The Polymorphs

Project Milestone 2
Drastically Different Designs

CPSC4140/6140, Fall 2025

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Community gardens

Features

Plot Management

- Interactive map with real-time plot availability
- Seasonal reservation and waitlist system
- Plot details (size, sun exposure, accessibility)
- Digital payment processing

Gamification

- Streak tracking and achievement badges
- Impact metrics (food grown, money saved, CO2 offset)
- Photo journal and progress tracking
- Weekly challenges and leaderboards

Community

- Discussion forums and mentorship matching
- Event calendar (workshops, seed swaps, festivals)
- Recipe sharing and problem diagnosis
- Local climate planting guides

Task & Resource Management

- Crop-based reminders and weather alerts
- Tool lending library with reservations
- Harvest logging and plot planning tools
- Community composting coordination

Food Sharing

- Surplus harvest exchange
- Preservation tutorials (canning, freezing, fermenting)
- Seed saving and library
-

Administrative (for Coordinators)

- Announcements and volunteer scheduling
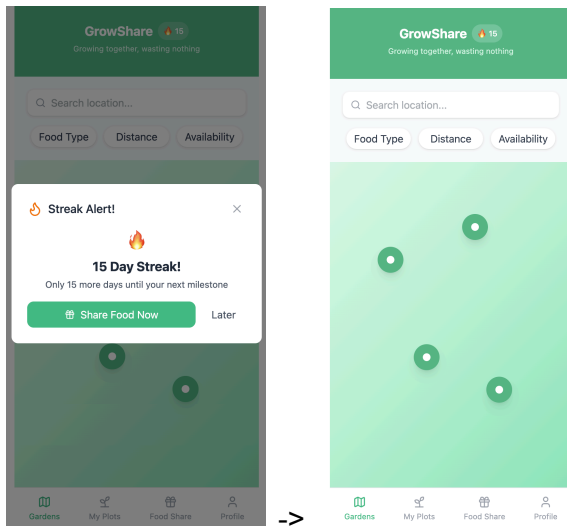- Incident reporting and membership management
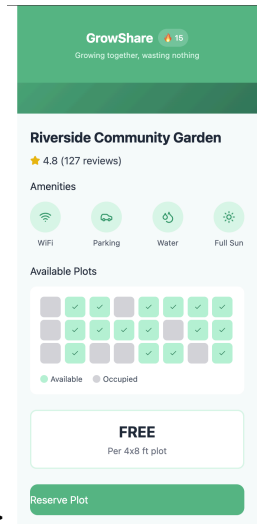
Target Users
- Off-campus students
- Working professionals
- Low-income households
- Environmentally conscious individuals
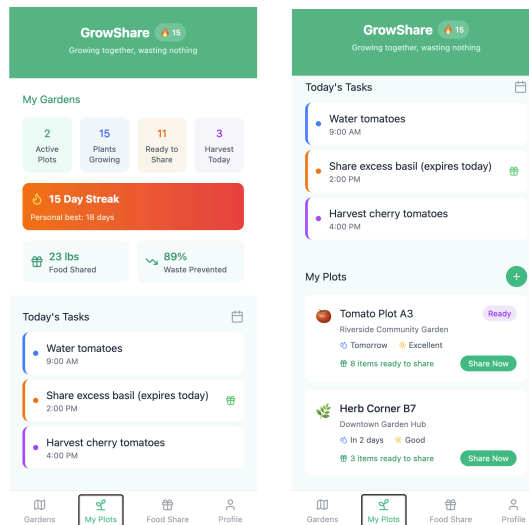- Community-minded residents

Mockup

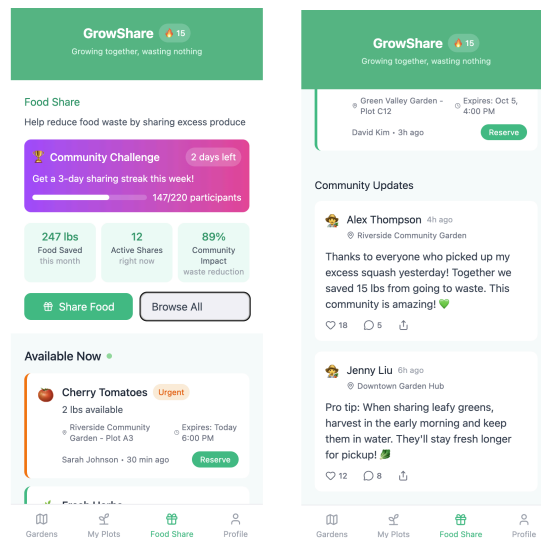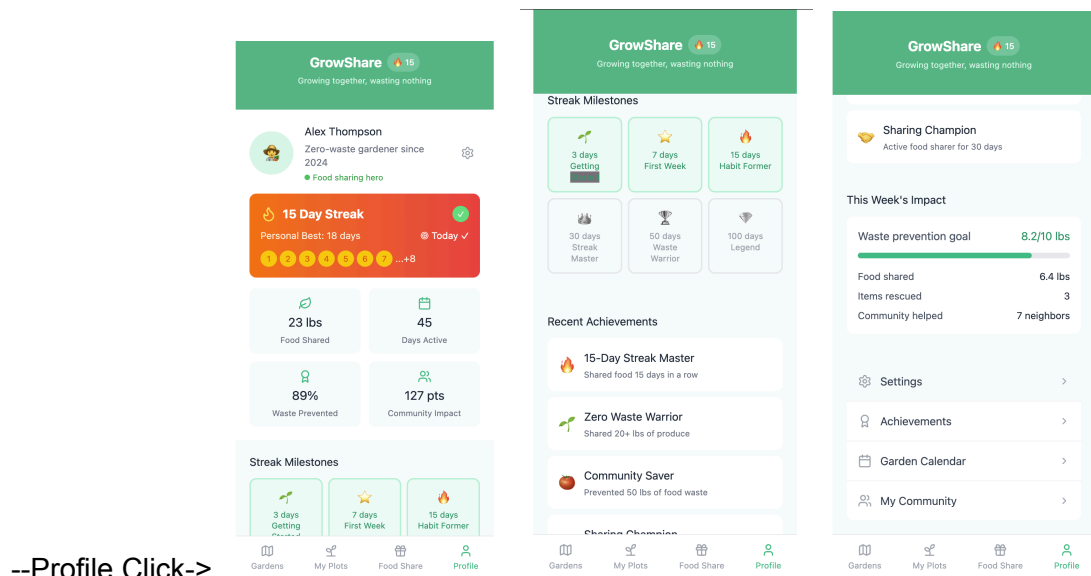Figma Link: https://cinch-bend-75997583.figma.site/

