Value Chain Development Options for North Dakota's Fruit and Vegetable Agricultural Industry

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Common Enterprise Development Corporation (CEDC) prepared this report for FARRMS, a recognized leader in local foods education and advocacy. The work was funded by USDA Rural Development Rural Business Opportunity Grant to assess the economic potential for fruit and vegetable processing facilities in rural portions of North Dakota. This work required sorting through the complexities of local food economies and the nuances of the rural characteristics of North Dakota communities, an undertaking that would have not been possible without the ongoing conversations and conversations between CEDC, FARRMS, producers, and other supporting organizations. During one such discussion, we gratefully received the input Ken Meter of the Crossroads Resource Center. His advice and suggestions directed us to a similar study he conducted in South Carolina. This led us to the concept of a food production node and helped us realized the intricate work that is required to scale up local food production. One quote of Meter's seems to sum it up,

> *"Transitioning from a situation in which little food is produced for local markets to one in which production is ample requires a difficult balancing act. At each step of the way, supply and demand must be balanced."*[1]

Meter's call for balance also applies to those of us who are involved in facilitating the development process. It is necessary to balance scope and perspective between the larger demand and smaller producers. The authors are thankful to the producers who completed the 2014 Local Food Producer Survey and helped us to understand the current trends in local food production. We owe special thanks to those who engaged in further discussions, Janel Anderson, Annie Carlson, Keith Knudson, Joanna Larson, Kimberly and Doug Lemieux, Apryl Lunde, Alyce Ann and Roger Lunde, Holly Mawby, Lindsay Ostlie, Julia and Mirek Petrovic, Kari Stroh, and Nicholas Traumbauer, each of whom helped us to consider the variety of producer needs and values that are behind-the-scenes of North Dakota's fruit and vegetable industry. Many thanks to all of you, it is our hope that many will find data, tools, and perspectives here useful in their endeavors to develop a thriving North Dakota local food economy.

[1] Meter, Ken. "*Food Production Nodes" Build a Web of Support Around a Food Hub.* Crossroads Resource Center. http://www.crcworks.org/foodwebs.pdf. 2013.

Introduction

The original goal of this project was to determine the feasibility of light processing facilities in rural portions of North Dakota. In collecting data on production and potential market, it became clear the development of light processing facilities was a necessary step in moving local foods from a seasonal industry to an income-generating network of enterprises that contribute to a thriving and sustainable local North Dakota economy. However, the feasibility of any post-harvest handling facilities for fruits and vegetables depends upon specific variables that cannot be generalized. The product needs of specific market partners, the preferred product mix, the proximity to complimentary markets, the available supply, and the off-season plans for any facility will influence the potential for feasibility. Light processing facilities are the missing link in the fruit and vegetable industry supply chain. Once this infrastructure is in place, producers will be able to meet processing requirements, maintain food safety standards, and have the means to build strategic partnerships to reach food service, retail, and other institutional buyers. This step towards development will help strengthen the supply chain in such a way that it becomes a value chain. Anthony Flaccavento of Appalachian Sustainable Development defines a value chain as,

> *"A supply chain that is designed to link supply with markets efficiently, but to do so while promoting certain core values, including equity and fair pay, ecological sustainability, community capacity, and health and food access*."[2]

Flaccavento prepared a toolkit for value chain development for the Central Appalachian Network, which offers a flexible framework for this report. The list of adapted questions can be found in the Appendix. This process of determining the scale for development allows variables such as production capacity and specific market strategies to inform the need for infrastructure. In this report, we offer preliminary findings and framework that can be utilized by producers, economic developers, technical assistance providers, food entrepreneurs, and supporting organizations to expand and create infrastructure that helps sustain viable food economies. In the section for market analysis, we present the methods and results for determining the market potential for locally grown fruits and vegetables for each county in North Dakota. We go on to examine current producer trends in accessing these markets. In the market expansion section, we discuss the role of market partners in building value chains and also consider the needs and potential of current producers. In the case studies, we offer descriptions of how two groups in the North Central region of North Dakota are using collaborative strategies to aggregate supply, building market partnerships, and developing existing resources into needed

[2] Flaccavento, Anthony. *Healthy Food Systems: A Toolkit for Building Value Chains.* Central Appalachian Network. http://www.ams.usda.gov/AMSv1.0/getfile?dDocName=STELPRDC5091499. 2009.

infrastructure. Finally, we provide an overview and cost projections for value chain infrastructure options that may be suitable for development in North Dakota.

Market Analysis

We quantified the potential market for locally produced fruits and vegetables in North Dakota by utilizing demographic data[3] to generate a per capita local food value perception score for each county in North Dakota. The four demographic indicators of household income, education level, age, and household size influence national per capita consumer demand for fresh produce. According to the Food Institute's 2011 Demographics of Consumer Spending Report, the national average of annual household expenditures on fresh produce was $429 in 2009. Households earning over $70,000 annually spent $520 per year on fresh produce while households earning over $100,000 annually spent $712 per year. Economist Roberta Cook from University of California- Davis explains,

> *"The economic power of higher income households has driven growth in chains such as Whole Foods, Trader Joe's, and Costco, and has likely contributed to a greater emphasis on quality in fresh produce departments among conventional retail chains."*[4]

Each score was then used with data for at-home and away-from-home consumption patterns[5] to estimate the fruit and vegetable spending for both at-home[6] and away-from-home[7] consumption. The potential market was then generated for locally produced fruits and vegetables with the assumptions that up to 10% of all fruits and vegetables consumed could be sourced locally.

The results listed here include spending figures that have been adjusted to reflect retail prices.

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[3] Data collected regarding population, median household income, and education was accessed from http://www.ers.usda.gov/data-products/county-level-data-sets.aspx and http://quickfacts.census.gov/qfd/index.html.

[4] Cook, Robera. *Eye on Economics: Much More than Dollars and Cents: Tracking Consumption Trends and Buyer Preferences.* Blueprints, The Produce Professionals' Quarterly Journal. http://ucce.ucdavis.edu/files/datastore/234-2159.pdf. 2011.

[5] Data for at-home and away-from-home food spending was sourced from USDA Economic Research Service Per Capita Food Expenditures for 2013 http://www.ers.usda.gov/data-products/food-expenditures.aspx. Away-from-home food spending was adjusted to reflect retail prices.

[6] At-home fruit and vegetable consumption patterns were based on calculations generated by Roberta Cooke in the Demographics of Consumer Food Spending report of 2011. It was adjusted at the county level based on demographic data.

[7] Away-from-home fresh produce spending was calculated using data from USDA Economic Research Service and 2007-10 National Health and Nutrition National Health Survey http://wwwn.cdc.gov/nchs/nhanes/search/nhanes09_10.aspx.

County	Total Food Spending	At-Home Produce Spending	Local Produce Market Potential for At-Home	Away-from-Home Produce Spending	Local Produce Market Potential Away-from-Home	Total Local Produce Market Potential
Adams	$8,303,627	$481,776	$48,178	$240,236	$24,024	$72,201
Barnes	$39,371,859	$2,215,039	$221,504	$1,183,754	$118,375	$339,879
Benson	$24,196,628	$884,555	$88,456	$617,685	$61,769	$150,224
Billings	$3,075,157	$162,162	$16,216	$94,202	$9,420	$25,636
Bottineau	$23,700,522	$1,324,992	$132,499	$685,690	$68,569	$201,068
Bowman	$11,308,414	$615,718	$61,572	$339,999	$34,000	$95,572
Burke	$8,113,629	$423,363	$42,336	$225,533	$22,553	$64,890
Burleigh	$311,234,719	$16,376,346	$1,637,635	$9,710,701	$971,070	$2,608,705
Cass	$572,911,562	$30,493,869	$3,049,387	$17,550,164	$1,755,016	$4,804,403
Cavalier	$13,708,022	$767,515	$76,752	$396,593	$39,659	$116,411
Dickey	$18,465,015	$953,049	$95,305	$534,219	$53,422	$148,727
Divide	$8,141,777	$479,536	$47,954	$249,409	$24,941	$72,895
Dunn	$14,643,939	$641,578	$64,158	$431,977	$43,198	$107,356
Eddy	$8,458,440	$454,671	$45,467	$230,320	$23,032	$68,499
Emmons	$12,265,442	$630,887	$63,089	$313,109	$31,311	$94,400
Foster	$11,843,224	$680,437	$68,044	$342,641	$34,264	$102,308
Golden Valley	$6,414,200	$304,058	$30,406	$171,017	$17,102	$47,508
Grand Forks	$243,405,345	$12,253,784	$1,225,378	$7,180,146	$718,015	$1,943,393
Grant	$8,363,441	$429,729	$42,973	$213,500	$21,350	$64,323
Griggs	$8,078,444	$453,487	$45,349	$210,807	$21,081	$66,429
Hettinger	$9,359,173	$442,376	$44,238	$249,537	$24,954	$69,191
Kidder	$8,542,884	$481,801	$48,180	$237,465	$23,747	$71,927
LaMoure	$14,658,013	$889,017	$88,902	$440,708	$44,071	$132,972
Logan	$6,846,974	$326,400	$32,640	$178,672	$17,867	$50,507
McHenry	$20,836,474	$1,015,512	$101,551	$543,728	$54,373	$155,924
McIntosh	$9,689,911	$516,241	$51,624	$252,858	$25,286	$76,910
McKenzie	$32,771,179	$1,258,085	$125,809	$1,022,479	$102,248	$228,056
McLean	$33,485,432	$1,690,509	$169,051	$930,790	$93,079	$262,130
Mercer	$30,230,832	$1,691,118	$169,112	$926,070	$92,607	$261,719
Morton	$102,000,910	$5,289,261	$528,926	$3,124,623	$312,462	$841,388
Mountrail	$32,989,325	$1,369,265	$136,927	$973,143	$97,314	$234,241
Nelson	$10,889,714	$647,447	$64,745	$302,700	$30,270	$95,015
Oliver	$6,593,643	$329,498	$32,950	$190,764	$19,076	$52,026
Pembina	$25,266,248	$1,370,604	$137,060	$687,990	$68,799	$205,859
Pierce	$15,660,781	$765,636	$76,564	$399,784	$39,978	$116,542
Ramsey	$40,652,588	$2,153,168	$215,317	$1,199,199	$119,920	$335,237
Ransom	$19,407,969	$920,643	$92,064	$517,461	$51,746	$143,810
Renville	$9,176,212	$446,589	$44,659	$260,275	$26,028	$70,686
Richland	$57,488,543	$2,950,902	$295,090	$1,695,839	$169,584	$464,674

