Resilience Gardens: A Permaculture Guide to Home Food Growing

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About this guide

This guide shows how to grow a productive home food garden with permaculture and soil-first organic methods. It is written for beginners and scales from a few beds by the kitchen door to a small homestead.

The approach rests on a few ideas:

- **Soil before fertilizer.** Test first, then build organic matter.
- **Little or no tillage.** Keep the ground covered and the soil life intact.
- **Beds and polycultures** instead of single-crop rows.
- **Perennials** alongside annuals, so the garden produces with less work each year.
- **Water held in the landscape** with mulch, earthworks, and drip.
- **Pest management by design:** habitat, timing, and barriers before any spray.
- **Tested preservation methods,** so the harvest keeps safely.

How to use it: read sections 1–4 before you dig anything. Use the plans in section 6 as templates, not prescriptions. For dates and varieties, ask your state Cooperative Extension office; local knowledge beats any general guide.

1. Why grow food now

A home garden is still the cheapest way to put fresh, nutrient-dense food on the table and buffer a household against supply shocks. The reasons are practical:

- **Supply resilience.** Long, just-in-time supply chains break under storms, pandemics, and price spikes. A garden and a stocked pantry bridge the gap.
- **Nutrition.** Most Americans still eat far fewer vegetables than recommended. Produce eaten within hours of harvest also keeps more vitamin C and folate than produce shipped for a week.
- **Soil and carbon.** A covered, undug, compost-fed garden builds organic matter year over year instead of losing it.
- **Cost.** Seeds and compost are cheap; leafy greens, herbs, and tomatoes are among the most expensive things in the produce aisle.
- **Skills.** Growing, saving seed, and preserving are skills best learned before you need them.

One warning: a garden planted in a burst of enthusiasm and then abandoned wastes seed, water, and effort. Start smaller than you think, and finish what you plant.

2. Permaculture principles in brief

Permaculture is design: arrange plants, water, structures, and your own routines so each element does several jobs and the system needs less outside input each year. Three ethics frame it: care for the earth, care for people, and fair share (return surplus to the system).

The principles that matter most for a food garden:

1. **Observe before you act.** Watch a site through a season if you can: where water runs and pools, where frost settles, where the sun falls in June and December.
2. **Catch and store energy.** Sun, rain, leaves, and kitchen scraps are free inputs. Capture them on site.
3. **Every element does more than one job.** A hedge is a windbreak, bee forage, and mulch source. A pond is irrigation, frog habitat, and a microclimate.
4. **Every function has more than one source.** Water from a roof tank *and* a swale *and* the hose. Greens from kale *and* chard *and* perennial sorrel.
5. **Use small, slow solutions.** Build one good bed and extend it, rather than clearing a quarter acre you cannot keep up with.
6. **Use edges and diversity.** Mixed plantings and bed edges are more productive and more pest-resilient than monocrop rows.
7. **Produce no waste.** Every crop residue goes back as mulch or compost; surplus gets stored, preserved, shared, or fed to animals.

The zone idea (section 3) is the most practical tool for a home gardener: put the things you visit most closest to the door.

3. Siting and design

Put the garden where you will see it every day, in full sun, with water close by. A distant plot gets neglected; permaculture formalizes that idea as zones.

Put what you visit most closest to the door

Permaculture zones, from the house outward. Start with Zone 1.

Zone 0	The house	Seed starting, kitchen scraps, pantry, root storage
Zone 1	Daily	Salad greens, herbs, tomatoes, compost, worm bin
Zone 2	Several times a week	Main vegetable beds, berries, hens, rain tanks
Zone 3	Weekly	Potatoes, winter squash, corn, fruit trees
Zone 4	A few times a season	Nut trees, woodlot, pasture, forage
Zone 5	Rarely	Wild edge: habitat to learn from, not manage

permaculture zones · 0 to 5

Most home gardens live entirely in Zones 1 and 2. Larger properties add Zones 3–5 over years, not all at once.

Sectors. Map what flows *into* the site from outside: summer and winter sun paths, prevailing wind, cold-air drainage, storm runoff, wildfire direction, a neighbor's view or noise. Place elements to use or block each one (a windbreak on the winter-wind side, tall crops where they will not shade short ones).

