Kickoff Meeting November 18, 19th, 2019

Technology-enabled, Rapid-response Fresh Food Supply Chains, Small Growers and Local Food Systems: Introduction and Overview of Event

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Arizona State University

FFAR

NM State University

ILPIL
International Logistics & Productivity Improvement lab

Agenda

- Introduction of event
- Goals of the event
- Background
- Vision of project
- Mechanisms of collaboration
- Conclusions

Activities Monday morning

Monday November 18th. Location: SkySong. 1475 N. Scottsdale Road, Scottsdale, AZ 85257 Global Conference Room #201

Development Team Workshops:

9:00 – 9:45 Introduction. Lead: Rene Villalobos

9:45 – 10:30 Supply Side Workshop. Leads: Omar Ahumada, Moderator: Adnan Abdullahi

10:30 – 10:45 Coffee Break

10:45 – 11:30 Market Intelligence Workshop: Lead: Hector Flores, Moderator: Xaimaire Hernandez

11:30 – 12:00 Automated Platforms: Lead: Hector Flores. Moderator, Leroy Jacob Vargis

12:00 – 1:00 Working Lunch: Lead Rene Villalobos

Activities Monday afternoon

GROWERS SESSION:

1:00 – 1:15: General Vision of Project –Rene Villalobos

1:15 - 2:15: Open discussion with growers. Leads: Rene Villalobos/Patty Emmert Moderator: John Romano

2:15 - 2:30: Coffee Break

PUBLIC SESSION (2:30 - 4:30):

2:30 – 2:35: Project Objectives and Introduction of the team, Rene Villalobos, Paul Gutierrez

2:35 – 2:45 General FFAR Vision - John Reich

2:45 – 3:30: 10-minute Presentations:

- Introduction/Vision – Rene Villalobos
- Introduction to Case Study – Rodrigo Ulloa
- Visualization – George Runger
- Market Intelligence –Hector Flores

3:30 - 3:45: Coffee Break

3:45 – 4:20: 10-minute Presentations:

- Models – Rodrigo Ulloa
- Model Inputs and Parameters – Sárbith Aguilar
- Results of Case study– Rodrigo Ulloa
- Underlying Logistics (Supply and Demand Side) - Arnold Maltz

4:20: Closing Remarks, Rene Villalobos, John Reich

Activities Tuesday morning

Tuesday November 19th. Location: Brickyard Engineering, 699 S Mill Ave, Tempe, AZ 85281, Room #420

Development Team Workshops:

9:00 – 10:30 Yields, Agronomic Potential, interaction with growers – Lead: Rodrigo Ulloa, Moderator: Adnan Abdullahi

10:30 – 11:00 Brain Storming: Demand Side and Shared Economies – Lead: Arnie Maltz, Moderator: Sarbith Aguilar

11:00 – 11:15: Coffee Break

11:15 – 12:00 Planning Tools & Case Study –Lead: Omar Ahumada, Moderator: Rodrigo Ulloa

12:00 – 1:00 Working Lunch + Development strategies for the project – Lead: Rene Villalobos, Moderator: John Romano

Objectives of the FFAR Grant

The project aims to achieve three major objectives:

1. Provide small growers with **market intelligence and planning tools** to reach the optimal markets at the right time with the right product and the least waste
2. Develop **automated logistics coordination/negotiation tools** that allow small growers to efficiently reach the final consumer;
3. Create a **research, development and deployment roadmap** for the efficient participation of micro and small growers in emerging direct-to-consumer produce channels such Amazon Fresh, instacart or Walmart Grocery

Vision

Build **agile** supply chains for Fresh Fruits and Vegetables (FFV) based on the proper utilization of **market intelligence**, **information technology**, **negotiation**, **coordination** and **planning** **decision support** **tools** encapsulated in an integrated environment for **technology-enabled, rapid-response supply chains**.

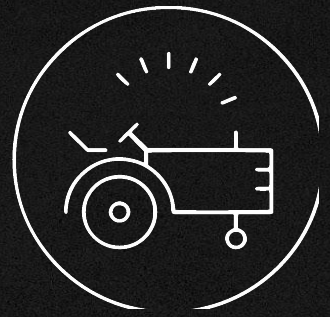
The Vision aims to...

- Capture higher margins of the FFV value chain for growers
- Provide transparency to stakeholders
- Reduce food waste
- Provide relevant information to consumers
- Empower the consumer to influence the system

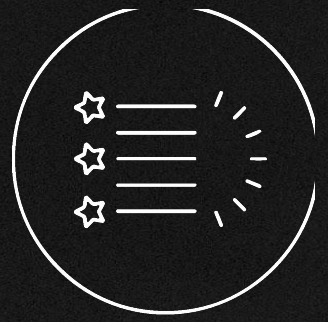
Motivation

Fresh Fruits & Vegetables (FFV) are the **cornerstone of healthy diets worldwide.**

