

**“Can a Food Hub Connect the Dots?”:
Helping Northfield, MN Pursue a Path to a Stronger Local Food System**

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Executive Summary

Introduction: Local produce distribution has been shown to have significant economic, social, and environmental benefits for communities. However, throughout the country, lack of distribution infrastructure prevents small-scale farmers from selling their produce to larger institutional markets. Food Hubs, also known as regional distribution centers, aggregate and redistribute local produce, serving as a potential policy solution to this infrastructure gap. By strengthening local food systems, food hubs often financially support local farmers, increase community access to fresh, local produce, and support more sustainable farming practices. **We will use Northfield, Minnesota as a case study to assess whether a food hub, as a means of addressing the infrastructure gap, would be an effective policy option to strengthen the local food system.** Farmer interest in the creation of a regional food hub for Northfield, Minnesota, sparked our research for this food hub feasibility study.

Methodology: We conducted interviews with local farmers and Northfield institutions, followed by qualitative and quantitative analysis, and developed six interdisciplinary criteria based on the factors we found to be the most important when assessing the potential for a food hub.

Results: We found that seasonality, rather than lack of distribution infrastructure, may be the main barrier to increasing local produce in institutions, and that although the food hub would support environmentally sustainable farming practices, it may actually decrease food access among low-income residents.

Conclusions: Our results indicate that a food hub would be feasible in Northfield, if current barriers are resolved. If created, we recommend that a Northfield Food Hub focus on the market for seconds, create contracts based on whether farmers are selling as a main market or solely for excess produce, use a farm committed to the hub as a central location, and include a processing and/or value-added system to help preserve fresh produce into the winter months.

Future Research: We suggest future research on: demand from other institutions in the greater region, the availability of local non-produce items, local food awareness in non-academic institutions, methods of addressing seasonality, food hub operating costs and markup, and the quantity of produce needed to make the food hub sustainable.

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I. Glossary

Farm-to-Fork: Bon Appétit’s definition of “local food,” which states that the farm must be within 150 miles and owner operated, with less than \$5 million in annual sales.

Farm-to-School, and Farm-to-Institution: A national movement to bring locally grown food directly to local customers, often through schools, institutions or other organizations.

GAP certification (Good Agricultural Practices): “verify that fruits and vegetables are produced, packed, handled, and stored in the safest manner possible to minimize risks of microbial food safety hazards” (USDA). The USDA offers this certification as a way to ensuring food safety for customers.

Grade 1: Produce of the highest physical quality and appearance. There are often restrictions that require produce to be a certain size, shape, and color in order to qualify for Grade 1 status.

Grade 2/Seconds: Produce of a slightly lower quality than Grade 1. Produce can be classified as Grade 2 due to physical blemishes and other imperfections, but must still be safe for human consumption.

HACCP (Hazard Analysis & Critical Control Points): A certification system that addresses food safety by controlling biological, chemical and physical hazards from reaching raw produce through the stages of production, distribution, and consumption (FDA)

Institution: An establishment serving a specific purpose for society. Examples include schools, hospitals and prisons.

Organic: Produce that has been grown without any chemical fertilizers, herbicides, Genetically Modified Organisms, or insecticides. Organic produce “integrates cultural, biological, and mechanical practices that foster cycling of resources, promote ecological balance, and conserve biodiversity” (USDA).

Retail: Direct to consumer sales. Examples of retail outlets include grocery stores, farmers markets, and Just Foods Co-op.

SNAP (Supplemental Nutrition Assistance Program): Government program (formerly known as food stamps) that provides credits for eligible low-income individuals to purchase food. These credits can be used at grocery stores and other retail locations (such as farmers markets) but may not be used to purchase prepared food.

Value-Added Product: Produce that has been processed into another product such as juice, jam, salsa, or salad dressing etc.

Wholesale: Distribution channel between producers and consumers that goes through intermediaries, rather than using direct sale to consumers, to reach retail and other food service outlets (Lindsay and Slama 2012).

II. Introduction

Local Food Systems: Environmental, Social and Economic Benefits

Reducing our food system's dependence on oil is a major challenge facing our country as we move into a carbon-constrained world. In *The End of Food*, peak oil expert Paul Roberts emphasizes that the United States relies on fossil fuels for all levels of food procurement, including production, processing and distribution (Roberts 2008). Intensive farming practices that require large amounts of land and chemical inputs, but relatively small amounts of labor, have led to significant increases in farm production (Móznér et al. 2011). However, these agricultural systems rely heavily on fossil fuel usage, as a result of increased chemical fertilizer, pesticides, and fuel use. Agriculture currently accounts for 14 percent of greenhouse gas emissions (Kern et al. 2012), and uses an average of 7.3 units of energy to produce one unit of food energy (Heller and Keoleian 2003). Contending that the U.S. industrialized agriculture system is dangerously and intrinsically dependent on oil, Roberts concludes that the U.S. needs a structural change to reduce food-related oil usage and the associated environmental impact.

Roberts proposes strengthening local food systems throughout the country as one potential solution. Others echo this argument stating, "an alternative agriculture paradigm will need to emerge [...] one that is more responsive to the needs of the community and the environment" (Azuma and Fisher 2001, 11). Furthermore, to be safe from rising fuel prices, we should put a more stable local food system in place for the future (Roberts 2008). For our research, we define "local food" using standards similar to those Bon Appétit Management Company uses for its Farm to Fork program. According to Bon Appétit's definition of "local food," the farm must be within 150 miles and owner operated, with less than \$5 million in annual sales.

Food produced and sold locally requires short supply chains, decreasing carbon emissions caused by transportation. Because large-scale farmers generally sell through national and/or global distribution chains, the majority of food sold locally is produced by small-scale farmers (Williams 2006). These farmers often use more environmentally sustainable farming practices, including fewer chemical inputs, less mechanization, and greater use of cover crops and crop rotation, than large conventional farms (Williams 2006). These practices have been shown to use less energy, reduce carbon emissions and preserve topsoil (Williams 2006, Pimentel et al. 2005).

There have also been many studies demonstrating that local food production not only uses more environmentally friendly practices, but also helps reduce food insecurity, and increases access to healthy, nutritious, and high quality products (Martinez et al. 2010). Since 2008, the percentage of the U.S. population receiving food stamps has increased from 9 percent to 14.5 percent (Food Research and Action Center). Because many low-income residents cannot afford to purchase nutritious, fresh food, they instead rely on more calorie-dense fast food. As communications director of Feeding America, Ross Fraser, states, "the face of hunger has changed" (Schulzke 2012). Increasing Supplemental Nutrition Assistance Program (SNAP) (See Glossary for Definition) beneficiary access to fresh produce may be one way to reverse this trend.

So far, however, this goal remains a distant dream, as the primary consumer base for local food currently consists of people with a significant disposable income.

Although local food has recently gained popularity, it has largely remained an elitist market, due to consumer willingness to pay a premium for local produce. The study “CSA: A Sustainable Alternative to Industrial Agriculture?” examined eight Community Supported Agriculture (CSA) programs over the course of five years and found that almost all of the CSA members had not only earned college degrees, but that approximately 60 percent also had post-grad education (Cone and Myher 2000). Furthermore, people within our own communities lack access to fresh fruits and vegetables everyday, as farmers in this region ship their product to the rest of the country. As Kathy Zeman, a local farmer, said, “this doesn’t make sense [...] it is more important to keep this food within the community.” A change in the distribution system of local food could provide a larger number of people more access to fresh, nutritious produce.

Increasing local food can also have positive economic effects for a community by re-investing money into local businesses, rather than spending it elsewhere. Food system analyst Gail Feenstra suggests that “in many places, a logical, and appropriate way to revitalize a community is the development of a local food economy” (Feenstra 1997, 28). Studies have found that “increasing in-county purchases from 1 percent to 15 percent [...] have generated thousands of dollars in local economies” (Feenstra 1997, 31). Increasing local food production and distribution can also create more jobs in agricultural labor, local distribution, and marketing.

Due to these benefits, local food systems have recently gained popularity, with direct-to-consumer marketed sales reaching \$1.2 billion in 2007, and the number of farmers markets rising from 2,756 in 1998, to 5,274 in 2009. Support for CSAs has increased dramatically as well, expanding from two farms in 1986 to more than 1,400 farms in 2010 (Martinez et al. 2010). The next step in the growth of local food systems is expansion into a more mainstream market.

Farm-to-Institution: Rising Interest and Barriers

Because of the economic, environmental and social benefits associated with local food and a desire to support local communities, institutions such as school systems and hospitals have recently made efforts to increase local food purchases (Azuma and Fisher 2001, Bellows 2003). Due to increased interest, initiatives connecting schools and other institutions (See Glossary for Definition) to local farms, termed “Farm-to-School” or, more broadly, “Farm-to-Institution” programs (See Glossary for Definition), have been started around the country. Studies reviewing Farm-to-Institution programs have found that increased institutional local product procurement “clearly represents a ‘win-win’ opportunity” (Azuma and Fisher 2001, 11) for both institutions and farmers (Azuma and Fisher 2001, Vogt and Kaiser 2008). For institutions, it is a chance to accrue more of the benefits of local food (Vogt and Kaiser 2008), while for small-scale farmers the increased institutional demand provides new markets that are often needed to keep their farm economically viable (Barham et al. 2012). In 2007, over 20 percent of local food sales were through direct-to-consumer venues, such as farmers markets and CSA models (Martinez et al. 2010). However, direct-to-consumer sales only represent 1 percent of the produce sold in the

U.S., with the remaining 99 percent sold through wholesale markets (See Glossary for Definition) to grocery stores, food distributors, and foodservice providers (Lindsey and Slama 2012). Further expansion by small-scale farmers into these wholesale markets may be crucial to their long-term sustainability as the limited direct-to-consumer markets become saturated (Lindsey and Slama 2012). Because of their large buying power, institutions have the ability to strengthen local food production by supporting regional farmers interested in transitioning to wholesale markets.

However, despite the logic of increased farm-to-institution sales, there are significant barriers that prevent the success of the movement. As researchers Azuma and Fisher conclude in their report analyzing seven Farm-to-School case studies, due to “numerous logistical, administrative and financial barriers, the devil is truly in the details.” (2001,11). A variety of factors can influence the success of institutional local food procurement, ranging from the seasonality of produce availability to the local culture of a given community (Azuma and Fisher 2001). However, lack of local food distribution and processing infrastructure is the barrier most commonly identified throughout the cases discussed by Azuma and Fisher, as well as in a literature review of 19 Farm-to-Institution studies conducted more recently (Vogt and Kaiser 2008). These studies consistently emphasize that “one of the primary barriers for farmers to sell to local... food services is getting the product to the [institutions]” (Azuma and Fisher 2001, 54) and “financial support for processing and central distribution” is much needed (Vogt and Kaiser 2008, 1). In a 2010 USDA Economic Research Survey about Local Food Systems, Martinez et al. further emphasize the lack of distribution infrastructure “for moving local food into mainstream markets” (2010, iv). This infrastructure could be as basic as a jointly owned refrigerated truck for produce delivery, or take the form of a processing center. However, the overall goal would be to streamline and unify local food distribution in order to increase demand from foodservice buyers who generally “want to make their food purchases using a one stop-shopping approach that allows them to order, receive and pay for produce in an efficient and cost-effective manner” (Bellows 2003, 2).

The lack of infrastructure available to small-scale farmers is rooted in the history of the U.S. food system, which has favored large agribusiness farms since the World War II era (Lindsey and Slama 2012, Nestle 2007). The development of food preservation technologies, synthetic farm chemicals, and sophisticated farming tools which occurred during and after the war made farming on a larger scale and shipping the product more efficient and financially viable (Lindsey and Slama 2012). As farmers shifted away from the small-scale production of diversified produce in favor of large-scale monoculture, the associated infrastructure designed to support local farm distribution and processing also disintegrated, making it challenging for the remaining vegetable or “specialty crop” growers to stay successful. Our current food distribution system is the result, where only 3 percent of the country’s farmland is used to harvest diverse fruit and vegetable crops and “almost every step of the current supply chain is driven by national, large-scale businesses” (Lindsey and Slama 2012, 8). The challenge now facing Farm-to-Institution development is to combat this history through the creation of alternative *local* supply

chain infrastructure designed to support the needs of the community and the environment by strengthening local food markets.

Potential Policy Solution: Food Hubs

Food Hubs, also known as regional distribution centers, are one possible policy alternative to this infrastructure problem, and are a potential means of bringing more local food into institutions. The term food hub refers to a centralized business that aggregates and redistributes food, while making positive economic, social, and environmental changes within a community (Barham et al. 2012). According to the USDA, Food Hubs are:

businesses or organizations that actively manage the aggregation, distribution, and marketing of source-identified products primarily from local and regional producers to strengthen their ability to satisfy wholesale, retail, and institutional demand. (Barham et al. 2012, 4).

With the potential economic, social, and environmental benefits of a strong local food system outlined above in mind, we examine how to best achieve these goals within a small community hoping to increase the presence of local food in the institutional setting. **We will use Northfield, Minnesota as a case study to assess whether a food hub, as a means of addressing the infrastructure gap, would be an effective policy option to strengthen the local food system.** Although economic factors will be most important when assessing the feasibility of the food hub's creation, we will use a triple bottom-line method of analyzing the food hub's feasibility. In addition to meeting economic factors, the food hub must benefit the community socially and environmentally through improving food access and supporting environmentally sustainable farming practices, in order to be considered successful. Our three-part perspective makes this research interdisciplinary. This interdisciplinary is critical to capturing a full picture of the food hub's feasibility, since sustainability in all regards is critical to long-term success. Our research also contributes to and expands the small body of literature on food hub feasibility studies, which are limited, often vague and missing important aspects of food hub analysis. Our study fills in current research holes by incorporating social and environmental indicators into our analysis, and perhaps more importantly, aids farmers in and around Northfield who have expressed previous interest in the establishment of a food hub.

There are many different food hub models, ranging from centralized warehouses, to online organizations, to truck delivery systems that help sell local food, but mainly distribute it outside of the immediate community. However, for our research, a successful food hub will refer to a model in which food is physically aggregated from local farmers and redistributed to institutions within the local community.

The USDA Regional Food Hub Guide, a comprehensive document summarizing the efforts and evaluating the success of 72 food hubs across the U.S., provides evidence that food hubs have strengthened their local food systems, resulting in positive economic, social, and environmental impacts in their communities. The report focuses on examples, such as the Local

Food Hub in Charlottesville, VA, which has reinvested more than \$850,000 into the local community, increased food access by selling to hospitals and schools and improved farming practices in the region through offering sustainable farming education classes (Barham et al. 2012).

Assessing Success

Because food hubs are a relatively new idea, there is currently not a commonly agreed upon list of important factors to consider when conducting a food hub feasibility study. In order to assess whether a food hub is a successful option for Northfield, Minnesota, we developed six important criteria, that fall into our triple bottom-line categories. These criteria were aggregated from the most commonly cited ideas in the few existing food hub feasibility and Farm-to-Institution studies. We believe that our criteria capture the most important factors to consider when assessing a local food system with economic, social and environmental goals. These factors are applicable even in different geographic locations.

Our Criteria for Success

Criteria for Economic Success

1. Would food hub supply and demand work?

Adequate supply and demand is the most critical component of a food hub's feasibility and success. Assessing potential producer supply and buyer demand is a central component of all food hub feasibility studies (Aubrey 2012, Boulé et al. 2011, Dane County...2011). In a recent interview, USDA Food Hub expert James Barham emphasized that the first step of a food hub feasibility study should be "to see if supply and demand match up" (2012). Of the few food hub studies conducted, the *Southern Wisconsin Food Hub Feasibility Study* (hereafter referred to as the "*Southern WI Study*") has the most effective approach to assessing supply and demand. The study interviewed producers and buyers about their current produce production and purchases, their projected supply for and demand from a food hub and the crops of interest. While the study gathered informative quantitative data through their assessment, they did not address other non-quantitative issues that can influence farmer supply and consumer demand, such as need for new markets. These elements are best captured through qualitative data gathered during individual interviews. In this study, quantitative and qualitative data are used to determine if supply and demand could work for a food hub.

2. Can food hub pricing work for producers and buyers?

Pricing is a key component of a food hub's economic success and sustainability. If buyers and producers cannot accept similar prices, then no one will sell to or buy from a food hub. Numerous studies have identified cost and pricing as critical to the success of food hubs and Farm-to-Institution initiatives (Aubrey 2012, Azuma and Fisher 2001, Bellows 2003, Dane County... 2011). The *Southern WI Study* found that 58 percent of farmers prioritized receiving a

fair price over food hub structure. Further, 63 percent of farmers were “doubtful that the [food hub] price would be enough to make it profitable.” Because of these concerns, the *Southern WI Study* places particular emphasis on making pricing work for farmers, bluntly stating “if [the food hub is not profitable for] growers in Year 1 there will not be a Year 2” (Dane County... 2011, 44). A recent Indiana food hub feasibility study echoes this viewpoint, stating that one of the primary things a food hubs should do is “use strategies to ensure that producers get a good price” (Aubrey 2012).

Studies focused on the institutional perspective have also identified pricing and cost as a major barrier that can make or break the success of a Farm-to-Institution program (Azuma and Fisher 2001, Bellows 2003, Vogt and Kaiser 2008). Vogt and Kaiser’s literature review of Farm-to-Institution studies found that in nine recent cases “cost, lack of competitive pricing and low prices of commodity food” prevent institutions from increasing their local food purchases. In a case study of a successful Farm-to-School program in Hartford, CT, the manageable cost was a “major factor for success of program” (Azuma and Fisher 2001, 28).

Despite the emphasis placed on cost, no food hub feasibility studies have incorporated an assessment of desirable prices into their research. In this study, we conduct an initial assessment of farmer marginal willingness to accept and institutional willingness to pay, as well as gathering information on how stakeholders set prices, in order to determine if food hub pricing has a chance of success.

3. Can stakeholders agree on food hub logistics?

Agreement on logistical aspects of the food hub including contracts, certifications, packaging, consumer expectations, delivery, and time constraints will be essential in determining the food hub’s feasibility. Past food hub studies, as well as a study examining Farm-to-School programs, suggest the importance of the logistical aspect in success of local food systems (Azuma and Fisher 2001, Dane County...2011, Lindsey and Slama 2012). The *Southern WI Study* cites “mak[ing] it easy for customers to do business with the food hub” as a main recommendation, saying specifically that the food hub should, “deliver consistent quality, packed the way customers demand,” and figure out the arrangements of pickups. The study also identified certifications as a factor for success, using surveys to determine “if current growing practices and safety protocols are consistent with the requirements of buyers.” The survey found that fewer than 10 percent of growers were Good Agriculture Practices (GAP) certified (See Glossary for Definition), with 50 percent of buyers requiring this certification, making this an important aspect to consider for our research. Finally, the study surveyed buyer and farmer interest in pre-season planning and purchase contracts. All of these logistical details will need to be examined in our study, and agreed upon by stakeholders in order for the food hub to be successful.

The Illinois food hub study similarly finds that food hubs should focus on figuring out a delivery system, making sure produce meets grading and certification requirements of buyers, and keeping quantity and variety of produce consistent. The study emphasizes the need to make sure farmers have certifications required by institutions, stating that “many customers have

specific requirements [certifications] for the food they purchase, making it in the food hub's best interest to comply with the needs of their customers" (Lindsey and Slama 2012). The study recommends that farmers become familiar with these requirements and begin writing their own food safety plans, and documenting their practices.

Lastly, Azuma and Fisher's Farm-to-School study finds that logistics are a main barrier preventing local food from reaching schools. The study advises the USDA to "undertake a study to evaluate the opportunities for reducing logistical barriers for family farmers to sell their products directly to school food services" (Azuma and Fisher 2001, 54). Further, the study identifies transportation and distributions services, as well as agreement on appearance, packaging, and delivery, as main barriers. One Farm-to-School case study found that initially the time and cost farmers spent to deliver produce to schools were barriers to success; however, this issue was resolved through the use of a pre-existing wholesaler. Finally, the study found that "vital to the success of the program was for the produce to meet specific grade specifications and be consistent, fresh, tasty and attractive [but that] the wholesaler worked because it addressed these concerns and provided forecasts about what would be available" (Azuma and Fisher 2001, 20). These logistical barriers cited by previous studies emphasize the importance of agreement on logistics for the success of a food hub in Northfield.