Sun. Fruiting vegetables need 6–8 hours of direct sun; leafy greens and roots tolerate 4–6. Tall crops and trellises go on the north side of the garden (south side in the Southern Hemisphere).

Slope and water. On a slope, run beds and paths on contour so rain soaks in instead of running off. Note low spots that stay wet; they suit a rain garden or pond, not tomatoes.

What to avoid: deep shade, the root zone of large trees (walnuts in particular, which are toxic to tomatoes and many other crops), and soil near old painted buildings or roads until it has been tested for lead.

Start small. One 4 x 8 ft bed done well teaches more than a half acre done badly. Expand outward from the door each season.

4. Building soil

Test the soil, feed it organic matter, and stop digging it. Living, well-fed soil does more for a garden than any bagged fertilizer.

Test first. Send a sample to your state's Extension soil lab before adding anything, then every 2–3 years. Most vegetables want pH 6.0–7.0. Old gardens and heavily manured ground are very often already high in phosphorus; adding more wastes money and feeds algae downstream. Fertilize to the report, not to habit.

Start a bed without digging (sheet mulch).

1. Mow or cut existing vegetation to the ground. Leave the roots.
2. Water the area well.
3. Lay plain brown cardboard (tape and labels removed), overlapping 6 inches so no light gets through.
4. Cover with 3–4 inches of finished compost for planting beds.
5. Top paths with 3–4 inches of wood chips.
6. Plant transplants straight into the compost; sow seeds once the cardboard has softened.

For compacted ground, a broadfork loosens subsoil without inverting the layers. Use it once to open the soil, not every year.

Feed it every year.

- **Compost:** 1–2 inches spread on beds each year keeps most gardens fertile. That is roughly a bushel per 25 sq ft, spread on top rather than dug in.
- **Mulch:** Keep soil covered with straw, shredded leaves, or chips year-round. Bare soil erodes and loses carbon.
- **Cover crops:** Sow into beds as they empty. Cereal rye with crimson clover or hairy vetch for winter; buckwheat in summer gaps. Cut at flowering and leave on the surface, or crimp, then plant through it.

- **Targeted amendments** only where the test calls for them: lime or sulfur for pH, feather or alfalfa meal for nitrogen, sulfate of potash for potassium.

Manure safety. Raw manure must go on at least 120 days before harvesting crops that touch the soil, and 90 days before crops that do not (USDA National Organic Program). Hot-composted manure avoids the waiting period. Never use dog, cat, or pig manure on food crops.

Persistent-herbicide warning. Hay, straw, grass clippings, and manure from animals fed treated hay can carry pyridine herbicides (aminopyralid, clopyralid) that survive composting and deform tomatoes, beans, and potatoes at tiny doses. Ask the source what was sprayed, or run a bean bioassay: pot up a few bean seeds in the material and watch for cupped, twisted leaves.

5. What to grow

Grow what you will eat, lean on dark leafy greens, and add perennials so the garden produces before you plant anything each spring. Greens, tomatoes, beans, roots, and storage crops are the backbone.

Annual staples, by what they deliver. Ratings are qualitative; see USDA FoodData Central for figures.

Crop	Standout nutrients	Why grow it
Kale, collards	Vitamins A, C, K; calcium; folate	Cold-hardy, picked leaf by leaf for months
Chard, beet greens	Vitamins A, C, K; magnesium	Heat- and cold-tolerant; one planting lasts all season
Spinach	Vitamins A, K; folate	Fast spring and fall crop. Its iron and calcium are poorly absorbed (oxalates)
Turnip and mustard greens	Vitamins A, C, K; calcium	30–45 days to first harvest
Tomatoes	Vitamin C, potassium, lycopene	High value per square foot; easy to preserve
Snap and lima beans	Fiber, folate, protein	Fix their own nitrogen; dry surplus keeps for years

Crop	Standout nutrients	Why grow it
Carrots, beets	Vitamin A (carrots), folate (beets)	Store for months in the ground or a cellar
Winter squash	Vitamin A, fiber, potassium	Stores 3–6 months at room temperature
Potatoes, sweet potatoes	Energy, potassium, vitamin C; vitamin A (sweet potatoes)	The most calories per square foot in a home garden
Garlic, onions	Flavor; prebiotic fiber	Planted in fall (garlic) or early spring; store well

Perennials to establish early. Plant these once and harvest for years. Check that each suits your hardiness zone.