They form the core of **local food and grass roots movements.**



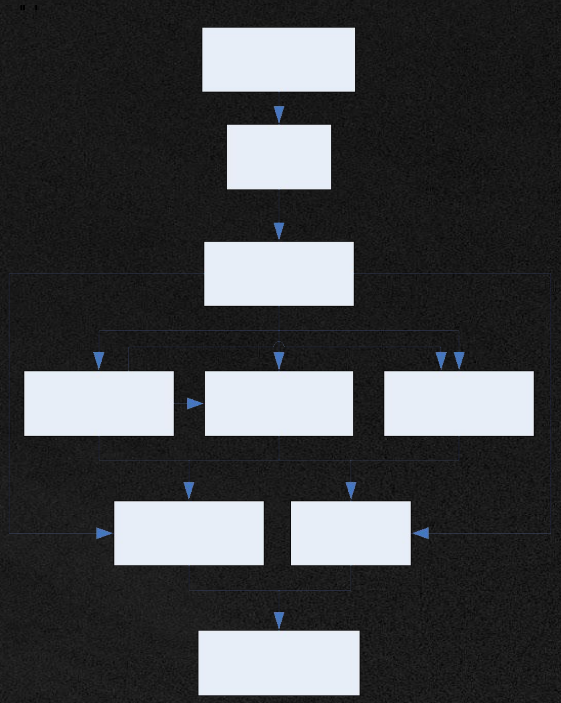
They present important opportunities for **small growers.**



Some challenges need to be sorted to take on these opportunities.

Current Conditions

Long cycle times, perishability, high variability and other special conditions (temperature controlled, compatibility, marketing practices) make the fresh supply chain very complex up to 50% of the product is lost when the product reaches the consumer



There are many players in the fresh produce SC, which increases costs and lead time, and reduces flexibility

Grower has narrow profit margins even though the complete chain does not

Conditions of small growers of FFV

- Capture a small margin of value chain
- Very often focused on organic and local markets
- **Highly dependent on third-party service providers**
- Lack supply/demand coordination
- Lack resources to service emerging market opportunities
- Lack efficient channels to access investment capital
- **Unprepared for disruptive technologies, marketing and distribution channels**

Disruptive Technologies and Strategies

- E-commerce and pick-up of orders (almost every grocery store)
- Sharing economies (uber eats, uber freight)
- Smart Appliances (order placing refrigerators)
- Real time information (POS, social networks)
- Virtual Economy (Amazon)
- **E-commerce and direct delivery of orders (Amazon, Instacart)**
- **Real time information and sensors (harvest, traceability, inventory levels)**

Some Strategies

1. Implement a connected multi-module decision system platform onto which market intelligence and supply chain planning tools will be hosted, enabled, and deployed
2. Explore and construct automated logistics monitoring and coordination tools
3. Build open access systems that are adaptable, scalable, transparent and enforce traceability

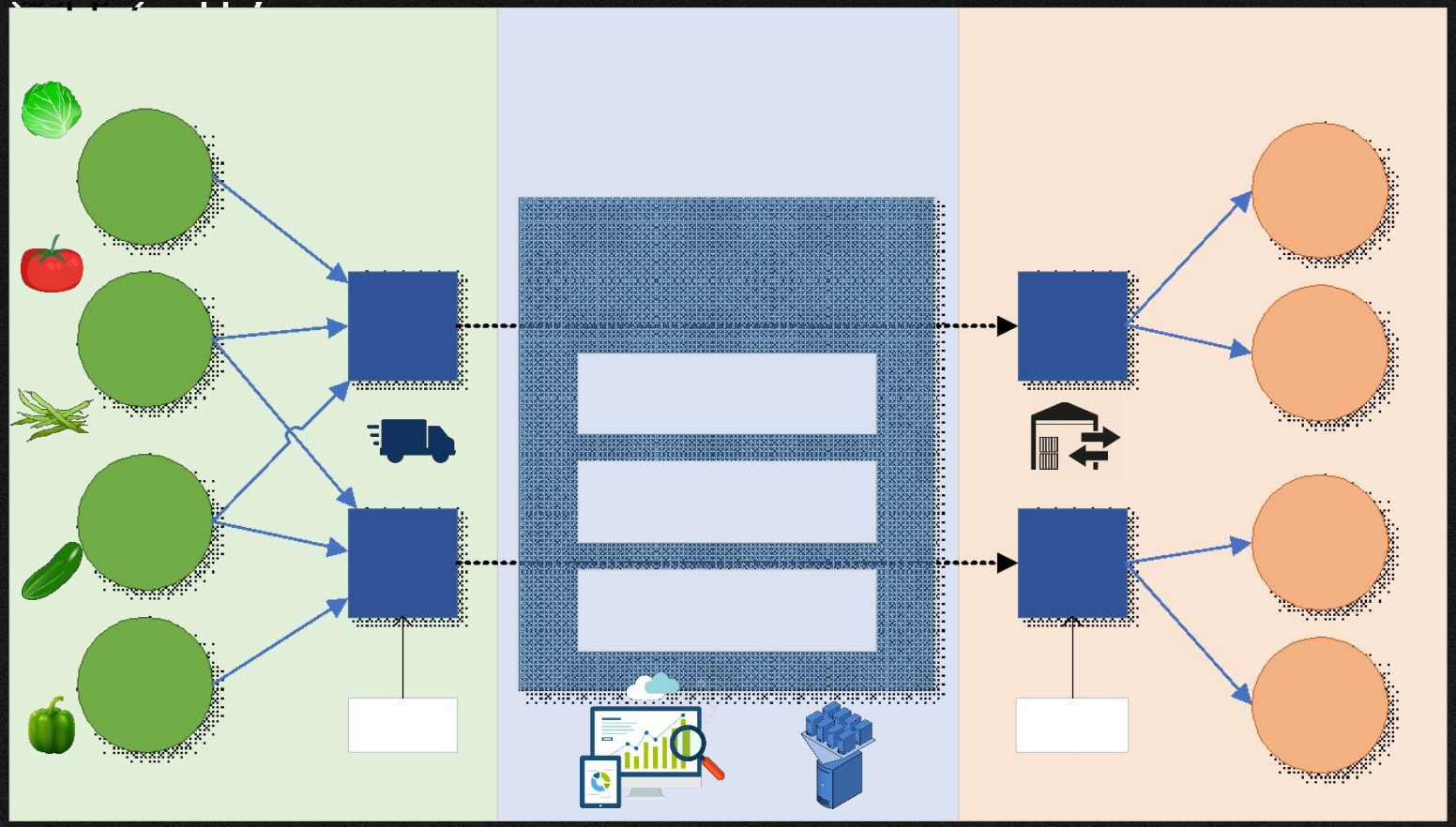
The envisioned environment will:

- Continuously get relevant data from available sources of data and information
- Identify current and future market opportunities
- Provide a platform that serves as a fresh food information-clearing house
- Give growers and their logistics agents access to the same supply chain information
- Enable efficient grower-to-market transactions

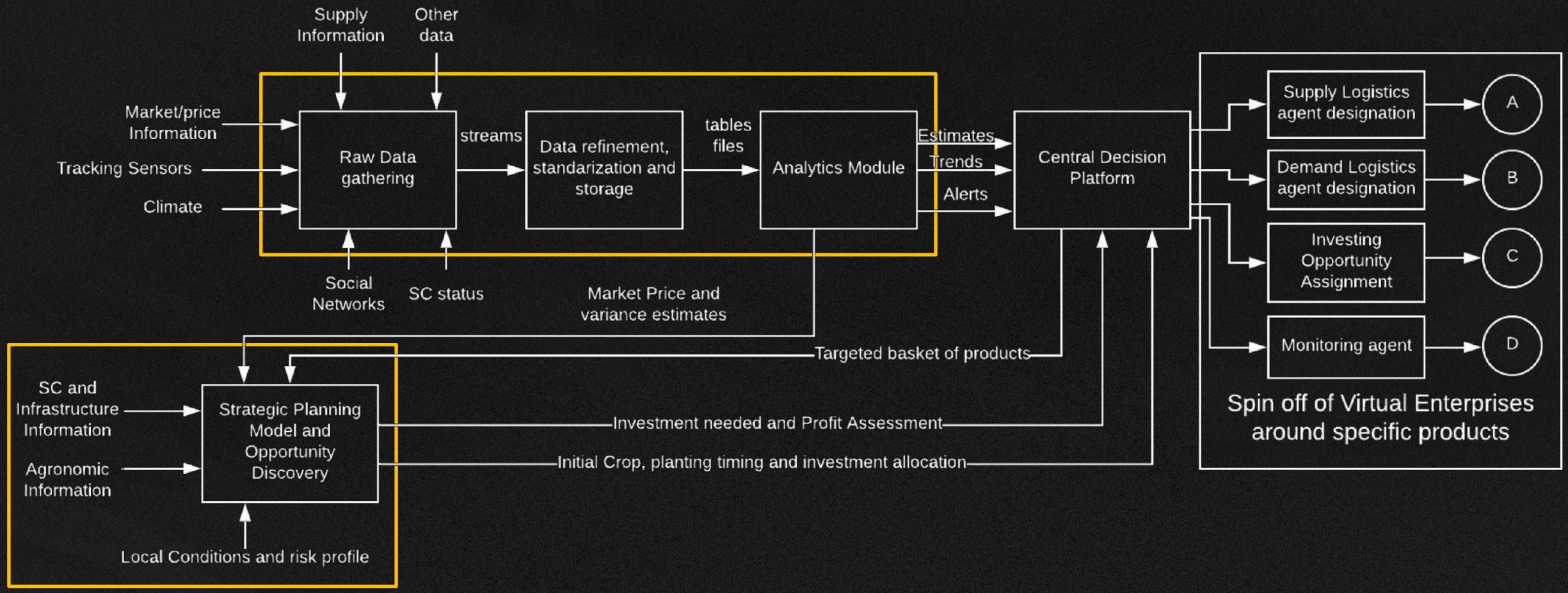
Segmentation of the Problem

Steps:

1. Opportunity is identified
2. The potential players are identified
3. The “articulator” agents put together the specific teams in the supply and demand sides, along with production plans
4. Final implementation takes place



High level view of how it will work (FFAR)



Vision of the Environment Implementation

The envisioned environment will:

- Continuously get relevant data from available sources of data and information
- Identify current and future market opportunities
- Provide a platform that serves as a fresh food information-clearing house
- Give growers and their logistics agents (supply chain articulators) access to the same supply chain information
- Enable efficient grower-to-market transactions
- Create an interface and negotiation with investors

The Supply Chain Articulator

- Has a fiduciary responsibility with the growers
- Mainly responsible for the interaction of the small growers, logistics service providers and demand-side counterparts
- Is the responsible party for tactical/operational planning and implementation of overall logistics, including:
  - Planning of planting schedules allocation “contracts” with growers
  - Entering in contracts with collection fleets, processing centers, and cold storage
  - Being responsible for the implementation of the programs supported by a Supply Side Decision Support Platform to automate planning, bidding, tracking
  - Providing the main interface with demand side logistics agents, central platform and Opportunity Coordinators
- Thus, the supply-chain articulator is the designer, implementer and coordinator of the expanded logistics strategies

Project Strategy

Advance in parallel in:

- Theoretical basis
- Model development, validation, implementation
- Supply Chain and Logistics issues
- Development of prototypes
- Pilot Implementation

Strategy for development

1. Application and adaptation of previously developed models to current situation of four weather complementary regions of New Mexico and Arizona
   - Identify current conditions (crops, weather, logistics infrastructure, etc.)
   - Identify additional growers and other SC stakeholders
   - Identify most attractive markets and products
   - Run and validate models
   - Assess potential benefits
   - Present benefits to farmers and other SC stakeholders
2. Develop initial central platform with limited functionality
   - Identify data relevant to growers and other SC stakeholders
   - Develop the front/back end of platform
   - Test and make it available to reduced group of people
   - Make it available to the general public as a prototype
3. Develop a beta prototype of the central platform
4. Develop a beta prototype of the supply side platform
5. Develop general design of the demand side platform

Strategy for pilot implementation

1. Identify targeted regions
2. Identify promising products and potential buyers
3. Identify potential growers
4. Assess production capacities and climatic conditions
5. Assess supply side logistics
6. Apply models for feasibility analysis
7. Show results to growers and potential buyers
8. Get “volunteers” for the pilot implementation
9. Identify a supply chain articulator
10. Negotiate terms of engagement
11. Develop specific integrated plan, including logistics
12. Deploy, monitor and control implementation

Chronology of main products

1. Targeted regions and (farmers and SC) partners identification (< 2 months)
2. Assessment of supply logistics and infrastructure for identified regions (3 months)
3. Assessment of current and projected demand logistics (18 months)
4. Initial data dictionaries of market and logistics data streams (3 months)
5. Initial platform for market and logistics data (12 months)
6. Open access agronomic-potential module (12 months)
7. Open access planting and planning module (12 – 16 months)
8. Initial market intelligence and analytics module (18 months)
9. Develop a beta prototype of the supply side platform (24 months)
10. Initial market negotiation platform (24- 26 months)
11. Develop general design of the demand side platform (30 months)
12. Prototype of integrated platform (24 – 32 months)
13. Final research roadmap for vision implementation (30 months)
14. Final Report 36 months (from 2/2019)

Objectives for today and tomorrow

- Agreement in the general vision
- Agreement in deliverables, priority and timing
- Identify main approaches to tackle each of the issues
- Breakdown general scope into activities and responsible parties
- Revise general plan for execution
- Agree in details of pilot implementation
- Identify and recruit “influencers” in each targeted region

Initial Team

- ASU Team
  - J. Rene Villalobos
  - George Runger
  - Arnie Maltz
  - Pat Phelan
  - Rodrigo Ulloa
  - Xaimarie Hernandez
  - Adnan Abdullahi
  - Sarbith Aguilar
  - Leroy J. Vargis
  - Raghav Jeevendra
  - Kristen Osgood
- Former ILPIL members
- NMSU Team
  - Paul Gutierrez
  - Steven Ramsey
  - Chadelle Robinson
- Other Partners
  - Jim Kallof
  - Patty Emmert
  - Duncan Family Farms
  - Local First Arizona
  - Stern Produce
  - La Montañita Coop
  - Sol y Tierra Growers