Criteria for Social Success

4. Is there widespread community support and enthusiasm?

The level of community interest in the creation of a food hub, enthusiasm about local food and opportunity to strengthen community ties and relationships will help determine the potential success a food hub. We do not want to recommend a food hub unless the Northfield community members are excited about it. Furthermore, level of interest could help to determine whether the community would be able to overcome any potential barriers that may make the food hub's feasibility less certain. Feenstra, in "Local Food and Sustainable Development," cites lack of consumer interest in local food as a main barrier to increasing local produce in communities, suggesting this is an important issue to examine (Feenstra 1997). A recent UC Davis food hub feasibility study, *Context Matters: Visioning a Food Hub for Yolo and Solano Counties*, specifically investigated community interest in local food prior to examining the potential creation of a food hub (Boulé et al. 2011). Community support was assessed by examining general interest in the subject and looking at pre-existing local produce markets, including farmers markets, fruit stands, and co-ops. The *Southern WI Study* also began with an initial survey to gauge stakeholder interest, concluding that results finding high interest "will be a platform for the food hub's success" (Dane County...2011, 20) and that this high level of interest "demonstrates that many are genuinely invested in the [food hub] concept and may be open to collaborating in order to address the concerns and obstacles surfaced by the study" (Dane County...2011, 27). An overall sense of interest in the food hub, and local food in general, is essential for even beginning to determine the feasibility of the project.

Many feasibility studies also pointed out the importance of establishing good relationships between stakeholders as a component determining success. In “Bringing Local Food to Institutions,” Bellows highlights “trusting relationships between buyers and sellers” (2003, 8) as critical to the sustainability of any Farm-to-Institution effort. The *Southern WI Study* also stresses the importance of strong relationships between the food hub and growers, recommending that food hubs “emphasize a strong relationship with growers and cultivate these to ensure ongoing trusted communication, and a consistent supply that will meet demand” (Dane County... 2011, 44).

Other knowledgeable researchers of food systems reiterate this belief. James Barham of the USDA stated that “the most vital aspect of a food hub’s success is really a strong relationship with the produce community” (2012). Feenstra also states that “involving residents in community relationships around food,” is a main benefit of using local food systems (Feenstra 1997, 34).

5. Would a food hub improve food access?

One of the primary goals for a food hub is to socially benefit the community by increasing local food access for the low-income residents of Northfield. As described above, access to fresh, local produce is often considered an elitist market, as the main avenues for purchasing local produce (CSAs, farmers markets) are expensive. This unequal distribution of access is considered to be an important environmental justice issue, as “the importance of food to life itself, as well as to the overall health profile of a community, makes it as important an element for vigilance by activists and academic communities as any other” (Williams 2006, 119). Past Farm-to-Institution studies, specifically Farm-to-School, have agreed on the importance of increasing low-income access to fresh produce stating, “all students, especially those from lower income families who rely on free or reduced price school meals, can benefit from improved nutritional quality and taste, as well as from related educational programs on local agriculture, nutrition and food systems” (Azuma 2001, 10). By increasing the amount of local food in Northfield institutions utilized by all income levels, fresh produce could reach a wider range of community members. Food hubs could be one approach to increasing food access, as “communities have the intellect and capacity to design and implement the institutional changes required to ensure the kind of nutritional and food environment essential to improved public health incomes leading to healthy communities. These changes are compatible (rather than inconsistent) with other environmental and ecological improvements that must take place for a whole systems approach to developing healthy and sustainable communities” (Williams 2006, 121).

Other food hubs have been created with the goal of increasing food access. The Intervale Food Hub in Burlington, VT began with the goals of “increasing local food production and consumption [...], ensuring fair prices for farmers [...], and addressing access to local food and access to markets” (Desai 2010, 1). In fact, 85 percent of Intervale’s subscribers had not previously participated in the pre-existing CSA program, one of the main sources of local food

before the food hub's creation. Because the food hub was created with the goal of increasing food access, this was used as a main indicator of success for the project.

The UC Davis food hub feasibility study also considered the issue of food access in their research. As the study states, "Ideally these new markets [food hubs] will sustain additional non-economic benefits to the local food system (e.g., improved access for low-income people)" (Boulé et al. 2011, 30). The research explores the demographics and current food access in both Yolo and Solano counties, examining poverty levels, Federal Programs for Food and Nutrition Assistance, prevalence of food deserts, and emergency food services. The study states that "a look at food deserts in the two counties, the role of poverty in food insecurity, and the relationship between food insecurity and poor health [...] will be important to address in the efforts to make the Yolo-Solano regional food system more equitable, environmentally sound, and economically viable" (Boulé et al. 2011, 58).

Criteria for Environmental Success

6. Would a food hub support sustainable farming practices?

Reducing the negative environmental impact of agriculture is a fundamental goal of local food systems (Roberts 2008). Therefore, in order for a food hub to successfully strengthen a local food system, it should increase environmental sustainability.

Despite claims that food hubs provide environmental benefits (Barham et al. 2012), most previous food hub feasibility and case studies have failed to measure the environmental impacts of a food hub (Boulé et al. 2011, Schmidt et al. 2011, Lindsey and Slama 2012). The *Southern WI Study* is the only study that attempts to measure environmental impact by assessing how fuel use would change as a result of a food hub. This is an approach taken by many studies that measure the distance traveled by local and non-local food, known as "food miles," to evaluate the environmental benefits of local food systems (Pirog et al. 2001, Thompson et al. 2008). While food transportation has been shown to increase our food system's energy usage and negative environmental impact (Pirog et al. 2001), the sustainability of food production is dependant on more than food miles (Heller and Keolin 2003). Instead, the ecological impact of our food system depends to a large extent on farming practices (van der Werf and Petit 2002, Lehuger et al. 2009, Williams 2006). This finding is supported by numerous other studies, which generally conclude that production practices often have a stronger influence on agricultural energy usage and environmental impact than transportation (Saunders et al. 2006, and references therein). Therefore, we measure a food hub's potential to increase environmental sustainability using the production practices of farmers interested in selling to the hub.

In order for us to strongly recommend the creation of a food hub for Northfield community, these six criteria must be evaluated and deemed successful, as explained further in our methodology. A successful policy solution to the infrastructure gap will meet all of the above criteria.

III. Methodology

Background

This food hub feasibility study was initiated in response to a need expressed by the Northfield community. Kathy Zeman, a local farmer, contacted Carleton College's Center for Community and Civic Engagement (CCCE) in 2012 for help determining a food hub's viability. Since then, other community stakeholders have become involved and interested in the idea, forming the Northfield Food Hub Alliance. The Alliance has met regularly since November 2012, after many community members attended a field trip to Viroqua, WI to learn about one successful food hub, the 5th Season Co-op. Prominent parties involved in the alliance include local farmers, managers of the natural foods co-op, managers and chefs working for Bon Appétit food service at Carleton and St. Olaf Colleges, a community service organizer at Carleton College, and other Northfield food activists. One of the primary goals of our study is to provide the Northfield community with the steps needed to strengthen their local food system, whether through a food hub or otherwise.

Case Selection: Northfield, MN

Besides the initial community interest, Northfield, Minnesota is a good case study site because the region's characteristics indicate that a food hub will most likely be successful in the area. Situated approximately 45 miles south of Minneapolis, Northfield has a population of 20,007 (US Census 2010). The median household income is \$62,109, with 6.4 percent of Northfield residents currently living below the poverty line (US Census 2010). Agriculture production in the Northfield region ranges from large-scale conventional corn and soybean operations to much smaller farms that sell through the CSA model, at the farmers market or direct wholesale to the local co-op and colleges.

According to Sustainable Food Systems expert Maggie Adamak, Northfield is in "a unique region of the state," which makes it "well suited" for the establishment of a food hub. Because southeastern MN has a diversified crop production compared to other areas, farmers in and around Northfield are already producing a range of crops other than large-scale soybean and corn commodities. Therefore, no change in farming production is necessary to produce the small-scale crops that food hubs are designed to support.

Additionally, Northfield is a case where a food hub would probably work because it shares similarities to other locations throughout the country where food hubs have been established successfully. Like Burlington, VT, the location of the successful Intervale Food Hub, Northfield is in a northern climate, meaning that similar season limitations apply to both areas. Another similarity Northfield shares with Burlington, as well as the successful Local Food Hub in Charlottesville, VA, is that it is a college town. Previous research has indicated that the presence of colleges in an area can lead to both higher demand and supply of locally grown produce than would otherwise be present in an area of the same sized population (Barham, 2012). This is particularly true in the case of St. Olaf and Carleton Colleges, where students regularly

work with and encourage the colleges' food service provider, Bon Appétit, to increase their local food procurement. Furthermore, Bon Appétit has a pre-established 20 percent "Farm-to-Fork" goal, fueling the company's interest and demand for local produce.

In addition to the colleges, Northfield has several other institutions currently lacking easy access to local produce that could be potential buyers from and beneficiaries of a food hub, including the Northfield Hospital, Northfield School District, the Three Links Retirement Center and the Laura Baker Home. Moreover, Northfield has no existing infrastructure to facilitate produce sales between these large institutions and small farmers in the region, indicating that a food hub could successfully play the distribution role.

Likewise, the current options for purchasing local food are limited to CSAs, farmers markets and the Just Foods Co-op, making local food access an issue for many Northfield residents who cannot afford these more expensive venues. Because current avenues for accessing local food are limited, an established food hub could increase food access and purchases of sustainably grown food. This is particularly true because currently the food shelf is the only location where lower income Northfield community members can realistically access local items. It is likely that a food hub would also strengthen the environmental sustainability of the Northfield food system because the majority of farmers involved in the Food Hub Alliance are small-scale farmers who use sustainable practices. Therefore, a hub would be financially supporting these farmers, which would strengthen the role these farms play in the local food system.

Finally, a food hub would probably be feasible in Northfield because it was a community-generated idea and has a high level of initial support from a variety of stakeholders, indicating that from the outset at least one criterion appeared to be satisfied.

Because Northfield is a case where a food hub is most likely to successfully promote the economic, social and environmental benefits of local food, this study gives us an opportunity to test the assumption that food hubs offer a feasible approach to strengthening local food systems. If we find that a food hub may not be successful at strengthening the triple bottom line of Northfield's local food system, or that it would only accomplish two aspects effectively, we can conclude that alternative solutions to the local food infrastructure issue must be explored in Northfield and towns like it, that lack of infrastructure may not be the largest barrier to strong local food systems and/or that food hubs may not be effective at strengthening all aspects of the triple bottom line simultaneously.

Data Gathering and Analysis

Interview Methods and Protocol

Data was primarily gathered through hour-long, semi-structured interviews with farmers and institutional buyers. Existing geographic or political boundaries, such as county lines, do not match the borders of the Northfield food system. Therefore, we chose our interviewees using the "snowball sample" method, in which we started with key community members (i.e. members of the Food Hub Alliance) and asked them to indicate other important people to interview. We

recognize that this sampling method could have biased us towards community members only interested in the food hub. However, because the goal of our research was to determine if there are enough people in Northfield to support a food hub, *not* the pervasiveness of support for a food hub in Northfield, we are not concerned about the pro-food hub bias in our sample methods. Although we interviewed as many people as possible, we excluded farmers living over 25 miles from Northfield partially due to time constraints and partially because community members expressed the greatest interest in knowing the food hub interests of local institutions and farmers. We interviewed 12 farmers, 6 institutions, 1 retailer and the Northfield Food Shelf (Appendix A, Sections 1, Map 1 and Appendix A, Section 2, Charts 3 and 4). Of the 12 farmers, 2 farmers are not yet in production. We excluded these 2 farms from the majority of our quantitative and qualitative analysis, but recorded their general interest and opinions.

We created two separate surveys, one for farmers and one for buyers. Our interview questions were developed in multiple stages. First, we formulated questions based off the Grower and Buyer Surveys used in the *Southern WI Study*. Second, we tested our interview questions on the manager of a local institution and the owners of a local farm. We incorporated their feedback and then presented our questions to the Northfield Food Hub Alliance with the help of Kelly Scheuerman, the assistant director of the Carleton CCCE. The Alliance gave us feedback in a two-hour session during which we read each question and gave everyone in the group the opportunity to give suggestions. We incorporated their feedback into our final survey questions (Appendix A, Section 3).

The farmer survey had four main sections. First, we asked farmers about their current produce sales, production levels, crops and prices. Second, we gauged farmer interest in a food hub by asking about their level of interest, how much produce they might want to sell and their main needs, especially in relation to price. Third, we asked logistical questions about current certifications and infrastructure, as well as what distance they would be willing to travel to deliver produce to a food hub. Fourth, we determined their farming practices by asking about their methods of dealing with specific aspects of farm production.

Our institutional interviews included four parts. First, we asked about current institutional local food access, limits and total produce purchases. Second, we determined institutional interest in buying from a food hub in terms of their level of interest, quantities they would be interested in purchasing, their main needs and price flexibility. Third, we gathered information about certifications and other needs. Fourth, we concluded the interviews with questions regarding number of people and meals served.

Interviews were conducted between January 8, and February 1, 2013. At least two members of our group attended every interview. We conducted interviews in person and recorded answers by hand. All interviews started with a definition of a food hub and description of our project. Interviewees were permitted to ask clarifying questions until they understood the food hub concept. We recorded interviewees' initial reactions. We asked questions in the same order during every interview, adding clarifying questions and/or explanations when needed. If the interviewee brought up relevant point not directly related to our interview question, we asked

follow-up questions. We ended all interviews by asking interviewees to share any other thoughts, comments or concerns. One group member transcribed interview notes into a shared document. The other group member(s) in attendance added their supplemental notes to ensure that comments were not missed.

Data Analysis and Criteria

We began data analysis by coding our interview responses to bring out prominent themes. Sixteen important themes were identified and color-coded. These themes were grouped under the different success criteria.

The themes are as follows:

- Market Preferences, Wholesale Risk, and Budget for Local Produce
- Level of Need for New Markets and Vendors
- Quantities
- Seasonality and Natural Barriers
- Crops and Other Products
- Prices
- Food Hub Flexibility
- Convenience, Time and Labor
- Consumer Expectations and Produce Appearance
- Certifications
- Cost as a Barrier
- Potential Interest in a Food Hub
- Relationships
- Food Access
- Farming Practices
- Community Dreams

Coding highlighted the most important themes, and showed how frequently different themes appeared across the interviews, as well as allowing us to isolate the quantitative data. We analyzed and evaluated the data gathered for each criterion using the methods outlined below.

Economic Success Methods

Supply and Demand

We analyzed supply and demand using quantitative and qualitative methods.

Calculating Supply:

To capture total production supply, we asked farmers to estimate their current total produce sales in dollars.¹ We then asked farmers to estimate what percentage of their current production they would potentially want to provide to a food hub and by what percentage they would be interested in expanding production for a food hub, assuming fair prices. We also asked farmers what crops they would be most interested in selling to a food hub, and how much of each crop. We used local food seasonality chart from Minnesota Grown to determine the seasonality of each crop (Minnesota Pollution Control Agency). Finally, we captured other aspects of their

¹ Some farmers gave us their total production for 2012, some from 2011 (due to atypical weather in 2012), while others gave projections for 2013.

potential food hub supply through questions about their needs for a food hub, interest in selling seconds (See Glossary for Definition) and level of interest in a food hub.

We analyzed the quantitative data multiple ways. First, we added all farmers' current produce sales to find total current sales for the farmers we interviewed. To determine potential supply for a food hub, we multiplied each farmer's total produce sales by the percentage that they projected providing.² For crops, we first compiled a list of all crops that farmers were interested in selling to a food hub. We then added the current quantities of each wholesale crop currently grown. Not all farmers gave us current wholesale crop quantities, so we did not capture the total production of each crop. We then added the crop quantity projections provided by farmers during the interviews. When farmers said that they would be interested in selling any of their current wholesale crops, but did not give us any projected quantities, we multiplied their current wholesale crop quantities by the percentage of their total production they projected providing to a food hub. We analyzed the qualitative supply data to determine the major limits on farmers' supply to a food hub that go beyond physical quantities.

Calculating Demand:

To assess demand we asked institutions about their current total produce purchases, as well their current total local produce purchases. We also asked them to estimate what quantity they would want to purchase from a food hub, but no institutions were able to give us concrete numbers. Therefore, we focused on their current produce purchases and current demand for local produce. Buyers also gave us lists of the crops that they would be most interested in buying. Additionally, we gathered information on when buyers are purchasing produce. Finally, we captured qualitative aspects of demand by asking buyers what they would need to buy from a food hub, their general level of interest, the limits on their local purchases and their interest in buying Grade 2 produce (see Glossary for Definition). During the interviews we recorded any comments that had bearing on their demand. To assess total produce purchasing power from all our institutions, we summed their current total produce purchases. We did the same for current total local purchases. We coded their qualitative demand data to determine the main themes influencing their level of demand.

Comparing Farmer Supply and Institutional Demand:

To determine if supply and demand would work for a food hub, we first examined the projected quantity of farmer supply to see how it compared to current institutional produce demand. We analyzed crops by determining if the crops that farmers are interested in providing matched up with institutional interest and needs in terms of crop type and seasonality. As part of this, we counted crops that would be harvested when all institutions are open. We did not count crops with growing seasons ending in September, because these crops are only minimally

² For a few farmers we were not able to get total production in dollars. In that case, we multiplied their total yearly pounds by the prices of the crops they sell to get a rough estimate of total sales. We then multiplied that number by the percentage they projected providing to a food hub.

available after the school year begins. Finally, we assessed the themes revealed through our qualitative data to determine whether there were significant barriers, reasons or needs for selling to a food hub that would directly impact food hub supply and/or demand.

We determined that there would be enough demand and supply to make a food hub successful if demand and supply are roughly equal, or demand is greater than supply, with no barriers to accessing the produce. The supply and demand aspect of a food hub would be deemed somewhat successful if there are barriers that are surmountable with a specific model of hub, or creative partnerships. A food hub would not be feasible if there is not enough total demand to match total supply.

Prices

To determine if pricing could work for a food hub, we gathered quantitative and qualitative information about community members' price sensitivity, approach to price setting, and farmers' current prices. To capture price sensitivity we asked questions about institutional marginal willingness to pay, or farmer marginal willingness to accept. We used "conventional distributor wholesale prices" as our baseline from which marginal willingness to pay or accept was determined, based off of the assumption that farmers and buyers would have a general sense of these prices, an assumption that was confirmed in our focus groups. We asked interviewees to estimate by what percentage more than the baseline "price" they would be willing to pay or accept. We did not use set dollar amounts because wholesale prices fluctuate dramatically throughout the season based on weather, availability and crop. We learned from institutions and farmers that using set prices would skew our results and not accurately capture the reality of price fluctuations in the region.

Teasing out farmers' marginal willingness to accept relative to distributor price was challenging, because some farmers were unsure of the distributor prices. Because of this, we also collected farmers' current prices and used these prices as the baseline from which they determined their marginal willingness to accept. To account for using the farmers' current prices instead of the conventional wholesale distributor price as a baseline, we assumed that the average percentage difference between conventional and organic pricing is 30 percent, an average given to us by the produce manager at Just Foods Co-op. To get a general sense of the gap between institutional willingness to pay and farmer willingness to accept, we set the conventional distributor wholesale price to 1.0 and the organic wholesale price as 1.3. We placed farmers and institutions along the continuum based on their preferences. Finally, we gathered information on how both producers and buyers determine their prices in order to understand how a food hub might work with people to find agreeable pricing for all stakeholders.

Because farmers had difficulty determining their willingness to accept and some institutions had no numerical limits on willingness to pay, we primarily gathered qualitative data. We analyzed each stakeholder's willingness to pay or accept to determine if there was adequate price flexibility on both sides. We also assessed the methods of price setting for overlaps that could increase the likelihood that a food hub could establish agreeable prices.

