

PRAIRIE FUTURES

About the plants in the gardens



AMARANTH (*Amaranthus*)

Amaranth is a high nutrient crop and a popular superfood worldwide. Amaranth can withstand harsh climatic conditions, is drought-tolerant and able to adapt to a wide range of growing areas, making it a promising crop for the future.

Farming

Amaranth does not have a high nitrogen demand like corn.

No herbicides are labeled for amaranth.

Although cover crops and no-till planting can help prevent weed seeds from starting.

A lot of insects like chewing on amaranth, but amaranth can tolerate a substantial amount of leaf feeding without having yield loss.

The main buyers of amaranth grain in the U.S. are Arrowhead Mills (TX), Health Valley (CA) and Nu-World Amaranth (IL). Some farmers in the Midwest and Great Plains have developed their own direct marketing; selling to local bakeries, or shipping to individuals for their own food use.

Yield

Amaranth brings around \$0.40/lb; organic may sell for \$0.65/lb. Amaranth can routinely yield 1000 lbs/acre, sometimes double, amaranth gross returns easily beat commodity crops.

Production costs are about the same as sorghum and soybeans. Seed cleaning is somewhat of an extra expense, but the big cost is transportation to market.

Total U.S. acreage for the last decade has been in the 1,500 to 3,000 acre range.

The global amaranth market size was estimated at USD 5.88 billion in 2017. It is poised to expand by 11.3% by 2026.

History

Amaranth was cultivated by the Aztecs about 6,000 years ago.

It was a food staple and part of their worship.

When the Spanish, as part of their efforts to force Christianity on the Aztecs, outlawed the grain, amaranth almost disappeared until research began on it in the U.S. in the 1970s.

US dealers are currently importing most of their amaranth from India and Bolivia.

Amaranth provides many health benefits: it's a complete protein, high in calcium, fiber, omega fatty acids, potassium, lysine and other vitamins and minerals. It can be used in salads, pasta, flour, cereal and beer.



MILLET (*Cenchrus americanus*)

Pearl millet is a warm season annual grass crop grown for grain. It has a growth habit similar to sorghum except that it is more drought tolerant and has an earlier maturity. Including the grain head, height can vary from 3' to 6' depending on variety and growing conditions.

Farming

Pearl millet is a crop that should need little in the way of pesticide use. An all crop or small grain combine header is appropriate for harvesting pearl millet. Combines must be adjusted to properly thresh the small seed of pearl millet. A good starting point for the combine settings are those recommended for sorghum.

Typically, the protein content of pearl millet is 45% higher than feed corn and it's also 40% higher in lysine.

Golden Prairie, a family farm in Nunn, CO is one of the largest distributors of organic millet in the country. Its millet can be found in the bulk food sections of natural grocery stores across Colorado.

History

Colorado produces the most millet in the country. The grain didn't arrive in Colorado until the late 1800s when it was grown for livestock feed. In the 1930s millet was the preferred bird food.

With healthy eating and gluten-free diets becoming more popular, so has millet because it is naturally gluten-free, easily digestible, high in fiber, vitamin B, iron, magnesium, and protein. It's also good for your heart, cholesterol, digestion, muscles, aids detoxification, respiratory health, and energy.

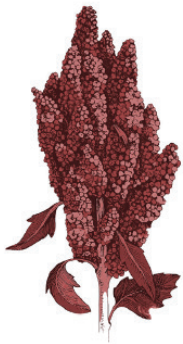
Uses: gluten free rice substitute, baked goods, noodles, beer and much more.

Yield

Yields of grain-type pearl millet are expected to improve with the release of new hybrids over the next several years. At this time, 4000 to 4500 lbs/acre would be a reasonable yield on good soils, with 3000 pounds on marginal soils.

Even though production costs on pearl millet are low (comparable to corn and sorghum), grain yields need to be increased by breeders to help make the crop competitive on a larger acreage. As feed formulators and buyers become more familiar with the crop, its potential markets will expand.

Like any grain crop, pearl millet will yield best on fertile, well drained soils. Pearl millet is an indispensable component of the dry farming system.



QUINOA (*Chenopodium quinoa*)

Quinoa is a hardy, drought-resistant plant from the Andes Mountains of South America. It can grow in poor soil without fertilizer or irrigation. The United Nations has dubbed it a “super crop” because they believe it could go a long way to remedy world hunger.