Perennial	Years to first harvest	Notes
Asparagus	2–3	20+ years per bed; plant crowns in early spring
Rhubarb	2	Stalks only; leaves are toxic
Strawberries	1	Renew beds every 3–4 years
Blackberries, raspberries	1–2	Trellis and prune out old canes yearly
Blueberries	2–3	Need acid soil, pH 4.5–5.5
Walking onions, chives	1	Green onions year-round
Sorrel, Good King Henry	1	Early-spring greens before annuals are ready
Jerusalem artichoke	1	Very productive and very invasive; contain it
Fruit and nut trees	3–10	Plant the first year; they are the slowest part of the system

Variety choice. Classic heirlooms are still widely sold (Kentucky Wonder, Marglobe, Detroit Dark Red, Black-Seeded Simpson, Long Standing Bloomsdale). Grow open-pollinated heirlooms if you want to save seed. Where a disease is known to be a problem

locally, choose a variety bred to resist it; seed catalogs mark resistance with codes such as V, F, N, and LB on tomatoes.

6. Garden plans

Three templates follow, from smallest to largest. Each uses permanent beds, succession planting, and a perennial edge, and each grows out of the one before it. They are examples, not prescriptions.

Plan 1: kitchen garden (about 500 sq ft)

Four 4 x 8 ft beds in Zone 1, beside the kitchen door. This is the place to start.

Each bed carries three plantings a year

Plan 1: kitchen garden, four 4 x 8 ft beds, about 20 x 24 ft overall

North

	Spring	Summer	Fall and winter
Bed 1 · fruiting north edge, trellis	Peas on trellis radishes between	Tomatoes, staked basil underneath	Garlic, October straw mulch over
Bed 2 · greens picked daily	Lettuce, spinach radishes	Chard, bush beans calendula edge	Kale, collards spinach overwinters
Bed 3 · roots storage crops	Carrots, beets onion sets	Bush beans after onions	Turnips fall carrots
Bed 4 · brassicas then vines; rests	Cabbage, broccoli transplants	Cucumbers summer squash	**Cover crop** rye + crimson clover

Perennial edge

Chives
Strawberries
Thyme, oregano
Sorrel
Rhubarb
Dill, cilantro
left to flower

Compost

Two bins:
filling, finishing

Paths 2 ft wide between beds, wood-chip mulched. Shaded cell = soil resting under cover crop.

Plan 1 · kitchen garden, 4 beds × 3 seasons

Each year, shift the four bed roles one bed south (fruiting → greens → roots → brassica and vine → back to fruiting) so no crop family repeats in a bed for 4 years.

Plan 2: household garden (about 1/12 acre, 35 x 100 ft)

Twelve 4 x 25 ft beds in four rotation blocks of three beds, with a perennial strip on the north side. Each block moves one step every year.

Block	Spring	Summer	Fall and winter	Next year becomes
A: Brassicas and greens	Cabbage, broccoli, kale, lettuce, peas	Chard, collards, bush beans	Kale, collards, spinach; garlic in one bed	B
B: Nightshades	Spinach, radishes (early)	Tomatoes, peppers, eggplant, basil	Rye and crimson clover cover	C
C: Beans, corn, squash	Potatoes in one bed	Three Sisters; pole and lima beans; winter squash	Rye and hairy vetch cover	D
D: Roots and alliums	Onions, carrots, beets, parsnips	Bush beans, cucumbers after onions	Turnips, fall carrots, beets	A

North strip (permanent): asparagus, rhubarb, and a trellised row of raspberries or blackberries, edged with chives and flowering herbs. **Support:** three compost bays, a 300–500 gallon rain tank off the nearest roof, and drip lines on a timer.

Plan 3: homestead garden (about 1/3 acre and up)

Plan 2 at the center, plus Zone 3 crops and the first tree crops. It suits rural lots and small farms.

