

# Soybeans

What do dog food, crayons, tofu, biodiesel, ink, carpet and candles have in common? They're all made with soybeans – and many more products are, too.

Let's learn about the production, processing, distribution and consumption of soybeans.



## Soybean History

Soybeans have a long history in the world, but a short history in our state. North Dakota production increased dramatically – by 55 times – from 3.5 million bushels harvested in 1980 to more than 200 million bushels annually today.

Write the year you think each important soybean event happened into the boxes below.

**1100 B.C., 1765, early 1900s, 1937, 1941, 1940s, 1987, 1992, 2002, 2024**

- On the International Space Station, soybean seeds become the first crop to complete a growth cycle in space.
- Chinese soybean seeds are first planted in North America by a Georgia colonist.
- SoyFoam, a biodegradable product that can extinguish fires, hits the market for firefighters.
- Purdue University students invent soy crayons in a contest to develop new uses for soybeans.
- Soybean production grows because of the need for oils, lubricants, plastics and other materials during World War II.
- Researchers at a university in Belgium develop a process for transforming vegetable oils, such as soybean oil, into fuels, such as biodiesel.
- Henry Ford builds a car with the body made primarily from soybeans rather than steel.
- The Newspaper Association of America comes up with the idea of using soybean oil to make ink instead of petroleum during the oil crisis.
- George Washington Carver studies growing soybeans and develops many products made from them.
- Chinese farmers raise soybeans.

# Production

## The Soybean Plant

Use the words in bold to identify the parts of the soybean plant.

Soybeans grow in **Pods** on the plants. Each plant may have 60 to 80 pods. Two to four **beans** grow in each pod. The plant's **stem**, **leaves** and pods are covered with short, fine hairs.

The soybean plant is a legume because its **roots** have **nodules** (small, rounded bumps). These nodules absorb nitrogen from the air and make it available for the plant's growth. After harvest, some of the nitrogen is released back into the soil for use by the next crop.

 **Video:** Planting with Peter — [www.bit.ly/PlantingWithPeter25](http://www.bit.ly/PlantingWithPeter25)

 **Video:** Harvest with Hayden — [www.bit.ly/HarvestwithHayden24](http://www.bit.ly/HarvestwithHayden24)

An acre is about the size of a football field. A bushel is about the size of a laundry basket.

## Soybean Math

1. A farmer has one soybean field that's 220 acres, another that's 380 acres and another that's 290 acres. How many total acres of soybeans does he have?

2. A farmer has a 530-acre soybean field, but grass grows in an 11-acre wash that flows through the field. On how many acres can she grow soybeans?


3. If one unit of soybean seed (about 140,000 seeds) costs \$56 and a farmer needs 8 units of seed for his field, how much will he spend on seed?

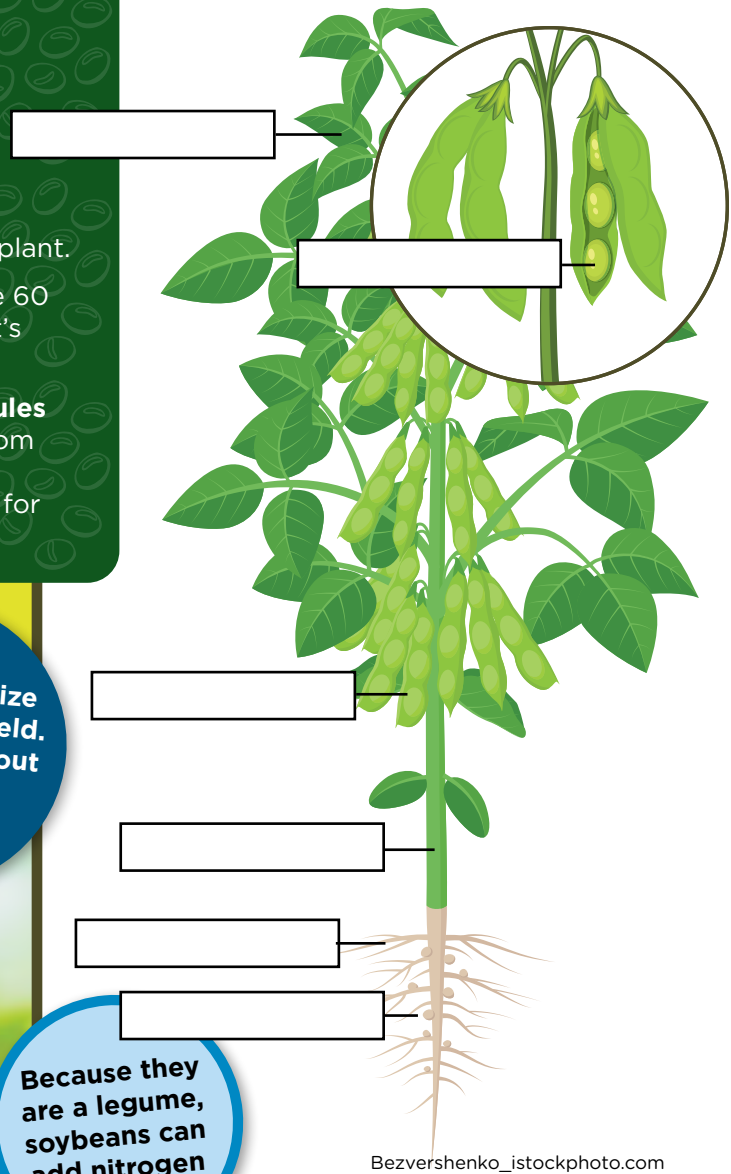
4. If a farmer can plant 6 acres of soybeans in 1 hour, how many acres can she plant in 13 hours?

