HIGH TUNNELS IN NEW BRUNSWICK

COMMUNITY FOOD SECURITY AND ECONOMIC DEVELOPMENT

EDWARD J. BLOUSTEIN SCHOOL OF PLANNING AND PUBLIC POLICY
RUTGERS UNIVERSITY
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MANY THANKS TO

Alena D’Auria, Rutgers Undergraduate
Margaret Brennan-Tonetta, Rutgers FIC
Lou Cooperhouse, FIC and F&S Produce Co., Inc.
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Lisanne Finston, Elijah’s Promise
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Shoufiul Islam, Rutgers FIC
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Stephanos Koullias, Western Queens Compost Initiative
Richard Ludescher, Rutgers SEBS
Tom Manning, NJ Agricultural Experiment Station

Jean Mahoney, Rutgers FIC
Bruce Master, Rutgers FIC
New Brunswick Community Gardening Coalition
New Brunswick Food Alliance
Christina Palassio, The Stop
Glen Patterson, City of New Brunswick Planning
Jack Rabin, NJ Agriculture Experiment Station
Mark Robson, Rutgers SEBS
Jaymie Santiago, New Brunswick Community Farmers Market
Skylar, Rutgers FIC
Tyler & Scott Thompson, XS Smith
Terry & Patrick Viggiano, First Fields
Frank Wong, Rutgers Facilities and Capital Planning

PREPARED BY

Edward J. Bloustein School of Planning and Public Policy, Rutgers University
Spring 2012 Community Development Studio

Max Azzarello
Anthony Capece
Michael Cassidy
Laura Chamberlain
Benjamin Faust
Sarah Franklin
Joshua Jensen
Emily Joiner
Benjamin Logue
Jacklyn McFarlane
Brandon McKoy
Matthew Sarsycki
Darius Scott
Charlene Sharpe
Carolyn Worstell

FACULTY

Kathe Newman
Associate Professor
Director of the Ralph W. Voorhees Center for Civic Engagement

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For more information, contact knewman@rutgers.edu
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Urban Agriculture & High Tunnels

While much of America’s food infrastructure is centralized, historically, food shaped the very place of the city. Looking at maps of older cities like London and New York, one can trace where and how food was produced, sold, and moved through the city. Often times it was as simple as the name of the route such as Bread Street, or Friday Street in London where fish were only sold on Fridays, or the street layout that suggests the routes people took to bring in livestock and the road networks that led to central markets (Steel, 2009). Since the industrial revolution, the production of food has been largely separated from the city. And few cities have large central fresh markets as real estate competition pushed food production and sale outside the urban core. Recently, a variety of concerns have placed urban food access back on the agenda. Urban agriculture offers techniques that allow for more specialization in growing due to smaller output and business models. It has positive environmental effects such as reducing storm water runoff improving the carbon cycle through increased energy efficiency and carbon sequestration (Ackerman et al., 2011). There are community economic development benefits too as community development corporations begin to channel capital to local food based microenterprises (Cantrell, 2012). Some communities are building food-related business such as food carts in Portland, Oregon. There is also an outreach and education component of urban agriculture and local food. Organizations like the Walnut Hill Community Farm and the Urban Tree Connection in Philadelphia have created programs specifically targeted to urban youth to teach them about local food careers in addition to teaching them about food insecurity. By teaching the community at large, especially the youth, about the possibilities of urban agriculture in the future, those efforts can go a long way in rethinking food systems for the next generation.

Urban agriculture happens in a variety of ways such as raised beds, windowsills, and community and rooftop gardens. Each has its advantages: raised beds may allow people who cannot garden in the ground an opportunity to grow produce. This is especially helpful for people with disabilities and the elderly. Windowsill growing, for those without a backyard, and community and rooftop gardens allow for a slightly bigger concentrated location to grow produce. But high tunnels use urban land to its full potential. A high tunnel structure is comprised of a series of metal or PVC piping semi-circle or
“hoop” shapes that are pushed into the ground or anchored to a foundation. The piping is secured directly into the ground rather than using concrete and is covered in plastic or shade cloth depending on season and growing needs. The cover provides a controlled environment using the greenhouse effect to grow anything from seedlings to permaculture. Hoop houses are well suited for the production of red peppers, basil, cut flowers, raspberries, strawberries, salad mix, baby spinach, tomatoes, melons, and, with enough vertical clearance, dwarf tree crops (Jett, 2004; Blomgren and Frisch, 2007). High tunnels in urban settings extend the growing season and act as a central location for community, knowledge, and innovation.