Home Screen

GrowShare 🔥15
Growing together, wasting nothing

Riverside Community Garden
⭐ 4.8 (127 reviews)

Amenities

WiFi   Parking   Water   Full Sun

Available Plots

🟢 Available   ⚪ Occupied

FREE
Per 4x8 ft plot

Reserve Plot

--Left Most Node Click->

GrowShare 🔥15
Growing together, wasting nothing

My Gardens

2	15	11	3
Active Plots	Plants Growing	Ready to Share	Harvest Today

🔥 **15 Day Streak**
Personal best: 18 days

🎁 **23 lbs** Food Shared   📉 **89%** Waste Prevented

Today's Tasks 📅

● Water tomatoes
9:00 AM

● Share excess basil (expires today) 🎁
2:00 PM

● Harvest cherry tomatoes
4:00 PM

Gardens | My Plots | Food Share | Profile

GrowShare 🔥15
Growing together, wasting nothing

Today's Tasks 📅

● Water tomatoes
9:00 AM

● Share excess basil (expires today) 🎁
2:00 PM

● Harvest cherry tomatoes
4:00 PM

My Plots ➕

🍅 Tomato Plot A3   `Ready`
Riverside Community Garden
🕐 Tomorrow   ☀ Excellent
🎁 8 items ready to share   `Share Now`

🌿 Herb Corner B7
Downtown Garden Hub
🕐 In 2 days   ☀ Good
🎁 3 items ready to share   `Share Now`

Gardens | My Plots | Food Share | Profile

-- Back Button and My Plots Click->

GrowShare 🔥15
Growing together, wasting nothing

Food Share

Help reduce food waste by sharing excess produce

🏆 **Community Challenge**   2 days left
Get a 3-day sharing streak this week!
━━━━━━━━━━ 147/220 participants

247 lbs	12	89%
Food Saved this month	Active Shares right now	Community Impact waste reduction

🎁 Share Food   Browse All

Available Now 🟢

🍅 **Cherry Tomatoes**   `Urgent`
2 lbs available
📍 Riverside Community Garden – Plot A3   🕐 Expires: Today 6:00 PM
Sarah Johnson · 30 min ago   `Reserve`

🍃 **Fresh Herbs**

Gardens | My Plots | Food Share | Profile

GrowShare 🔥15
Growing together, wasting nothing

📍 Green Valley Garden – Plot C12   🕐 Expires: Oct 5, 4:00 PM
David Kim · 3h ago   `Reserve`

Community Updates

👤 **Alex Thompson**   4h ago
📍 Riverside Community Garden
Thanks to everyone who picked up my excess squash yesterday! Together we saved 15 lbs from going to waste. This community is amazing! 💚
♡ 18   💬 5   ↗

👤 **Jenny Liu**   6h ago
📍 Downtown Garden Hub
Pro tip: When sharing leafy greens, harvest in the early morning and keep them in water. They'll stay fresh longer for pickup! 🥬
♡ 12   💬 8   ↗

Gardens | My Plots | Food Share | Profile
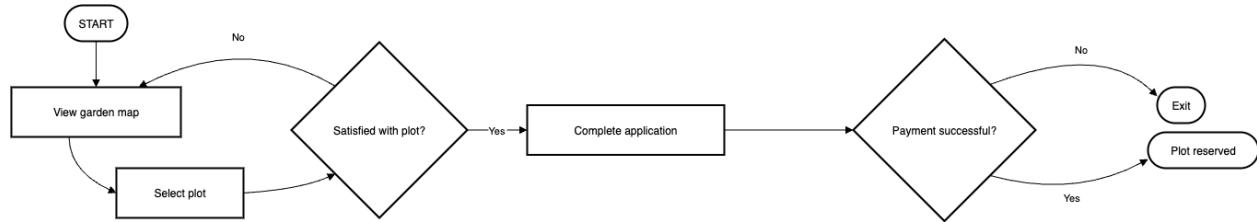
--Food Share Click->

--Profile Click->

User Story Board

Sketches & Diagrams

Flow for reserving a garden space:

Discussion about Community Gardens

Strengths:

- **Experiential education**: Users develop deep understanding of food production through hands-on growing, creating lasting behavioral change rather than superficial awareness
- **Community building**: Fosters social connections and knowledge sharing among participants, reducing isolation while promoting collective action
- **Direct waste reduction**: Homegrown produce is valued more highly, leading to measurably less waste of both garden and store-bought food
- **Addresses food insecurity**: Provides free/low-cost fresh produce to participants, particularly beneficial for low-income households
- **Mental health benefits**: Gardening provides stress relief, physical activity, and sense of accomplishment
- **Scalable model**: Can start small with one garden and expand to multiple neighborhood locations

Weaknesses:

- **High time commitment**: Requires regular maintenance (watering, weeding, harvesting), which may exclude busy professionals and students during peak academic/work periods
- **Weather and seasonal dependency**: Limited to growing seasons; winter months offer no engagement in many climates
- **Physical accessibility barriers**: May exclude elderly, disabled, or physically limited individuals who cannot perform manual labor
- **Geographic limitations**: Only works where suitable land is available; urban areas face space constraints and zoning issues
- **Wait times for plots**: Popular gardens may have waiting lists, delaying access for interested participants
- **Upfront infrastructure costs**: Requires initial investment in land, water systems, tools, and fencing before any benefits accrue
- **Knowledge barrier**: Inexperienced gardeners face steep learning curve; crop failures can discourage participation

- **Limited immediate impact**: Takes months to see results, unlike apps that provide instant value

Recipes for logged food and meal prep guides, food inventory systems

Features

Description:
FreshSave helps users reduce food waste through smart inventory tracking, personalized recipe suggestions, and gamified challenges. The app prioritizes expiring ingredients, generates optimized meal plans, and enables community food sharing - all while rewarding users with points, streaks, and achievements for sustainable habits.

