Imagine that a student signed up for a video streaming subscription, a service that costs $9.00 a month to enjoy binge-worthy television and movies at any time of day. A few months into her subscription, she receives a notification that the monthly price will be increasing to $12.00 a month, which is over a 30 percent price increase! The student can either continue with her subscription at the higher price of $12.00 per month or cancel the subscription and use the $12.00 elsewhere. What should the student do?

Perhaps she’s willing to pay $12.00 or more in order to access and enjoy the shows and movies that the streaming service provides, but will all other customers react in the same way? It is likely that some customers of the streaming service will cancel their subscription as a result of the increased price, while others are able and willing to pay the higher rate. The relationship between the price of goods or services and the quantity of goods or services purchased is the focus of today’s module.

This module will explore the market forces that influence the price of raw, agricultural commodities. To understand what influences the price of commodities, it’s essential to understand a foundational principle of economics, the law of supply and demand.

Understand the law of supply and demand.

Supply is the quantity of a product that a seller is willing to sell at a given price. The law of supply states that, all else equal, an increase in price results in an increase in the quantity supplied. Imagine a bakery that produces and sells cookies. The law of supply states that the baker is willing to increase production and sell more cookies if the price he can sell the cookies for increases. Thus, he is willing to produce more cookies if they can be sold for $3.00 than if they are sold for $0.75.

This relationship between price and quantity is modeled below. The supply curve demonstrates that as price increases, the quantity supplied increases. Alternatively, as the price decreases, the quantity supplied decreases. A positive relationship exists between price and quantity when it comes to the supply curve.
Farmers and ranchers respond to price changes in the same way. If the price of grain is lower, producers may wait to sell their grain and keep it in storage, reducing the supply that is in the market. If the price of feeder cattle is low, a cow/calf producer may feed his calves an extra few months, waiting for the price to improve. However, if the price of these commodities are high, producers are willing to sell a greater quantity of their commodity to the market.

Producers make the decision of whether or not to supply their commodity to the market at a particular price, but there are external factors that determine the total supply, or quantity of agricultural goods in the market. With a classmate, name three factors that contribute to the total supply of an agricultural commodity.

When these factors are large enough, the supply curve will shift. If, for example, a new hybrid of seed is developed that substantially increases the yield of corn, the supply of corn will shift to the right, as seen in Figure 7.1. Alternatively, if there is a severe drought, and yield drops significantly, the supply of corn decreases. This will cause the supply curve to shift to the left, as seen in Figure 7.2.

**Demand** is the quantity of a product that a buyer is willing and able to purchase at a given price. The law of demand states that, all else equal, as the price of a good or service increases, consumer demand for the good or service will decrease. Now, think about a consumer who is in the market to buy cookies from a bakery. The law of demand suggests that the consumer will purchase more cookies as the price for cookies decreases. Further, the consumer will purchase fewer cookies as the price increases. Thus, a consumer is willing and able to purchase fewer cookies if they cost $3.00 than if they only cost $0.75.

The demand curve is downward sloping. The demand curve charted below demonstrates that as price increases, the quantity demanded decreases. Alternatively, as the price decreases, the quantity demanded increases. An inverse relationship exists between price and quantity when it comes to the demand curve.

Demand for an agricultural commodity is derived from final consumers. Think about the many final consumer products that are made from agricultural commodities! Whether it’s corn or wheat in cereal and other food products, ethanol in gasoline, or meat products, final consumers will ultimately influence the demand for agricultural commodities.
When factors of demand are large enough to influence the total demand for a good, the demand curve will *shift*. If the world population grows over the next decade, the demand for most food products will increase and *shift to the right*, as seen in Figure 7.3. Alternatively, if an economic recession hits and household income decreases, the demand for relatively expensive food products, such as beef, will decrease. This will cause the supply curve to *shift to the left*, as seen in Figure 7.4.

![Diagram of demand curve shift](image)

### Factors that Influence Total Supply for U.S. Commodities

1) **Weather**

Weather is one of the primary factors that influences the supply of a commodity. Weather conditions during the growing season such as drought, hail, or wind will have an impact on the supply of a commodity. If the Midwest is experiencing a particularly dry growing season, the supply of crops grown in this region will decrease. For livestock, significant heat can cause heat stress or exhaustion among cattle and can lead to higher death loss, decreasing supply. Additionally, global weather also influences supply. If South America is experiencing exceptional weather and has a strong crop, the quantity supplied to the global market will increase, influencing U.S. markets.