- **Field beds for storage crops:** potatoes, sweet potatoes, winter squash, dry beans, and field or flint corn in long beds, rotated through a summer cover crop (buckwheat or cowpeas) every third year.
- **Fruit tree guilds:** each tree ringed by plants that help it. For example, an apple with comfrey for chop-and-drop mulch, chives and garlic at the drip line, daffodils to deter voles, and white clover as living groundcover.
- **Berry hedge** on the windward side, doubling as a windbreak and bird habitat.

- **Hens in rotation:** a mobile coop or paddocks that follow the harvest, clearing residue and pests and manuring beds 120+ days before the next food crop.
- **Water on contour:** a swale above the orchard feeding a small pond or rain garden, with roof tanks for the annual beds.

Build Plan 3 over 3–5 years. Plant trees the first year, because they are the slowest part of the system.

7. Planting

Plant into warm-enough soil, at 2–3 times the seed's own thickness, at bed spacing rather than row spacing. Sow thinly: over-sowing wastes seed and the labor of thinning.

Bed spacing. In a 4-ft-wide bed you plant in a grid and never step on the soil, so plants can sit closer than in traditional rows. Spacing is between plants in every direction.

Crop	Spacing	Per sq ft	Sow depth
Carrots, radishes	3 in	16	1/4 in
Beets, spinach, bush beans	4 in	9	1/2–1 in
Onions, garlic	4–6 in	4–9	sets 1 in, cloves 2 in
Lettuce, chard	6–8 in	2–4	1/4 in
Pole beans	6 in along a trellis	8	1 in
Kale, collards, peppers	12–18 in	1	transplant
Potatoes	12 in	1	4 in, then hill or mulch
Tomatoes (staked or caged)	18–24 in	—	transplant deep, up to first leaves
Winter squash	3–4 ft	—	1 in, or let vines run off the bed

Soil temperature, not the calendar. A cheap soil thermometer at 2 inches deep beats any date. Frost dates are a guide; check your current local dates with Extension, since the 2023 USDA hardiness map moved many areas about half a zone warmer.

Window	Minimum soil temp	Sow or set out
4–6 weeks before last frost	40°F	Peas, spinach, lettuce, onion sets, kale and cabbage transplants, potatoes
2–4 weeks before last frost	45–50°F	Carrots, beets, chard, radishes, turnips, parsnips
At last frost	60°F	Beans, sweet corn, squash, cucumbers, tomato transplants
2–4 weeks after last frost	65°F	Peppers, sweet potato slips, melons, okra, lima beans
6–10 weeks before first fall frost	—	Collards, kale, turnips, beets, carrots, spinach, garlic (in fall)

Polycultures. Mixed plantings use space and time better than single-crop rows:

- **Interplant fast and slow crops.** Radishes in the carrot bed; lettuce under young tomatoes; spinach between garlic.
- **Three Sisters.** Corn, pole beans on the corn, and squash across the ground. Works best with a field corn or tall sweet corn and runner or cornfield beans.
- **Flowers in every bed.** Dill, cilantro, calendula, sweet alyssum, and buckwheat feed the hoverflies and parasitic wasps that eat aphids and caterpillars.
- **Rotate families.** Do not follow tomatoes, potatoes, peppers, or eggplant with each other in the same bed for 3 years.

Companion-planting charts promise more than the research supports. Habitat for beneficial insects and crop rotation have the best evidence; most "plant X beside Y" pairings do not.

8. Water

Store water in the soil first, in tanks second, and deliver it slowly at the root. The basic rule: soak deeply, then wait until the soil starts to dry. Frequent light sprinkling grows shallow roots and wet leaves that invite disease.

Hold it in the soil. Every 1% gain in soil organic matter lets the soil hold noticeably more water. Mulch cuts evaporation sharply; bare soil in July can lose more water to the air than the crop uses.

Catch it from roofs. A roof yields about 0.6 gallon per square foot per inch of rain. A 1,000 sq ft roof in a 1-inch storm fills a 600-gallon tank. Use a first-flush diverter, a screened inlet, and an opaque tank to block algae. Check your state's rules; a few restrict rainwater collection.

Slow it in the landscape.

- **Swales:** level ditches dug on contour, with the spoil mounded downhill, that spread runoff and let it soak in. Plant trees and shrubs on the mound.
- **Rain gardens:** shallow basins at downspouts or low spots, planted with species that tolerate wet feet.
- **Contour beds:** on any slope, beds and paths across the slope, never up and down it.