Thank you

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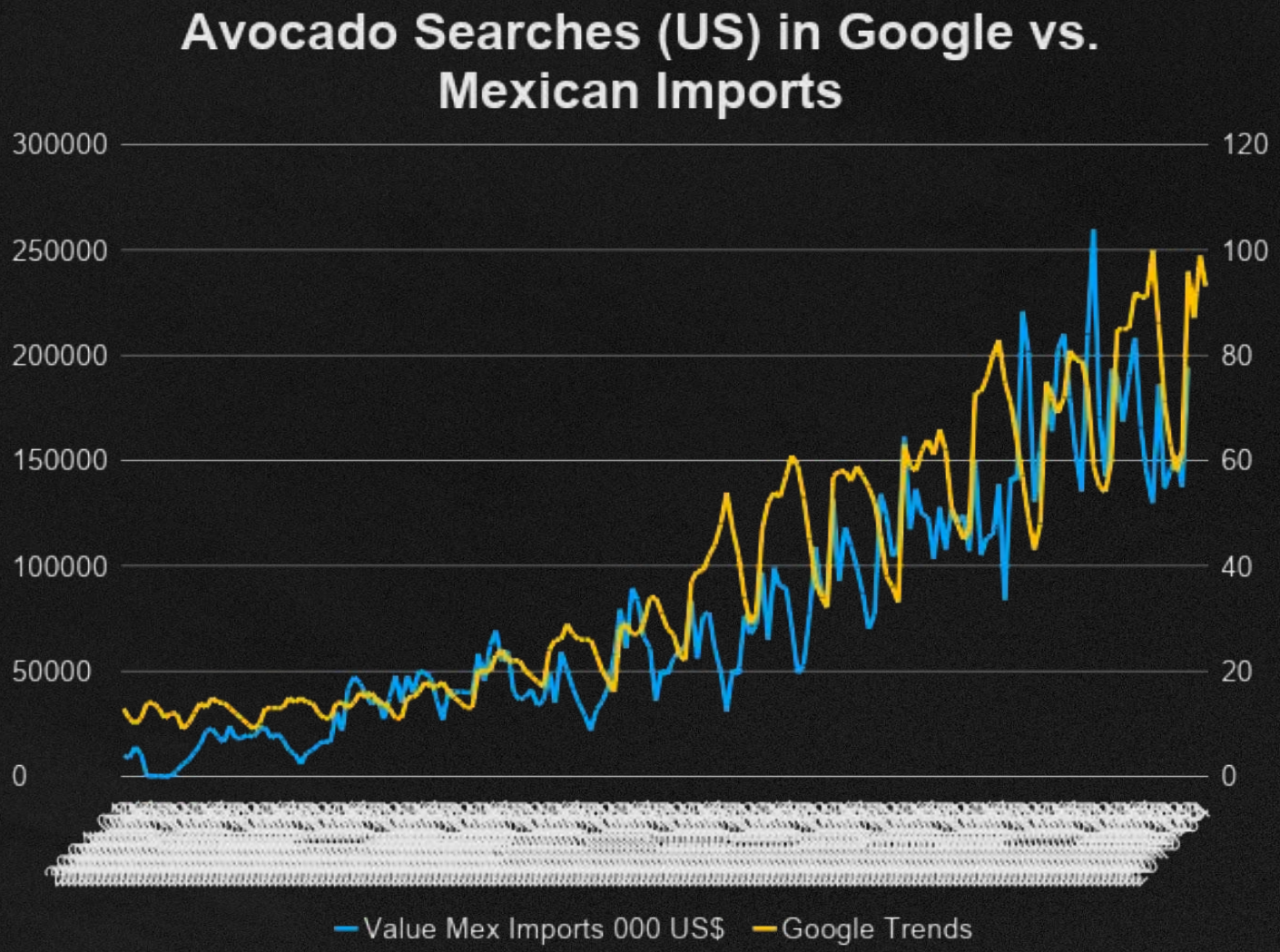
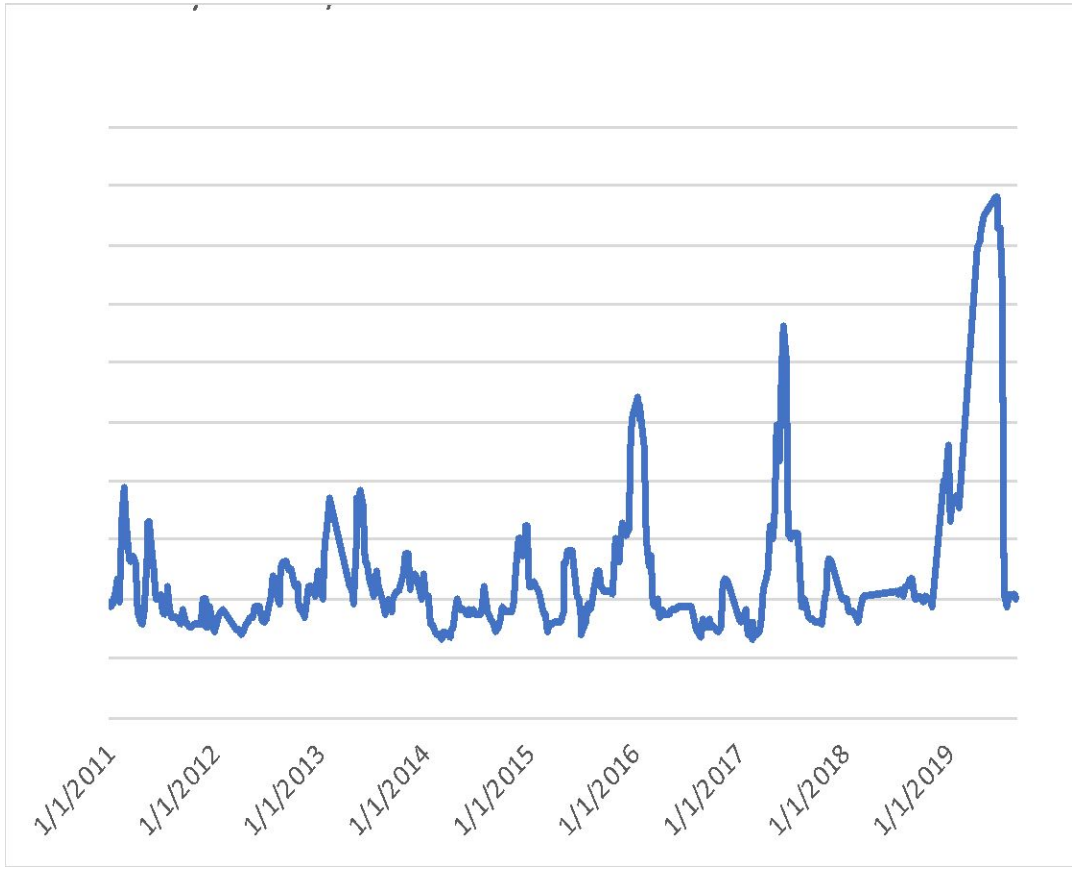
Example of opportunity discovery

