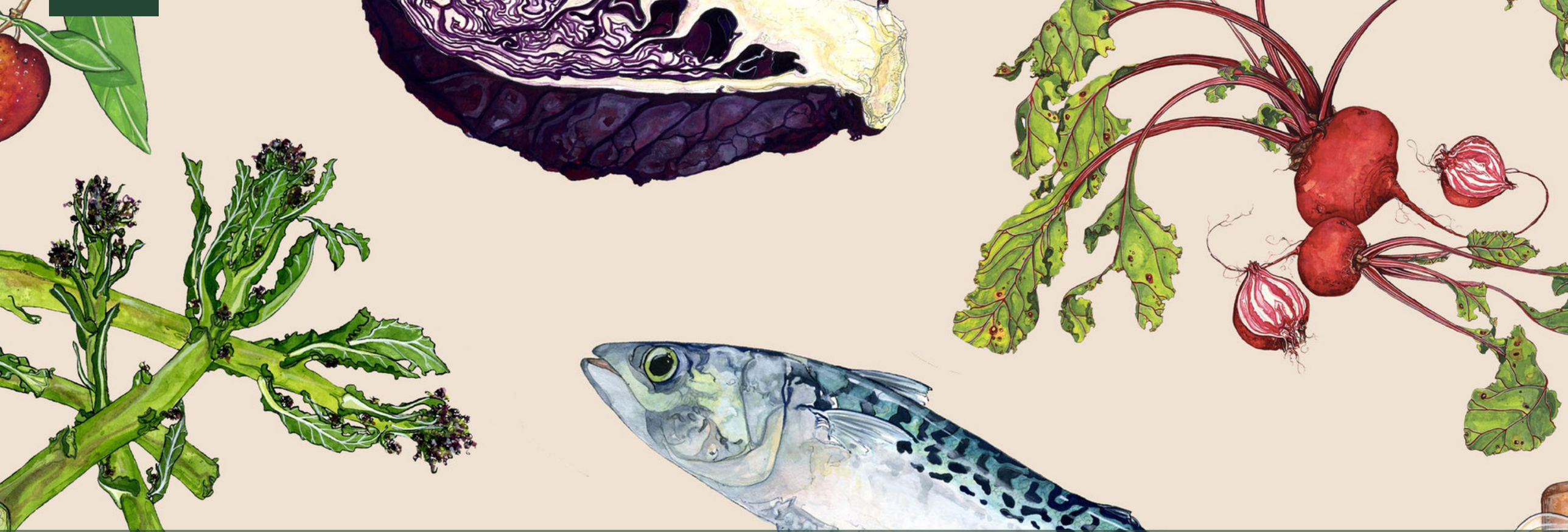


IIT INSTITUTE OF DESIGN

Envisioning Sustainable

Food Sourcing Solutions

PARTNERS

Center for Good Food Purchasing

Chicago Department of Public Health

Chicago Food Policy Action Council

COLLABORATORS

Chicago Parks District

Chicago Public Schools

YMCA

SPONSOR

New Futures Lab (Fabri-Kal)

PROJECT LEADER

IIT Institute of Design

Illustration | **Emma Dibben**

SECTION I

INTRODUCTION | **Prototyping Infrastructures**

Table of Contents

Glossary of Terms

Artificial intelligence (AI) | The branch of computer science concerned with creating intelligence in machines.

Blockchain | A technology that creates a distributed ledger of records. Each member of a blockchain system holds all records held within each block of the chain.

Intelligent Systems | Systems of products, services, and/or technologies with embedded computing power. Often includes AI and machine learning capabilities.

Machine Learning | A subset of AI that trains computer models to learn in simulated environments using recursion loops.

Near field communication (NFC) | A built-in feature of smartphones, NFC uses short-range wireless technology to securely connect electronic devices for peer-to-peer communication.[2]

Nutrient | A food or biochemical substance used by the body to grow, survive, and self-maintain; from a public policy perspective, sufficient allocation of nutrients results in the improvement of quality of life and socioeconomic advancement for a group of people or population.[3]

Prototype | Something created to test the functionality, aesthetic, or use of a design. Prototypes take many forms, including physical models, paper sketches, sample code, and digital representations.

Recursion | The self-referential loop that is created when something is evaluated in terms of itself.

Radio frequency identification (RFID) | RFID chips, or tags, use radio waves to transmit information about the objects they are attached to–commonly used for inventory management.

Sustainability | The quality of being able to meet the needs and objectives of a present situation while simultaneously guaranteeing that those needs and objectives can continue to be met in the future. Environmental sustainability entails the ongoing sustenance of earth's ability to sustain life.

Sustainable Solution | A design intervention intended to induce a social transition to address persistent social problems–such as inequity or labor exploitation–in an ongoing manner. Sustainable solutions may engage technology, politics, economics, business, culture, and public opinion in new, unorthodox ways.

Overview

This brief is divided into three main sections:

1. **Introduction |** provides information about the research context and an overview of the methodology.
2. **System of Solutions |** depicts speculative scenarios that demonstrate how new behaviors, infrastructures, and value exchanges can build a more equitable and sustainable food system. This section outlines how these scenarios are interconnected at the micro (products and services), meso (platforms and infrastructures), and macro (social system) levels.
3. **Conclusion |** includes a high-level summary and closing thoughts.

Executive Summary

PROJECT OVERVIEW

This brief was developed by graduate students and faculty as part of the Sustainable Solutions Workshop at IIT's Institute of Design. The work is the result of a 14-week collaboration between a variety of community partners involved in the Chicago food ecosystem. Designers began with the challenge of developing infrastructures to support the goals of the Good Food Purchasing Program; over the course of the semester, the challenge evolved into an attempt to define the most equitable and sustainable system for the movement of nutrients throughout Chicago.

Designers gained an understanding of the complex challenges and assumptions that underlie the current food system in the United States through site visits, secondary research, and prototyping; they eventually identified five areas in the current system where intervention is likely to have a high impact: production, distribution, procurement, consumption, and disposal.

This report outlines sustainable solutions designers believe could create systemic change at these points, transforming the food ecosystem of Chicago from one in which low prices and mass quantities prevail to one focused on collaboration and justice.

1. SCALING PURCHASING REQUIRES SCALING PRODUCTION

Finding locally grown food to meet local demand is challenge shared by all the partners; the resulting competition for local produce can only be alleviated by scaling local production.

2. A NIMBLE, FLEXIBLE SUPPLY CHAIN IS A RESILIENT SUPPLY CHAIN

Food systems are incredibly complex, and it can be difficult to transform deeply embedded processes and relationships. A supply chain that optimizes for flexibility and fluidity will be more resilient to sudden changes in the macro context.

3. COLLECTIVE IMPACT CREATES COLLECTIVE GAIN

The GFPP has the potential to increase its impact by fostering individual involvement, in addition to institutional participation, through collective purchasing (e.g. cooperatives). This would shift some power from producers to consumers, empowering citizens to demand higher standards of nutrition, labor, sustainability, animal welfare, and local food.

4. SMALL CHANGE LEADS TO BIG CHANGE

By facilitating grass-roots development, local businesses and communal stakeholders are able to leverage new technologies and infrastructures in service of large-scale change.

5. YOU ARE WHAT YOU EAT

A food system designed with the ethical, environmental, and cultural dimensions of eating in mind restores food to a position of centrality in individual and communal development.

Context | Partners

CENTER FOR GOOD FOOD PURCHASING | CFGFP

The Good Food Purchasing Program encourages large institutions to focus their spending on five core values – local economies, environmental sustainability, valued workforce, animal welfare, and nutrition. These goals build on existing momentum to increase the availability of good food throughout the region and work in tandem with ongoing efforts. The City of Chicago passed a resolution to adopt the Good Food Purchasing Program in October 2017.[4]

CHICAGO FOOD POLICY ACTION COUNCIL | CFPAC

CFPAC is a 501(c)(3) non-profit that advocates for responsible food and agriculture policy recommendations and promotes systemic policy changes allowing all communities to readily obtain healthy food. The CFPAC champions the cause of the GFPP's expansion to institutions of healthcare and higher education, as well as across the state of Illinois.

CHICAGO DEPARTMENT OF PUBLIC HEALTH | CDPH

The Chicago Department of Public Health focuses on making Chicago a healthier and safer city through providing guidance, services, and strategies for organizations and individuals.

| Collaborators

CHICAGO PARK DISTRICT | CPD

CPD is a sponsor of the Summer Food Service Program (SFSP) and Child and Adult Care Food Program (CACFP), federally funded programs that provide nutritious meals to low-income children. In 2018, CPD provided over 1,250,000 meals to Chicago's youth. CPD has adopted the GFPP, and has been working toward greater sustainability through the pilot of a composting program and the expansion of its recycling program.

THE Y | YMCA

YMCA Chicago serves tens of thousands of meals to the over 11,000 children that attend its seasonal camps each year. It also features fourteen teen programming sites, where it stages its Youth Safety and Violence Prevention program (YSVP). The sharing of meals is an important driver of community in the YSVP. While not a participating GFPP member, the Chicago YMCA is investigating avenues for improving the nutritional value of its food services.

CHICAGO PUBLIC SCHOOLS | CPS

Feeding over 360,000 students every school day, CPS has a responsibility to students and their families to provide nutritious meals. CPS has adopted the GFPP and has placed members on the Good Food Task Force to share solutions and celebrate successes.

Context | Sponsor

NEW FUTURES LAB

New Futures Lab is a design-led innovation team reimagining the role of packaging as it relates to food mobility, access, and waste reduction. They use design and design-thinking to identify inspired alternatives to the status quo and focus on long-term growth strategies to accelerate sustainable business transformation. New Futures Lab is a division of Fabri-Kal.

| Project Leader

IIT INSTITUTE OF DESIGN

IIT Institute of Design (ID), founded as the New Bauhaus, is the country's leading graduate-only design school. Teaching systemic, human-centered design, the school's pedagogical approach is centered on the methods and critical skill sets required to engage systemic and complex global challenges.

Defining the Problem

The American food system is one of the most advanced in the world. Partway through the twenty-first century, we are now just beginning to reckon with its innate systemic weaknesses:

- **Inhumane treatment** | Industrial farms and meat-processing plants subject both people and animals to deplorable conditions.
- **Unfair markets** | Small, community-minded producers struggle to compete in the market, despite growing demand for organic, locally raised food.
- **Unequal access** | Food deserts–areas without ready access to fresh, nutritious food–are omnipresent, and especially concentrated in neighborhoods of historically marginalized populations.
- **Unsustainable production** | Food production is responsible for over one-quarter of the world's greenhouse gas emissions.[5]
- **Wasteful consumption |** Nearly one third of the 430 billion pounds of food produced is never eaten.[6]

The inequitable and unsustainable nature of the system stems from a variety of interconnected elements, including but not limited to: an over-reliance on industrial agriculture, outdated technologies, government subsidies and lobbying efforts, institutionalized racism, fractured municipal efforts, and a lack of education about food production and nutrition.

The partner organizations we worked with on this project – the GFPP, CPS, CPD, and the YMCA – are advocates for one particular group in Chicago who experience the brunt of these systemic injustices: Chicago's children, many of whom reside in food deserts and depend upon institutional providers like our partner organizations for their nutrition. We began by situating ourselves in these organizations' efforts to bring good food to these youth, thereby grounding our approach to redesigning America's food system in the point-of-view of future generations.

Good Food Purchasing Program

The Good Food Purchasing Program (GFPP) allows public institutions to "lead the movement towards a values-based food system" by leveraging their billions in collective purchasing power.[4] When large institutions demand higher standards for their food and refuse to subsidize the inequity in food systems, large-scale shifts can occur. The program started in Los Angeles in 2012, and the policy was adopted by the City of Chicago in 2017.

The program centers on a framework to score suppliers across five values:

- **Local Economies |** Support small and mid-sized agricultural and food processing operations within the local area or region.
- **Nutrition |** Improving equity, affordability, accessibility, and consumption of high quality culturally relevant Good Food in all communities is central to our focus on advancing Good Food purchasing practices.
- **Valued Workforce |** Provide safe and healthy working conditions and fair compensation for all food chain workers and producers from production to consumption.
- **Environmental Sustainability |** Source from producers that employ sustainable production systems, protect and enhance biodiversity, and reduce food waste and greenhouse gas emissions.
- **Animal Welfare |** Provide healthy and humane care for farm animals.