We determined that for our data to indicate that a food hub could successfully set satisfactory prices, the prices that farmers need must be roughly equivalent to the prices that institutions can pay. We concluded that food hub pricing could probably be successful if farmers and institutions have similar methods for determining prices, even if price needs are somewhat different. A food hub would not be able to manage pricing successfully if pricing needs are consistently different, and there is no commonality in stakeholder's approach to price setting. We recognize that a food hub would also have costs of its own, but for the purposes of our price analysis we decided to focus only on whether pricing could work directly between the farmers and institutions.

Logistics

To determine whether logistics could work, this criterion was evaluated by assessing the main farmer and institutional needs, as well as farmers' current delivery systems. Success in this category was determined by whether agreement existed among community members on initial logistics such as contracts, delivery and drop off, consumer expectations, and produce grade. If there was disagreement, there must be potential for these conflicts to be worked around in order for this criterion to be successful.

Social Success Methods

Community Support and Enthusiasm

The criterion was evaluated through community focus group meetings, and overall responses to interview questions. Meetings with the Northfield Food Hub Alliance group gave us an overall sense of how the community felt about the project, and gave those involved with local food in Northfield a platform to voice their opinions and give advice. Interviews also provided insight into community interest, which we assessed with questions concerning level of interest in local food and a food hub. Additionally, discussion before and after each interview gave us a better sense of each interviewee's enthusiasm level. We determined that in order for this criterion to be successful, the majority of interviewees and Food Hub Alliance participants needed to express an overall feeling of enthusiasm. The criteria would be unsuccessful if less than half of our interviewees expressed disagreement or disapproval of the idea.

Food Access

To determine the impact of a food hub on local food access, we focused on its potential impacts on the local food access of low-income Northfield residents. To measure if local food access for low-income residents would increase, we examined whether a food hub would redirect local produce within the community, allow institutions that are not currently providing local produce to access local food, and allow institutions already purchasing local produce to increase their local percentages. We did not include Just Foods in this analysis, as they are at their local produce purchases limit, and are too expensive to serve the low-income community of Northfield. We also examined the income range of residents able to use these institutions in order to see

which community residents would be able to access this local produce. We defined low-income using the Northfield Food Shelf qualifications for participation, which follow the USDA guidelines set by the Federal Government. According to these guidelines, residents must have an income less than or equal to 200 percent of poverty, or \$44,000 for a household of four (Bickel 2013). We gathered data on food access throughout our interviews, focusing on how many people and what income range each institution serves. With farmers, we discussed where they currently deposit their excess and seconds produce.

We determined that in order for this criterion to be successful, local food access must increase, meaning that local food would be reaching more community residents, specifically low-income residents. Improved food access would occur if farmers continued to give the same or a larger quantity of produce to the local food shelf, while channeling more of their current produce to institutions through the food hub, or increasing production through expansion for the hub.

Environmental Success Methods

Farming Practices

We determined that for a food hub to successfully support sustainable agriculture, it would have to increase the amount of sustainably farmed food purchased by institutions. This would only happen if the farmers providing the largest amounts of food to the food hub use sustainable production practices and if institutions are not already buying 100 percent sustainably grown food. However, a universally agreed-upon definition of “sustainable agriculture” does not exist (Heller and Keolin 2003). We based our definition off of USDA Organic Standards (See Glossary for Definition), environmental sustainability indicators developed by Heller and Keolin in their U.S. Food System Assessment (2003) and research at the Rodale Institute comparing the environmental impacts of conventional and organic agriculture (Pimentel et al. 2005). For our purposes, “sustainable” farmers adhere to the following criteria:

- 1) *No synthetic chemical inputs.* Research has found that synthetic fertilizers and pesticides have a negative environmental impact due to their destruction of ecosystems, and the fossil fuel energy required for their production (Pimentel et al. 2005, Tilman et al. 2002, Williams 2006, Kim and Dale 2008). Practices using natural inputs have been found to use 30 percent less energy than synthetic chemical based practices (Pimentel et al. 2005).
- 2) *Use of cover crops and/or extended crop rotations.* These practices have been shown to conserve soil and water resources, as well to reduce insect, disease, and weed problems, minimizing the need for synthetic inputs (Pimentel et al. 2005, Lal 2004).
- 3) *Reduce tillage and/or increase natural organic matter inputs.* These practices increase soil organic matter, resulting in water resource conservation (Pimentel et al. 2005), increased soil microbial activity and topsoil preservation (Heller and Keoleian 2000, Follett 2001, Balesdent et al. 2000, West 2002).
- 4) *Grow a variety of crops.* Increasing biodiversity can provide various ecological services essential to agriculture, including recycling of nutrients and regulation of soil

microclimate (Heller and Keolin 2003, Altieri 1999). Further, ecosystems with higher biodiversity have been shown to have higher carbon uptake and nutrient storage (Cardinale 2012, Tilman 2006).

To evaluate a food hub's ability to support the sustainable farming practices above, we asked farmers about their current methods of dealing with weeds, insects and soil health, as well as their crop diversity, and the number of times they till. We then determined if their practices adhered to our four "sustainable agriculture" criteria outlined above by counting the number of unsustainable practices each farm used. Any farm using any unsustainable practice was deemed "less sustainable." Farms using practices in keeping with our five criteria were classified as "more sustainable."

We then compared farm sustainability with the amount of produce each farmer projected selling to a food hub. Some farmers gave us a range of dollars. In that case, we used the highest number of dollars they gave to determine their potential supply to a food hub. Farms committing to less than \$10,000 of produce were deemed "small quantity" farms. Farms contributing between \$10,000 and \$20,000 were deemed "medium quantity" farms. And farms offering over \$20,000 were classified as "large quantity" farms. Farmers only interested in providing no produce or only excess produce were classified as providing "none."

For institutions, we identified where institutions purchase the majority of their produce. We assumed that fruits and vegetables provided by large-scale food distributors are grown using conventional practices. We also assumed that a food hub would cause institutions to reduce their distributor produce purchases, rather than redirecting current local purchases from sustainable farms. We used data from the USDA to determine whether these practices were more or less sustainable. We compared local farmers' practices with the practices used to grow the distributors' produce to determine if the food hub would increase the amount of sustainably grown food purchased by institutions, thereby increasing the environmental sustainability of the Northfield food system.

IV. Results

Overview

In this section we will present our quantitative and qualitative results for each of our six criteria. Because there is a plethora of information presented in each section, we provide a bullet point summary at the conclusion of each criterion. For a list of interviewees, see the Appendix A, Section 2.

Economic Success

Supply and Demand

Farmer Supply

The quantity of produce available for a food hub is dependent on farmers' current market preferences, level of need for new markets, production levels, projected food hub supply, interest in expansion, and food hub prices. Season, weather limitations and crop variety also control the amount of produce available for a food hub.

Market Preferences and Wholesale Risk

The 10 farmers we interviewed currently sell between \$1,083,878 and \$1,086,878 of produce through CSAs, farmers market, wholesale to local institutions, restaurants, and retailers (See Glossary for Definition). Eight of these farmers are committed to their current markets and would supply to a food hub only after satisfying the needs of existing customers. Farmers cited three main reasons for this: 1) the security of selling to a guaranteed market, 2) the higher prices associated with direct sales, and 3) the relationships they have built with buyers. CSA farmers in particular stated a strong preference for their current members and reluctance to sell a significant amount to a food hub, in part because of the greater risk associated with selling to wholesale markets. As CSA farmers Ben Doherty and Erin Johnson explained, "Wholesale is much less predictable and more risky... there is more potential for high income years, but also equal potential for lowest income years." In contrast, the CSA model protects from income fluctuations because customers buy in at the beginning of each season. Furthermore, for some, selling wholesale to a newly established food hub presents an even higher risk. David Hougen-Eitzman of Big Woods Farm explained, "As a farmer, I'd be reticent to jump into a food hub, but someone needs to. I want to be cautious."

Farmers already selling wholesale were obviously less concerned with risk, but did express reluctance at reducing direct sales in favor of the food hub. Because there is no middleman, direct sales usually yield higher prices than distributor transactions. Additionally, 7 out of 10 farmers are already selling to institutional markets, which decreases their interest in supplying to a food hub. As Dayna Burtness of Laughing Loon farm explained, there is "no real reason to sell to [Northfield] institutions through a food hub, when it's easy to do it directly."

Farmers have also formed strong relationships with their buyers. Todd Harvey of Fireside Orchard specified that the food hub would be a “third tier market” for him, since he has valued customers whom his orchard has been serving for generations. In addition to valuing buyer friendships, farmers are also aware that their “reputation depends” on these customers.

Overall, farmers who preferred their current markets reported that they would not want to sell large quantities to a food hub. “Do I need a food hub?!” wholesale farmer Rae Rusnak exclaimed, “NO! I don’t have enough quantity to provide for the huge amount schools [and other institutions] already need. I turn people away!...the huge scale of demand is [already] overwhelming.”

Level of Need for New Markets

Because most farmers are satisfied with their current markets, many do not need or want a new market for large quantities. Instead, farmers want a market for the produce that is rejected by their other buyers, sharing a common desire for the food hub to take excess and Grade 2 produce. This was a need expressed by 8 of the 10 farmers. For some farmers, the only condition under which they would sell to a food hub is if it was a willing market for excess produce. “If I had a... pressure relief valve for excess apples, then yeah, I’d be very willing to move apples [to the food hub] and use it as a back-up plan,” Harvey of Fireside explained. He often has to dump his extras in late December, when his retail and wholesale season comes to a close. The desire for the food hub as an excess market was particularly strong among some CSA farmers, such as Betsy Allister and Andrew Ehrmann of Spring Wind farm, who already “use the wholesale market as overflow [for the] overplanting [they do] for their CSA and the farmer’s market.”

Often, the produce that farmers cannot sell is Grade 2, known as “seconds.” Kathy Zeman, a livestock farmer who originally introduced the idea of the food hub to the Northfield community, believes that the “best purpose of a food hub would be creating a better market for seconds.” According to Zeman, 50 percent of Northfield farmers’ yields are seconds that are generally wasted. However, we found that some farms already have consistent markets for their seconds through institutions like the colleges where product appearance matters less. Unfortunately, farmers still have difficulty selling Grade 2 produce to retail markets, as consumers are generally wary. As a result, in bad weather years, farms such as Gardens of Eagan have to leave up to 60 percent of their crop yield in the fields. As manager Linda Halley explained, “If we knew there was a market for seconds, we’d be bringing them in instead of me yelling ‘LEAVE THEM OUT THERE!’” While some farmers agreed with Halley, others were unsure about the economic efficiency of harvesting the seconds they currently leave in the field. Burtness said that she would “love to sell seconds” but only in a way “that wasn’t a cost and time suck to me.” Three other farmers agreed with this perspective.

Overall, farmers estimated selling at least 27,500 pounds of seconds and excess produce to a food hub (Appendix B, Section 1, Table 6). This number does not represent the total quantity of available seconds and excess. Because seconds and excess are not harvested and/or sold, we had difficulty obtaining concrete quantities; only four farmers gave specific amounts. However, as described above, the majority of farmers expressed significant interest.

Despite the majority desire to supply only excess or seconds to a food hub, some farmers expressed interest in increasing the number of “normal” Grade 1 (See Glossary for Definition) markets in Northfield and selling more of their current produce consistently to the hub. SEEDS farm, unique because it does not solely depend on sales for income, expressed a strong need for new markets. Further, Ehrmann of Spring Wind Farm believes that there is “great potential for a food hub” because it “seems smart to have more markets in the future especially with more farms popping up in the area.” Little Hill Berry farm, a newly established farm in the region is a perfect example of one these new farms and reinforced Ehrmann’s perspective. The owner, Aaron Wills, said that, “every year new farmers come and have harder times getting into the market” since established farmers “are already maxing out more straight-forward markets.”

Quantities

The perspectives and needs discussed above impacted the quantities that farmers were interested in providing to a food hub. Table 1 below summarizes the amount of Grade 1 produce each farm projected selling to a hub. Farmers projected quantities assuming a fair price. Further, they specified whether they would be interested in expanding production for a food hub, or if they would simply reallocate their current product.

Grade 1 Quantities Farmers Projected Selling to a Food Hub		
Farm	Quantity (Projected value in \$)	Reallocation of current produce or expansion?
Farm 1	\$18,190-\$30,316	Reallocation/Expansion
Farm 2	\$70,000*	Expansion
Farm 3	\$4,500	Reallocation
Farm 4	0	N/A - Excess only
Farm 5	\$12,000-\$25,000	Expansion
Farm 6	\$11,400-\$13,680	Expansion
Farm 7	0	N/A - Excess only
Farm 8	\$3,650-\$7,300	Reallocation/Expansion
Farm 9	\$12,000-\$16,000**	Reallocation
Farm 10	0	N/A - Excess only
Total Projected Food Hub Sales	\$132,340-\$166,796	

*This value was calculated using the projected total of this farm, which is currently expanding.

**This value was calculated using crop quantities and prices instead of a percentage of totals.

Table 1. *Grade 1 Quantities Farmers Projected Selling to a Food Hub.* This table shows the quantities farmers projected selling to a food hub (in dollars), and each farm’s interest in expansion of production v. reallocation of current production for a food hub.

Total quantity of produce **currently** sold by farms listed below = \$1,083,878-1,086,878

As Table 1 demonstrates, 7 out of the 10 farms in production expressed interested in selling Grade 1 produce to a food hub, projecting a total of between \$132,340 and \$166,796. The total amount that farmers projected selling to a food hub is around 12 percent of their current total annual sales, which are between \$1,083,878 and \$1,086,878. Farmers were divided about whether they planned to expand production for the food hub, or reallocate current product. Only one farm was interested in expanding specifically for a food hub. In general, we found hesitation about committing too much produce to a food hub, whether through reallocation or expansion. However, despite the level of satisfaction farmers expressed with their current markets, many are still interested in providing Grade 1 produce to a food hub. Some farmers are intrigued by the idea of redirecting some of their produce to a food hub, but only if the prices are appealing.

Prices

As evidenced above, farmers were clear that pricing would strongly influence their decision to supply to a food hub. In response to the question, “What do you need to sell to a food hub?” eight farmers identified fair pricing in their top three needs. “Price will be a major driver...and hurdle,” said one farmer. Many farmers made supply projections after specifying that they would sell produce to the food hub only “if the price were right.” As one farmer put it, “If [the prices are] fair, then great! If not, then no way. No produce for them!” Overall, most farmers had significantly higher interest in selling Grade 1 produce consistently to a food hub if the prices were competitive with those they receive elsewhere.

Seasonality and Natural Limits

The growing season and weather have a significant impact on potential supply for a food hub. In Northfield, produce seasonality is especially challenging for local farmers, because institutions with large demand (the colleges and the school system) are closed, or serve limited numbers, in the summer. As Open Hands farmers Doherty and Johnson explained, the “hardest time of the year is August, when it’s crunch time and we have too many eggplants, tomatoes, and peppers... [and] there is no school in session.” They, along with other farmers, emphasized their inability to provide consistent local produce throughout the winter months when institutional demand is strong. Many farmers suggested that the food hub could help with season extension by including processing and cold storage.

The potential quantity supplied to a food hub also depends on weather patterns, which can have devastating and unpredictable impacts on crop yields. John Zimmer of SOGN Orchards said that his interest in the food hub is “really based on what Mother Nature gives me this year.” Since he’s been “burned” in the past, he’s reticent to get involved in “more than he can handle.” In addition to lower crop yields, weather patterns can be at odds with institutional requirements, limiting farmers’ ability to sell to certain institutions. For example, Doherty and Johnson have struggled to sell wholesale to the school system because schools are “not able to shift the menu if

the weather prevents the crop from being harvested at needed times.” Weather can also increase the amount of Grade 2 produce due to the damage it causes to crops.

Crops and Other Products

Finally, farmers discussed crops they would be interested in selling to a food hub (Appendix B, Section 1, Table 7). In general, farmers were flexible about what to grow for the hub and fairly open to what institutions demanded. A few farmers were clear that they would want to sell crops that are easiest to produce efficiently on a larger scale. We found that of the 23 crops farmers currently sell wholesale, 13 are available between September and December. Finally, some farmers were interested in selling other products to the food hub, such as honey, eggs, and meat.

Institutional Demand

Institutional demand for food hub produce is dependent on demand and preference for local, budget flexibility, the number of meals each institution serves, need for new local vendors, the amount currently spent on total and local produce, food hub prices, and institutional seasonal schedule. Institutions also expressed concerns and needs regarding certifications and produce appearance, which will be discussed in later sections.

Current Institutional Demand, Preference and Budget for Local Produce

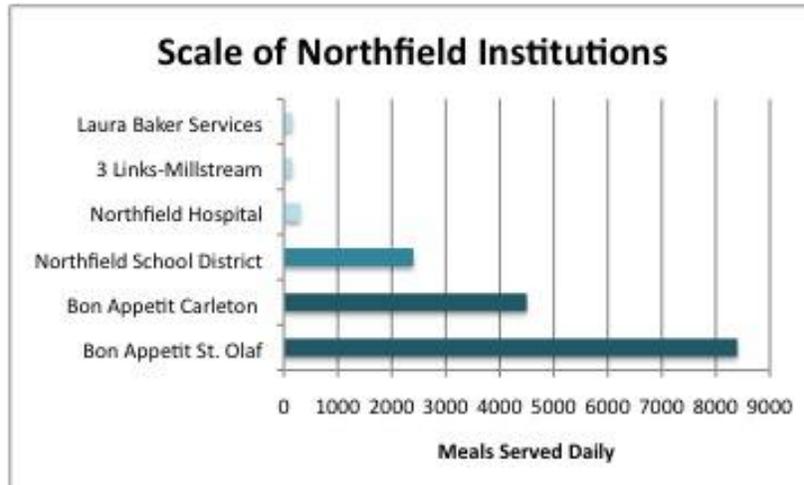
Understanding the reasoning behind institutional food purchases better informs our ability to predict their potential demand from a food hub. Institutions that already buy produce from local farmers tend to serve more people and have a high level of demand for local produce, but are also clear that they will prioritize their direct farmer sales over a food hub. The smaller institutions generally purchase no food from local farmers, but expressed interest in making connections with farmers in the region. However, they serve very few meals relative to the larger institutions (Figure 1), indicating that their demand for local produce would be small even if they bought more locally. We have divided the institutions into three tiers based on their demand for local food, purchasing power and budget flexibility:

Tier 1. *Large demand and flexible budget*: Bon Appétit at Carleton, Bon Appétit at St. Olaf and Just Foods Co-op³ (dark blue)

Tier 2. *Large demand, and limited budget*: The Northfield School District (blue)

Tier 3. *Small demand, and limited budget*: Northfield Hospital, Millstream Commons, and Laura Baker (light blue)

³ Just Foods is actually a retailer; however, we will refer to them as an institution throughout this section to maintain clarity.



* Just Foods is not included, as it is only a retail outlet and does not plan on purchasing significant amounts of produce from a food hub.

Figure 1. *Total meals served daily by each Northfield Institution.* This figure shows the relative scale, measured by number of meals served daily, of each institution in Northfield, and divides institutions into 3 tiers based on their demand for local produce, purchasing power, and budget flexibility.

The high level of demand for local produce among Tier 1 institutions is evidenced by their company commitment to local food. Bon Appétit (BA) has a 20 percent Farm-to-Fork requirement that is often exceeded both at Carleton and St. Olaf. The BA food managers at both colleges indicated unlimited demand for local produce. However, Peter Abrahamson of BA at St. Olaf also expressed loyalty to the farmers he currently buys from, indicating that he will always prioritize them over a food hub. As a result, he is most interested in purchasing food hub “left-overs,” for a reduced price on a case-by-case basis, rather than using the food hub as a regular distributor. Just Foods Co-op, a slightly different case because of the organization was founded with the mission of supporting local food, already buys 80 to 90 percent of their produce locally during the growing season. While expressing unlimited demand for local, they also indicated that they have plenty of summer produce supply and primarily need local produce during the winter months. They were also clear that “Just Foods would maintain prior... relationships” with farmers already selling to the Co-op.