Core Features:
Food Inventory Management

- Log groceries with expiration dates
- Visual alerts for expiring items (red/yellow/green system)
- Barcode scanning for quick entry
- Automatic expiration tracking

Smart Recipe Suggestions

- AI-powered recipes based on available ingredients
- Prioritizes expiring items first
- Filters: quick meals, budget-friendly, dietary preferences
- Shows ingredient match percentage
- Nutritional information (calories, servings, time)

Meal Prep Planning

- Auto-generated weekly meal plans
- Optimized to use all expiring food
- Zero-waste focused scheduling
- Drag-and-drop calendar interface
- Shopping list generation

Gamification System

- Daily streak tracking (consecutive days without waste)
- Points for logging food, cooking recipes, sharing items
- Achievement badges and levels

- Weekly challenges with bonus rewards
- Leaderboard for friendly competition
- Impact stats (pounds saved, money saved, CO2 reduced)
-

Community Sharing

- Post surplus food for neighbors
- Browse nearby available items
- Free pickup or trade system
- User ratings and profiles
- Location-based matching
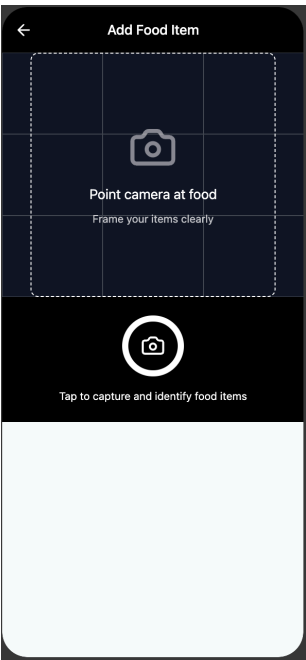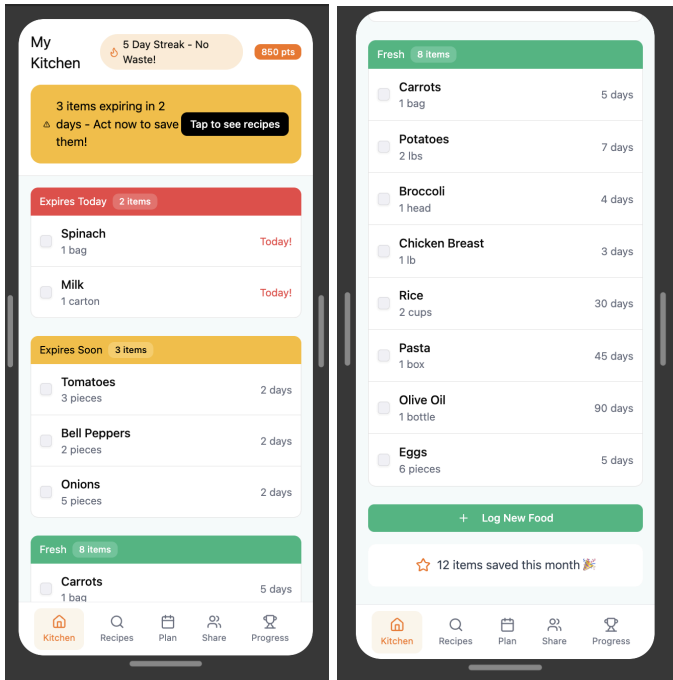- In-app messaging

Waste Prevention Analytics

- Track food saved over time
- Environmental impact metrics
- Cost savings calculator
- Monthly waste reports
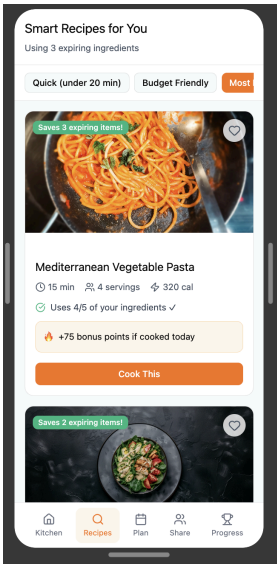- Personalized tips and insights

Target Users:

- Off-campus students with limited budgets
- Working professionals with busy schedules
- Low-income households maximizing resources
- Environmentally conscious individuals
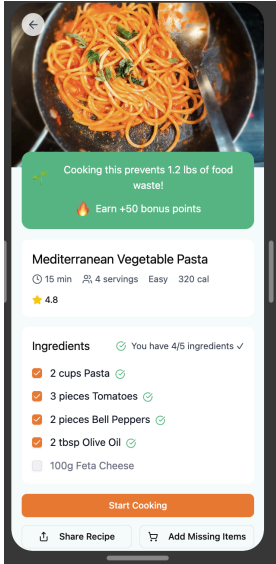- Community-minded food sharers

Mockup
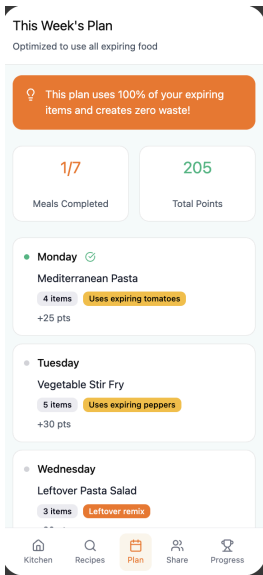
App Name: FreshSave - Food Waste Reduction & Meal Prep

My Kitchen

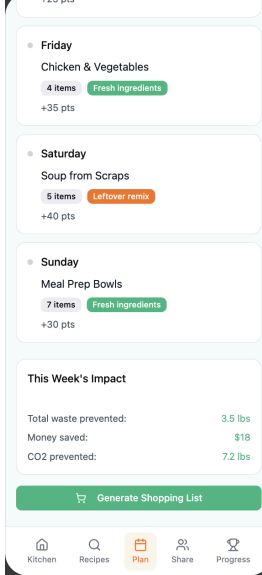5 Day Streak - No Waste!