Farming

Quinoa (keen-wah) belongs to the same family as the sugar beet and spinach, and isn't a grain but a seed. Its leaves can be eaten like spinach but its seeds can also be used in the same way as grain.

Quinoa is a warm season crop, requiring full sun and germinates best in soil ranging between 65 - 75 degrees. Quinoa is drought tolerant and will do well on 10” of water or less. It resists light frosts. When the plant approaches a foot in height, it will close in its canopy, shading out weeds and reducing evaporation based moisture loss. At full maturity, quinoa will be 3 to 7 feet high, with small, flat, circular seeds.

Yield

The price of quinoa has increased dramatically, nearly tripling between 2006 and 2013 due to high demand in the United States and Europe.

The U.S. alone imported 22.3 million pounds from 2008 to 2010.

Prices started to drop in 2015 indicating a better balance of supply and demand, but there is nevertheless a strong market for quinoa even today. In 2017 quinoa could be purchased for around \$1.10 per pound.

History

Quinoa originated in the Andean region of northwestern South America. It was first used to feed livestock 5–7 thousand years ago, and for human consumption 3–4 thousand years ago in the Lake Titicaca basin of Peru and Bolivia.

Since the early 1980s, quinoa has been cultivated and commercially produced in the Colorado Rockies, especially in the San Luis Valley. Ardent Mills, North America's leading flour supplier and grain innovator, has an exclusive partnership with Colorado Quinoa.

Quinoa lowers risk of heart disease, fights osteoporosis, promotes brain development and liver health and improves metabolism and the immune system. It is high in fiber and protein and cholesterol and gluten free. It's used in pasta, soup, baked goods, salads, and beer.



SUNCHOKES (*Helianthus tuberosus*)

Also known as Jerusalem artichoke, this healthy root vegetable is cultivated for its highly nutritious and fleshy tuber. The tubers are slightly sweet with a nutty flavor, and you can eat them raw or cooked.

Farming

This plant is so easy to grow, it's an almost no maintenance perennial crop, if you've got the space (it can be invasive). Pest and mostly disease resistant, drought and flood tolerant. It grows in full sun to part shade and is tolerant of poor soil but not waterlogged soil. Reproduces by tubers, plant in early spring. The plant is 6 -10 feet tall by indefinitely spreading width.

It has many uses and health benefits: gastrointestinal and digestive health, lowers blood sugar levels, loaded with vitamins B and C, controls cholesterol, controls blood pressure, high in copper and iron, boosts the immune system, and is high in potassium and protein.

Yield

Livestock can eat all parts of the sunchoke plants. Once the stalks start to fall over in the early autumn, the plants can be cut at the base and the above ground parts fed to livestock.

Tubers can be harvested in the spring or at the end of summer after they have finished flowering. Dig up the tubers manually, or with a tractor implement designed to harvest potatoes.

Crop yields are high, typically 7–9 short ton/acre for tubers, and 8–12 short ton/acre green weight for foliage. Tubers remaining in the ground lie dormant over winter and can handle temperatures as low as –22 °F.

History

Before the arrival of Europeans, Native Americans cultivated Sunchoke as a food source. The tubers persist for years after being planted, so that the species expanded its range from central North America to the eastern and western regions.

Early European colonists sent tubers back to Europe, where it became a popular crop and naturalized there. It later gradually fell into obscurity in North America, but attempts to market it commercially have been successful in the late 1900s and early 2000s.



HEMP (*Cannabis sativa*)

Hemp grows in a variety of climates and soil types, it is naturally resistant to most pests, and grows very tightly spaced allowing it to out compete most weeds. Hemp is a natural and sustainable substitute for cotton and wood fibers.

Farming

Varieties of hemp, whose stems are used for fiber, bio-fuel, or other products, grow to 6-7 feet in height. Grain production may be optimized with no more than 150,000 plants/acre and sowing 20 to 30 lb/ac of seed.

Hemp can be sown with a grain drill such as used for wheat. Hemp needs 8 - 12" of water, depending on variety and soil. Fiber and grain hemp varieties require less water than CBD hemp.