Prototyping Infrastructures

PROTOTYPING TO LEARN

"Prototyping to learn" is a design concept that focuses on rapid iteration and experimentation. Designers quickly build physical objects to communicate ideas and provoke critique. Such "discursive designs" – designs that facilitate discourse – are used as tangible props to explore opportunity areas, understand technical affordances, and surface ethical concerns. Ideas are subsequently refined by pivoting (exploring a new idea) or iterating (incorporating feedback into the next prototype).

FEATURES

Attributes of products and infrastructures devoted to specific functions – i.e. facilitating specific actions among the actors involved.

AFFORDANCES

Actionable properties embedded in products and infrastructures that shape interactions.

IMPACTS

Collective or individual forces that promote change within the dynamics of the system; impacts can be intentional or unintentional.

GOALS

Desirable high-level results based on actors' ambitions in designing the interventions and taking actions.

Methods

DESIGN APPROACH

As the Good Food Purchasing Policy rolls out and expands across the Chicago metro area, design presents unique value in envisioning the infrastructures needed for its sustained success. Designers took a non-linear, prototype-led approach to examine and respond to the social, cultural, natural, political, manufactured, financial, digital, and human implications of the proposed infrastructures. Below are some key activities conducted in this research:

- EXPLORING

  Whenever possible, researchers immersed themselves in the partner organizations' context by visiting their locations and observing activities as they occur. Research locations included:

  - Union Park (Chicago Parks District)
  - Rautner Family YMCA
  - Open Kitchens (Chicago Public Schools)

- EXPERIMENTING

  Each week, designers produced prototypes of features to support the partner organizations realize their GFPP goals.

- Infrastructural solutions explored across micro, meso, and macro levels were later aggregated and synthesized into the solutions presented in this brief.

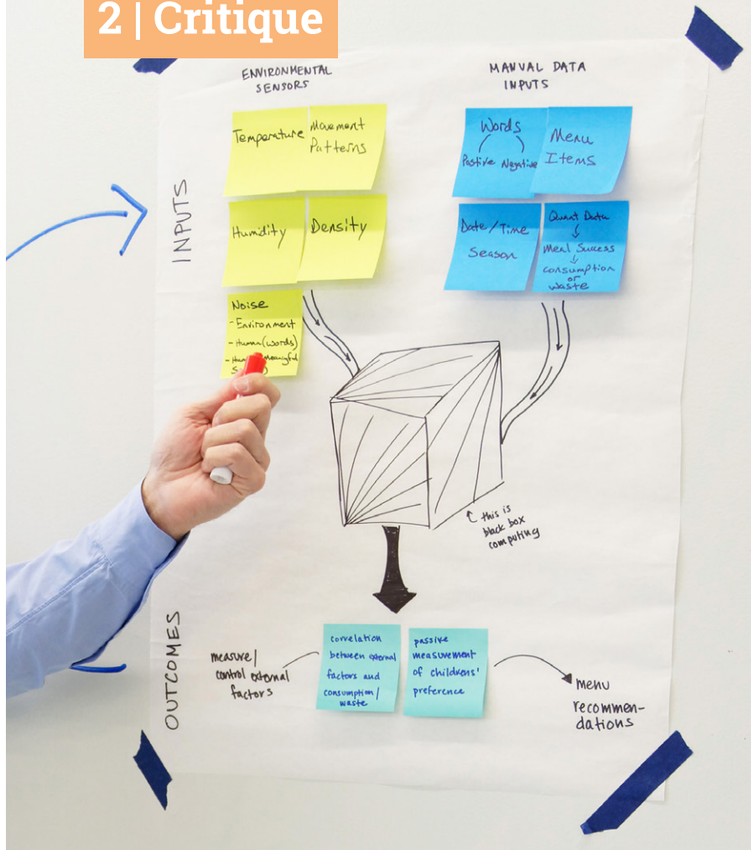
- ENVISIONING

  The solutions collectively narrate a future vision for the Good Food Purchasing Policy as a platform to support the sustainable movement of nutrients in Chicago.

1 | Prototype

Prototypes physicalize an idea enabling designers to experiment, or “tinker,” with the technological, infrastructural, and conceptual affordances.

2 | Critique



Critique makes proposals stronger by subjecting designs to a variety of contextual considerations: ethics, system requirements, and unintended consequences.

3 | Iterate

Iteration enables communal feedback to be incorporated into subsequent prototypes, while pivoting enables new ideas to be explored.

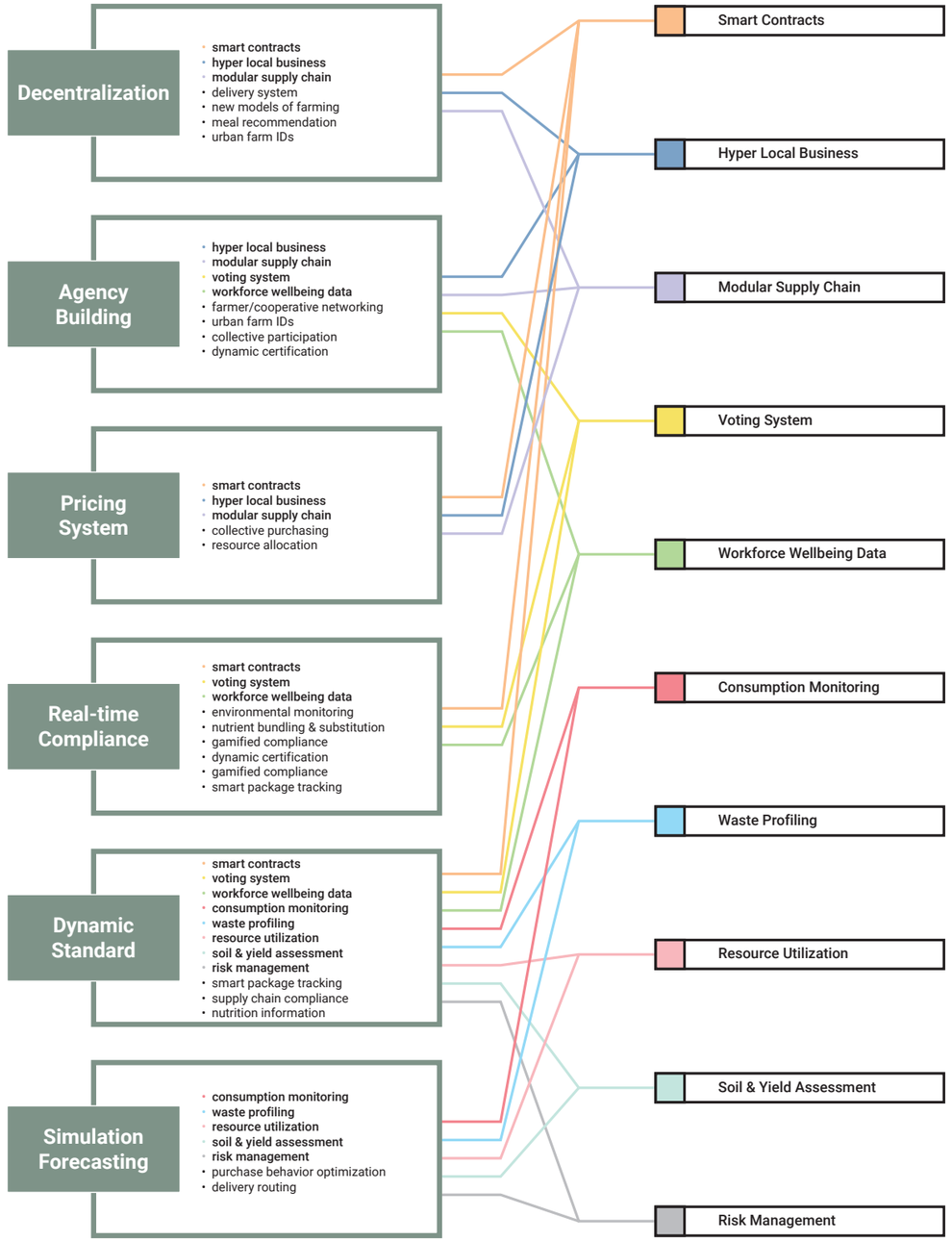
Thematic Clusters

SYNTHESIZING SYSTEMIC FEATURES

After 12 weeks of prototyping, the team synthesized common features across scenarios into thematic clusters. This afforded modular components that could be reused and leveraged across the system in a variety of combinations. The ten collective features were then combined to support six high-level systemic requirements:

- Decentralization
- Agency Building
- Pricing System
- Real-time Compliance
- Dynamic Standards
- Simulation Forecasting

These abstract concepts were then explored through situated actions tied to GFPP goals, which form the system of solutions portion of this brief.



Brief

INITIAL FRAMING

Research and develop evocative visions of sustainable solutions to food sourcing in Chicago through scenarios and narratives that take into consideration the social, economic, and environmental goals of the Chicago Good Food Purchasing Program.

Photo | Scott Warman

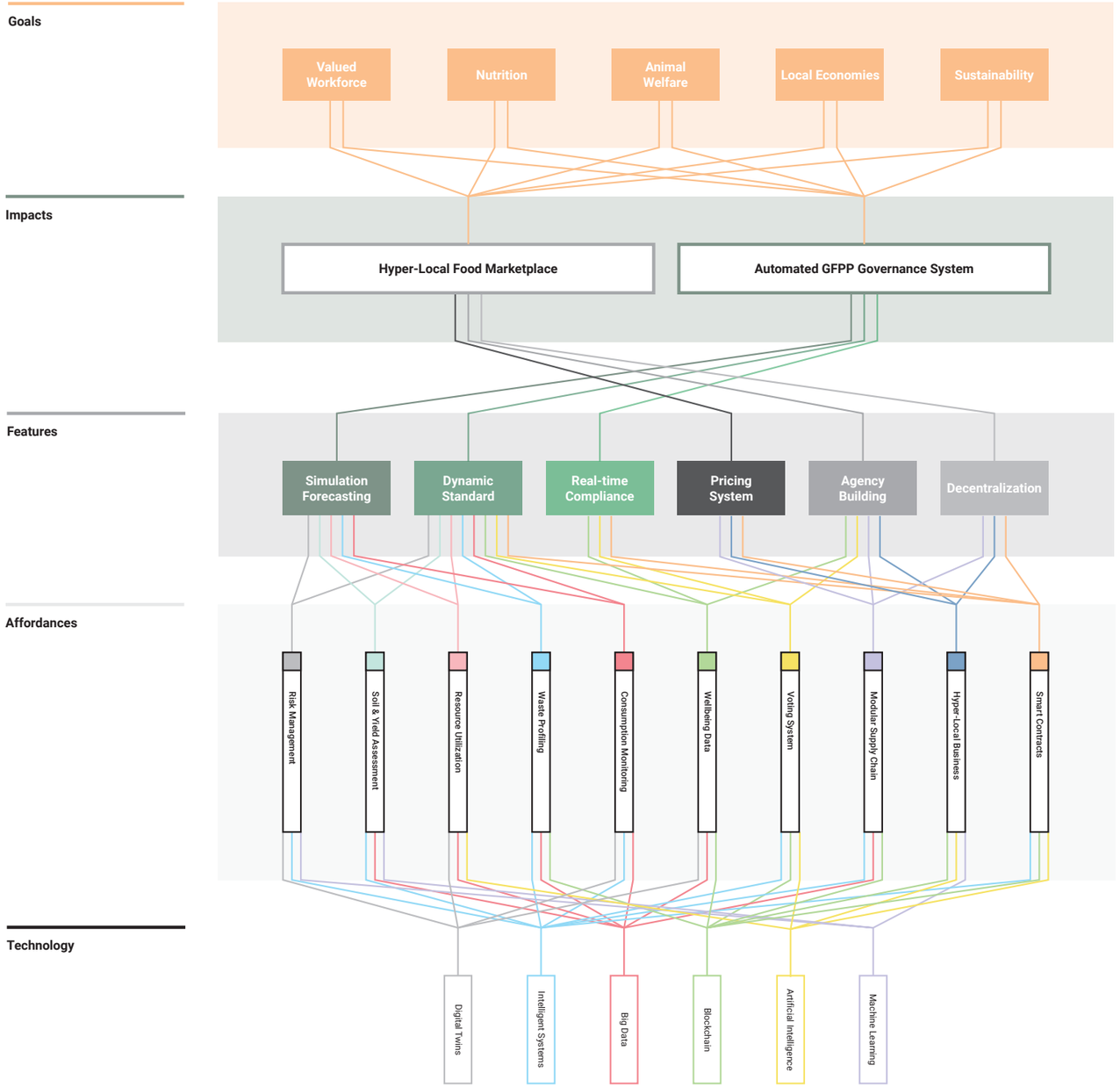
Reframe

INITIAL FRAMING

Research and develop evocative visions of sustainable solutions to food sourcing in Chicago through scenarios and narratives that take into consideration the social, economic, and environmental goals of the Chicago Good Food Purchasing Program.