850 pts

⚠ 3 items expiring in 2 days – Act now to save them! **Tap to see recipes**

Expires Today 2 items

Spinach
1 bag
Today!

Milk
1 carton
Today!

Expires Soon 3 items

Tomatoes
3 pieces
2 days

Bell Peppers
2 pieces
2 days

Onions
5 pieces
2 days

Fresh 8 items

Carrots
1 bag
5 days

Kitchen | Recipes | Plan | Share | Progress

Fresh 8 items

Carrots
1 bag
5 days

Potatoes
2 lbs
7 days

Broccoli
1 head
4 days

Chicken Breast
1 lb
3 days

Rice
2 cups
30 days

Pasta
1 box
45 days

Olive Oil
1 bottle
90 days

Eggs
6 pieces
5 days

+ **Log New Food**

⭐ 12 items saved this month 🎉

Kitchen | Recipes | Plan | Share | Progress

← **Add Food Item**

📷

Point camera at food

Frame your items clearly

📷

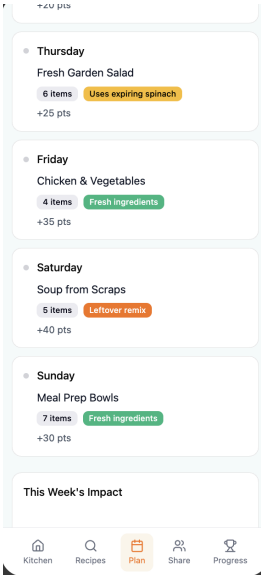Tap to capture and identify food items

--Log New Food Item->

-- Back and Recipes Clicks ->

--Cook This Click->

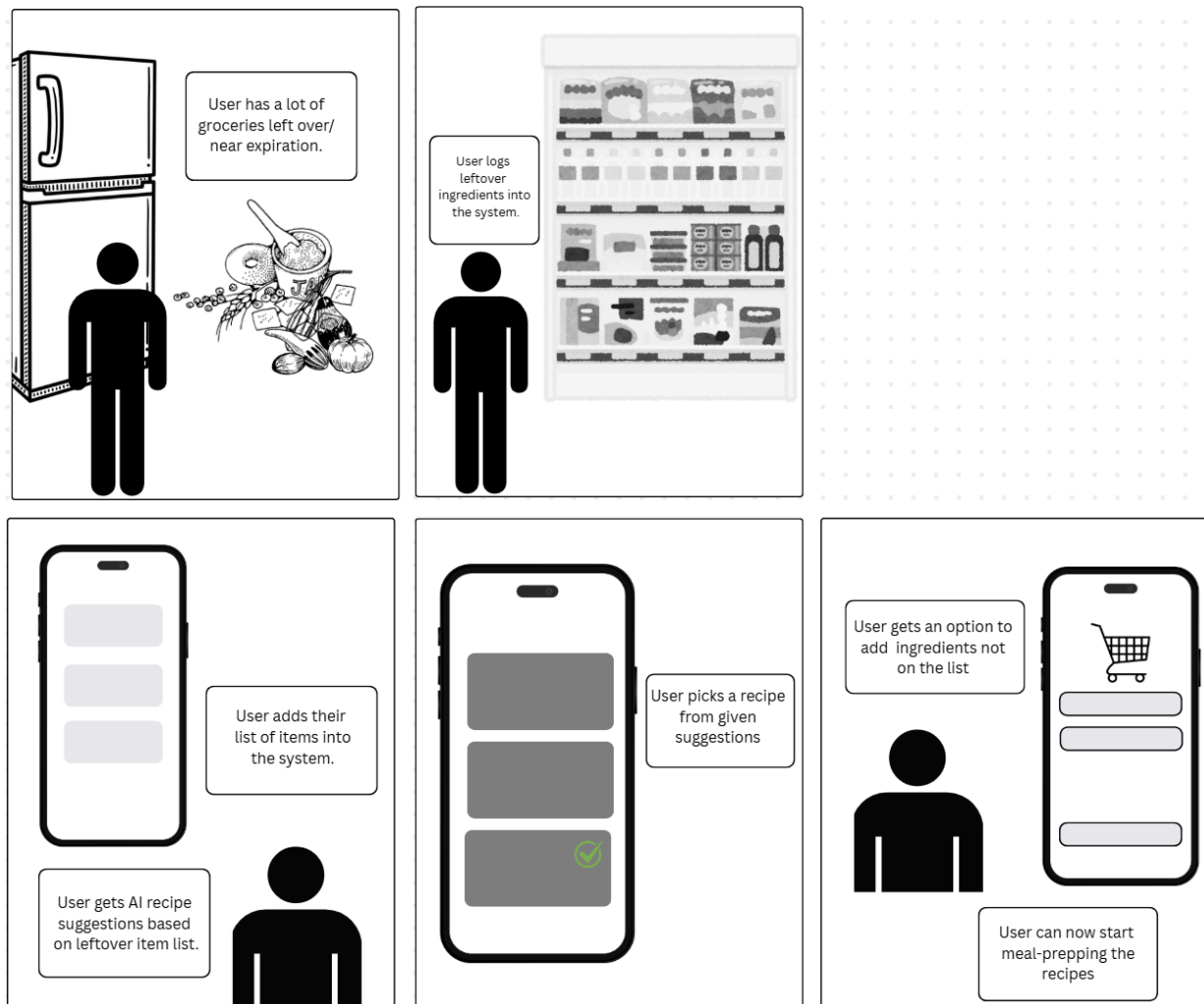--Back Click and Plan Click ->

Share & Save
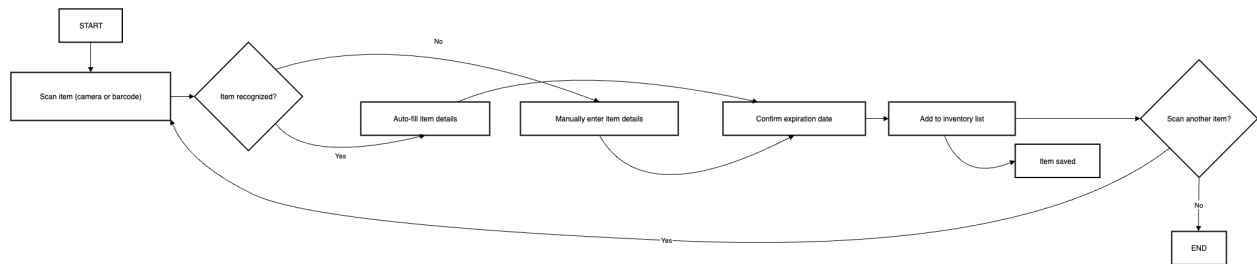Give away extras before they spoil