The seed is a high protein food for humans, livestock and birds. Seeds turned into oil are used for food, body care and technical products like paint and bio-fuel. Most hemp product manufacturers are forced to import hemp seed, oil and fiber from growers in Canada, Europe, and China.

Yield

In 2012 the U.S. hemp industry was valued at an estimated \$500 million in annual retail sales and growing for all hemp products, according to the Hemp Industries Association, a non-profit trade organization consisting of hundreds of hemp businesses.

With estimated production expenses of \$286 per acre, net returns for hemp for fiber can range from -\$116 to \$473 per acre. Returns for hemp seed were estimated to range from \$60 to \$800 per acre. Returns for hemp CBD ranges from \$5000 to \$100,000 per acre.

Uses:

Stalk is used for fabrics, cordage, netting, geotextiles, brake linings, fiber board, hempcrete, insulation, animal bedding, paper, rope and much more.

History

In the U.S., the first hemp plantings were in Jamestown, Virginia. From then on hemp was used in everything from 19th century ship sails to the covers of pioneer wagons.

In 1937, the passage of "Marihuana Tax Act" occurred, and, despite the U.S. government's "Hemp for Victory" campaign during World War II, misplaced fears that industrial hemp is the same as marijuana discouraged farmers from growing hemp. The Controlled Substances Act (CSA) of 1970 formally prohibited cultivation.

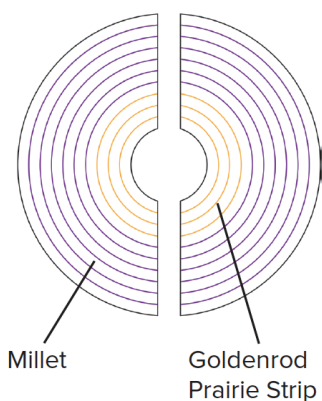
The 2018 Farm Bill, which incorporated the Hemp Farming Act of 2018, removed hemp as a Schedule I drug and instead made it an agricultural commodity.

In October 2019, it became legal to grow in 46 U.S. states.

Prairie Strips

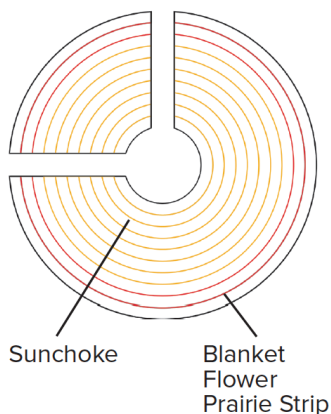
Prairie conservation strips protect soil and water while providing habitat for wildlife. The STRIPs project (Science-based Trials of Rowcrops Integrated with Prairies) has researched prairie strips for over ten years, showing that integrating small amounts of prairie into strategic locations within corn and soybean fields can yield disproportionate benefits for soil, water, and biodiversity.

Research shows that prairie strips are one of the most affordable and environmentally beneficial conservation practices available. Prairie strips protect water quality, reducing overland flow by 60% and nitrogen and phosphorus transport by 90%. They have no impact on crop yield other than the land taken out of production.



GOLDENROD (*Solidago*)

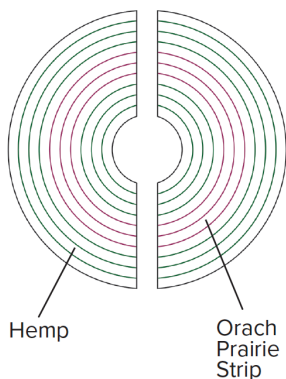
Goldenrod is a native perennial that provides sources of pollen and nectar for bees and other insects. Can be used for revegetation of disturbed areas, for mine spoil reclamation, and soil stabilization. This plant is grazed by cattle, sheep, horses, and whitetail deer. Goldenrod is used for kidney, bladder, and joint health. Mature goldenrod is drought tolerant with minimal pest or disease problems.



BLANKETFLOWER (*Gaillardia*)

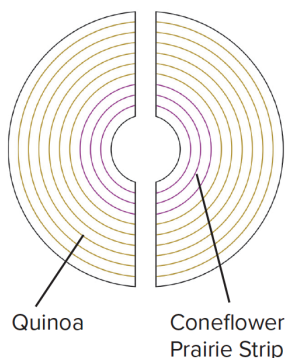
Blanketflower is a native wildflower useful for rehabilitation of disturbed sites. It has utility as a cover crop and food source for pollinators, wildlife, and livestock.

