

Final Report

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Project name: STERN PRODUCE: Developing sustainability metrics for “ARIZONA FRESH TOGETHER” local food program.

Project client: Stern Produce Co.

1. Abstract

Local food systems are now facing a new set of intersecting economic, social and environmental challenges. Recurrent socio-economic and biophysical changes put the sustainability of food systems at risk. There is an urgent need to develop knowledge-based tools or metrics to assess and monitor food sustainability and to identify pathways for food security and resource conservation.

Stern Produce is a small scale, family owned business that has been serving our local Arizona community for a 100 years now since 1917. Essentially, it is a food distribution company that conducts wholesale supply of agricultural farm produce, dairy products and meat. Their mission is to supply the freshest fruits, vegetables and specialty food products with a first-class customer delivery experience. Recently, it has embraced the responsibility to conduct business in a manner that fosters societal resilience, invests in community wellness and environmental health. In order to do so, Stern has introduced an exclusive local food program in their organization named as the Arizona Fresh Together (AFT) program. The AFT program is intended to serve as a sourcing platform for the local restaurants and retail stores to procure sustainable food from our valley based local organic growers.

This project, in partnership with Stern Produce’s Regenerative Strategy Manager, Kristen Osgood, aimed to identify core comprehensive sustainability metrics to develop sustainability baseline indicators and assess the impacts of these indicators on the three tenets of sustainability: economy, environment and society, in addition to human health and wellness. By formulating

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these metrics, Stern Produce is acknowledging the significance of transparency in their business operations and changing their business model towards a triple bottom line orientation. Based on the findings, the project assisted Stern in identifying the intervention points and facilitated cross departmental engagement in the AFT program in order to encourage value added business operations.

2. Table of Contents

• Introduction	2
• Literature Review	4
• Context	6
• Methodology	8
• Findings	12
• Conclusion	25
• Future Direction	27
• Appendices & Acknowledgment	27

3. Introduction

Stern Produce is a small scale, family owned business that has been serving our local Arizona community for a 100 years now since 1917. Essentially, it is a food distribution company that conducts wholesale supply of agricultural farm produce, dairy products and meat. They operate from their three warehouse locations in Phoenix, Flagstaff and Tucson, with their 45,000 sq.ft. Phoenix facility as the major hub. Since its inception, Stern Produce is committed to building partnerships with local farms in Arizona to meet the wholesale demand for Arizona grown goods. It has embraced the responsibility to conduct business in a manner that fosters societal resilience, invests in community wellness and environmental health.

Stern Produce's sustainability manager is Miss Kristen Osgood (an ASU Alumna) who is also my project partner. Since joining Stern Produce a year ago, she has been introducing new

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sustainability plans and programs into the organization while keeping its operations profitable, scalable and sustainable. Out of her many successful attempts, latest is the 'Arizona Fresh Together' (AFT) program, introduced in January 2017. She let me partner with her and work on the development of the AFT program as my applied project. The AFT program is fundamentally a local, organic and sustainable food program with an intention to connect local Arizona farmers with retail and restaurants statewide, supporting our local restaurateurs' efforts to source responsibly. As a result of which, Stern Produce is expected to increase its market share and profits from distributing local, organic produce from the state of Arizona.

Through the AFT program, Stern Produce attempts to revolutionize Arizona with local food supply chain partnerships. It wants to promote the local food system, associated with sustainable agriculture by addressing the challenges of food security and enhancing the strength and resiliency of regional food systems with responsible sourcing, community building and stimulating our local economy. The utopian idea is to create local food production-distribution networks, often starting on smaller, sustainable family farms, with farm products transported over shorter geographic distances, generally processed either on the farm itself, or with smaller local processors. Then, the sustainable/local food distribution networks hit the direct-to-retail and foodservice market. In this way, Stern benefits the local farmers as well as the consumers. Stern Produce intends to exclusively add a significant proportion of locally-sourced, organic product lines to their existing inventories that will appropriately change with the seasons of Arizona and cater to the specialty food demands of the restaurant chefs.

From a business standpoint, the company expects to leverage first mover advantage and create more meaningful partnerships in the valley, over a short period of time. Moreover, with the alarming hunger conditions in the state and the rising demand for local products, the AFT program is all set to thrive and flourish. However, it needs to address the issues of procurement barriers, special order lead times and equate the increasing demands with increasing sales. In order to rise to that challenge, I shall be researching and developing a set of sustainability metrics, relevant to the company's goals of the AFT program to evaluate and modify its impacts. Once Stern measures the impacts, it can then better manage it. These metrics shall help Stern in constructing and comparing different scenarios and evaluating likely impacts on proposed food system interventions intended to advance AFT's goals.

Osgood articulates: "We want the AFT program to be a cornerstone catalyst for creating a thriving food economy for Arizona". In January 2017, the AFT program, was initiated by partnering with 17 local farmers. Currently, that number has risen up to 31 local farms across the state and counting. By local, organic food procurement, Stern Produce will aim to a) support local farms, b) help protect food safety and health of our communities and c) restore our local economy. Local organic foods are grown sustainably, meaning they do not negatively impact the environment through air or water pollution, or fossil fuel consumption or degrading soil quality, inducing erosion and accelerating the loss of biodiversity. Growers focus on sustainable practices, such as minimized pesticide use, no till agriculture and composting, minimized transport to consumers and minimal to no packaging for their farm products. Farm products are supposed to be more nutritious and tend to be more flavorful as they won't deteriorate during transportation or warehousing time. Sustainable agriculture also means that the socio economic fabric of the

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surrounding communities is improved or maintained as it is. Additionally, buying local, will benefit smaller in-state growers who have small scale operations, better crop diversity, and use fewer pesticides and fertilizers than the typical large, commercial-scale, single monocrop agriculture farmlands. This helps in preserving our valuable farmlands and biodiversity. At the same time, it also provides significant sources of income for our local farmers. Apart from that, food grown locally, processed locally and distributed locally generates employment opportunities and subsequently helps stimulate the local economy. As the food supply chain evolves, local restaurant eating should become as convenient as buying local. The ultimate aim is to make consumption of healthy locally accessible food a lifestyle for the people of Arizona. As Stern Produce has the necessary transportation and storage infrastructure, it now wants to focus its efforts on initiatives that can help local foods easily find their way to restaurant plates and shopper bags. Developing sustainability metrics for measuring Stern's impacts on its triple bottom line will serve them as a guiding tool to strategically continue running the AFT program.

4. Literature Review

In the early 1900s, close to 40% of Americans lived on farms, compared to 1% in 2000, and 90% of the food bought and consumed in the United States was grown locally. (Pirog, 2009). As a result of this, communities grew an interest and gained knowledge of the food they consumed with direct contact with the farmers. Food was rarely processed or packaged and fruits, vegetables, fish and dairy products typically travelled less than a day to the markets. (Giovannucci, et al., 2010). Food consumption was mostly dictated by seasonality and local availability. Then, following World War 2, the American food system dramatically shifted from local to national and global scale. With improved technology, transportation, refrigerated trucking systems, geographic concentrations etc., all contributing to non local food systems, there emerged a whole new set of agricultural system known as the conventional food system. (Giovannucci, et al., 2010)

The conventional food system or the global industrialized food system is characterized by efficiency and externalized costs, mainly targeted at massive food production, maximizing the economies of scale and lowering the overall costs paid by the consumers. (Sloan, 2010). It considers food as primarily a "commodity". Although, it has its own benefits like increased yields of production that helps resolve the problems of food shortage worldwide (Hartmann 2011), it creates a disconnect between local food and consumers, especially because there is always a division between natural and urban lands of developed countries. (Hartman, 2011). As a result of this disconnect, consumers don't have any clue of the provenance of the food they consumed. On the other hand, producers also have no clue of the exact demands of consumers. The market also pushes this conventional production into a vicious cycle. As food is considered as "commodities", they are traded off globally to earn foreign exchange to payoff the debts. This creates an insecurity for the growers who in turn, cut down on the environmental and social standards to compete with costs in the international markets. (Flora, 1995). Thus, the

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development of local economies gets suppressed and the local market resiliency suffers. This also indirectly affects the prices of the food available to the consumers. The fresh and organic healthy food becomes pricier which is affordable only by the rich class and the low-income groups are left to purchase the food with low prices, which are apparently stale, unhealthy and not in the best of edible conditions. This disparity leads to inequity problems of food access. (Holtslag, 2010). Additionally, in order to accelerate the production process, there is a heavy reliance on biotechnology that causes chemical pollution affecting people's health. (Hinrichs 2000); long distances travelled or food miles covered resulting in a large carbon footprint. It also leads to degradation of public infrastructure because of high volumes of truckload travelled as well as packaging disposed of. (Hinrichs 2000). Hence, all of these above mentioned reasons call for an alternate food system that is more localized and sustainable.