HOW MIGHT WE...

Infrastructure a self-organizing system (marketplace) for the equitable and sustainable movement of nutrients throughout Chicago?



SECTION II

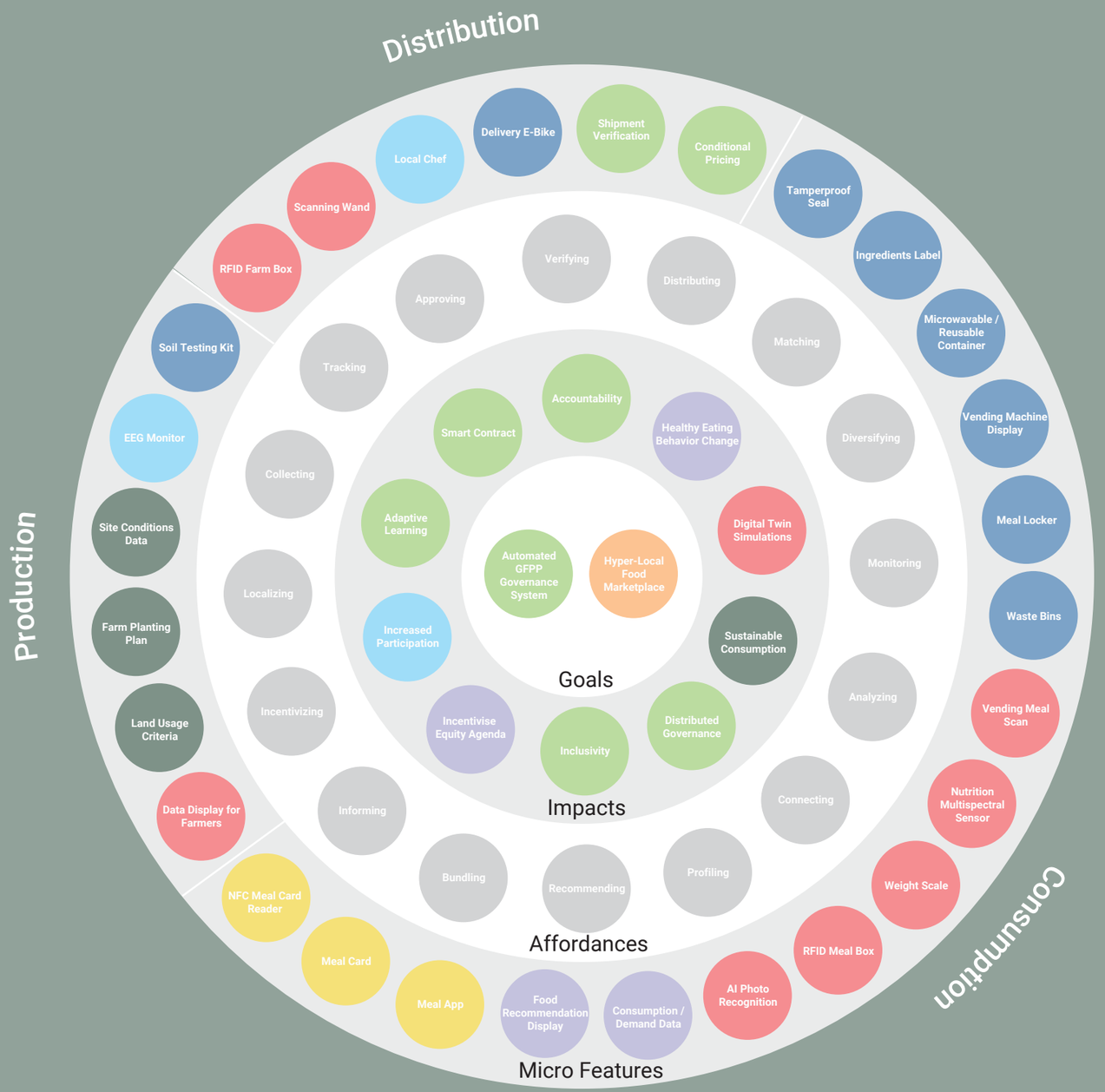
DESIGNS | **System of Solutions**

Landscape Overview

FROM POLICY POLICE TO SELF-GOVERNING SYSTEM

As it stands, GFPP is a policy compliance framework, leveraging the buying power of large actors to drive systemic change. Expanding on this existing model, we envision a future in which the goals of GFPP are embedded into a structured marketplace (i.e. a platform or set of platforms) in which not only buyers, but suppliers are encouraged to engage in transactions of mutual self-benefit.

Intelligent systems facilitate the flow of relevant economic, environmental, and consumer data, allowing for greater agility and flexibility for suppliers. The use of blockchain injects trust into the system. All of this lowers barriers of entry to local entrepreneurs and cooperatives, while the application of real-time scoring systems around GFPP compliance enable the marketplace to drive towards socially just practices that facilitates the distribution of nutrients to undernourished areas. A hyper-local focus encourages a fragmented, albeit coordinated and resilient, system of supply to move nutrients where they are demanded.



Governance

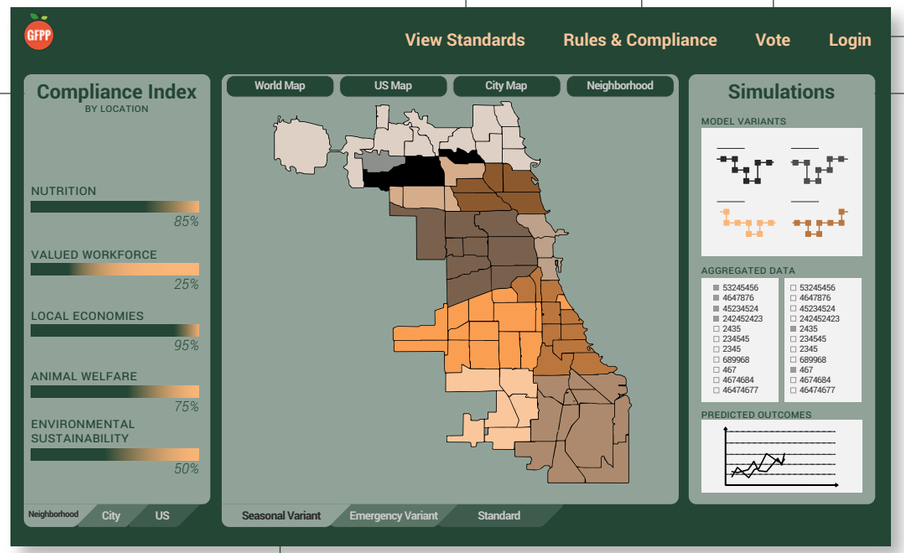
How to distribute the power of market governance throughout this system remains a topic of some debate. Policymakers, procurers, and suppliers large and small, clearly, all have a stake in the metrics of compliance.

As a result, we envision that a balance of power between these different actors will be maintained through tiered blockchain-enabled permissions, so that all actors throughout the supply chain can participate.

Rules for Compliance
Rules govern how individual entities meet compliance standards based on a set of if-then parameters. These rules are adaptive based on conditional data inputs reflected in the compliance Index.

View Dynamic Standards
Actors are able to view smart contract standards based on GFPP goals:
- Nutrition
- Workforce
- Local Economies
- Animal Welfare
- Sustainable Sourcing

Compliance Index
Data collected from site level sensors and interventions provide real-time information about GFPP compliance to assist in intelligent decision making.



Vote
Actors in the system are given voting rights based on their permission level. Different permission levels are weighted according to their role. Votes are cast to make changes to the conditions for GFPP compliance.

Login
Actors and participants in the system are given login credentials. Permission levels are based on login credentials and allow different actors different levels of access and capabilities.

Digital Twin Simulations
Actors can manipulate conditions and parameters for GFPP compliance to see how rules will play out before making a decision and casting a vote.

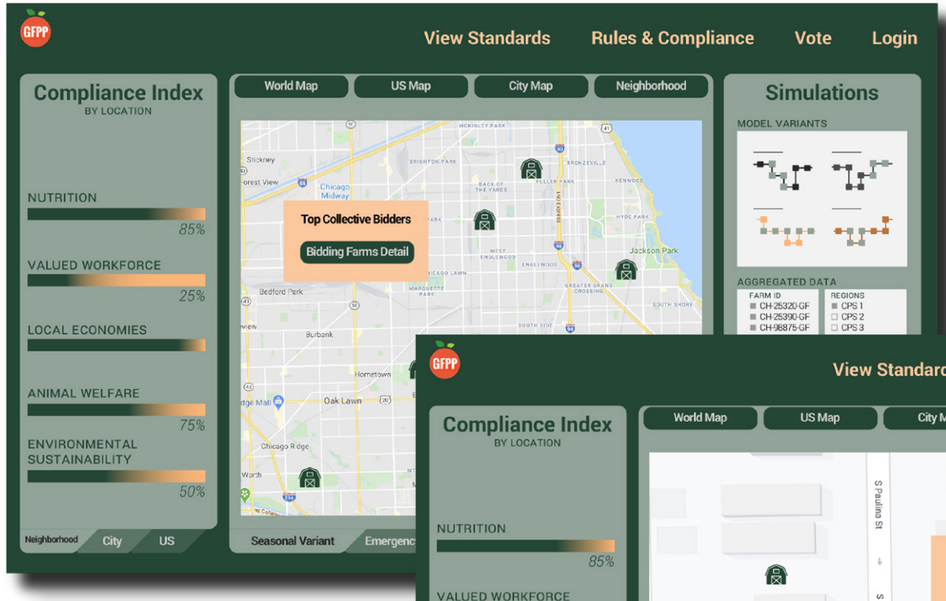
Geo-Located Data
Ability to explore conditions on a hyper local scale. Actors can connect variations in compliance to GFPP standards as a result of global and local forces.

