ZONE 1: INTENSIVE KITCHEN GARDEN DESIGN

4-Family Permaculture Farm, Kurukshetra, Haryana

Updated for Rotated Property (209ft E-W × 836ft N-S)

Date: January 26, 2026
Status: FINAL DESIGN - Optimized for Narrow Width
Zone Location: 40-110 ft from north boundary
Total Area: 14,630 sq ft = 0.34 acres
Families: 4 (Cluster Village - Option 1 RECOMMENDED)

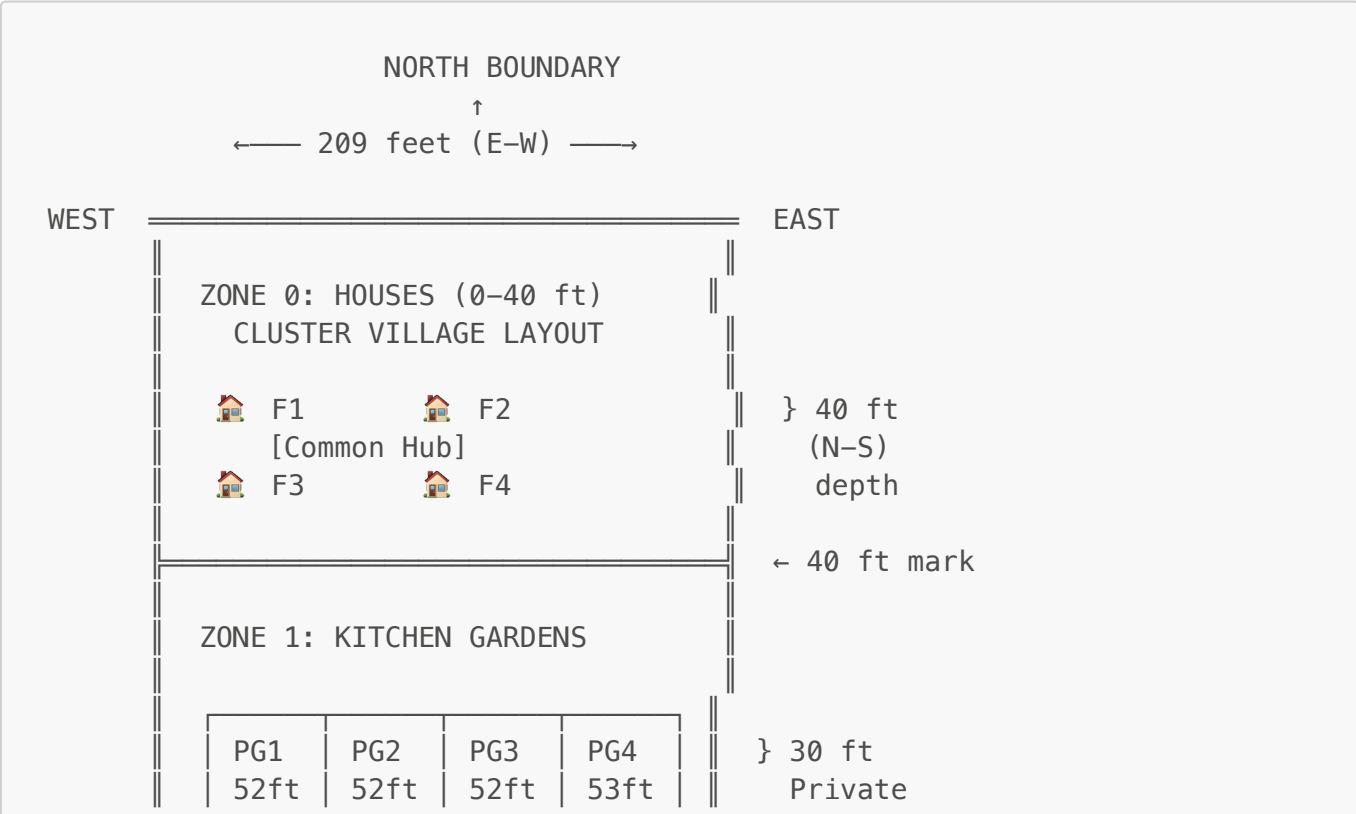
EXECUTIVE SUMMARY

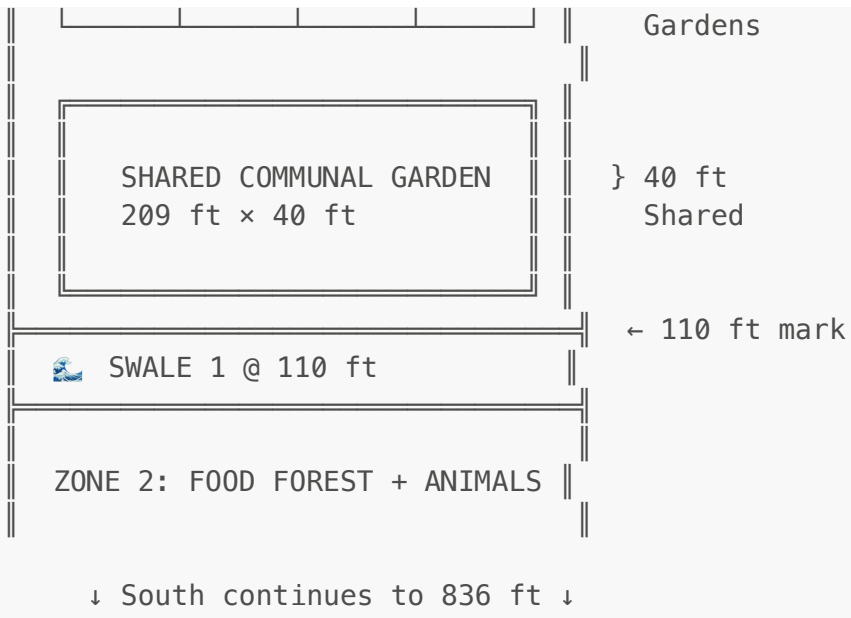
Zone 1 is the **most intensively managed zone** of the permaculture design, providing daily fresh vegetables, herbs, and salad greens for 4 families. This design balances:

- **Private garden strips** (52ft × 30ft per family) = immediate access from each house
- **Shared communal gardens** (209ft × 40ft) = larger crops, shared labor
- **Intensive year-round production** = 3 seasons in Kurukshetra climate
- **Water efficiency** = drip irrigation, mulching, and swale integration

Key Design Constraint: 209ft width means gardens are **narrow but deep** - perfect for north-south orientation and individual family strips.

