

agMag

December 2006

A Magazine about Agriculture for North Dakota Students

TECHNOLOGY

Technology is the practical application of science. In agriculture, you'll find technology on the farm, in research laboratories, in factories where equipment is designed and manufactured, in processing plants where food and fiber products are made, and in stores where they're sold to you.

With technology, more and better quality food can be produced for more people less expensively yet with fewer farmers and less land.

Tools and Machines

On each line, write how the tool or machine makes agriculture more efficient.

Air wrench _____

Tractor _____

Milking machine _____

Truck _____

Computer _____

Bottle filler _____

Pasta press _____

Cash register/scanner _____

Refrigerator/freezer _____

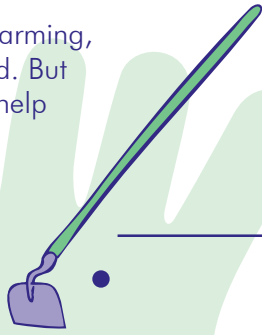
Can you think of other tools and machines used in agricultural production, processing, distribution and consumption? Write down some of the uses for these tools and machines.



From **Hand Tools** to **Big Machines**

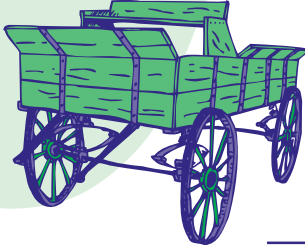
When people first started farming, they did everything by hand. But today, farmers rely on the help of machines.

Name each hand tool and machine. Then draw a line from the hand method to the machine used today.

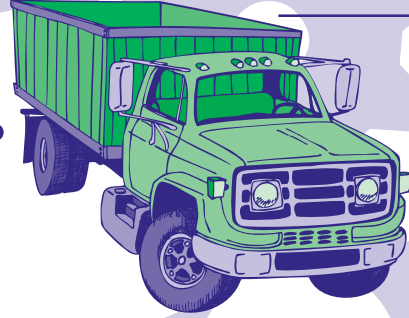




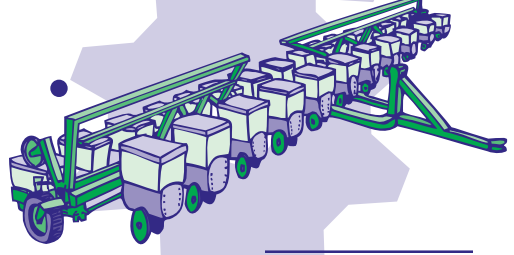












If a farmer planted 5 acres per hour with a horse-drawn planter in 1900, how many acres did he plant in an 8-hour day? _____

Today's farmer can plant 50 acres per hour with a tractor and seeder. How many acres can he plant in an 8-hour day? _____

How many more acres can the farmer plant in a day now compared to 1900? _____

Research: How many square feet are in an acre? _____

● Agriculture in **Space**

Today, satellites and computers help farmers take better care of the land and grow more crops. The satellites take photos of their fields and track the exact coordinates (latitude and longitude) so farmers can plant straighter rows, identify insect or disease problems, and determine which parts of the field are most productive or need more fertilizer.



Technology Then to Now

Number these tools in order from earliest (1) to present (7).

- _____ small tractor
- _____ satellite in orbit
- _____ hoe
- _____ tracked combine
- _____ horse-drawn plow
- _____ walking cultivator
- _____ four-wheel drive tractor



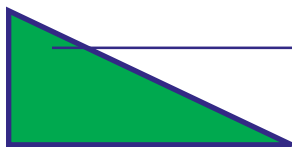
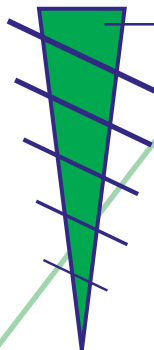
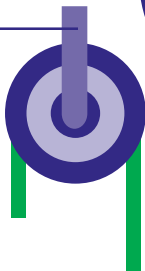
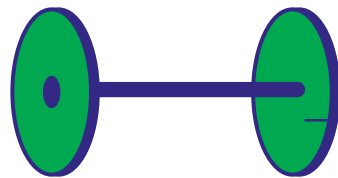
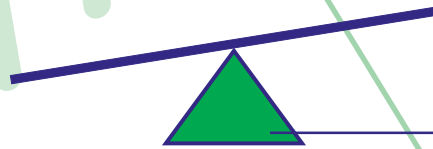
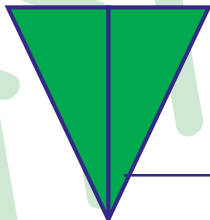
Tracks Instead of Wheels

Some farmers are replacing the wheels on tractors and combines with tracks, like those on bulldozers and military tanks. Tracks don't pack the soil as much as wheels, even though the tractor weight is the same.