Local food system is one which allows for affordable, nutritious and culturally appropriate food for all. (Holtslag 2010). This system has several positives: shorter distances travelled between producers and consumers; small scale of production catering to the demands of the community and a commitment to the social, economic and environmental dimensions of local sustainability. (Holtslag 2010). Additionally, local food systems use a circular food system, where the food waste can be transformed into energy which contributes to further food production activity. A circular local food system can therefore make full use of local resources and reduce the ecological footprint of the agricultural area, which promotes the development of local sustainability. (Zecca 2014). Apart from environmental concerns, food production also directly impact the finance and conditions of human resources. Thus with short supply chains and new relationships between producers and consumers, there are more job opportunities created and higher incomes generated within the certain communities. A shorter transportation distance and less middlemen within the process and marketing phases also means more profit goes to local food producers. (Zecca 2014). As a result of closer relationship between producers and consumers, conflicts between social classes and stakeholders is reduced and the social capital of the community is enhanced. Also, different people with various identities can have similar access and similar affordability to the fresh and seasonal food. From an economic perspective, consumption on a local scale promotes development of the local economy. Additionally, the costs of transportation can be saved, as the distance is shorter and more efficient, while the local farmers are able to have a decent income from these food system activities. (Dale 2010). Regarding the environmental perspective, the green house gas emissions can be reduced and the usage of fuel can be decreased as well. Most of these farms also engage in composting activities, thus, waste management is well taken care of and losing nutrients from the soil is avoided to maximize the value of waste resources.

Recently, sustainability has been the major underlying principle of many business operations. Sustainability is a widely acknowledged concept that calls for an integration of policy and environmental, social and economic dimensions. (Selfa & Qazi, 2004). However, the concept of sustainability is implemented at varying levels. Due to intense diplomacy, destabilized socio-democratic policies and damaging shortfalls between the higher level objectives and actual impact, the outcomes are not impacting the local scale as it is expected to be. (Dale, Ling, et al., 2010). Thus, most attention has been paid on the local level these days. The concept of local

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sustainability focuses on self-sufficiency, collective action, qualitative development as opposed to quantitative development, community based, social relationships and small scale decentralization. The three dimensions of sustainability: economy, society and environment are independent but not mutually exclusive. As we now know, what local sustainability is focused on, let's interpret the three tenets of sustainability from a local food systems standpoint in the following way:

Environmental dimension of local sustainability means the focusing on the development of the local endogenous resources which enable the reduction of local pollution and the exploitation of natural resources, along with making the territorial area more ecologically resilient; a state which increases the ability to adapt when facing local, regional or national changes (Selfa, Qazi, 2004).

Economic dimension of local sustainability intends to increase the local income and improve the standard of living, reducing energy dependence and diversifying the energy supply (Selfa, Qazi, 2004).

Social dimension of local sustainability can be reflected on the achievement of community peace through social cohesion, stability, social participation, respect for cultural identity and institutional development. (Selfa, Qazi 2004) Reducing unemployment and improving the quality of jobs, as well as increasing social cohesion and reducing poverty levels are the key actions at local level to achieve sustainability from a social perspective. On the one hand, activities such as community gardens, promotion of renewable energy within the local area could help to build up social capital to enhance social relationships. On the other hand, the activities can also increase local job opportunities to help solve employment issues. Local sustainability also has a particularly positive psychological and happy impact on the prospects of the young local population. (Dale, 2010)

Thus, Stern as a revolutionary business is conducting its operations with a focus on the above three tenets of sustainability. And the AFT program is a stepping stone in that direction. With this project, I am creating a set of sustainability metrics that will acknowledge and measure the impacts of the AFT program and build on it by contributing to addressing challenges in the three central tenets of sustainability: economy, environment and society.

5. Context

Stern Produce Co. is a distributor of wholesale produce. The original business model used to thrive by extracting value from their "services offered" rather than the "products they traded". However, over a period of time, as part of doing responsible business and with a growing sense of commitment to the community they served, the company decided to add value laden sustainable ways of doing business instead of the traditional supply chains. Adding value meant strategically discovering new ways of promoting certain aspects of the usual business' supply chains that can positively impact the business as well as the community. As per Bloom and Hinrichs (2011), adding value chains to the business as usual, was aimed at "differentiating value

[Your short title here.]

added products, committing to the welfare of all participants, creating strategic partnerships and the role of trust and shared governance”. With this thought in mind, Stern Produce tasked their Sustainability Manager, my mentor, Kristen Osgood to create such a unique food program that would be invested in the welfare of the community and forge resilient partnerships within it, maintain business operations transparency, as well as give suitable profit margins to the company. Thus, the Arizona Fresh Together (AFT) program was born. As explained earlier, this program was strictly dedicated to promoting the purchase of local goods (produce, dairy and meat) by providing Stern Produce customers the platform to buy from Stern’s 31 local farm partners. The AFT program defines local as within the state of Arizona. Additionally, Stern recognizes and distinguishes the local goods as USDA certified ‘organic’, ‘sustainable’ 3rd party certified (certified naturally grown, rain forest certified etc.) and ‘made’ includes products locally made but not necessarily with locally sourced raw materials or ingredients in it. These labels retained further transparency for the customers and the organization’s operations. They also encouraged Stern with the knowledge and incentives to buy more local.

The main purpose of this project is to identify a set of sustainability metrics to create relevant baseline indicators for the AFT program. The project’s objective will help establish the AFT program as a robust and legitimate stand alone food program in Stern Produce and the local food system in Arizona. Currently, Stern Produce does not locally source. Most of their produce and meat is purchased nationally and at times globally, since out-of-state purchasing, at the moment, tends to be more economical and consistently reliable for a year round availability. With the AFT program, this trend is going to alter with more local in-state purchasing. According to Osgood, aligning and partnering with these 31 local farms was not easy. Such business relationships demand long term commitments with consistency and trust to make the AFT program a viable success. Stern is continuing to grow more partnerships within the community in order to diversify the products’ availability portfolio, year round, to maintain consistent supply of products and strengthen the resiliency of the network.

While Osgood will be actively involved in developing and rolling out the AFT program in full scale, my stand alone parallel initiative in this project is to create those appropriate sustainability metrics and baseline indicators to assess the relevant sustainability implications of implementing the AFT program. The sustainability metrics I created will throw a direct light on the comparison of the amount of environmental impacts savings, financial contribution to the local economy and the positive social impacts that are caused in going local vs non-local. The results shall help to promote the AFT program, gain momentum and help them figure out strategies, to make their food supply chain operate sustainably. The long term sustainability outcomes that were expected to emerge as a result of this project were:

- Support local and often family run smaller farms in AZ.
- Help protect our health as well as the health of our communities.
- Stimulate our local food economy.
- Preserve our valuable farmlands, unique biodiversity and celebrate it.
- Help Stern Produce, as a company, to invest in their business model, expand their market share and increase profits, through a sustainability lens.

[Your short title here.]

Additionally, the AFT program is expected to have a positive ripple effect across the state. It is also partly aimed at creating a robust network of sharing information on local agricultural and distribution practices just like a food industry consortium having all the local producers and distributors help each other grow. Stern Produce hopes to gain some first mover advantage in this regard.

6. Methodology

In order to achieve my goals for this project I engaged myself in the following activities:

- Identified appropriate sustainability metrics to measure the effects of the AFT program.
- Created baseline indicators to assess them
- Researched on Arizona local farmlands, their potentials and limitations and identified ways to reach out to the local farmers and gauge their interest, motivation and perception about the AFT program.
- Did site visits with my project partner, Osgood, to some of the farmlands here in Phoenix area to have a real world hands on knowledge and experience in better understanding the core of the program
- Had weekly meetings with Osgood, to co-develop the program as well as this project.
- Used appropriate sustainability system based assessment, stakeholder engagement and communications plan to further my project.

