IOWA ag TODAY

EXPLORING THE CONNECTION BETWEEN AGRICULTURE AND YOU!

ISSUE 6

PLANTS & ANIMALS... FUELING INNOVATION

Your classroom is like a mini science lab. Many of the materials found in a classroom started on a farm. Paper, pencils, cotton T-shirts, and leather shoes all come from plants and animals. Even high-tech products use farm connections. **Corn starch** from corn can be used to make **biodegradable plastics.** Soybeans can be processed into biodiesel fuel. Animal parts that aren't used for food can be made into medicines. Scientists, manufacturers, and others turn these agricultural materials into new products. This helps recycle products and create new inventions.

RENEWABLE & NON-RENEWABLE

Every resource has a story. Renewable resources like crops, trees, wind, and solar can be replaced over short periods of time. Non-renewable resources like oil, coal, and certain metals take thousands or even millions of years to form. Agriculture plays such an important role: farmers provide renewable materials every year that can be turned into food, fuel, fiber, and even new technologies.

THINK & DISCUSS

How do farmers and scientists work together to create renewable solutions? What new product could you design using materials that come from plants or animals?

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HOW PLANTS AND ANIMALS POWER UP!

THINK & DISCUSS
Compare the cattle and pig living environments. What are some similarities and differences?

All living things need energy to grow and develop. For example, most cattle live outside in large, grassy areas called **pastures.** They eat the grass and sometimes get extra feed from corn and soybeans. Vitamins and minerals can also be added to complete a healthy diet. Let's investigate the relationship between cattle and plants...

Cattle in Natural Cycles

Cattle are part of two natural processes: the **carbon cycle** and **energy cycle.**

The carbon and energy cycles describe how carbon moves through air, water, soil, plants, and animals and how energy is passed along the way. It all begins with the sun. Green plants use energy from sunlight to make food through a process called **photosynthesis.** Plants take in water and gas in the air, called **carbon dioxide,** and turn it into energy to grow its roots, stems, and leaves. Grass, corn, and soybeans are plants eaten by cattle. When they chew and digest the plants, the energy and carbon move into their bodies. This energy helps the cattle grow, move, and make milk. As cattle breathe, they release carbon dioxide back into the air. Cattle also produce waste as part of their digestive processes. Their manure adds **nutrients** to the soil that helps plants grow. Plants pull in more carbon dioxide from the air and nutrients and water from the soil, keeping the cycles going.

Plant Nutrients

The main nutrients plants need are nitrogen, phosphorus, and potassium. These are called **macronutrients.** Plants use their roots to pull nutrients from the soil. When nutrients run low, farmers put **fertilizer** on the fields to add nutrients back to the soil.

What Pigs Need:

What do pigs need to grow and be healthy? They need a balanced diet! Pigs are fed a mixture called a **feed ration.** This feed ration can have corn, soybeans, vitamins, and minerals. They also need clean, fresh water.

Many pigs are raised in barns that protect them from bad weather like hot summers and snowstorms. Barns also protect the pigs from predators and diseases.

If a pig does get sick, farmers can work with a **veterinarian.** These special animal doctors provide medicines such as **antibiotics** for the pig to get better and **vaccinations** to prevent pigs from getting certain diseases.

DID YOU KNOW?

In the 1930s, many pastures were overgrazed because animals ate grass faster than it could grow back, causing erosion and other issues. Today, farmers use practices that protect their land, such as rotating cattle through smaller areas called paddocks. As cattle move from one paddock to the next, the grass has time to regrow, keeping pastures healthy and productive.

FIBER FROM FARMS

Wool

Wool comes from sheep. But how do we get wool? How do we use it?

Wool is the fiber that grows on sheep. It grows continuously! If it's never **sheared,** or cut, the sheep would become stressed and uncomfortable. Shearing usually happens once a year in the spring before the hot summer months. Most sheep are sheared with electric clippers or shearing machines, and the **fleece,** or wool, is removed in one piece! Afterward, it's washed to remove dirt, bugs, and oils, then combed and spun into yarn that can be dyed many colors. This warm, soft fiber can be made into clothes, blankets, and rugs. Wool is natural and grows back each year, making it a renewable resource.

DID YOU KNOW?

Iowa has more sheep farmers than any other state!

