the impact of a number of alternative scenarios to the projected baseline. We looked at the following five scenarios:

1. **Disruption of Poultry Trade (Avian Influenza) to China and South Korea**
    a. Over the projection period, SBM exports as meat and poultry drop from 58.1 million tons to a total 55.3 million tons.
2. **Three-Year Global Recession**
    a. Over the projection period, total SBM exported as meat and poultry drops from 58.1 million tons to a total 53.2 million tons.
3. **Exchange Rate Volatility**
    a. Over the projection period, SBM export as meat and poultry drop from 58.1 million tons to a total 49.2 million tons.
4. **Import Tariff Rate Increase**
    a. Over the projection period, SBM exports as meat and poultry drop from 58.1 million tons to a total 47.4 million tons.
5. **Export Growth Due to Trans-Pacific Partnership**
    a. Over the projection period, SBM exported as meat and poultry increases from 58.1 million tons under the baseline scenario to 65.1 million tons.

Looking Ahead

According to USDA long-term projections, world meat and poultry consumption is expected to grow over the next decade. Poultry consumption will increase faster than pork and beef consumption, due to its lower cost advantage compared to beef and pork. Factors that will contribute to the overall global growth in meat and poultry consumption include increasing incomes and population growth, primary in developing countries, as well as diet diversification.

Expansion and promotion of U.S. meat and poultry exports for all four meats included in this study is relevant to U.S. soybean growers because our findings confirm that a large amount of SBM, and by extension, soybeans are indirectly exported as meat and poultry exports. For instance, in 2013/14 SBM exported as meat and poultry (4.3 million tons, see Table 3 on page 19) represented about 19% of the 2013/14 domestic SBM consumption (22.6 million tons, see Table 5 on page 24).

Exporting U.S. meat and poultry to new markets is key to increase U.S. meat and poultry exports. Developing countries such as those in Central and South America, the Middle East, and Northern Africa account for about 81 percent of the projected growth in global consumption of meat due to a growing middle class within those countries. These are price-sensitive markets. Considering that broiler meat has a price advantage over beef and pork, broiler exports have the most potential for export growth in developing countries.

DIS findings indicate that it takes more SBM to produce one metric ton of turkey (RTC) than for any other animal species. In second place is pork followed by broilers. Beef uses the least amount of SBM per metric ton of beef produced.

Broilers

USDA's long term projections indicate production expansion for broilers during the entire projected period are driven by higher number of birds and increased average weight at slaughter. Barring a recurrence of avian influenza, production growth for the immediate two years should be expected. Export growth is also expected during the entire projected period (12 years). Strong competition from other

countries, mainly Brazil, will continue for U.S. poultry producers during the projected period. U.S. broiler meat exports will continue to go primarily to Mexico while expanding to other countries.

Pork

The U.S. is ranked as the world's third-largest pork producer after the EU, with China being the top producer. The pork sector is projected not only to recover from reduced production in 2014 due to PEDv, but also to expand based on increased production efficiencies. Larger U.S. pork supplies will bring competitive prices and encourage shipments to most markets, in particular to Mexico, which is a key market for U.S. pork. Pacific Rim nations are also key for the long-term growth of U.S. pork exports. The U.S. is the top pork exporter in the world. Based on USDA projections to 2024, U.S. pork exports will continue leading global pork exports.

Beef

The U.S. is the world's largest beef producer and is currently positioned as fourth in beef and veal exports after India, Brazil, and Australia. Ongoing herd expansion will increase production. U.S. beef exports are projected to increase as growing domestic supplies will contribute to reduced prices. It is also expected that the U.S. will recover its market share in Asia as beef exports from Australia are projected to decline; however, over the long run U.S. beef exports will continue trailing Australia's beef exports. Key markets for U.S. beef are Mexico, Canada, Japan, and South Korea.

Turkey

The U.S. is the largest turkey producer and exporter in the world. U.S. turkey exports declined this year due to constrained supply caused by HPAI. Nonetheless, USDA long-term projections for the next ten years support poultry export (including turkey meat) expansion during the projected period. After recovering from the negative impact from HPAI, it is expected that turkey production will increase on the same basis as for broiler production expansion (i.e., higher number of birds and higher average weight at slaughter).

Observations

The following are summarized observations noted as research regarding the value derived by the soybean industry through meat and poultry exports has been completed. These observations are subsequently used to provide recommendations for USB to formulate strategies for increasing U.S. meat and poultry exports.