Rolette	$51,306,563	$1,915,485	$191,549	$1,367,951	$136,795	$328,344
Sargent	$13,686,911	$731,951	$73,195	$380,453	$38,045	$111,240
Sheridan	$4,588,106	$237,065	$23,707	$117,124	$11,712	$35,419
Sioux	$15,586,893	$440,463	$44,046	$406,740	$40,674	$84,720
Slope	$2,677,568	$134,603	$13,460	$80,504	$8,050	$21,511
Stark	$99,263,528	$4,926,164	$492,616	$3,097,079	$309,708	$802,324
Steel	$6,896,233	$404,719	$40,472	$207,342	$20,734	$61,206
Stutsman	$74,310,425	$3,958,778	$395,878	$2,192,062	$219,206	$615,084
Towner	$8,152,332	$461,329	$46,133	$240,483	$24,048	$70,181
Traill	$11,632,115	$639,364	$63,936	$349,731	$34,973	$98,910
Walsh	$39,069,269	$2,037,784	$203,778	$1,063,840	$106,384	$310,162
Ward	$239,221,865	$11,879,139	$1,187,914	$7,463,859	$746,386	$1,934,300
Wells	$14,798,752	$802,676	$80,268	$402,964	$40,296	$120,564
Williams	$104,129,594	$4,823,625	$482,362	$3,189,832	$318,983	$801,346
North Dakota	**$2,545,248,167**	**$128,973,771**	**$12,897,377**	**$72,193,813**	**$7,219,381**	**$20,116,758**

Table 1: Market Potential per North Dakota County

The total estimated market for locally produced fruits and vegetables throughout the state totals more than $20 million each year. The unmet demand for local food throughout North Dakota expands from all market segments: direct-to-consumer, direct-to-retail, direct-to-food service, and wholesale. Production data sourced from the 2014 Local Food Producer Survey by FARRMS indicates that producers tend to rely on direct-to-consumer sales for revenue. In fact, 70% of producers utilize farmers markets, community supported agriculture, or on-farm sales as the primary outlet for their products. Only 28% of producers sell any of their produce to hotels, restaurants, schools, or other markets. However, 86% of the growers surveyed have an interest in scaling-up their operations to meet the demand for locally produced fruits and vegetables.

Expanding Market Access

There are two options for rural producers to access new markets in ways that align with their production abilities. They can expand direct-to-consumer sales to reach urban markets, or they can expand local market strategy to include more institutional buyers. It is important to note that expanding to additional direct-to-consumer markets is not always worth the time. Producer comments in the survey data describe the, *"Expense of going to multiple markets (price to have stand, gas, time, etc.)"* Another cites challenges such as, *"Time and money (gas) spent on commute from farm to market. The produce outlets we use now not capable support larger produce quantity. People want cheap produce (at least in farmers' market they do), to keep prices affordable we cannot hire help or invest in equipment (like refrigerator truck)."*

Some producers suggested the need for strategies to overcome the barriers to expansion by

increasing sales to institutional buyers. One producer suggested exploring ways to, *"Increase number of local food outlets such as stores and restaurants by creating low bureaucracy cooperation scheme."* One producer offered an idea of *"An online purchasing food hub for farmers to show what is available for institutions to purchase."* Another detailed the need for collaborative marketing, *"I think the best support we can have is for more regional support that will link our vendors to a network of customers whether it is families, schools, hospitals, or restaurants. Once it is in place we can work on unified distribution to these customers."*

The unmet demand for locally produced fruits and vegetables is so extensive that it is imperative to consider potential production prior to trying to consider the scale of potential value chain infrastructure. By entering additional market segments such as direct-to-retail and direct-to-food service, producers have the opportunities to engage in buying agreements and scale up production with greater predictability.

Each of the fruit and vegetable producers within the state face a different set of circumstances influencing their decisions to scale up production to access new markets. Producers know that as they expand the reach of their markets, their operations will increase in complexity. At the same time, engaging in more traditional supply chains reduces the percentage of the consumer dollar that reaches the producer.

Potential strategies for meeting demand include developing a detailed and specific plan regarding potential connections among market partners and producers to form value chain relationships. Philip Ackerman-Leist explains,

> "*Strategic collaborations and business relationships between farms, processors, distributors, and retailers that operate on the basis of explicitly conveyed values—shared values that create a collaborative business opportunity and, ideally, customer allegiance."*[8]

The potential exists to build partnerships among grocers, restaurants, schools[9], and other food-service institutions. It is true that not all buyers will be interested in purchasing local products from local producers. Time and commitment are required on the part of the producers and the buyers to engage in preseason planning, discuss specific needs and expectations, make purchasing agreements, and convey the local value behind the product.

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[8] Ackerman-Leist, Philip. *Rebuilding the Foodshed: How to Create Local, Sustainable, and Secure Food Systems.* Chelsea Green Publishing. White River Junction, Vermont. 2013.

[9] For a listing of the schools interested visit the North Dakota Farm-to-School Directory at http://ndfarmtoschool.org/directory-of-farmers-and-food-service/schools/

Ackermain-Leist explains,

> *"Once 'local' enters the restaurant and grocery sector, those businesses become responsible for heightening the value of the product to their customers. In that scenario, value is immediately tied to values. The diner and the shopper willing to pay prices considered fair to the farmer justifiably expect to connect dollar value with appropriate farm practices. Such consumers are all the more intrigued when they feel the entire supply chain that got the food to their plate of their grocery basket is well grounded in its ethics and commitment to the local and regional community."*[10]

For growers, identifying potential customers as their partner market is a critical strategic effort that happens perpetually as their businesses evolve and grow. Below are some characteristics of potential customers and market partners.

Potential Customer	Market Partner
Willing to purchase locally grown food.	Makes effort to connect and source from local producers.
Will purchase local food only if prices are competitive with conventional suppliers.	Will purchase local food understanding local produced product is often higher quality and are willing to pay for that quality.
Will purchase local food if it fits in their current menu and food preparation processes.	Will explore new ways to incorporate local foods into their menu.
Does not market the story of their business/organization.	Sees the stories of local producers as a valuable addition to their own story.

Table 2: Characteristics of Potential Customers and Market Partners

Building connections with market partners can help inform the process of expanding production. Building the supply for a larger market can be a gradual process and increasing production takes careful planning and consideration. Rebecca Thistlethwaite, author of *Farms with a Future: Creating and Growing a Sustainable Farm Business* insists local food producers utilize holistic management practices in decision-making[11]. Producers who take the Farm Beginnings course offered through FARRMS use Thistlethwaite's book as a text and participate in workshops on holistic management strategies. The producers learn to set goals in three areas: quality of life, form of production, and future resource base and test all decision making against these goals.

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[10] Ackerman-Leist, 2013.

[11] Thistlewaite, Rebecca. *Farms with a Future: Creating and Growing a Sustainable Farm Business.* Chelsea Green Publishing. White River Junction, Vermont. 2012.

Producers know not to plant too much without identified market or committed buyers. The commitment that comes from market partners can guide the process by identifying core products for expansion and building the potential for revenue to support expansion. Having a defined market and a core product makes the process easier for determining the potential and the parameters for post harvest handling facilities including wash and pack, processing, cold storage, and commercial kitchen space.

Case Studies

The producer groups featured in these two case studies are in the process of exploring the potential of post-harvest handling, aggregation, and distribution options. In working with these producers, we applied concepts from a study by the Crossroads Resource Center entitled, *Making Small Farms into Big Business: A Plan for Infrastructure Investments to Connect Small Farms in South Carolina to Local Markets.* In this study, Ken Meter and Megan Phillips Goldenberg demonstrated how developments among small clusters of producers can lead to an interconnected and sustainable local food economy. These small clusters, called food production nodes, are imperative to the move from direct-to-consumer markets to strategic partners within supply chain relationships.

Farmers and food buyers often create food production nodes with producers who are in close proximity to one another in order to work collaboratively and utilize common food production infrastructure. The core infrastructure needed for successful food production node development include: season extension, training programs, washing, sorting, and packing facilities, food storage, local distribution capacity, and small retail and direct-to-consumer markets to meet local consumer demand.[12]

Emerging Food Hub— Anamoose, ND

Near the small town of Anamoose, Mirek and Julia Petrovic grow a variety of fruits and vegetables at Slavic Heritage Farm. To date, they have sold their products at farmers markets throughout McHenry County, as well as larger markets in Harvey, Rugby, and Devils Lake. This year though, they are working on something big when it comes to local foods—a food hub. They envision their food hub as a mission-based enterprise that aggregates products from area farmers and offers distribution services to retailers. In addition, the hub will help build relationships between customers and producers and serve as a point for community engagement.

