

Ag Mag


A Magazine about Agriculture for North Dakota Students



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.

 **Video:** Soybeans are Everywhere — www.bit.ly/NDSoybeansEverywhere



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 191 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, 2021

- Chinese farmers raised soybeans
- On the International Space Station, soybean seeds were grown and became the first crop to complete a growth cycle in space
- Soy-based product to reduce dust on gravel roads developed at North Dakota State University
- Chinese soybean seeds were planted by a Georgia colonist
- Purdue University students invent soy crayons in a contest to develop new uses for soybeans
- Soybean production grew 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 built a car with the body made primarily from soybeans rather than steel
- The Newspaper Association of America was looking for new ways to make ink beyond standard petroleum-based ink and came up with the solution of using soybean oil
- George Washington Carver studied growing soybeans and developed many products made from them

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:** The Life of a Soybean — www.bit.ly/LifeOfaSoybean

Soybean Math

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

1. If one 50-pound bag of soybean seed costs \$35 and a farmer needs 9 bags of seed to plant his field, how much will he spend on seed?

2. If a farmer can plant 46 acres of soybeans in 1 hour, how many acres can she plant in an 11-hour day?

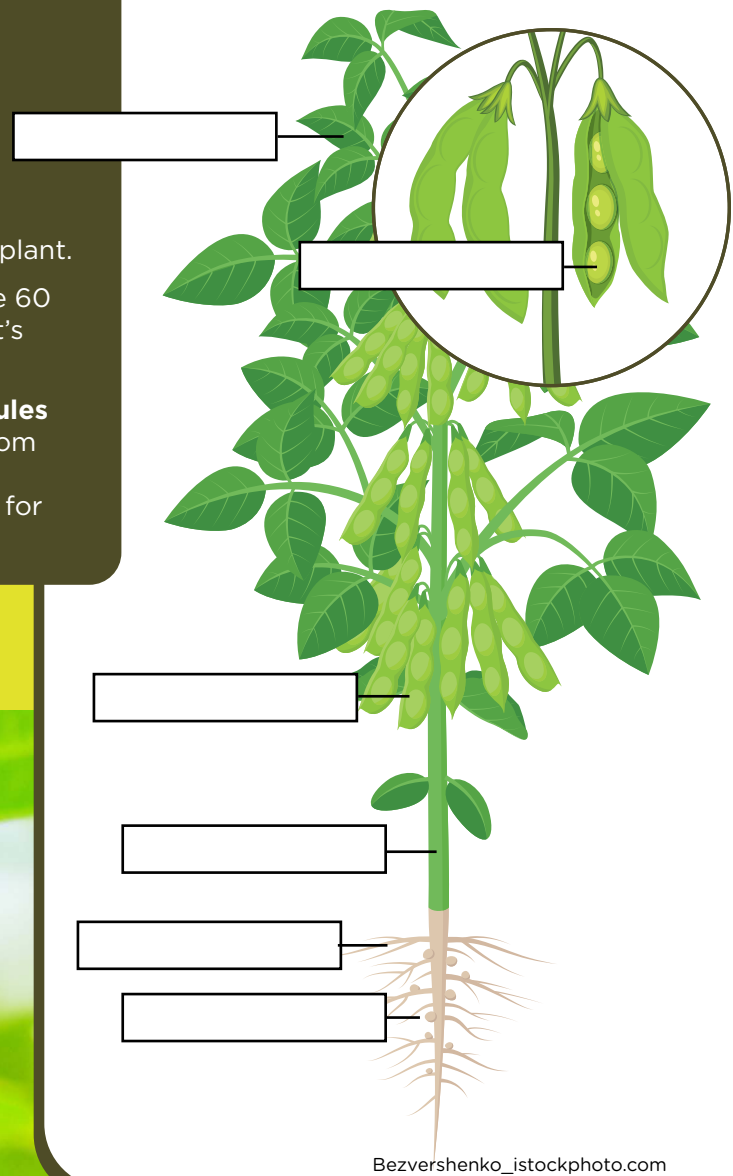
3. A soybean farmer can harvest 20 acres per hour. How many acres can a farmer harvest in 12 hours?

