Growing Groceries

Presented by Washington State University King County Master Gardeners

The Nutritional Powerhouse: Corn and Beans (Legumes)

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May 28, 2025

WASHINGTON STATE UNIVERSITY EXTENSION

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Notices

Master Gardeners provide a multitude of resources for home gardeners. This gardening information is research-based, available to the public, and focused on environmentally friendly and sustainable gardening practices.

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Tonight's topics

Corn

- History and uses
- Nutritional value
- Classification and types
- Varieties of Sweet Corn
- Cultivation
- Pests and diseases

Beans (legumes)

- Classification of beans
- History
- Nutrition and health benefits
- Cultivation, maintenance and care
- Pests and diseases
- Harvest and storage

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History and Uses

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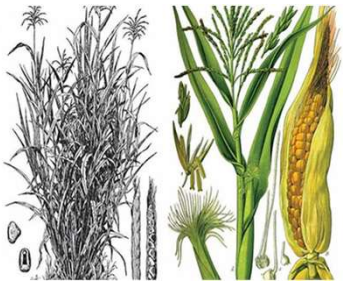
History

- A Mexican wild grass called *Teosinte* (tēō'sintē) is considered one of the primary ancestors of modern corn
- Corn was cultivated throughout the Americas by 2500 BCE.
- Corn spread to Europe, Asia and Africa after the discovery of the Americas.



Teosinte and maize look like very different plants, but it only took a few changes to teosinte's genes to get maize. (Credit: Andrea Elyse Messer/Penn State)

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Modern uses of processed corn

- **Edible:** cake, cookies, dessert mixes, baby food, cereals, chewing gum, carbonated beverages, bread, chips, chocolate, soups, hot dogs, ice cream, jams, marshmallows, pet food, doughnuts, and many more!
- **Non-edible:** Batteries, blankets, cardboard, chalk, cleaners/detergents, crayons, cosmetics, plates, cups, ink, insecticides, matches, paper, plastics, shampoo, shoe polish, fuels (ethanol) and many more!

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Interesting Facts

- Corn grows on every continent except Antarctica
- Corn is an ingredient in more than 4,000 everyday grocery items
- One bushel of corn produces approximately 2.8 gallons of ethanol along with 18 pounds of distillers grain, a high-protein livestock feed.
- A single bushel of corn can sweeten about 400 cans of soda

https://www.dietaryguidelines.gov/

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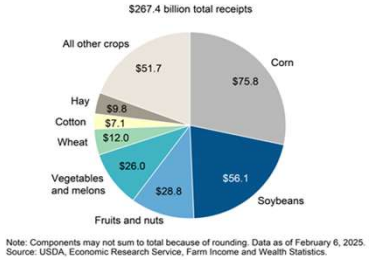
Food Fact$



Note: Components may not sum to total because of rounding. Data as of February 6, 2025.
Source: USDA, Economic Research Service, Farm Income and Wealth Statistics.

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Nutritional Value

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Essential Dietary Nutrients

- Protein – Fats – Carbohydrates are all required for a healthy diet
- Proteins are formed from 20 amino acid molecules, 9 of which humans must ingest in food. Histidine, Isoleucine, Leucine, Lysine, Methionine, Phenylalanine, Threonine, Tryptophan and Valine.
- Foods that contain all nine (9) essential amino acids are beef, poultry, fish, eggs, dairy, soy, quinoa and amaranth and buckwheat.
- Corn lacks Lysine – Beans lack Methionine
- Beans have Lysine – Corn has Methionine
- Together Corn and Beans make a “complete protein”

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Is Corn Healthy?

Macronutrients (med. ear/half cup kernals)
- ~ 3 grams of protein
- ~ 15 grams of carbohydrates
- 5 milligrams of sodium
- 244 international units of vitamin A
- Small amounts of B vitamins, magnesium and potassium

Antioxidants that ease wear and tear on the body’s cells, including:
- Vitamin C
- Lutein and zeaxanthin, which support vision and eye health

https://www.hopkinsmedicine.org/health/wellness-and-prevention/health-benefits-of-corn

- High fiber
- Low in fat
- Has about 77 to 100 calories
- Gluten free

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Is Corn a Grain or a Vegetable?