Governance

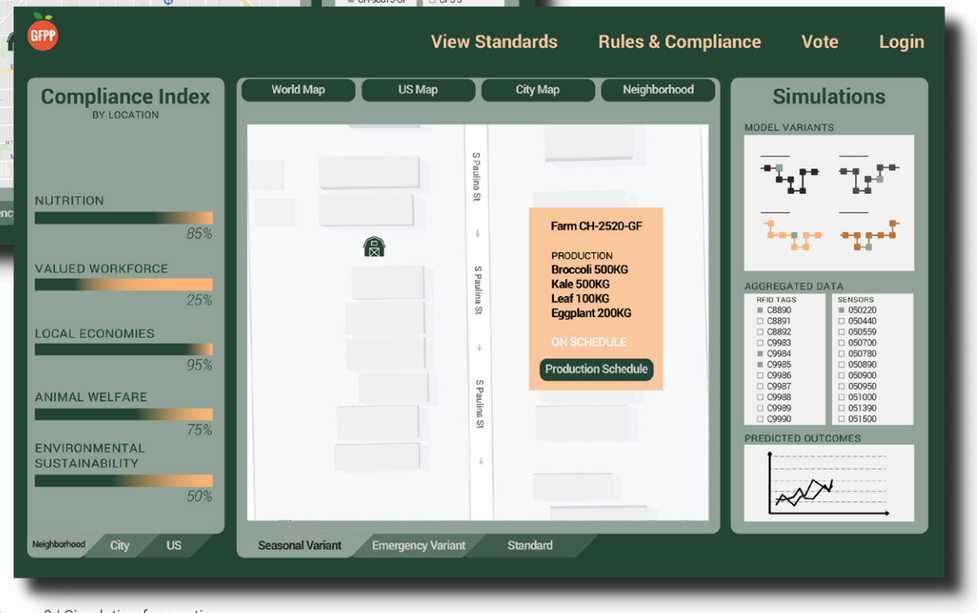
COMPLIANCE PROFILING & SIMULATION FORECASTING

In aggregate, **profiles of compliance** (screen 1) would enable governance stakeholders to identify patterns of success among individual or collective actors in the system according to the five GFPP values. Contrarily, the dynamic system would allow for shifts in incentives to counterbalance the natural ebb and flow of demand for a particular GFPP value (e.g. workforce) in order to continually push system participants toward compliance on all five values.

On a complementary note, **simulation forecasting** (screen 2) would enable one to assess the implications of large-scale behavioral shifts (i.e. "variant") or stress test the resiliency of the system against a hypothetical or forecasted threat (i.e. "emergency") – whether an unforeseen global pandemic, like COVID-19, or a predictable trend, such as rising temperatures due to global warming.



Screen 1 | Compliance profiling



Screen 2 | Simulation forecasting

Situated Action | Localizing Food Production

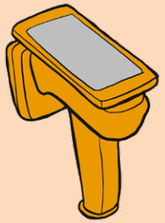
Increasing the supply of food available within Chicago through a network of local, urban farms is a sustainable way to offset the negative impacts of food transportation. These farms would provide meaningful, equitable work for those living in historically disinvested communities while repurposing the city's stagnant brownfields. Connected, intelligent systems lower barriers-to-entry, all while monitoring nutrient quality and environmental sustainability.

SOIL AND LIGHT SENSOR KIT

Real-time data on light quality, soil moisture, PH, and temperature populates the smart profile of the lot and its associated crops.

PRODUCTION PLANNER

Coupling farm-level sensor data with projections for institutional demand enables farmers to sync their production schedules to meet local supply needs.



DIGITAL TRACKING

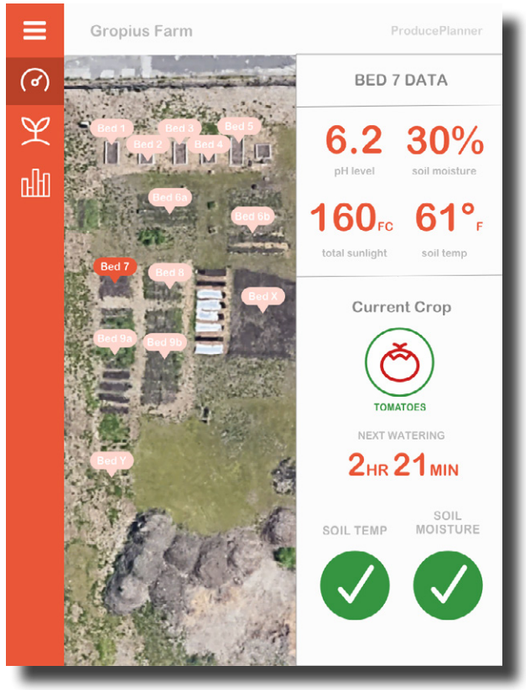
Each food package contains a unique identifier to validate its movement. Once the package is scanned, the information is added to the blockchain for verified transparency throughout the supply chain.

Speculative Interfaces | Localizing Food Production

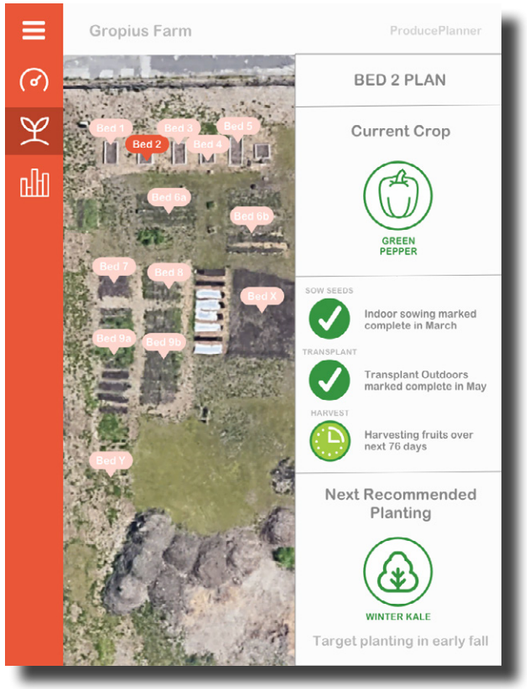
SMARTER PRODUCTION PLANNING

Organizing outputs from hyper-local producers to support community needs and institutions is critical to our envisioned infrastructure.

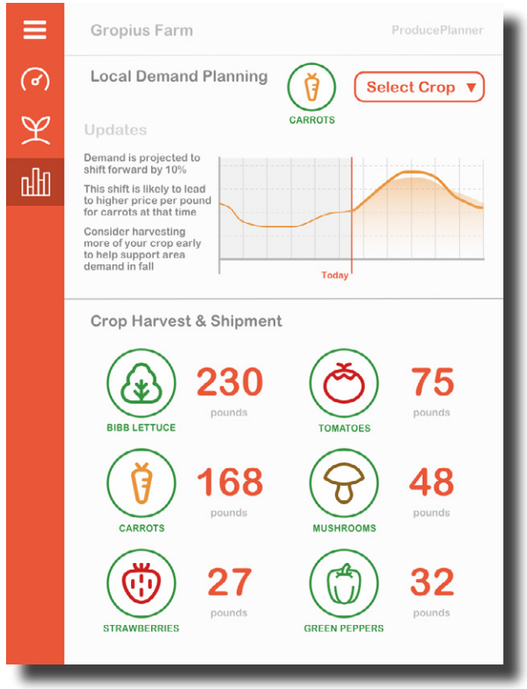
To foster local supply, system participation must be encouraged through low barriers-to-entry and de-risked enterprise. By embedding soil and light sensors on each lot, smarter profiles can be built for each farm down to the individual bed. With visibility into the system-modeled demand projections (provided by institutional smart contracts), farmers can create custom plans that specify the type of crop to plant, where it should be planted, and when the plant should be harvested to support peak demand within the area.



Screen 1 | Monitoring performance



Screen 2 | Recommending actions



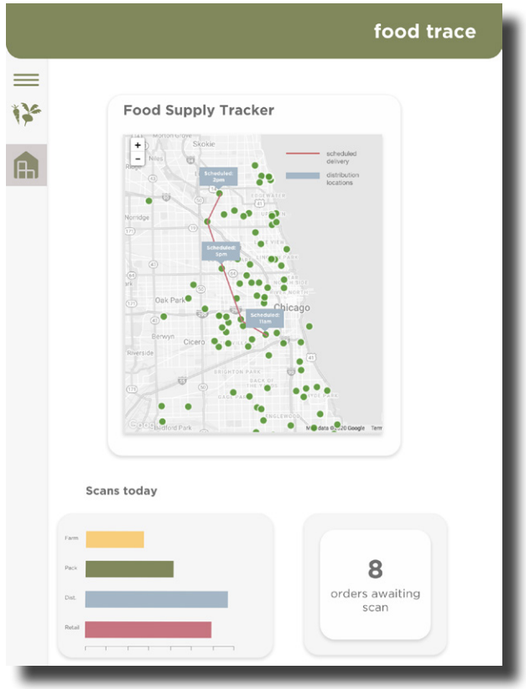
Screen 3 | Forecasting demand

Speculative Interfaces | Localizing Food Production

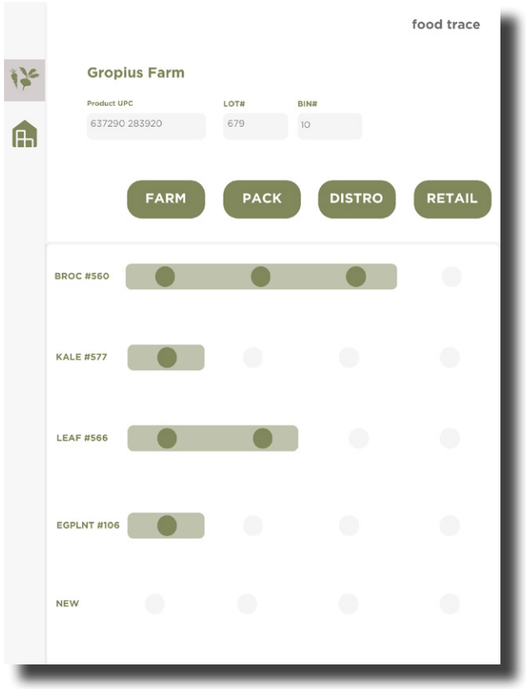
FOOD TRACEABILITY

Farmers embed RFID sensors into their lots, establishing infrastructure that traces local food supply from farm to fork.

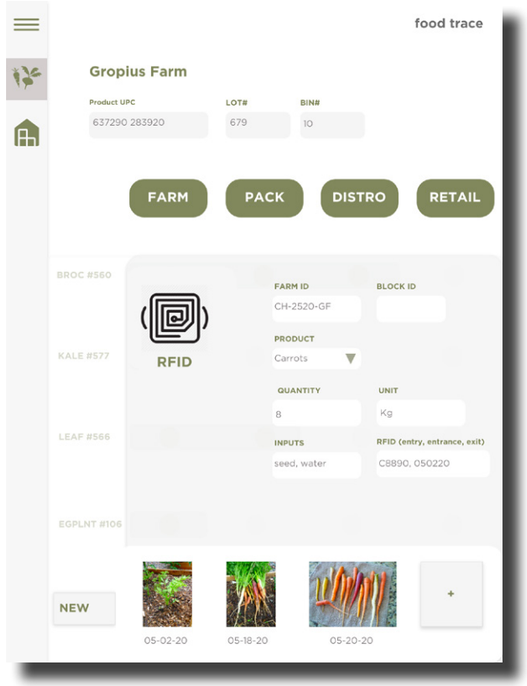
The product view (screen 1) communicates the initial entry point of the crop or product into the system. When farmers enter new crops to the system, it records their production timeline. The farm view (screen 2) shows local producers a snapshot of their products through the supply chain. The city view (screen 3) incorporates data from all active producers, distributors and retailers. This dashboard indicates the flow of produce throughout the system and highlights new scans that occur within the system.