PROPERTY CONTEXT





Legend:

- PG = Private Garden (per family)
- F1-F4 = Family 1-4 houses
- 🌊 = Swale (water collection)

ZONE 1 BREAKDOWN

Total Zone 1 Area: 14,630 sq ft (0.34 acres)

Allocation:

- **Private Garden Strips:** 209ft × 30ft = **6,270 sq ft** (43%)
  - Family 1: 52ft × 30ft = 1,560 sq ft
  - Family 2: 52ft × 30ft = 1,560 sq ft
  - Family 3: 52ft × 30ft = 1,560 sq ft
  - Family 4: 53ft × 30ft = 1,590 sq ft
- **Shared Communal Garden:** 209ft × 40ft = **8,360 sq ft** (57%)
  - Annual crop beds
  - Perennial herbs
  - Shared infrastructure (tool shed, compost, seedling nursery)

Total: 6,270 + 8,360 = **14,630 sq ft** ✓

PART 1: PRIVATE GARDEN STRIPS

Design Principle: **"Your doorstep garden - 5 steps from kitchen"**

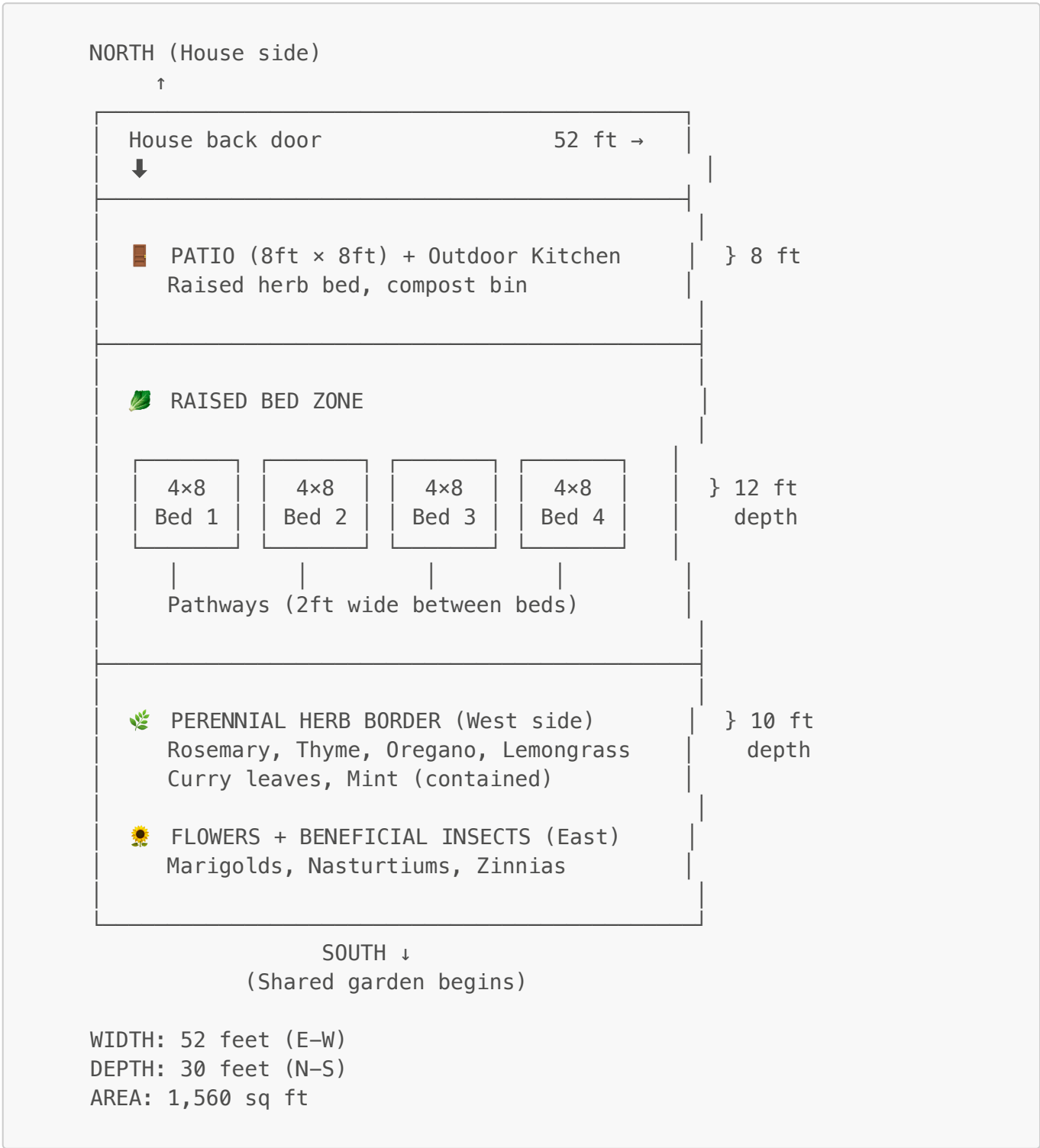
Note: While houses are arranged in a **Cluster Village** pattern (Option 1) with central common hub, each family still gets a dedicated garden strip extending south from their cluster position. Gardens can be

arranged side-by-side or adjusted based on final cluster configuration.