2) **Yields**

The amount that a producer is able to produce, or yield, directly affects supply. As the yield of a commodity increases, the supply increases. To calculate the total production of a commodity, multiply the number of acres in production and the yield in bushels or tonnage produced per acre. Yield is influenced by other factors such as weather, soil fertility, and technology.

3) **Disease**

A disease outbreak will decrease the supply of livestock. In recent history, the U.S. has experienced outbreaks that have affected the supply of pork and poultry. For example, the outbreak of Avian Flu significantly decreased the supply of laying hens. Disease can have a major impact on the domestic supply of livestock.

4) **Technology**

Improvements to technology increases the production of a product. Think about the impact that research and development of seed hybrids have had in the yield of crops, for example. Seed developed to withstand disease or custom applying fertilizer are two examples where technology has led to increased efficiency and productivity in the field. As technology evolves, the yield and supply of commodities will continue to increase and become more efficient.
5) Cost of Production

The cost of growing a commodity certainly influences the amount that is produced. Input expenses like the cost of land, seed, fertilizer, equipment, and taxes must be considered before growing a commodity. If growing soybeans becomes more profitable than growing corn due to increases in corn input costs, a producer may decrease the number of acres planted to corn. Or, if the cost of feed for cattle or hogs increases substantially, livestock on feed will be reduced. As expenses to produce a particular commodity increases, the supply of that commodity will decrease.

6) Government Policies

The federal and state governments also influence agriculture through policies like trade agreements, farm subsidies, tariffs, property taxes, and conservation programs. Such policies can influence the quantity supplied. For example, through government programs like the Conservation Reserve Program (CRP), farmers can be paid to not plant crops for a certain number of years. The greater number of acres enrolled in CRP will reduce the supply of the commodities normally grown on this land. Government policies also influence the livestock industry. For example, feedlots with over 1,000 head of cattle are required to comply with certain environmental regulations that yards with fewer than 1,000 head are not required to meet. Increased regulation encourages feedlots who are near the 1,000 head capacity to remain below this threshold.

Factors Influencing Total Supply

- Weather
- Yield
- Disease
- Technology
- Cost of Production
- Government Policies

Factors that Influence Total Demand for U.S. Commodities

1) Population Size
The demand for products will increase the more people in the market who want to buy the product. Since agricultural commodities are food products, and everyone needs food to survive, an increase in population will increase the demand for all agricultural commodities and food products.

2) Consumer Taste & Preferences
Consumer preferences, habits, and cultural customs will influence the demand for a good. If consumers have a preference for non-GMO food, the demand for non-GMO commodities will increase. If consumers have a preference for grass-fed or free-range meat products, the demand for livestock raised under these practices will increase. Consumer tastes are likely to change over time as they become more sophisticated and other attributes in their life changes, like changes in income.
3) Income
A consumer’s demand for products is influenced by the size of his or her income. An increase in the level of income will increase the demand for goods, because a rise in income will cause an increase in consumption. Think about how much more one would purchase by earning an additional $20,000 per year! For most goods, an increase in income will lead to an increase in consumption and increase demand.

4) Price of Substitutes
The demand for a good can also be influenced by the price of a substitute. Think about meat substitutes. Common protein options for dinner include beef, chicken, pork, or fish. These products can easily be substituted for each other, so the price of competing products can influence demand of another. For example, if the price of beef increases, consumers may choose to purchase more chicken instead. This would increase the demand for chicken and decrease the demand for beef.

5) Research and Media
Research findings and media sources can also influence demand. If research findings are reported and heavily shared with the public, it could have a large impact on demand for particular goods. For example, if a well-publicized study concludes that 6 ounces of beef consumption per day increases your chance of heart disease by 50 percent, the report is likely to have a large impact on the demand for beef.

6) Government Policies
Government policies and activities also influence the demand for goods. Take ethanol, for example. If the government requires that gasoline must contain a certain percentage of ethanol in an effort to reduce carbon emissions, the demand for corn will increase in order to comply with the government regulation. The government can also increase demand by functioning as a consumer and purchasing agricultural products. In the past, the federal government has purchased excess grain inventories, as well as excess milk to dehydrate and turn into powdered milk in the event of a national emergency.

7) International Markets
International markets influence the demand for U.S. commodities. The U.S. produces more agricultural products than the country can consume each year, which creates a surplus. This allows the U.S. to export a percentage of its production abroad. Negotiating trade agreements increases demand for U.S. commodities. In fact, exports account for about 15 - 20 percent of the total corn and soybean crop alone. Other coarse grain exports can vary annually from 12 - 25 percent of total U.S. production.