4. A farmer has 98 acres of soybeans and harvests 38 bushels per acre. How many bushels does he produce?

5. The farmer takes 900 bushels of soybeans to elevator and sells them for \$9.83 per bushel. How much was he paid?

6. Another farmer harvested 2,260 bushels of soybeans from 72 acres. How many bushels per acre did she harvest?

7. A farmer's tractor uses 5.6 gallons of biodiesel per acre. How many gallons of biodiesel does he need to plant his 97 acres of soybeans?



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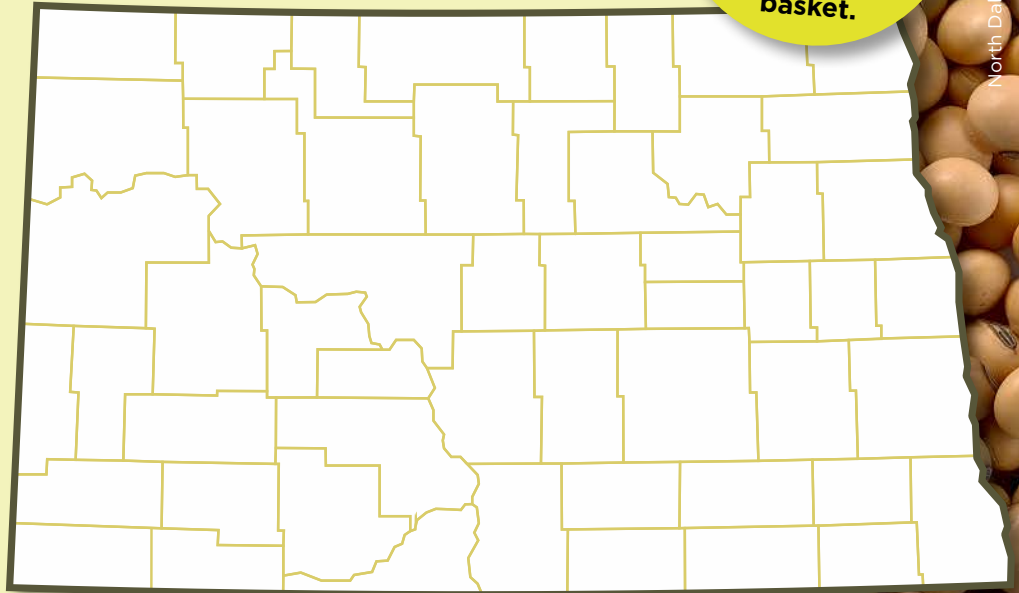
 **Video:** Morken Family Farm — www.bit.ly/MorkenFamilyFarm

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, 12 North Dakota counties each produce more than 5 million **bushels** of soybeans every year. Identify them on the map: **Barnes, Bottineau, Cass, Dickey, Grand Forks, LaMoure, Richland, Sargent, Stutsman, Traill, Ward, Wells**



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

North Dakota Soybean Council


U.S. Soybean Production

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

Identify these 10 states on the map.



Processing

 **Video:** Biodiesel — www.bit.ly/NDbiodiesel

When processed, each soybean produces about 20% oil and 80% meal.

Soybean oil and meal are used in many different products. Soybean oil is used in foods and industrial products. Soybean meal is used in animal feeds to provide protein and energy.

Oil or Meal?

All these things are made from soybeans. Put an **O** in front of the ones you think are made from soybean oil and an **M** in front of the ones you think are made from soybean meal.

- _____ Salad dressing
- _____ Biodiesel
- _____ Chicken feed
- _____ Shoe soles
- _____ Paints
- _____ Dairy Cattle feed
- _____ Lubricants
- _____ Cleaners
- _____ Dog food
- _____ Mayonnaise
- _____ Carpet backing
- _____ Tires
- _____ Textured vegetable protein

Biodiesel

Use the word bank to fill in the sentences to learn about biodiesel.

oil, trucks, independent, renewable, petroleum, pollution, smog, healthier

Biodiesel is fuel for many vehicles, including _____, buses and tractors. It is usually made from soybean oil.

Biodiesel produces less air _____ than _____ diesel. It reduces _____ and makes our air _____ to breathe.

Biodiesel is _____, which means we can always make more. Petroleum diesel comes from crude _____, a fossil fuel, and some day it may run out. Since biodiesel is made in the U.S., it also helps our country become energy _____.

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.