On steep or unstable slopes, or near foundations and septic fields, get local advice before digging earthworks; badly placed swales can cause slumps or wet basements.

Deliver it efficiently. Drip tape or soaker hose under mulch puts water at the roots, keeps leaves dry, and uses roughly half the water of overhead sprinklers. A battery timer and a pressure regulator make it run itself.

How much. Most vegetable gardens need about 1 inch of water a week from rain plus irrigation, more in sandy soil and peak summer heat. Check by digging: the soil should be moist 4–6 inches down.

9. Pests and diseases

Design so that pests rarely reach damaging numbers, then step up through the least-harmful controls only when scouting shows you need to. This is integrated pest management (IPM).

Work down this ladder, stopping at the first step that works:

1. **Prevent.** Healthy soil, right plant in the right place, resistant varieties, 3-year family rotation, clean seed, and good spacing for airflow.
2. **Invite predators.** Flowering strips, a water source, brush or rock piles, and no broad-spectrum sprays. Birds, toads, ground beetles, lacewings, and parasitic wasps do most of the work.

3. **Scout.** Walk the garden every few days. Check leaf undersides. Catch problems while they are a few plants, not a bed.
4. **Block.** Floating row cover over brassicas, squash, and greens until they flower or are harvested; collars for cutworms; netting for birds; fencing for deer and rabbits.
5. **Remove by hand.** Pick beetles into soapy water, crush egg clusters, prune and bag diseased leaves (do not compost them).
6. **Targeted organic controls.** Bt (*Bacillus thuringiensis*) for caterpillars; insecticidal soap or horticultural oil for aphids and mites; spinosad for beetles and leafminers (spray at dusk; it harms bees while wet); copper or sulfur for some fungal diseases. Read and follow the label every time.

Common problems and first responses.

Problem	Crops	First response
Cabbage worms, loopers	Kale, cabbage, collards	Row cover from planting; Bt if needed
Squash bugs, vine borers	Squash, pumpkins	Row cover until flowering; hand-pick eggs; plant resistant *C. moschata* types (butternut)
Aphids	Most crops	Hose off; let lady beetles and hoverflies arrive; soap if severe
Early blight, Septoria	Tomatoes	Mulch to stop soil splash; prune lower leaves; drip not overhead; resistant varieties
Late blight	Tomatoes, potatoes	Resistant varieties (LB); remove and bag infected plants immediately; report outbreaks to Extension
Deer, rabbits	Everything	8-ft fence for deer, 2-ft buried-edge mesh for rabbits; nothing else is reliable

10. Tools

A no-dig garden needs few tools: no plow, no daily spading, very little hoeing once the mulch is down.

Essential

- Digging fork or broadfork (loosening without turning)
- Steel bow rake
- Stirrup or collinear hoe (shallow weeding only)
- Hand trowel and pruners
- Wheelbarrow or garden cart (compost and mulch move by the yard)
- Hose, soil thermometer, and a notebook for planting dates and yields

Worth adding later

- Drip irrigation kit and timer
- Floating row cover and hoops
- Seed-starting shelf with LED shop lights
- Compost thermometer

Buy only what you need, clean tools after use, keep edges sharp, and oil wood handles and steel before winter. Good tools outlast the gardener.

11. Harvest, storage, and seed saving

Harvest young, cure what needs curing, store each crop at its own temperature and humidity, and save seed from the best plants. Oversized vegetables are tougher and blander, not better.

Harvest in the cool of the morning, and use or chill produce quickly. Pick beans, cucumbers, and squash every 2–3 days; plants slow down once seeds start to mature. Cut greens a few outer leaves at a time so the plant keeps producing.

Curing and storage. Several crops rot in storage unless they are cured first.