Cotton

Are you wearing a sweatshirt or T-shirt today that feels soft and comfortable? If so, it might be made of cotton. Cotton grows on a plant that makes fluffy white **bolls,** made up of tiny seeds covered in soft fibers. Farmers harvest the bolls, and machines separate the seeds from the fibers. The seeds can be used for animal feed and cottonseed oil, while the fibers are spun into thread and woven into fabric. This fabric becomes clothes, towels, sheets, even paper money! Cotton grows best in sunny, warm climates that don't get too much rain. If an area becomes too dry, **irrigation systems** can water the plants. In the U.S., most cotton is grown in the south, with Texas as the leading producer.

DID YOU KNOW?

One acre of land, which is about the size of a football field, can produce about 700 pounds of cotton! That's enough to make more than 1,774 T-shirts!

Corn Fibers

Corn kernels contain something called starch. Scientists can turn this starch into a special material called PLA (polylactic acid). PLA can be spun into soft fibers that feel a lot like cotton or polyester. These fibers can be used to make clothes, carpets, and even plastics. One cool thing about corn fibers is that they are **biodegradable.** They can break down naturally and are better for the environment than some **synthetic,** or man-made materials.

Soybean Fibers

Soybeans also make strong and useful fibers. This fiber feels soft and smooth, almost like wool or silk. Soybean fibers can be made into socks, T-shirts, and blankets. They are comfortable to wear and absorb moisture, which helps keep you cool and dry.

WHY IT MATTERS

Using corn and soybeans to make fiber helps farmers and the environment. Farmers can grow these renewable crops every year, and scientists and clothing makers can then turn them into eco-friendly products!

WHERE IN THE WORLD?

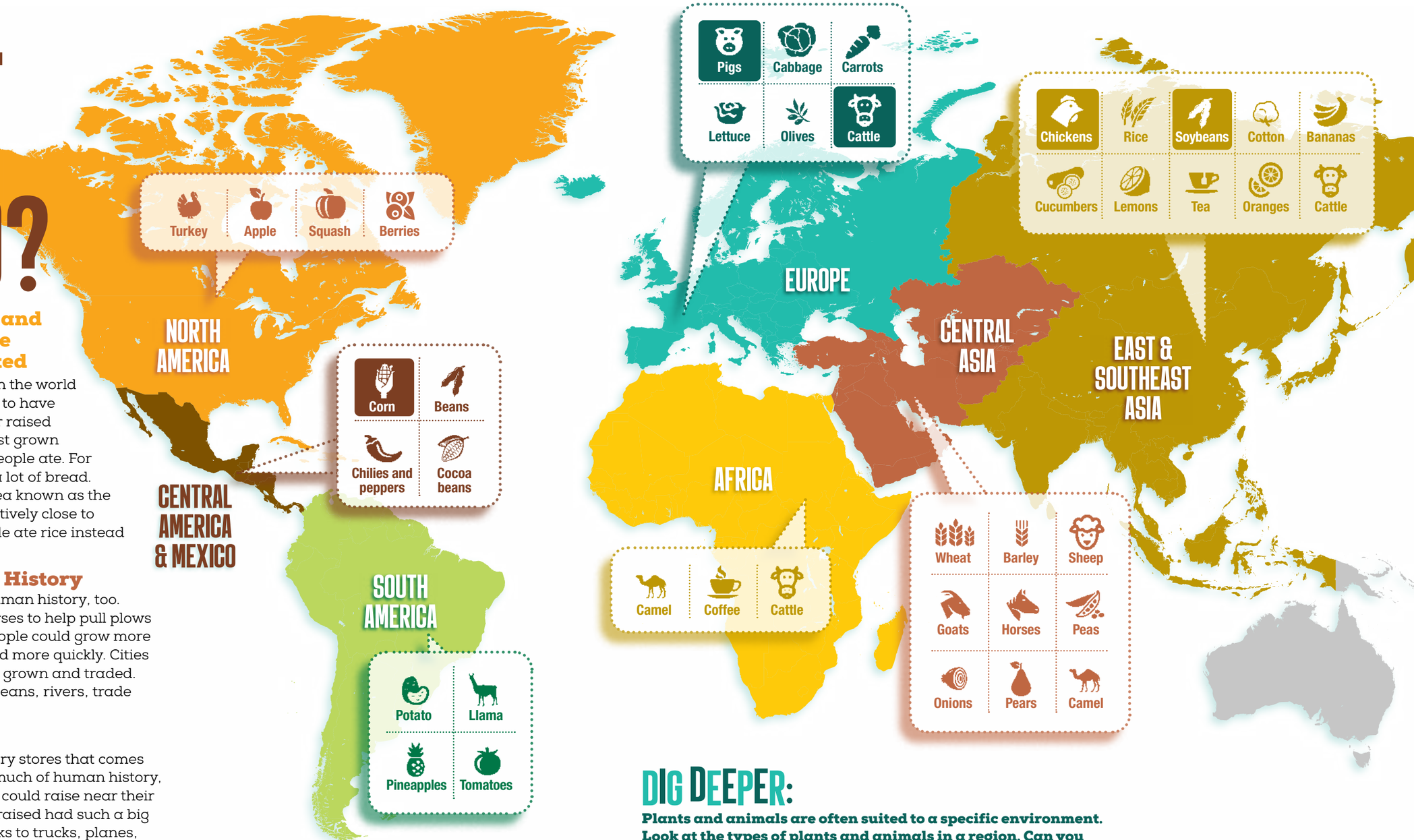
Very few of the plants and animals we raise in the United States originated here. This map shows where in the world plants and animals are thought to have been originally **domesticated,** or raised by people. Where crops were first grown determined what kind of food people ate. For example, people in Europe ate a lot of bread. Wheat was first grown in an area known as the **Fertile Crescent,** which was relatively close to Europe. But in China most people ate rice instead of wheat.