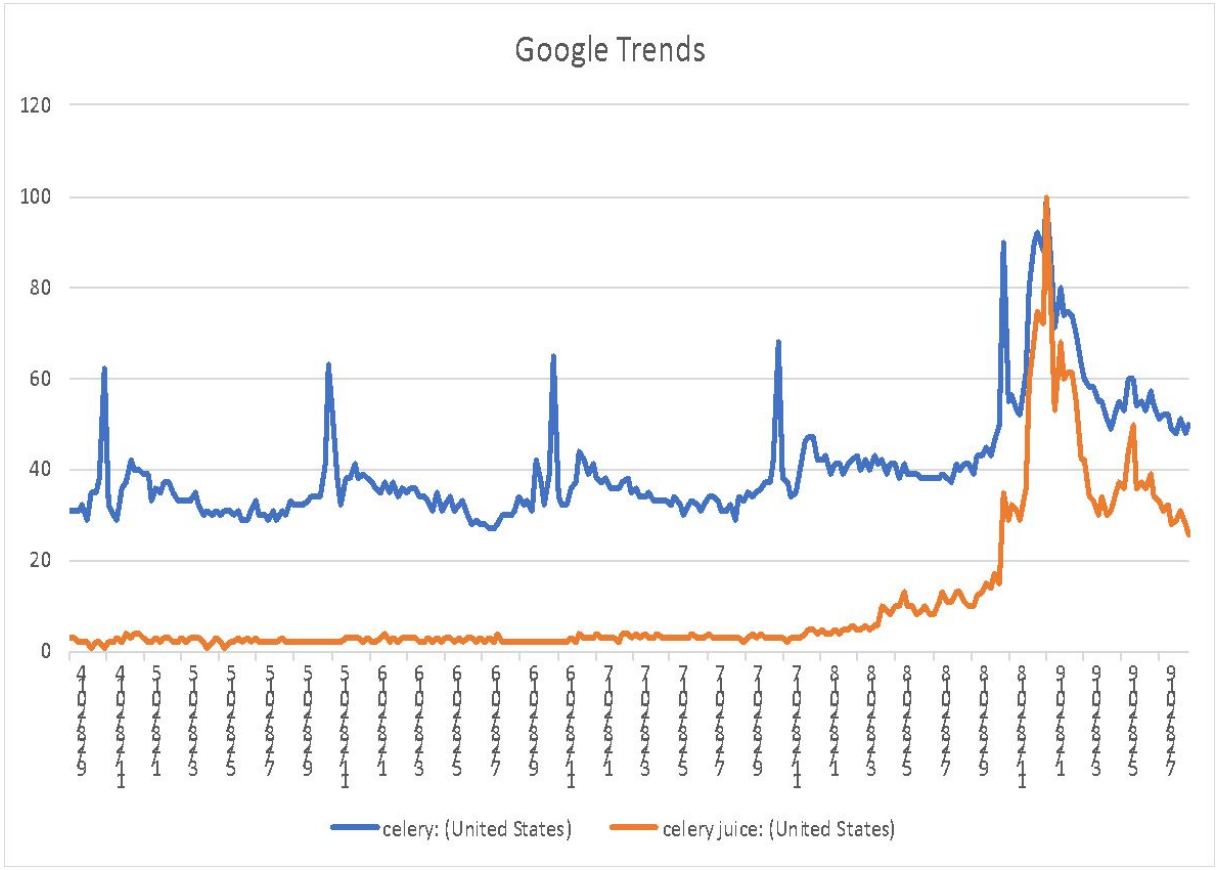


Example of Implications:

- Is this an opportunity for local growers to substitute and/or complement targeted product?
- Anticipate demand and prices
- Determination of local production conditions
- Determination of logistics needed
- Is the opportunity capturable?