Each family gets a **52ft × 30ft private strip** (1,560 sq ft) south of the housing cluster for:

- Daily salad greens
- Herbs for cooking
- Quick-harvest vegetables
- Personal favorite crops
- Family-specific needs (medicinal herbs, flowers, etc.)

Layout: 52ft × 30ft = 1,560 sq ft per Family



Private Garden Components (Per Family)

A. Raised Bed System

4 Beds: 4ft × 8ft each = 128 sq ft total growing space **Pathways:** 2ft wide × 40 linear ft = 80 sq ft **Layout:** East-West orientation for maximum sun exposure

Bed Rotation Plan (3 Seasons):

Bed	Rabi (Nov-Mar)	Zaid (Mar-Jun)	Kharif (Jun-Oct)
Bed 1	Leafy greens (spinach, fenugreek, coriander)	Amaranth, bottle gourd (trellis)	Okra, chillies
Bed 2	Peas (trellis), radish	Cucumber (trellis), beans	Beans, gourds
Bed 3	Carrots, beets, turnips	Tomatoes (caged)	Brinjal, tomatoes
Bed 4	Onions, garlic, lettuce	Peppers, basil	Peppers, ginger

Succession Planting: Stagger planting by 2 weeks for continuous harvest.

B. Patio Zone (8ft × 8ft = 64 sq ft)

- **Outdoor kitchen prep area** (3ft × 6ft counter)
- **Kitchen herb pots** (tulsi, mint, coriander) - immediate access
- **Single-bin compost** (3ft × 3ft) - kitchen scraps
- **Seating area** (small bench or chairs)

C. Perennial Herb Border (West Side)

50 linear feet × 2ft wide = 100 sq ft

Spacing: 2-3 ft apart

- **Rosemary** (3-4 plants) - drought-tolerant
- **Thyme** (4-5 plants) - ground cover
- **Oregano** (3-4 plants) - spreading
- **Lemongrass** (5-6 clumps) - tall screen
- **Curry leaf** (1-2 plants) - Indian cooking essential
- **Mint** (2-3 pots - CONTAINED!) - invasive if not contained
- **Aloe vera** (3-4 plants) - medicinal

Benefits: Low maintenance, year-round harvest, attracts pollinators.

D. Flower/Beneficial Border (East Side)

50 linear feet × 2ft wide = 100 sq ft

Purpose: Pollinator attraction, pest management, beauty

Plants:

- **Marigolds** (Tagetes) - 20 plants - nematode control, pest deterrent
- **Nasturtiums** - 10 plants - aphid trap crop, edible flowers
- **Zinnias** - 10 plants - butterfly attractor
- **Sunflowers** (dwarf) - 5 plants - pollinator magnet, edible seeds
- **Cosmos** - 10 plants - long-blooming, low maintenance

Seed saving: Save seeds annually for self-sufficiency.

Private Garden Management (Per Family)

Soil Building

- **Initial:** 4-6 inches compost mixed into beds (4 beds × 32 cu ft = **128 cu ft compost**)
- **Annual:** Top-dress each bed with 2 inches compost (4 beds × 10 cu ft = **40 cu ft/year**)
- **Source:** Family compost bin + shared composting area

Watering System

- **Drip irrigation:** 1 line per raised bed (4 beds × 8ft = **32 linear ft tubing**)
- **Timer:** Shared timer for 4 families (1 zone per family)
- **Backup:** Hose bib at patio for hand watering pots
- **Frequency:** Daily in summer, 2-3x/week in winter

Mulching

- **Material:** Wheat straw, rice husks, or dried leaves
- **Application:** 3-4 inches thick on beds (refresh every 2 months)
- **Benefits:** Moisture retention, weed suppression, soil temperature control

Pest Management

- **Companion planting:** Marigolds, nasturtiums throughout
- **Neem spray:** Homemade neem oil spray (bi-weekly in growing season)
- **Hand-picking:** Daily inspection during evening walks
- **Beneficial insects:** Ladybugs, lacewings (attracted by flowers)

Production Estimates (Per Family - Private Garden)

Conservative Yield Estimates:

Crop Category	Annual Yield	Notes
Leafy Greens	150-200 kg	Continuous harvest, 3 seasons
Tomatoes	80-120 kg	Peak season: Mar-Jun, Jun-Oct

Crop Category	Annual Yield	Notes
Beans/Peas	30-50 kg	Trellis-trained, 2 seasons
Root Vegetables	40-60 kg	Carrots, radish, beets, turnips
Peppers/Chillies	20-30 kg	Year-round with protection
Cucurbits	60-80 kg	Gourds, cucumber (trellis)
Herbs (fresh)	15-25 kg	Year-round from perennial border
Total	**395-565 kg**	**~450 kg average per family**

Market Value (if surplus sold):

- Average 450 kg × ₹30/kg = **₹13,500 per family per year**
- Or: Fresh organic produce for 4-person family year-round

Food Self-Sufficiency:

- 450 kg vegetables/year ÷ 4 people = **112 kg per person/year**
- Target: 150 kg/person/year → **75% self-sufficient** from private garden alone!