The Tier 2 institution, the Northfield School District, also currently purchases local produce, in part because of federal Farm-to-School initiatives. Pam Hoyt, Northfield School District food manager, reported that she “currently takes whatever the farmer can offer,” and “has not had to limit [local] purchases.” Hoyt also indicated loyalty to her current direct farmer purchases. However, the School District demand for local produce is limited by budget inflexibility. The Tier 3 institutions, the Hospital, Millstream Commons, and Laura Baker have no local percentage requirements and have never consistently purchased local items, apart from the products available from their large-scale produce distributors. While extremely enthusiastic

about local food, these three institutions serve very few people (Figure 1). Therefore, they will not be demanding large quantities of produce from a food hub.

Need for New Vendors and Interest in Seconds

Despite loyalty to current farmers, all institutions were interested in new local vendors. The larger institutions often cannot buy enough local produce to last more than one meal period. The School System, Hospital, Millstream Commons and Laura Baker also expressed need for local vendors, but did not know how to contact local farmers. As Eileen Anderson of Laura Baker explained, I “don’t know where I’d get local from... [but] I’d like it a lot.”

However, not all institutions were interested in buying seconds. Carleton, St. Olaf, Millstream Commons and Laura Baker all expressed willingness and interest in buying seconds, as long as the “quality is good.” The School District and Hospital, however, were much more reticent about purchasing seconds. Community members thought this reticence reflected a need for education more than actual preferences, since these institutions order from produce distributors that already provide seconds. Just Foods cannot take any seconds, since as a retailer they have to cater to customer demand and expectations.

Quantities

Because institutions had a hard time predicting how much they would buy from a food hub, we gathered data on their past behavior. Below we summarize current institutional produce purchasing (Table 2). We have also included the amount of local produce purchased by institutions already buying local.

Current Total Institutional Produce Purchases			
Institution	Current total annual produce purchases (\$)	Current annual local produce purchases (\$)	Willing to accept Grade 2?
Bon Appetit Carleton	\$395,472	56,991	Yes
Bon Appetit St. Olaf	\$640,446	92,439	Yes
Just Foods Co-op	560,000*	560,000	No
Northfield School District	\$80,000-\$100,000	22,304	No
Northfield Hospital	\$52,000	7,800**	No
Millstream Commons	\$13,752	N/A	Yes
Laura Baker School	\$6,000-\$7,200	N/A	Yes
Total	\$1,747,670-\$1,768,870***	\$739,534	

*Just Foods already buys 80 percent to 90 percent of their produce locally and indicated that they would not be able to increase this amount. Therefore we have only included their local produce purchases.

**We are unsure about accuracy of this number, as it was a very rough estimation. Further, it only includes Bix local produce

***This total includes purchases of produce that cannot realistically be grown in MN, such as citrus fruits and bananas.

Table 2. *Current Total Institutional Produce Purchases.* This table shows the annual total and local produce purchases (in dollars) for each Northfield institution, as well as each institution's willingness to accept Grade 2 produce.

As discussed above, Tier 1 and 2 institutions are committed to their current markets. Therefore, the majority of the \$739,534 they already spend on local produce is less likely to be redirected to a food hub. On the other hand, their local produce purchases include some items ordered from their large-scale distributors, such as Bix, which they value less their direct-sale local purchases and would possibly be replaced by a food hub. Ideally, though, a food hub will increase, not redirect institutional local purchases. The high level of interest in local produce expressed by all institutions, particularly the Tier 1 institutions, indicates that these institutions would shift dollars from their total produce purchases towards a food hub. The Tier 3 institutions that currently buy no local produce would definitely purchase food hub produce directly from their total produce budget. Further, although the Hospital reported purchasing local items through their large-scale distributor, Bix, the amount was very roughly estimated during our interview. It must be noted that while total produce purchases give a sense of institutional scale and demand, a portion of this money is spent on produce that cannot be grown in Northfield. Therefore, all of the institutional produce purchases could not be redirected to a food hub unless there is a dramatic change in consumer expectations.

Price

Institutions had differing opinions regarding the importance of fair price, as indicated by institutional range in budget flexibility. The small-scale institutions were clear that price would play a large role in their decision to purchase from a food hub, while the large scale institutions were very price flexible. See more in our section analyzing institutional price preferences (Page 36).

Seasonality

We found that “weather and seasonality are the biggest limits to local food purchases” for most institutions. As mentioned previously, the growing season is often at odds with institutional demand patterns, while weather disrupts the regularity of local produce availability. Institutions mentioned these challenges multiple times, both during our interviews and our community meetings.

The Tier 1 institutions struggle with the contrast between the seasonality of produce and their institutional schedules. Carleton closes in the summer, St. Olaf scales back to only 100 to 200 people per meal period, and the School District is not in session, meaning that institutional

demand during peak harvest season decreases dramatically. As Abrahamson of St. Olaf asserted, the “climate and the school system are not pals.” Although open during the summer, Just Foods also pointed to seasonality and climate as the primary obstacle limiting their local purchases. They are “already buying so much local [during the growing season] that there is not much room for growth, unless there is season extension on either side of the traditional season,” according to produce manager Matt Malecha. All of these institutions are looking for ways to “distribute local product more evenly throughout the growing season.” They find that they are getting “tons of produce during a period where we can’t buy it,” but then have no access to local produce during the winter months, particularly from January to March. Like farmers, institutions identified season extension and processing as potential solutions to seasonal barriers, and expressed a huge interest in locally processed items.

Weather is a barrier for all buyers, but is particularly challenging for institutions like the School District, Millstream Commons, Laura Baker and the Hospital, which have set 4-week menu rotations and therefore require consistent and reliable produce deliveries. “Weather has wreaked some havoc in the past,” Pam Hoyt of the School District noted. Joyce Lovstrand, of Millstream Commons, reported that the variability in produce availability has decreased her satisfaction with previous one-time local produce purchases. As a result, she has diminished demand for, and interest in, local produce.

Crops and Other Products

The Tier 1 institutions indicated that because they already have access to local produce they would be more interested in purchasing other products, such as meats, dairy and grains. Institutions refer to these products as the items sold in the “middle of the store,” and report that they are the hardest to find locally. The Tier 2 and 3 institutions were not interested in local products other than produce because of certification fears. All institutions were open to buying whichever crops the food hub had available, but specified their top preferences (Appendix B, Section 1, Table 8).

Supply and Demand Summary

- Farmers prefer their current markets because of lowered risk, higher prices and relationships. Many farmers already sell to local institutions.
- Institutions fall into three different tiers based on their size, budget flexibility and demand for local.
- Most farmers are interested in the food hub as a market for excess produce and/or seconds. 4 out of 7 institutions are interested in purchasing seconds.
- Farmers projected supplying between \$132,340 and \$166,796 of Grade 1 produce. Institutions currently spend between \$1,747,870 and \$1,768,870 on produce annually. Institutions spend \$739,534 on local produce.
- Pricing will be a major factor in farmer and institutional interest in the food hub.
- Weather and seasonality are major barriers to farmer supply and institutional demand.

- Both farmers and institutions are flexible about which crops they want to sell and buy from a food hub. Institutions are very interested in other local products.

Prices

Farmer Prices

Although all farmers agreed they wanted a “fair price,” the definition of “fair” varied from farmer to farmer, as did the price that they would be willing to accept from a food hub. Farmers set prices in a variety of ways: from the wholesale prices of other farmers, the efficiency of each crop’s production, the season, the quantity demanded, the produce Grade, the customers’ needs and the market price. Basing prices off of other farmers in the community was especially prevalent. As one farmer said in regards to a food hub’s pricing, “we trust other farmers who already sell wholesale. We’d try [their prices] for a year and then see if it was working financially.” Additionally, farmers emphasized the influence that order quantity has on their pricing, explaining that a certain quantity has to be ordered for a delivery to be cost effective.

Chart 1 below summarizes the information we were able to gather on the prices farmers are willing to accept for Grade 1 produce. All farmers want prices similar to what they currently receive, which vary depending on farming practices. The few farmers growing conventionally already use conventional distributor prices, and are therefore willing to accept those prices. Sustainable farmers require significantly higher prices, although some are willing to take more of a price reduction than others. For a sense of prices range by crop among Northfield farmers reference Table 7 in Appendix B. Farmers are willing to take a small price cut for a variety of reasons, most frequently for less labor-intensive crops and the added convenience a food hub could provide. The largest price decrease a farmer is willing to take is 25 percent off their current prices, however this farmer is known to have higher prices than most. Additionally, farmers indicated that in order for them to consistently sell Grade 1 produce to a food hub they would need prices similar to what they receive from other local wholesale buyers, such as Just Foods Co-op. The Co-op currently pays farmers around the organic wholesale market price, or the price that farmers request. As one farmer asked, “why would I sell [a high quality product] to the food hub if I could sell it for more to the Co-op?”

On the other hand, farmers are interested in selling their excess or Grade 2 produce for lower prices, especially if a food hub increased the ease of delivery. One farm is willing to offer seconds for prices 64 percent lower their typical wholesale prices, on the condition that the produce is picked up from the farm. Other farmers did not express the same willingness to sell their seconds for such a large price cut, but most indicated that lower prices for seconds were acceptable.

Farmer Price Flexibility	
Farm	Marginal Willingness to Accept for Grade 1 Produce
Farm 1	Prices 20-25% higher than distributor wholesale prices Sliding scale based on customer needs.
Farm 2	Could accept 5-10% lower prices than current for efficient crops.
Farm 3	Trust other farmer's wholesale prices, also satisfied with Co-op prices. Recognize trade-off between convenience and prices. Maybe could do 10% below organic wholesale prices.
Farm 4	Happy with current prices, would be able to accept 10-15% less if food hub handled delivery. Require higher prices than conventional wholesale due to greater amount of labor.
Farm 5	Wide range of pricing for different customers. Some crops are very labor-intensive, so not price-flexible. Other crops are easier, so could potentially lower prices by 20-25%.
Farm 6	Would like to keep prices same as current ones.
Farm 7	Looking for fair prices, important to develop relationship with manager. Doesn't need to have the highest or lowest price.
Farm 8	Satisfied with organic wholesale prices.
Farm 9	Prices have to be around market prices, but quantity purchased is also relevant. Containers used, labor required play a role.
Farm 10	Use conventional distributor prices.

Chart 1. Farmer Price Flexibility. This chart summarizes each farmer's willingness to accept prices for their produce, estimated from a "wholesale price" or from their own prices.

Institution Prices

Food hub pricing was a very important factor considered and discussed by many institutional buyers throughout the interviews. Institutions can be categorized into two groups based off their price flexibility. The Tier 1 institutions are not limited by price sensitivity, while the Tier 2 and 3 institutions have little or no ability to pay more than their current distributor prices (Chart 2). Depending on their price sensitivity, institutions determine their prices based off farmer needs, product quality, the cost per plate, their food budget, the season and market prices.

For BA Carleton, BA St. Olaf and Just Foods pricing is determined on a case-by-case basis and is dependent on the relationship they have with the farmer, the quality of the produce and farmer justification for the price. They all have a strong willingness to pay more than their conventional distributor prices and struggled to determine the exact percentage when asked. As Abrahamson of BA St. Olaf explained, "there is no cut off, instead I look at each situation individually." As Michael Delcambre, a chef for Carleton Bon Appétit stated, "I'll pay pretty much what the farmer's asking." BA Carleton manager Katie McKenna explained that there are "more factors in [their pricing] than dollars and cents" because their budget system, which is

balanced from meal to meal, “is much more fluid.” Despite these statements, some farmers in the community reported that, while they enjoy working with BA Carleton, the food service is less flexible on prices than other wholesale buyers. Overall, the three price flexible institutions were generally unwilling to pay prices three to four times more than the conventional distributor price. Malecha, the produce manager for Just Foods, explained that he would only buy a product at such a high price if the farmer had a reasonable justification.

The Tier 2 and 3 institutions are not able to pay significantly more than their current distributor prices. The School District determines prices on a case-by-case basis, reporting that the current local prices they pay are not “significantly different than those from the distributor.” This may be in part because they primarily purchase from local conventional farmers and in part because farmers in the region have reported selling their produce to the school system for prices lower than typical. Pam Hoyt of the School District explained that she is federally prohibited from paying a premium on food and is only able to pay 1 percent more than her distributor prices. Laura Baker, the Hospital and Millstream all reinforced the need for prices similar to what they pay now, but were willing to pay “a little more, like maybe 5 percent” more than what they currently pay. They all emphasized the importance of staying within their budget.

Institutional Price Flexibility	
Institution	Marginal Willingness to Pay
BA St. Olaf	Willing to pay more for local food, recognize higher level of quality. Ask farmers for their prices and then see if within budget. Aware of price differences between farms. Important to have high profile local items for educational component.
BA Carleton	Big picture approach to spending, claim that price is not super important but has to be in the right ballpark. Willing to pay farmers what they request but only works because prices are in the right range.
Northfield School District	Legal restrictions on paying premium prices, current local prices are about 1% more than distributor prices.
Northfield Hospital	Expect to pay a “little more” for local, already pay more for Bushel Boy tomatoes because they are seasonal/higher quality.
Millstream Commons	Can balance slightly higher prices, 5% markup seems reasonable. Ideal would be distributor wholesale prices though.
Laura Baker School	Would like to see prices similar to conventional ones, 5% markup might be okay but would have to see.
Just Foods Co-op	Pay markup for local produce, would hesitate over grossly inflated prices but willing to engage in discussion with farmers.

Chart 2. Institutional Price Flexibility. This chart summarizes each institution’s willingness to pay for local produce, estimated from a “wholesale conventional distributor price.”

Prices Summary

- Farmers set prices in a variety of ways: from the wholesale prices of other farmers, the efficiency of each crop's production, the season, the quantity demanded, the produce Grade, the customers' needs and the market price.
- Institutions determine their prices based off farmer needs, product quality, the cost per plate, their food budget, the season and market prices.
- For Grade 1 produce farmers want prices similar to what they receive now, with some flexibility. Institutions are split; three are very price flexible, while the other four are very price inflexible.
- Farmers are willing to offer Grade 2 produce for lower prices.

Logistics

Farmer Logistics

Food Hub Market Flexibility

There is a divide within the Northfield farming community between three farmers who want the food hub to have set contracts and four farmers who do not want set contracts. This split reflects a divide between farmers who want to use the food hub as a buffer for overflow crops or seconds, and farmers who want the food hub to be one of their main markets for crops. Some farms, such as Spring Wind, currently use the wholesale market as a way to generate income without having to guarantee specific quantities or crops ahead of time. This allows them to plant excess produce for their CSA as a safeguard, but still be able to sell this produce if they do have produce leftover. Because of this, they would not want to have to commit to certain produce quantities ahead of time. Spring Wind currently harvests their produce and then calls St. Olaf to negotiate orders if an excess market is needed. Linda Halley, of Gardens of Eagan, would like to be able to appraise what her harvest is, and then have the food hub order three to five days in advance so she can process and prepare produce for sale. In addition, some farmers mentioned that it would be difficult to know what their harvest would be like early enough to make contracts, stating that this would be stressful, and had to predict. Farmers who want to use a food hub primarily as a market for excess, do not want to be in set contracts, as it is difficult to predict these quantities ahead of time.

On the other hand, farmers who wanted set contracts, indicated that they needed preseason commitments. Monica Irwin of SEEDS farm stated multiple times that a guaranteed market with preseason commitments was the farm's primary need for a food hub. Other farmers did not want to plant more crops unless they knew they would be able to sell them; as David Hougen-Eitzman of Big Woods Farm said, "if [...] we knew we could sell to them [guaranteed market] yes, we would increase production." Rae Rusnak of L&R Poultry and Produce agreed that she would not want the farmers to bear the full risk of being unable to sell their produce stating, "[I] want a contract ahead of time. Otherwise where do you put 10,000 lbs of squash? I

don't want to hear I can't take it now!" Farmers interested in using the food hub as a main market, prefer to have set contracts to ensure they will be able to sell their crop.

Convenience, Time and Labor

There was agreement among farmers that the food hub should be convenient and save time for farmers through pickups and short delivery distance, ease of dealing with food hub staff, and consolidation of multiple markets. Most farmers who currently sell wholesale deliver to each customer individually, sometimes spending entire days making deliveries. This can be a problem for farmers like John Zimmer of Sogn Orchard who in the past has had more produce he could sell, but no have time to deliver it. As he said, "[I] can't do anything else productive while driving." Although the distances farmers are willing to travel for produce delivery varied from 5 to 50 miles, Ben Doherty and Erin Johnson from Open Hands Farm said time spent delivering was a significant barrier. This past year they delivered to the school system, but had to drop their produce at five different locations, which they considered time wasted. Due to this time barrier, they currently sell less to the school district, but think a food hub could solve this problem by helping to facilitate and consolidate distribution. Most farmers would like to keep driving to a minimum and within the Northfield area. Some farmers even stated that they would be willing to take lower prices due to time saved with the food hub. For example, Aaron Wills of Little Hill Berry said, "[I] wouldn't want to deal with spending a day delivering, and a food hub would solve that problem. [It is] worth it for cost of the food hub not to have to go out and about!"

Time and labor were often cited as variables that could determine whether or not farmers would change current practices in order to sell to a food hub, especially when dealing with seconds and farm expansion. For example, many farmers are interested in selling seconds to a food hub, but stated this would depend on labor and time. Zimmer has seconds he could pick after November 1, but does not have the time and wants a vacation. Therefore, he does not plan on harvesting his produce unless someone else does it.

Consumer Expectations and Produce Appearance

As mentioned in Supply and Demand, a few farms have trouble selling seconds due to consumer expectations about produce appearance. Strict guidelines in terms of blemishes, shape and size make it difficult to sell produce even if it is edible. However, this is primarily a problem with retail sale, as institutional food service providers can use produce regardless of appearance.

A more common problem cited by farmers is the question of identity preservation within the food hub system. For all farmers, maintaining a personal quality produce reputation is essential. As Dayna Burtness of Laughing Loon said, "Reputation is everything. Once a chef has doubts, its all over." Most farmers now control their quality reputation by selling their produce directly to the consumer. The issue with a centralized system like a food hub is that all farmers' produce would be mixed together, potentially eliminating identity preservation. Other farmers' lower quality produce could be mixed in, possibly lowering a farmer's reputation in ways beyond their control. As Wills of Little Hill Berry farm, stated, reputation of quality is important, and he wants to make sure his produce maintains this reputation of quality even if it is mixed

with others' produce. A food hub's reputation of quality to meet consumer expectations would be important for success.

The same problem of identity preservation applies to Organic Certification (See Glossary for Definition). Although almost all farms we interviewed use very sustainable practices, some are officially Certified Organic, while others are not. A food hub could potentially eliminate consumer knowledge of a farm's Organic practices if it mixed all farmers' produce together regardless of certification.

Certifications

Because reputation is maintained through direct sales to customers, many local farmers in Northfield do not have official certifications such as Organic or GAP. Since their customers trust them and can see exactly where their produce is coming from, these certifications are not necessary. However, official health certification, especially GAP, may be required if selling through a food hub. Some farmers believe the GAP regulations are an overreach, treating the ecosystem as "the enemy." However, although almost all farmers listed cost as a possible barrier to becoming certified, as the process is expensive, many farmers are willing to apply for GAP certification if institutions require it, and the cost was manageable. In fact, some farmers are already in the process just in case such regulations are necessary for the future. John Zimmer wonders if farmers will be able to deliver directly to institutions like Bon Appétit as regulations continue to become stricter over time. As Zimmer said, "Are regulations the way of the future? [...] This means that a food hub could be really important in supporting and guiding [farmers] through the regulatory process and world."

Cost as a Barrier

Cost was often cited by farmers as a barrier especially in reference to harvesting seconds, applying for certifications, and sustainably running a food hub. Although many farmers have seconds they could sell if a new market opened up, farmers often questioned the cost and profitability of picking seconds. John Larson of Bridgewater Produce indicated that he is not always convinced that it is economical to pick seconds, stating that just because there's a market doesn't mean that it will make him money. However, adapting for this extra cost is a possibility for some farmers. As David Hougen-Eitzman said, "Picking seconds depends on labor because it costs money to pick, and right now [we're] maxed out on labor, so [we] would have to budget for it [...] would have to incorporate it into business plan." Furthermore, as mentioned previously, certifications potentially required by a food hub may be too expensive for farmers to obtain, resulting in too little profit to make the costs worthwhile. According to Hougen-Eitzman, making economic ends meet is most important.

