

## **CSU Agronomy Agents Corner**

### **Where does food come from?**

The question has been used for years to create a cliché of people in the city being unaware of farm work. Let's take a deeper look at how and where food is developed. Farm production requires a genetic source, investment, mineral resources, and innovation. According to the U.N. Food and Agricultural Organization, the five largest plant crops in the world in 2018 were sugarcane, corn, rice, wheat, and potatoes. The most populous farm animals were bees, chickens, cattle, sheep, and ducks. By changing the unit of measure to 1,000 head for poultry and hives for bees, the order changes to cattle, sheep, goats, pigs, and buffaloes.

Sugarcane as we know it is not a species that grows in the wild. It is a cross between plants from New Guinea and India. The high sugar concentration comes from plants native to New Guinea known as noble cane. Wild relatives of noble cane are crossed with it to create hybrids that possess many traits required to have success in farms around the world. Cold tolerance is required to produce sugarcane in latitudes far further from the equator than New Guinea. Production extends north to Louisiana and south to Argentina. Disease resistance is required everywhere for monoculture to be successful. Insect pests are controlled in large part from breeding as well. Commercially planted seed is vegetatively propagated from stalks on the farm. Seed companies receive their income from either per acre royalties or taxpayers.

Corn was developed by the Mayans from a wild grass known as teosinte. Modern corn hybrids extend their range into cold temperate climates. Corn hybrids are bred to fit into niches. The same species is used to grow sweet corn, field corn (both grain and silage), and popcorn. Broom corn is not actually corn but sorghum. Corn maturity ratings enable growers to know if a hybrid will mature fast enough to grow in Minnesota or continue to grow long enough to take advantage of the long growing season in Georgia. Seed companies are large and receive their income from growers' annual purchases.

Rice was first domesticated in the lower Yangtze River basin. Today rice is grown in many countries. Markets exist for sticky rice (Jasmine), fragrant rice (Basmati), brown rice, and long, medium and short grain white rice. Rice seed is produced by some of the same companies as corn seed around the world. In the U.S. variety development is dominated by a few universities. Louisiana State University, the University of Arkansas, and Southeast Missouri State University all have rice breeding programs. The largest growing areas are along the Mississippi River. California has a rice production area as well. In Florida rice is used as a once in seven years rotational crop with sugarcane on less than 25,000 acres for the entire state. A rice growing area in Minnesota produces only wild rice. A hybrid rice seed company in Texas creates rice seed that far outperforms the public varieties in terms of production per plant. However, the cost of the hybrid seed is high enough that the university provided open pollinated varieties are usually a better investment.

Wheat was first domesticated in Turkey. China is now the largest producer and India the largest exporter. The USDA recognizes eight types of wheat. The popular varieties in Colorado are developed by CSU and marketed through Plains Gold. Several land grant universities have a wheat breeding program.

Potatoes are native to Peru. They are vegetatively propagated like sugarcane. CSU has been developing potato varieties at the San Luis Valley Research Center since 1940. Seed certification and

breeding were added in 1964 and 1979 respectively. Potatoes are used universally in plant breeding and pathology education as an example of why not to put all your eggs in one basket. From 1845-1849. A combination of British Imperialists requiring food to be exported from Ireland and a severe spread of potato blight led to The Irish Potato Famine. The potato blight was so bad due to overuse of a single parental line in the development of potato varieties. Essentially all the potatoes that were planted were susceptible and potato was the largest crop in the country. About 20% of the Irish population perished as a result of the famine.

The highest concentration of investment varies by the class of crop. According to Iowa State Extension's Ag Decision Maker, land is the highest input cost for corn production. UC North Ridge lists land as the highest input cost for rice as well. The government of Manitoba lists equipment maintenance as the highest input cost in potato production. These costs are common across agronomic crops. With fresh fruit crops, the highest input cost will typically be harvest labor. Handpicking berries and stone fruit require careful handling throughout the process to prevent bruising. A crossover between the types of expense occurs depending on where in the world sugarcane is grown. The Patil University of Agriculture and Technology in India lists harvest labor as the highest cost. In developing countries sugarcane is harvested manually by small landholders. In G20 countries and with large landholders in developing countries sugarcane harvest is mechanical.

Nutrients are sourced from around the world. The largest reserve of phosphorus ore is in Morocco. Nitrogen fertilizers are created using methane as the source of hydrogen in ammonium synthesis. Hydrogen is then combined with nitrogen filtered from air. The International Plant Nutrition Institute lists Canada as the largest supplier of potassium. For many years acid rain decreased or eliminated the need for sulfur fertilizer in most of the U.S. After scrubber installation on coal fired power plants, sulfur is no longer supplied in adequate amounts from rain. The source remains the same though. Cleaning of scrubbers provides sulfur that is used as fertilizer. Magnesium and micronutrients are frequently present in adequate amounts in soil. Plant availability is more of a challenge than the actual amount present. This is overcome by pH adjustments or supplemental foliar application.

What is considered technology changes with time. The plains were developed for row crop agriculture following the invention of the mold board plow. After the dust bowl the use of the mold board gave way to using less destructive land preparation tools. Since then tractors and implements have grown dramatically. In my lifetime, I have seen my grandfather work with a John Deere Model A and a Ford-Ferguson. A family friend used Shire horses to pull his implements in Gardner, CO into the 1980s. My own work has included tractors ranging from a tricycle Case 830 to a Quadtrac Steiger 600. Aside from the readily apparent differences of size and power these machines each represent different stages of technology development. In the last ninety years tractors have gone from manual start, carburation, manual steering, manual transmission and magneto ignition to electric start, fuel injected, GPS guided, paddle shift, and electronic ignition. Modern farm innovation includes advances in chemistry, genetics, remote sensing, and data processing.

Now you are prepared to work on a more complete answer. Food comes from global resources, investment, risk management, hard work, and innovation.