A soy innovation that:

1. Provides durability for long-lasting wear, excellent grip on a variety of surfaces and under different weather conditions, and enhanced traction. _____
2. Makes artificial turf backing strong and not affected by moisture. _____
3. Reduces dust on gravel roads, construction sites and farms to improve air quality. _____
4. Is used in all car seats the Ford Motor Company manufactures. _____
5. Restores the flexibility and water-repelling qualities of shingles to extend roof life. _____
6. Requires less drying time, uses less water and produces less waste than conventional plywood glues. _____
7. Removes oil, grease and other materials from different surfaces. _____
8. Burns longer and cleaner than many paraffin versions. _____
9. Is used to print more than 90% of the nation's daily newspapers because it provides more accurate colors and makes it easier to recycle paper. _____



- A. Football fields and mini golf courses
- B. Soy-based sealer
- C. Soy ink
- D. Soy foam
- E. Soy cleaners and degreasers
- F. Tires and running shoes
- G. Soy-based adhesive
- H. Soy candle
- I. Soy-based dust suppressant



Distribution

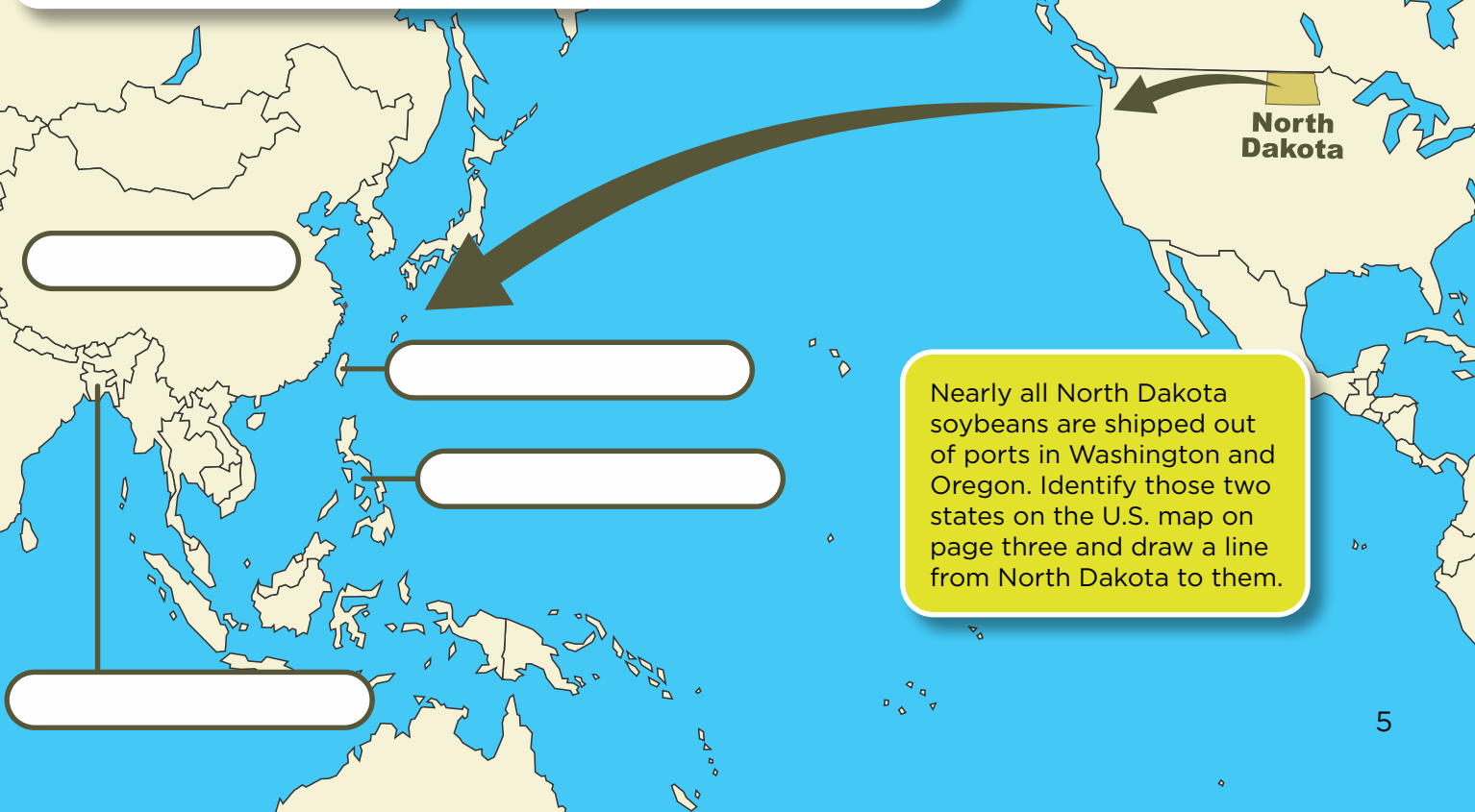
1. If a farmer produces 35 bushels per acre and the semi holds 1,200 bushels, the soybeans from how many acres will fill that semi?
2. One train car can hold the soybeans from 4 large semi-trucks. A train that moves soybeans from North Dakota usually is 110 cars. How many semi-trucks of soybeans would it take to fill the 110-car shuttle train?
3. A 110-car train can move more than 403,000 bushels (12,100 tons) of soybeans from North Dakota to the Pacific Northwest (ocean ports in Washington and Oregon). There the soybeans are transferred to an elevator then to a huge ocean-going freighter. The freighter holds 57,000 tons of soybeans. How many shuttle trains does it take to fill a freighter?
4. About 25% of North Dakota's soybeans are shipped to other states and about 4% stay in the state. The rest are exported to other countries. What percentage is exported?