Another significant farmer concern is economical sustainability of the food hub. Todd Harvey of Fireside Orchard wondered, "How can this pay for itself? What kind of facility are you going to have? Obviously that's the whole question!" Farmers point out that even if the food hub runs as non-profit, it has to cover its operating expenses, most likely by taking price cuts. Depending on the food hub model, these price cuts could be significant. Linda Halley of Gardens

of Eagen works with one distributor who takes a 24 percent cut for operation costs. Concerns about how an intermediary, or middleman, would improve farmer livelihoods were expressed during Northfield Food Hub Alliance meetings. Farmers worry that due to cuts, the food hub would have to pay farmers prices that are too low, or set prices too high for institutions to be interested in purchasing the produce. As one farmer said, “the markup is going to be...a huge challenge [to] supporting farmers and selling to institutions at reasonable levels.” This is a critical factor for farmers, such as Doherty and Johnson, who would prefer to maintain their direct relationship with St. Olaf rather than using a middleman such as a food hub in order to keep the price at the best level for both parties.

Institution Logistics

Food Hub Market Flexibility

Institution contract flexibility depends on whether the institution had set menu cycles. The School District, Hospital, and Millstream Commons have set menu cycles, and often plan meals months in advance. Joyce Lovestrand, food manager at Millstream Commons, had once purchased produce from a local farm and explained that it was hard not knowing when the produce would arrive. In reference to working with a food hub, Lovestrand said she “would be interested, but it’d have to be pretty consistent and that’s the hard part.” Both the School District and the Hospital preferred the idea of preseason planning with farmers so the type and quantity of produce would be guaranteed ahead of time. However, both were open to being flexible. The Hospital food manager Elizabeth Berry said she could try making her menu more generic, using “vegetable in season” to incorporate whatever produce she has. Food options, such as the salad bar, are more flexible because items there can vary. As Berry said, “there the sky is the limit!”

Both BA St. Olaf and BA Carleton are very flexible in terms of contracts. Both institutions stated they could take produce whenever, depending on what is available from farmers, and are “as open to preseason planning as farmers are.”

Convenience, Time and Labor

Many institutions expressed interest in working with a food hub due to current time constraints. Hospital food manager Elizabeth Berry, who has not purchased from local farmers before, said she could make contracts with individual farmers but that it would be a lot of work for her. Joyce Lovestrand from Millstream Commons said that although she would not be interested in preseason planning with lots of farmers, she would be interested in meeting with one person from a food hub to coordinate logistics.

The Hospital, Millstream Commons, and the School District also questioned how the produce would get from the food hub to their institutions, wondering: “how would it be delivered?” and “would I have to go get it?” All of these institutions hoped that the food hub would deliver to them, as “time is of the essence.”

Consumer Expectations and Produce Appearance

Because the majority of the institutions we interviewed are food service providers that often process and cook produce before serving it to customers, they are more flexible about produce appearance. BA Carleton and BA St. Olaf are willing to take any grade, and require little processing, only dicing. All institutions except the School District and the Hospital said they would be willing to take blemished produce, as long as they are still edible. However, because the School District and the Hospital buy from large food distributors like Sysco and Bix, they most likely already buy seconds without knowing it. Regarding consumer expectations, the smaller institutions of the School District, Millstream and especially the Hospital, preferred that the produce arrived somewhat processed. As a retailer, Just Foods cannot take any blemished produce because the average consumer will not purchase physically damaged produce.

Certifications

Institutions were most concerned about certification logistics and expressed a general sense of losing control over the certification process by not being able to trace food back to specific farms. Because most farms currently do not have official certifications, institutions like Bon Appétit rely on the trust that develops through building relationships with each individual farmer. Katie McKenna of Bon Appétit wondered “What certifications would the hub use in place of these relationships?” This is true for food safety certifications, like GAP, and Organic Certifications (See Glossary for Definitions). Currently, institutions can keep track of whether their food has been produced with sustainable practices, even if farms are not officially certified, because of direct sales and their ability to check each farm individually. Maintaining this trust and knowledge about farm health and environmental practices could be more difficult if all farmer produce is mixed together.

The School District, Hospital, and Millstream Commons were most concerned about food safety requirements. Elizabeth Berry of the Hospital explained that she is serving the elderly and sick population, people with compromised immune systems, and would require a health certification like GAP. Joyce Lovestrand of Millstream, who is also serving the elderly said, “I am serving delicate adults!” and was also concerned about food safety standards and sanitation. The School District requires GAP and HACCP health certification (See Glossary for Definition), and would also need food safety requirements. Food manager Pam Hoyt stated, “the food safety concerns piece is very real [...] Who is touching the raw produce? How is it being processed? Anytime you are serving the public, you need to be able to trace and track what is going on with your food.”

Logistics Summary

- Farmers are divided about whether the food hub should have set contracts or a flexible sale system. Institutions are flexible.
- All stakeholders agree that a food hub should be convenient and save time. Many expressed a desire for a delivery and pickup system.
- Consumer expectations limit farmers ability to sell their Grade 2 produce; however, food service providers are overall unconcerned about product appearance.

- Farmers and institutions are concerned about food hub safety certifications. Most farmers are willing to apply for GAP, which the majority of institutions require.
- Farmers are concerned that the cost of certifications, added labor and food hub operation may be prohibitive to the food hub's success.

Social Success

Community Support and Enthusiasm

Farmer Support and Enthusiasm

Potential Food Hub Interest

Overall, the Northfield farming community expressed substantial interest in the creation of the food hub, but many still have concerns and questions. Because the impetus for researching the feasibility of a food hub came from within the community, there has been significant community interest in following and contributing to the research, as evidenced by the formation of the Northfield Food Hub Alliance. The general sense of overall enthusiasm in Northfield is demonstrated by community member Angel Dobrow when she said “Bias your results pro-food hub, because we want it to happen!” during a recent Sustainable Farmers Association meeting. As David Hougen-Eitzman of Big Woods Farm stated, “If criteria were met, convenient, price was good, and [we] knew what we could sell, then yes [we] would increase production! It'd just be exciting to be part of the whole thing!” Even farmers who were not interested in participating themselves were enthusiastic about the role a food hub could play in Northfield. John Larson of Bridgewater Produce stated that he “thinks it is a good idea for the community” and that especially for new farmers, “the economic realities may make it critical.”

Relationships

Farmers worry that a food hub may weaken their current relationships with buyers. Of the twelve farmers we spoke with, ten frequently mentioned relationships during interviews. In many cases, close friendships have developed between the farmers and food service purchasers, causing many farmers to want to maintain direct contracts with their current customers. For example, Dayna Burtness of Laughing Loon farm said that Peter Abrahamson from BA St. Olaf will be attending her wedding in the spring and was the first person to call her after last year's flood to make sure she was okay. Todd Harvey of Fireside Orchard said he wanted to maintain relationships with his current wholesale customers because his farm has been selling to many of them since his grandfather's generation. With a centralized distribution system, these personal farmer-to-institution relationships could potentially be lost.

Many farmers also discussed how the food hub's success would depend on choosing the right person to run the operation. Trust would be an important factor, especially as this person would be helping to determine prices. As David Hougen-Eitzman explained, “We would

also have to see what the food hub people are like. Just going to have to find the right person to make it work [...] food hub manager is going to make or break success.”

Institution Support and Enthusiasm

Potential Food Hub Interest

All institutions indicated that they would be interested in buying from a food hub if it met their criteria. Eileen Anderson of Laura Baker expressed enthusiasm for the food hub, saying, “I’d really like it, I really would. When people call me and say they have 50lbs of squash, I take it right away, I like it! They like it! You can tell!” Elizabeth Berry of the Hospital and Joyce Lovestrand of Millstream echoed Anderson’s perspective. Just Foods Co-op is also interested in playing a role with the food hub, whether that would be investing in a warehouse for the central location, or helping out in another way. As produce manager Matt Malecha stated, the Just Foods mission statement requires that Just Foods does everything it can to support fair and just food, and Just Foods would love to be involved in the food hub process.

Relationships

Depending on how much local food they currently purchase, institutions had different opinions about how relationships would be affected by a food hub. Institutions that do not currently purchase local food, such as Northfield Hospital, Millstream, and Laura Baker, conceivably would only gain relationships with the creation of the food hub. However, Bon Appétit and the Northfield School District were very worried about losing the personal relationships they currently have. The managers of these institutions frequently asked, “will personal relationships be lost?” and “Would the food hub cut down on direct contact?” Comments about how working with a food hub might be off-putting due to a desire to maintain individual relationships with farmers, were brought up at community meetings. Peter Abrahamson of BA St. Olaf highly values his personal relationships with farmers, saying they are critical and lets farmers enjoy free meals in the St. Olaf dining hall, saying, “we’re not just going to buy your food, we’re going to help you out.” He would not be willing to let these existing relationships go away.

Abrahamson, Katie McKenna, and Michael Delcambre from Bon Appétit all commented on personal visits they currently make to farms, which not only build trust and make sure farms are using good practices, but also have become visits to see friends, as these relationships have become more established. From a practical perspective, Delcambre thought it could be challenging to ensure this trust with a food hub wondering, “how [will we] confidently know where our food is coming from without these individual relationships?” Overall, Delcambre’s main goal is getting more local food into the BA Carleton meals. He “wants to meet more farmers, get more farmers in the kitchen, even if not through food hub, and wants to know them as well!”

Pam Hoyt of the School District also values these relationships and worries that some of the excitement of getting local food could be lost with the creation of a food hub. As she

explained, “[the] real benefit of the Farm-to-School movement is the ability to form partnerships and get to know the farmers. If all food is thrown together, then you lose some of that specialness of knowing exactly where the food came from [and] could lose ability to highlight these relationships with a more central distribution system.” She also worries that a good educational opportunity for her students would be lost, as she currently tries to incorporate classroom farmer visits with her local food purchases.

Community Support and Enthusiasm Summary

- All stakeholders expressed substantial interest in a Northfield food hub.
- However, many farmers and institutions were concerned about losing personal relationships if local food purchasing becomes centralized.

Food Access

Overview

The only place low-income residents can currently access local food is the Northfield Food Shelf. The Food Shelf serves approximately 500 households, or 1,500 people per month. Their customers can pick up a food supply every month, and participate in Thursday’s Table, a meal feeding 180 people every Thursday evening. Food Shelf manager Judy Bickel stated that she can see significant benefits of the local produce the Food Shelf receives in donations as it is fresher, lasts longer, tastier, and chemical free. Whenever the Food Shelf has local produce in stock, the majority of it is gone by the end of the day, and she believes that 100 percent of Food Shelf participants choose the local produce when they have the option. Bickel thinks the Food Shelf is one of the only places these residents can access local produce. Although residents can use SNAP cards at the Northfield Riverwalk Farmer’s Market, Bickel believes this is rare, as the farmers market is very expensive (Appendix B, Section 2, Table 9).

Farmers and Food Access

Farmers are most interested in a food hub model that would keep their food within Northfield institutions and would be able to bring food into institutions that do not currently have access. As Betsy Allister and Andrew Ehrmann of Spring Wind farm explained, they “would prefer if food was going right into the local community.” Allister and Ehrmann even cited increasing food access as a motivation for getting GAP certified, saying that they may be certified if they knew their produce would be reaching more people who wouldn’t be able to get it otherwise. Monica Irwin of SEEDS farm was also more interested in a food hub that would “hopefully get more food into more people’s hands.”

However, 9 out of 10 farmers also expressed excitement in the food hub’s potential to create a new market for the seconds and excess that they currently donate to the Food Shelf. For example, SEEDS farm had one week last season during which they donated 1,000 pounds of excess seconds produce to the food shelf every day. John Zimmer has donated as much as 4,000

pounds of apples in one day to the Food Shelf. A loss of these current donations could dramatically decrease the Food Shelf's amount of local produce.

Institutions and Food Access

All institutions except Just Foods believed that a food hub could increase their local food percentage, thereby getting more local food in the hands of their consumers. Tier 1 and 2 institutions could increase their local produce percentages with the creation of a food hub. Some of their consumers, especially from the School District, could also be potential Food Shelf participants. However, the School District, BA Carleton and BA St. Olaf already receive some local produce, and do not have nearly as many low-income customers as the Food Shelf. Furthermore, as most of these students are not from local areas, we do not give them as high of a priority when attempting to increase community local food access.

Food Access Summary

- The Food Shelf is the main source of local, fresh produce for low-income Northfield residents, and serves approximately 1500 people.
- Farmers prefer to keep their produce in the Northfield community, and would like a food hub to distribute to institutions who currently do not have access to local produce.
- Farmers are interested in selling the produce they currently donate to the Food Shelf.
- Four institutions already have access to local produce; these institutions serve over 5,900 people (including School District). The remaining three do not have access and only serve 150 people.

Environmental Success

Farming Practices

Farmer Sustainability

Of the 10 farmers in production, seven use entirely sustainable farming practices (Appendix B, Section 3, Table 11). These farms employ a variety of practices that satisfied our sustainable agriculture criteria, ranging from hand weeding to mulching. The remaining three farms are “less” sustainable because they employ between one and four unsustainable practices, in addition to some sustainable practices. The unsustainable farms most commonly apply synthetic chemicals in the form of pesticides, fertilizers and herbicides. However, two of these farms use Integrated Pest Management (IPM) practices, which assess insect life cycles and seasonal conditions to determine when to spray, resulting in less, more targeted spraying (Hougen-Eitzman 2013).

All of the farms with the “large quantity” food hub projections use entirely sustainable practices (Table 3). However, the farms that expect to provide a “medium quantity” for the food hub are split – one farm uses sustainable practices, but the other farm uses four unsustainable practices. The two “small quantity” farms are both sustainable. One of the two farms planning to

provide only excess produce to the food hub is “more” sustainable, while the other is “less” sustainable.

Farming Practices and Quantities				
Correlation between Quantity and Practices (# of farms)				
Farm Size	Large	Medium	Small	None
# of More Sustainable Farms	3	1	2	0
# of Less Sustainable Farms	0	1	0	2

Table 3. *Farming Practices and Quantities.* This table divides farms by the quantity size they are interested in selling to a food hub (large, medium, small, and none), and shows the number of these farms that use more sustainable or less sustainable farming practices for each category.

Institutional Sustainability

Six institutions buy between 75 and 100 percent of their produce from large-scale distributors, such as Bix, Sysco and US Foods. These distributors get the majority of their produce from PRO*ACT, “America’s leading distributor of fresh produce to the foodservice industry” (www.proactusa.com). PRO*ACT sources the majority of their produce from large-scale farms, such as “Sunkist” and “Rainier Fruit Company” (www.proactusa.com/growers). These farms are primarily located in other regions, including California, Florida and Mexico (PRO*ACT 2013). While specific practices vary depending on crop type, the majority of U.S. conventional produce farms apply synthetic chemicals to their fields, use minimal crop rotation and grow only one crop (U.S. Census of Agriculture 2007, USDA 2001). Therefore, the majority of produce purchased by institutions is grown using unsustainable practices. Just Foods was the exception, sourcing up to 90 percent of their produce from local farmers during harvest months and small-scale local distributors throughout the year.

Farming Practices Summary

- The majority of the farmers interested in selling to a food hub use “more sustainable” practices. All farms use at least one sustainable practice.
- Institutions purchase the majority of their produce from large-scale distributors who source produce that is grown using unsustainable practices.

Beyond the Criteria: Other Insights and Findings

Common Needs for a Food Hub

Throughout our interviews we noticed trends that did not fit into our criteria. Significantly, the majority of farmers share the same fundamental food hub needs, which are that the food hub has fair, competitive prices, is convenient, and provides either a guaranteed or flexible market (Table 4). These frequently mentioned needs indicate what would be critical for a food hub’s success in Northfield.

Farmers' Top Food Hub Needs	
Top Food Hub Needs	# of Farmers (out of 11*)
Fair, competitive prices	8
Convenient	8
Market type: Guaranteed or flexible	3 – guaranteed 4 – flexible
Increases, not replaces, markets	3
Maintains farmers’ reputations	3
Good communication and relationship with manager	2

*This number includes Little Hill Berry Farm, not yet in production.

Table 4. *Farmers’ Top Food Hub Needs.* This Table shows the top six food hub needs reported by farmers, and shows the number of farmers reporting each need.

Institutions were more divided about their greatest needs to sell to a food hub. The main needs are shown below (Table 5).

Institutions’ Top Food Hub Needs	
Top Food Hub Needs	# Institutions (out of 7)
Reliable Certifications	4
Reasonable, locked-in prices	4
Produce is clean, good overall appearance	3

Table 5. *Institutions’ Top Food Hub Needs.* This table shows the top three food hub needs reported by institutions, as well as the number of institutions that reported each need.

Processing Center and Cold Storage

Another common desire expressed by farmers and institutions is the need for a processing center. If available, farmers could process seconds into value-added items (See Glossary for Definition), preserve produce harvested during the summer so it could be usable throughout the winter months, and transform the raw produce into a form the smaller institutions could more easily use. This idea was mentioned by 8 of the 12 farmers interviewed, and 6 of the 7 institutions. Further, it was discussed at every community meeting we attended. This was not an idea we offered to interviewees.

With a processing center, all equipment could be in one space for all farmers to use so that each farmer would not have to buy expensive equipment individually. Laurie Hougen-Eitzman of Big Woods Farm pointed out that it “takes too much time to process beans – if there was a machine to do it [we] would want to go in with the farmers in the region.” Monica Irwin of SEEDS summed up the general desire for a processing center, saying “it would be so awesome to have a processing center in the region for farmers to use!” Farmers and institutions pointed out that the processing center could address the seasonality challenge they face, as it would allow farmers to grow and harvest produce in the summer months, and then market product in the winter when institutional demand is significantly higher. Along these lines, Dayna Burtness stated that the “most promising idea is to start a value-added company for things like soup and salsa that could buy produce from local farmers and make products that store on the shelves.” Institutions were clear that from their perspective a processing center would be the best addition a food hub could provide for Northfield. As Katie McKenna of BA Carleton explained, “processing needs can limit local food access...[therefore the] food hub would especially help with processing.” Overall, processing is a function that Just Foods manager Pat Neily believes the “food hub will have to have.”

Similarly, community members were also interested in the possibility of a food hub with a root cellar or other form of cold storage to preserve produce for sale during the winter months. Some farmers, such as Rae Rusnak of L&R Poultry and Produce, are already planning on renting out cold storage units for next season. Community members are also aware that SEEDS already has a large root cellar. However, the root cellar currently has a rodent problem, meaning that in the short-term it is not a viable place to store produce and extend the growing season.

Beyond the Criteria Summary

- Farmers shared the same top needs for a food hub, while institutions were more divided.
- All stakeholders would like a processing center in Northfield.
- Community members are also interested in a food hub with produce winter storage capabilities.

V. Analysis and Discussion

Overview

The complexity of the information presented above makes it challenging to reach a clear conclusion about the viability of a food hub for Northfield. In this section, we will analyze and discuss our findings by criteria, in terms of the positive, negative and complicating impacts they have on a potential food hub's success. Additionally, we will point out assumptions in our research and their potential influence on our findings. Finally, we will conclude our discussion with some broader insights about a food hub's success.