5. A soybean farmer can harvest 15 acres per hour. How many acres can he harvest in 9 hours?

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 **Video:** Morken Family Farm — [www.bit.ly/MorkenFamilyFarmND](http://www.bit.ly/MorkenFamilyFarmND)

 **Video:** Life of a Soybean — [www.bit.ly/LifeofaSoybean](http://www.bit.ly/LifeofaSoybean)



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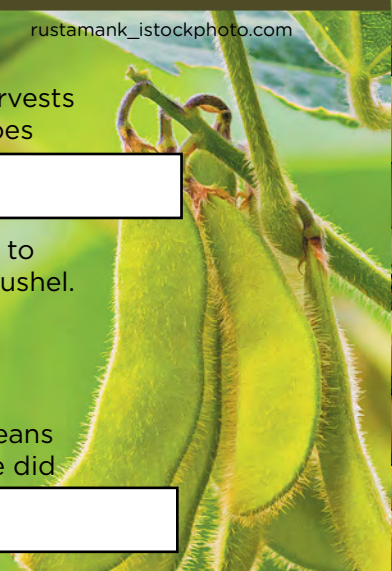
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Because they are a legume, soybeans can add nitrogen to soil.

6. A farmer has 112 acres of soybeans and harvests 38 bushels per acre. How many bushels does the farmer produce?

7. The farmer takes 950 bushels of soybeans to the elevator and sells them for \$9.77 per bushel. How much was the farmer paid?

8. A farmer harvested 2,580 bushels of soybeans from 80 acres. How many bushels per acre did that farmer harvest?

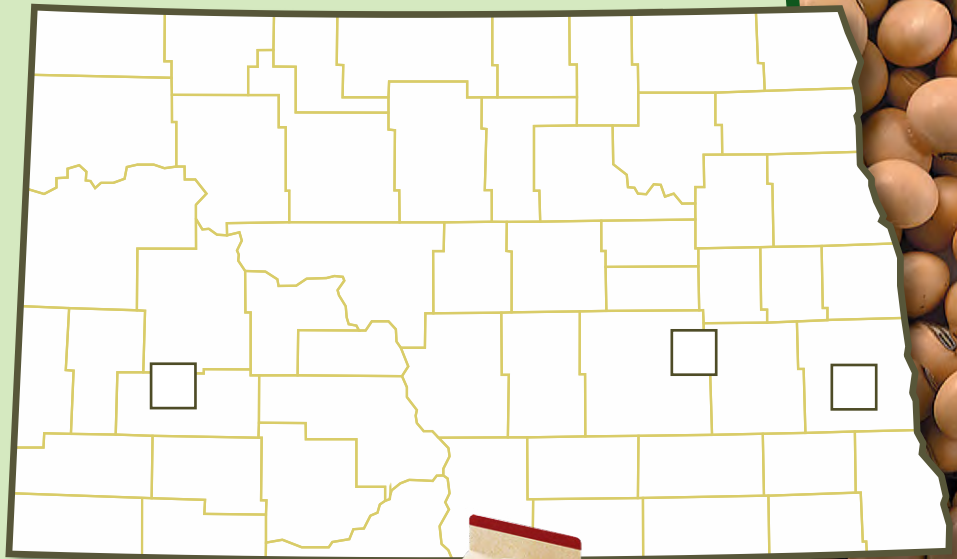


# Production

## North Dakota Soybean Production

North Dakota farmers usually plant more than 6 million acres of soybeans. The entire state of Massachusetts is 5.9 million acres. That's a lot of North Dakota soybeans!