Livestock and Human History

Livestock played a big role in human history, too. Cultures that had cattle and horses to help pull plows could grow more food. When people could grow more food, their **civilization** developed more quickly. Cities developed near where food was grown and traded. These places were often near oceans, rivers, trade routes, and crossroads.

Then and Now

Today, we can buy food in grocery stores that comes from all over the world. But for much of human history, people could only eat what they could raise near their home. Crops and livestock they raised had such a big influence on **culture.** Now, thanks to trucks, planes, trains, and ships, we can send crops and livestock all over the world.



THINK & DISCUSS

Iowa grows a lot of corn and soybeans. Iowa also raises a lot of pigs, chickens, and cattle. Where in the world were these crops and livestock originally from? What is similar or different between those places and Iowa?

DIG DEEPER:

Plants and animals are often suited to a specific environment. Look at the types of plants and animals in a region. Can you describe anything about that part of the Earth? Is it hot or cold? Are there mountains? Jungle? Grasslands?

CORN HYBRIDS

When we cross plants or animals, the offspring can be better than either parent. This improved performance of the offspring is called **hybrid vigor.** In the 1940s, Iowa-born scientist **Norman Borlaug** studied wheat to help fight hunger. One variety of wheat produced lots of seeds, but its tall stalks fell over and were hard to harvest. Another variety had short, sturdy stalks but produced few seeds. By cross-pollinating the two, Borlaug created a wheat variety with **short, strong stalks and lots of seeds.** This breakthrough saved millions of lives.

Corn's Journey

Farmers and scientists can also select specific traits over time, improving crops for thousands of years. **Corn,** grown widely in Iowa today, traces back to a grass called **teosinte** in Mexico. Teosinte only had 8–16 seeds per ear. Early farmers selected plants with more seeds to grow. Over many generations, this careful selection, along with modern **corn hybrids,** led to today's corn, which has about **800 seeds per ear!**

Teosinte

More Than Plants

Plants aren't the only species humans have improved. Modern cattle descend from the wild **aurochs** of Europe. Farmers domesticated them, selecting the best meat producers, which became **Angus and Hereford** breeds, and the best milk producers, which became **Holstein and Jersey breeds.**

What is BIOTECHNOLOGY?

Crossbreeding and selective breeding laid down the groundwork of **biotechnology.** The word "bio" means life or living, and "technology" means using science to solve problems. So, biotechnology is a technology applied to living organisms. Karl Ereky, known as the "father of biotechnology", says it is "using living things to make other things".

We have to understand how living things work. Traits are passed from one generation to the next generation. By modifying or changing these traits, scientists can make future plants and animals better.

Biotechnology can help farmers grow more food to feed a growing world population.