Economic Success

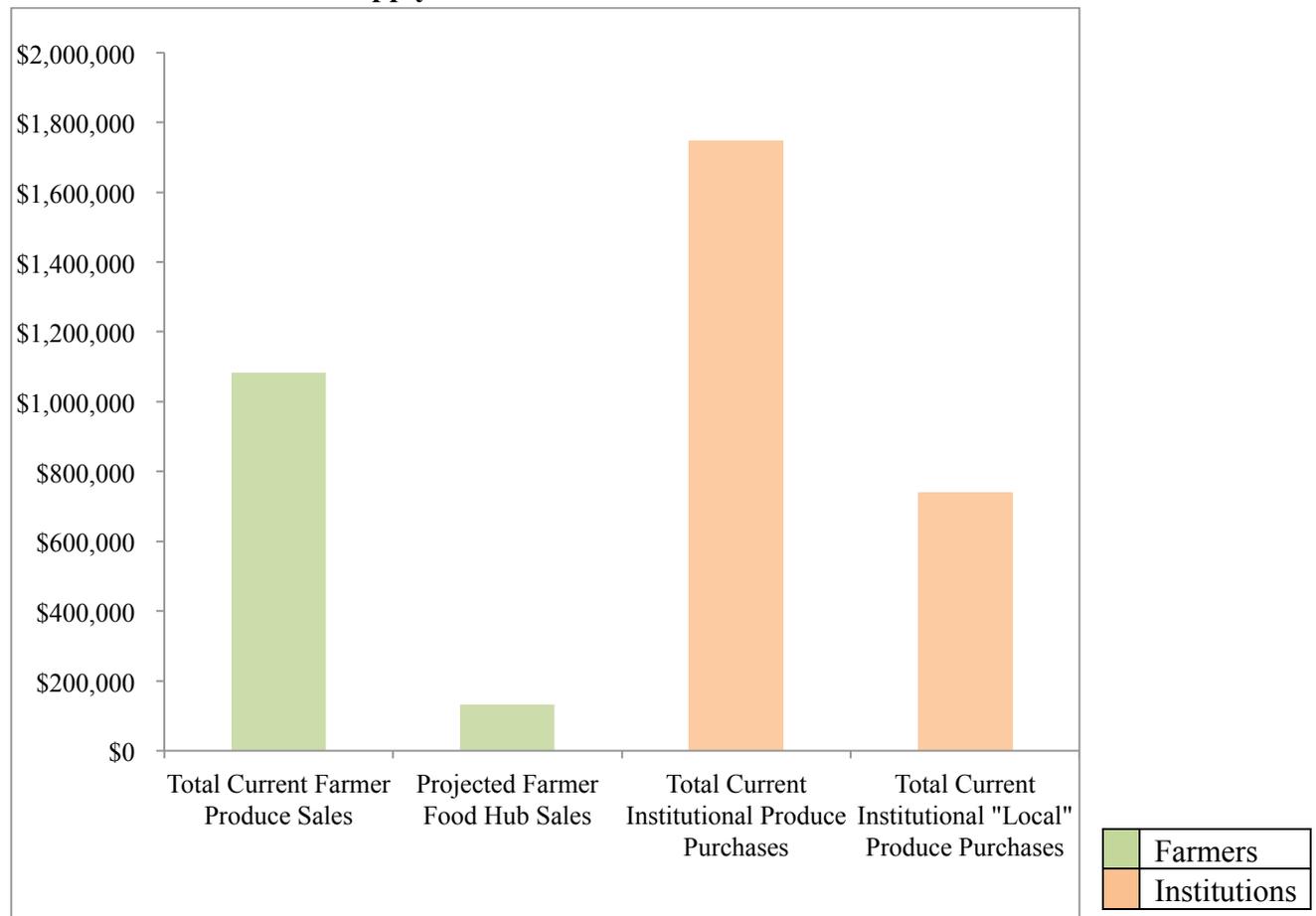
Would food hub supply and demand work?

Overall, there is enough institutional demand to meet the supply of farmer Grade 1 produce, satisfying our criteria that institutional demand must be greater than or equal to farmer supply for a food hub to be successful. However, our supply and demand findings are extremely complex and success in this category is conditional on a food hub's model and approach. Therefore, we conclude that a food hub could be *somewhat successful* at matching supply and demand. In order to effectively facilitate supply and demand, a food hub must: offer prices acceptable to all stakeholders, give farmers a reliable market, add to rather than replace current markets, address farmers' need for a Grade 2 and excess produce outlet, and navigate the seasonality mismatch. Additionally, there are numerous assumptions that could potentially influence our findings, which are described further below.

We conclude that supply and demand could work for a food hub because farmers projected supplying between \$132,340 and \$166,796 worth of Grade 1 produce, while institutions currently spend between \$1,747,870 and \$1,768,870 annually on produce. This means that farmers want to supply between 7 and 9 percent of the amount that institutions currently spend on produce (Figure 2). As mentioned in results, some of the total institutional produce budget is spent on items that cannot be grown in Minnesota, such as citrus fruits and bananas, and therefore the money cannot be redirected to local produce unless consumer expectations change. We believe that institutions will be willing and able to spend some percent of this money on a food hub, but cannot make certain conclusions about the amount because we were not able to gather data on projected institutional demand from a food hub. In order to get a sense of already established financial commitment to local produce, we collected data on current institutional spending. Five institutions already spend \$739,534 on "local produce." However, because the Tier 1 institutions were clear that dollars are not limiting their local food purchases and indicated interest in buying local produce whenever it is available, we expect that these institutions would prefer to increase, rather than redirect, the money they spend on local produce. Although less flexible and smaller, the Tier 2 and 3 institutions were also overwhelmingly

enthusiastic about local food. Overall, because all institutions expressed a high level of demand for and interest in local produce, we maintain that institutions would be excited and able to spend a small portion (7 to 9 percent) of their current total produce budget on food hub produce. This conclusion is dependent on the food hub offering prices that are acceptable to all stakeholders, a challenge that is discussed at great length in our analysis of prices (Page 53)

Farmer Supply and Institution Demand



* Quantities calculated using minimum amounts reported by farmers and institutions

Figure 2. *Farmer Supply and Institution Demand.* This figure shows the total quantity of current farmer produce sales, and farmers’ projected produce sales for food hub. It also shows current institutional total and local produce purchases.

There are multiple other challenges the food hub will have to address to make supply and demand work. First, farmers’ fear of selling large quantities wholesale, particularly to a newly established food hub, directly limits the quantity of produce they are willing to supply. While the projected \$132,340 to \$166,796 dollars of Grade 1 produce is a start, we have not conducted research on the total level of annual sales required to keep the food hub economically sustainable over the long term. Therefore, it is possible that the current amount projected by farmers will not

be enough to cover food hub operation costs. This potential deficiency could be addressed initially through grants, but over time the food hub will have to fund itself. If the hub cannot gain the trust of more farmers, particularly the CSA farmers who view wholesale as risky, it may not be able to succeed.

Additionally, as discussed above, farmer and institutional commitment to their current markets directly limits the supply and demand available to a food hub, especially since many of our farmer and institutional interviewees already sell to and buy from one another. In order to be successful, a food hub will have to expand upon, rather than replace, these prior markets and relationships. This means that the food hub has to connect excess “unspoken for” regional produce supply and demand.

Apart from the few farms without consistent buyers, excess and Grade 2 produce is the most obvious source of uncaptured supply in Northfield, with at least 27,500 pounds available (Appendix B, Table 6). Because excess and Grade 2 produce was not the main focus of our data collection, we do not know the total amounts potentially available for a food hub. However, as explained in results, the majority of the farmers expressed a significant need for a seconds and excess produce market. Assuming that there is adequate supply to support the overwhelming interest these farmers expressed, the hub could fill a gap in the Northfield local food system by providing a market for these produce items. However, there are three main challenges to this approach. First, some Northfield institutions are unwilling to purchase Grade 2 produce due to consumer appearance expectations. Second, if farmers are only interested in selling excess items on a sporadic basis, the food hub may receive patchy supply. And third, the excess produce that farmers want to sell has generally already been refused by Tier 1 institutions due to maxed out demand, as many farmers already sell much of their overflow and grade 2 produce to these Tier 1 institutions.

This third challenge comes from seasonality and weather constraints that make what appears to be a simple math problem more complicated. Due to the mismatched seasonality of farmer supply and institutional demand described in results, if farmers only wanted to or were only able to sell to a food hub primarily during the summer, the hub would have to rely on the demand from the institutions that remain open - the Millstream Commons, Laura Baker, the Hospital and Just Foods. Just Foods has made it clear that they are already maxed out on the amount of local produce they can buy during the summer, leaving Millstream Commons, Laura Baker and the Hospital. Taken together, the combined total annual produce purchases of these institutions make up around only 50 percent of the Grade 1 supply projected by farmers. Furthermore, these institutions would never spend their entire produce budget in the summer months, especially considering that some of these items cannot be grown in Minnesota. Weather could also be a challenge for a food hub, as many farmers and institutions cited unpredictable climate as a problem.

Our crop analysis sheds some light on the extent of the seasonality mismatch. We found that slightly over 50 percent of the crops Northfield farmers expressed interest in growing for a food hub are available between September and December, when the larger institutions are open.

While this is somewhat promising, it indicates nothing about the patchiness of the supply of these crops and the possibility of having a supply of too much of one crop at a time for institutions to handle. However, we do see potential for the alignment between the crops farmers grow and the crops institutions want; Northfield farmers reported growing all but three of the crops demanded by institutions. Additionally, Tier 1 institutions expressed a significant interest in purchasing other local food products, such as meat and dairy, from a food hub. These products are barely, if at all, limited by seasonality. However, because we were mainly interviewing produce growers, we do not have data on the potential supply of these items from local farmers.

When considering the findings discussed above, it is important to understand how our initial research assumptions could have influenced our results. First, our assumption that the farmers and institutions gave us correct quantity estimates potentially influences our supply and demand findings. These estimates were often determined on the spot during our interviews and therefore may not be completely accurate, especially since in some cases, we had to calculate and extrapolate totals based on other information interviewees were able to provide. However, we do have confidence in these numbers because our interviewees carefully thought through and considered details, such as crop efficiency and weekly produce orders, to make their estimations. Further, many institutions gave us concrete data from financial records reporting their yearly total and local produce purchases.

Our use of dollar amounts as a measure of quantity could also influence our supply and demand results. Even though the supply and demand totals appear to match, the variation in crop pricing could skew the amounts. If all farms were selling completely different crops, or institutions were buying different produce, this would be an issue. For example, if one farm only sold expensive items, such as asparagus and herbs, but another farm just sold potatoes, their dollar amounts would not represent similar quantities. However, because most farms in the area sold a similar range of crops, we do not think this assumption has a significant effect on our findings.

Can food hub pricing work for producers and buyers?

We were not able to get enough information to make a final conclusion about whether food hub pricing can work. However, we conclude that while agreement on Grade 1 prices may be more difficult to achieve, acceptable Grade 2 pricing could most likely be reached. At the very least, we have determined that institutions and farmers often set prices using compatible methods that could be utilized by a food hub trying to negotiate a universally accepted “fair price.” Using our pricing criteria for success to analyze our findings, we conclude that food hub pricing could be *somewhat* successful.

As discussed in results, we found that four of seven institutions were fairly price inflexible, while the majority of farmers wanted prices the same as, or within 10 percent, of their current prices for Grade 1 produce. As reported by Just Foods Produce Manager Matt Malecha, there is an average difference of 30 percent between conventional and organic wholesale distributor prices. Therefore, when pricing needs are placed along a continuum, it is clear that there would still be a substantial gap between the prices farmers need and the prices institutions

are able to offer (Appendix C, Section 1, Figure 3). However, the three price flexible institutions also had the largest demand, indicating that they would be buying more substantial amounts of produce from a food hub than the small, price inflexible institutions anyway.

Because the majority of farmers were open to accepting significantly lower prices for seconds, in one case up to 64 percent less than their current prices, it seems likely that Grade 2 prices could be agreed upon. Farmers also expressed willingness to sell their excess produce at a discount, but only after they could not sell it anywhere else. This lower price would enable the Tier 2 and 3 institutions to purchase from the food hub. However, two out of these four price inflexible institutions were not interested in purchasing seconds and would require education or seconds processing before they are willing to purchase Grade 2.

Farmers and the Tier 1 and 2 institutions often set their prices based on each other's needs, indicating a higher likelihood that the food hub could negotiate an agreement between the two parties. Still, farmers also indicated that the ease of growing specific crops would increase their willingness to accept lower prices for those crops. At least initially, a food hub should focus on buying and selling these more efficient crops.

There are a few limitations to our pricing methodology that influence our results. First, because a food hub model has yet to be determined, the operating costs are unknown and were excluded from our pricing analysis. Therefore, even if prices aligned perfectly between institutions and farmers there is still a chance that pricing would not work due to food hub operating costs, which could require a large enough markup that institutions would no longer be interested in buying food hub produce. However, because the large institutions are so price flexible, their willingness to pay higher prices may outweigh the challenges posed by a larger markup.

Our pricing conclusions are also based on the assumption that all institutions have the same perception of "distributor wholesale prices." These prices can vary dramatically throughout the season based on product availability. They can also vary depending on the amount institutions order, which is dependent on institutional size. Therefore, even if all institutions want their "distributor wholesale prices," those prices could be different from institution to institution. Lastly, the 30 percent estimated difference between organic and conventional prices varies widely depending on crop and season, and does not necessarily apply to the prices set by sustainable farms in the region. There are some times of year when local prices may be lower than distributor prices.

Can stakeholders agree on food hub logistics?

Finding a way to work around logistics will probably be the most difficult step for the Northfield community, but this could be accomplished with community member compromise and creative solutions. Therefore, when applying our logistics criteria requirements for success to our findings, we conclude that food hub logistics could be somewhat successful.

There is complete agreement within the community that the food hub should be convenient and save time. The majority of farmers agreed that the food hub should be located within Northfield, as most farmers reported an unwillingness to travel, which would limit the

central location to this geographic range. The school system is the only institution for which farmers expressed distribution concerns, as it has multiple locations.

The hardest logistical aspect will be whether the food hub should use set contracts and guaranteed markets because the community is currently completely divided on this issue. This issue is particularly difficult to solve because it depends on whether farmers want to use the food hub as a main or secondary market.

Certifications represent another issue for the food hub, as almost all institutions require a health certification (GAP), while hardly any farmers are GAP certified. However, the majority of farmers have stated an overall willingness to apply for GAP certification if required by institutions. This assumes that prices are at a level at which it is profitable for farmers to undergo the expensive certification process, and that farmers can afford to become certified in the first place. Along those lines, cost may be a barrier to many aspects of food hub logistics, especially certifications, harvesting extra produce, and finding a way to sustainably cover the food hub's operating expenses. Even if all farmers and institutions agree on all other logistical aspects, this cost could stand in the way of the food hub being successful.

There is also the issue of identity preservation, which affects both farmer reputation and institutional ability to trace where produce is coming from. This inability to keep track of individual farmer practices and rely on personal trust is reflected in the institutional need for official certifications. Addressing this problem would be critical to a food hub's success, because stakeholders will not utilize the food hub if they do not believe that high quality produce and trustworthiness is maintained.

Lastly, both farmers and institutions have concerns about consumer expectations and appearance of produce, especially regarding seconds. It seems there is not a clear idea among institutional buyers of what seconds actually are, and how they can be used. If resolved, this could open up more markets for seconds, which is the main type of produce that farmers are interested in selling. Some institutions also prefer produce to arrive pre-processed. Although most farmers currently are not in a position to be able to process their own produce, many have expressed interest in having some sort of processing equipment for the community to share.

Overall, logistics will take some thought, but should be possible to coordinate if the community works together to come up with creative solutions that work for the majority of stakeholders.

Social Success

Is there widespread community support and enthusiasm?

Overall, there is substantial community interest in the food hub, satisfying our requirements for success for this criterion. Even stakeholders who are not interested in participating themselves think a food hub would be a great idea for the community. The main hurdle in this category is the potential loss of relationships. This is an important consideration, as these relationships are highly valued and important for many community members. The potential for keeping these relationships does not just depend on whether the food hub is created but also depends on

community willingness to put effort into maintaining these relationships. Overall, we believe the community not only has enough interest to warrant the creation of a food hub, but also has such a high level of enthusiasm for the food hub project that there is the potential to successfully work around possible barriers to success described in other sections.

Would a food hub improve food access?

It is unclear whether or not a food hub would increase food access in Northfield. A food hub could negatively impact food access by offering a market for produce that is otherwise donated to the Food Shelf. If a food hub creates a new seconds market, farmers may stop donating this produce to the Food Shelf, causing a decrease in local produce access for low-income Northfield residents.

On the other hand, a food hub would increase all institutions' local produce percentages, assuming that the challenges and barriers discussed in other sections were addressed. However, many of the Tier 1 institutions that have the most interest in and ability to buy local produce, serve very few low-income and local residents, especially in comparison to the Food Shelf (Appendix C, Section 2, Table 10). Therefore, increasing local percentages in these institutions would not be increasing access for those residents who need it most. Further, approximately 20 percent of the institutional produce purchases are already local, meaning that they already provide consumers access to local produce. A food hub could increase food access for Tier 3 institutions, which serve low-income residents and do not currently have access to produce grown by local farmers. Although this would increase food access for low-income Northfield residents, the scale of these institutions is very small in comparison to the Food Shelf; taken together they serve only 10 percent of the amount of people served at the Food Shelf (Appendix B, Section 3, Table 10). Therefore, if the food hub ended up transferring local produce from the Food Shelf to the Tier 3 institutions, it could actually decrease the number of low-income residents with access to fresh, local produce.

The food hub's affect on local food access in Northfield is also dependent on whether farmers choose to expand or redirect their current production for the food hub. If farmers choose to only sell produce from expansion to the food hub and continue to donate some excess to the Food Shelf, this could increase food access for all income levels. Several farms did express interest in expansion and increasing produce production for a food hub, meaning more local food could be circulating within the Northfield community. However, if farms end up mainly redirecting current Food Shelf donations to sale for the food hub, food access would decrease, as previously stated.

Therefore, it is highly possible a food hub could decrease food access for low-income residents if farmers begin selling seconds and excess produce rather than donating it to the food shelf, unless farmers substantially increase production for the food hub and donations to the Food Shelf are sustained.

Environmental Success

Would a food hub support sustainable farming practices?

We found that a food hub in Northfield would support sustainable farming practices because 1) 100 percent of the farmers projecting “large quantities” for the food hub use sustainable practices, 2) seven of the ten farms use sustainable practices and 3) six out of the seven institutions currently purchase the majority of their food from large-scale distributors sourcing produce that is conventionally grown. Therefore, our success criteria requirements for a food hub supporting sustainable farming practices are met. Furthermore, we found that even the relatively “less sustainable” farmers in the Northfield community typically use practices that are more sustainable than those used by the large-scale conventional produce growers. Clearly, if the institutions replace their conventionally grown produce with produce from a food hub, their dollars will be supporting sustainable practices rather than environmentally degrading and high-energy usage conventional practices.

It is important to understand the assumptions that could have influenced our results. First, our assumption that all conventional produce growers use unsustainable practices, while supported by USDA data, has potential flaws depending on the specific crop. Additionally, we assume that institutions will increase the amount of dollars they spend on sustainably grown produce, rather than redirecting money that they already spend on sustainably grown items. Given the large institutional interest in purchasing more local produce, along with institutional commitment to their current direct sales with farmers, it seems likely that they will increase purchases rather than redirecting them, a finding that supports this assumption. Likewise, if farmers merely shift their produce sales to a food hub, rather than increasing production or selling currently “unspoken for” produce, then there will be no overall increased monetary support for sustainable farming practices, because this redirected produce would just be financially supported by institutions rather than current buyers. Since we found that many farmers would be interested in increasing production for a food hub, that they were all very committed to their current markets and that they had an interest in selling excess and seconds that currently do not get sold, we conclude that it is likely that a food hub would cause farmers to grow more produce, rather than redirecting current quantities.

Our definition and classification of “more” and “less” sustainable farms is based on our assumption that a farm using any practice that does not fit with our definition of sustainable is “less” sustainable. In reality, ecosystem dynamics are often hard to predict and it is possible that a farm applying synthetic chemicals could use other practices that make it equally, or more sustainable than other farms. For example, applying synthetic fertilizer rather than organic manure could result in less nitrogen run-off in some situations. This is because the inorganic nitrogen in fertilizer is already in a form accessible to plants, allowing them to take it up more efficiently, whereas manure can increase the risk of surface sealing, a process that prevents the nutrients from leaching into the soil (Smith et al. 2000). Even among the “more sustainable” farms, interactions between different production practices could potentially result in a varying

level of ecological sustainability, depending on the weather, season, and crops grown (Kim and Dale 2008). On the other hand, when considering environmental impact only from an energy usage perspective, synthetic chemicals are undoubtedly less sustainable due the large amount of energy required for their production (Pimental et al. 2005). Therefore, despite the potential variation within our farm practices sustainability assessment, we are confident in our finding that a food hub would financially support sustainable farming practices.