To ensure a sustainable local food system, we need to holistically look at every single aspect of the system that possibly may get affected due to the food supply chains. I decided to strategically look at factors that will influence the environment, the economy as well as the society as a result of accelerating business for Stern in the local food system. Hence, I categorized my impacts under the following buckets:

- **Health:** This is to ensure that the working environments for the farm workers are safe and stable. It accounts for the health impacts from dust, volatile compounds sprays, gases etc. across the entire lifecycle of how food is produced, processed, packaged, labeled, distributed, marketed, consumed and disposed of. It looks at, distance a product and its raw materials are shipped before its consumed. This also takes into account the fact, that the end product that is produced does not contain any harmful compounds that can deteriorate human or livestock health.
- **Sustainability:** This is to ensure a stable base of family farms that use production practices which are less chemical and energy intensive. This also accounts for conservation, protection and restoration of our natural resources, landscapes and biodiversity in the process of farming. It supports sustainable farming practices like cover cropping, drip irrigation, composting, eliminating tillage etc. that would contribute to

[Your short title here.]

producing more nutritious food while improving the natural ecological conditions to sustain production permanently.

- **Resilience:** This ensures that the food system is robust enough to thrive in the face of challenges like natural calamities, social upheavals, human made disasters, increased pest attacks, climate variability due to climate change and increasingly expensive water and energy supplies. It aims at strategies to yield more, with less resource use like water without losing it or disposing it off unnecessarily in the process (evaporation, leakage etc.)
- **Diversity:** This is aimed at diversity in the size and scale of the production like crop diversity and considering geographic differences in different farmlands. It also accounts for diversity in natural resources, climatic conditions, customs and culture of practices of growing crops. Additionally, the focus is on diversity of socio-demographics and biological and cultural diversity.
- **Fairness:** This is aimed at ensuring fairness and just communities in fair working conditions. It also accounts the fact that communities must have access to affordable food that is health promoting and culturally appropriate. It also targets at just or better than minimum living wages.
- **Economic Balance:** This ensures that economic opportunities are created across different scales of activity from local to regional for a diverse range of food system stakeholders. The local food systems must result in value propositions and circulate financial capital within the community that will attract investments and economic opportunities at the local and regional levels.
- **Transparency:** This is to ensure that the farmers and the consumers are well aware of and educated to actively engage and participate in the decision making process in all sectors of the system. It allows them to understand the entire operations of the system right from how food is produced to how it is disposed off and what potential ramifications it has throughout the process. This will promote vertical integration of operations as a competitive advantage in the marketplace. It will also promote horizontal distribution of ownership to ensure participation in the whole food chain.

After doing enough relevant research and carefully considering AZ's food system in particular, I zeroed down on four core sustainability metrics for local food systems against whom, certain key indicators were identified. These metrics were chosen based on their significance on the human health, as well as its impact on social, economic and environmental sustainability. Metrics help to assess progress towards a given goal. They can be composed of multiple indicators which can be defined as quantitative or qualitative factors that capture system changes following an intervention in a simple and reliable manner. These indicators, derived from multiple variables, with data collected from direct field observations and questionnaire surveys, will enable us to statistically measure impacts of the AFT program as the program continues to grow further. The chosen metrics with their respective indicators are as follows:

[Your short title here.]

Metrics	Indicators
Food Safety and Food Nutrition	Farm Certification
	Crop Diversity
	Crop Food
	Pest Control
	GMO/Non GMO
	Food Storage and processing
	Food taste and enjoyment
Ecosystem/Bio Diversity Stability	Water Usability
	Farming Practices
	CO2 emissions
	Pest control methods
	Soil Health
Economic Resilience and Stability	Food affordability
	Creation of job opportunities
	Stern local revenue indicators/Profitability
Socio Cultural Well Being	human health and safety
	quality of life/human well being
	Equity, Justice
	Biological and Cultural diversity
	Resiliency in the system
	Happiness

Metrics & Indicators Criteria:

- Opportunities based: the data selected measures progress towards the goals (positive) rather than regression away from the goals (negative)
- Statewide: the data chosen should be available in all the 30 farms all around the state of Arizona, rather than for the U.S.
- Measurable: the data must be quantifiable.
- Available: the data must be open and available to the public
- Cost effective: It must be possible to access the data with no or little monetary input.
- Stable, reliable and credible: the data must be collected from a credible source, in a consistent way and replicable from one-time period to the next.

[Your short title here.]

- Understandable and usable: the data must be easily understood by potential interpreters of the data, so that it can be applicable in their own communities.
- Sensitive to change: the data must respond to change over a reasonable length of time and not take hundreds of years to show progress.

Additionally, I conducted qualitative survey interviews with these 14 farms to gather information on how they perceived the AFT program and the local food system in Arizona as a whole. My questions for them were categorized into the three tenets of sustainability and were aimed at realizing how educated and aware were these farmers in their farming practices from a sustainability perspective.

Environmental Questionnaire

My questions were framed to understand more about the kind of sustainable farming practices, these farmers have adopted in their farms to ensure our natural resources and biodiversity is restored. Questions I asked were as follows:

- *Is your farm certified organic, biodynamic or naturally grown?*
- *How many different types of produce do you grow? Do you grow any heirloom varieties? (crop diversity)*
- *Do you use genetically engineered seeds on your farms?*
- *What type of fertilizers do you use?*
- *What pest control methods have you adopted on your farms?*
- *What water pollution prevention strategies do you use? Do you have any buffer zones? How do you deal with the downstream of water on land and communities?*
- *What types of sustainable farming practices do you do? (cover cropping, composting, eliminating tillage etc.?)*
- *Do you utilize any heavy CO2 yielding tools or infrastructure on your farms that can potentially lead to air pollution? If yes, what strategies are in place to minimize the impact?*

Social Questionnaire

To understand the social impacts of local food programs, I relied exclusively on my survey interviews with the farmers. My questions for them were targeted at understanding how these

[Your short title here.]

farmers are ensuring the social cohesion between them and their workers and the society as a whole are balanced out. Questions I asked were as follows:

- *Human health & safety: What steps/precautions do you take (if any) for your farm workers in combating morbidity or mortality from pesticide exposures, food contamination, livestock to human diseases, drinking water contaminations, ergonomic risks with farm tools etc. on farmlands?*
- *Quality of life and human well being: Can you give us an overall picture of the amount of dollar figure your farm workers are making on an hourly/daily basis? Does it comply with the state's average wage rate? Do they get any additional benefits such as healthcare etc.? How are their housing conditions, job security, life expectancy rates?*
- *Equity, justice and ethics: Do your farm workers take participation (have a voice) in decision making, have knowledge of and access to labor rights, have representation in associations/cooperatives? Do they have any sort of accountability measures or mechanisms? How would you describe your ethics of farming, food systems and regenerative ecosystem stewardship?*
- *Biological and cultural diversity: How many female workers do you employ? What is the ratio between male to female workforce on your lands? Do you associate cross cultural diversity in your workforce? How do you deal with migration/immigration issues?*
- *Resiliency & Vulnerability: What are your coping mechanisms and response to shock strategies in case of natural calamities (hurricanes, floods, droughts), market crashes, social upheavals? What social learning and local knowledge institutions are in place to grow the capacity of your internal food system and absorb any sort of external disturbances?*

Economic Questionnaire

My questions were targeted at understanding how and in what capacity are these local food systems contributing to the local economy. Questions I asked were as follows:

- *Can you give us an averaged dollar percentage of how much do you make in annual sales from your local production? Has that figure risen or dropped over time? How do you project*

[Your short title here.]

your sales trends in the coming years? What do you think the market perception is currently towards local produce?

- *What employment opportunities have you generated in your entire food supply chain (production, processing and distribution), that can boost our local economy?*
- *Can you give us an idea of how much does local food markets draw shoppers to neighboring businesses, increase property values or even encourage entrepreneurship in the local community?*

6. Findings

Conventional method generally refers to out of state and non-local sourcing of products grown in the conventional food system that tends to be cheaper as they are produced in mass scale. Although local food is seasonal based and cost ineffective at the moment, we believe that, if consumption grows in large scale within communities and if the demand for local food grows in volumes, then the prices of local products will eventually become cost competitive in the markets too. Moreover, the sustainability implications of consuming local produce outweighs all other factors that conventional food systems entail. These implications will be discussed below:

I. Environmental Implications of the AFT program: Pollution Prevention:

Food miles are the distance food travels from its point of origin to its point of destination. Currently, at Stern 70% of their fruits comes from abroad and more than half of the vegetables are imported. Hence, it has a hugely significant food miles' footprint or carbon footprint. By sourcing food locally from within Arizona's farms, we can reduce that green house gases emissions factor by a significant margin.