In Latin culture, corn is regarded as a grain. It is harvested once it’s fully mature and dried and ground into flour to make tortillas

Americans of European ancestry are more likely to harvest corn when the kernel is soft and juicy and serve it as a vegetable, steamed, fried or roasted.

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Classification of Corn

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The Poaceae (Grass) Family

- 70% of all crops grown are grasses
- Corn, rice, and wheat provide >50% of calories consumed by humans

Photo: Gia Parsons

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The Poaceae (Grass) Family

Cereal grasses
- Corn
- Wheat
- Rice
- Barley
- Millet
- Oats
- Rye

Other grasses
- Lemongrass
- Bamboo
- Sugarcane

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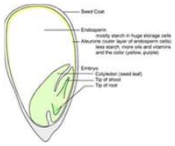
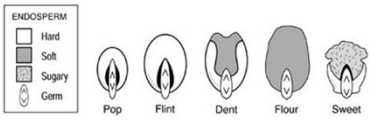
Classification

- Corn is one of the most diverse grain crops found in nature.
- Selection pressure by both humans and nature has resulted in various types of corn
- Classified by characteristics of their kernel endosperm (tissue surrounding the embryo that provides food for the seed's growth)





https://pubs.nmsu.edu/_h/H232/index.html

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Types of Corn

- Flint
- Pop
- Pod
- Dent
- Flour
- Sweet

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Flint Corn

- Zea mays var. indurata
- Majority grown in Central and South America
- Named after its hard glassy outer shell
- Dried and ground into corn meal
- Type of corn meal for making hominy (alkali treated, fine ground) and polenta (dried, coarse ground).

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Popcorn

- Zea mays var. everata
- Carbon dated to 3600 BC
- Tough outer shell encapsulating a small amount of soft starch content
- Explodes when heated turning the kernel inside-out
- Try substituting nutritional yeast for butter and salt

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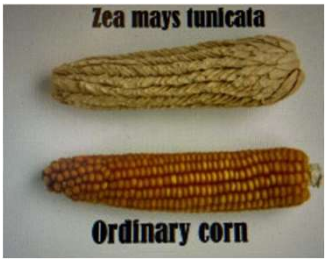
Pod Corn

- Zea mays var tunicata
- Once thought to be a wild ancestor of modern corn
- Mutant gene causes a husk to form around each kernel known as Glumes
- Not commercially grown
- Decorative
- Religious purposes for some Native American peoples.



https://pubmed.ncbi.nlm.nih.gov/22829149/

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Dent Corn (aka Field Corn)

- Zea mays var. indentata
- 99% of all corn production in US
- Major Uses:
  Livestock feed
  Ethanol fuel
  Raw materials for non-edible commodities
- Food uses: (high starch content)
  Cornmeal
  Corn flakes
  Yellow corn chips
  Corn starch

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Flour Corn

- Flour corn is a variety of corn
- Widely grown in the drier parts of the United States, western South America and South Africa.
- Soft starchy endosperm and a thin pericarp
- Primarily used to make corn flour
- Frequently found in Aztec and Inca graves

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Sweet Corn

- Zea mays var. saccharate
- Genetic mutation of field corn
- Kernels consist of sugar rather than starch
- Predominantly hybridized for levels of sweetness and storage life

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Sweet Corn

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Varieties of Sweet Corn

- Hybrids vs Open pollinated
- Kernel color
- Ear size
- Days to harvest
- Level of sweetness

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Levels of Sweetness

- Normal **(su)** becomes starch relatively quickly after harvest.
- Sugar Enhanced **(se)** accumulates more sugar than the (su) varieties.
- Super sweet **(sh2)** the sweetest of all, with the sugars converting to starches much more slowly than with other types.
- Synergistic – **(syn)** combines the desirable traits of (su), (se) and (sh2); are sweet, creamy, tender with excellent storage life.
- Augmented **(shA or aug)** super sweet types that also have the (se) trait. Sweet, tender, and have a long harvest period with excellent storage.

https://extension.umn.edu/vegetables/growing-sweet-corn#shrunken-%28sh%29-sweet-corn-494163

https://www.canr.msu.edu/news/a_primer_on_decoding_the_sweet_corn_section_of_your_seed_catalogue