Typically, 16 North Dakota counties each produce more than 5 million bushels of soybeans every year. Write the numbers of each county on the map: **1. Barnes, 2. Benson, 3. Bottineau, 4. Cass, 5. Foster, 6. Grand Forks, 7. LaMoure, 8. McLean, 9. Ransom, 10. Richland, 11. Sargent, 12. Steele, 13. Stutsman, 14. Traill, 15. Ward, 16. Wells**



## U.S. Soybean Production

The top 10 soybean-producing states are **Illinois, Iowa, Minnesota, Missouri, North Dakota, Indiana, Nebraska, South Dakota, Ohio and Kansas.**

Write the names of these 10 states on the map.

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One acre of soybeans can produce 82,368 crayons or 2,500 gallons of soymilk.

# Processing

Use the word bank to fill in the sentences to learn about soybean processing.

North Dakota has two soybean processing plants: the Green Bison Soybean Processing plant at Spiritwood and the North Dakota Soybean Processors plant at Casselton. They're called **1.** \_\_\_\_\_ plants because soybeans are crushed to break down the **2.** \_\_\_\_\_ soybeans into soybean oil and soybean meal.

The oil is used in **3.** \_\_\_\_\_ and food production; in industry such as for **4.** \_\_\_\_\_, paints, plastics, cleaners and candles; and to make **5.** \_\_\_\_\_, a fuel that can replace petroleum diesel. The soybean meal is used to make **6.** \_\_\_\_\_, soy flour and firefighting SoyFoam.

The oil from Green Bison is processed into renewable diesel at the Marathon **7.** \_\_\_\_\_ in Dickinson.

These new crush plants allow North Dakota farmers to sell their soybeans closer to home to reduce **8.** \_\_\_\_\_ costs and help meet the growing **9.** \_\_\_\_\_ for animal feed and renewable fuel.

## Word Bank

animal feed  
cooking  
crush  
demand  
printing inks  
refinery  
renewable diesel  
transportation  
whole

Soybean oil in vehicle tire processing improves their flexibility at lower temperatures and increases traction in snow and rain.



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## Soy Innovations

Soy can be used in many ways. You probably use soy every day without realizing it.

After each soy innovation description, write the letter of the products it may be used in.

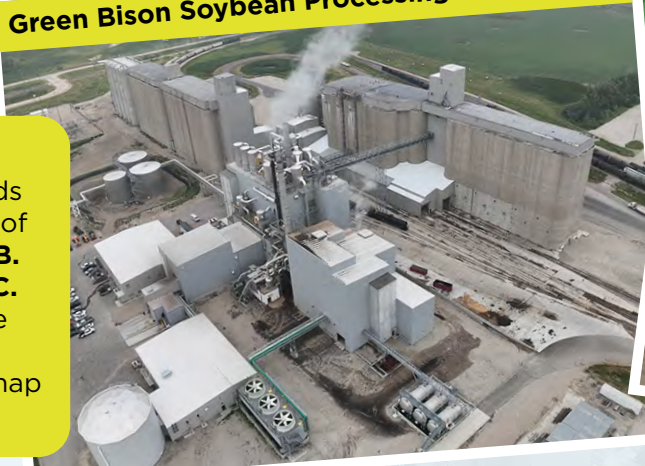
1. This bio-based foam made from soy helps put out wildfires in a safe, eco-friendly way. \_\_\_\_\_
2. Many NFL and college teams use soy-based materials for this surface. \_\_\_\_\_
3. Automakers and athletic brands use soy to create durable rubber-like materials for these items. \_\_\_\_\_
4. This cleaner, longer-burning alternative to paraffin wax is made from soy oil. \_\_\_\_\_
5. An alternative to petroleum-based glues, this soy product is used in making wood products like plywood. \_\_\_\_\_
6. This safe biodegradable option breaks down grease and grime in industrial and household settings. \_\_\_\_\_
7. By sealing and waterproofing rooftops, this soy product protects homes and buildings. \_\_\_\_\_
8. This sustainable lubricant made from soy oil keeps chainsaws running smoothly. \_\_\_\_\_



- A. Soy-based cleaners and degreasers
- B. Soy-based bar and chain oil
- C. Football field turf
- D. Soy-based sealer
- E. Tires and running shoes
- F. Firefighting SoyFoam
- G. Soy-based adhesive
- H. Soy candle



Green Bison Soybean Processing



North Dakota Soybean Processors



Write the letter that corresponds with the towns of **A.** Spiritwood, **B.** Casselton and **C.** Dickinson in the squares on the North Dakota map on page 3.