When the soil is compacted, plant roots have a more difficult time breaking through the soil in search of moisture and nutrients. Also, rainwater is more likely to run off the soil surface rather than soak into the soil where it is most needed by the plant roots.

Name That Tool

Name these simple tools. They are all parts of machines today. They make lifting, pulling and moving things easier.



Can You Drive a Tractor Straight?

You probably could if the tractor is equipped with the newest steering technology. A light bar in front of the steering wheel flashes to tell you to steer right or left to keep the tractor going straight down the row. Several satellites orbiting above the earth signal the tractor to let you know if you are drifting off the row. Some systems automatically drive the tractor so your hands don't even have to be on the steering wheel!

Plant Technology

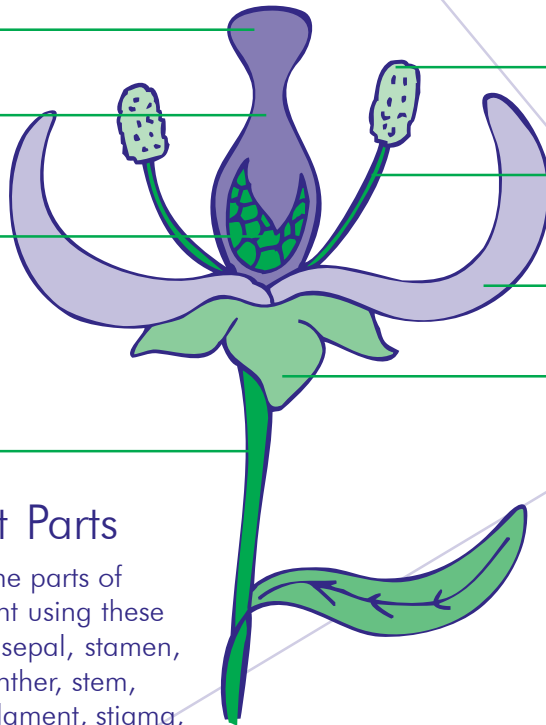
Plant Breeding

Scientists improve plants through plant breeding. They take pollen from one plant and put it on the stigma of another plant. The seed that the pollinated plant produces is a combination of the two plants.

For example, a scientist might cross or take the pollen from one wheat plant that is short but doesn't produce much grain with a wheat plant that produces a lot of grain but falls over in the rain because it's too tall. By crossing the two plants, the scientist hopes to develop a wheat plant that produces a lot of grain but is short so it doesn't bend over as easily.

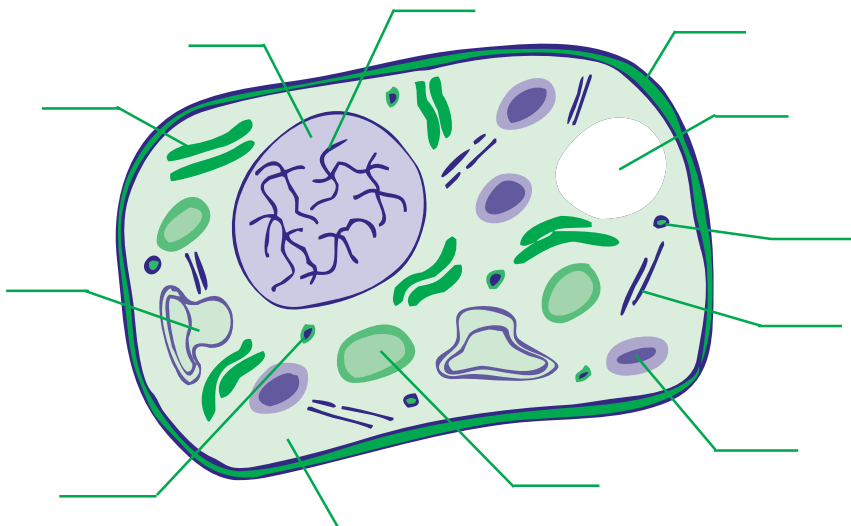
Plant Parts

Label the parts of the plant using these words: sepal, stamen, style, anther, stem, pistil, filament, stigma, ovary, petal.