Blanketflower's name may refer to the resemblance of the flower to the brightly patterned blankets made by Native Americans, or blanketing the ground with colonies of blooms. It is native to North and South America and cultivars have been bred for ornamental use.



ORACH (*Atriplex hortensis*)

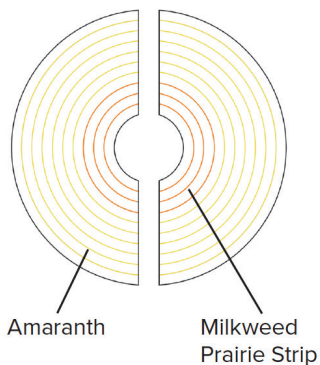
A cool season plant, orach is a warm season alternative to spinach that is less likely to bolt. It was commonly grown in Mediterranean regions from early times. This delicious plant tolerates both alkaline soil and salt, and is frost tolerant as well. Harvest the young leaves as they mature. Pinch flower buds to encourage branching and continued production of new leaves. The seeds are edible and a source of vitamin A. Seeds are also used to make a blue dye. Orach is great source of iron, magnesium, calcium, zinc, phosphorous, vitamin C and antioxidants.



CONEFLOWER (*Echinacea*)

Coneflowers are found in eastern and central North America, where they grow in moist to dry prairies and open wooded areas. They are drought tolerant and long-lasting.

Echinacea is cultivated for medicinal use: as an over-the-counter remedy for the cold or flu, and used to treat pain, inflammation, migraines and other issues. Some species are cultivated in gardens for their showy flowers.



MILKWEED (*Asclepias tuberosa*)

Milkweed is a native perennial that appeals to monarch butterflies, hummingbirds, bees and moths. Does not need watering except in the driest conditions. People have used milkweed for fiber, food, and medicine.

Floss produced by the plant's seed pods has economic potential. It's used for winter jacket insulation, comforter and pillow filling and life preservers. Also used for mopping up fossil fuel industry messes with potential for use as acoustic padding in cars, trucks and trains. Also suppresses pests like stink bugs, thrips, aphids and leaf-hoppers.

OGALLALA AQUIFER



This area, along with all of the high plains, is irrigated by the Ogallala aquifer, one of the world's largest fresh groundwater resources. It underlies 175,000 square miles/112 million acres in eight states. The water in the High Plains Aquifer system accumulates over thousands of years primarily through infiltration of precipitation.

This region was labeled the "Great American Desert" on early maps (1820-1850). Technological advances in the early to mid-20th century led to an explosion of irrigated acres, from 2.1 million irrigated acres in 1949 to more than 15 million acres half a century later. Today, it's hard to overstate the importance of water pumped from the High Plains aquifer as a principal driver of the region's largely agricultural-based economy and way of life. Current annual withdrawals

from the aquifer are estimated to be on the order of 19 million acre-feet. Water pumped from the High Plains Aquifer system supports nearly 30% of the U.S. irrigated crop production as well as significant proportion of cattle, dairy and hog production.

Most of the water pumped from the Ogallala aquifer is used for agriculture. Decades of pumping from the aquifer have steadily and significantly lowered the groundwater table at rates greater than natural recharge from precipitation have led to significant water level declines, particularly in parts of the central and southern High Plains. Based on current depletion rates, it is estimated that more than a third of the Southern High Plains will be unable to support irrigation within the next 30 years. Portions of the aquifer also are affected by water quality issues related to agriculture, including nitrogen loading.

Today, widespread recognition of the aquifer's water quantity and quality declines is generating significant concern about the near- and long-term economic security and longevity of communities in the region.

How we will respond as a region to these challenges?

What management shifts can support productive, profitable farming while slowing declines or even stabilizing groundwater levels?

Addressing the Ogallala region's serious challenges requires involvement of a wide variety of stakeholders working together towards encouraging shifts in field and irrigation management. It also requires investment (local, regional and Federal) in research, effective regional education and communications, and other initiatives with potential to extend the usable life of this vital resource.

Information about the Project

Prairie Futures is a public artwork and agricultural landscape installation which aims to establish and support community based conversations around farming in the Colorado High Plains. — www.prairiaseaprojects.com

Joes, Colorado — July 2021