I figured out the top 10 conventional farms with the highest quantities of produce sales to Stern. These farms were mostly all situated in various parts of California and a few in Mexico. The farms are as follows:

- *Boskovich Farms*
- *Nature Ripe Farms*
- *Church Brother Farms*

[Your short title here.]

- *Darrigo Brothers Farms*
- *Driscoll Farms*
- *Field Fresh*
- *Ippolito Farms*
- *Mann's Farms*
- *Sunkist Farms*
- *Taylor Farms*

All of these conventional produce lands first in the Phoenix warehouse. Thus I calculated the respective food miles travelled from the Phoenix warehouse, and subsequently, their GHG emissions.

For a comparison analysis, I measured the food miles travelled in local sourcing from the local farms within the state of AZ. Out of the 31 farms in Arizona that Stern has partnered with in the AFT program, I was able to interview 14 farms whom I considered as my baseline examples for the purpose of this project.

- *Pinnacle Farms*
- *Roosevelt Farms*
- *Ramona Farms*
- *Sarah Farms*
- *Abby Lee Farms*
- *Arizona Farms Cheese Co.*
- *Arizona Microgreens*
- *Blue Sky Organic Farms*
- *Duncan Family Farms*
- *Hickmans Family Farms*
- *Martori Farms*

[Your short title here.]

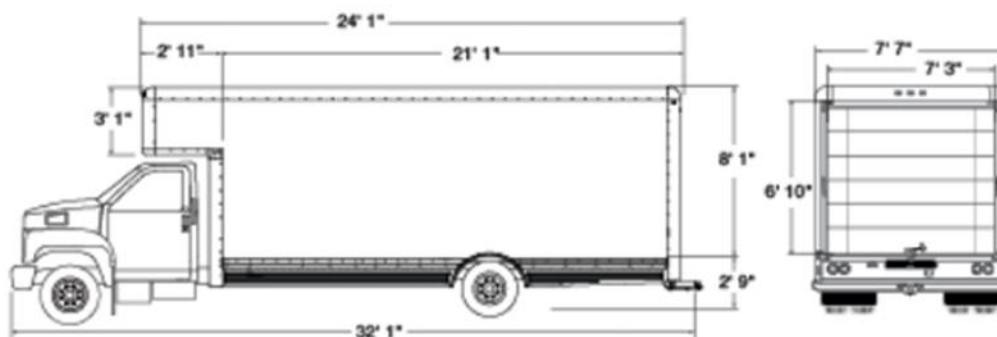
- *True Garden*
- *Top Knot Farms*
- *WholeSum Family Farms.*

Stern trucks go for pick up from these farms. I figured out the closest Stern warehouse (Phoenix, Tucson and Flagstaff) from each of these farms sites because it makes more sense to pick up products for the nearest warehouse, to cut down on greenhouse gas emissions. Unfortunately, I could not get in touch with any farm that does business with the Flagstaff warehouse. Out of these above selected 14 farms, only Top Knot Farms and Wholesum Family Farms is strategically located to provide products for the Tucson warehouse. The rest of the farms can provide produce for the Phoenix warehouse.

I calculated the green house gas emissions caused due to the food miles travelled. The volumes of produce carried in the trucks varies depending on the season, the producing capacity of the farms and the demand in the market. Thus I had to standardize the volume of produce carried in a 24 feet size Stern truck, assuming it to be filled to its optimum capacity. It is important to note that; I have accounted the GHG emissions for only the 'sourcing miles' from the farms to Stern's warehouse. Accounting for the distribution miles from Stern's warehouse to different distributors was out of the scope of this project. Additionally, I also figured out the best route optimization distances possible for pick ups from the Phoenix and Tucson warehouses, assuming they pick up produce from all the nearby farms on the same day.

- Standardized Dimensions of the truck are assumed as below:

[Your short title here.]



Capacity

- Volume: 1418 cu. ft.
- Max load: 6,500 lbs.
- Gross vehicle weight: 18,000 lbs. max.
- Empty weight: 11,500 lbs.
- Towing capacity: Up to 7,500 lbs.

Fuel

- Unleaded fuel
- Fuel tank capacity: 60 gal.
- Miles per gallon: 8 mpg

(Photo courtesy: UHAUL website)

[Your short title here.]

Freight Emissions Calculator

Enter the information below to calculate the CO2 emissions created.

Less than Truckload

Shipment Weight (lbs):

Shipment Distance (miles):

CO2 Emissions (Metric Tons): **0.033**

Truckload

Shipment Distance (miles):

CO2 Emissions (Metric Tons):

Shipment Weight = Shipment Actual Weight
(use dimensional weight* if higher)

Distance = Miles from pickup location to delivery location

Figure: The above snapshot is a tool to calculate freight emissions taken from the “Delivered Green” website

STERN SITE	FARM SITE	Closest STERN SITE	Distance between FARM and closet STERN (Miles)	Time in Hrs/Mins	CO2 emissions in Metric Tons
STERN PRODUCE PHOENIX: 3200 S 7th St, Phoenix, AZ 85040	Boskovich Farms: Oxnard, Ca	STERN Phoenix	437	6 Hr 26 Mins	0.233
	Church Brother Farms: 19065 Portola Dr, Salinas, CA, 93908	STERN Phoenix	677	9 Hr 52 Mins	0.36
	Darrigo Brothers California: Salinas CA	STERN Phoenix	677	9 Hr 49 Mins	0.36
	Driscoll: 151 Silliman Rd, Watsonville, CA 95076	STERN Phoenix	696	10 Hr 11 Mins	0.37
	Field Fresh: Watsonville, CA	STERN Phoenix	700	10 Hr 15 Mins	0.372
	Ippolito: Salinas CA	STERN Phoenix	677	9 Hr 49 Mins	0.36
	Manns: Salinas CA	STERN Phoenix	677	9 Hr 49 Mins	0.36
	Sunkist: Claremont, CA	STERN Phoenix	344	4 Hr 49 Mins	0.183
	Taylor Farms: Salinas CA	STERN Phoenix	677	9 Hr 49 Mins	0.36
	Nature Ripe: Salinas CA	STERN Phoenix	677	9 Hr 49 Mins	0.36

The above table represents the distance in miles, time taken to cover that distance and subsequent CO2 emissions in metric tons for the top 10 highest selling conventional farms, Stern sources its products from.

[Your short title here.]

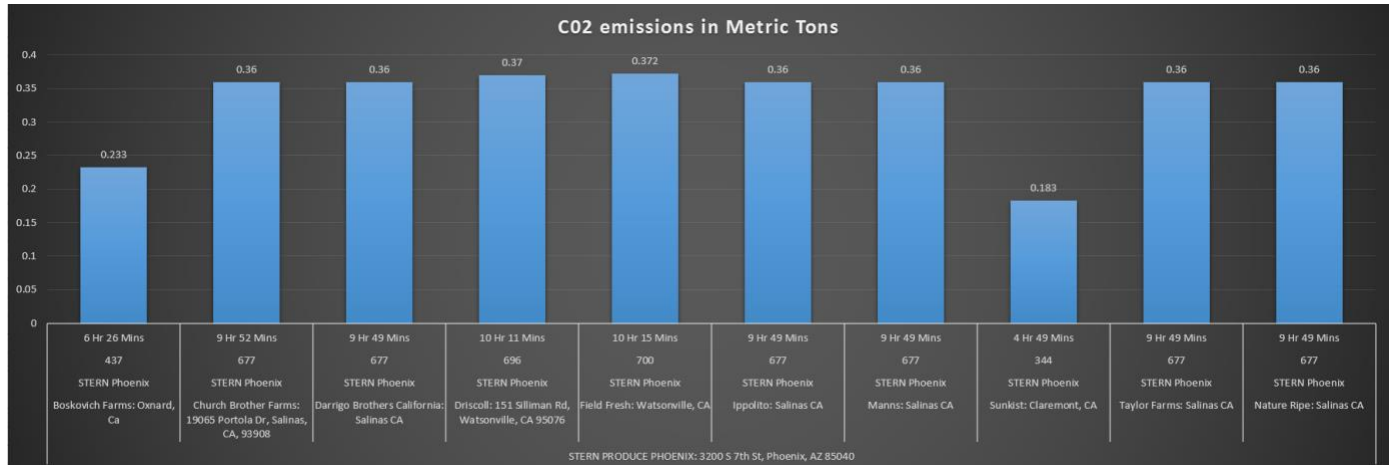


Figure: The above histogram depicts a graphical representation of the CO2 emissions released in conventional sourcing of food produce from out of state of AZ.