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[12] Meter, Ken and Megan Philips Goldenberg. 2013. *Making Small Farms into Big Business: A Plan for Infrastructure Investments to Connect Small Farms in South Carolina to Local Markets.* Crossroads Resource Center. www.crcworks.org.

Their situation is unique, as they secured the physical location of the hub prior to fitting together the pieces regarding purchasing agreements or strategic partners. The building site was an opportunity in itself for propelling the idea into reality. The building is an old post-office that served as retail space in Anamoose, but then stood vacant. When the town considered demolishing the structure, the Petrovics purchased the building from town of Anamoose for an affordable price and received $15,000 in grants for roof repairs.

With a little renovation and construction, they can convert the basement into processing and storage facilities, rent apartments from the upper level rooms to help cash flow the food hub business, and eventually include a small store and bakery for those living in and visiting Anamoose. The inclusion of the community is a central component to their success. So much of the hubs success will come from garnering local support through relationship building, utilizing farmers markets as a marketing tool, and delivering and selling products to larger market areas.

They anticipate sourcing product from several area farms, including their own to supply retail buyers from surrounding towns and are working to seek out urban retailers such as the up-and-coming BisMan Community Food Co-op in Bismarck.

The Petrovics intend to start manageable with local supermarkets, using preseason planning to gain a sense of the products mix, scale, quality, and duration expected by these buyers. Buy starting small, they expect they can remain flexible to changes in the market and maintain stable growth as they expand the enterprise.

While the site for the hub is already secured, one of the challenges in planning and development remains prioritizing equipment and space for washing, packing, and processing. One priority central to the Pertovics' operation is minimizing waste. While they are working to convert the basement space to processing and aggregation space, they also envision a renovating a large room upstairs into commercial kitchen to utilize excess product. In addition to the basic requirements for wash-pack facilities, their equipment list includes a commercial dehydrator and chopper, with intentions to scale up as the business grows.

Multi-Farm Collaboration— Rolette, ND

Four producers in the town of Rolette have been working closely together over the past few years. They partner to purchase seeds, collaborate at the farmers markets, attend trainings and conferences, and make production plans together. This group consists of Janel Anderson, Kimberly and Doug Lemieux, Alyce Ann, Roger, and their daughter-in-law, Apryl Lunde. Together they grow a variety of fruits and vegetables on nearly 15 acres of field and several high tunnels and greenhouses.

They grow asparagus, beans, beets, broccoli, cabbage, carrots, celery, garlic, melons, onions, peppers, pumpkin, strawberries, squash, sweet corn, squash, and tomatoes. They have been selling at farmers markets in Rolette, Rolla, and Belcourt, and have even considered selling as far away as Devils Lake.

The group continues to look toward the future. Apryl considers the amount of time she will have to dedicate to marketing and sales as her young children grow and begin school. She also is aware of the likelihood that she will be the successor of her in-laws farm. Currently, Alyce Ann and Roger have juneberries, plums, and chokecherries in the ground, which can one day serve as a U-pick opportunity. They continue to grow fruits and vegetables in their high tunnel and ¾ acre garden. This year they tilled an additional two acres to expand their operation. Kimberly and Doug are building a greenhouse and considering a high tunnel to extend their production capacity. Doug has a vision for flash-freezing and marketing a "North Dakota Vegetable Blend." Janel envisions dedicating part of her field to a pumpkin patch for agritourism and become a partner for agricultural education with local schools.

In the mean time, the group is asking the question, "What would it take to start selling our product to school and restaurants?" Last year, Janel went to area schools to gauge their interest in purchasing fruits and vegetables from a local producer. Some schools expressed no interest as they relied heavily on prepared product in their menu plan. Others took advantage of the opportunity to access fresh, local produce and purchased melons, potatoes, peppers, squash, and tomatoes. Soon the Ojibwa School on the Turtle Mountain Indian Reservation approached them about buying greens on a regular basis. Other interest has come from area schools in Dunseith and Wolford. The Wolford students have even visited Janel's farm for educational tours.

These producers see the addition of a wash and pack facility as an essential to their expansion and are considering the potential for a commercial kitchen with light processing capabilities. Their first step in the process is to find identify market partners, establish a core product mix, and discuss buyer needs, expectations, and interest in purchasing agreements. This kind of preseason planning will allow these producers to expand production with greater certainty.

They see school buyers as potential partners, especially Dunseith that feeds students throughout the summer months. They intend to sell their best quality to the schools and request fair and competitive prices. In addition, they are considering the potential for food service partners such as country clubs, bar and grills that offer Friday night steak night, and convenience stops that serve sandwiches.

Options for Infrastructure Development

These case studies are just two examples of the potential that exists for infrastructure development in North Dakota's fruit and vegetable industry. The following information includes explanations, equipment lists, and projections to be used and adapted to suit potential development needs throughout the state. The following options for light processing offer details to the It is recommended any producer exploring facility and value adding investments contact both their local health district and the State Health Department.[13]

The regulatory factors to consider when planning for produce processing or aggregation are largely aimed at the producers. Good Agricultural Practices Certification is required by a large majority of commercial buyers. A new model that is just now emerging is Group or Global GAP. In the Group GAP model, producers attain benefits of scale such as in-house skilled technical support, locally appropriate solutions, and buffer between farmers and external food safety interests.

In North Dakota farmers of produce can market their uncut/unprocessed produce to anyone including restaurants and retail food stores. However, any cutting, shredding, slicing, or chopping requires those processing methods be done in a licensed and inspected facility. If the farmer is going to do the light processing in a commercial kitchen, that kitchen will need to be licensed and inspected. The State Health Department or local health district would want to review and approve those processing methods, as processed produce requires refrigeration and monitoring to prevent contamination.

The State Health Department issues a small food processors license that would be required and issued to whomever is responsible for the cutting, processing, bagging, etc. An inspector would inspect the commercial kitchen to ensure it meets health department facility requirements. They would also inspect for proper cleaning of equipment, handling of food products, labeling, and storage after processing. Inspections are done once per year. There are no classes or certifications required for the processor. The cost for a small food processor annual license is $60 per year. The State Health Department is regulatory authority regarding small food processors in most counties. There are only a couple of local health units that deal with small food processors: First District Health of Minot and The City of Bismarck. Most defer back to the State Health Department.

Wash-Pack Facilities

Wash-pack facilities are a dedicated space for removing the dust, dirt, and debris from harvested produce. The development of efficient models for wash-pack facilities depends

[13] Contact information for local health districts within North Dakota can be found here: http://www.ndhealth.gov/localhd/

on market expectations, operational scale, and product mix. Three models for wash-pack facilities are presented here: on-farm wash station, wash-pack shed, and wash-pack operation.

Washing requirements vary greatly among fruits and vegetables. Products such as leafy greens require thorough washing in cool water and subsequent drying. Other products such as tomatoes, celery, and apples must be washed in slightly warmer water. Many other products such as carrots, beets, potatoes, melons, and winter squash are not typically washed in water, but instead brushed clean.

Wash-pack facilities may also contain cold storage capacity. Storage can be a successful strategy for seasonal extension and off-season revenue. Some products such as apples, beets, cabbage, carrots, garlic, onions, potatoes, and squash can be stored and remain saleable for six months. However, proper storage temperature and humidity varies by crop and should be kept constant[14].

On Farm Wash Station

On farm wash stations are intended for simple and effective method of hand-washing fresh vegetables using materials commonly available from hardware store at modest cost. It is a good option for producers with one to three acres of production.

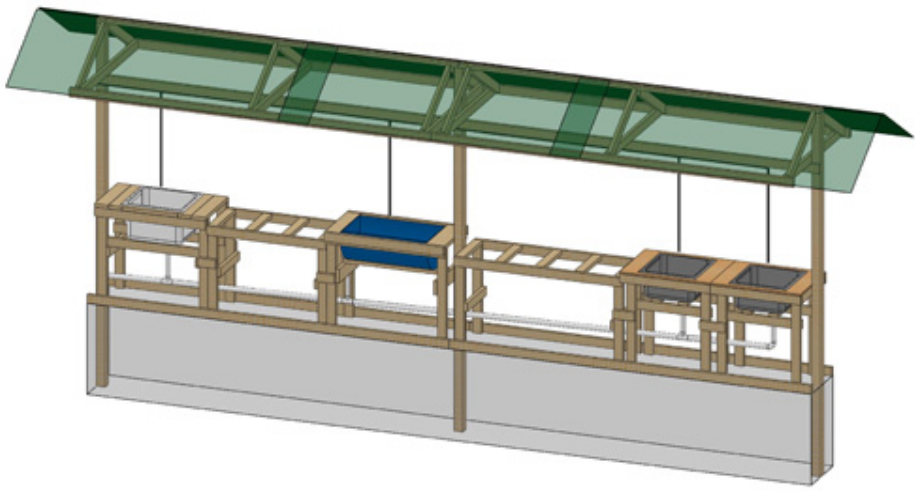

Figure 1: In-Field Wash Station. Image Credit: Leopold Center for Sustainable Agriculture

[14] Additional information on specific storage requirements can be found at http://www.familyfarmed.org/publications/wholesalesuccess/.