Screen 1 | Product View



Screen 2 | Farm View



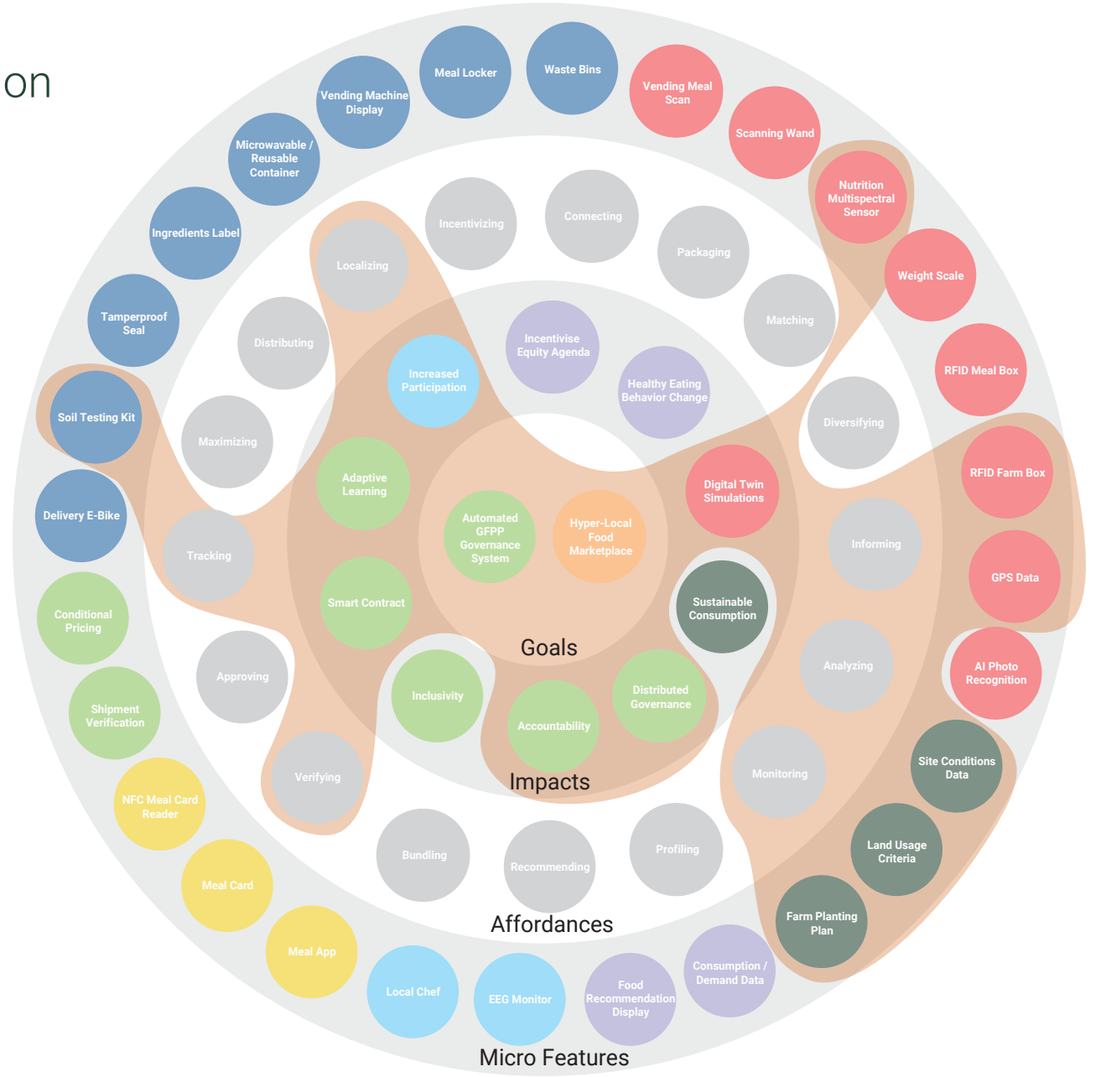
Screen 3 | City View

Anatomy of Infrastructure | Localizing Food Production

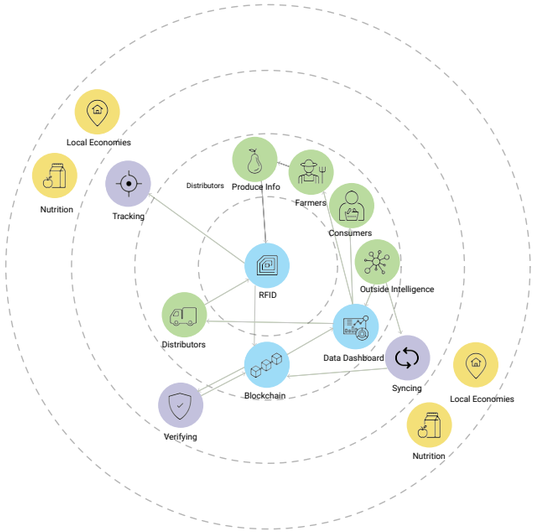
For producers, the intelligence created by ground data collection, demand projections, and smart contract systems - as well as the visualization of this data - enables more agile, adaptive, and resilient production planning. This will lower barriers of entry to hyper-local farm cooperatives and enhance risk management for farmers.

At the same time, the embedding of RFID sensors along the food value chain from farm to fork enables comprehensive traceability, creating transparency that increases the accountability of actors in the system.

These two aspects of the solution will escort and accelerate the development of a hyper-local food marketplace from the production side.

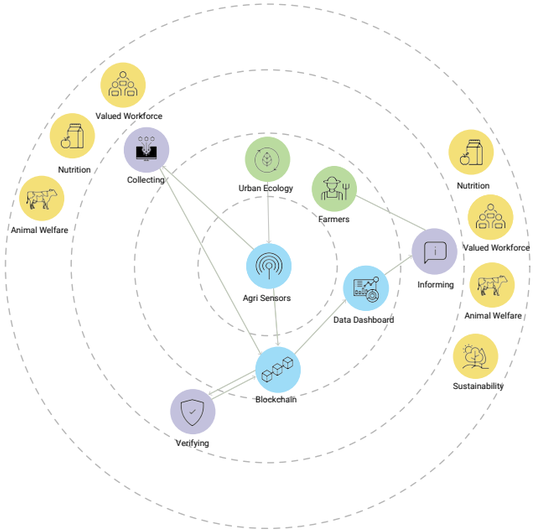


Anatomy of Infrastructure | Localizing Food Production



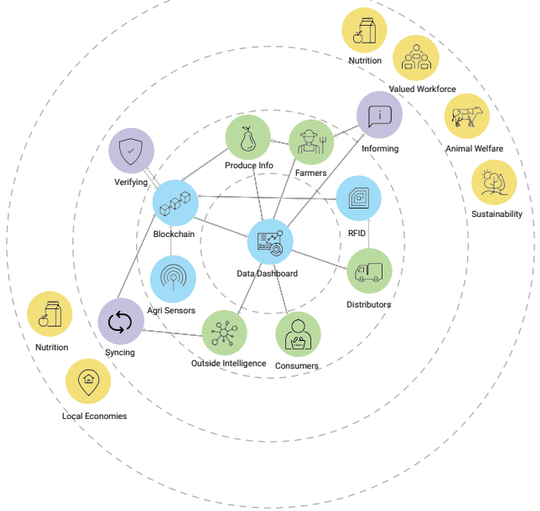
TRANSPARENT SUPPLY CHAINS

RFID tags track movement throughout the supply chain, while blockchain supports encryption and verification of all data inputs. Working in tandem, the two technologies provide transparent quality assurance to producers, distributors, and consumers.



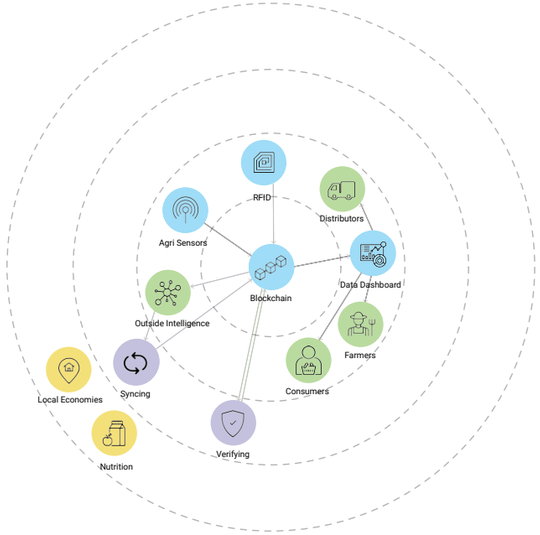
INTELLIGENT PLOTS

Sensors capture different aspects of urban ecology (temperature, humidity, etc.) and provide farming advice alongside projected yields, in order to derisk urban farming.



DYNAMIC DASHBOARD

A dashboard interface synthesizes information inputs for farmers, consumers, and distributors to provide a holistic picture of a farm's performance and the quality of food.

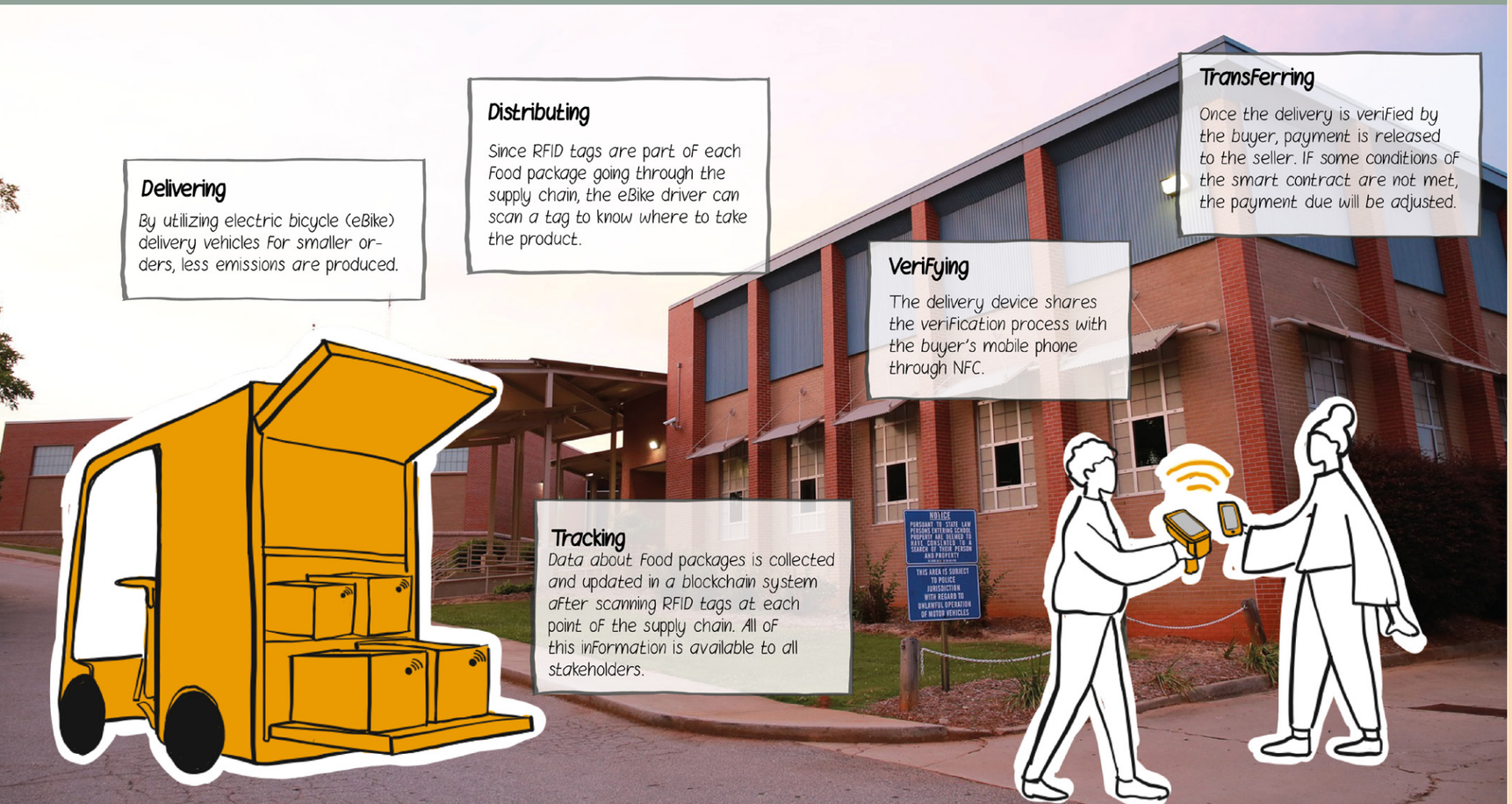


DISTRIBUTED LEDGER

The distributed ledger of blockchain affords independent security of the whole system, allowing for the independent verification of all RFID and ambient sensor data.

Situated Action | Flexible, Traceable Distribution

In service of a fully accountable supply chain, packages are tracked throughout hyper-local modes of transit. End-users verify their order arrived as expected and contribute knowledge to the network. Transactions are supported by smart contracts that allow individual actors to join the ecosystem.



DIGITAL TRACKING

Each food package contains a unique identifier to validate its movement. Once the package is scanned, the information is added to the blockchain for verified transparency throughout the supply chain.

