

IOWA ag TODAY

EXPLORING THE CONNECTION BETWEEN AGRICULTURE AND YOU!

ISSUE 5

STEM FEEDS THE WORLD

In the year 1800, there were around one billion people on Earth.

Today there are about 8 billion people. By the year 2050, it is likely there will be 10 billion people on Earth! That is a lot of mouths to feed!

A growing population means we need 60% more food than we do today. Farmers have to do this with the same amount or less land. Producing more food isn't the only challenge. We need to create more jobs and build communities. We need to educate children and keep them healthy. We need to



protect the environment. All while being **sustainable**.



Innovations in **science** have helped agriculture increase the amount of food that's grown. Plant breeders



have developed

drought tolerant crops.

Technology allows farmers to be more efficient while running their farm. Farmers use new machinery like combines to harvest corn. **Engineers** help develop solutions to problems. New types of sustainable packaging are being made. Agriculturalists use **math** every day to produce more food. Math is used to determine how much fertilizer to apply to fields.

Scientists, farmers, and engineers work together to continue improving modern agriculture. They want to sustainably feed the world!



WHAT IS SUSTAINABILITY?

Sustainability is an important part of agriculture! Being sustainable means keeping everything in balance. Economic, social, and environmental needs are the three pillars of sustainability.

Economic sustainability means creating jobs, supporting the community, and making money in business.

Social sustainability means all people have access to food, education, and healthcare.

Environmental sustainability means protecting habitats, water, soil, and air.

Keeping the three pillars of sustainability in mind helps farmers provide food, fuel, and fiber!



Iowa Agriculture Literacy Foundation



ONE OF A KIND



Look at the picture of the plants. What do you notice? When farmers

choose a crop to plant, they consider the environment the plant will grow in. Farmers used to breed plants to get more desirable characteristics, called **traits**. They would then keep seed from the desired plant for the next year. The desired seed is called a **hybrid** seed. Today, plant breeders create hybrids for farmers to use.

The traits for hybrids are determined by the plant's environment. Heat, **drought**, and **disease tolerance** are examples of traits in plants. In Iowa, we need hybrid seed that can grow in the hot, dry summers.

Animals are also bred for traits. The traits farmers want depend on the livestock they raise. Dairy and beef cows are used for different things. This means they need to have different traits. A dairy farmer might want their cows to have high milk production. A beef farmer might want their cows to grow quickly and efficiently.



DID YOU KNOW?

Scientists can develop **transgenic organisms**. Transgenic organisms combine desired traits using the genes of two species! Transgenic organisms can help solve problems like pests in fields. Scientists developed a transgenic organism using corn and soil bacteria, called Bt corn. Bt corn can protect itself from the larval stage of the corn borer that eats the plants leaves.

Career Corner:

Julián Lenís is a soybean breeder for Corteva Agriscience. He uses investigation skills to develop new soybean varieties. Depending on the season, Julián may be working in the field, analyzing data in the lab, or meeting with farmers.



MATH AND DATA MAKE GOOD SOIL

All plants we eat have nutrients in them. These plants get their nutrients from the soil and air. The three

main nutrients plants need are nitrogen (N), phosphorus (P), and potassium (K). N, P, and K are specific types of nutrients called macronutrients.

When we grow lots of plants year after year, the nutrients are lowered. Farmers use math to determine how much N, P, and K the plants have used. Farmers put nutrients back in the soil using precision agriculture.

Precision agriculture uses technology like special maps. The maps are data that inform farmers what areas need to be nutrients. This helps farmers to not waste nutrients. Red on a map means the area is low in a nutrient and needs more. Yellow means the area is getting low and could need nutrients in the future. Green means the area is just right!



Creative Fertilizer

Some farmers raise livestock like pigs. This means they get a lot of a certain **byproduct** – manure! Manure is rich in nitrogen. Farmers can use this as a fertilizer.