In Field Wash Station		Total Cost	$1,200
	Quantity	Cost	Total
Lumber	n/a	$150	$150
Hose Line	1	$25	$25
Plastic Sink	1	$150	$150
Steel Sink	1	$200	$200
Plastic Tub	1	$100	$100
Dry Rack	2	$100	$200
Drain Line	1	$25	$25
Roof	1	$150	$150
Labor	10	$20	$200

Table 3: Equipment List for In Field Wash Station

Wash-Pack Shed

The wash-pack shed allows producers to wash, dry, sort, pack, and cold store product immediately after picking. The proposed design[15] can be a feasible option for farmers with 4 to 6 acres of production. However, there are a number of shed design options with or without a walk in cooler that could be customized to fit the needs of a specific grower outside of that production scale. When exploring washing, processing and packing investments, it is recommended that existing buildings or other infrastructure be utilized to reduce costs.

Wash & Pack Shed		Total Cost	$4,725
	Quantity	Cost	Total
Lumber	NA	$500	$500
Dunk Tub	3	$100	$300
Dry Rack/Screen Table	1	$100	$100
Spin Drier	1	$225	$225
Scale/Screen Table	1	$250	$250
Roller Table	1	$150	$150
Cool Bot Cold Storage	1	$1,800	$1,800
Electric Service	1	$600	$600
Labor	40	$20	$800

Table 4: Equipment List for Wash & Pack Shed

Wash-pack Operation

A larger wash-pack operation could be an option for growers with 7 to 10 acres of production or more. Here again, every effort should be made to utilize existing buildings and infrastructure. The cost breakdown below assumes a 1600 square foot building

[15] The system prototype for this projection can be found at https://flywheelfarmvt.wordpress.com/tag/organic-farming/.

including 2400 cubic feet of climate-controlled storage. Costs could be drastically reduced if an existing building were available for use with electrical and plumbing already in place. An operation of this scale could accommodate multiple producers. There are several potential benefits for producers working together. The most apparent is access to economies of scale. Economies of scale are a proportionate saving in costs gained by an increased level of production. By leveraging their combined resources and production yields, producer collaborations have better access to the capital needed to finance operational investments, in addition to the production needed to justify those investments.

Pack-house Operation		**Total Cost**	**$124,500**
	Quantity	Cost	Total
Building 1600 sq ft	1	$44,800	$44,800
Wet Cold Storage	1	$12,000	$12,000
Dry Cold Storage	1	$12,000	$12,000
Chilled Storage	1	$12,000	$12,000
Barrel Root Washer[16]	1	$3,250	$3,250
Vegetable Wash Line	1	$600	$600
Roller Conveyer 5'	4	$500	$2,000
Roller Conveyer 10'	4	$700	$2,800
Steel Sink	2	$175	$350
Drying Rack	1	$200	$200
Shelf	4	$150	$600
Table	8	$175	$1,400
Curtain	2	$350	$700
Stock Tank	2	$125	$250
Hand Wash Station	1	$100	$100
Spin Drier - 5 Gallon	1	$250	$250
Electrical	na	$10,000	$10,000
Mechanical & Plumbing	na	$20,000	$20,000
Labor Hours - Equipment Setup	60	$20	$1,200

Table 5: Equipment List for Pack-house Operation

Light Processing Commercial Kitchen

In general, light processing refers to chopping, slicing, peeling, coring, pulping, and shucking. The scale and equipment needs for each facility is dependent upon the variety of produce coming into the facility. For smaller operations, it can be more cost effective to cut and chop products manually. In other cases, it may be best to utilize fresh-cut machines, or machines that are mechanized to chop, dice, slice, and package.

[16] Cost for a Barrel Root Washer considers the price for ordering a kit. DIY designs are available and would provide barrel washer at lower cost.

Light processing facilities can include commercial canning operations in which products are prepared, processed, sealed, cooled, labeled, and stored in containers. Canning provides shelf life to highly perishable fruits and vegetables and lends itself to products such as pickles, salsas, dips, spreads, and sauces that can be sold in retail markets or utilized in food service.

Another optional addition to light processing facilities includes freezing. The potential for frozen fruits and vegetables includes, but is not limited to: green beans, corn, broccoli, peas, carrots, squash, and cauliflower. In small operations, the process can include blanching, shocking, packaging, and freezing. Large operations use flash freezing where food is frozen in cryogenic temperatures.

The functions and scale of a successful light processing facility can vary widely depending on the market and customers served. For the purposes of this report we are considering a facility where fruits and vegetables are cut, sliced, shredded, and bagged.

Commercial Kitchen for Light Processing		**Total Cost**	**$92,495**
	Quantity	Cost	Total
Building	1	$41,000	$41,000
Dishwasher	1	$3,200	$3,200
Triple Sink	1	$600	$600
Hand Sink	1	$100	$100
SS Tables	4	$1,250	$5,000
Vegetable Cutter	1	$320	$320
Wedger	1	$100	$100
Vegetable Slicer/Shredder	1	$375	$375
Food Processor	1	$1,900	$1,900
Dehydrator[17]	1	$5,400	$5,400
Refrigerator	1	$900	$900
Freezer	1	$900	$900
Blast Freezer[18]	1	$18,000	$18,000
Cooker/Canner	1	$5,000	$5,000
Vacuum Sealer	1	$600	$600
Digital Scales	2	$600	$1,200
Misc. Utensils	n/a	$2,500	$2,500
Electrical	n/a	$3,000	$3,000
Mechanical & Plumbing	n/a	$2,400	$2,400

Table 6: Equipment List for Light Processing

[17] Dehydrator is cost based a commercial dehydrator available at http://www.webstaurantstore.com/excalibur-com1-stainless-steel-one-zone-commercial-dehydrator-2400w/358COM1.html

[18] Blast freezer cost is based on a commercial model available at http://www.foodservicewarehouse.com/delfield/t14d/p879.aspx

Example Feasibility Analysis for Wash-Pack and Light-Processing Facilities

The feasibility analysis for wash-pack and light processing facilities utilizes the Rolette area growers' case study as a scenario. The first step in analyzing feasibility of integrating wash-pack or processing facilities into their operation is to consider the potential market for locally grown fresh produce in Rolette and the adjacent counties. Using the market potential by county data presented earlier in the report, we can assess the market potential for local foods in the defined area.

County	Population (Estimated)	Local Produce Market Potential for At-Home	Local Produce Market Potential Away-from-Home	Total Local Fresh Produce Market Potential
Bottineau	6736	$132,499	$68,569	**$201,068**
Rolette	14582	$191,549	$136,795	**$328,344**
Towner	2317	$46,133	$24,048	**$70,181**
McHenry	5922	$101,551	$54,373	**$155,924**
Pierce	4451	$76,564	$39,978	**$116,542**
Benson	6877	$88,456	$61,769	**$150,224**
Area Total	40885	**$636,751**	**$385,532**	**$1,022,283**

Table 7: Market Potential for Rolette Area

Using this data, we can determine an estimated market potential for locally produced fruits and vegetables for the area to total more than $1 million. In Rolette County, the estimated market of $328,344 consists of $191,549 for at-home consumer and $136,795 for away-from-home consumption. Using data collected by USDA Economic Research Service, we can extrapolate where food dollars are spent for both at-home and away-from-home consumption.

Potential Market for Rolette Area Local Fresh Produce - At Home				
Food stores	Other stores	Home delivery and mail order	Farmers, manufacturers, and wholesalers	Total sales
61.9%	27.1%	3.6%	7.3%	100.0%
$394,316	$172,677	$23,009	$46,749	$636,751

Table 8: Market Potential for At-Home Consumption of Local Produce

Potential Market for Rolette Area Local Fresh Produce - Away From Home						
Eating and drinking places	Hotels and motels	Retail stores, direct selling	Recreational places	Schools and colleges	All other	Total
74.5%	3.8%	3.6%	3.9%	6.8%	7.4%	100.0%
$287,364	$14,473	$13,883	$15,051	$26,256	$28,506	$385,532

Table 9: Market Potential for Away from Home Consumption of Local Food

This breakdown gives producers insight as to how they can prioritize marketing strategies and develop a network of market partners. While schools and colleges comprise a small portion of away from home spending, building those partnerships may align closely with the values held by the producers. They can maintain these farm-to-school connections while also building partnerships with area restaurants and grocers.

Facility and Equipment Needs

John Hendrickson of The University of Wisconsin – Madison's Center for Integrated Agricultural Systems estimates that for every acre of fruit and vegetable production, farmers require a minimum facility space[19]:

- Greenhouse (for transplant production): 300 square feet per acre.
- Washing & Packing Area: 150 square feet per acre.
- Refrigerated Storage: 150 cubic feet per acre.

From these recommendations we can estimate the Rolette Area Grower's Collaborative, based on 9 acres of production, will need approximately:

- 2700 square feet of greenhouse.
- 1350 square feet of washing & packing space.
- 1350 cubic feet of refrigerated storage.

With an existing access to 1500 square feet of greenhouse, the priority is to add a wash-pack facility with cold storage. Depending on the development of market partnerships, growers will also want to explore the possibility of commercial kitchen space, but the additional capital and labor needs may prove prohibitive until efficient production and post-harvest handling processes are developed by year three or after.

Estimated total startup costs are $100,000, including existing land, buildings, and equipment valued at $47,500. Additional capital need is estimated at $52,500 providing:

[19] Grower to grower: Creating a livelihood on a fresh market vegetable farm John Hendrickson, CIAS Outreach Specialist University of Wisconsin-Madison College of Agricultural and Life Sciences October, 2005.

- $10,000 for technical support including feasibility analysis, business planning, and facility design. This expense can be higher or lower depending on the complexity of the proposed business model, skills/experience of the growers, and access to supporting organizations that could provide technical assistance for free or discounted pricing.
- $17,500 for additional machinery and equipment
- $20,000 in operating capital.
- $ 5,000 for wash-pack shed with Coolbot refrigerated storage.