Beyond the Criteria: Other Insights and Findings about a Food Hub's Potential for Success

As the Northfield community considers the viability of a food hub, our broader findings about farmers' and institutions' highest priority needs should be foremost in stakeholders' minds. Most farmers and institutions agree that the food hub must be convenient and offer "fair prices." Beyond that, the needs of farmers and institutions are split, with farmers more focused on contracts, and institutions prioritizing certifications. The issues behind these logistical aspects are discussed fully above (Page 54), however we wish to emphasize the high priority they need to be given in order for a food hub to succeed.

Additionally, the overarching community consensus and interest expressed in a processing center and/or cold storage infrastructure provides evidence of the major barrier seasonality plays in local food sales and indicates that a processing center could be a successful food hub model for the Northfield community. The processing center could also increase the amount of locally available products sold in the "middle of the store," which would allow some institutions like Just Foods, which are maxed out on local produce purchases, to buy from the food hub and increase their local percentages. Similarly, a food hub with cold storage infrastructure could be a successful approach to strengthening Northfield's local food system.

VI. Conclusions and Recommendations

Food Hub Economic, Social and Environmental Success

Overall, we conclude that a food hub could be a successful approach to strengthening the Northfield local food system *economically* and *environmentally*, if the barriers discussed above are addressed. Although community interest is strong, the possibility that a food hub could weaken relationships and decrease food access for low-income community members prevents us from concluding that a food hub would successfully strengthen the *social* aspects of the local food system. Furthermore, although evaluated separately, our criteria will certainly influence one another to impact overall success. In particular, it is critical that quantity and prices are considered simultaneously especially if the food hub focuses only on seconds and offers prices that will not entice farmers to sell Grade 1. This could significantly decrease Grade 1 supply available to a food hub.

When comparing our criteria, we acknowledge that economic success is the most immediate factor determining a food hub's feasibility. However, in light of the numerous social and environmental challenges our world faces, we urge local food system stakeholders to fully consider these factors when deciding whether or not to implement local food system policy. Food justice advocate Orrin Williams enforces this perspective, arguing that in order to fix the problems with our global food system we must address environmental degradation and social injustices (Williams 2006). Further, ensuring economic, social and environmental success is integral to agricultural sustainability. Ikerd (1993) defines sustainable agriculture as "capable of maintaining its productivity and usefulness to society over the long run... it must be economically viable and socially supportive, commercially competitive and environmentally sound" (as referenced in Rigby and Caceres 2001, 30). By supporting sustainable farming practices, a food hub could be a positive step towards addressing larger environmental issues, such as the nation's dependence on energy and oil. If Northfield creates a less energy reliant and more sustainable local food system by implementing a food hub, it could provide a model for other communities attempting to decrease fossil fuel usage.

Connections to Previous Literature

Overall, this is the first qualitative food hub feasibility study conducted. Although the qualitative nature of the study may provide more complex conclusions, it also captures important farmer needs, such as a need for an excess market, which would not be captured in a structured, quantitative survey. Furthermore, the criteria we use to assess food hub success can be important indicators of food hub feasibility throughout the country and can be used for future food hub studies, with methodological improvements where needed.

Further, this research has significant implications for food hub feasibility and local food system literature, as our results support and differ from the literature in key ways. First, our finding that a food hub would support sustainable farming practices offers critical support for the claim frequently made in previous food hub literature that food hubs increase environmental

sustainability. Food hub feasibility studies have either asserted this claim without data to support their conclusion (Barham et al. 2012, Aubrey 2012, Lindsey and Slama 2012) or assessed how food miles might decrease with the creation of a food hub (Dane County...2011). As discussed in our criteria selection, food miles are not as effective an indicator of environmental sustainability as farming practices, even when considering energy use (Heller and Keolin 2003). This is the first study to examine and prove the potential for a food hub to support sustainable farming practices.

This is also the first food hub feasibility study that assesses the potential for agreement on pricing. Similar to the *Southern WI Study*, we found that pricing is a major concern for farmers considering selling to a food hub (Dane County...2012). Especially since farmers consistently listed pricing among their top three needs to sell to a food hub, more research about pricing should be conducted for future food hub feasibility studies.

Further, our finding that a food hub could provide local produce to institutions without any previous local food access supports the literature, which has asserted that increasing institutional local food access is one of the primary benefits that food hubs can provide, especially for hospitals and schools (Barham et al. 2012, Morgan 2012). These studies also generally argue that increasing institutional access to local food strengthens community bonds and relationships (Barham et al. 2012). Additionally, studies cite increased food access as a direct social benefit of food hubs (Schmidt et al. 2011). Therefore, our finding that a food hub could potentially weaken relationships and decrease local food access for low-income Northfield residents contradicts existing food hub and local food system literature (Barham et al. 2012, Bellows 2003), calling into question the common belief that stronger food systems will naturally support stronger social connections (Feenstra 1997, Barham et al. 2012).

Additionally, our discovery that farmers are most interested in selling their excess and Grade 2 produce to a food hub, rather than using it as a primary market, challenges previous local food literature. A recent USDA study, “Local Food Systems: Concepts, Impacts and Issues,” emphasizes the lack of consistent, large-volume markets available to small-scale farmers (Martinez et al. 2010). While this may be true for newer Northfield farmers, such as Little Hill Berry Farm, overall we did not find that Northfield farmers consistently lack markets. Additionally, our conclusion that Northfield food system stakeholders are most interested in a food hub’s season extension potential through the creation of a processing center or cold storage differs from previous food hub studies that identify distribution infrastructure as a primary stakeholder need.

We argue that our findings differ from previous literature because Northfield farmers already have an institutional market for their produce, making the area different from other regions where food hubs have been established (Barham et al. 2012, Schmidt et al. 2011). This means that contrary to the findings of local food system scholars such as Vogt and Kaiser (2008) and Azuma and Fisher (2001), lack of distribution infrastructure is not the main barrier to institutional local food access in Northfield. Instead, seasonality and institutional scale are the most significant hurdles that must be overcome for local food purchasing to increase. We argue

that a food hub can address these challenges and, as a result, posit that food hubs can play a broader role in strengthening local food systems than previously discussed.

Northfield Recommendations

In order for the Northfield community to implement a food hub, we propose several suggestions and solutions to the barriers and challenges brought up in the Discussion. In terms of supply and demand, one solution to the inadequate institutional demand in the summer could be identifying additional wholesale buyers throughout Northfield such as restaurants and grocery stores, as well as expanding into other nearby markets in Rochester and Faribault. Including a processing and value-added aspect to the food hub would address the seasonality barrier and fulfill the institutional demand for local produce during the winter, as produce would not have to be sold immediately after harvest. The food hub could also address this seasonality issue by focusing on crops that are harvested in the fall, when large-scale institutions are open.

Because so many farmers were interested in selling seconds to the food hub, we also see the potential for initially establishing the food hub as an aggregator of seconds. There may be a current lack of understanding of the meaning of Grade 2 produce, and the extent to which it can be used in food service. Further education of institutions could solve this problem and increase the market for seconds. A processing center could also address the institutional concern about consumer expectations of appearance, by turning blemished or bruised produce into value-added products, which the institutions would be willing to use. Several other established food hubs incorporate processing, such as Wisconsin Innovation Kitchen and Bushel & Pecks, and the Illinois Food Hub study states that “food hubs that offer processing can play an important role” in addressing the issue of wasted seconds, and buyer desire for processed produce (Lindsay and Slama 2012).

To address the issue of the ebb and flow of excess produce, the farms wanting to devote a higher percentage of their crops to the food hub, such as SEEDS, could take the lead and use their crop as the majority of sales to institutions. These “majority” farms could incorporate the more sporadic excess produce from other farmers. This model would be similar to Locally Grown, a farmer-run food hub in Iowa that is organized by one farm that aggregates produce from other farms in their area in order to have enough produce to sell to institutions. This food hub has also pooled resources to build a commercial kitchen, which they use to preserve their produce and extend local food availability into the winter. Like Locally Grown, the Northfield food hub could focus initially on one crop as a trial run and then expand. Based off our crop analysis, we recommend starting with crops that multiple farmers have interest in selling to a food hub (Appendix B, Section 2, Table 7).

A food hub would probably be able to address the unpredictability of produce availability caused by weather events by receiving product from more than one farm. Although it is possible that extreme weather could devastate the entire region, it is also likely that farms will be impacted differently depending on their geography and location. Therefore, with more farmer supply to draw on, there is a higher likelihood that produce will be available more consistently.

Given the information we discovered about how farmers in the region set prices, we conclude that if the food hub manager took time to meet with each individual buyer and producer, an agreement on pricing could be reached. Another option is that, at least initially, the more price flexible Tier 1 institutions could subsidize the less price flexible Tier 2 and 3 institutions in order to pay farmers fair prices for Grade 1 produce. Additionally, the food hub could start simply as a market for seconds and excess items, on which there is more institutional and farmer agreement on prices.

Additionally, the food hub would have to overcome the logistical challenges we identified. In order to solve the current community divide over the necessity of contracts, we believe a system could be set up that works with both sets of desires. Under this system, farmers who want to regularly sell produce to the food hub would have set contracts and guaranteed markets, however other farmers would still be able to sell their excess produce without an official contract ahead of time. Farmers could choose which avenue they want to take at the beginning of the season.

The problem of certifications should not be an issue for farmers willing to become GAP certified if required by institutions. For farmers who want to sell to the food hub, but are not willing or able to invest in GAP certification, it is possible that a food hub could apply for a grant in order to subsidize the certification expense for farmers. Other successful food hubs, including the 5th Season Coop in Viroqua, which community members visited last fall, have used this method to financially support farmers interested in becoming GAP certified. Although some institutions had concerns about trusting the food safety and environmental practices of farmers without direct sales, official GAP certifications required by a food hub and a system for ensuring all participating farmers use sustainable practices could solve this problem.

We are not sure how a food hub would be able to preserve farmer identity. For farming practices, it is possible the food hub could separate produce based on organic certification versus no certification, but this seems unlikely. Community members may have to compromise on this issue, and accept that their produce will no longer have their name attached to it in the institutional setting.

The food hub would also have to address how it would cover its operating expenses. Other food hubs have used government grants to get started (Barham et al. 2012) and cover costs until they become profitable. Some hubs have required members to pay a fee to participate, like a co-op model. This idea was not as popular with some Northfield community members, but should still be considered as an option. After figuring out how the hub will cover its expenses, it will become clearer how large the markup will have to be in order for the food hub to be a profitable business.

To increase the food hub's ability to strengthen the social components of Northfield's local food system and prevent the loss of relationships, we recommend a centralized location that provides a space for community gatherings. Additionally, since many farmers are mainly interested in the food hub as a market for excess produce, it is possible they could maintain their main deliveries and direct relationships, while only using the food hub as an avenue for excess

produce. In order to ensure increased local food access for low-income community members, we recommend that a food hub sets a percentage of produce that it donates regularly to the Food Shelf, or that it at least donates excess produce it cannot sell. The food hub could continue to increase the sustainability of farming in the region by reaching out to large-scale farms once it is established and providing education classes on sustainable farming methods. This approach has been taken by other food hubs across the nation, such as the Local Food Hub in Charlottesville, VA.

Recommendations

- Central location needed - potentially could either use SEEDS root cellar, or Just Foods could expand to accommodate food hub
- Need to address to fix seasonality mismatch, either through:
 - Increasing summer demand by reaching out to broader range of institutions
 - Processing center
- More research needed in markets for seconds and excess
 - Especially for seconds pricing
- Food hub should be convenient, with flexible options for contracts
- Food hub should facilitate farmer GAP certification, and potentially provide funding
- Food hub should work with all stakeholders to set agreed upon prices
- Community should prioritize social and environmental gains from food hub
 - Food hub should donate set a percentage of produce to Food Shelf
 - Food Hub should promote and be associated with sustainable farming practices
- Community should look into government grants to initially fund food hub

Future Research

While our findings offer an initial conclusion about the feasibility of a Northfield food hub, we recognize that we have only scratched the surface of the complex details involved in establishing a food hub. First of all, future research on expanding the institutional demand to the larger Northfield region is critical for predicting a food hub's level of success. Many community members have already recommended that we talk to the Faribault prison, school district and Shattuck St. Mary's boarding school. More research within Northfield on the demand from other wholesale buyers, such as restaurants and grocery stores, should also be conducted, especially as several community members expressed explicit interest in selling to restaurants. Similarly, because we were only able to get data about current produce demand from the institutions interviewed, it would be ideal to gather more information regarding their projected demand from a food hub. Additionally, more research on the food hub interest of other regional farmers would be valuable.

The high level of demand for a "back-up" market from farmers indicates a need for a seconds and excess outlet in the community, whether that comes in the form of a food hub or not. Research on alternative market solutions for excess and Grade 2 produce should be gathered, particularly if the community decides not to create a food hub. In particular, further research is

needed regarding Grade 2 quantities and pricing because our interviews only focused on Grade 1 produce. Because seconds now seem to be an essential component of a food hub's success, more research on this subject is certainly needed.

Likewise, research on how to address the common and often cited seasonal barrier in Northfield and other northern regions must be conducted. Information on the feasibility of season extension, processing, flash freezing and other methods of navigating seasonal limits would be invaluable for communities like Northfield where the largest institutions with the highest demand for local produce are open only from September through May or June. The ability to preserve produce harvested during the summer and take advantage of this demand during the unserved winter months could be beneficial for farmers and institutions.

Furthermore, additional research is needed regarding the feasibility of aggregating local non-produce items, which are more consistently available throughout the year. Time and time again in our community meetings and interviews with institutions, we heard the desire for local food, such as grains, from "the middle of the store." We also identified a large demand for local liquid eggs from Bon Appétit. What is the availability of meat, eggs and cheeses in the Northfield region? Is it feasible to overcome the cost and certification barriers in order to supply more of these products to institutions? These are questions institutions in Northfield want answers to.

As our interviews demonstrated, many members of the community are concerned about "cost as a barrier" to the success of the hub, especially if a processing center needs to be funded. More research about the economic feasibility of establishing a central location, or processing center, must be conducted in order for the Northfield community to establish a hub. Research about different options for covering this cost must be conducted, including obtaining government grants available through the USDA or having participants pay a membership fee. More interviews with community members to determine which avenue they would like to take in this regard are required. Additional research on pricing specifics and food hub operating costs is also needed once more concrete details are decided regarding the food hub model. Along these lines, more research about the feasibility of including processing in the food hub operation is needed.

Similarly, the level of supply and demand needed for the food hub to be economically sustainably is currently unknown. We did not take the produce quantity needed for long term success into consideration in our research, but it is clearly important to know before investing in a food hub. Further, in our interviews we only asked stakeholders about what quantities they would want to supply or demand at "a fair price." More research about how these quantities would change at lower or higher prices would shed more light on the food hub's potential for success. Additionally, research on food hub logistical details such as food hub model, location, and transportation need to be investigated before determining a food hub's success.

Through the course of our research we also found a gap in the literature regarding the environmental sustainability of local food. The methodology we created for this study is a good start, however we believe that much more research could and should be conducted about the environmental impact of specific farming practices. Further, significantly more research is

needed concerning the different environmental impact of local and non-local food. There are some studies that have attempted to assess the environmental impacts of our US food system using a Life Cycle Analysis, which takes a cradle-to-grave approach to measuring the environmental impacts of food production, consumption and waste (Heller and Keolin 2003). While this research is valuable, it does not specifically address local versus non-local produce. Overall, if local food activists would like to continue extolling the environmental benefits of local food systems, there needs to be more research to back up their case. Along these lines, although not the main focus of our research, we also found a lack of reliable data about the economic gains of local food systems.

More broadly, our research identifies a need for further investigation of the food hub feasibility throughout the nation, as well as greater research on the largest barriers to Farm-to-Institution food distribution and access. More solutions to these barriers will have to be identified in order to increase the sustainability and decrease the energy use of our food system.

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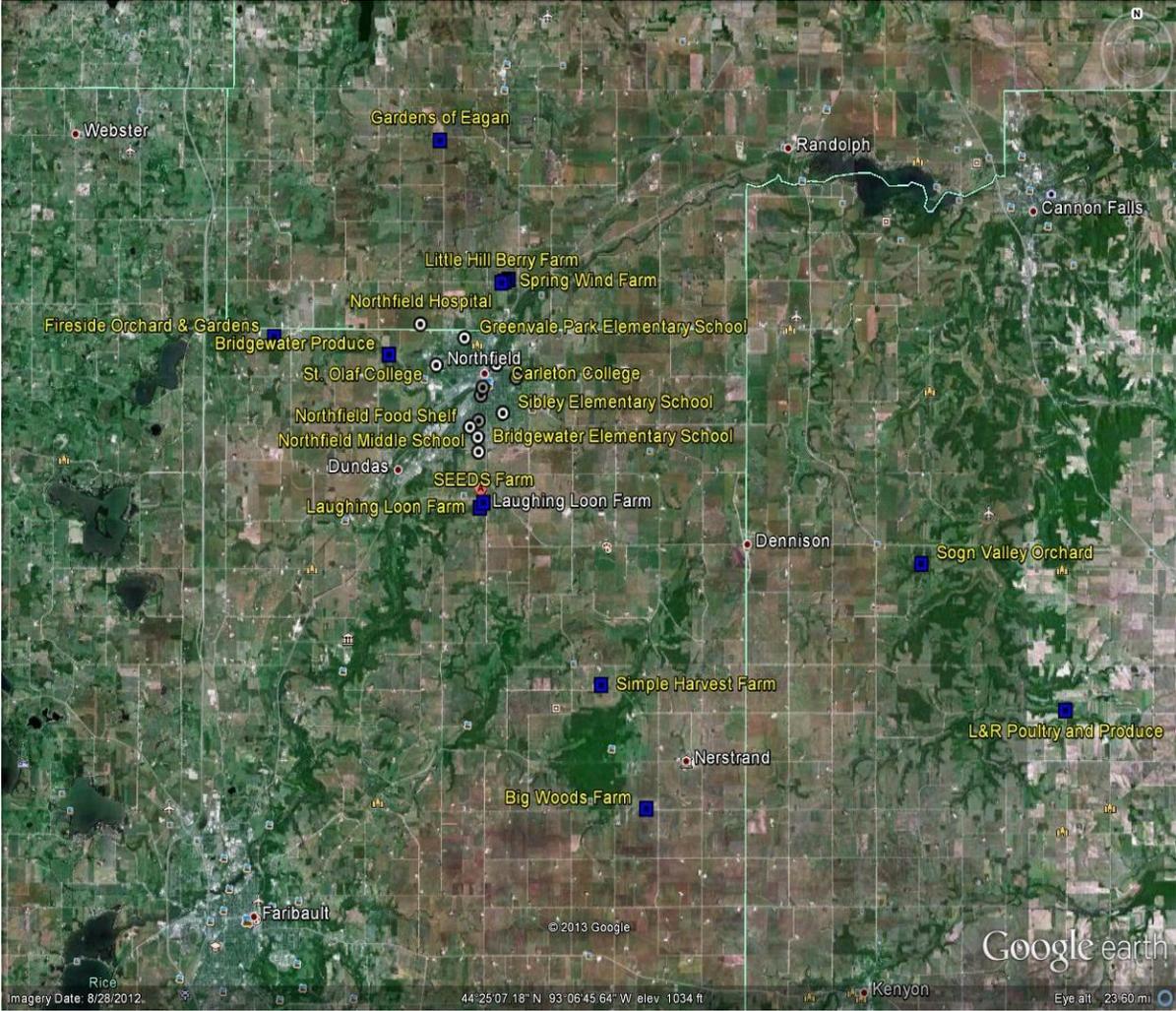
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VIII. Appendix

Appendix A – Methodology

Section 1.



Map 1. Northfield, MN with location of all interviewed farms (squares) and institutions (circles).