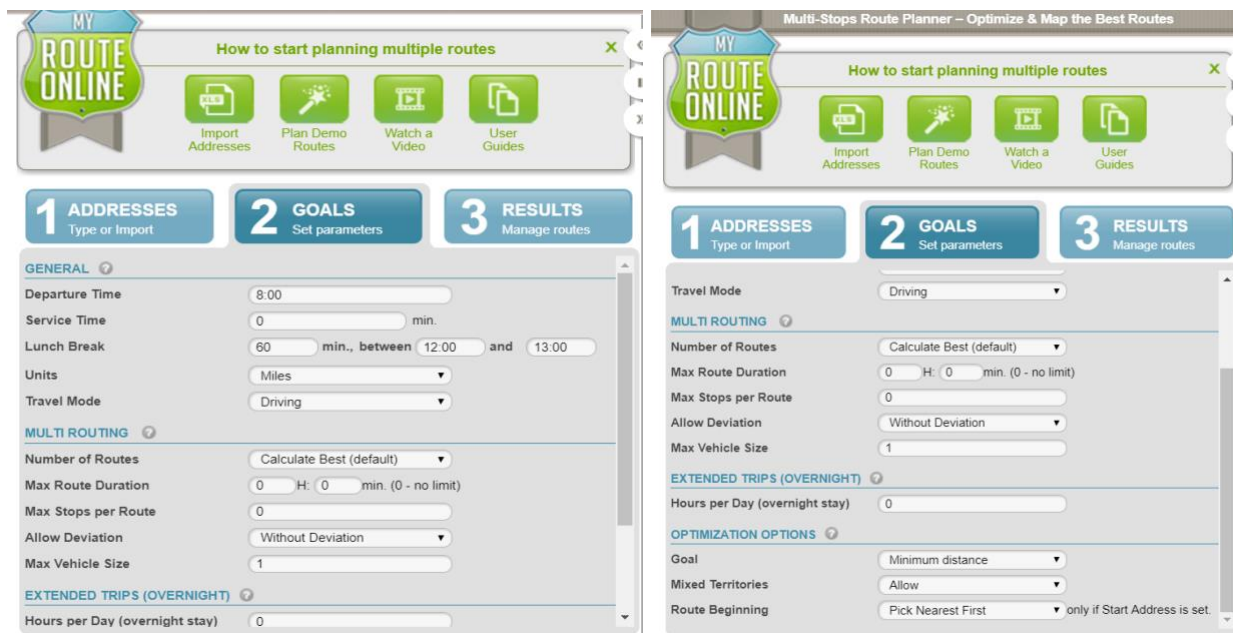


Figure: The above snapshots represent the process tool I used from My Route Online.com to optimize the routes of transportation

[Your short title here.]

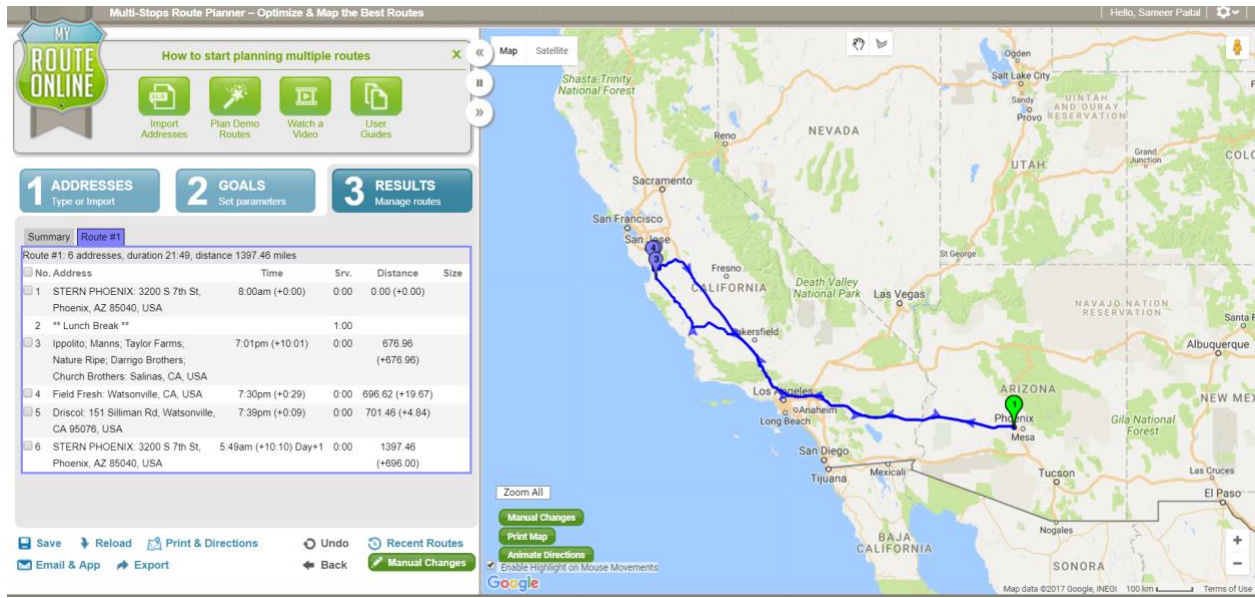


Figure: The above snapshot shows the optimized route for Stern to pick up produce collectively from the farms nearby to each other in Salinas and Watsonville, CA

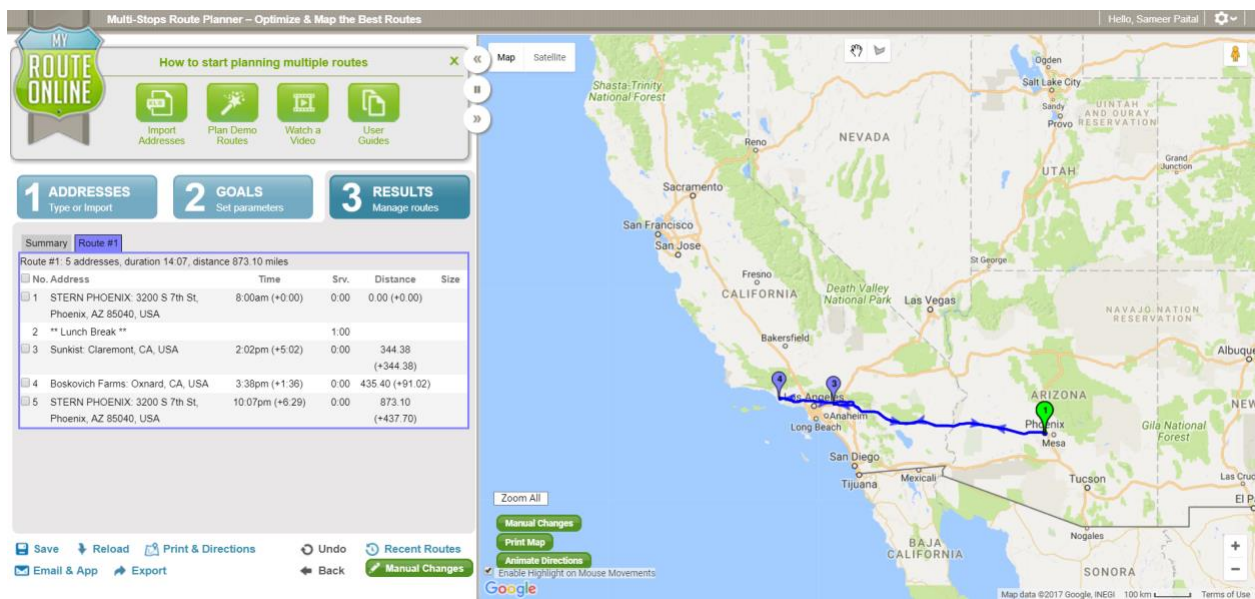


Figure: The above snapshot shows the optimized route for Stern to pick up produce collectively from the farms nearby to each other in Oxnard and Claremont, CA

[Your short title here.]