Revenue

Revenue projections include a look at a potential product mix of fruits and vegetables for these producers. The wash-pack shed allows growers to develop partnerships with school, retail, and restaurant buyers while maintaining higher margin direct-to-consumer sales through farmers markets and community-supported agriculture. The revenue projections assume 5.75 acres of production in year one, 7 acres of production in year two, and 8.25 acres of production in year three. Retail grade yield is estimated at 70% of total yield, with 20% of retail grade product being sold through direct-to-consumer market channels.

Prices for direct to consumer market channels were calculated using the North Dakota Farmer's Market and Grower's Association 2011 price list adjusting for inflation. The remaining 80% of retail grade product is sold to schools, restaurants and retail grocery stores at 65% of direct sale prices. It is assumed that half of the "Seconds" or "B" grade product (30% of total yield) is composted, fed to animals or saved for personal use. The other half is sold at 30% of direct sales prices.

Year 1 - 2016										
				Price per Pound				Revenue by Market Channel		
	Acres Planted	Yield	Yield - B Grade	Direct	Indirect	B Grade	Total Revenue	Direct	Indirect	B Grade
Asparagus*	0.25	500	150	$2.50	$1.63	$0.75	$686	$175.00	$455.00	$56.25
Beans*	0.25	1000	300	$2.25	$1.46	$0.68	$1,235	$315.00	$819.00	$101.25
Brocolli**	0.5	4200	1260	$3.30	$2.15	$0.99	$7,609	$1,940.40	$5,045.04	$623.70
Cabbage*	0.25	6500	1950	$1.15	$0.75	$0.35	$4,104	$1,046.50	$2,720.90	$336.38
Cauliflauer**	0.5	11100	3330	$1.15	$0.75	$0.35	$7,008	$1,787.10	$4,646.46	$574.43
Carrots**	0.25	8437.5	2531	$1.70	$1.11	$0.51	$7,875	$2,008.13	$5,221.13	$645.47
Cucumber*	0.25	4500	1350	$1.15	$0.75	$0.35	$2,841	$724.50	$1,883.70	$232.88
Garlic**	0.1	500	150	$6.50	$4.23	$1.95	$1,784	$455.00	$1,183.00	$146.25
Onions*	0.4	10400	3120	$1.60	$1.04	$0.48	$9,135	$2,329.60	$6,056.96	$748.80
Peas**	0.25	1125	338	$4.00	$2.60	$1.20	$2,471	$630.00	$1,638.00	$202.50
Peppers*	0.5	14000	4200	$4.50	$2.93	$1.35	$34,587	$8,820.00	$22,932.00	$2,835.00
Potatoes*	0.5	10000	3000	$1.50	$0.98	$0.45	$8,235	$2,100.00	$5,460.00	$675.00
Spinach*	0.25	3000	900	$4.50	$2.93	$1.35	$7,412	$1,890.00	$4,914.00	$607.50
Sweet Corn*	0.5	4500	1350	$1.75	$1.14	$0.53	$4,323	$1,102.50	$2,866.50	$354.38
Strawberries***	0.5	5000	1500	$2.50	$1.63	$0.75	$6,863	$1,750.00	$4,550.00	$562.50
Tomatoes*	0.5	15000	4500	$2.50	$1.63	$0.75	$20,588	$5,250.00	$13,650.00	$1,687.50
	5.75	99763	29929				$126,755	$32,324	$84,042	$10,390

Table 10: Projected Revenue Year 1

Year 2 - 2017										
				Price per Pound				Revenue by Market Channel		
	Acres Planted	Yield	Yield - B Grade	Direct	Indirect	B Grade	Total Revenue	Direct	Indirect	B Grade
Asparagus*	0.25	500	150	$2.50	$1.63	$0.75	$686	$175	$455	$56
Beans*	0.25	1000	300	$2.25	$1.46	$0.68	$1,235	$315	$819	$101
Brocolli**	0.75	6300	1890	$3.30	$2.15	$0.99	$11,414	$2,911	$7,568	$936
Cabbage*	0.25	6500	1950	$1.15	$0.75	$0.35	$4,104	$1,047	$2,721	$336
Cauliflauer**	0.75	16650	4995	$1.15	$0.75	$0.35	$10,512	$2,681	$6,970	$862
Carrots**	0.5	16875	5063	$1.70	$1.11	$0.51	$15,749	$4,016	$10,442	$1,291
Cucumber*	0.25	4500	1350	$1.15	$0.75	$0.35	$2,841	$725	$1,884	$233
Garlic**	0.1	500	150	$6.50	$4.23	$1.95	$1,784	$455	$1,183	$146
Onions*	0.4	10400	3120	$1.60	$1.04	$0.48	$9,135	$2,330	$6,057	$749
Peas**	0.25	1125	338	$4.00	$2.60	$1.20	$2,471	$630	$1,638	$203
Peppers*	0.5	14000	4200	$4.50	$2.93	$1.35	$34,587	$8,820	$22,932	$2,835
Potatoes*	0.5	10000	3000	$1.50	$0.98	$0.45	$8,235	$2,100	$5,460	$675
Spinach*	0.5	6000	1800	$4.50	$2.93	$1.35	$14,823	$3,780	$9,828	$1,215
Sweet Corn*	0.5	4500	1350	$1.75	$1.14	$0.53	$4,323	$1,103	$2,867	$354
Strawberries***	0.5	5000	1500	$2.50	$1.63	$0.75	$6,863	$1,750	$4,550	$563
Tomatoes*	0.75	22500	6750	$2.50	$1.63	$0.75	$30,881	$7,875	$20,475	$2,531
	7	126350	37905				$159,644	$40,711	$105,848	$13,086

Table 11: Projected Revenue for Year 2

Year 3 - 2018										
				Price per Pound				Revenue by Market Channel		
	Acres Planted	Yield	Yield - B Grade	Direct	Indirect	B Grade	Total Revenue	Direct	Indirect	B Grade
Asparagus*	0.25	500	150	$2.50	$1.63	$0.75	$686	$175	$455	$56
Beans*	0.25	1000	300	$2.25	$1.46	$0.68	$1,235	$315	$819	$101
Brocolli**	1	8400	2520	$3.30	$2.15	$0.99	$15,218	$3,881	$10,090	$1,247
Cabbage*	0.25	6500	1950	$1.15	$0.75	$0.35	$4,104	$1,047	$2,721	$336
Cauliflauer**	1	22200	6660	$1.15	$0.75	$0.35	$14,016	$3,574	$9,293	$1,149
Carrots**	0.5	16875	5063	$1.70	$1.11	$0.51	$15,749	$4,016	$10,442	$1,291
Cucumber*	0.25	4500	1350	$1.15	$0.75	$0.35	$2,841	$725	$1,884	$233
Garlic**	0.1	500	150	$6.50	$4.23	$1.95	$1,784	$455	$1,183	$146
Onions*	0.4	10400	3120	$1.60	$1.04	$0.48	$9,135	$2,330	$6,057	$749
Peas**	0.25	1125	338	$4.00	$2.60	$1.20	$2,471	$630	$1,638	$203
Peppers*	0.75	21000	6300	$4.50	$2.93	$1.35	$51,881	$13,230	$34,398	$4,253
Potatoes*	0.5	10000	3000	$1.50	$0.98	$0.45	$8,235	$2,100	$5,460	$675
Spinach*	0.75	9000	2700	$4.50	$2.93	$1.35	$22,235	$5,670	$14,742	$1,823
Sweet Corn*	0.5	4500	1350	$1.75	$1.14	$0.53	$4,323	$1,103	$2,867	$354
Strawberries***	0.5	5000	1500	$2.50	$1.63	$0.75	$6,863	$1,750	$4,550	$563
Tomatoes*	1	30000	9000	$2.50	$1.63	$0.75	$41,175	$10,500	$27,300	$3,375
	8.25	151500	45450				$201,951	$51,499	$133,898	$16,553

Table 12: Projected Revenue for Year 3

*Source: Midwest Vegetable Production Guide for Commercial Growers

**Source: Vegetable Maturity Dates, Yields, and Storage by Ronald Smith, NDSU Extension 2010

***Source: Penn State Extesnion Strawberry Production retrieved at http://extension.psu.edu/business/ag-alternatives/horticulture/fruits/strawberry-production

Preliminary projections for a five-year income statement suggest that producers could generate an additional $150,000 in revenue per year by investing in a wash-pack facility with cold storage, in addition to developing a strong network of market partners. Assuming total labor costs at 54.7% and other operating/overhead expenses at 37.2%, the Rolette area growers could generate over $73,000 in net income before taxes on just over $900,000 in sales over a five-year period.

Aggregation Centers

Aggregating centers specialize in sourcing product from a variety of producers over a large geographic area. The centers can provide buyers a simplified way to purchase large quantities. The most common aggregation centers function as food hubs and can have a number of revenue streams depending on the business model, on-farm capabilities of suppliers, and mix of market channels.[20]

Not all food hubs specialize in a single market segment. In fact, many food hubs practice a diversified market segment model in which they engage direct-to-consumer, direct-to-food service, direct-to-retail, and wholesale markets. The Food Hub Survey by the Wallace Center at Winrock International shows that the three most commonly reported customer types among food hubs were as follows:

- 58% of food hubs reported selling to restaurants, averaging 33% of total sales.
- 39% reported selling to small grocery stores, averaging 14% of total sales.
- 35% reported selling K-12 food service, averaging 11% of total sales. [21]

Existing food hubs employ a variety of market models. Intervale Food Hub in Burlington, Vermont reaches consumer markets through a multi-farm CSA sales model.[22] La Montinita Food Cooperative operates five consumer-owned retail grocery cooperative locations throughout New Mexico.[23] An Oregon based organization, Ecotrust, saw an opportunity to develop a virtual tool to connect local food buyers and producers.[24] Cherry Capital Foods sources, stores, and distributes products from 150 small farms to supply a variety of food

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[20] Barham, James, Debra Tropp, Katheen Enterline, Jess Farbman, John Fisk, and Stacia Kiraly. 2012. *Regional Food Hub Resource Guide.* U.S. Department of Agriculture, Agricultural Marketing Service. Washington, DC. http://dx.doi.org/10.9752/MS046.04-2012

[21] Fischer, M., Hamm, M., Pirog, R., Fisk, J., Farbman, J., & Kiraly, S. 2013. *Findings of the 2013 National Food Hub Survey.* Michigan State University Center for Regional Food Systems & The Wallace Center at Winrock International. Retrieved from http://foodsystems.msu.edu/activites/food-hub-survey.