- If assumptions under which meat and poultry export projections were formulated are held, the related projections for SBM exported as meat and poultry for the 2015/16 to 2026/27 period indicates that SBM exported as meats will increase 25% from 4.126 million tons ($1.377 billion) to 5.161 million tons ($1.711 billion).
- On a tonnage basis, SBM exported as broiler meat is projected to grow the quickest over next 12 years (400,000 tons), followed by pork (300,000 tons), beef (170,000 tons), and turkey (160,000 tons).
- Continued support for broiler meat and pork export expansion is critical for the growth of SBM exported as meat. Promoting turkey meat exports, in particular, is important because the amount of SBM that goes into the production of turkey is larger than the amount of SBM used for any other meat production and the amount of U.S. meat turkey meat exported is relatively small compared to the other meats. However, due to highly pathogenic avian influenza, turkey exports may be limited by domestic supply until the virus is contained or eradicated.

- On a percentage basis, SBM exported as turkey meat will grow the quickest (65%), followed by beef (57%), broiler (22%), and pork (17%).
- Per pound of exported meat and poultry, turkey provides the greatest opportunity to expand indirect SBM exports; pork is second and broiler is third. Beef provides the least pound-for-pound opportunity.
- If passed and implemented, the recent completion of the Trans-Pacific Partnership (TPP) trade agreement will advance export opportunities for U.S. red meat exports and, to some extent, U.S. poultry exports.
- Because the U.S. and Brazil have large amounts of land to produce feed and processing sectors capable of handling large quantities of broiler meat, both countries are expected to remain the largest broiler producers and exporters in the world. Brazil is projected to capture a rising share of the world market due to its weak currency, plant flexibility and other factors.
- Even though beef production and exports are expected to increase during the next decade, because production of beef uses the least amount SBM, the impact of beef export expansion is less significant on SBM exported as meats, but nonetheless is relevant.
- Beef is the most limited for near-term expansion due to herd size and supply constraints. Beef exports will be constrained by supply for the next few years.

Recommendations

The following are recommendations for USB consideration as strategy for increased meat and poultry exports is formulated and executed. These recommendations are based upon our experience and the research embodied in this report.

An Increased Focus on Key and Emerging Meat and Poultry Export Markets

Trans-Pacific Partnership

Very recently, the U.S. and other nations finalized wording on a broad trade agreement known as the Trans-Pacific Partnership. This trade agreement is generally viewed as a direct response to the ASEAN-Australia-New Zealand Free Trade Agreement, which has allowed nations party to that agreement to gain meat and poultry export market share in the region. If passed and implemented, the trade agreement holds promise for increased U.S. meat and poultry exports. U.S. pork, poultry, and beef exports to Japan and Vietnam will have trade-restricting practices dramatically reduced (to zero in some cases), making U.S. meat and poultry exports more competitive with other nations currently benefiting from the ASEAN-Australia-New Zealand Free Trade Agreement.

Recommendation: *Nations covered by TPP offer great meat and poultry export market expansion opportunities for increased meat and poultry exports from the U.S. USB should work diligently to maximize these opportunities if this trade agreement is implemented over the next 15 years.*

Mexico

Mexico is one of the major current and expanding export markets for the U.S. meat and poultry products. The Mexican market represents 63 percent of total U.S. turkey exports. Mexico accounts for approximately 28 percent of the U.S. total pork exports in 2014. Broiler exports to Mexico represents approximately 21 percent of the total U.S. broiler export market. U.S. beef exports to Mexico accounted 17 percent of total beef exports in 2014, which is second only to Japan. While the U.S. has a free trade agreement with Mexico, due to disagreements over Country of Origin Labeling, an appeal to the World

Trade Organization is underway. Barring negative consequences of an unfavorable ruling, Mexico will continue to be a strong importer of U.S. meat and poultry.

Recommendation: *Efforts to grow the competitiveness of the U.S. as a preferred source of pork, broiler and turkey exports to Mexico should be a top USB priority. Focus on beef exports to Mexico will likely not yield the same effectiveness as a focus on pork and poultry exports.*

Colombia

Since the U.S.-Colombia FTA went into force in May 2012, U.S. pork exports to Colombia have increased the most compared to other meats. Pork exports rose from 10,171 MT CWE in 2011 to 43,962 MT CWE in 2014, representing an increase of 332%. The second most important meat exported to Colombia is broiler meat. However, broiler meat exports to Colombia have not experienced the same level of growth as U.S. pork exports. Growth of broiler meat exports to Colombia during the same period were just 17% above pre-FTA levels (28,986 MT RTC). Moreover, broiler meat exports actually declined 2% 2013 to 2014

U.S. meat and poultry exports to Colombia from January to August 2015 decreased for all meats compared to the same period in 2014. The strong U.S. dollar may have played a role in the decline of U.S. meat and poultry exports to Colombia this year. In addition, the deterioration of poultry meat exports to Colombia this year may be the result of the negative impact of this year's HPAI outbreak in the U.S.