PART 2: SHARED COMMUNAL GARDEN

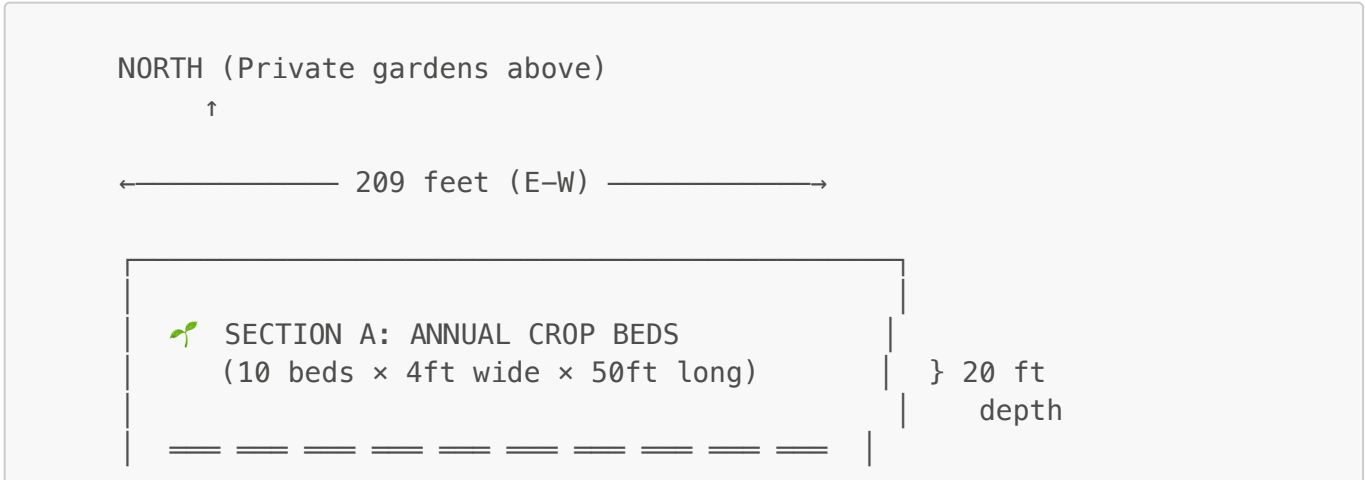
Design Principle: **"One day per week, feed all families"**

Area: 209ft × 40ft = **8,360 sq ft** (0.19 acres)

Purpose:

- Grow larger quantities of staple vegetables
- Crops requiring more space (potatoes, pumpkins, corn)
- Shared labor → reduced individual workload
- Bulk processing (canning, pickling, dehydrating)
- Seedling nursery for all families
- Tool storage and shared infrastructure

Layout: 209ft × 40ft = 8,360 sq ft



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├─────────────────────────────────────────────┤
│                                             │
│  🥔 SECTION B: ROOT CROPS & GROUND STORAGE  │
│     (Large beds for potatoes, sweet potato, │  } 10 ft
│      onions, garlic - bulk quantities)      │    depth
│                                             │
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│                                             │
│  🌿 SECTION C: PERENNIAL HERBS & SUPPORT    │
│                                             │
│  West side:                  East side:     │  } 10 ft
│  - Tool shed (8×10)          - Nursery      │    depth
│  - 3-bay compost             - Seed saving  │
│  - Bulk storage              - Herb garden  │
│                                             │
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          ↓
      SOUTH (Swale 1 @ 110 ft)

WIDTH: 209 feet (E-W)
DEPTH: 40 feet (N-S)
AREA: 8,360 sq ft
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Section A: Annual Crop Beds (20ft depth)

Configuration: 10 beds × 4ft wide × 50ft long = **2,000 sq ft** growing space

Pathways: 2ft wide between beds = **1,000 sq ft**

Bed Layout (North to South):