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Varietal names for su, se, sh2 and shA corn that grow in WA

Normal (su)
- Golden Bantam
- Jubilee Hybrid
- Silver Queen
- Honey and Cream

Sugar enhanced (se)
- Sugar Buns
- Bodacious
- Luscious
- Trinity

Supersweet (sh2)
- Supersweet Jubilee
- Vision MXR
- Glacial White
- Catalyst XR

Augmented (shA or aug)
- Solstice
- Euphoria
- Nirvana
- Yellowstone

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Pollination and Reproduction

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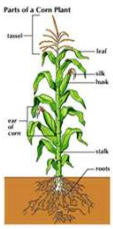
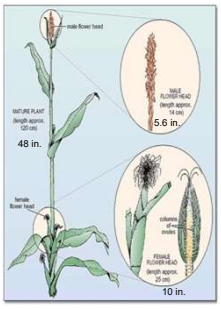
Parts of a corn plant

- Mature plant (height 4 – 6 ft.)
- Male flower head (length approx. 5.5 in.)
- Female flower head (length approx. 10 in.)
- Columns of ovules in each ear



https://kids.britannica.com/students/assembly/view/53137



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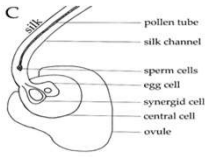
Pollination & Fertilization

- A pollen grain lands on the exposed silk tissue, germinates immediately and forms a pollen tube
- Pollen tube penetrates the silk channel and grows, extending down to the ovule and carries two sperm cells to the ovule
- The pollen tube and sperm are received by the synergid cell within the ovule. One sperm cell will fertilize the egg cell, while the other will fertilize the central cell

https://www.cropscience.bayer.us/articles/bayer/closer-look-corn-pollination



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Isolation requirements

- Isolation avoids mixing types of corn, gene type (sugar level), kernel color
- Cross-pollination can lead to poorer flavor and texture.
- Cross-pollination can be prevented by distance of 250-300 feet from the nearest corn field.
- Plant varieties of different maturity dates so that they do not bloom at the same time.

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Cultivation

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Growing Conditions

- Full Sun
- Consistent and plentiful moisture
- Well draining soil
- Soil temp of at least 50F (60-85 is best)
- pH 6.0 – 6.8
- Fertile soil

Sweet corn requires high levels of N and moderate amounts of P and K to grow well. Consider doing a soil test, before planting,

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Planting

- Rotate into a planting bed where legumes were last grown.
- Plant in a block of at least 4 rows
- Space rows 24 to 36 inches apart
- Plant seed 1 inch deep
- Space seeds 8 to 10 inches apart

https://extension.unh.edu/resource/growing-sweet-corn-fact-sheet

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Maintenance

Monitor

- **Fertilize** — yellow to light green leaves, slow growth
- **Water** — 1 to 1.5 inches of water per week
- **Look for pests** — cutworms, mites, aphids, corn earworm, earwigs,
- **Signs and symptoms of disease** — smut, rust

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Harvest and Storage

- Sweet corn matures in 15-24 days from silk emergence depending on temperature
- Ears are mature when silks are dry and brown
- Sugars are at their highest when the kernels are at the “milk stage” (kernel juice appears milky)
- For best quality and flavor, harvest and use immediately

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Identify and Manage Pests

If you observe a BMSB, please take a photo and report the sighting to https://invasivespecies.wa.gov/ or via the mobile app WA Invasives (Bugwood)

Brown Marmorated Stink Bug (BMSB)

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Brown Marmorated Stink Bug (BMSB)

Symptoms

- On corn, BMSB feeds on the outside of developing ears, injures kernels inside
- Also feeds on tassels and stems

Management steps

- Pick and destroy BMSB egg masses or groups of young nymphs
- Encourage predatory and parasitoid insects (e.g., samari wasp)
- https://www.stopbmsb.org/more-resources/video-series/