Example of opportunity discovery

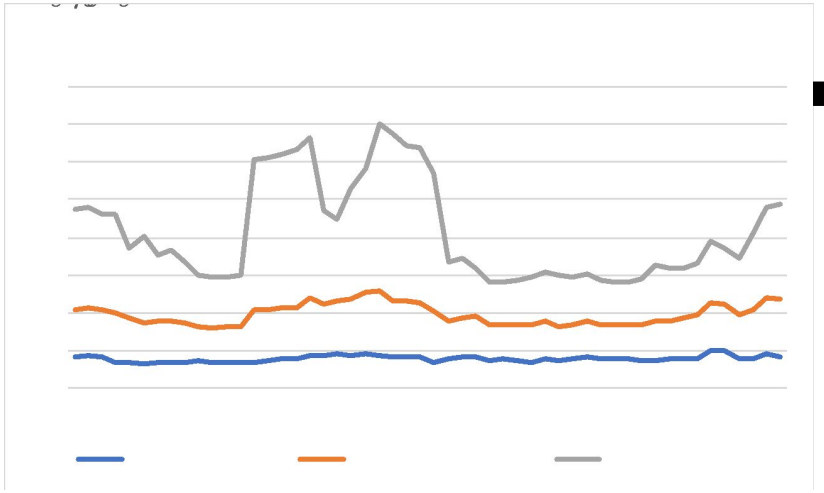




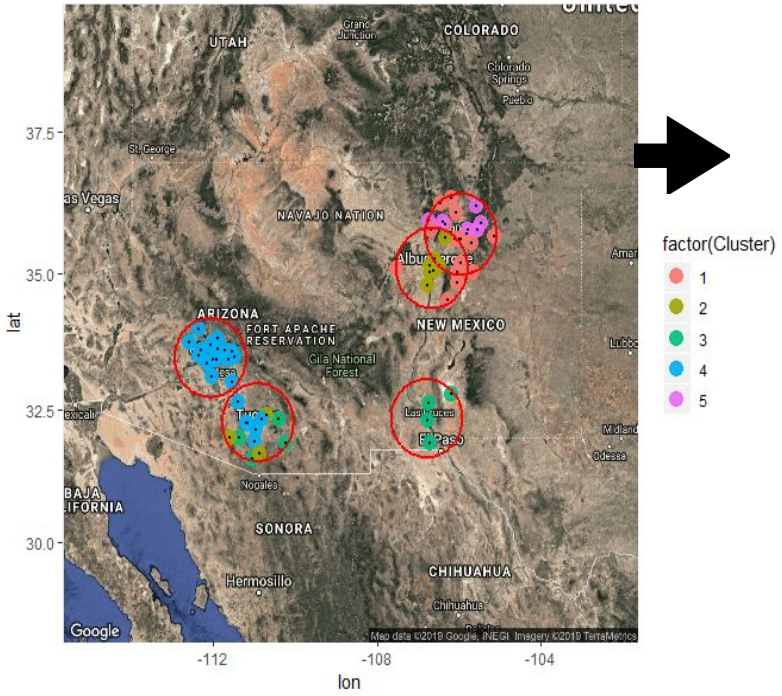
https://www.healthline.com/health-news/celery-juice-healthy-or-hype#What-are-the-pros-of-celery-juice?

Decision support tools

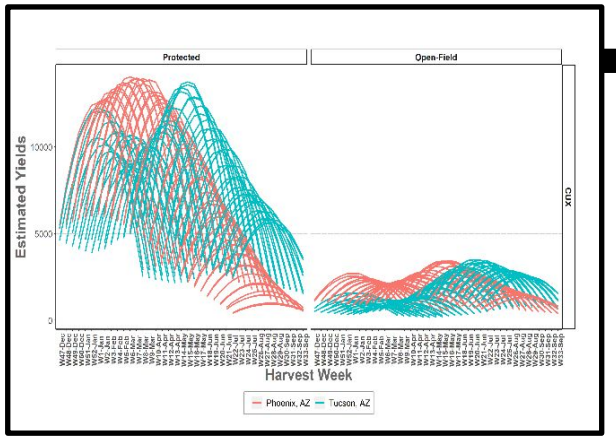
Projected Prices



Potential Growing Regions



Expected Yields



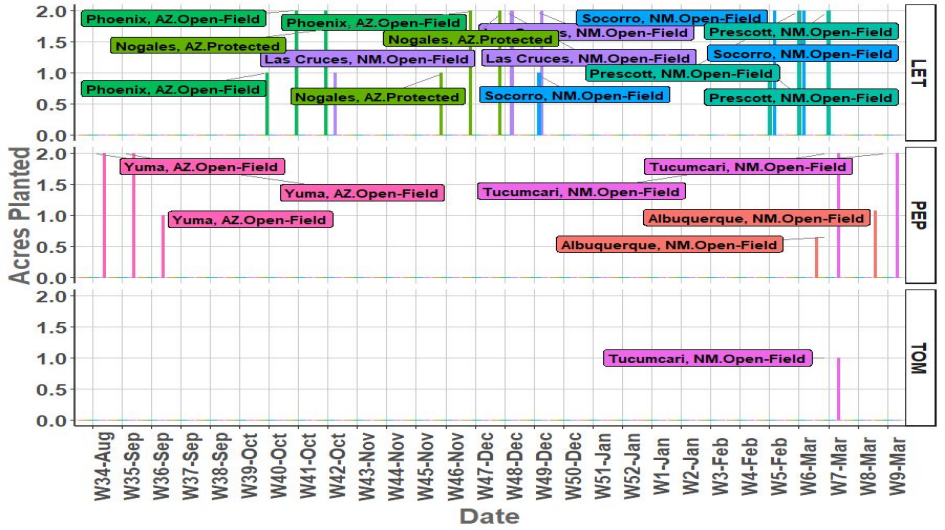
Planning Tools (Planting/Harvesting Decisions)