International commodity markets can also influence the demand for U.S. commodities. For example, if South America grows more acres of soybeans, the supply of soybeans in South America will increase, leading to a decrease in price for South American soybeans. If soybeans are less expensive in South America, other countries, such as China, will end up purchasing more soybeans from South America, decreasing the demand for U.S. soybeans.
<table>
<thead>
<tr>
<th>Scenario</th>
<th>Change in Supply</th>
<th>Change in Demand</th>
</tr>
</thead>
<tbody>
<tr>
<td>A disease outbreak among soybean fields in the mid-west. (soybean)</td>
<td>Decrease</td>
<td>No Change</td>
</tr>
<tr>
<td>Argentina experiences perfect weather during their growing season. (corn)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>The U.S. enters into a free-trade agreement with several countries. (soybeans)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>A well-conducted and publicized study finds that GMO food is safe to consume and has no credible health concerns (corn)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>The income of the average citizen increases (beef)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Consumers develop an appetite for bacon. (pork)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>There is a well-publicized disease outbreak among broiler chickens. (poultry)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>A health report is released that red meat is linked to heart disease. (beef)</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**Price discovery** is the process used to determine prices for a good based on conditions affecting supply and demand. When the supply and demand curve intersect, the market is in **equilibrium**. This is where the quantity demanded and the quantity supplied are equal. The market is always working to reach equilibrium.

![Diagram of supply and demand curves](image)

The supply and demand curve determine the market price of a good or commodity. If factors of supply or demand lead to shifts in either one of these curves, market prices will change in an effort to work towards equilibrium. The scenarios below demonstrate how shifts in supply and demand will influence the market price.

**Scenario 1**
It's a record year for corn. Weather conditions were perfect and improved seed genetics have enabled producers to achieve a 7 percent increase in yield from last year. Last year, the price of corn in July was $4.30. There has been no major change affecting the demand for corn over the last year. Based on this information, what will happen to the price and quantity of corn?

The technology and great weather conditions increase the supply of corn, shifting the supply curve to the right. The new intersection between the shifted supply curve ($S_2$) and the demand curve establish the new equilibrium price and quantity. At this intersection, the price has decreased to $4.00 and the quantity has increased to $Q_2$.

**Increase Supply, Decrease Price**
Scenario 2
There’s a disease outbreak among hogs, causing projected yield to decrease substantially. Last year, the price of hogs in July was $95.00/cwt. There has been no major change affecting the demand for pork over the last year. Based on this information, what will happen to the price and quantity of hogs?

The disease outbreak will decrease the supply of hogs, shifting the supply curve to the left. The new intersection between the shifted supply curve ($S_2$) and the demand curve establish the new equilibrium price and quantity. At this intersection, the price has increased to $110.00/cwt and the quantity has decreased to $Q_2$.

**Decrease Supply, Increase Price**

Scenario 3
The U.S. government recently negotiated a new trade deal with countries in the Pacific, creating new markets for American agriculture. Last year, the price of live cattle averaged $105/cwt. There has been no major change affecting the supply of beef over the last year. Based on this information, what will happen to the price and quantity of live cattle?

Access to new markets will stimulate an increase in demand of live cattle, shifting the demand curve to the right. The new intersection between the shifted demand curve ($D_2$) and the supply curve establish the new equilibrium price and quantity. At this intersection, the price has increased to $110/cwt and the quantity has increased to $Q_2$.

**Increase Demand, Increase Price**
Scenario 4
Ethanol production has slowed dramatically because it’s no longer being subsidized and margins are tight. Prior to this, corn averaged $4.00. There has been no major change affecting the supply for corn over the last year. Based on this information, what will happen to the price and quantity of corn?

The slowdown of ethanol production decreases the demand for corn, shifting the demand curve to the left. The new intersection between the shifted demand curve ($D_2$) and the supply curve establish the new equilibrium price and quantity. At this intersection, the price has decreased to $3.70 and the quantity has decreased to $Q_2$.

Identify important crop and livestock reports

Studying how market supply and demand information impacts commodity prices is known as fundamental analysis. A fundamentalist’s goal is to predict how prices will move as factors of supply and demand change.

Crop Reports
In commodity markets, producers and agribusinesses rely on market reports produced by the United States Department of Agriculture (USDA) to shape expectations about supply and demand conditions for the U.S. and the world. Fundamental analysts keep a careful eye on these reports, and compare supply and demand projections for the coming year to previous years. The monthly WASDE Report, Crop Production Annual Summary, Prospective Plantings, Acreage Report, Crop Progress, Cattle on Feed, and Hogs and Pigs are key, market-moving reports that are released throughout the year. These reports are discussed below.