STERN SITE	FARM SITE	Closet STERN SITE	Distance between FARM and closet STERN (Miles)	Time in Hrs/Mins	CO2 emissions in Metric Tons
STERN PRODUCE PHOENIX: 3200 S 7th St, Phoenix, AZ 85040	Pinnacle Farms:8841 South 27th Ave	STERN Phoenix	6.6	14 Mins	0.004
	Roosevelt Farms: 3146 East Wier Avenue, Phoenix, AZ, United States, Phoenix 85040	STERN Phoenix	5.1	7 Mins	0.003
	Ramona Farms: AZ-87, Sacaton, AZ 85147	STERN Phoenix	38	39 Mins	0.02
	Sarah Farms: 2751 E Palo Verde St, Yuma, AZ 85365	STERN Phoenix	185	2 Hr 55 Mins	0.098
	Abby Lee Farms: 1400 W Baseline Rd, Phoenix, AZ 85041	STERN Phoenix	4.1	9 Mins	0.002
	Arizona Farms Cheese Co: 2008 S. Hardy Dr. Tempe, AZ 85282	STERN Phoenix	7.9	12 Mins	0.004
	Arizona MicroGreens: 3146 E Wier Ave, Phoenix, AZ 85040	STERN Phoenix	5.1	7 Mins	0.003
	Blue Sky Organic Farms:4762 N 189th Ave, Litchfield Park, AZ 85340	STERN Phoenix	29	34 Mins	0.015
	Duncan Family Farms: 18969 W. McDowell Rd. Buckeye, AZ 85396	STERN Phoenix	26.4	29 Mins	0.014
	Hickmans Family Farms:6515 Jackrabbit Trail, Buckeye, AZ 85326	STERN Phoenix	32.1	37 Mins	0.017
	Martori Farms:51040 Valley Rd, Aguilu, AZ 85320	STERN Phoenix	95.4	1 Hr 35 Mins	0.051
	True Garden: 5949 E University Dr, Mesa, AZ 85205	STERN Phoenix	26	28 Mins	0.014
	STERRN PRODUCE: 810 E 17th St, Tucson, AZ 85719	Top Knot Farms: 535 N. Calle Tortuga Benson AZ, 85602	STERN Tucson	41.1	44 Mins
WholeSum Family Farms: 2811 N Palenque Ave, Nogales, AZ 85621		STERN Tucson	62.1	1 Hr 2 Mins	0.033
STERN PRODUCE: 7810 N Hwy 89 Flagstaff, AZ 86004		N/A	N/A	N/A	N/A

Table: The above table represents the distance in miles, time taken to cover that distance and subsequent CO2 emissions in metric tons for the top highest selling local farms, Stern sources its products from.

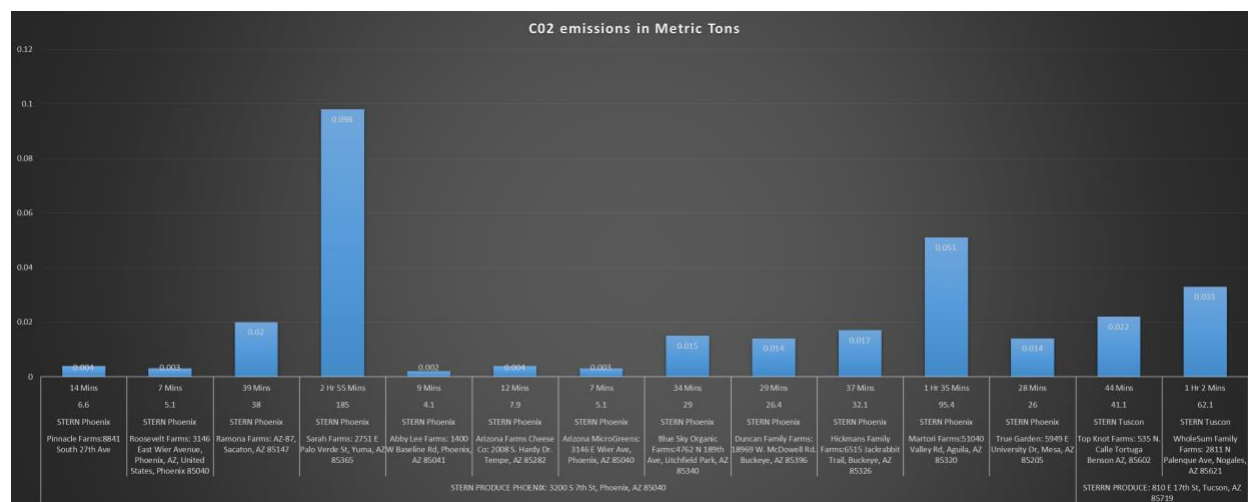


Figure: The above histogram depicts a graphical representation of the CO2 emissions released in local sourcing of food produce from within the state of AZ

In order to cut down on emissions, we need to cut down on the food miles covered. The best possible way to do that is to optimize the routes that Stern trucks take. Below is a graphical analysis of how the routes to the pick up farms can be optimized from Stern's Phoenix and Tucson warehouses, assuming that all the farms are covered on the same day.

[Your short title here.]

Below are the route optimization data from Stern's Phoenix warehouse.

Multi-Stops Route Planner – Optimize & Map the Best Routes

How to start planning multiple routes

1 ADDRESSES Type or Import

2 GOALS Set parameters

3 RESULTS Manage routes

Summary Route #1

Route #1: 15 addresses, duration 10:35, distance 530.29 miles

No.	Address	Time	Srv.	Distance	Size
1	STERN PRODUCE PHOENIX: 3200 S 7th St, Phoenix, AZ 85040, USA	8:00am (+0:00)	0:00	0.00 (+0:00)	
2	Arizona MicroGreens: 3146 E Wier Ave, Phoenix, AZ 85040, USA	8:09am (+0:09)	0:00	4.09 (+4.09)	
3	Roosevelt Farms: 3146 E Wier Ave, Phoenix, AZ 85040, USA	8:09am (+0:00)	0:00	4.09 (+0:00)	
4	Arizona Farms Cheese Co: 2008 S Hardy Dr, Tempe, AZ 85282, USA	8:21am (+0:12)	0:00	8.14 (+4.04)	
5	True Garden: 5949 E University Dr, Mesa, AZ 85205, USA	8:46am (+0:25)	0:00	26.47 (+18.33)	
6	Ramona Farms: AZ-87, Arizona	9:28am (+0:43)	0:00	56.15 (+29.68)	

Multi-Stops Route Planner – Optimize & Map the Best Routes

How to start planning multiple routes

1 ADDRESSES Type or Import

2 GOALS Set parameters

3 RESULTS Manage routes

7	Abby Lee Farms: 1400 W Baseline Rd, Phoenix, AZ 85041, USA	10:15am (+0:46)	0:00	92.27 (+36.12)	
8	Pinnacle Farms: 8941 S 27th Ave, Laveen Village, AZ 85339, USA	10:21am (+0:06)	0:00	94.75 (+2.48)	
9	Hickmans Family Farms: 6515 Jackrabbit Trail, Buckeye, AZ 85326, USA	11:02am (+0:41)	0:00	120.85 (+26.10)	
10	Duncan Family Farms: 18969 W McDowell Rd, Buckeye, AZ 85396, USA	11:12am (+0:10)	0:00	126.84 (+5.99)	
11	Blue Sky Organic Farms: 4762 N 189th Ave, Litchfield Park, AZ 85340, USA	11:18am (+0:06)	0:00	130.29 (+3.45)	
12	** Lunch Break **		1:00		
13	Martori Farms: 51040 Valley Rd, Agula, AZ 85320, USA	1:32pm (+1:14)	0:00	200.18 (+69.89)	

Multi-Stops Route Planner – Optimize & Map the Best Routes

How to start planning multiple routes

1 ADDRESSES Type or Import

2 GOALS Set parameters

3 RESULTS Manage routes

9	Hickmans Family Farms: 6515 Jackrabbit Trail, Buckeye, AZ 85326, USA	11:02am (+0:41)	0:00	120.85 (+26.10)	
10	Duncan Family Farms: 18969 W McDowell Rd, Buckeye, AZ 85396, USA	11:12am (+0:10)	0:00	126.84 (+5.99)	
11	Blue Sky Organic Farms: 4762 N 189th Ave, Litchfield Park, AZ 85340, USA	11:18am (+0:06)	0:00	130.29 (+3.45)	
12	** Lunch Break **		1:00		
13	Martori Farms: 51040 Valley Rd, Agula, AZ 85320, USA	1:32pm (+1:14)	0:00	200.18 (+69.89)	
14	Sarah Farms: 2751 E Palo Verde St, Yuma, AZ 85365, USA	3:52pm (+2:20)	0:00	345.99 (+145.81)	
15	STERN PRODUCE PHOENIX: 3200 S 7th St, Phoenix, AZ 85040, USA	6:35pm (+2:43)	0:00	530.29 (+184.31)	

[Your short title here.]