[22] National Good Food Network. 2015. *Field Guide to the New American Foodshed: Intervale Food Hub.* *http://foodshedguide.org/cases/intervale-food-hub/*

[23] Cantrell, Patty & Bod Heuer. 2014. *Food Hubs: Solving Local.* The Wallace Center at Winrock International. Retrieved from http://ngfn.org/solvinglocal

[24] Ecostrust. 2012. *FoodHub Spreads Love of Local Food Across Pacific Northwest.* http://food-hub.org/news/tag/pacific-northwest/. Accessed January 2015.

services, grocers, and specialty restaurants.[25] Red Tomato sources product from a network of 80 farmers and supply 22 retail chains in 14 states. Their business strategy relies on marketing by conveying the story behind the product.[26]

Financial analysis indicates a produce hub would need to generate a minimum of $1 million in annual revenue to support the operational overhead costs of aggregation, packing, sales, and distribution. Benchmark data from existing local food hubs supports this finding.[27] Assuming a diversified marketing approach made up of revenue streams in direct to consumer, retail grocery, and food service market channels, it is projected a hub would require 133 acres of fruit and vegetable production to generate $1 million in annual sales needed for economic viability. The projections described here assume a business model with $1 million in annual sales.

Food hub facilities should be located on a major transportation route with close proximity to a group of committed producer suppliers and large market providing a substantial customer base. Access to additional space for operations expansion is important. Such a site would have key operations of aggregation, processing, packing, sales, and distribution. A recommended minimum facility size is 3,000 square feet to accommodate equipment and cooler space needs during peak season months July through October. However, a 5,000 square foot facility could be ideal in providing room for business growth in the first five years of operation. The operating and financial model described in this report assumes a 4,200 square foot facility with 900 square feet of cooler space.

Capital Expenditures are estimated to be $155,000, the bulk of which pays for an 800 square foot walk in cooler, a refrigerated delivery truck and a refrigerated delivery van. Other capital expenditures include grading and packing equipment, office equipment, and leasehold improvements. Operating capital needs are estimated to be just over $180,000. The significant operating capital line items are pre-opening salaries and wages ($26,667), starting inventory purchases ($25,000), consulting & legal fees ($40,000), and working capital ($40,000).

[25] Chantrell and Heuer, 2014
[26] Chantrell and Heuer, 2014
[27] Local Food Research Center. 2012. *Non-Profit Food Hubs: Summary of Economic Viability.* Appalachian Sustainable Agriculture Project. Asheville, North Carolina.

Required Start-Up Funds	Amount		Totals	Depreciation		Notes
Fixed Assets						
Leasehold Improvements	25,000			15.00	years	
Equipment	60,000			7.00	years	
Furniture and Fixtures	10,000			5.00	years	
Vehicles	60,000			5.00	years	
Other Fixed Assets				5.00	years	
Total Fixed Assets			155,000			
Operating Capital						
Pre-Opening Salaries and Wages	26,667					GM for four months at $54K/year + 1 month employee wages
Prepaid Insurance Premiums	2,500					Property & Liability
Inventory	25,000					Assuming 3% of total year 1 purchases
Consulting/Legal/Accounting Fees	40,000					Development and supply organization support
Rent Deposits	4,200					1 month's rent
Utility Deposits	1,500					
Supplies	2,500					
Advertising and Promotions	5,000					
Licenses	3,000					
Other Initial Start-Up Costs	5,000					
Working Capital (Cash On Hand)	40,000					
Total Operating Capital			155,367			
Total Required Funds			$ 310,367			
Sources of Funding	Amount		Totals	Loan Rate	Term	Monthly Payments
Owner's Equity	12.89%		40,000			
Grants/Other Investors	12.89%		40,000			
Additional Loans or Debt						
Commercial Loan	74.22%		230,367	6.00%	84.00	$3,365.32
Total Sources of Funding	100.00%		$ 310,367			$3,365.32

Table 13: Projected Start-up Costs for Aggregation Center

Fixed Operating Expenses	Monthly	Year One	Year Two	Year Three
Expenses				
Advertising (including website development)	$ 1,800	21,600	18,000	15,000
Delivery Fleet	3,609	43,308	47,639	52,403
Bank & Merchant Fees	100	1,200	1,260	1,323
Conferences & Seminars	25	300	315	331
Dues and Subscriptions	200	2,400	2,520	2,646
Miscellaneous	150	1,800	1,890	1,985
Insurance (Liability and Property)	150	1,800	1,890	1,985
Licenses/Fees/Permits	100	1,200	1,260	1,323
Legal and Professional Fees	650	7,800	8,190	8,600
Office Expenses & Supplies	200	2,400	2,520	2,646
Postage and Delivery	50	600	630	662
Rent (on business property)	4,200	50,400	50,400	50,400
Repairs & Maintenance	175	2,100	2,205	2,315
Taxes-Other	250	3,000	3,150	3,308
Telephone and Communications	150	1,800	1,890	1,985
Utilities	650	7,800	8,190	8,600
Total Expenses	12,459	149,508	151,949	155,508
Other Expenses				
Depreciation	2,020	24,238	24,238	24,238
Interest				
Commercial Loan	1,090	13,079	11,395	9,607
Total Other Expenses	3,110	37,317	35,633	33,845
Total Fixed Operating Expenses	15,569	186,825	187,582	189,353

Table 14: Operating Expenses for Aggregation Center

The projected mix of revenue by market channel is as follows:

- Sales to Food Service Customers – 33%
- Sales to Retail Grocery Customers – 33%
- Sales to Direct Marketing Customers – 27%
- Sales to 3rd Party Processors – 7%

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Totals
0.00%	0.00%	0.00%	4.00%	8.00%	18.50%	18.50%	18.50%	18.50%	10.00%	4.00%	0.00%	100.00%
-	-	-	15,629	31,258	72,284	72,284	72,284	72,284	39,073	15,629	-	390,725
-	-	-	17,973	35,947	83,127	83,127	83,127	83,127	44,933	17,973	-	449,334
-	-	-	20,669	41,339	95,596	95,596	95,596	95,596	51,673	20,669	-	516,734

Table 15: Retail Grocery Sales

Retail Grocery			
Price Per Unit	$	1.00	100.00%
Variable Cost Per Unit	$	0.73	73.00%
Gross Margin Per Unit	$	0.27	27.00%
Projected Unit Sales			
Seasonality Factor			
Year One			
Year Two Growth		15.00%	
Year Three Growth		15.00%	
Overhead Exp Allocation		33.50%	
Projected Revenue	$	390,725	
Variable Costs		285,229	
Gross Margin		105,496	
Overhead Expenses		123,313	
Profit		(17,818)	-4.56%
Breakeven Sales Revenue	$	456,716.45	
Breakeven Sales Units		456,716	

Table 16: Break Even Analysis for Retail Grocery Sales

The most significant operating expenses are delivery fleet expenses of over $43,000 for year one and facility rent at $50,400 per year. Products that are aggregated and packed for distribution need to be transported to market quickly. Many produce wholesale buyers require deliveries made with refrigerator trucks that can maintain appropriate temperature. An aggregation hub would require a refrigerated truck for out of town deliveries and product pickup, and/or a refrigerated van for in-town deliveries and special runs. A critical management function will be the efficient coordination of delivery and on-farm pick up routes.

	Van Expense		
Expenses	**Month**	**Year**	**Per Mile**
Loan Interest	$46.67	$560.00	
Depreciation	$125.00	$ 1,500.00	
Fuel	$364.58	$ 6,250.00	$ 0.21
Maintenance/Repair	$476.25	$ 5,715.00	$ 0.19
Tires	$33.33	$ 400.00	$ 0.01
Insurance	$333.33	$ 4,000.00	
Registration, Title and Taxes	$50.00	$ 600.00	
Total	**$1,429.17**	**$19,025.00**	

	Truck Expense		
Expenses	**Month**	**Year**	**Per Mile**
Loan Interest	$83.33	$1,000.00	
Depreciation	$312.50	$ 3,750.00	
Fuel	$729.17	$ 12,500.00	$ 0.31
Maintenance/Repair	$627.50	$ 7,530.00	$ 0.19
Tires	$44.44	$ 533.33	$ 0.01
Insurance	$333.33	$ 4,000.00	
Registration, Title and Taxes	$50.00	$ 600.00	
Total	**$2,180.28**	**$29,913.33**	

Table 17: Projected Fleet Expenses

Business Development Strategies

When it comes to options for light processing infrastructure and value chain development, there is no one-size-fits-all approach that producers can follow. Instead, they have the opportunity to develop solutions that are suited to their markets. The Petrovics's unique opportunity to develop a food hub in Anamoose may not be such a rarity. Rural communities often have under-utilized structures such as former schools, city halls, post offices, or churches that can be a springboard for helping producers enact strategies to scale up.