The manure is **injected** into the soil close to planting time. This way the growing plant can use the nutrients when they need them. This also helps the manure stay in the soil when it rains so it doesn't run off.



Career Corner:

Nancy Mwiroti is the executive director of pi515. She helps youth learn how technology, like coding, is used in agriculture.

Nancy spends her days communicating with students, finding solutions to challenges, and learning something new.





CORN: TOOLS OF THE TRADE THEN AND NOW

Iowa tribes were the first farmers in Iowa to grow corn. They prepared the soil, planted,

harvested, and ground the corn using tools made from rocks, bones, and sticks. As time went on new hand-powered tools and machines were invented. This made planting and harvesting easier. Can you identify how each artifact may have been used?

1. Can you find a tool that made the job of picking and husking ears of corn easier?
2. What tool could be used to cut down whole corn stalks?
3. Removing corn kernels from the cob was hard work. What tool could help with this job?

A



B



C



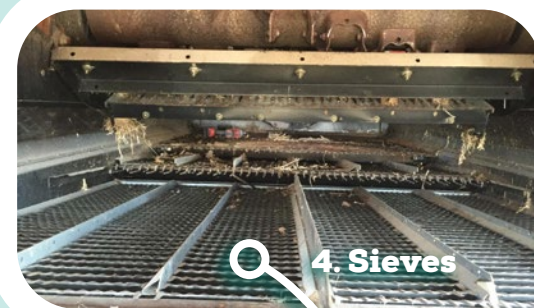
DID YOU KNOW?
In the early 1900s, farmers harvested one acre of corn per day. The corn was picked by hand and hauled using horses. Today, farmers can harvest more than 100 acres of corn per day! They pick the corn with combines and haul it using semi-trucks.

Today's farmers use combines to harvest corn. This one machine does the job of a corn knife, corn husking hook, and corn sheller.

At the front of a combine is the **head (1)**. Farmers switch heads to harvest different crops. A corn head has points that go between the rows of corn. As the combine moves through the field, the head cuts the corn stalks down and removes the ears. Spinning parts then move the ears of corn to the center of the head. The **feeder (2)** takes the ears inside the combine.

In the **threshing area (3)**, the ears are pushed against a spinning cylinder. The corn kernels fall off the cob. The corn falls through holes in large **sieves (4)** and is moved into the grain tank. When the **grain tank (5)** is full, the **auger (6)** takes the corn out to a wagon or truck.

The husks and cob (**chaff**) do not fit through the holes in the sieves. A spinning action throws the chaff out behind the combine onto the field.



4. Sieves



Spreader



3. Threshing area

2. Feeder

5. Grain Tank

6. Auger

1. Head

DID YOU KNOW?

Fields are measured in acres. An acre is about the size of a football field! Harvested corn is measured in bushels. A bushel is about the size of a small laundry basket.



TECH'D OUT FARMS

When your grandparents were young, they could not Google questions they had. Google didn't even exist!

Technology makes tasks easier today. Technology is on farms too! Some tractors steer themselves. Computers mix ingredients to make animal feed! Visit a farm and you will find technology everywhere!

Robot Milking Machines

Robots can be found doing many tasks at a dairy. From moving feed and cleaning floors, to milking cows, robots help farm hands and farmers save time!



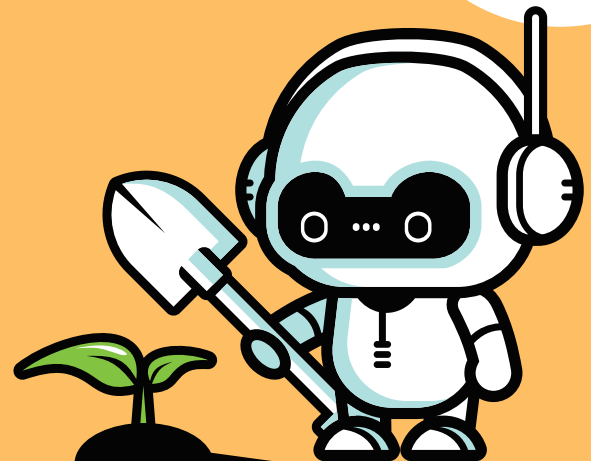
Red Robot

Thanks to robots, milking can take less time! Robotic dairies have **robotic milking machines**.