Below are the route optimization data from Stern's Tucson warehouse.

Multi-Stops Route Planner – Optimize & Map the Best Routes

How to start planning multiple routes

1 ADDRESSES Type or Import

2 GOALS Set parameters

3 RESULTS Manage routes

Filter: Green (4)

Title	Address	Srv.	Order	Size
STERN PRODUCE	810 E 17th St, Tucson, AZ 85719, USA			
Return (make it also the End Address) Recent Start/End Addresses...				
A	Top Knot Farms 535 N Calle Tortuga, Benson, AZ 85602, USA	60		
B	WholeSum Family 2811 N Palenque Ave, Nogales, AZ 85621, USA	60		
C	Title (optional) Full address C here	60		
D				
E				
STERN PRODUCE	810 E 17th St, Tucson, AZ 85719, USA	60		

Summary Route #1

No.	Address	Time	Srv.	Distance	Size
1	STERN PRODUCE TUSCON 810 E 17th St, Tucson, AZ 85719, USA	8:00am (+0:00)	1.00	0.00 (+0.00)	
2	Top Knot Farms 535 N Calle Tortuga, Benson, AZ 85602, USA	9:52am (+0:52)	1.00	45.76 (+45.76)	
3	** Lunch Break **		1.00		
4	WholeSum Family Farms 2811 N Palenque Ave, Nogales, AZ 85621, USA	1:21pm (+1:29)	1.00	120.24 (+74.48)	
5	STERN PRODUCE TUSCON 810 E 17th St, Tucson, AZ 85719, USA	3:23pm (+1:02)	1.00	182.23 (+61.99)	

Environmental Implications

Summary of the Survey responses I got from the farmers:

- All the 14 farms are certified. They are certified either organic (6 out of 14), GHP (Good Handling Practices) / GAP (Good Agricultural Practices) certified (11 out of 14) or naturally grown. This means that there is strictly no use of any synthetic chemical inputs (e.g. fertilizers, pesticides, antibiotics, food additives), irradiation and the use of sewage sludge. GHP/GAP certification verifies that the farm has taken proactive measures to reduce the risk of contamination by adhering to generally recognized industry best practices of producing, processing, storing, packaging and distributing food produce.

[Your short title here.]

- None of the farms use genetically modified seeds. Some of them use fertilizers that are organic certified. But mostly, the source of fertilizers is composting, fish waste, micro nutrients, human waste manure, earth and sea minerals.
- The crops are mostly rotated and cover cropping is done in most parts of the summer in Arizona. Sustainable farming practices like eliminating tillage to prevent soil erosion was one of the predominant responses I got from all the farmers. Majority of them practice composting and recycle their own compost as fertilizer for the soil.
- None of the farms use chemical sprays for pest control. Instead, they use, bird traps, beneficial bugs, enzymes, companion planting, plant based oils like neem oil and peppermint, trained birds like hawks and falcons etc. to eradicate pests of any sort.
- Majority of the farms used sprinklers systems and drip irrigation for watering their fields to avoid excess wastage of water. They have created buffer zones like big ditches around the periphery of their farms to block the runoff of water during rainy seasons. These farms are never close by to any conventional large farms. Thus, the risk of getting contaminated water is low. Additionally, 3 out of 14 farms claimed that the water they use undergoes robust water testing programs for microbes and is considered even safer for human consumption.
- These local farms, due to their small acreage don't need extensive usage of tractors on their fields. Most of the production process is hand done. The two farms that need tractors on their fields use John Deere tractors that have specialized engines for lesser emissions and noise. They claimed 90% less electricity usage than traditional farming per acre of land.
- One interesting takeaway for me from these interviews was how all farmers mentioned greater accountability for them when food was raised and grown locally. They explained how they felt morally responsible to use sustainable agricultural practices and be accountable to safer ecological practices, as they were growing food for their own neighbors, their own community. This accountability gave them a sense of bonding and ownership towards their community members.

II. *Social implications of the AFT program:*

Summary of the responses I got:

- In general, all these farms have formalized safety training programs, regular inspections and audits, weekly team meetings to discuss issues or concerns that needs to be addressed. The employee trainings are rigorous in terms of safety protocols. There is provision for instant reporting and follow ups with feedback assessment to ensure that every single head is safe and aware.
- All the farms pay their workers' wages above the state's average wage rate. The full time employees also do have access to additional benefits like healthcare etc. 5 out of 14 farms also pay annual bonuses based on yearly sales. 3 out of 14 farms also provide for housing and access to community healthcare for their farm workers.
- There was not a positive response regarding equity, justice and ethics awareness of farm workers. Most of them didn't understand what it exactly meant. Those who did, said that, there is lack of avenues here in the state's local policies to educate and engage the less educated farm workers in that direction. They simply didn't feel the need to engage their workers in the decision making process at all. As long as they are paid well and well taken care of, these workers are happy.
- Interestingly, the biological and cultural diversity ratio was really impressive for those farms. On average, every farm employed 30% women and 50% native Navajos, Mexicans etc. 3 farms in particular had more female heads than male in their workforce. They said they preferred women employees as they were more reliable and had better work ethic.
- In terms of resiliency, most of the farms were uncertain and concerned. According to them, their farms are so small in terms of revenue, that in the event of a market crash, they really didn't know how to sustain themselves. They already have price competitiveness concerns with large retail houses and social upheavals like this, would just make them more vulnerable and diminishing. My interviewee at Blue Sky Organic, even described a situation, where she was asked by Whole Foods to grow vegetables in the coming season for their local inventory. She went ahead and invested tons of thousands of dollars and grew all those crops that Whole Foods had asked her to. But, when the season arrived, Whole Foods backed out from purchasing their produce,

[Your short title here.]

stating price factor as an issue. As a result of which, Blue Sky incurred huge losses that season in 2015 and till now, is still recuperating from that loss.

III. Economic implications of the AFT program:

Summary of the responses I got:

- In general, all the farms projected a local sales revenue growth from in between 5% to 15% in the past 3-4 years. However, they expect this growth to soar higher, had there been more awareness, education and encouragement towards eating local and seasonal. All the farmers agreed that more organizations like Stern should step up and support our local farmers in doing business in the community. Almost all my farms blamed the lack of education and willingness amongst consumers to prefer local food over cheaper but unhealthy conventionally sourced food. Some even hinted at greenwashing that happens in farmers' markets in the name of local produce. There are farmers that import potatoes from other states and sell them here in Arizona farmers markets in summer claiming them to be locally produced. Whereas, the AZ climate doesn't support growing potatoes, in the summer season at all. If consumers would have been aware and educated of such things, they would never buy these products. My interviewees also clearly expressed their frustration over consumers who don't know how to adapt to season based eating habits if they want to support local. Additionally, they expect support and incentives from the local government and the big retail houses to sustain symbiotically in the competitive market today.
- The farmers that I interviewed employ an average of 30 to 50 people in their business in the peak season. That number drops down in the non peak seasons as these workers are mostly contingent labor force. However, these are the heads economically supported only in the producing aspect of farming. Except for a single farm, none could provide me a concrete answer as to how many heads are employed in the processing, packaging and distribution aspects of farming. It is unfortunate, they don't even track that data. Currently, it is out of the farmers' budget and capacity to track how much are they contributing to the local economy of AZ.

[Your short title here.]