# Distribution

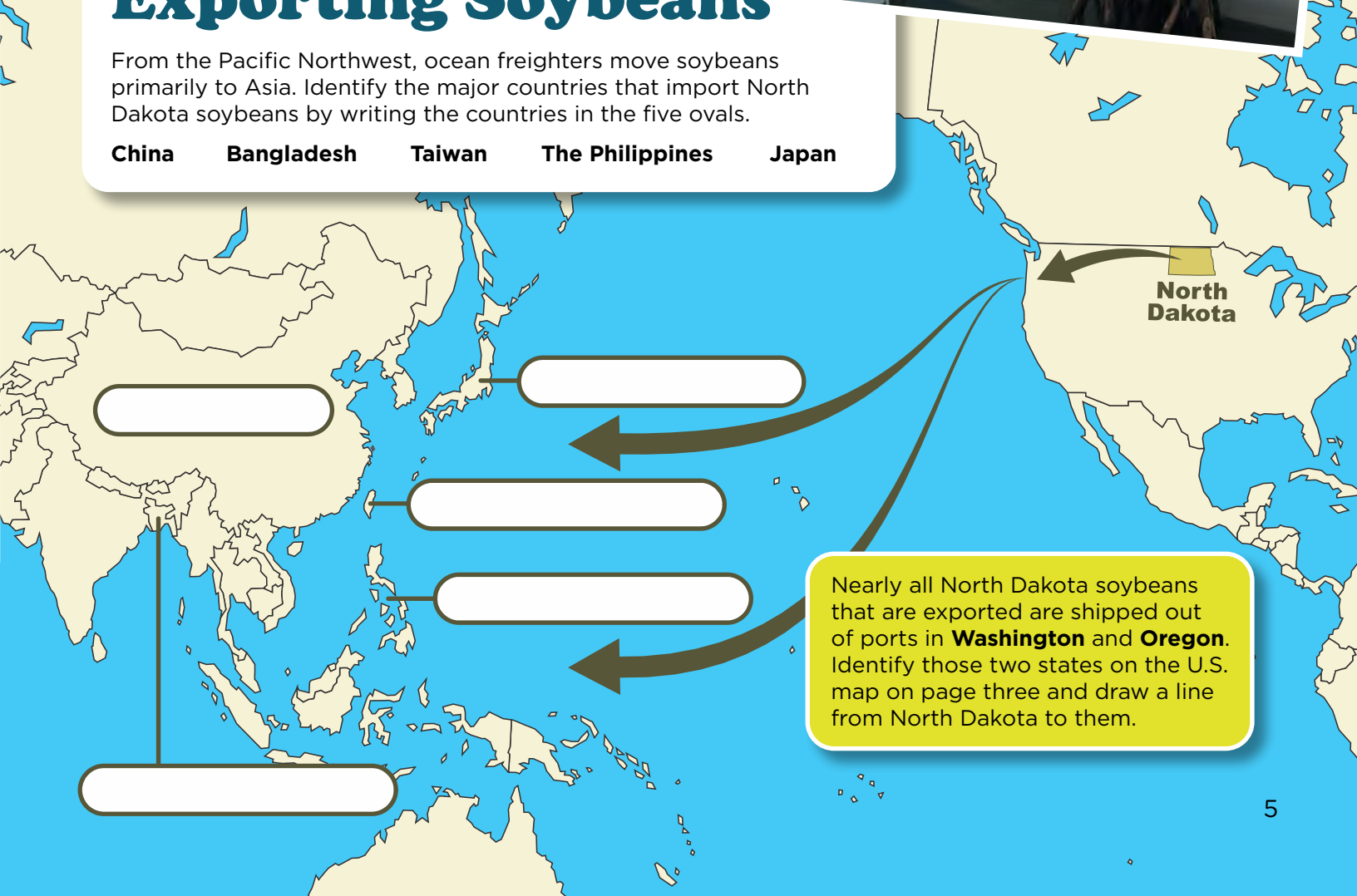
If farmers don't sell their soybeans to a processing plant, they probably sell them to a local elevator and deliver them there by semi-truck. If the elevator sells the soybeans for export, they're loaded into train cars for the trip west.