Crop	Cure first	Store at	Humidity	Keeps
Carrots, beets, turnips, parsnips	No; trim tops to 1 in	32–40°F	90–95% (damp sand or sawdust)	4–6 months
Cabbage	No	32–40°F	90–95%	3–4 months
Potatoes	2 weeks at 50–60°F, dark	40–45°F, dark	90%	5–8 months

Crop	Cure first	Store at	Humidity	Keeps
Sweet potatoes	5–10 days at 80–85°F, 85–90% RH	55–60°F (never below 50°F)	75–85%	6–10 months
Winter squash (not acorn)	10 days at 80–85°F	50–55°F	50–70%	3–6 months
Onions, garlic	2–4 weeks warm, dry, airy shade	32–40°F	65–70%	6–8 months
Dry beans, peas	Dry on the vine; freeze 48 hours to kill weevils	Cool, airtight jars	Low	Years

Parsnips, carrots, leeks, collards, and kale can also stay in the ground under a thick straw mulch in much of the country and be harvested through winter.

Seed saving. Start with crops that mostly pollinate themselves:

- **Easy:** beans, peas, lettuce, tomatoes. Save from open-pollinated (not hybrid, "F1") plants. Ferment tomato seed in its own juice for 2–3 days, rinse, and dry.
- **Harder:** squash, corn, cucumbers, and brassicas cross with others of their species. They need distance, bagging, or hand-pollination to stay true.
- **Biennials:** carrots, beets, cabbage, and onions flower in their second year.

Dry seed fully, then store it in labeled jars in a cool, dry, dark place. Most vegetable seed keeps 3–5 years; onion and parsnip seed are best used the next season.

12. Preservation

Use only tested, current recipes: pressure-can low-acid vegetables, acidify tomatoes, and never rely on old canning books or family recipes, many of which predate current botulism research.

Canning rules that are not optional.

- **Low-acid vegetables** (beans, corn, carrots, beets, potatoes, greens, squash, and any mix containing them) must be **pressure canned**. A boiling-water bath does not reach the temperature that destroys *Clostridium botulinum* spores.

- **Tomatoes** can be water-bath canned only with added acid: 2 tablespoons bottled lemon juice or 1/2 teaspoon citric acid per quart (half that per pint).
- **Adjust for altitude.** Above 1,000 ft, add pressure or processing time as the recipe directs.
- **Have dial gauges tested every year**; many Extension offices do it free.
- **Never** use oven canning, open-kettle canning, or a multicooker such as an Instant Pot for pressure canning. Use only an appliance built and tested as a pressure canner.
- **Winter squash and pumpkin** may be canned only in cubes, never puréed or mashed.

Current sources: the *USDA Complete Guide to Home Canning* (2015 revision) and the National Center for Home Food Preservation.

Other ways to preserve, often easier and safer.

Method	Best for	Key points
Root cellar / cool storage	Roots, cabbage, potatoes, squash, onions	No energy, no processing; see section 11
Freezing	Beans, greens, corn, peas, berries	Blanch vegetables first (most 2–4 min) to stop enzymes
Drying	Beans, peppers, tomatoes, herbs, fruit, sweet corn	125–140°F dehydrator or solar dryer; blanch most vegetables first
Lacto-fermentation	Cabbage (sauerkraut), cucumbers, carrots, peppers	About 2% salt by weight; keep vegetables under brine; cool storage once sour
Pickling (vinegar)	Cucumbers, beans, beets, peppers	Use tested recipes with 5% acidity vinegar; never dilute the vinegar

13. Resources

Your state Cooperative Extension office is the first stop: local frost dates, soil testing, variety trials, and free gauge testing.

Public references

- USDA Plant Hardiness Zone Map (2023 edition)

- USDA FoodData Central: nutrient figures for any crop
- National Center for Home Food Preservation: tested canning, drying, and fermenting recipes
- *USDA Complete Guide to Home Canning*, 2015 revision
- USDA National Organic Program rules on raw manure and compost (7 CFR 205.203)

Books

- Toby Hemenway, *Gaia's Garden: A Guide to Home-Scale Permaculture*
- Bill Mollison, *Permaculture: A Designers' Manual*
- Charles Dowding, *No Dig*
- Jeff Lowenfels and Wayne Lewis, *Teaming with Microbes*
- Suzanne Ashworth, *Seed to Seed*
- Mike and Nancy Bubel, *Root Cellaring*

Inspired by: Victor R. Boswell, *Victory Gardens*, USDA Miscellaneous Publication No. 483, issued February 1942, revised January 1943.

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