High tunnels are easy-to-construct non-permanent structures that can increase production in a small area and extend the growing season for approximately twelve weeks (six each at the beginning and end of the annual growing season). Since urban land use is often subject to change, the flexibility hoop houses offer gives them an advantage over traditional greenhouses. For communities with access to open lots, hoop houses offer a growing environment that minimizes capital and energy investments as they can be constructed in a variety of sizes. While most high tunnel operations are semi-permanent, high tunnels can be easily moved. hoop houses typically provide a cost advantage over traditional glass-panel greenhouses and can be constructed without electrical connections for ventilation or supplemental heat. Instead they are heated by the covers and cooled with roll-up sidewalls and detachable end walls (Jett, 2004). While high tunnels should hold their own in cold weather, growers may opt to include secondary heating systems instead of risking the loss of a sizeable portion of their crops and income overnight. The passive greenhouse system of a high tunnel is fairly reliable; however, to safeguard against extreme instances of frost, farmers typically employ measures such as wood pellet stoves or electric heaters. Thermal massing is less resource-intensive. It uses barrels of water placed against the southern facing wall of the house to stabilize the temperature.

High tunnels mitigate the risk of growing crops earlier in the season and they increase harvest quality by protecting crops from extreme weather conditions such as wind, frost, sudden temperature fluctuations, and heavy storms. They protect crops from disease and pest infestation, which make them ideal for producing heirloom and specialty vegetables and spices (Jett, 2004; Neuman, 2010). High tunnels isolate produce from harmful pathogens by providing a barrier to airborne contaminants and its siding can prevent contamination from soil and water runoff vectors. Because of this controlled environment, high tunnels also allow for a great deal of control over soil, watering, and wind exposure. Farmers can grow specialty items and can experiment with selective breeding to improve their produce. High tunnels offer other economic benefits. They are typically classified as temporary agricultural structures for property assessment and taxation, since they usually lack a concrete foundation or footing. Unlike traditional greenhouses, crops in high tunnels can be grown in the ground instead of hydroponically or in raised beds and can be easily configured and re-configured. The low cost makes it easier to buy or build multiple high tunnel systems. Business owners can grow produce for specific clientele, including restaurants that may yield higher returns on investment.

Practicing urban agriculture, through the implementation of high tunnels, provides a different message than other forms of urban agriculture like traditional community gardens, urban orchards, or aquaponic farms. The high tunnel does three clear things. First, it serves as a landmark for urban agriculture within a community. High tunnels, with their design, stand out amongst other structures in the built environment. They offer a different component to traditional urban form. By witnessing the unique (to urban dwellers) appearance, community members and visitors will be curious about what happens inside. If the tunnels are integrated into other urban agricultural efforts, the hoop house becomes a symbol of community growing efforts.
Second, it formalizes urban agriculture. Constructing a high tunnel in the city requires following formal zoning and land use rules. Large high tunnels offer different types of urban growing practices than what occurs in people’s backyards, porches, and windowsills. Third, it unifies community members. One important component of urban agriculture initiatives worldwide is that individuals are brought together through a common interest in food, growing, and education and this enhances a sense of community. Essentially, these programs take people out of their backyards and bring them together. This is not to say that growing should not occur on a small household scale, but a high tunnel community farming initiative offers a venue to bring people together that have common interests.

The Master Peace Farm, located in Riverdale Maryland, is part of the University of Maryland’s Cooperative Extension Service. The community farm offers a mentoring program in which horticulture students organize a community farmer’s market and educate local youth on sustainable growing practices, a volunteer program for Local Master Gardeners, and a location for 22 community garden plots that can be purchased ($10/year) by community members (Harris 2008). In 2009, the Master Peace Community Farm constructed a high tunnel that it used with the mentoring program and allows harvesting of winter crops later in the season.