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BED 1:  4ft × 50ft = 200 sq ft | 2ft path
BED 2:  4ft × 50ft = 200 sq ft | 2ft path
BED 3:  4ft × 50ft = 200 sq ft | 2ft path
BED 4:  4ft × 50ft = 200 sq ft | 2ft path
BED 5:  4ft × 50ft = 200 sq ft | 2ft path
──────────────────────────────────────────
CENTRAL ACCESS PATH (4ft wide - cart access)
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BED 6:  4ft × 50ft = 200 sq ft | 2ft path
BED 7:  4ft × 50ft = 200 sq ft | 2ft path
BED 8:  4ft × 50ft = 200 sq ft | 2ft path
BED 9:  4ft × 50ft = 200 sq ft | 2ft path
BED 10: 4ft × 50ft = 200 sq ft | 2ft path
```

Rotation Plan (3-Year Cycle):

Bed Group	Year 1	Year 2	Year 3
Beds 1-2	Tomatoes, peppers, brinjal	Legumes (beans, peas)	Brassicas (cabbage, cauliflower)
Beds 3-4	Legumes (beans, peas)	Brassicas (cabbage, cauliflower)	Tomatoes, peppers, brinjal
Beds 5-6	Brassicas (cabbage, cauliflower)	Tomatoes, peppers, brinjal	Legumes (beans, peas)
Beds 7-8	Cucurbits (bottle gourd, pumpkin - trellis)	Root crops (carrot, beet, radish)	Leafy greens (amaranth, spinach)
Beds 9-10	Leafy greens (amaranth, spinach)	Cucurbits (bottle gourd, pumpkin - trellis)	Root crops (carrot, beet, radish)

Benefits of 3-Year Rotation:

- Prevents soil nutrient depletion
- Reduces pest/disease buildup
- Legumes add nitrogen for heavy feeders
- Balances soil pH over time

Section B: Root Crops & Bulk Storage (10ft depth)

Area: 209ft × 10ft = **2,090 sq ft**

Purpose: Grow storage crops in large quantities for year-round use.

Crops (Rotated Annually):

Crop	Area	Season	Expected Yield	Storage Method
Potatoes	800 sq ft	Rabi (Nov-Mar)	800-1,200 kg	Cool, dark storage 3-4 months
Sweet Potatoes	400 sq ft	Kharif (Jun-Oct)	400-600 kg	Room temp 2-3 months
Onions	500 sq ft	Rabi (Nov-Apr)	500-750 kg	Braided, hung in shed 4-6 months
Garlic	200 sq ft	Rabi (Nov-Apr)	100-150 kg	Braided, hung 6-8 months
Ginger	190 sq ft	Kharif (Jun-Dec)	150-200 kg	Buried in sand 2-3 months

Total Yield: 1,950-2,900 kg storage crops annually

Storage Infrastructure:

- **Root cellar** (8ft × 6ft × 6ft deep) - potatoes, sweet potatoes
- **Hanging racks** in tool shed - onions, garlic
- **Sand storage bins** (4ft × 3ft × 2ft) - ginger, turmeric

Section C: Perennial Herbs & Support Infrastructure (10ft depth)

Area: 209ft × 10ft = **2,090 sq ft**

West Side (Infrastructure):

1. **Tool Shed (8ft × 10ft = 80 sq ft)**
    - Wall-mounted tool racks (shovels, rakes, hoes)
    - Wheelbarrow parking (2 carts)
    - Irrigation supplies (hoses, drip fittings)
    - Pest management supplies (neem oil, sprayers)
    - Seed storage (cool, dark cabinet)
2. **3-Bay Compost System (12ft × 6ft = 72 sq ft)**
    - Bay 1: Fresh material (current additions)
    - Bay 2: Active composting (turning every 2 weeks)
    - Bay 3: Finished compost (ready to use)
    - Each bay: 4ft × 6ft × 3ft tall
    - Annual production: **3-4 cubic yards** (2,300-3,000 kg)
3. **Bulk Storage Area (8ft × 6ft = 48 sq ft)**
    - Mulch materials (straw, rice husks)
    - Bags of amendments (bone meal, neem cake)
    - Harvest baskets and crates
    - Processing equipment (dehydrator, canning supplies)

East Side (Propagation & Perennials):

1. **Seedling Nursery (10ft × 8ft = 80 sq ft)**
    - **Shade structure:** 50% shade cloth, 8ft tall
    - **Seed starting trays:** 20-30 trays rotating
    - **Hardening-off area:** Graduated sun exposure
    - **Potting bench:** 4ft × 2ft work surface
    - **Purpose:** Start 80-90% of seeds in-house (cost savings!)
2. **Perennial Herb Garden (20ft × 4ft = 80 sq ft)**
    - **Medicinal herbs:** Tulsi (holy basil), aloe vera, ashwagandha
    - **Culinary herbs:** Large curry leaf plants, rosemary bushes
    - **Tea herbs:** Lemongrass, mint (contained), stevia
    - **Aromatic:** Lavender, lemon verbena

- **Shared harvest:** All families access as needed

3. **Seed Saving Station (6ft × 4ft = 24 sq ft)**
    - **Drying racks:** Mesh screens for seed drying
    - **Storage:** Glass jars labeled by variety/year
    - **Work area:** Small table for seed cleaning
    - **Goal:** 50% seed self-sufficiency by Year 3

PRODUCTION SUMMARY - SHARED GARDEN

Annual Crop Beds (2,000 sq ft):

- Mixed vegetables: 1,500-2,000 kg per year
- Divided among 4 families = **375-500 kg per family**

Root Crops & Storage (2,090 sq ft):

- Storage crops: 1,950-2,900 kg per year
- Divided among 4 families = **487-725 kg per family**

Total Shared Garden Yield:

- **862-1,225 kg per family per year**
- Combined with private garden (450 kg) = **1,312-1,675 kg per family**

Food Self-Sufficiency:

- 1,500 kg vegetables/year ÷ 4 people = **375 kg per person/year**
- Target: 150 kg/person/year → **250% of target!** (surplus for preservation, sale, sharing)

IRRIGATION SYSTEM - ZONE 1 COMPLETE

Water Source

- **Primary:** Tubewell (shared with all zones)
- **Secondary:** Swale 1 overflow (passive irrigation in monsoon)

Distribution Network

Main Line: 1.5-inch PVC from tubewell to Zone 1 (100 ft run)

Private Gardens (4 families):

- **Drip lines:** 4 families × 32 ft = **128 ft drip tubing**
- **Timer zones:** 4 zones (1 per family, 15 min/day summer)
- **Emitters:** 6-inch spacing, 1 GPH drippers

Shared Garden:

- **Main line:** 1-inch PVC down center (50 ft)

- **Lateral lines:** 10 beds × 50 ft = **500 ft drip tubing**
- **Timer:** 1 zone, 20 min/day summer
- **Soaker hoses:** Root crop area (200 ft)

Water Consumption

Private Gardens:

- 4 families × 1,560 sq ft × 0.5 inches/day = **1,170 gallons/week** (summer)
- 4 families × 1,560 sq ft × 0.2 inches/day = **470 gallons/week** (winter)

Shared Garden:

- 8,360 sq ft × 0.5 inches/day = **1,250 gallons/week** (summer)
- 8,360 sq ft × 0.2 inches/day = **500 gallons/week** (winter)

Total Zone 1 Water Use:

- **Summer:** 2,420 gallons/week = **346 gallons/day**
- **Winter:** 970 gallons/week = **139 gallons/day**

Water Efficiency:

- Drip irrigation: 90-95% efficiency (vs 60% overhead)
- Mulching: Reduces evaporation 50-70%
- Swale overflow: Supplements in monsoon (Jun-Sep)

IMPLEMENTATION CHECKLIST

PHASE 1: SITE PREPARATION (Month 1-2)

Private Gardens (Per Family: ₹8,000-12,000)

Materials:

- ☐ Raised bed lumber (4 beds × 32 linear ft = 128 ft cedar or treated wood) - **₹4,000-6,000**
- ☐ Soil/compost (128 cu ft = 3.6 cubic meters) - **₹2,000-3,000**
- ☐ Drip irrigation kit (32 ft tubing, emitters, timer share) - **₹1,500-2,000**
- ☐ Mulch (1 cubic yard wheat straw) - **₹300-500**
- ☐ Hand tools (trowel, cultivator, pruners) - **₹500-800**

Labor:

- ☐ Build 4 raised beds (8 hours per family)
- ☐ Mix soil and fill beds (4 hours)
- ☐ Install drip irrigation (2 hours with shared timer)
- ☐ Plant perennial herbs (2 hours)
- ☐ Mulch beds and borders (2 hours)

Total per family: ₹8,000-12,000 + 18 hours labor

Shared Garden (Split 4 ways: ₹10,000-15,000 per family)

Materials:

- ☐ Permanent bed edging (10 beds × 100 ft = 1,000 ft bamboo or stone) - **₹8,000-12,000**
- ☐ Soil amendments (2 tons compost, 200 kg neem cake) - **₹6,000-8,000**
- ☐ Drip irrigation (500 ft tubing, fittings, timer) - **₹8,000-12,000**
- ☐ Tool shed materials (8×10 shed kit or build) - **₹15,000-25,000**
- ☐ Compost bins (3 bays, wood/bamboo) - **₹3,000-5,000**
- ☐ Shade cloth nursery (10×8 structure) - **₹2,000-3,000**

Labor:

- ☐ Mark and edge 10 beds (16 hours)
- ☐ Build tool shed (24 hours - shared)
- ☐ Build compost system (8 hours)
- ☐ Install irrigation (12 hours)
- ☐ Build nursery structure (8 hours)
- ☐ Amend soil in beds (16 hours)

Total shared: ₹42,000-65,000 ÷ 4 families = **₹10,500-16,250 per family**

PHASE 2: PLANTING (Month 2-3)

Private Gardens

- ☐ Source perennial herb plants (15 plants × ₹50-100 = ₹750-1,500 per family)
- ☐ Source flower seeds/transplants (₹300-500 per family)
- ☐ Plant first rotation of raised beds (seasonal)
- ☐ Establish watering schedule

Shared Garden

- ☐ Source seeds in bulk (₹2,000-3,000 split 4 ways)
- ☐ Start seedlings in nursery (6 weeks before planting)
- ☐ Plant first rotation (group work day - 8 hours per family)
- ☐ Plant root crops (potatoes, onions - bulk purchase ₹3,000-5,000)

PHASE 3: ESTABLISHMENT (Month 3-6)

- ☐ Daily watering and monitoring
- ☐ Weekly weeding sessions (1-2 hours per family private, 2-3 hours shared/family)
- ☐ Bi-weekly compost turning
- ☐ Monthly pest/disease monitoring
- ☐ First harvests begin (leafy greens at 4-6 weeks)

ONGOING MAINTENANCE (Per Family Time Investment)

Daily (15-30 minutes)

- Check irrigation system
- Harvest ripe produce from private garden
- Visual pest/disease inspection
- Water potted herbs on patio

Weekly (2-3 hours)

- Weed private garden beds (1 hour)
- Shared garden maintenance day (2 hours group work)
- Harvest from shared garden
- Succession planting (replace harvested crops)

Monthly (4-5 hours)

- Soil testing and amendments
- Compost turning and spreading
- Pest management (neem spray, companion planting)
- Seed starting for next rotation
- Tool maintenance

Seasonal (8-10 hours per season)

- Crop rotation planning
- Bed preparation and cover cropping
- Major compost application
- Irrigation system maintenance
- Seed saving and storage

Annual Time Investment per Family:

- **Private garden:** ~120 hours/year (10 hours/month)
- **Shared garden:** ~100 hours/year (8 hours/month)
- **Total:** ~220 hours/year (18 hours/month average)

Return on Time:

- 1,500 kg vegetables/year ÷ 220 hours = **6.8 kg per hour**
- Market value: 6.8 kg × ₹30/kg = **₹204 per hour** return!

FINANCIAL SUMMARY

Initial Investment (Per Family)

Category	Private Garden	Shared Garden (÷4)	Total per Family
Infrastructure	₹4,000-6,000	₹7,000-10,000	₹11,000-16,000
Soil/Amendments	₹2,000-3,000	₹1,500-2,000	₹3,500-5,000
Irrigation	₹1,500-2,000	₹2,000-3,000	₹3,500-5,000

Category	Private Garden	Shared Garden (÷4)	Total per Family
Plants/Seeds	₹1,000-2,000	₹1,500-2,000	₹2,500-4,000
Tools	₹500-800	₹500-750	₹1,000-1,550
TOTAL YEAR 1	**₹9,000-13,800**	**₹12,500-17,750**	**₹21,500-31,550**

Subsequent Years (Annual Costs):

- Seeds: ₹1,000-1,500 per family
- Compost/amendments: ₹500-1,000 per family
- Mulch: ₹500-800 per family
- Irrigation repairs: ₹200-500 per family
- **Total annual: ₹2,200-3,800 per family**

Return on Investment

Year 1:

- Investment: ₹21,500-31,550
- Harvest: ~1,200 kg vegetables (partial year, establishment)
- Value: 1,200 kg × ₹30/kg = **₹36,000**
- **ROI: 14-67% in Year 1**

Year 2 onwards:

- Annual cost: ₹2,200-3,800
- Harvest: ~1,500 kg vegetables (full production)
- Value: 1,500 kg × ₹30/kg = **₹45,000**
- **ROI: 1,085-1,945% annually!**

Payback Period: 7-10 months

Additional Benefits (Non-Monetary):

- Organic produce (premium quality)
- Food security (always fresh vegetables)
- Educational for children
- Physical activity and mental health
- Community building through shared labor
- Seed sovereignty (own seed stock)

CROP CALENDAR - KURUKSHETRA CLIMATE

RABI SEASON (November - March) - Cool Season

Private Gardens:

- Leafy greens: Spinach, fenugreek, coriander, lettuce, bok choy
- Legumes: Peas (trellis), broad beans

- Roots: Carrots, beets, radish, turnips
- Alliums: Onions, garlic, scallions
- Brassicas: Cabbage, cauliflower, broccoli (if space)

Shared Gardens:

- Potatoes (main crop - 800 sq ft)
- Onions (bulk - 500 sq ft)
- Garlic (bulk - 200 sq ft)
- Brassicas (cabbage, cauliflower - 400 sq ft)
- Legumes (peas - 400 sq ft)

Planting: Mid-October to November **Harvest:** January to March **Characteristics:** Best season, low pest pressure, consistent growth

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ZAID SEASON (March - June) - Hot Season

Private Gardens:

- Summer vegetables: Tomatoes, peppers, chillies, brinjal
- Cucurbits: Bottle gourd, bitter gourd, cucumber (trellis)
- Legumes: French beans, cluster beans
- Greens: Amaranth (heat-tolerant)
- Herbs: Basil, coriander (with shade)

Shared Gardens:

- Tomatoes (caged/staked - 400 sq ft)
- Peppers and chillies (400 sq ft)
- Cucurbits (bottle gourd, ridge gourd - trellis - 600 sq ft)
- Amaranth (leafy green - 200 sq ft)
- Okra (200 sq ft)

Planting: Late February to March **Harvest:** April to June **Characteristics:** Hot, dry, requires consistent watering, shade cloth may help

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KHARIF SEASON (June - October) - Monsoon Season

Private Gardens:

- Monsoon vegetables: Okra, brinjal, chillies
- Cucurbits: Bottle gourd, sponge gourd, pumpkin (trellis)
- Legumes: Beans (various types)
- Greens: Amaranth, malabar spinach
- Root: Ginger (small plot)

Shared Gardens:

- Sweet potatoes (bulk - 400 sq ft)

- Ginger (bulk - 190 sq ft)
- Okra (400 sq ft)
- Beans (400 sq ft)
- Cucurbits (pumpkin, bottle gourd - 400 sq ft)
- Turmeric (200 sq ft)

Planting: May to July **Harvest:** August to November **Characteristics:** High humidity, disease pressure, excellent growth with proper drainage

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SUCCESSION PLANTING SCHEDULE

Principle: Plant small amounts every 2-3 weeks for continuous harvest.

Example: Leafy Greens (Rabi Season)

- Week 1 (Nov 1): Plant 25% of bed
- Week 3 (Nov 15): Plant 25% of bed
- Week 5 (Nov 29): Plant 25% of bed
- Week 7 (Dec 13): Plant 25% of bed

Result: Continuous harvest from early January through March!

Apply to:

- Leafy greens (spinach, lettuce, coriander)
- Radishes
- Beans
- Cucumbers

PEST & DISEASE MANAGEMENT

Preventive Measures

1. **Crop Rotation:** 3-year cycle prevents soil-borne diseases
2. **Companion Planting:**
    - Marigolds near tomatoes (nematodes, aphids)
    - Nasturtiums near cucurbits (aphid trap crop)
    - Basil near tomatoes (whiteflies, thrips)
    - Onions/garlic near carrots (carrot fly)
3. **Healthy Soil:** Compost-rich soil = stronger, disease-resistant plants
4. **Proper Spacing:** Air circulation reduces fungal diseases
5. **Mulching:** Prevents soil splash (reduces fungal spores on leaves)
6. **Drip Irrigation:** Keeps foliage dry (reduces fungal/bacterial issues)

Common Pests (Kurukshetra) & Organic Solutions

Pest	Affected Crops	Organic Solution
Aphids	Leafy greens, peppers	Neem spray, ladybugs, strong water spray
Whiteflies	Tomatoes, brinjal	Yellow sticky traps, neem spray
Fruit Borers	Tomatoes, brinjal, okra	Hand-pick, pheromone traps, neem spray
Cutworms	Seedlings (all)	Collars around stems, hand-pick at night
Leaf Miners	Leafy greens	Remove affected leaves, neem spray
Spider Mites	Beans, cucurbits	Strong water spray, neem spray, predatory mites

Organic Spray Recipes

Neem Oil Spray (General Purpose):

- 2 tbsp neem oil
- 1 tbsp liquid soap (emulsifier)
- 1 liter water
- Spray every 7-10 days, early morning or evening

Garlic-Chilli Spray (Aphids, Caterpillars):

- 10 garlic cloves + 5 green chillies, blended
- Steep in 1 liter water overnight
- Strain, add 1 tbsp soap, spray weekly

Compost Tea (Fungal Diseases):

- 1 kg finished compost in mesh bag
- Steep in 10 liters water for 3-5 days
- Dilute 1:5, spray on leaves (beneficial microbes)

COMMUNITY COORDINATION

Labor-Sharing Protocol (Shared Garden)

Weekly Work Day: Every Saturday morning, 7-10 AM (3 hours)

Rotation Schedule (4-week cycle):

- **Week 1:** ALL families (major tasks: bed preparation, planting, harvest)
- **Week 2:** Families 1 & 2 (maintenance: weeding, watering check)
- **Week 3:** Families 3 & 4 (maintenance: weeding, watering check)
- **Week 4:** ALL families (compost turning, pest management, planning)

Minimum Commitment: 2 adults per family per work day

Benefits:

- Shared knowledge and skills
- Reduced individual burden
- Social bonding
- Accountability

Harvest Sharing (Shared Garden)

Principle: Equal distribution by weight, adjust for family size.

Process:

1. Harvest together during work day
2. Weigh total harvest
3. Divide by 4 (or proportionally by family size)
4. Each family takes their share in baskets
5. Log harvest in shared notebook (track production)

Surplus Options:

- Preserve (canning, pickling, dehydrating)
- Sell at local market (split proceeds)
- Gift to extended family/community
- Compost if excess and not preservable

Decision-Making

Quarterly Planning Meetings (4/year):

- Review past quarter's successes/challenges
- Plan next quarter's plantings (crop rotation)
- Discuss amendments to labor schedule
- Budget review and seed/supply purchases

Consensus-Based: All major decisions require 3/4 families agreement.

SEASONAL MAINTENANCE TASKS

Spring (March-May)

- [ ] Prepare beds for Zaid planting
- [ ] Start tomato/pepper seedlings in nursery (6 weeks before transplant)
- [ ] Apply compost to beds (2-inch top-dress)
- [ ] Install trellis systems for gourds/cucumbers
- [ ] Mulch heavily (3-4 inches) for summer heat
- [ ] Check irrigation system, repair leaks
- [ ] Plant heat-tolerant herbs (basil, lemongrass)

Summer (June-August)