Photo by: Gerald Brust, Univ of Maryland

https://hortsense.cahnrs.wsu.edu/fact-sheet/corn-brown-marmorated-stink-bug/

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Aphids

Symptoms

- Leaves become yellow
- Masses of plant lice (and ants, ladybugs) on leaves

Management steps

- Provide proper nutrition. High levels of nitrogen in the foliage encourage aphid reproduction. Reduce amount of nitrogen fertilizer or switch to a slow-release type.
- Encourage natural enemies including ladybird beetles, lacewings, syrphid (hover) fly larvae, and parasitic wasps.
- Hose to knock off aphids
- Control aphid protecting ants

Corn leaf aphids on tasseling corn (Dept. Plant Pathology Archive. NCSU. Bugwood.org)

Photo: Clemson University USDA Extension slide series, Bugwood.org

https://hortsense.cahnrs.wsu.edu/fact-sheet/corn-corn-aphids/

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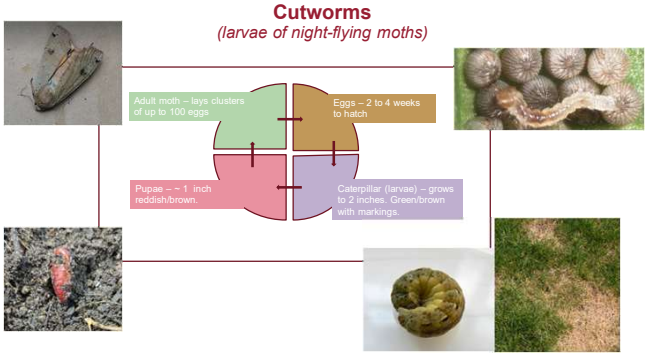
Cutworms
(larvae of night-flying moths)



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Cutworms

Symptoms
- Small plants cut off at soil line and topple over

Management steps
- Hand-pick night-feeding larvae, when practical.
- Scratch soil surface to turn up caterpillars and pupae
- Encourage natural enemies of cutworms including birds and spiders
- Use barriers or collars around plants

See https://hortsense.cahnrs.wsu.edu/fact-sheet/corn-cutworms-and-armyworms/

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Corn earworm (larval stage of *Helicoverpa zea* moth)

Symptoms
- Ears, tassels, and silks with worms and/or frass;
- ears with holes inside;
- kernels gouged.

Management steps
- Plant varieties with tight husks (such as 'Country Gentleman', 'Golden Security', 'Silvergent', and 'Staygold')
- Early-season plantings (before April) are less likely to be damaged.
- In small plantings, a clothespin placed at the point where the silk enters the ear can prevent earworm access. Place clothespins soon after the first silk is seen.

https://hortsense.cahnrs.wsu.edu/fact-sheet/corn-corn-earworm/

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Earwigs

Symptoms
- Ears only partly filled
- Shortened silks
- Presence of earwigs on silks
- Feed on silks and prevents pollination

Management steps
- Trap with rolled newspaper, cardboard, or burlap placed near corn
- check daily and destroy

Earwigs are largely beneficial, feeding on many pests such as aphids, mites, and nematodes, as well as on algae, fungi, and decaying plant material.

Photo: David Cappaert, Michigan State University, Bugwood.org

https://hortsense.cahnrs.wsu.edu/fact-sheet/corn-earwigs/

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Smut (*Ustilago maydis* fungus)

Symptoms
- Gall-like swelling
- Ears, tassels, leaves with black gnarled growth
- Galls break open to release spores

Management steps
- Plant resistant varieties: 'Blitz', 'Commander', 'Goldie', 'Reliance'
- 3-year minimum crop rotation
- Remove plant debris
- Collect and destroy galls before the spores are released. DO NOT COMPOST!
- Fungicides are NOT an effective control option

Photo: Clemson University-USDA slide series, Bugwood.org

https://hortsense.cahnrs.wsu.edu/fact-sheet/corn-smut/

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Questions?