Think & Discuss

- **What are some examples of biotechnology in plants, animals, or medicine?**
- **How do you think Norman Borlaug's work with wheat influenced modern corn hybrids?**

FARMERS AS ENERGY PRODUCERS

When you think of farmers, you probably picture fields of corn or soybeans. But many Iowa farmers also "grow" another crop–energy! Across our state, farmland is being used not only for producing food but also for generating power that supports homes, schools, and businesses.

Wind energy is one example. Wind turbines are installed in locations where data shows they can operate efficiently. Scientists and engineers use math and science to study wind speeds, land elevation, and distance from power lines to determine where turbines may work best. Because turbines occupy a relatively small footprint, agricultural activities such as growing crops or raising animals often continue around them.

Solar power is another option for farmers to use. Solar panels may be placed on barns, machine sheds, or other areas to capture sunlight and turn it into electricity. Depending on the system, this electricity can help power equipment, buildings, or other farm operations.

Iowa farmers are also involved in **biofuels.** Corn can be turned into **ethanol,** and soybeans are refined into **biodiesel.** These fuels power cars, trucks, and tractors, and provide one way to supplement traditional gasoline or diesel.

Energy production can offer farmers an additional source of income, depending on the type of project and agreements involved. It represents one of several ways farmers manage their land and resources.

Each energy source, wind, solar, or biofuels, comes with its own considerations. Engineers, scientists, and farmers continually study how these systems affect agriculture, rural communities, and the environment.

Farming's primary role remains in food production, but today, some farmers also contribute to the state's energy supply. With help from science, technology, engineering, and math, Iowa farms support multiple types of resources that play a role in powering modern life.

LOOK IN YOUR FRIDGE

Did you know that all the foods you eat were grown or raised on a farm? It's true!

The **milk** you drink comes from dairy cows. These cows walk up to milking machines two to three times a day. While they are being milked, they can eat snacks and socialize with other cows! Dairy cows only produce whole white milk. Chocolate and strawberry flavors are added after the cow is milked. It would be pretty amazing if cows could make flavored milk themselves, but they don't!

Lots of food in your fridge comes from **pigs, chickens, and turkeys. Bacon, sausage,** and **ham** come from **pigs, chickens** give us **eggs** and **chicken meat,** and **turkeys** give us **turkey lunch meat** for our sandwiches and more. These animals live in big barns where they can run around, eat, and drink as they like. These barns are made to keep them safe, healthy, and warm.

Veggies and Fruits

Iowa farmers also grow **fruits, vegetables,** and other **specialty crops** like **honey,** usually grown during the warmer months. You can find locally grown food in grocery stores, restaurants, and farmers markets. Fruits and vegetables grow on many types of plants. **Apples, bananas, peaches,** and **oranges** grow on trees. **Blueberries** and **raspberries** grow on bushes. While **strawberries, cucumbers,** and **grapes** grow on vines. **Sweet potatoes** and **carrots** grow underground on the roots of the plant.

DIG DEEPER

Iowa is great at growing lots of different foods! Check your fridge and see which foods Iowa farmers might have grown in Iowa!

Career Corner:

Ellen Walsh-Rosmann is the owner of FarmTable Procurement and Delivery. The idea for her business came from a challenge she faced as a farmer. She wanted to sell vegetables to schools and businesses. But, finding new customers and delivering them was time-consuming. She needed to spend her time working on the farm. Unfortunately, she couldn't find a company that would help her sell her produce. So, she started on her own. Ellen now works with over 40 farmers. She finds schools and restaurants that want food products and delivers to them. Maybe you can turn a problem into a business too!

ISSUES AND TEACHER GUIDES

Iowa Agriculture Today is a publication of the Iowa Agriculture Literacy Foundation (IALF).

IALF serves as a central resource for all pre-K-12 educators to inspire teaching through the lens of agriculture. IALF's statewide initiatives are supported by agricultural stakeholders, including the Iowa Farm Bureau Federation, Iowa Corn Growers Association, Iowa Pork Producers Association, Iowa Soybean Association, Iowa Beef Industry Council, Iowa Turkey Federation, GROWMARK, Corteva Agriscience, Iowa Department of Agriculture and Land Stewardship, National Agriculture in the Classroom, and others dedicated to strengthening agriculture literacy among Iowa's educators and students.

Access the Teacher Guide and the electronic version of this publication at IowaAgLiteracy.org. Email the IALF team at Info@IowaAgLiteracy.org.

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