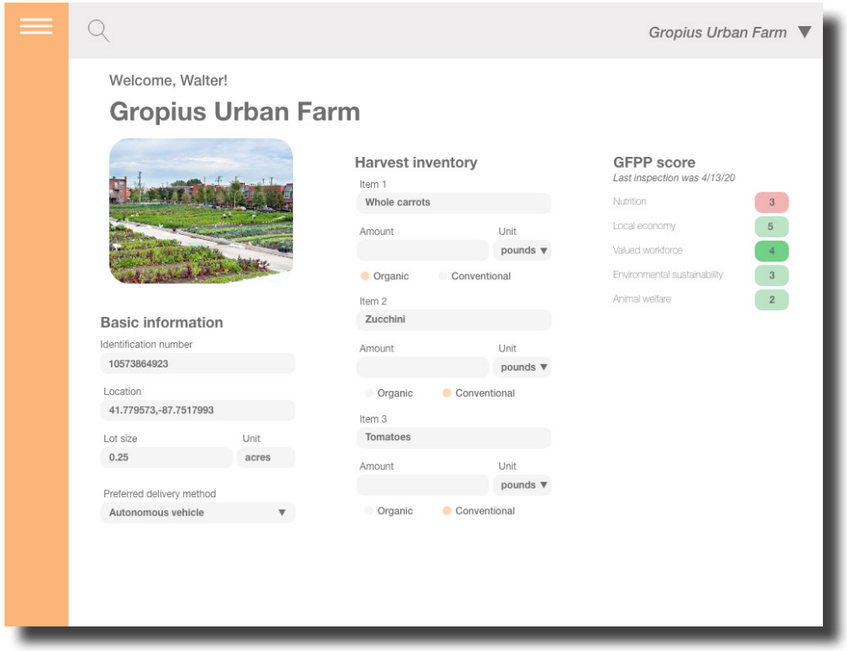
SMARTPHONE SCAN

Buyers confirm delivery by scanning the delivery device with their smartphone using near field communication. This confirmation is shared with the seller and prompts the delivery verification process. All information is recorded in the blockchain.

EBIKE DELIVERY

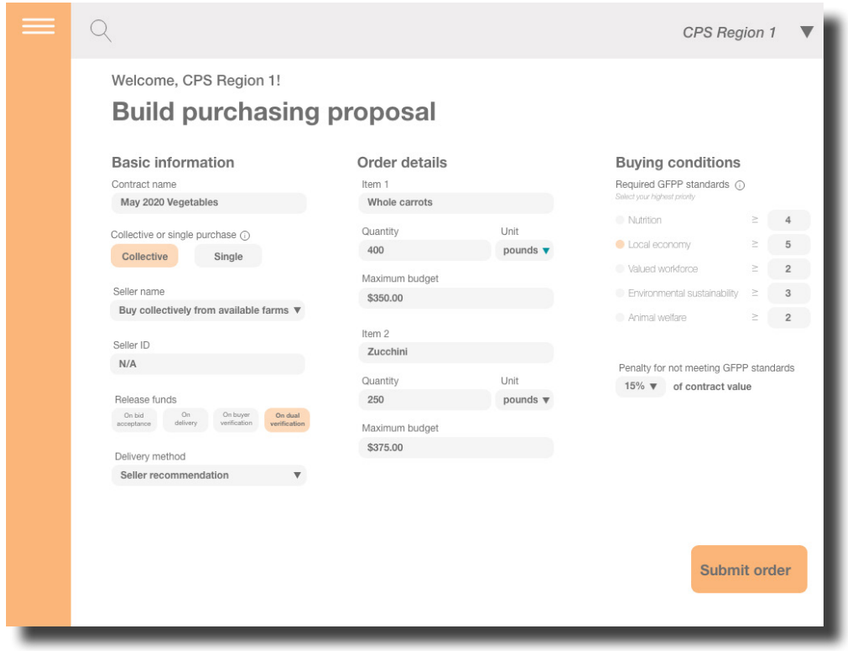
For short-range deliveries (i.e. from urban farms and kitchens) electric bicycles are used for low-emissions delivery.

Speculative Interfaces | Flexible, Traceable Distribution



VENDOR PROFILE

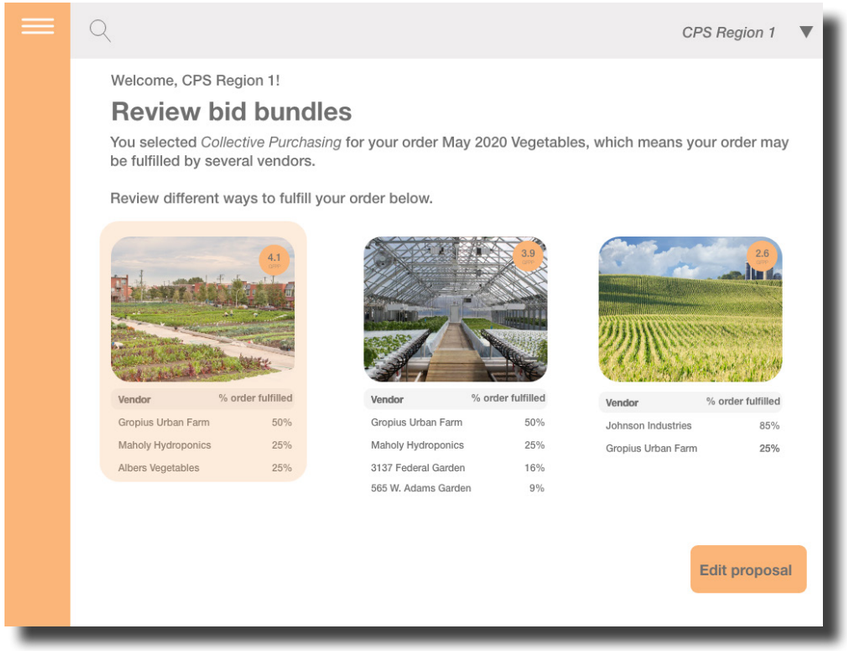
Vendors keep track of their inventory and real-time GFPP scores through the smart contract platform. The vendor profile is tagged to each purchase order, enabling dynamic feedback.



CREATE PURCHASE REQUEST

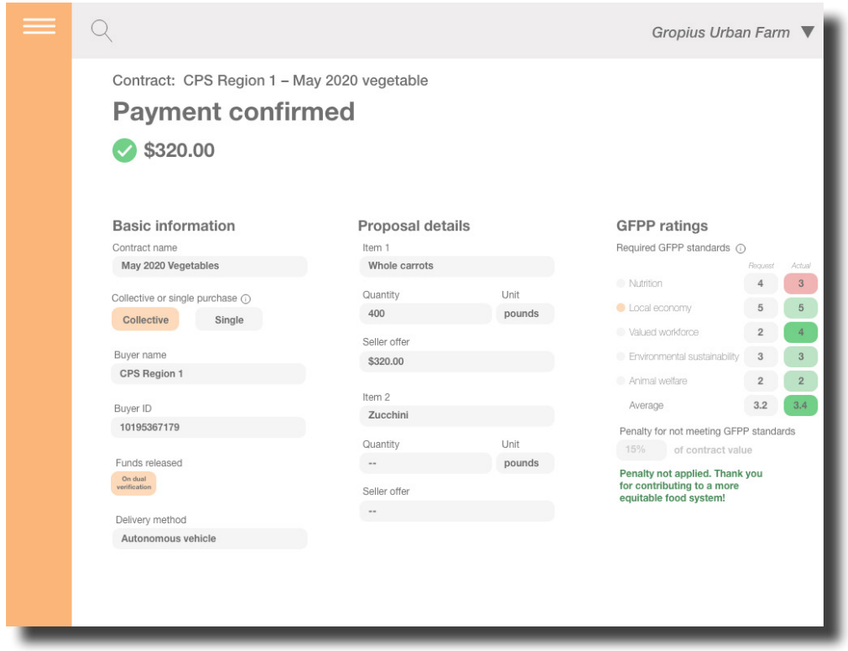
Purchasers input their order, desired quantity, and sourcing parameters (single vs. multiple suppliers). Their GFPP preferences are integrated directly into the purchase request, indicating the threshold scores required on each of the five GFPP values.

Speculative Interfaces | Flexible, Traceable Distribution



REVIEW VENDOR BIDS

Purchasers are presented with vendor options that meet their desired quantity, price, and preferred GFPP scores. In this example, collective purchasing allows the purchaser to achieve more of their GFPP goals by bundling several vendors together. The platform's machine learning component learns purchasing preferences over time to make the best recommendation for them.



CONFIRM PURCHASE

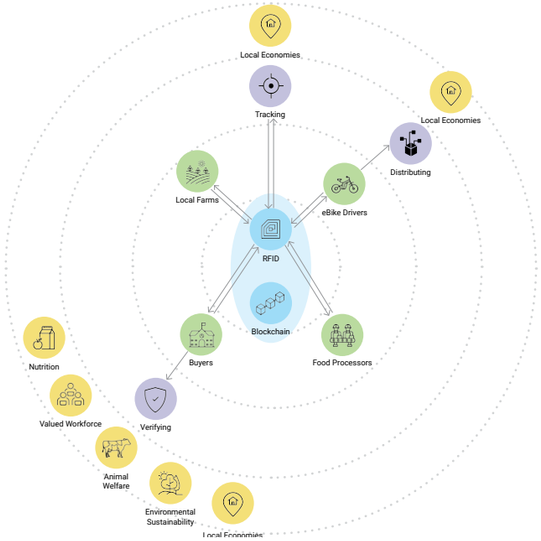
Once a purchaser accepts the vendor bid, the smart contract is complete. Funds are dispersed automatically according to the agreement. All this activity is captured in a blockchain ledger associated with the specific order.

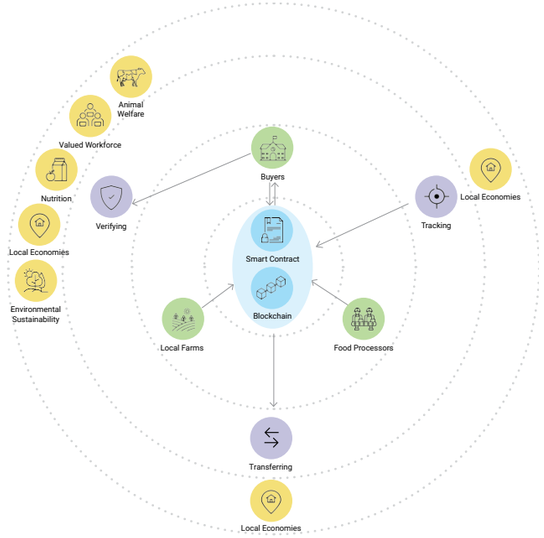
Anatomy of Infrastructure | Flexible, Traceable Distribution

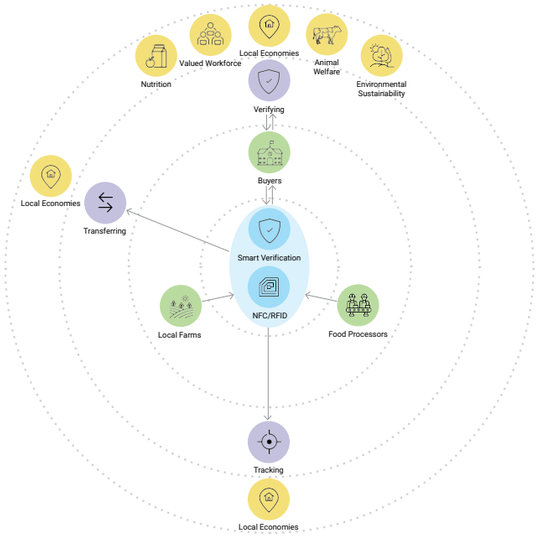
DISTRIBUTION

For procurers looking to comply with GFPP goals, machine-learning enables real-time GFPP scoring of prospective vendors, while a dynamic recommendation feature facilitates optimal decision-making. The exercise of procurers' collective bidding and purchasing power increases the incentive for vendors and suppliers to comply. This creates positive pressures towards GFPP compliance both up and down the supply chain. As a whole, the market platform enabled by these technological features encourages real-time and adaptive policy compliance rather than compliance driven by external enforcement and centralized auditing procedures.