Plant Cells

Label the parts of the plant cell using these letters: **(A)** nucleus, **(B)** cell wall, **(C)** endoplasmic reticulum, **(D)** chromosomes, **(E)** lysosome, **(F)** peroxisome, **(G)** filaments, **(H)** golgi, **(I)** mitochondrion, **(J)** cytoplasm, **(K)** chloroplasts, **(L)** vacuole



Biotechnology

Biotechnology provides new ways to improve plants. For example, scientists can take a gene (small portion of the DNA or chromosomes) from the cell of one plant and place it into the cell of another plant. DNA affects characteristics like how tall a plant is, the color of its leaves and the size of the fruit.



By using biotechnology, scientists can select the DNA that affects only the desired traits that will improve the plant. The new plant doesn't have the undesirable characteristics that may come from transferring all the genes using conventional crossbreeding.

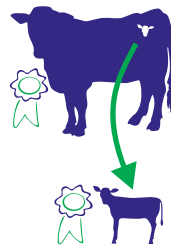
Animal Technology

Better Livestock

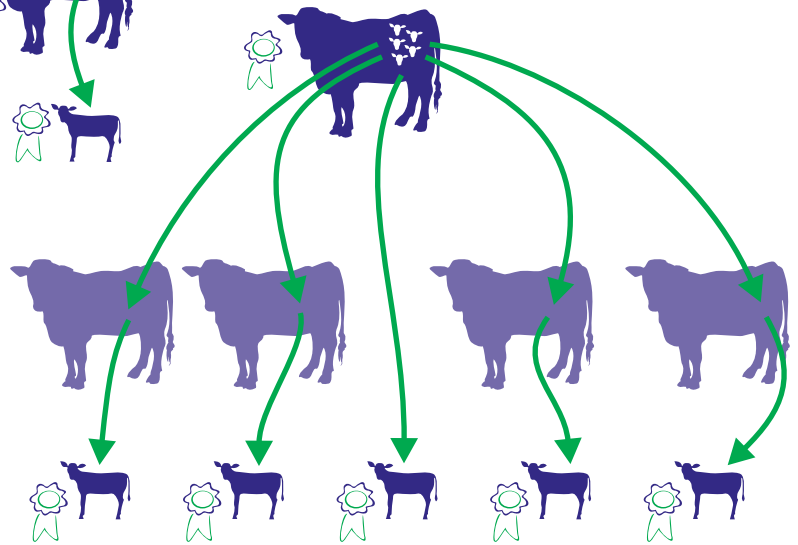
Farmers want livestock to be stronger and healthier so they produce more meat, milk and eggs. They also make more money if their animals are strong and healthy. They select the best female animals to have babies because the baby animals will grow up to look and produce like their mothers and fathers.

One way to obtain more baby animals from the best females is to use embryo transfer technology. Scientists remove extra embryos from the best mothers and put each embryo into another cow, which will give birth to a calf.

Natural Breeding



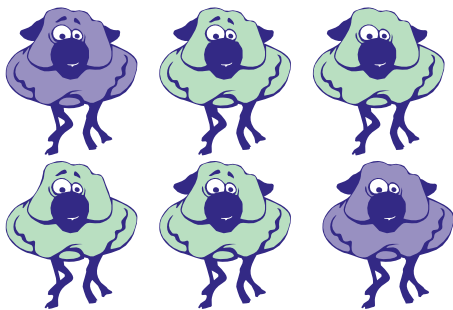
Embryo Transfer



Cloning is another new technology that can improve livestock. It means making an exact copy by reproducing an animal from one of its own cells.



Circle the clone of this sheep.