Section 2. Interviewees

Farmer Interviewees

Farmer Name	Farm	Acres of Produce in Production	Years Farming
Ben Doherty and Erin Johnson	Open Hands	10	7 years
Betsy Allister and Andrew Ehrmann	Spring Wind	3.5	3 years
Danya Burtness	Laughing Loon	4 to 5	8 (3 years on own)
David and Laurie Hougen-Eitzman	Big Woods	5 to 6	21 years
John Larson	Bridgewater Produce	20	10 years
John Zimmer	Sogn Orchard	21	6 years
Linda Halley	Gardens of Eagan	30	20 years
Monica Irwin	SEEDS	3 to 4	4 years
Rae Rusnak	L&R Poultry and Produce	5	11 years
Todd Harvey	Fireside Orchard	30	26 years
Aaron and Molly Wills *	Little Hill Berry	1.5	2 years
Kathy Zeman *	Simple Harvest	0	47 (10 years on own)

*Not currently in produce production, so not included in majority of results data.
Interviews used for perspectives and ideas surrounding food hub

Chart 3. *Farmer Interviewees.* The chart above lists the farmers we interviewed, along with each farms' name, total acres in production and the number of years each farmer had been farming.

Institution and Other Interviewees

Institutions		
Food Manager (& Head Chef, if present)	Name	Background
Peter Abrahamson	Bon Appetit (BA) St. Olaf	St. Olaf is a private liberal arts college with approx. 3100 students. BA is a national food service provider working for St. Olaf. The company, a subsidiary of the Compass Group, uses the slogan "Food Service for a Sustainable Future."
Katie Mckenna and Michael Delcambre	Bon Appetit (BA) Carleton	Carleton College is a private liberal arts college with approx. 2000 students. They also use BA as their food service provider.
Pam Hoyt	The Northfield School District	The Northfield School District consists of 5 schools with approx. 2,350 students total.
Liz Berry and Kathy (Head Chef)	The Northfield Hospital	The primary hospital in Northfield, the Northfield Hospital serves approx. 50 people per day
Joyce Lovestrand	Millstream Commons* with Three Links	Millstream Commons is an assisted living center run by 3 Links Retirement Center that serves approx. 50 people.
Eilleen Anderson	The Laura Baker School	The Laura Baker School provides instruction for students with developmental disabilities ages 5 to 22 and serves approx. 50 people.
Retailer		
Manager, Produce Manager, and Head Marketer	Name	Background
Pat Neily, Matt Malecha, and Stephanie Aman	Just Foods Co-op	A community-owned natural foods market and deli, Just Foods Co-op has 2,500 members and is the primary source for local food in Northfield.
Food Shelf		
Judy Bickel*	The Northfield Food Shelf	The Food Shelf provides food for low-income members of the Northfield community, serving approx. 1500 people

*The Food Shelf does not have any potential demand from a food hub, so is only cited in our Food Access assessment.

Chart 4. Institutional and Other Interviewees. The chart above lists the institutions, retailer and food shelf managers we interviewed, along with each institutions' name and background.

Section 3. Interview Questions

Farmer Interview Questions

Current Production

How long have you been a produce grower?

On how many acres of your farm do you currently grow produce? What is the potential acreage for growth?

At present do you sell any wholesale? If so, what crops?

If yes, can we have get your wholesale prices?

If no (or yes), how (else) do you sell your produce?

How many people do you estimate that your produce reaches?

How many total dollars and/or pounds of produce do you estimate that you grow each season?

Can you estimate how many pounds of seconds you have each season?

Are you able to sell seconds?

Would you be interested in selling seconds?

Interest in Food Hub

What is your level of interest in selling wholesale produce to an organization that aggregates and redistributes local food (i.e. a food hub)?

Assuming fair prices, what percentage of your produce would you be interested in selling wholesale to the food hub?

Would you be interested in increasing production for a food hub?

What top crops would you be most interested in selling wholesale to a food hub? Can you estimate how many pounds for each crop?

What would you need to sell to a food hub?

What about price?

-Conventional wholesale?

-Bump up? By what percent?

Infrastructure:

How do you currently deliver/sell your produce?

How much time do you currently spend marketing and distributing your produce?

Do you use a refrigerated delivery truck?

How full is it?

How many miles round trip would you be willing to travel to deliver your produce to the food hub?

Do you have washing facilities for your produce?

Do you have storage capacity (ie refrigeration/root cellar, etc.) for your produce?

Do you have storage space that is currently unused?

Do you have the ability to extend the growing season? (Hoop houses)

If no, would you consider expanding in this area to be part of a local food hub?

Practices:

Are you GAP certified? Would you be willing to apply for GAP certification if required by the food hub?

How do you deal with weeds?

How do you deal with insects?

Do you take any measures to maintain your soil quality? What are they?

How often do you till your land?

How many types of crops do you grow each year?

Do you use crop rotation?

Are you interested in selling other products to a food hub? If so, what?

Do you have any other thoughts, perspectives on how a food hub would impact the Northfield community, or needs you would like to share?

Institution Interview Questions

Current Purchases

Do you buy produce for foodservice, retail sales, both, or other?
Do you work with a food distributor?
How interested are you in buying local produce? and do you already? where from?
How many total pounds of produce do you buy each month?
Roughly what percentages of your current produce purchases are designated “local”? Do you have a local percentage goal?
What limits your local produce purchases?
Can you give us data on how much total \$ you spend on local produce?
Do you have a limit on \$ you’re able to spend on local produce (or total produce)? How much?

Interest in Food Hub

How interested would you be in buying from a local food aggregator (i.e. “food hub”) as a means of streamlining local purchases?
Would your contracts allow you to work with a food hub?
Do you think that your local food percentage would change with a food hub?
What would you need to buy from a food hub?
-What about price?
-Would you be able/willing to pay more than distributor wholesale prices for local produce?
-How much roughly? By what percent?
What crops would you be most interested in buying if a local source was available? Can you estimate number of pounds?

Logistics

Are you willing to buy seconds?
Do you need to receive processed, packaged or value-added produce?
What certifications are required for you to purchase produce (e.g. GAP, labor practices, organic, etc.)?
How interested would you be in pre-season planning to coordinate with farmers about crops?

Social Impacts:

How many people do you serve per day?
If don’t know: How many meals per day do you serve?
How many people at each meal?
How much overlap in customers?

How interested would you be in buying other local products (ie not produce)?
What other concerns, comments or questions do you have?

Appendix B – Results

Section 1. Supply and Demand

Grade 2 Produce		
Farm	Projected Quantity of Grade 2 Produce (lbs.)	Additional Indication of Interest
Farm 1	1,000s lbs.*	Especially interested in selling Grade 2 tomatoes, cucumbers, and zucchini.
Farm 2	11,000 lbs. (tomatoes/cucumbers)	Amount of Grade 2 produce depends on year, ranges from 30-60% of tomatoes and cucumbers; No current market for Grade 2.
Farm 3	10,000 lbs.	Nothing picked is wasted - the 10,000 lbs. are left in the field. Most interested in selling Grade 2 carrots.
Farm 4	1,500 lbs.	No waste left in fields, but about 1,500 lbs. thrown away last season. Currently feeds excess produce to animals.
Farm 5	--	“Tons of seconds left in the field,” but also some produce goes to Harvest for the Hungry and the Food Shelf.
Farm 6	--	Current wholesale customers willing to buy Grade 2, so only 150-200 lbs of produce unsold annually. No “waste,” everything “goes back to the Earth.”
Farm 7	4,000 lbs.	Able to make cider from some seconds, but also leaves many apples on the trees because sales end November 1st.
Farm 8	--	Some seconds used for personal consumption, not a lot of waste in fields. 600 lbs currently to Food Shelf.
Farm 9	--	Amount of seconds depends on presence of hail or not. Year without hail: 5-10% Grade 2, year with hail: 30-50%.
Farm 10	--	15-20% of crop is seconds, often don’t pick because primarily sell retail.
Total	More than 27,500 lbs.	

*Exact quantity not given.

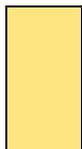
Table 6. Projected Quantity of Grade 2 Produce. Projected quantities of Grade 2 produce were gathered during farmer interviews and summed to find a total quantity for Northfield. Qualitative data about general interest was also recorded. 27,500 lbs. is the total Grade 2 quantity. However, the interest reported in the right hand column indicates that farmers have more Grade 2 produce they would like to sell, but are unsure of the exact quantities.

Crops					
Crop	# Farms Selling Wholesale	Growing Season	Current Amount Sold Wholesale*	Projected Amount for Food Hub*	Wholesale Price Range (\$/unit)**
Apples	2	Aug-Dec	126,000 lbs.	24,000 lbs.	depends on variety
Beans	1	June-Sept	1,000 lbs.	250-500 lbs.	\$2.00-\$3.50/lb.
Berries	1	July-Aug	112 lbs.	--	depends on type
Broccoli	3	June-Oct	980 lbs.	1294 lbs.	\$1.77-\$2.50/lb.
Cabbage	1	June-Oct	1,650 lbs.	1000-2000 lbs.	\$3.00-\$6.00/lb.
Carrots	3	July-Nov	270 lbs.	231 lb	\$1.00/lb.
Cauliflower	1	July-Nov	980 lbs.	500 lbs.	\$5.00-6.00/lb.
Chard	1	Sept-Nov	100 bunches	30-50 bunches	\$1.33/bunch
Cucumbers	3	July-Sept	400 lbs.	120 lbs.	\$1.00-\$1.40/lb.
Eggplant	3	Aug-Sept	200 lbs.	685-1350 lbs.	\$1.00-\$3.50/lb.
Garlic	2	Aug-Nov	550 lbs.	15 lbs.	--
Greens	4	June-Sept	225 lbs.	67.5 lbs.	\$5.00/lb.
Herbs	2	July-Sept	--	--	variable by type basil: \$7.00/lb.
Kale	3		160 lbs.	48-80 lbs.	\$4.00-\$6.00/lb.
Melons	3	Aug-Sept	720 lbs.	72 count	variable by type
Onions	4	Aug-Dec	4,200-5,700 lbs.	500-1000 lbs.	\$0.60-\$1.00/lb.
Peppers	3	July-Sept	375 lbs.	262 lbs.	\$1.50-\$4.00/ lb.
Potatoes	3	July-Dec	2,000-2,100 lbs.	80-160 lbs.	\$1.00-\$3.00/ lb.
Radishes	1	May-Oct	357 lbs.	92-167 lbs.	\$2.00-\$3.00/ lb.
Root Crops	2	Sept-Dec	1,400 lbs.	60 lbs.	\$0.60-\$0.65/ lb.
Sweet Corn	3	July-Sept	160 dozen.	0	3-5/dozen
Tomatoes	5	July-Sept	11,800 lbs.	3000 lbs.	variable by type
Winter Squash	4	Sept-Dec	16,700 lbs.	900-1000 lbs.	\$0.70-\$1.00 /lb.

*These quantities were roughly estimated during our interviews. Some farmers did not know or share how much of each crop they produce; therefore these numbers do not indicate the total crop production quantity.

** We compiled all farmer wholesale prices for each crop to provide the range above.

Table 7. Crops: Number of Farms Currently Selling Wholesale, Growing Season, Estimated Amount Sold Wholesale, Projected Amount for Food Hub, and Wholesale Price Range. The quantities were calculated from data gathered during farmer interviews. Crop growing season was taken from the Minnesota Grown seasonality chart (MN Pollution Control Agency). Wholesale prices were collected during farmer interviews.

 In Season between Sept. and June

Institutional Crop Preferences			
Crop	# Institutions Expressing Interest	Total Meals Served by All Interested Institutions (per day)*	# of Farms Currently Selling Wholesale
Apples	2	8,700	2
Berries	2	2,700	1
Black Beans	2	12,900	0
Carrots	4	13,350	3
Celery	1	150	0
Chives	1	150	0
Cucumbers	1	150	3
Garlic	1	8,400	2
Green Beans	3	13,050	1
Greens	3	4,950	4
Leeks	1	150	0
Melon	2	2,550	3
Onions	4	13,350	4
Parsnips	1	4,500	2
Potatoes	2	450	3
Radishes	1	150	1
Rutabagas	1	4,500	2
Sweet Corn	2	6,900	3
Tomatoes	5	13,500	5
Turnips	1	4,500	2
Winter Squash	2	8,700	4

*The meals of each institution expressing interest were added together to find the total meals served among all interested institutions.

Table 8. Institutional Crop Preferences. The crops listed above were compiled from institutional interviews. The “Total Meals Served by All Interested Institutions” column roughly indicates the scale of the demand for each crop. The number of farms currently selling wholesale give a sense of the crop’s supply.

Section 2. Food Access

Food Shelf Local Food Access	
Month (2012)	Food Shelf Local (lbs.)
January	n/a
February	n/a
March	n/a
April	n/a
May	0
June	612 lbs.
July	3,391 lbs.
August	5,289 lbs.
September	3,137 lbs.
October	1,190 lbs.
November	665 lbs.
December	0
Total lbs./year	14,284 lbs.

Table 9. *Food Shelf Local Food Access.* Quantities were taken from their 2012 food records. They only received produce between the months of June and November. Data on local produce was not available for the months of January through April.

Section 3. Farming Practices

Table 11. Farming Practices Part. 1									
	Practices	Farm 1	Farm 2*	Farm 3	Farm 4	Farm 5	Farm 6	Farm 7	
WEEDS	Bed preparation		Uses organic practices	X					
	Cultivation	X					X	X	X
	Drip-line irrigation								
	Flame Weeding	X				X			X
	Hand Weeding	X				X	X	X	
	Herbicide								
	Mowing								X
INSECTS	Flaming							X	
	Hand picking	X			X		X	X	
	Intercropping					X		X	
	Keeping soil & plants healthy						X		
	Row Cover	X			X		X	X	
	Synthetic Insecticide Sprays								X (IPM)
	Till under destroyed crops				X				
Vacuum						X			
SOIL QUALITY	Add organic fertilizer and needed minerals	X	X			X	X	X	
	Animal manure	X		X	X		X		
	Compost		X					X	
	Foliar feed							X	
	Mulching			X					
	Soil tests	X	X			X	X	X	
	Synthetic Fertilizer								
Till in cover crops									
MULTIPLE USES	Alternative Substance Application				X			X	
	Cover crop	X	X	X		X	X		
	OMRI Sprays	X	X	X	X	X	X	X	
CROP ROTATION	years/cycle	yes	4 yr.	3-4 yr.	3-4 yr.	varies	3 yr.	yes	
TILLAGE	# of times/yr	2 to 4	2	3	3	1 to 4	1 to 2	1 to 2	
DIVERSITY	# of species	40+	21	58	4	8+	50	5	
SUSTAINABLE	More/Less/Not	MORE	MORE	MORE	MORE	MORE	MORE	LESS	
QUANTITY	None to Large	Large	Large	Small	None	Large	Medium	None	

*Did not get specifics on weed and insect management practices

Table 11. Farming Practice Part 2.

	Practices	Farm 8	Farm 9	Farm 10	Typical Conventional Produce Farm**
WEEDS	Bed preparation				
	Cultivation	X			
	Drip-line irrigation			X	
	Flame Weeding				
	Hand Weeding	X			
	Herbicide		X	X	X
	Mowing		X		
INSECTS	Flaming	X			
	Hand picking	X			
	Intercropping			X	
	Keeping soil & plants healthy	X			
	Row Cover	X			
	Synthetic Insecticide Sprays		X (not IPM)	X (IPM)	X
	Till under destroyed crops				
Vacuum					
SOIL QUALITY	Add organic fertilizer and needed minerals	X		X	
	Animal manure	X			
	Compost			X	
	Foliar feed				
	Mulching				
	Soil tests	X		X	
	Synthetic Fertilizer		X	X	X
Till in cover crops			X		
MULTIPLE USES	Alternative Substance Application				
	Cover crop	X		X	
	OMRI Sprays			X	
CROP ROTATION	years/cycle	unsure	N/A	2-3 yr.	none
TILLAGE	# of times/yr	2	0	2	unsure
DIVERSITY	# of species	50	1	35	1
SUSTAINABLE	More/Less/Not	MORE	LESS	LESS	NOT
QUANTITY	None to Large	Small	Medium	None	75% to 100% of institutional produce

**Sources: USDA Fruit and Vegetable Agricultural Practices (2001), U.S. Census of Agriculture (2007)

Table 11. Farming Practices. This chart depicts the farming practices used by farmers in the Northfield region, as well as the practices used by the average conventional produce grower. Data was gathered during interviews for Northfield farmers, and from statistics provided by the USDA and U.S. Census of Agriculture for the average conventional produce grower. Data was then evaluated using our “sustainable farming” criteria. Red indicates unsustainable practices, while green indicates sustainable. Farm size is based on the amount they projected selling to a food hub (see key).

Key	
Practices	
	More Sustainable
	Less Sustainable
Quantity (\$)	
None	Only Excess
<10,000	Small
10,000-20,000	Medium
>20,000	Large

Appendix C – Discussion

Section 1. Prices

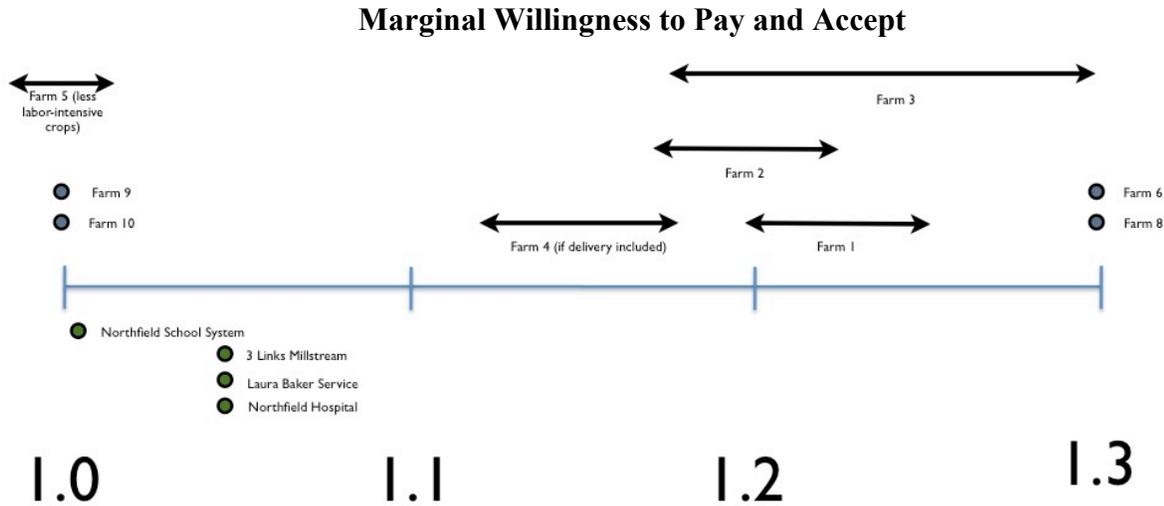


Figure 3. *Marginal Willingness to Pay and Accept.* This chart shows the marginal farmer willingness to accept and institutional willingness to pay. All values are based on conventional distributor prices (which therefore have a value of 1) and range to organic wholesale prices, which are typically 30% higher than conventional prices (and thus have a value of 1.3). Farmers’ price range is represented above the number line, by points when they gave specific pricing needs, and by arrows when they gave a range of prices. Below the number line are the institutions with influential price restrictions. The other institutions we interviewed are not represented on this chart because they have extremely flexible spending limits, or were not able to give us a solid description of their price limitations.

Section 2. Food Access

Northfield Institutional Food Access			
Institution	# of People Served	Average Income of Population Served	% Below Poverty Line
Northfield Food Shelf	1,500	Less than \$44,000/family & Usually \$22,000/family	Majority
Northfield Hospital	50	\$61,055/family	10.8% people
3 Links	50	\$61,055/family	10.8% people
Laura Baker	50	\$61,055/family	10.8% people
Northfield School District	2,300-2,400	\$90,409/family	4.7% of families
BA Carleton College	1,400-1,500	data unavailable	~4.5% students*
BA St. Olaf	2,200	data unavailable	data unavailable

*Estimated

Table 10. *Northfield Institutional Food Access.* This table shows the number of people served by each institution, as well as the average income of the population each institution serves and the percent of people they serve who are below the poverty line. Green indicates institutions that serve a small population, while pink indicates institutions serving a large population (see key). Yellow differentiates the Food Shelf.

	Small
	Large