Anatomy of Infrastructure | Flexible, Traceable Distribution







FARM-TO-TABLE TRACKING

RFID allows for farm-to-table tracking. Every time a RFID tag is scanned, the information is collected and stored in blockchain which can be accessed by system-wide stakeholders.

SMART CONTRACTS

Smart contracts provide a seamless transaction experience for actors throughout the supply chain. The contracts allow buyers to rank their priorities among the five GFPP values and connect with local suppliers.

P2P VERIFICATION

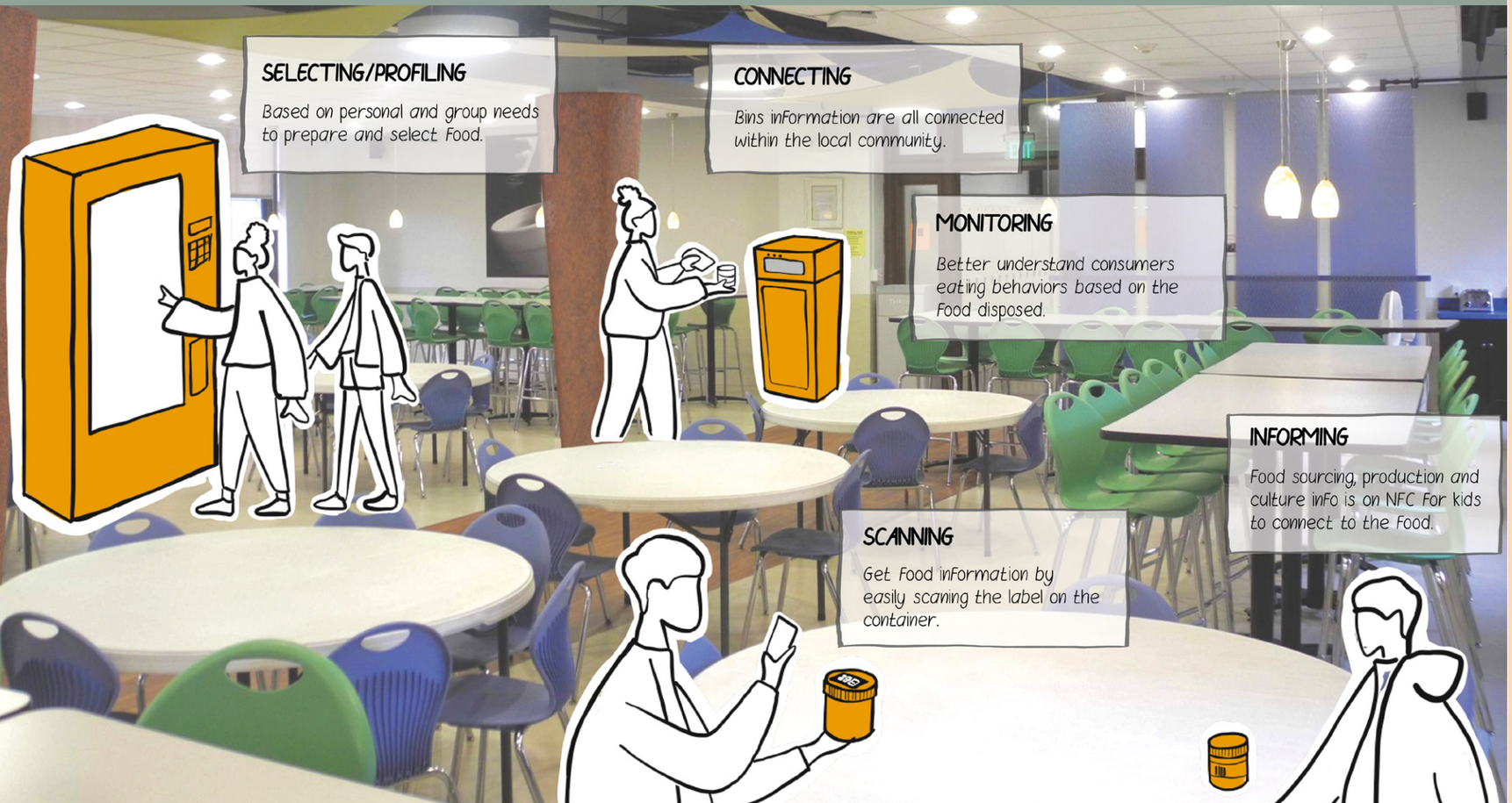
Peer-to-peer verification (P2P) confirms product deliveries match all the terms of the smart contract.

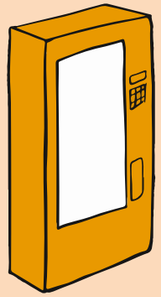
CLEAN, LOCAL DISTRIBUTION

Electric bikes are used to deliver orders via efficient routes, thereby lowering net carbon emissions.

Situated Action | Smart Consumption

By understanding what foods people want to eat, farmers and suppliers can be better informed of what to grow. Likewise, people can investigate the source of food to make better-informed choices. Food consistently not consumed is also noted by the system, enabling a shift to alternative options.





VENDING MACHINES

To support meal-service locations that don't have kitchens, and supplement those that do, vending machines pair consumer choice with preference data to inform procurement decisions.

REUSABLE FOOD CONTAINERS

When the vending machines are restocked, the previous day's empty containers are taken back, washed, and re-used, creating a closed-loop system.

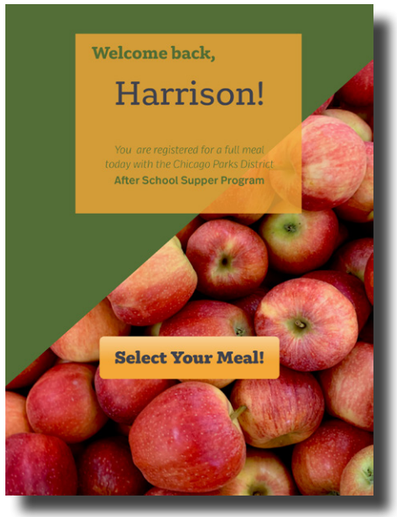
FOOD LABELS

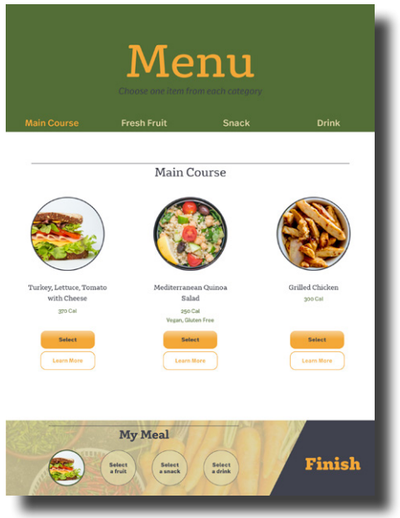
QR code labels enable food consumers to access the farm-to-table journey of each ingredient and see a meal's aggregate nutrition profile.

SMART WASTE BINS

Smart waste bins measure and identify food waste to determine sources of waste and generate strategies for waste reduction.

Speculative Interfaces | Smart Consumption





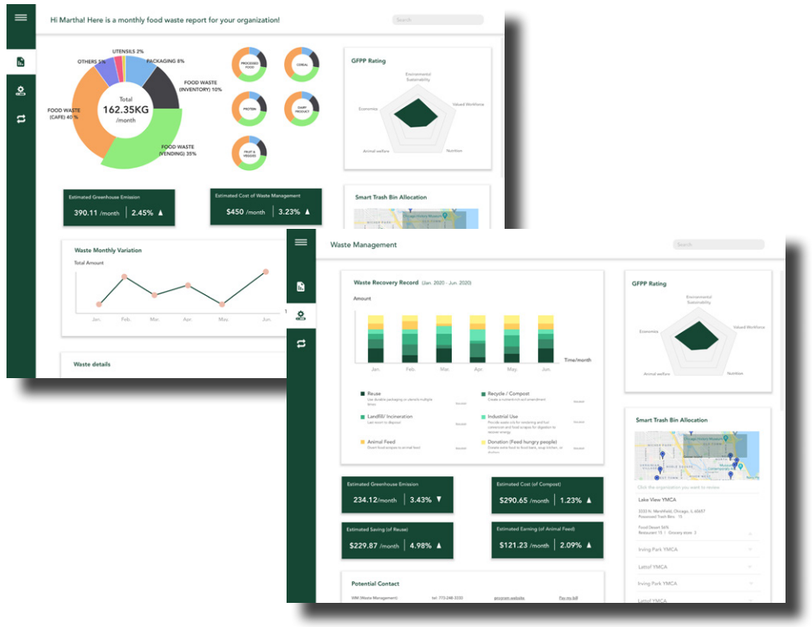
MEAL SELECTION

People can personalize their meals to suit their cultural-, lifestyle-, and taste-based preferences. More choice allows for more flexible meal planning, so foods don't need to be selected based on their ability to be scaled to hundreds of meals per day. This opens the door for more locally prepared and balanced meals.

KNOWLEDGE SHARING

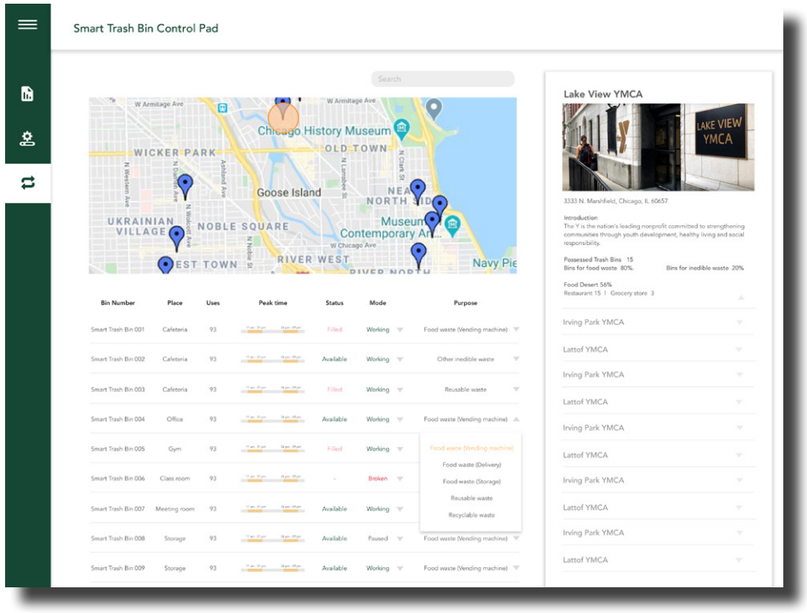
A QR code label on the package makes the food traceability information accessible to consumers. People can discover the journey from farm to table: the ingredient and nutrient breakdown, a 3D tour of the farm responsible for production, and the history of culturally relevant recipes.

Interfaces | Smart Consumption



MEAL SELECTION

Managers and operators can monitor downstream waste generation to target upstream sources, manage their waste disposal methods, and construct potential waste recovery strategies by evaluation that is provided by this software based on GFPP standards.



CONTROLLING WASTE BINS

Based on waste evaluation and existing waste management methods, this control pad helps organizations manage their smart trash bins. Bins must be diversely purposed in order to handle various kinds of waste and to predict potential waste disposal methods. This ensures that different waste can obtain maximum value later in the waste stream.