More Milk

If a cow produces 100 1-cup glasses of milk a day and giving her a hormone will increase her production 10%, how many glasses of milk will she produce? _____

How many gallons of milk is that? _____

This cow can produce milk for about 300 of the 365 days in a year, so how many cups of milk will she produce in one year? _____

How many gallons of milk is that? _____

If a prize-winning cow produces one calf per year, how many calves will she have in 5 years? _____

If 10 embryos from the prize-winning cow are transferred to 10 other cows each year, how many calves from the prize-winning cow will there be in 5 years? _____

Technology for Food Safety

Irradiated Meat

Irradiation is similar to microwaving, but it doesn't raise the food's temperature and cook it. Irradiation reduces the number of harmful pathogens such as viruses, bacteria and other microorganisms that can cause foodborne illness. Irradiated meat still needs to be handled properly and cooked thoroughly to eliminate contamination and destroy all the pathogens.

Freshness Indicators

Food packages may soon come with freshness indicators that change color as the food gets older and not safe to eat.

Electronic Noses

North Dakota State University faculty are researching machines that can smell food. Odor is a main indicator of food spoilage, and these electronic sniffers will be able to determine whether or not food is safe to eat more accurately than a human nose.

Career Corner

Douglas Davidson —
Agricultural and
Biosystems Engineer
Mandan, N.D.

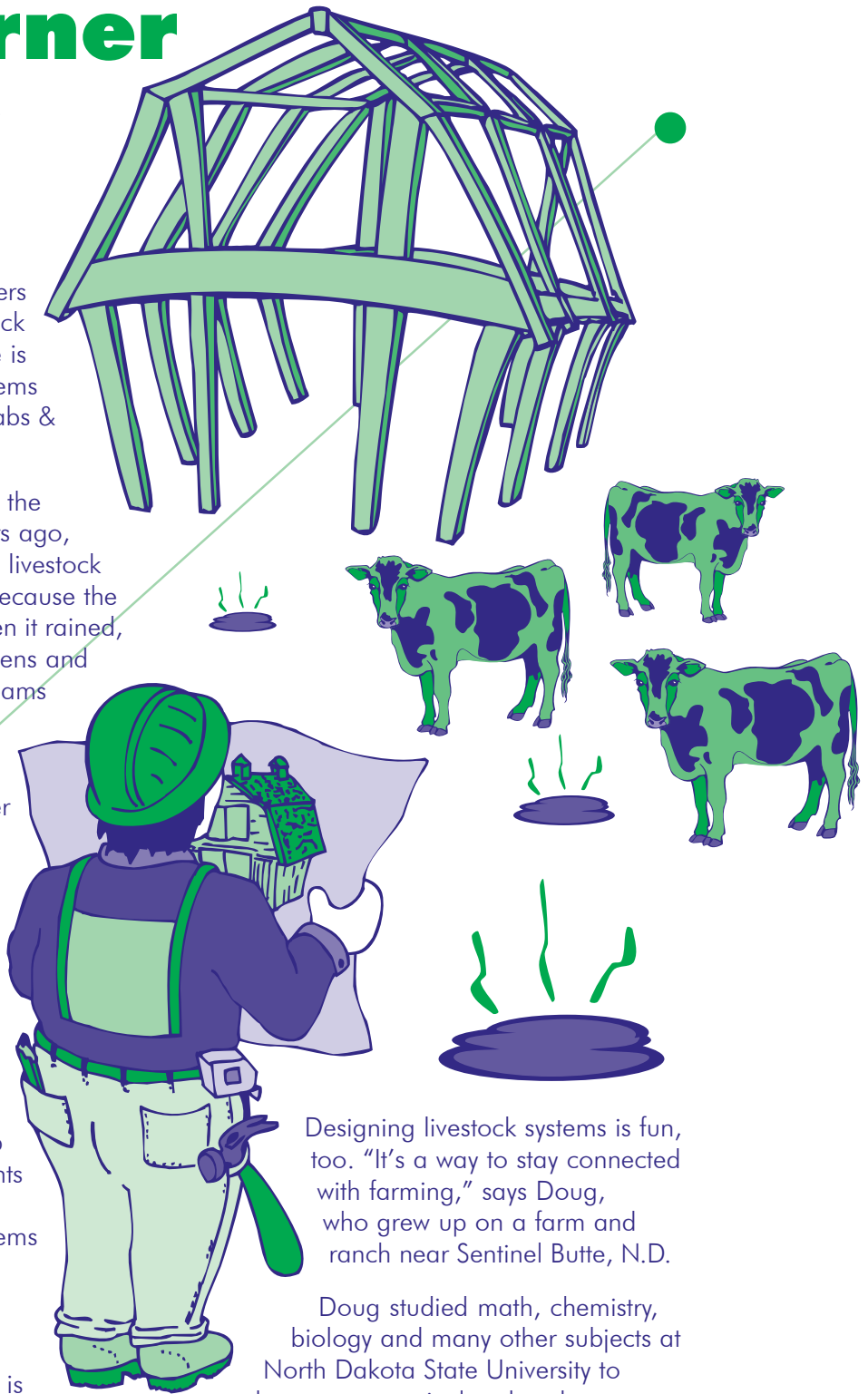
Doug Davidson helps farmers build new barns and livestock waste handling systems. He is an agricultural and biosystems engineer with DeHaan, Grabs & Associates, Mandan, N.D.