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Resources

- https://extension.unh.edu/resource/growing-sweet-corn-fact-sheet
- https://s3.wp.wsu.edu/uploads/sites/2071/2014/04/Sweet-Corn-FS104E.pdf
- https://pubs.nmsu.edu/_h/H232/index.html
- https://yardandgarden.extension.iastate.edu/faq/what-are-differences-between-various-types-sweet-corn#:~:text=Supersweet%20(sh2)%20cultivars%20contain%20the,corn%20a%20firmer%2C%20crunchy%20texture
- https://extension.umn.edu/vegetables/growing-sweet-corn#shrunken-%28sh%29-sweet-corn-494163
- https://ipm.missouri.edu/cropPest/2012/7/corn-pollination-the-good-the-bad-and-the-ugly-pt-3/
- https://crops.extension.iastate.edu/blog/mark-licht-zachary-clemens/birds-and-bees-corn-pollination
- https://entomology.ca.uky.edu/ef130#:~:text=Bt%2Dcorn%20is%20a%20type,material%20from%20a%20donor%20organism
- https://www.mayoclinichealthsystem.org/hometown-health/speaking-of-health/corn-a-versatile-nutrition-choice#:~:text=Health%20benefits%20of%20corn,as%20one%20carbohydrate%20food%20choice..
- https://hortsense.cahnrs.wsu.edu/fact-sheet/corn-brown-marmorated-stink-bug/
- https://tfrec.cahnrs.wsu.edu/beers-tfentomology/bmsb/identifying-bmsb/
- https://pubs.extension.wsu.edu/product/pest-watch-brown-marmorated-stink-bug-home-garden-series/

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Resources

- https://iowarfa.org/ethanol-center/ethanol-co-products/distillers-grains-facts/#:~:text=One%20bushel%20of%20corn%20produces,18%20pounds%20of%20distillers%20grains
- http://www.gardening.cornell.edu/homegardening/scene05f6.html
- https://www.canr.msu.edu/news/a_primer_on_decoding_the_sweet_corn_section_of_your_seed_catalogue
- https://horticulture.oregonstate.edu/oregon-vegetables/corn-sweet-processing
- https://extension.umn.edu/vegetables/growing-sweet-corn#sugary-enhanced-%28se%29-sweet-corn49416-49416https
- https://www.uvm.edu/vtvegandberry/factsheets/corngenotypes.html
- https://www.hartfordhospital.org/about-hh/news-center/news-detail?articleId=27851&publicid=46#:~:text=Added%20sugars%20and%20high%20fructose,other%20fats%20in%20the%20blood.
- https://www.hopkinsmedicine.org/health/wellness-and-prevention/health-benefits-of-corn

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Thank You!

And now for some closing announcements before questions…

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Upcoming Presentations

Growing Groceries
2025 Warm Season Series
Wednesdays 7:00pm-8:30pm

Date	Class
Wed, April 16	Growing the 'Other' Edible Nightshades: Peppers, Tomatillos, Eggplant
Wed, April 30	Roots and Rare Fruits
Wed, May 14	Grow Cukes, Squash and Melons- Big and Small
Wed, May 28th	The Nutritional Powerhouse: Corn and Beans (legumes)
Wed, June 11	Summer Starts for Fall and Early Spring Harvests
Wed, June 25	Caring for Community: Master Gardener Demonstration Gardens

PNW Garden Savvy
2025 Series 2
Saturdays 9:30am-10:30am

Date	Class
Sat, April 12	Gardening with Children
Sat, April 26	Plant It Where the Sun Don't Shine
Sat, May 3	Protecting Our Unsung Heros, Our Pollinators
Sat, May 17	Understanding King County Soils for Better Gardening
Sat, May 31	Rain Gardens
Sat, June 7	Deer Resistant Gardening

More info: https://kingcounty.mastergardenerfoundation.org/education

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Master Gardener Resources

Ask a Master Gardener
Visit: https://extension.wsu.edu/king/ask-a-master-gardener

Become a Master Gardener
For information on King County Master Gardener training (including signing up for the email notification list), visit: https://extension.wsu.edu/king/gardening/become-a-master-gardener

Applications for the 2026 class will open in September 2025

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Thank you for the support!

Growing Groceries

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King County Master Gardener Program
https://extension.wsu.edu/king/gardening
- Demonstration Gardens
- Plant Clinics
- Education Outreach
- Science-based Publications

Master Gardener Foundation of King County
http://www.mgfkc.org
- Fundraising for these programs

More information about growing groceries:
https://kingcounty.mastergardenerfoundation.org/education/gg/

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