WASDE Report
The World Agriculture Supply & Demand Expectations (WASDE) report is prepared monthly and includes forecasts for U.S. and world supply and usage for crops and oilseeds such as wheat, rice, corn, barley, sorghum, oats, soybeans, and cotton. Additionally, U.S. coverage of the WASDE report includes sugar, meat, poultry, eggs, and milk.

Total Supply
WASDE provides information about total supply in the U.S. Total Supply of a commodity in the U.S. is the sum of production, beginning stocks, and imports, or:

$$\text{Total Supply} = \text{Production} + \text{Beginning Stocks} + \text{Imports}$$
Crop Production includes two components. 1) Areas harvested, and 2) Yield per acre. To calculate production for a given year, multiply the area harvested and yield per acre.

Supply also takes into account Beginning Stocks. Beginning Stocks, also known as carryover, is the amount of a commodity left over from the previous production year that is carried over into the coming year. Thus, beginning stocks in 2018 is equal to ending stocks in 2017. Beginning stocks is calculated by taking the difference between Total Supply and Total Use from the previous year.

Imports is the amount of a commodity brought into the country from abroad.

Take a look at a wheat supply example from a recent WASDE report.

<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Area Planted</td>
<td>56.8</td>
<td>55.0</td>
<td>50.2</td>
<td>50.2</td>
</tr>
<tr>
<td>Area Harvested</td>
<td>46.4</td>
<td>47.3</td>
<td>43.9</td>
<td>43.9</td>
</tr>
<tr>
<td>Yield per Harvested Acre</td>
<td>43.7</td>
<td>43.6</td>
<td>52.6</td>
<td>52.6</td>
</tr>
<tr>
<td>Bushels</td>
<td>Million Bushels</td>
<td>Million Bushels</td>
<td>Million Bushels</td>
<td>Million Bushels</td>
</tr>
<tr>
<td>Beginning Stocks</td>
<td>390</td>
<td>732</td>
<td>976</td>
<td>976</td>
</tr>
<tr>
<td>Production</td>
<td>2,026</td>
<td>2,062</td>
<td>2,310</td>
<td>2,310</td>
</tr>
<tr>
<td>Imports</td>
<td>151</td>
<td>113</td>
<td>125</td>
<td>125</td>
</tr>
<tr>
<td>Supply, Total</td>
<td>2,768</td>
<td>2,927</td>
<td>3,410</td>
<td>3,410</td>
</tr>
<tr>
<td>Food</td>
<td>958</td>
<td>957</td>
<td>963</td>
<td>963</td>
</tr>
<tr>
<td>Seed</td>
<td>70</td>
<td>67</td>
<td>61</td>
<td>61</td>
</tr>
<tr>
<td>Feed and Residual</td>
<td>114</td>
<td>152</td>
<td>260</td>
<td>225</td>
</tr>
<tr>
<td>Domestic, Total</td>
<td>1,151</td>
<td>1,177</td>
<td>1,292</td>
<td>1,249</td>
</tr>
<tr>
<td>Exports</td>
<td>864</td>
<td>723</td>
<td>973</td>
<td>973</td>
</tr>
<tr>
<td>Use, Total</td>
<td>2,015</td>
<td>1,952</td>
<td>2,267</td>
<td>2,224</td>
</tr>
<tr>
<td>Ending Stocks</td>
<td>792</td>
<td>976</td>
<td>1,143</td>
<td>1,186</td>
</tr>
<tr>
<td>Avg. Farm Price ($/bu) 2/</td>
<td>5.99</td>
<td>4.89</td>
<td>3.60-3.80</td>
<td>3.75-3.85</td>
</tr>
</tbody>
</table>

(Noticed that ending stocks in 14/15 is equal to beginning stocks in 15/16)
(Will recreate this image so not using screenshot)

Total Demand
The Total Usage, which describes the demand for a commodity, is the number of bushels that are used domestically for food, seed, or livestock feed. Additionally, the number of bushels exported is also included in total usage. Total Usage of a commodity is the sum of these variables:

\[
\text{Total Usage} = \text{Domestic Usage} + \text{Exports}
\]

Stocks-to-Use Ratio
The stocks-to-use ratio is a useful measure of supply and demand for a commodity. This ratio provides the level of carryover stock as a percentage of the total demand. The stocks-to-use ratio makes it easier to understand the relationship between supply and demand and is easy to compare from one year to the next.