Exporting Soybeans

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

China **Bangladesh** **Taiwan** **The Philippines**



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 spaghetti sauce, 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)**, often is included in Chinese foods.
9. Soy is an excellent source of **(iurn or iron)**.
10. Soyfoods reduce the risk of heart **(disease or dizeese)**.
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)**, the scientific name for pigs.





Career Corner



North Dakota Soybean Council



Joe Morken Casselton Farmer

Joe Morken and his family farm near Casselton where they grow soybeans, sugarbeets and corn. About half of their acres are planted to soybeans because the soybeans usually make money for the farm and they're used in the crop rotation to improve the soil.

The Morkens sell about half of their soybeans before harvest to guarantee a price then store the rest of the crop in grain bins on the farm or at a local elevator to sell later.

Joe is the third generation on the family farm. He continues to work with his parents, Harvey and Mary, on the operation. His wife, Robin, works at a Casselton company that markets specialty food products, including soybeans. They have two young sons.

In addition to growing up on the farm, Joe studied ag business management at North Dakota State College of Science in Wahpeton.

"Farming isn't the way it was for my grandfather," Joe said. "With today's technology, farming is almost completely different. It's such a business now. For example, we watch input costs (such as seed, fuel, fertilizer, herbicides and more), and we're more careful with the land (to preserve healthy soil)."

There is no such thing as an average day on the Morken farm.

"The seasonality of year changes our workday," Joe said. "Most grain farmers do our preventive maintenance (on equipment), planning, fertilizer prep, input buying, etc. in winter. We're doing more office work and bookkeeping."

"During planting and harvest, we work longer hours — 12- to 16-hour days aren't uncommon (to get the crop in or out when weather cooperates). Again, technology has made a difference. When I started farming, we didn't have autosteering, so the last four or five hours of the day were tough. Now the longer days are easier and safer so we can get more done."



Soybean Careers

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

elevator manager, agronomist, exporter, truck driver, chef, entomologist, crushing plant manager, farmer, buyer, livestock nutritionist



1. Prepares fields, plants the seeds, provides nutrients and pesticides for the plants, harvests and sells the soybeans	<input type="text"/>
2. Conducts research to improve soybean production or works with a farmer to improve their farm's production	<input type="text"/>
3. Studies insects that might harm soybean crops	<input type="text"/>
4. Purchases soybeans from local farmers to store until selling them to an exporter or processor	<input type="text"/>
5. Transports soybeans from farm to elevator or elevator to processor	<input type="text"/>
6. Purchases soybeans from elevator or sometimes directly from farmers for processing or exporting	<input type="text"/>
7. Runs the soybean processing plant to make sure the meal and oil are processed correctly	<input type="text"/>
8. Combines soybean meal with other ingredients to make a nutritious feed for animals	<input type="text"/>
9. Sells soybeans to international customers	<input type="text"/>
10. Cooks soy and other foods	<input type="text"/>

North Dakota Soybean Council

Take this Ag Mag home to share what you've learned about soybeans.

Thank you for providing information for this Ag Mag:

North Dakota Soybean Council
 North Dakota State University
 USDA National Agricultural Statistics Service
 United Soybean Board

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