Your Listings

2 lbs Tomatoes	Free
🕐 Posted 2 hours ago	
Pick up by tonight!	

Available Nearby

Sarah Chen — 0.3 miles
4 pieces Bell Peppers — Free — Message
Pick up by tomorrow
🌟 Sarah has saved 15 items this month!

Mike Johnson — 0.7 miles
Mixed bundle Fresh Herbs — Free — Message
🌟 Mike has saved 8 items this month!

Kitchen | Recipes | Plan | **Share** | Progress

–Share->

Sarah Chen — 0.3 miles
4 pieces Bell Peppers — Free — Message
Pick up by tomorrow
🌟 Sarah has saved 15 items this month!

Mike Johnson — 0.7 miles
Mixed bundle Fresh Herbs — Free — Message
🌟 Mike has saved 8 items this month!

Emma Davis — 1.2 miles
2 loaves Bread — Trade — Message
Expires today!
🌟 Emma has saved 22 items this month!

+ Post Item to Share

Kitchen | Recipes | Plan | **Share** | Progress

🔥
12 Day Streak!
Keep it going!

Level 3 - Waste Warrior
150 pts until Level 4 🏆

850 pts — 1000 pts

Your Impact

| 24 lbs | 45 lbs | $156 |
| Food Saved | CO2 Prevented | Money Saved |

Achievements

First Save — Prevented your first

Week Warrior — Maintained

Zero Waste Week — Complete a

Kitchen | Recipes | Plan | Share | **Progress**

–Progress Click->

Achievements

First Save — Prevented your first food waste — Unlocked

Week Warrior — Maintained streak for 7 days — Unlocked

Zero Waste Week — Complete a week with zero waste

Community Hero — Share 10 items with neighbors

Recipe Master — Cook 25 waste-prevention recipes

Planet Protector — Prevent 50 lbs of food waste

Weekly Challenges

Cook 3 recipes this week — +150 pts
Use up expiring ingredients
1/3

Share 2 items with community — +100 pts
Help neighbors save food
1/2

Kitchen | Recipes | Plan | Share | **Progress**

Cook 3 recipes this week — +150 pts
Use up expiring ingredients
1/3

Share 2 items with community — +100 pts
Help neighbors save food
1/2

Maintain 10-day streak — +200 pts
Keep the momentum going
5/10

Top Savers This Week

1	Emma Davis	⤴ 1240
2	Alex Chen	⤴ 1180
3	You You	⤴ 850
4	Sarah Kim	⤴ 820
5	Mike Johnson	⤴ 760

Kitchen | Recipes | Plan | Share | **Progress**

User Story Board

Users:

1. Students who live off campus
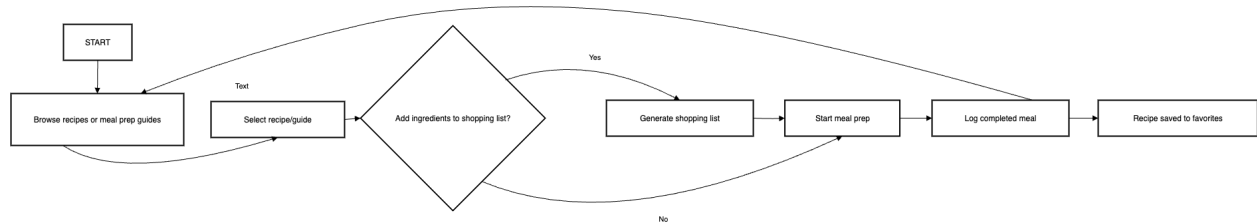2. Working professionals
3. Low-income households

User has a lot of groceries left over/ near expiration.

User logs leftover ingredients into the system.

User adds their list of items into the system.

User gets AI recipe suggestions based on leftover item list.

User picks a recipe from given suggestions

User gets an option to add ingredients not on the list

User can now start meal-prepping the recipes

Sketches & Diagrams

Logging:

Recipe:

Discussion about the Recipes System:

Strengths

- **Low barrier to entry**: Free app download with no specialized equipment required beyond a smartphone
- **Immediate value delivery**: Users get recipe suggestions instantly upon logging first items
- **Flexible usage patterns**: Works for quick 2-minute check-ins or extended meal planning sessions
- **Personalization**: AI adapts to dietary preferences, skill levels, and available ingredients for each user
- **Gamification drives engagement**: Streaks, achievements, and leaderboards provide motivation through psychological rewards
- **Quantifiable impact tracking**: Users see concrete metrics (pounds saved, money saved, CO2 reduced) validating their efforts
- **Community features reduce waste**: Enables food sharing with neighbors, creating local networks

- **Addresses root causes**: Tackles forgetting about food and lack of recipe ideas (primary drivers of household waste)

Weaknesses

- **Requires consistent data entry**: Effectiveness depends on users manually logging all groceries and updating inventory, creating friction
- **App fatigue risk**: Users may lose motivation after initial enthusiasm wanes; many food waste apps see high abandonment rates
- **Digital divide**: Excludes users without smartphones or those uncomfortable with technology
- **Privacy concerns**: Food inventory data reveals personal information about eating habits, financial status, and household composition
- **Recipe quality dependency**: AI-generated recipes may not always be appealing or culturally appropriate, leading to user frustration
- **Doesn't address impulse buying**: Only helps with food already purchased; doesn't prevent over-purchasing at stores
- **Barcode scanning limitations**: Not all items have barcodes (bulk goods, farmers market produce), requiring manual entry
- **Community sharing safety**: Liability and food safety concerns with peer-to-peer food exchange features
- **Notification overload**: Expiration alerts and streak reminders could become annoying rather than helpful

Secondary Market Routing System

The Problem

This solution caters to producers in the supply chain, specifically designed to facilitate the distribution of products and stock more easily and autonomously. In addition to producing stock, farmers also face the challenging task of distributing their goods. Some stock goes directly to manufacturers, who process the raw stock into food products sold at the markets. Other times, when secondary manufacturers aren't involved, the food goes directly to the consumer through local markets. Produced stock can also go to consumers through restaurants, which receive products directly from farmers.