The stocks-to-use ratio is calculated by dividing Carryover Stocks by the Total Usage:

\[
\text{Stocks to Usage} = \frac{\text{Carryover Stocks}}{\text{Total Estimated Usage}}
\]

The stocks-to-use ratio helps to determine if the amount of a commodity supplied is high or low, which will influence market prices. If this ratio is high, it means that production from the previous year is covering a high percentage of future demand, even before the new crop is grown. A high ratio indicates a higher supply, causing a drop in prices.

Alternatively, if the ratio is low, it means that most of projected demand must be covered by production in the coming year. A low ratio indicates a lower supply, and will cause an increase in the price of the commodity.

Some benchmark ratios can be established for crops by looking at historical stocks to use data. On a world basis, a stocks-to-use ratio for corn under 12 percent has led to stronger prices. For soybeans, the level is below 10 percent, and below 20 percent for wheat.

Below is a graph that plots the stocks-to-use ratio from 1978-2016 for corn. The second graph plots the average price for corn over the same time period. Notice that when the stocks-to-use ratio is high, prices are lower, and when the ratio is low, prices are higher.
**Days of Supply Remaining**

Another way to interpret the supply of a commodity is to look at Days of Supply. **Days of Supply** shows how long the current supply can sustain existing demand.

Below is a graph that plots the Days of Supply for corn from 1978-2016. The second graph plots the average price for corn over the same time period. Notice that when the Days of Supply is high, prices are lower, and when the Days of Supply is low, prices are higher.

**Other Reports**

The **Crop Production Annual Summary** reports the actual acres, yield and total production from the previous year. This report provides the final inventory, or ending stocks, from the previous year. This report is released January 12th.

**Prospective Plantings** is released March 31st and estimates the number of acres that are expected to be planted to each commodity. It specifies the planting intentions of producers. Later in the season, the **Acreage Report** is released on June 30th and reports the number of acres that were actually planted to each commodity, providing a more accurate estimate of production. These three reports of some of the most influential reports to the market.

The USDA also releases weekly **Crop Progress** reports throughout a crop’s growing season. This report describes the condition of the crop, percentage of crop that is planted, and the percentage that is harvested.
Livestock Reports
Fundamental analysis for livestock focuses on projected supply.

Cattle on Feed Report
USDA releases a monthly Cattle on Feed report. The report documents the number of cattle in U.S. feedlots, the number of cattle being placed in feedlots, and the number being marketed for harvest. USDA collects this information by surveying feedlots with a capacity of 1,000 or more head. This report provides a short-term outlook for beef supply coming to market, and can also impact input markets, such as corn, that is fed to livestock.

The four main inventories kept by the Cattle of Feed report include:

- **Cattle on feed** are steers and heifers being fed a ration of grain, silage, hay and/or protein supplement for slaughter market that are expected to produce a carcass that will grade select or better. It excludes cattle being "backgrounded only" for later sale as feeders or later placement in another feedlot.

- **Placements** are steers and heifers put into a feedlot, fed a ration which will produce a carcass that will grade select or better, and are intended for the slaughter market.

- **Marketings** are steers and heifers shipped out of feedlots to a slaughter market.

- **Other disappearance** includes death loss, movement from feedlots to pasture, and shipments to other feedlots for further feeding.


Hogs and Pigs Report
The USDA releases the Hogs and Pigs report quarterly to provide information on the inventory of hogs in the U.S. This report includes the inventory by class and weight groups, and the number of hogs that went to market and those kept for breeding.
<table>
<thead>
<tr>
<th>Item</th>
<th>2015</th>
<th>2016</th>
<th>2016 as percent of 2015</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>(1,000 head)</td>
<td>(1,000 head)</td>
<td>(percent)</td>
</tr>
<tr>
<td>March 1 inventory</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>All hogs and pigs</td>
<td>67,399</td>
<td>68,124</td>
<td>101</td>
</tr>
<tr>
<td>Kept for breeding</td>
<td>5,962</td>
<td>6,980</td>
<td>100</td>
</tr>
<tr>
<td>Market</td>
<td>61,418</td>
<td>61,144</td>
<td>101</td>
</tr>
<tr>
<td>Market hogs and pigs by weight groups</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Under 50 pounds</td>
<td>19,454</td>
<td>19,897</td>
<td>102</td>
</tr>
<tr>
<td>50-119 pounds</td>
<td>17,129</td>
<td>17,198</td>
<td>100</td>
</tr>
<tr>
<td>120-179 pounds</td>
<td>13,585</td>
<td>13,819</td>
<td>102</td>
</tr>
<tr>
<td>180 pounds and over</td>
<td>11,255</td>
<td>11,229</td>
<td>100</td>
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</tbody>
</table>