These machines milk cows without the farmer present. At a robotic dairy, cows wear an ID tag. When the cow wants to be milked, she enters the robotic milking machine. The machine reads her ID tag. If it's time to milk her the robot cleans her teats and attaches the milking cups. The cow is then milked while she eats a special snack! While milking the robot collects data. The data helps the farmer learn about their cow's health. The robot automatically stops milking when the cow's milk slows. Robots help dairy farms save time and take care of their animals!

Techie Turkey Farms

Have you ever used an app to control the lights at home or toy robot? Modern turkey barns use special sensors to collect data like temperature, water intake, and feed. The sensor data goes into an app. Farmers can check the app on their cell phone. If a barn gets too hot, the app sends an alert to the farmer. Using the app, the farmer can turn barn fans on to cool the barn even when in bed! Techie turkey farms help farmers care for their birds!



THINK & DISCUSS
What do you think will be the next robot to help farmers?

ALL IN A CONTAINER

Packaging makes up 28.1% of the waste in the United States. That was 82.2 tons just in 2018! Packaging food is needed to keep food fresh and safe. It also helps us make food choices. Still, package waste, like plastics, is a big environmental concern. Plastic can end up in the ocean. They also take a long

time to break down. This causes problems in ocean ecosystems. That's why scientists are making new packing technology. They are investigating how bacteria can eat plastics! Through investigations, scientists learn more about nature. New information can help us engineer plastic that breaks down quicker.

NOTHING TO WASTE

Getting food to our tables takes fresh water, energy, and land. If food is wasted, it can end up in landfills to **decompose**. This releases methane, a greenhouse gas. Greenhouse gases impact climate change. Farmers help reduce food waste by feeding **byproducts** to

livestock. Like apple mash! When apple juice is made the apples are smashed. This removes the juice, and leaves mash, a byproduct, behind. Farmers can feed the mash to their cattle! This keeps food out of the landfill!

You can even help reduce food waste! Instead of throwing away a browning banana, make banana bread!





UNDER ROOF

Our Earth has a limited amount of land. As the human population grows our space becomes more limited. Farmers, scientists, engineers, and mathematicians use innovation to find ways to raise more food on less land.

Farmers save land by raising livestock inside. Some farmers use hoop barns, monoslope barns or confinement buildings. Engineers work with scientists to make sure buildings meet the animals' needs. **Monoslope** buildings have slanted roofs and walls on two sides. They are designed to create a breeze for cattle. **Confinement buildings** are temperature controlled. They have special vents to filter air. This keeps harmful viruses out and livestock comfortable.

Raising animals inside also makes it easier for farmers to care for livestock. The animals are protected from predators when they are inside. Farmers can feed them easily, clean their pens, and control extreme temperatures. All these innovations help farmers feed the world with less space!

 **DID YOU KNOW?** Greenhouses can be used to grow plants in small areas! They let solar energy in through clear panels. The solar energy is transformed into thermal energy. This heats up the greenhouse and lengthens growing seasons. Material engineers are working to develop new panels for greenhouses. Even ones that can transform solar energy into electrical energy!

 **Try making a desktop greenhouse to grow soybeans! All you need is soil, two plastic cups, rubber bands, a soybean seed, and sunlight!**



Confinement building



Monoslope building

Career Corner:

Erika Prewitt is an aviary system specialist for the company Big Dutchman. She sets up technology in cage-free barns for laying hens and pullets. Erika helps farmers if the technology in their barn is not working. As Erika travels to different poultry farms, she is always learning and gaining hands-on experience!



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