The same is true with the Rolette area growers, with their emerging partnerships with schools and cafes. Producers have the opportunity to build connections with buyers dedicated to sourcing local products. However, producers are busy growing local food. They need community collaboration in order to truly grow a local food economy. Economic developers, city governments, and job authorities can offer ways to assist these producers to make the most of their resources.

Here we offer a business development model that technical assistance providers can use with producers to develop a plan for market expansion. This place-based approach assesses common variables among growers and facilitates the development of localized food production nodes. Food production nodes serve as small cluster of production and processing that can lead to an interconnected and sustainable local food economy. The formation of production nodes is imperative to the transition local food activities from individual farms selling direct-to-consumer markets toward a network of strategic partners within supply chain relationships. [28]

The potential exists to develop the necessary infrastructure to grow local foods in a way that is appropriate to the diverse growers and their communities. This business development model is presented in a series of overall steps, with questions provided to elicit the needs of the producers and their buyers.

The business modeling process begins by identifying the vision and mission of the core producers. These producers may choose to develop their processing strategies through any kind of legal organization including a sole proprietorship, partnership, cooperative, non-profit organization, or a limited liability company. However the organization may develop, it is essential to have a solid understanding and commitment to the group's vision, goals, and strategies.

The model complements the visioning process by identifying the current and potential assets including: land, facilities, human resources; partners in technical assistance, funding, and marketing; and current operational strategies. This provides an understanding of the growers' capacity and potential for development.

The next area to examine the potential for production and the need for facilities is the market opportunity. This includes a quantitative snapshot of the defined trade area as well as a qualitative assessment of potential buyers and market partners that leads to the process of building customer relationships. For growers, identifying potential customers as their partner market is a critical strategic effort that happens perpetually as their businesses evolve and grow. By building these market partnerships, the growers should have a good sense of product demand and volume. The resulting assessment of the growers' vision, market opportunity, and assets will provide information necessary to build a production node business model.

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[28] Meter, Ken and Megan Philips Goldenberg. 2013. *Making Small Farms into Big Business: A Plan for Infrastructure Investments to Connect Small Farms in South Carolina to Local Markets.* Crossroads Resource Center. www.crcworks.org.

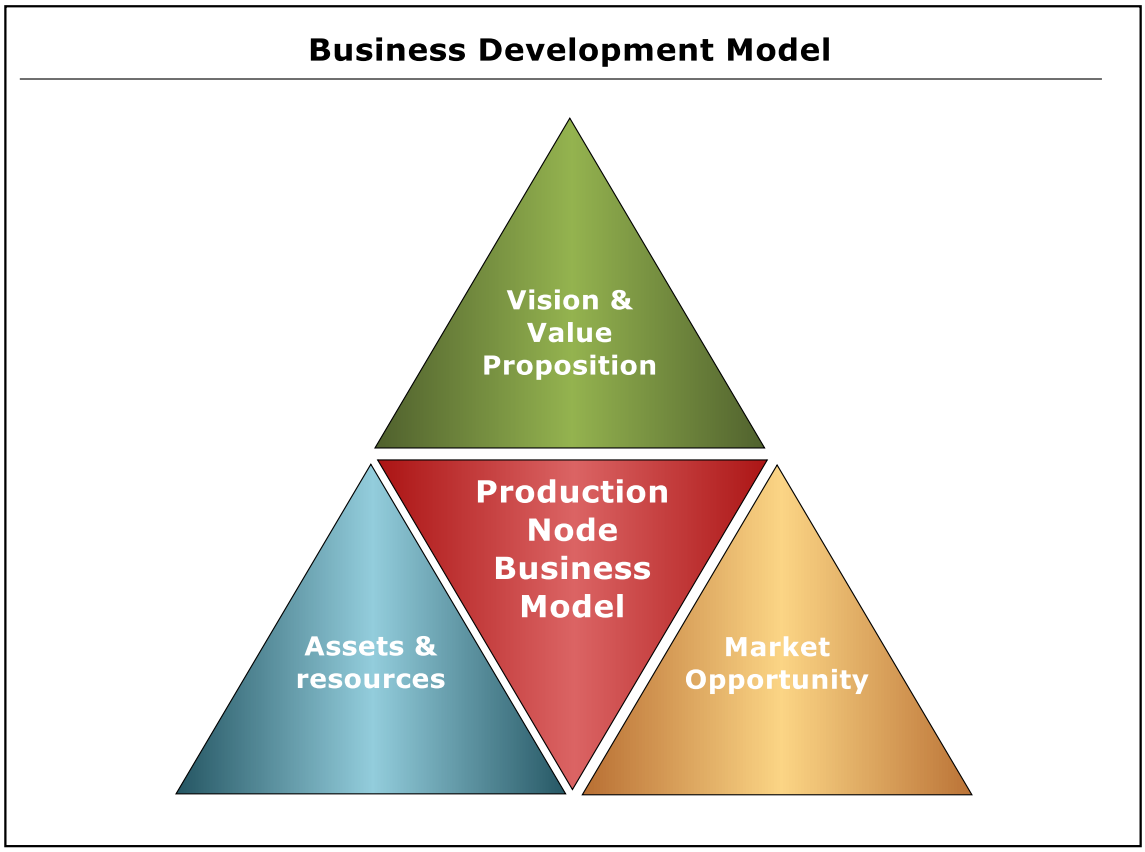

Figure 2: Components of Production Node Business Model

The inner workings of the business model include revenue projections and operational plans. The projecting revenue section helps growers to identify clear strategies based on market demands to determine core and signature crops. A template is provided for some common fruit and vegetable crops grown in North Dakota. The template projects revenue based on the sales through direct-to-consumer and institutional market channels and can be modified overtime to project future revenue as growers scale up production and navigate market segments.

The final section of the model helps growers determine operational needs and develop an operational plan. By utilizing the vision, assets, revenue projections, and resulting strategies, growers can explore their operational needs and set the goals necessary to initiate their business. Growers can consult a prepared equipment list for wash-pack, cold storage, commercial kitchens, and light processing facilities to prioritize their needs and determine the best route for developing infrastructure. The prioritization of equipment and infrastructure development will then lead to the process of drafting an operational plan for supplies, inventory, human resources, general operations, and management capacity.

When working through the model, it is important to note that these steps will not always be linear. There may be times it is appropriate to refine areas already completed in order to

fully develop the certain steps. Keep in mind as a place-based business developments model, each scenario will be different and each step will initialize conversations that will likely continue to develop over time. It is recommended to keep thorough records and progress when working through this model, noting reasons for each decision or change in decisions.

Business Development Model for Fruit and Vegetable Growers Entering New Market

1.0 Core Group Assessment

1.1 Determine the characteristics of the core group including number, proximity, and product mix:

- *How many producers are within the group, and what is their proximity to one another?*
- *What products, and how much of each product you producing?*
- *Do you currently conduct any value-adding or processing in marketing your products?*
- *What products would you produce in your ideal operation?*
- *How many acres do you currently have in production for local food products?*

1.2 Assess current operational strategies:

- *What are your current production techniques?*
- *Do you currently conduct any value-adding processing in marketing your products?*
- *What is your defined trade area?*
- *What are the regions you prefer to sell to?*
- *How do you manage excess product?*

1.3 Map existing and potential assets including facilities, human resources, land base, partners, and resources:

- *What facilities are available or needed for wash-pack, storage, or processing?*
- *How many hours do you and your existing staff to production and processing?*

- *How many acres do you have access to?*
- *Are there producers in the group who currently work with other growers in marketing product?*
    - *If so, what cooperative marketing models have been implemented?*
    - *What have been the successes, failures, and lessons learned?*
- *What do expectation or concerns do you have about cooperative marketing models?*
- *Do you want to retain your own farm brand in cooperative marketing or would you prefer a separate overarching brand?*
- *What kinds of financial resources are available for expansion?*
- *What resources are available for technical assistance, production expansion, and business development?*

1.4 Identify vision for development and expansion by asking qualitative questions to evoke discussion:

- *What values drive business development?*
- *What potential buyers would you like to build partnership with?*
- *How would such partnerships benefit the business, the buyers, and the community?*
- *How do you envision scaling up and accessing new markets?*
- *How do you see collaboration with each other beneficial?*

2.0 Market Mapping

2.1 Examine the potential market.

- *Utilize the quantified local food consumption data for North Dakota counties (See Table 1) based on the preferred trade area to determine an estimated market potential for locally produced fruits and vegetables.*
- *Use data collected by the USDA Economic Research Service to determine where food dollars are spent in the region.*
- *How does the resulting data influence the prioritization of market strategies.*

2.2 Consider the potential to grow business through farmers markets, community supported agriculture, on farm sales, or other direct-to-consumer market channels.