Objective:

$$Max = \sum_{tki}(\sum_{f} SC_{tkfir} + \sum_{h}\sum_{w} SW_{htkwir} + \sum_{h}\sum_{d} SD_{htkdir}) \cdot price_{tki} + \sum_{hj} SK_{hj} Psalv_{j}$$
$$- \sum_{pjl} Plant_{pjl} Cplant_{jl} - \sum_{pjl} Opl_{tl} \cdot CLabor - \sum_{tl} Hire_{tl} \cdot Chire - \sum_{tl} Opt_{tl} \cdot Ctemp$$
$$- \sum_{tf} Opf_{tf} Chire - \sum_{tkw} Z_{tkw} Pavg_{tk} - \sum_{fhk} Pack_{hfk} (Ccase_{k} + Coper_{k})$$
$$- \sum_{tkw} Invw_{tkw} Chw_{kw} - \sum_{tkd} Invd_{tkd} Chd_{kd}$$
$$- \sum_{tkqfir} SC_{tkqfir} CT_{fir} - \sum_{htkqwir} SW_{htkqwir} CTW_{wir} - \sum_{htkqdir} SD_{htkqdir} CTD_{dir}$$
$$- \sum_{htkqfdr} SPD_{htkqfdr} CTPD_{fdr} - \sum_{htkqwdr} SWD_{htkqwdr} CTWD_{wdr} - \sum_{htkqfwr} SPW_{htkqfwr} CTPW_{fwr}$$

$$- \sum_{tkqfir} SC_{tkqfir} price_{tki} Time_{fir} / SL_{k} - \sum_{htkqwir} SW_{htkqwir} price_{tki} TimeW_{wir} / SL_{k}$$

Production Decision and Allocation



Some quotes from distributors

"I've had situations where **I buy loads and loads of produce from a farmer, turn around and try to sell it but can't because my customers can get it so much cheaper directly from other farmers**, then I'm left throwing out $10,000 worth of green beans".

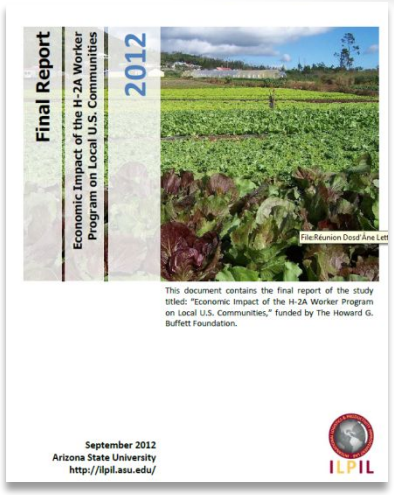
"Personally, I've seen numerous times where **the demand for a certain product is there, just no one will deliver**. For example, this grower used to grow the sweetest red cherry tomatoes. I mean they were beautiful, a real nice product. Now, he grows hemp. And he's going to make millions. For some the business just isn't as lucrative as it needs to be. **I'd love to sell beautiful red cherry tomatoes again, people want them, but no one has them**".

"**I wish I could tell farmers what to plant, but how would I know what to make? I don't have a crystal ball that I could rub that has all the answers**".

"What would be useful to me is if **all the farmers coordinated in such a way that everybody knew what was being planted by each farmer**. That would be especially beneficial for me as someone that needs to supply a variety of produce and has seen produced being thrown out since all of the farmers produce the same product".

"In my mind, there already has to be **some sort of meeting were all the farmers get together and say 'I will plant carrots and you plant tomatoes' that only makes sense**".

Some Projects related to Fresh Supply Chain



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2. Ahumada, O. and J.R. Villalobos, “A Tactical Model for Planning the Production and Distribution of Fresh Produce,” *Annals of Operations Research*, DOI: 10.1007/s10479-009-0614-4, Vol. 191, Issue 1, pp. 339–358, 2011.
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8. Flores, H., J. Rene Villalobos, “A stochastic planning framework for the discovery of complementary, agricultural systems,” European Journal of Operational Research, Volume 280, Issue 2, Pages 707-729, 2020,
9. Villalobos, et al., Computers and Electronics in Agriculture, https://doi.org/10.1016/j.compag.2019.105092

Questions for Growers Session

- How do you decide how, when and what to plant?
- Where do you deliver your produce? Does someone come pick the produce up?
- What kind of contract do you have? Can you elaborate?
- How do you market your product? Do you focus on local markets only?
- What is the presentation (packaging) of your product? How is that decided?
- What is your experience working with co-ops? CSA?

Questions for Growers Session II

- What is your main problem when it comes to growing?
- Do you know people who have abandoned the business? Why?
- Have you been involved in consumer-direct markets (i.e. farmers markets)?
- Have you tried to coordinate your operations with other growers? (schedule and share resources)
- What kind of information technology do you use? (traceability, marketing, etc.)
- What do you feel you are lacking right now as a grower that would make you more successful?