- [ ] Daily irrigation checks (system + hand-water if needed)

- [ ] Harvest regularly to encourage production
- [ ] Monitor for heat stress (provide shade if needed)
- [ ] Monsoon prep: Ensure drainage pathways clear
- [ ] Start Kharif seedlings (okra, amaranth)
- [ ] Weed aggressively (monsoon = weed explosion)
- [ ] Pest monitoring (high humidity = high pest pressure)

Fall (September-November)

- [ ] Harvest and cure storage crops (onions, garlic, ginger)
- [ ] Prepare beds for Rabi planting
- [ ] Order seeds for Rabi season
- [ ] Plant cover crops in fallow beds (legumes for nitrogen)
- [ ] Compost spent plants from Kharif
- [ ] Start Rabi seedlings (cabbage, cauliflower in nursery)
- [ ] Prune perennial herbs (hard prune before winter)

Winter (December-February)

- [ ] Reduce watering frequency (2-3x per week)
- [ ] Protect tender plants from cold snaps (row covers)
- [ ] Harvest cool-season crops
- [ ] Plan spring planting (order seeds by January)
- [ ] Build/repair infrastructure during dry season
- [ ] Spread compost on beds for spring prep
- [ ] Prune fruit trees in Zone 2 (late January)

SUCCESS METRICS

Year 1 Goals (Establishment)

- [ ] All infrastructure built and operational
- [ ] Irrigation system functioning efficiently
- [ ] 75% of planned crops successfully grown
- [ ] Compost system producing 2+ cubic yards
- [ ] Each family harvesting 800+ kg vegetables
- [ ] Labor-sharing protocol working smoothly

Year 2 Goals (Optimization)

- [ ] 90%+ crop success rate
- [ ] Seed self-sufficiency at 30%+
- [ ] Each family harvesting 1,200+ kg vegetables
- [ ] Reduced pest/disease issues (better prevention)
- [ ] Compost system producing 3+ cubic yards
- [ ] Establish seed saving protocols

Year 3 Goals (Maturity)

- ☐ Full production: 1,500+ kg per family
- ☐ Seed self-sufficiency at 50%+
- ☐ Perennial systems fully established
- ☐ Minimal external inputs (mostly self-sufficient)
- ☐ Consider expanding productive area or diversifying

ADAPTATION NOTES

If Property Width Changes Again

- Private garden strips scale proportionally (maintain 52ft per family)
- Shared garden can expand/contract in E-W direction
- Maintain minimum 40ft depth for shared garden

If Additional Families Join

- Add proportional private strips (52ft per new family)
- Expand shared garden southward into Zone 2 buffer
- Scale infrastructure (larger compost, bigger shed)

If Water Becomes Limited

- Prioritize private gardens (daily needs)
- Shift shared garden to drought-tolerant crops
- Increase mulch thickness (6 inches)
- Consider greywater integration from houses

If Labor Decreases (Families Leave)

- Reduce shared garden size proportionally
- Convert excess beds to cover crops
- Focus remaining labor on high-value crops
- Consider hiring seasonal help for peak times

CONCLUSION

Zone 1 is the **heart of the food production system** for this 4-family permaculture farm. By balancing:

- **Private gardens** = Daily convenience + family autonomy
- **Shared gardens** = Bulk production + community building

...this design achieves:

✅ **High productivity:** 1,500 kg vegetables per family annually
✅ **Food sovereignty:** 250% of target self-sufficiency
✅ **Efficient use of narrow property:** 209ft width maximized with N-S strips
✅ **Manageable workload:** 18 hours/month per family
✅ **Economic viability:** 1,085-1,945% annual ROI after Year 1

✅ **Community resilience:** Shared labor reduces individual burden
✅ **Environmental sustainability:** Organic methods, water efficiency, soil building

Next Steps:

1. Review and approve design with all 4 families
2. Finalize budget and cost-sharing agreements
3. Source materials and schedule Phase 1 construction
4. Begin site preparation (Month 1)
5. Start planting (Month 2-3, aligned with season)

This Zone 1 design is ready for implementation! 🌱

APPENDICES

Appendix A: Recommended Seed Suppliers (India)

1. **Organic Seeds:**
    - Vandana Shiva's Navdanya (organic, heirloom)
    - Uravu (organic vegetable seeds)
    - Sahaja Samrudha (organic, open-pollinated)
2. **Hybrid Seeds (if needed):**
    - Indo-American Hybrid Seeds (IAHS)
    - Nunhems (Bayer) - widely available
    - Namdhari Seeds - reliable germination
3. **Local Sources:**
    - Kurukshetra agricultural market (mandi)
    - Local nurseries (inspect for quality)
    - Seed exchanges with nearby farmers

Appendix B: Tool List (Per Family + Shared)

Per Family (Private Garden):

- Hand trowel
- Hand cultivator (3-prong)
- Pruning shears
- Watering can (2 gallon)
- Garden gloves
- Harvest basket

Shared (Communal Garden):

- Spade (2)
- Garden fork (2)
- Rake (2)

- Hoe (2)
- Wheelbarrow (2)
- Broad fork (1 - for bed prep)
- Soil knife (4)
- Measuring tape
- pH meter
- Spray bottle (for pest management)

Appendix C: Soil Testing Protocol

Frequency: Annually (pre-Rabi planting, October)

Tests:

- pH (target: 6.0-7.0 for most vegetables)
- NPK levels (nitrogen, phosphorus, potassium)
- Organic matter content (target: 5%+)
- Electrical conductivity (salinity - important in Haryana)

Labs:

- Indian Council of Agricultural Research (ICAR) - subsidized
- Local agricultural university (KUK in Kurukshetra)
- Private labs (faster results, ₹500-1,000 per test)

Amendments Based on Results:

- Low pH: Add dolomite lime
- High pH (common in Haryana): Add sulfur, organic matter
- Low N: Neem cake, compost, legume cover crops
- Low P: Bone meal, rock phosphate
- Low K: Wood ash, kelp meal

Document Status: COMPLETE ✅
Ready for Implementation: YES
Requires: Family approval, budget finalization, material sourcing

Zone 1 Design - January 26, 2026