When farmers first came to the prairie more than 100 years ago, they usually built barns and livestock pens by rivers and creeks because the animals needed water. When it rained, the water washed out the pens and flowed into the ditches, streams and rivers.

Today we know that putting livestock facilities near water isn't a good idea because the animal manure may pollute the water.

Doug designs barns and feedlots so manure doesn't get into the water or otherwise harm the environment. He also plans storage basins that hold manure until farmers pump it on their fields to help plants grow. Some engineers even design waste handling systems that burn the methane gas given off by manure to produce electricity.

Designing livestock systems is an important job, Doug says. Farmers must protect the environment as they produce food, and they can help supply the world with energy by producing electricity from their animals.



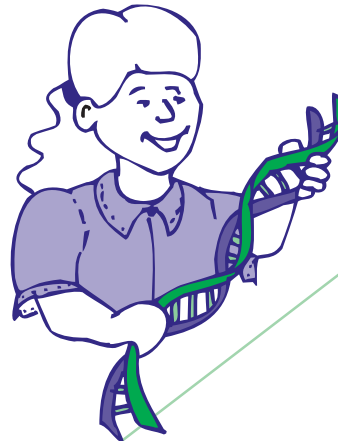
Designing livestock systems is fun, too. "It's a way to stay connected with farming," says Doug, who grew up on a farm and ranch near Sentinel Butte, N.D.

Doug studied math, chemistry, biology and many other subjects at North Dakota State University to become an agricultural and biosystems engineer.

"I think it is an exciting career,"
Doug says.
"There is always something new."

Technology and You

One day, you may want to become a scientist or engineer who develops technology that is used in agriculture. These people have special names based on what they do. Draw a line between the picture of the agricultural professional and his or her title. On the line, write what each does.



nutritionist

geneticist

agronomist

chemist

entomologist

Why **Technology** in Agriculture is **Important**

Today more than 6 billion people live on Earth. In 20 to 30 years, there may be 9 billion people if the present rate of population growth continues. They will all need to eat every day. Technology will help make that possible.

U.S. Farm Productivity

Year	Ag Technology	Number of People Each Farmer Feeds
1850	Horse-drawn plow	4
1910	Steam tractor	7
1986	Combine	77
2006	Satellite	144

**Take this Ag
Mag home
to share with
others what
you've
learned
about
technology in
agriculture.**

Thank you to the following for providing information for this issue of North Dakota Ag Mag:

Council for Biotechnology Information
South Dakota State University
North Dakota State University
National 4-H Council
Ag in the Classroom, Illinois Farm Bureau

The North Dakota Ag Mag is a project of the North Dakota Agriculture in the Classroom Council, which is organized through the North Dakota Department of Agriculture.

N.D. Department of Agriculture
600 E. Boulevard Ave., Dept. 602
Bismarck, ND 58505-0020
Voice: (701) 328-2231
Toll-free: 1-800-242-7535
Fax: (701) 328-4567
E-mail: ndda@state.nd.us
Web: www.agdepartment.com

Ag Mag Production by North Dakota State University Agriculture Communication: Becky Koch, Editor; Lon Tonneson, Writer; David Haasser, Graphic Designer