- *What direct-to-consumer sales strategies do you implement now?*
- *What additional strategies might you consider?*
- *Document the points that arise in discussion including market saturation, labor limitation, or other barriers.*

2.3 Identify potential institutional buyers within the trade area.

- *What are the opportunities within this trade area for food service, retail, or other direct to institution sales?*
    - *To identify potential school buyers, see the ND Farm to School Directory of Food Service at **ndfarmtoschool**.org/directory-of-**farmers**-and-**food-service/** for a list of schools with interest in buying fruit and vegetables locally.*
    - *To identify potential restaurant buyers consider independently or cooperatively owned restaurants that value community involvement or offer menus that utilize fresh produce or specialty products on a regular basis.*
    - *When identifying retail grocers, consider independent or cooperatively owned grocers.*
    - *Also consider colleges, hotels, nursing homes, hospitals, or other institutions that offer food service options that could be potential buyers.*
    - *Are there food companies or food businesses (think Pride of Dakota) that would have interest in sourcing their product locally?*

3.0 Market Partnership Development

3.1 Explore potential market partnerships by asking questions that elicit potential value propositions.

- *What customer segments does the group want to serve?*
- *What products would our ideal buyers be most interested in sourcing locally?*
- *Are there buyers that we already have some relationship with?*
- *How could they benefit from building these relationships?*
- *How could their customers benefit from such partnerships?*
- *What changes will you need to make to your staff to accommodate new buyers?*

3.2 Build customer relationships by continuing conversations with potential buyers.

- *Identify types of products partners are most interested in sourcing locally.*
- *Explore how local products might complement current menu or product offerings and be a selling point to their customers.*
- *Identify the volume buyers use each week.*
- *Consider how that volume might vary throughout the year based on availability or menu changes.*
- *Consider kinds of products that require processing prior to use.*
- *Identify what kinds of products are suited in their whole, unprocessed form.*

3.3 Identify most advantageous market partners.

- *What relationships has the group established with customers?*
- *Are there key market partnerships that still need to be developed?*
- *Continue building relationships with market partners.*
- *Consider the type and quality of relationship expected from our customers.*
- *Keep list of other potential buyers to integrate during future years of expansion.*

3.4 Share vision of progress with other emerging production nodes and unique markets, especially other processors, restaurants, retailers, hubs, distributors who are dedicated to the expansion of local food and may be future players in regional collaborations.

4.0 Potential Revenue Projections

4.1 Determine core product mix and production schedule.

- *Are there products that can serve as staples of your revenue?*
- *Are there products that will serve as specialty or signature items?*
- *Are there products that will take years before they are saleable?*

4.2 Calculate product revenue based on:

- *Acres planted per product*
- *Direct-to-Consumer Sales*
- *Institutional sales*

- *Use template to calculate future projections, increasing production as appropriate.*[29]

	Lbs per Acre	Acres Planted	Yield	Price per Pound Direct-to-Consumer	Price per Pound Institutional Sale	(Yield x 20% Direct-to-Consumer) + (Yield x 80% Institutional Sale)
Asparagus	2000			$2.50	$1.63	
Beans	4000			$2.25	$1.46	
Broccoli	8400			$3.30	$2.15	
Cabbage	26000			$1.15	$0.75	
Cauliflower	22200			$1.15	$0.75	
Carrots	33750			$1.70	$1.11	
Cucumber	18000			$1.15	$0.75	
Garlic	5000			$6.50	$4.23	
Onions	26000			$1.60	$1.04	
Peas	4500			$4.00	$2.60	
Peppers	28000			$4.50	$2.93	
Potatoes	20000			$1.50	$0.98	
Spinach	12000			$4.50	$2.93	
Sweet Corn	9000			$1.75	$1.14	
Strawberries	10000			$2.50	$1.63	
Tomatoes	30000			$2.50	$1.63	
Total						

Table 18: Template for product revenue projections

[29] Source Midwest Vegetable Production Guide for Commercial Growers, Vegetable Maturity Dates, Yields, and Storage by Ronald Smith, NDSU Extension 2010 Penn State Extension Strawberry Production retrieved at http://extension.psu.edu/business/ag-alternatives/horticulture/fruits/strawberry-production

5.0 Operational Needs

5.1 Consider the infrastructure needs for expansion based on product mix buyer needs.
John Hendrickson of The University of Wisconsin – Madison's Center for Integrated Agricultural Systems estimates that for every acre of fruit and vegetable production, farmers require a minimum facility space[30]:

- *Greenhouse (for transplant production): 300 square feet per acre.*
- *Washing & Packing Area: 150 square feet per acre.*
- *Refrigerated Storage: 150 cubic feet per acre.*
- *Other post-harvest handling needs might include commercial kitchen and/or processing facilities.*

5.2 Identify and prioritize facility needs.

- *Be sure to consider existing infrastructure and assets such as under utilized commercial kitchens, existing buildings for renovation.*
- *What operating expenses might be required for expansion?*
- *Consult equipment list in Table 19 to determine and priorities.*
- *Research accurate costs and estimates for your region.*

5.3 Discuss your location and why it is important (if at all).

- *Describe whether your vision includes a destination business where your customers will find you. Examples include a community kitchen, pumpkin patch, or U Pick.*
- *Describe the physical needs of a location such as zoning or locations near specific physical resources.*

[30] Grower to grower: Creating a livelihood on a fresh market vegetable farm John Hendrickson, CIAS Outreach Specialist University of Wisconsin-Madison College of Agricultural and Life Sciences October, 2005.

Item	Number Needed	Cost Per Each	Total Cost
Wet Cold Storage		$12,000	
Dry Cold Storage		$12,000	
Chilled Storage		$12,000	
Barrel Root Washer		$3,250	
Vegetable Wash Line		$600	
Roller Conveyer 5'		$500	
Roller Conveyer 10'		$700	
Steel Sink		$175	
Drying Rack		$200	
Shelf		$150	
Table		$175	
Curtain		$350	
Stock Tank		$125	
Hand Wash Station		$100	
Spin Drier - 5 Gallon		$250	
Electrical		$10,000	
Mechanical & Plumbing		$20,000	
Dishwasher		$3,200	
Triple Sink		$600	
Hand Sink		$100	
Stainless Steel Tables		$1,250	
Vegetable Cutter		$320	
Wedger		$100	
Vegetable Slicer/Shredder		$375	
Food Processor		$1,900	
Dehydrator		$5,400	
Refrigerator		$900	
Freezer		$900	
Blast Freezer		$18,000	
Cooker/Canner		$5,000	
Vacuum Sealer		$600	
Digital Scales		$600	
In Field Wash Station		$1,200	

Table 19: Equipment List for Potential Infrastructure

5.4 Discuss and document the components of the facility.

- *Determine if you will be building new, purchasing existing, or leasing space.*
- *Describe any potential facilities that you have identified and verify zoning.*
- *List information such as price (lease rate, asking price or contractor bids), income production from unused portions of the property and any additional costs such as drafting fees, permits, utility deposits, etc.*
- *List the square footage, features included, and renovations/repairs needed. Also, discuss if the space is expandable for future use.*
- *Any listing reports or drawings of your facility should be included in the appendix of your business plan.*
- *List all equipment, furniture & fixtures or other assets owned and its fair market value. Typical items include automobiles, computers, desks/chairs, equipment, and tools.*
- *List all equipment, furniture & fixtures needed to operate the business, the potential source of that equipment, and verified price or cost of the assets.*
- *Actual quotes or bids for the purchase of assets should be included in the appendix of the business plan as supporting documentation.*

6.0 Operational Planning

6.1 Determine needs for human resources.

- *Analyze current and future labor capacity and needs.*
- *If employees are needed, list number of employees including the positions needed, the responsibilities of each position, and whether they are seasonal or year round.*
- *Consider any benefits offered to employees and the criteria set out to qualify for these benefits.*

6.2 Discuss general operations.

- *Operations Layout Sketch*
- *Description of Production Processes*
- *Production Capacity of current facility*
- *Projected need for expanded production*

6.3 Consider direct Costs including:

- *Materials, Labor*
- *Production Overhead*
- *Quality Control Methods*
- *Environmental, Occupational Safety, and other Government Regulation*

6.4 Articulate management capacity.

The management section is essential if you need to borrow money from a financial institution. This section should include one of two things:

- *Resume—Revise resume to focus on experience and skills most relevant to your farm's operation.*
- *Biography – If you do not have a resume handy simply write a one or two paragraph biography highlighting relevant experience and skills.*

Conclusion

There are many options for developing needed infrastructure for the development of local food economies in North Dakota. However, each of these options depends greatly on the level of production and supply. Many of the producers we worked with through the feasibility and business modeling process clearly want to scale up their production and enter new markets, but want to do so in a way that is aligned with their business values.

The greatest opportunity exists within localized efforts to develop small-scale infrastructure that meets producer needs for expansion. Such an approach will take time, as various nodes emerge throughout the state. It will also take collaboration. Producers need collaborative assistance from city governments, community developers, small business developers, state agencies, technical assistance providers, and dedicated market partners in order to establish the needed infrastructure developments that will lead to a viable and efficient network of farm and food enterprises.

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Appendix: Determining Value Chain Development Scale

Questions for determining the scale of value chain development, adapted from Anthony Flaccavento's document for the Central Appalachian Network, "Healthy Food Systems: A Toolkit for Building Value Chains."

1. How large is the unmet demand for healthy, local foods in your defined region? Can the expansion of farmers markets, CSA's and other direct-to-consumer options meet this demand?

2. Who and where are the specific market drivers for healthy local foods? Are public schools, colleges, universities, or local retailers interested in sourcing products from local producers? Are they dedicated to promoting the values held by your farm?

3. What is the estimated total demand, and for your products? Is there a minimum demand that must be met?

4. Roughly how many farms / acres of land would be required to meet this demand?

5. Is there broad enough interest among farmers to meet this demand, and if so, how much assistance and support (training, materials, finance) will they likely need?

6. Why are these markets beneficial for farmers? Do they reduce costs? Improve prices? Provide larger or easier market access?

7. How many farmers / food producers will be needed to meet the minimum – and projected – demand, and how close are these farmers to one another?

8. What infrastructure is needed to link the desired products to the markets? Does some or all of it currently exist?

9. What will it cost to build or access the needed infrastructure? What forms of funding – grants, loans – are available?

10. Is there a local organization or business willing and able to launch the value chain? To manage it, if necessary?