## Exporting Soybeans

From the Pacific Northwest, ocean freighters move soybeans primarily to Asia. Identify the major countries that import North Dakota soybeans by writing the countries in the five ovals.

- China
- Bangladesh
- Taiwan
- The Philippines
- Japan



Nearly all North Dakota soybeans that are exported are shipped out of ports in **Washington** and **Oregon**. Identify those two states on the U.S. map on page three and draw a line from North Dakota to them.

# Consumption

Select the word that's spelled correctly in each sentence to learn about delicious and nutritious soyfoods.

1. The cooking oil labeled as **(vegetable or vegtable)** oil in the store probably is made from soybeans.
2. Read ingredients on the **(Nutrishon or Nutrition)** Facts label to see if it says soybean oil.
3. Textured soy **(proteen or protein)** adds nutrition to nachos, chili and other foods.
4. Soy sauce is a dark brown **(liquid or likwid)** made from soybeans that have undergone a fermenting process.
5. Soybeans that are soaked, ground fine and **(straaned or strained)** produce soy milk, which can be poured on cereal or used in a smoothie.
6. Edamame beans are soybeans that are harvested while they're still **(immature or imachure)** so they are softer and sweet tasting. Boil or steam them then eat the beans out of the pod.
7. Soy nuts can be **(sprinkled or spinkeld)** over salad to add crunch.
8. Bean curd, which is called **(tofoo or tofu)**, is used in a variety of Asian foods.
9. Soy is an excellent source of **(iurn or iron)**.
10. Soy lecithin is an emulsifier, meaning it helps combine ingredients that **(typically or typicly)** don't mix well, like oil and water.
11. Animals eat soybeans, too. About half of the soybean meal is fed to **(poletry or poultry)**, such as chickens and turkeys.
12. About ¼ of the U.S. soybean meal is fed to **(swine or swein)**, another name for pigs or hogs.



# Career Corner



Stephanie Cook is passionate about agriculture.

“On our family farm, we raise mainly soybeans and corn,” Stephanie said. “However, over the years, we have raised barley, edible beans and sugarbeets and other crops. We also raise pigs and goats as a 4-H and FFA project for my daughters.”

Stephanie will take over the fourth-generation operation that her parents now manage. Her husband Jesse works off the farm in agribusiness.

“We plant soybeans in late April and May,” Stephanie said. “After planting, we usually run the land roller over the fields to ensure good seed-to-soil contact. This also makes it easier to combine in the fall because it flattens big dirt clumps and pushes any rocks into the ground.”

They scout for weeds, pests and signs of disease after seeds emerge.

“Typically in October we start harvesting once the soybean plants turn brown and dry up,” Stephanie said. “From the combine, we will either haul the soybeans to the elevator or crush plant, or store them in a grain bin to haul in later in the year.”

But their work isn’t done yet.

“It’s important to take care of the soil and prepare for the next year’s crop,” Stephanie said. “In the fall, we might spread some fertilizer and work the ground once. Then in the spring, we will work the ground to make a good seedbed and start planting again.”

In addition to her career as a farmer, Stephanie supports agriculture as a 4-H club leader, as the Kindred FFA Boosters president and as a ND Soybean Growers Association board member.

“It is mind blowing how many different ways soybeans are used every day. They don’t just feed us and animals; they are used in many products, from crayons to firefighting. Soybeans really are a magical bean.”

## Stephanie Cook

Davenport, ND, Soybean Farmer



# Soybean Careers

The soybean industry includes a wide variety of careers. Use this word bank to write the letter for each career after its definition.

**A. elevator manager, B. agronomist, C. exporter, D. truck driver, E. entomologist, F. livestock nutritionist, G. buyer, H. farmer, I. crush plant manager**

- Prepares fields, plants the seeds, provides nutrients and pesticides for the plants, harvests and sells the soybeans
- Conducts research to improve soybean production or works with a farmer to improve their farm's production
- Studies insects that might harm soybean crops
- Purchases soybeans from local farmers to store until selling them to an exporter or processor
- Transports soybeans from farm to elevator or elevator to processor
- Purchases soybeans from elevator or sometimes directly from farmers for processing or exporting
- Runs the soybean processing plant to make sure the meal and oil are processed correctly
- Combines soybean meal with other ingredients to make a nutritious feed for animals
- Sells soybeans to international customers

Find answers to activities in this Ag Mag and learn more about soybeans at [www.ndda.nd.gov/agmag](http://www.ndda.nd.gov/agmag).

Thank you for providing information for this Ag Mag:

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