Top 10 Conventional Inventory Sales data for 1-1-17 to 11/6/17:

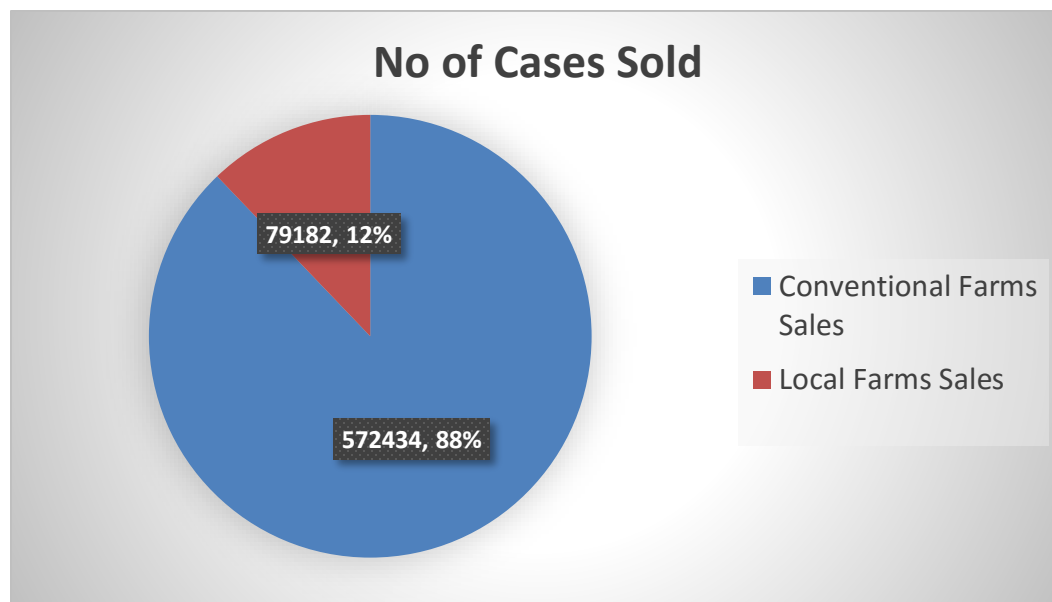
Conventional Farms	Cases Sold
Boskovich Farm	49,700.95
Nature Ripe	24,025.48
Church Brothers	13,446.50
Darrigo	37,277.61
Driscoll	108,742.40
Field Fresh	23,144.80
Ippolito	17,351.66
Mann's	53,633.33
Sunkist	87,945.81
Taylor Farms	157,165.77
Total Cases	572,434.31

Similarly, **Local Inventory Sales Data for 1-1-17 to 11-6-17** was calculated.

Total Cases sold = **79,181.60 cases**

And direct dollar value spent to the local providers/economy is appx **1.3 million**

[Your short title here.]



7. Conclusions

The AFT program is one of a kind. As clear from the findings above, this local food program, not only helps protect our environment or economy but also advocates food access and health, food justice, food sovereignty and racial equity especially for those that are marginalized by race, ethnicity, gender, size of business/farm or economic class. This project provided a holistic approach to supply chain analysis in order to develop metrics to assess the AFT sustainability program at Stern produce. The sustainability metrics that I created and the consequences of those metrics that I presented, present a novel methodology and clear results that will be useful to Stern and similar businesses. The project also provided a comprehensive assessment tool including health, resilience, fairness and transparency that are not generally used in a typical supply chain analysis but are predominantly categorized from a sustainability perspective. Local food programs like AFT create opportunities for a new frontier for the local foods movement and it is up to the advocates, entrepreneurs, farmers, academia and the government to be the explorers, discoverers and the mappers of this critically important collaborative space. However, during the course of my project, I recognized a lot of factors that act as barriers to the successful running of local food programs like the AFT. They are discussed below.

To begin with, metrics to measure sustainability should be well defined, meaningful, measurable, motivational and easy to understand and communicate to all stakeholders. That includes the farmers to the policymakers, business executives and the average consumer base. During my research and while conducting stakeholder meetings, I realized that there was a huge gap in information and data collection and distribution in the realm of local food systems. These gaps

[Your short title here.]

potentially impact the assessment of progress on sustainable agricultural development. Insufficient data (frequency and scale of data collection), inconsistent guidelines for measuring metrics, weakness in predictive models and a lack of investment in new technologies for monitoring systems all contribute to the collective confusion that surrounds supporting local food systems and local farmlands. Additionally, lesser coordination of activities and data sharing between various stakeholder groups makes this problem even worse.

Moreover, there are large uncertainties around social characteristics of sustainability that are potentially impacted by the local food systems. The uncertainties like, changes in diet and taste, population growth and density, rapid urbanization, availability of agricultural land for production, the ratio and locations of net producers to net consumers in the region are all fluctuating trends and inconsistent. We can only rely on strong predictive long term trends data which is again uncertain and poorly collected. Similarly, I struggled to actually measure the economic impact of sustainability, from local food systems. The reason being lack of available data and geographic scope. Although the concept of contributing to the local economy definitely makes sense, in terms of output, gross regional product, income and jobs. But research is really sparse on how much local food markets draw shoppers to neighboring businesses, increase property values or even encourage entrepreneurship. My interviewees couldn't answer questions like these and had to blame the lack of infrastructure, time and money to assess these factors.

There is a heavy disparity and inconsistency issue with the supply and demand side in the markets for local produce. As a result of which, huge corporate retailers don't trust local farms to do business with them. And, consumers don't rely on local food as they do not get guarantee in availability and quality. We need to improve market forecasts, warning systems, updated information on crops, and transparent solutions oriented decisions on the supply side to ensure consistent and close to accurate crop production. Such data is currently not available due to lack of human resources, technology, and funding. On the demand side, policymakers need cross-sectional information that includes comparisons between different social groups, regions, and net producers vs. net consumers; information on long-term trends, seasonal patterns etc. to maintain a systematic, reliable collection of data (metrics) to track progress. Available technologies include geographic information systems (GIS), remote sensing, global positioning systems (GPS), and numerous Internet and smartphone tools. Strong public-private partnerships can help realize their full potential.

However, that being said, we should look beyond typical economic metrics like income and job opportunities to account for more social benefits that are intangible but worthwhile. The AFT program at Stern, ensures building community cohesion. It creates a platform and opportunity for the food producers to insert themselves into the social fabric of the rural communities and simultaneously connect with urban customers. While on one hand, consumers gain a better appreciation for the value of local farms to their communities, they also develop a sense of trust and resiliency knowing who is growing their food they eat and how they grow it. These factors account as social capital in addition to the economic capital that are the key benefits of local food systems.

8. Future Directions

There is tremendous opportunity for other students to potentially build off, of this project. The reason being that, 3 months' time frame was not sufficient to assess these metrics from their baseline indicators and measure its impacts. My project just laid out the foundation and created a set of metrics against which, the sustainability indicators shall be used to evaluate their potential implications on the environment, economy and society. There is scope to actually forecast, measure and compare the results of these indicators with time as AFT program continues to generate more revenue and consequently affect lives of more people. As the volumes of local product sales competitively increases and matches the conventional product sales numbers, there will be stronger evidences to display against the impacts that are created on the environment as well as the society. In addition to that, branding and marketing the AFT program to demonstrate the importance of local food systems could be potentially another project in itself. The metrics I present can be used as a marketing tool to substantiate the case further. Life-cycle assessments—complete analyses of energy use at all stages of the food system including consumption and disposal—suggest that localization can but does not necessarily reduce energy use or greenhouse gas emissions.

9. Acknowledgements

I am immensely grateful and thankful to Kristen Osgood, my project partner who is so passionate and knowledgeable about sustainability. She has been a tremendous mentor through out the course of this project and without her guidance, this project would not have been remotely possible. I also express my gratitude to Stern Produce Co. for letting me do this project with them and accommodating my requests to the best of their ability. I would also want to thank Paul Prosser, my instructor, for giving me direction and adding valuable inputs and feedbacks throughout the course of this project. Not to forget, the Arizona farmers and many other local and out of state stakeholders in this project, whom I interviewed for my project. All of them were cooperative, friendly and got me thinking about this project from a different perspective. Lastly, I thank the School of Sustainability for this opportunity and the MSUS committee for the constructive evaluation of this project.

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- HEALTH AND WELFARE OF THE COMMUNITY
- SUSTAINABILITY
- RESILIENT PARTNERSHIPS WITHIN THE COMMUNITY
- DIVERSITY
- FAIRNESS
- LOCAL ECONOMY BALANCE
- TRANSPARENT BUSINESS OPERATIONS
- FIRST MOVER ADVANTAGE

Environmental Effects of Industrial Agriculture

- **Loss of Biodiversity**
- **Soil Erosion**
- **Air pollution – increase CO₂**
- **Degradation of water quality**
- **Human health**