Anatomy of Infrastructure | Smart Consumption

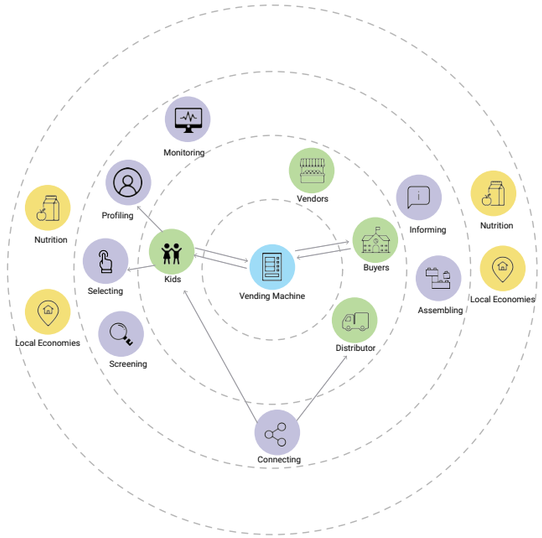
CONSUMPTION

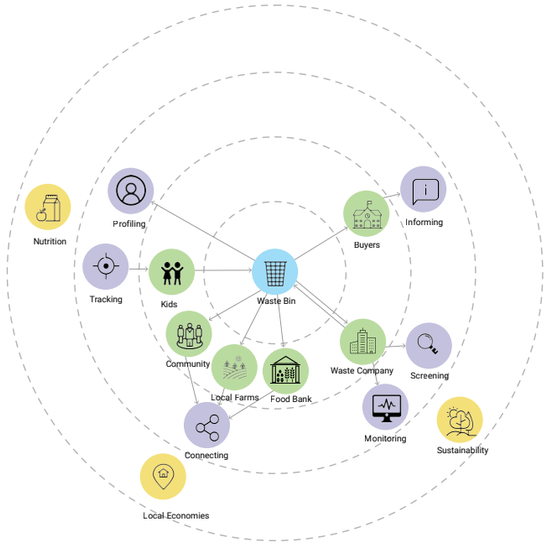
Contextual data drawn from consumer meal-selection are utilized to deliver a wider and more flexible variety of food choices based on cultural, lifestyle, or taste preferences. The RFID labeling on food packaging enables education of young consumers about the journey that brought their food to them, often beginning with a local producer.

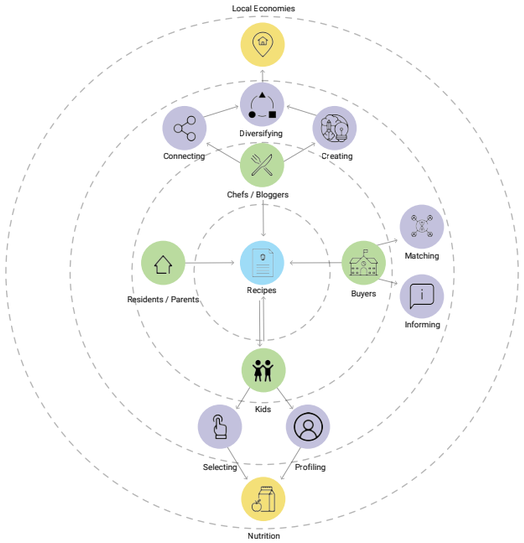
At the same time, smart waste bins and sensors enable waste generation analysis to inform upstream sourcing and strategies for waste reduction.

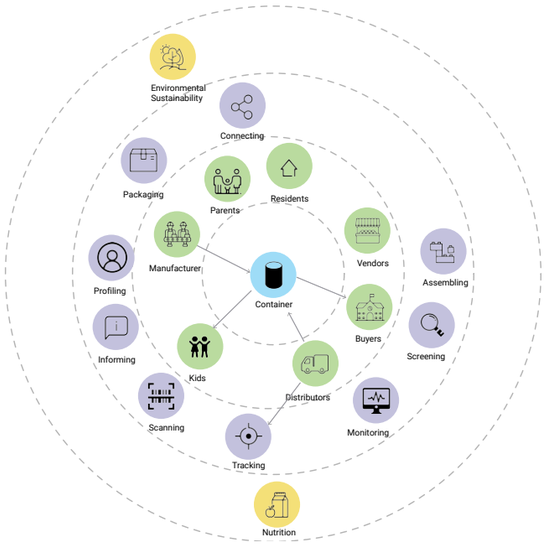
These two aspects accelerate the shift from a mass consumption paradigm to one that is more diverse, inclusive, and energy- and environmentally sustainable.

Anatomy of Infrastructure | Smart Consumption









DATA-DRIVEN PROCUREMENT

Vending machines provides a range of data-informed meal options, responding to local and regional preferences. By profiling consumer choices at the point-of-sale, the GFPP can identify purchasing patterns to inform procurement.

WASTE MANAGEMENT

Site-generated waste is weighed, measured, and analyzed before being fed into the system, allowing for local shifts in production capacity and distribution.

CULTURALLY RELEVANT RECIPES

QR labels serve as a content portal to promote stories of cultural heritage while celebrating the recipes of the local chefs that created them.

CLOSED-LOOP CONSUMPTION

A closed-loop systems yields no waste: organic foods are composted and distributed among local urban farms while plastic containers are collected, cleaned, and reused.

SECTION III

CONCLUSION | **Final Reflections**

Summary

FROM POLICY POLICE TO SELF-GOVERNING SYSTEM

In April 2020, at the height of the COVID-19 crisis, *The New York Times* published a story of an Idaho farmer forced to consign tens of thousands of pounds of onions to decompose in trenches – all because customers are no longer buying onion rings at restaurants in dense urban markets, such as New York and California.[8]

As we author this report, we are continuing to witness the innumerable shortcomings of the mass-production paradigm upon which the current system is built. Even before COVID-19 laid bare the limitations of our global supply chains, our work sought to address the known blind spots of an industry designed to compete on cost alone, issues of equity, accessibility, quality, nutrition, animal welfare, and fair labor. Such categorical oversight represent the backbone of the GFPP value system and policy.

But policies alone are insufficient. We need new markets, behavioral incentives, modes of production, governance models, distribution systems, and infrastructures. The proposals offered in these pages represent achievable micro- and meso-level interventions in service of macro-level paradigm shifts. As such, they are intended to expedite the development of new methods of production, distribution, procurement, consumption, and disposal of food.

We propose four macro-level paradigm shifts:

1. from standardized, mass-produced offerings to made-to-order, small-scale batch-based offerings.
2. from opaque, rigidly optimized global supply chains to transparent, agile forms of distributed production.
3. from subsidizing single-source calorie-rich foods (e.g. dairy, refined grain, meat) to cultivating crop diversity among nutrient-rich foods (e.g. vegetables, fruits, fish, and whole grains).
4. from conceiving of the choice of healthy, nutritious as a premium offering to a mainstay of ethical and culturally enriching eating practices.

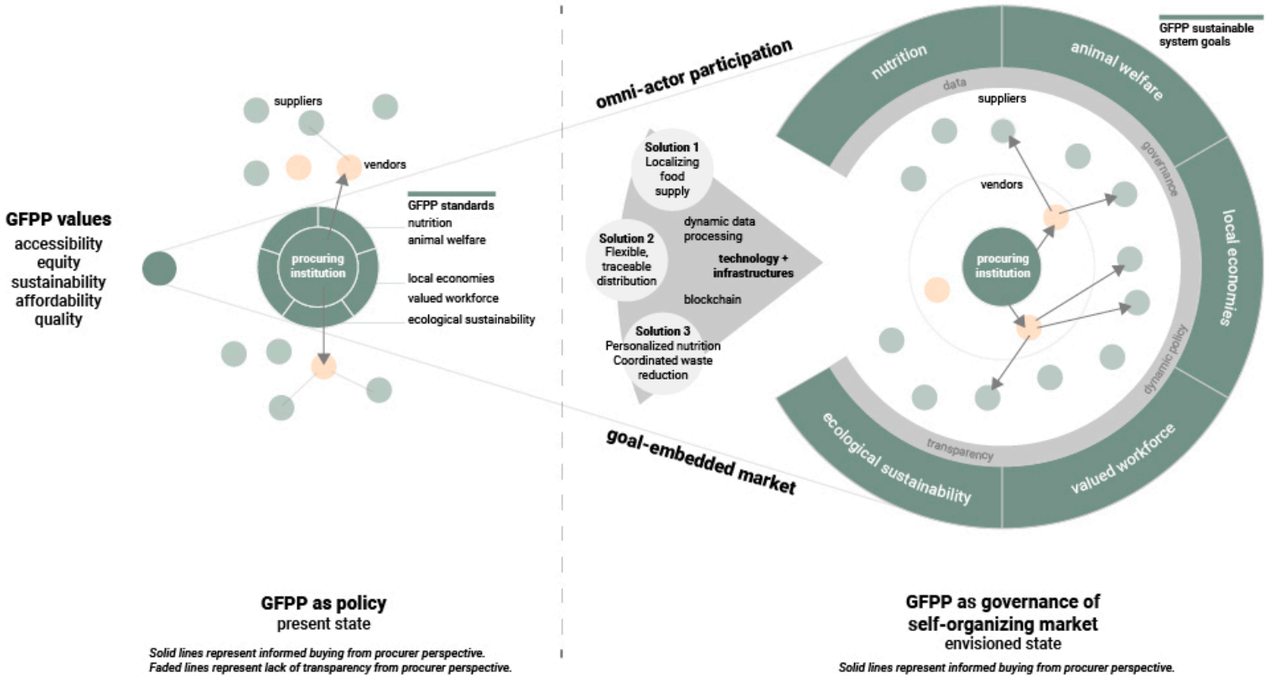
LOOKING FORWARD

The infrastructures prototyped and the systems rendered in this report represent feasible, viable, and desirable pathways towards equity and sustainability for the GFPP. **The tangibility of the ideas is their fundamental strength, not their infallibility. These proposals are intented to facilitate further conversation and debate and should not be understood as ready-made blueprints for implementation.** Nevertheless, we stand by the rigorous research, thoughtful debate, and strategic planning required in their development.

We hope they may serve as actionable guide posts for the GFPP, and other industry stakeholders, looking to transform our food economy.

LIMITATIONS

Halfway through the 14-week project, Illinois issued a stay-at-home order in response to the COVID-19 pandemic. Two in-person engagements with our partners were canceled and while we continued to work remotely, we were unable to interface with our partners due to their critical role in serving the city.



GFPP as policy
present state

Solid lines represent informed buying from procurer perspective.
Faded lines represent lack of transparency from procurer perspective.

GFPP as governance of self-organizing market
envisioned state

Solid lines represent informed buying from procurer perspective.

Citations

1. "Branding and Advertising." Emma Dibben Illustration, http://www.emmadibben.com/brandingandadvertising. Accessed 6 May 2020.

2. NFC (Near Field Communication) Definition. https://techterms.com/definition/nfc. Accessed 6 May 2020.

3. Policy - National Food and Nutrition Policy | Global Database on the Implementation of Nutrition Action (GINA). https://extranet.who.int/nutrition/gina/en/node/8238. Accessed 6 May 2020.

4. Good Food Purchasing Program Purchasing Standards for Food Service Institutions. Center for Good Food Purchasing, 2017.

5. Ritchie, H., & Roser, M. (2019, December). Environmental impacts of food production. Retrieved May 6, 2020, from https://ourworldindata.org/environmental-impacts-of-food

6. US EPA, OLEM. "Sustainable Management of Food Basics." US EPA, 11 Aug. 2015, https://www.epa.gov/sustainable-management-food/sustainable-management-food-basics.

7. Unsplash. Photo by Scott Warman on Unsplash. https://unsplash.com/photos/NpNvI4ilT4A. Accessed 6 May 2020.

8. Yaffe-Bellany, D., & Corkery, M. (2020, April 11). Dumped Milk, Smashed Eggs, Plowed Vegetables: Food Waste of the Pandemic. Retrieved May 6, 2020, from https://www.nytimes.com/2020/04/11/business/coronavirus-destroying-food.html

9. Nogueira, A., Ashton, W., Teixeira, C., Lyon, E., & Pereira, J. (2020). Infrastructuring the Circular Economy. Energies, 13(7), 1805.

10. Nogueira, A., Ashton, W. S., & Teixeira, C. (2019). Expanding perceptions of the circular economy through design: Eight capitals as innovation lenses. Resources, Conservation and Recycling, 149, 566-576.

11. Nogueira, A. M. (2019). Sustainable Solutions in Complex Spaces of Innovation (Doctoral dissertation, Illinois Institute of Technology).

ID

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