To facilitate the distribution of goods, farmers establish sales channels and avenues to sell their products to these recipients, although this proves to be rather difficult. Firstly, to open these channels, farmers must identify the right consumer and effectively market their products. For marketing and communication, farmers often hire intermediaries to handle these tasks on their behalf, in exchange for a share of their earnings. Those venturing into direct farmer-to-consumer channels encounter some difficulties. For one, publicity and marketing are skills many farmers lack. With over a million farms in the US alone, smaller farms face intense competition and often lack the resources to sell their products online. Modern consumers have a preference for local, fresh, and sustainable goods. There are also several logistical issues that make it difficult to sell directly to consumers, including transportation challenges and maintaining product freshness while waiting for sales. Failing to meet these concerns can mean thousands of dollars of generated food waste, not to mention a loss in revenue for farmers

The Solution

The Secondary Marketing Routing System aims to simplify opening sales channels by raising awareness of potential customers to producers, and vice versa. It will operate as an online platform for farmers to advertise their goods to local consumers, as well as for consumers, including manufacturers, restaurants, secondary market sellers, and individual consumers. The SMRS main interface will be a map of the local community, displaying different information depending on whether the user is classified as a producer or a consumer.

For the producer users, they will see dots on the map, each representing a registered consumer or secondary producer within their area. Both producers and consumers can use the scroll wheel or the '-' and '+' buttons to zoom in and out, revealing more potential consumers. Each dot will display the name of the registered consumer above, and when clicked, it will expand the dot into a dialog box, revealing the following information.
- Name of the consumer
- The types of stock they're searching for (meat, dairy, produce, etc.)

By default, the producer view will only display the consumers whose desired stocks match what the producer has available for distribution. Producer users can click the filter icon near the top left of the page to adjust the consumers visible on the map. Producers can filter by:

- Customer Name
- Desired Goods
  - "My Goods" (Goods that the producer has registered for sale, choosing this option will override all filters below)
  - Meat
  - Dairy
  - Produce
  - Etc.
- Classification
  - Secondary Producer
  - Restaurant
  - Market
  - Independent Consumer

For consumer users, their UI will display available producers in their area. Clicking on one of the producers will expand the dot into a dialog box, which will reveal:
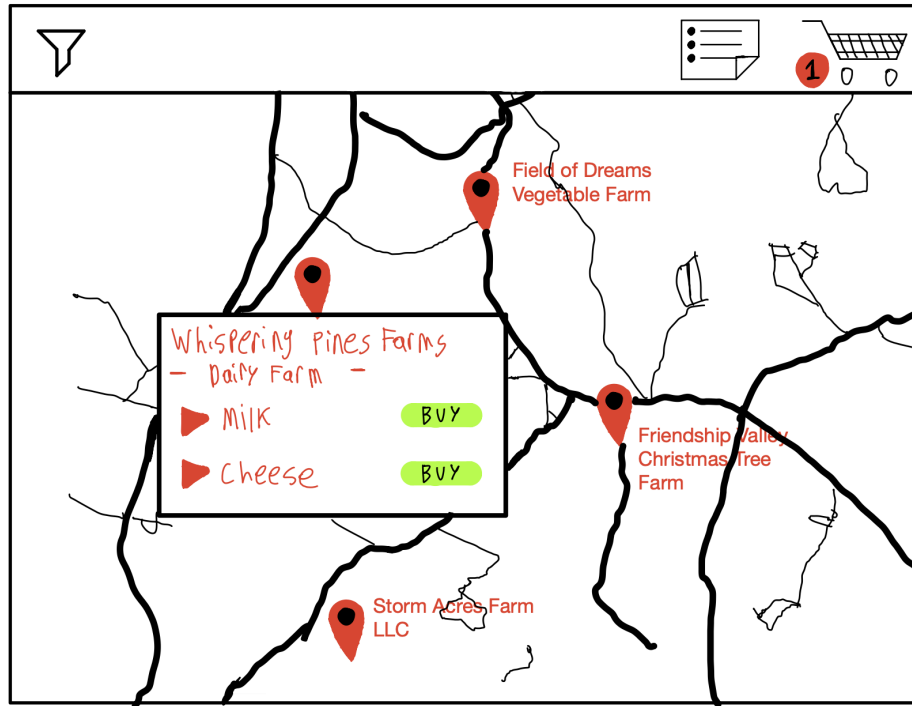- The producer's name
- Business Type
  - Produce Farm
  - Dairy Farm
  - Lumber Farm
  - etc.
- A list of stock available for sale
  - Price
  - Quantity Available
  - Freshness

Each stock item in the dialog box has a "Buy" button, which, when clicked, will direct the consumer to a purchase screen. Consumers can select the quantity of stock they want, and even set up a recurring purchase.