The FTA between the U.S. and Colombia will eventually remove tariffs and other barriers to goods and services. As part of the agreement, the U.S. allowed longer phase-out periods to some sensitive sectors, so that those sector would have more time to adjust to the trade liberalization. Sectors receiving the longest phase-out periods include poultry, which explains some of the reluctance to embrace poultry from the U.S.

Recommendation*: The FTA between the U.S. and Colombia can provide opportunities for U.S. meat and poultry export growth. Continued focus in Colombia is advised. Given the potential of this market, promptly resolving any unfounded issues that may pose obstruction to U.S. meat and poultry export to Colombia is important.*

China

China has the most potential to grow in the next 10 years. More explicitly, China is poised for a long-term economic restructuring that will lead to more pork and poultry imports. As per capita GDP grows in China, there is potential for high domestic demand for beef as well. Although China continues to severely hamper, if not ban, U.S. beef due to the BSE case in December 2003, there is some beef exports recently going to China through Hong Kong. U.S. trade officials have been trying to get China to lift the ban, but with little success.

Recommendation*: In order to achieve long term objectives, USB should fund efforts to enhance U.S. poultry and pork exports to China. However, it is important to mention that a large proportion of U.S. pork production is ineligible to export to China due to ractopamine use which contradicts China's pork import requirements. In order to benefit from the significant pork export opportunity growth in China, the U.S. needs to substantially increase the number of plants that meet China's pork import requirements and at the same time, implement a ractopamine-free verification program that even includes segregation at the cold storage facility level, following the example of Canada. Meanwhile, the EU, which does not use ractopamine in its pork production, is increasing its market share in China's pork imports. In addition to the potential growth in beef export after lifting the ban, turkey should also be included in promotions in China. This is because of the fact that China is the second largest market for turkey from the U.S.*

Japan and South Korea

Japan is the largest foreign market for U.S. beef, with 2014 exports totaling nearly $1.6 billion. However, beef exports in 2015 so far are behind the last year's pace due to a weaker Australian dollar compared to the U.S. dollar and a new trade partnership between these two countries in 2015, which gives beef from Australia an advantage over other countries. Japan is also a key market for U.S. pork as well as the potential for poultry. Korea is also a very important trade partner like Japan. Animal protein demand should continue growing along with the increase per capita income in Korea. South Korea has a lot of limitations on meeting its own animal protein consumption and potential future demand. USB should work with animal agriculture in the U.S. to ensure greater Korean acceptance of the quality and value of U.S. meat and poultry products.

Recommendation**:** *USB can increase awareness of the quality and value of U.S red meat and poultry, while also educating Japanese and South Korean consumers about U.S. producers and the places where they raise livestock and poultry. Maintaining Japan as a top tier market for U.S. pork should be a priority for USB. This is because Japan has the world's largest pork deficit between domestic supply and demand.*

Middle East and North Africa

The Middle East and North Africa region shows promise for growth in some, but not all meat sectors. Generally speaking, due to religious and cultural beliefs, there are limits to the amount of pork that could be imported by this region. Because the U.S. is a major exporter of pork, this is a heavy discount in opportunity related to other current and expanding export destinations. Poultry and beef exports, particularly poultry, constitute opportunities for this region. However, contrary to the last time this analysis was conducted, with significantly lower crude oil prices, consumers in this region may be constrained in their ability to increase protein in their diets.

Recommendation: *Notwithstanding the substantial recent fall in crude oil prices, the Middle East and North Africa region does hold promise for increased meat and poultry exports over the next 12 years. As lower priced crude oil induces increased consumption, major oil exporting countries in this region will benefit from larger oil revenues. This, coupled with the fact that the region does not lend itself to efficient production of animal proteins, further enables it to be viewed as an opportunity.*

Russia

The largest importer of U.S. broilers up until 2010 was Russia. Since then, however, Russia has implemented domestic policies that are designed to increase meat production and reduce imports. As we've seen since 2010, imports to Russia have dramatically fallen. We have no reason to expect this trend to abate given the degree to which Russia-U.S. diplomatic relations have cooled in the last few years.

Recommendation: *Opportunities for increased trade with Russia have deteriorated since this analysis was conducted previously. While there may be sporadic meat export opportunities with Russia, significant efforts to increase meat and poultry exports are likely better spent elsewhere.*