User Interface Diagrams
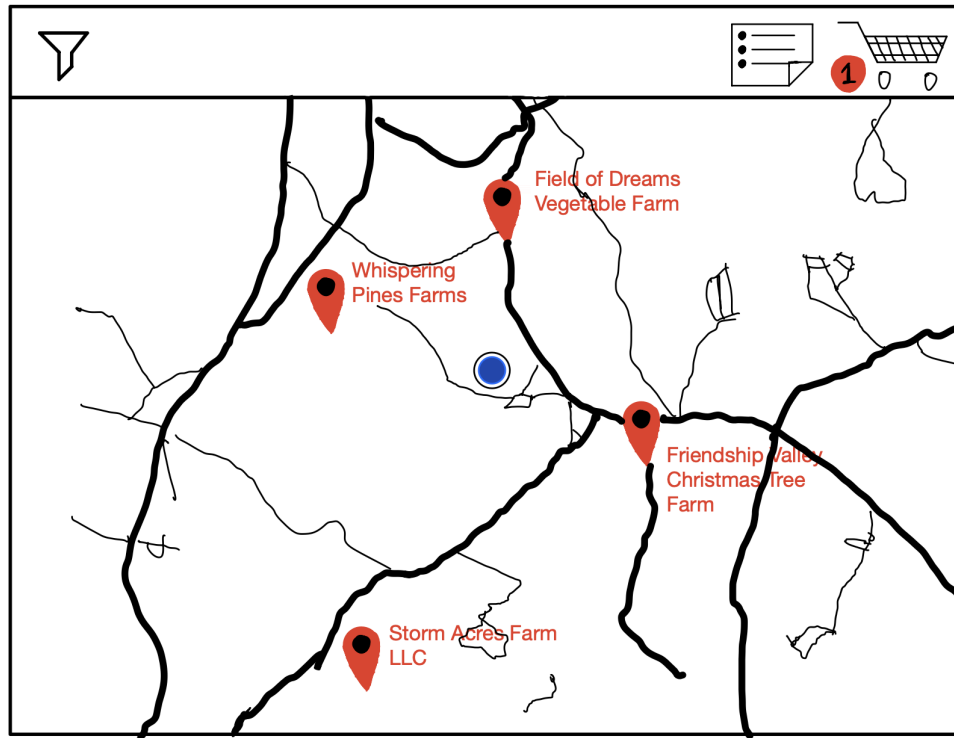
The image above illustrates the consumer view of the SMRS. The main interface consists of a map that the user can zoom in and out of with the middle mouse button. Using the user's location, it will display all registered producers in a given region. The filter icon in the top right can be clicked to expand a drop-down to adjust the producers shown. The cart icon in the top right displays all goods the user plans to purchase. In the case above, the user has one item in their cart. Clicking the cart will take them to the checkout page. Next to the cart icon is the 'shopping list' icon. The customer can click this to be taken to a page where they can refine their search for the items they are looking for. Customers can keep track of goods they plan to purchase; however, the shopping list feature is primarily intended for producers to find consumers in need of specific goods. All goods within the 'shopping list' will affect the default visibility of their business to consumers. By default, without tweaking the filter, a producer will only see a consumer if an item in their 'shopping list' matches a good sold by the producer.

By clicking on a displayed producer, the UI will display a dialog box. The user can use the box to add items to their cart.
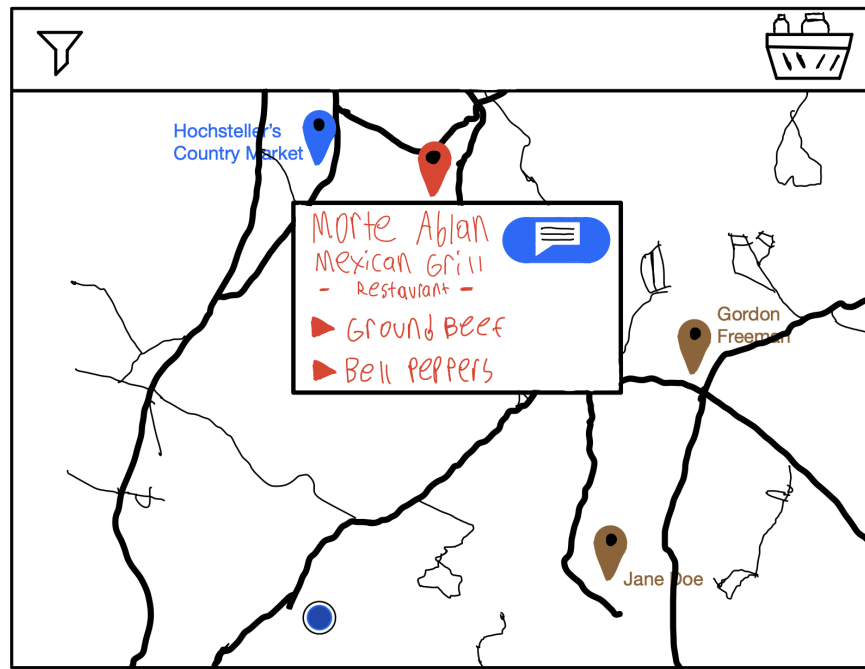
The illustration above displays the producer's view of the SMRS interface. For producers, the markers on the map are color-coded to match the type of consumer

- Red : Restaurants
- Blue : Markets
- Brown : Independent Consumers
- Orange : Secondary Producers & Manufacturers

The illustration above is from the perspective of Storm Acres Farm LLC. Notice how the location marker is in the same place as the business was displayed in the consumer view. The icons available in the producer view differ from those in the consumer view. The basket in the top right corner can be clicked to be brought to the stock page. There, the user can add new goods for sale, which will affect how their business shows up by default in the consumer view. Remember that for a consumer to be visible, they must be in need of the goods sold by the user. The filter icon can be used to disable the "My Goods" filter. When disabled, all consumers in the area will be visible regardless of what they're searching for.

Strengths and Challenges

This system provides a centralized online platform that facilitates direct connections between farmers and consumers, restaurants, and markets, potentially reducing reliance on costly intermediaries. The map-based interface with filtering options allows both producers and consumers to efficiently discover and transact with each other, improving market visibility and reducing food waste through quicker sales of perishable goods. However, the system also has drawbacks: farmers must still input and manage accurate stock, pricing, and freshness data, which could be burdensome for smaller operations. Additionally, logistical challenges like transportation, delivery, and ensuring food safety remain outside the scope of the platform, limiting its ability to fully resolve distribution issues. Adoption may be slow if producers and consumers are hesitant to adopt new sales methods. Finally, the costs of funding and maintaining the platform will necessitate a cut of producer earnings.

Overall Discussion:

Our team conducted three collaborative brainstorming sessions following IDEO's creative design principles, generating over 15 potential design concepts to address food waste reduction. We deliberately explored different intervention points in the food lifecycle, different user contexts, and different technological modalities to ensure we covered a broad design space. During these sessions, we considered solutions ranging from smart refrigerator integrations and AI chatbots to composting networks and grocery store partnerships. We also explored the possibility of libraries loaning out barcode scanning devices or tablets for food inventory tracking, which could address the technology access gap for low-income households. However, most of these ideas either required expensive hardware that our target users couldn't afford, addressed waste after it occurred rather than preventing it, or already existed in the market without meaningful differentiation. The library device lending program, while addressing accessibility concerns, would have limited effectiveness compared to a personal mobile app since food inventory needs to be checked multiple times daily and the friction of borrowing and returning devices would discourage consistent usage.

Based on our user research findings, we identified three critical pain points that consistently emerged from our work with off-campus students, working professionals, and low-income households. First, we found some people feeling disconnected from where their food comes from [1] and lacked understanding of food waste's environmental impact[2]. Second, food waste in households occurred primarily because they forgot about items or didn't know how to use leftovers effectively[3]. Third, our research revealed systemic distribution inefficiencies that caused produce to waste before reaching consumers[4][5]. These three distinct problems demanded three fundamentally different design approaches, which became our final selections: Community Gardens, FreshSave Recipe App, and Secondary Market Routing System.

The Community Gardens design addresses the disconnection problem through direct engagement with food production, requiring physical presence at outdoor locations with mobile app support for coordination and gamification. This solution operates in a completely different

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[1] Raquel. (2021, January 11). *How disconnected have we become from the food chain?*. How Disconnected Have We Become From the Food Chain? https://www.fiftyshadesgreener.ie/blog/how-disconnected-have-we-become-from-the-food-chain

[2] Hartmann, C., Lazzarini, G., Funk, A., & Siegrist, M. (2021). *Measuring consumers' knowledge of the environmental impact of foods - sciencedirect*. ScienceDirect. https://www.sciencedirect.com/science/article/pii/S0195666321005298

[3] Sideck, C. (n.d.). *Look at leftovers to reduce food waste*. Tellus. U.S. Department of Agriculture. Retrieved October 3, 2025, from https://tellus.ars.usda.gov/stories/articles/look-leftovers-reduce-food-waste

[4] ReFED. (n.d.). *Food waste data—causes & impacts*. Retrieved October 3, 2025, from https://refed.org/food-waste/the-problem/

[5] Environmental Protection Agency. (2025, June 10). *Preventing wasted food at home*. https://www.epa.gov/recycle/preventing-wasted-food-home

modality from typical food waste apps because it demands long-term commitment and hands-on learning rather than passive digital interaction. Our research data showed that gardeners who grew even small amounts of their own food developed significantly more awareness about waste and were more likely to use all parts of produce they purchased[6]. The physical and community oriented nature of this design makes it drastically different from our other two solutions, as it changes users' fundamental relationship with food through experiential learning rather than information delivery.

The FreshSave Recipe App takes an entirely different approach by focusing on household level behavior change through AI powered inventory management and gamified engagement. This mobile first solution requires no physical infrastructure and instead relies on daily micro interactions where users log food items, receive recipe suggestions, and track their waste prevention impact. The modality here is purely digital and individualistic, though community sharing features add a social dimension. Unlike the gardens which require dedicated weekend time blocks, this app integrates into existing routines through quick kitchen interactions and commute time recipe browsing. Our research revealed that working professionals cited "lack of time to plan meals" as a primary waste driver, making this just in time assistance model particularly relevant for that user segment.

The Secondary Market Routing System diverges completely from both previous designs by targeting systemic distribution problems rather than individual consumer behavior. This web based platform operates as a two sided marketplace connecting farmers directly with restaurants, markets, and consumers, addressing the supply chain inefficiencies our research uncovered. The primary users are business entities making procurement decisions at desks during business hours, though individual consumers can browse via mobile. This B2B focus makes it drastically different from the consumer focused apps, as it requires understanding of business logistics, recurring purchase agreements, and wholesale pricing models. The stakeholders here overlap minimally with our other designs, as most community gardeners and recipe app users are not restaurant owners or produce buyers for grocery chains.

These three designs collectively cover the food waste problem from production through consumption to distribution, representing intervention at fundamentally different stages of the food lifecycle. The time horizons also differ dramatically. Community gardens operate on seasonal cycles measuring success in months, the recipe app delivers immediate daily value, and the marketplace facilitates just in time transactions. The level of user commitment varies from high sustained engagement for gardening to medium daily app usage to variable occasional marketplace browsing. Technology dependency also spans a spectrum from low tech augmentation of physical gardening to high app centricity for recipes to medium facilitation of existing business transactions.

We considered creating one comprehensive platform incorporating all three approaches, but our user feedback consistently indicated preference for focused, specialized tools over complex multi-function applications. Users reported feeling overwhelmed by apps attempting to

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[6][People who grow their own fruit and veg waste less food and eat more healthily, says research](#)

solve too many problems at once and stated they would rather use separate tools that each excelled at one thing than a single mediocre all in one solution. Additionally, the three designs serve different primary stakeholders who may not overlap significantly. A restaurant procurement manager has different needs and workflows than a college student trying to use leftover vegetables.

Ultimately, these three designs were selected because they represent genuinely different solutions to food waste that are not merely variations on a theme. They differ in modality (physical location versus mobile app versus web platform), context of use (weekend outdoor activity versus daily kitchen routine versus business procurement), stakeholder groups (community members versus individuals versus business buyers), and intervention strategy (education through experience versus behavior change through gamification versus efficiency through market connectivity). Together, they demonstrate that food waste is a complex systemic problem requiring intervention at multiple points rather than a single silver bullet solution, directly reflecting the multifaceted nature of the challenge our research revealed.

Website

Find this document in the documents container on the website:
https://versatilevariable.github.io/ThePolymorphs/