While hoop houses seem to offer many benefits for urban growing, building a high tunnel in an urban environment presents some challenges related to zoning and other land use issues. In the rest of this report, we discuss our efforts to work with community groups to construct high tunnels in downtown New Brunswick. We talk about the potential community vision, the challenges of building downtown, and an initial effort to add high tunnels to the New Brunswick Community Farm Market on the Rutgers Cook campus.

High Tunnels in New Brunswick

We met with the New Brunswick Community Gardening Coalition (NBCGC) to learn more about their ideas for larger urban agriculture projects in the city. The New Brunswick Community Gardening Coalition includes Elijah’s Promise, Unity Square Partnership, Christ Church, Rutgers Against Hunger and the New Jersey Agricultural Experiment Station.

- Elijah’s Promise is a New Brunswick community organization that seeks to improve community food security by increasing access to healthy affordable food and expanding a food based economic development strategy that creates jobs and small business development opportunities. Elijah’s Promise runs a community raised bed garden on Oliver Street.
- Unity Square Partnership is a religious based community organization that works in a largely Latino neighborhood in New Brunswick and hosts three community gardens. Through the New Brunswick Community Gardening Coalition, it has taken the lead in organizing events to promote community capacity through local efforts like Seed Swaps and workshops.
COMMUNITY FOOD SECURITY AND ECONOMIC DEVELOPMENT

• Christ Church runs a food pantry and hosts a small community garden and is a central partner in the New Brunswick Community Gardening Coalition.
• Rutgers Against Hunger (RAH) is a University initiative to reduce hunger in the state. RAH partners with the New Brunswick Community Farmers Market (NBCFM), a Farmers Market located on Jones Avenue on the Rutgers Cook campus at the intersection of a large Latino, a large African American and the University communities. The site includes a market, raised beds, compost bin, and tool shed.
• The New Jersey Agricultural Experiment Station (NJAES) at Rutgers specializes in outreach programs for agriculture and fisheries in urban communities. With a wide array of specialists including farmers, agricultural economists, horticulturalists, and engineers, the extension is an invaluable resource in planning urban food systems. County extension agents are important players in local urban agricultural efforts.

These organizations play important roles in shaping New Brunswick’s urban agriculture possibilities. The New Brunswick Community Gardening Coalition is a relatively new organization that represents a meeting of minds from a few interested local growers. While the group is still in its early stages, they have already organized activities and meet regularly to enhance community growing projects. The coalition created an online information hub that connects community growers and farmers. We communicated with all of these organizations as improving the food infrastructure in New Brunswick requires a partnership of these actors.

The New Brunswick Community Gardening Coalition members considered how high tunnels fit with their existing projects and suggested that the tunnels could be used to expand production, community outreach, and urban gardening education. Coalition members suggest that if the high tunnels were constructed on the Rutgers’ owned lot near the New Brunswick Community Farmers’ Market, the lot could eventually become a center for a community ecological education. The NBCGC would like to develop a Masters Urban Gardeners Program in partnership with the NJAES. The high tunnel would be an integral component of this program. Masters Gardeners Programs typically require community service hours by future master gardeners before certificates are awarded. The high tunnels and other

![Figure 2: Rendering of high tunnels at the NB Community Farm Market, 2012 CD Studio](image-url)
education activities could link nicely with these efforts. Community gardening courses might include:

- **Basic Gardening**: educating people on the simple steps to start a home garden. Steps could include how to prepare the land, what to grow, how to water, and how to use organic pest control techniques.
- **Water Conservation Techniques**: teach potential growers about installing roof water catchment systems, grey water filtration, rain gardens, and rain barrel painting for children.
- **Composting Techniques**: teach people how to create a composting bin that turns organic waste into garden fuel.
- **Soil Testing**: provide contact information with organizations that can test soil.
- **Constructing High Tunnels for Household Use**: hold workshops on how to take the large-scale high tunnel and apply its season extending techniques on a smaller, household scale.
- **Seed Swaps**: community event in which members gather and exchange seeds. This allows gardeners to be exposed to crops they normally would not grow and furthers an exchange of community knowledge.
- **Environmental Education for Children**: have children help harvest food from the high tunnels and offer education about basic ecological principles that relate to sustainable growing and living practices.

The New Brunswick Community Gardening Coalition is transforming the New Brunswick Community Farmers Market into a specialty Hispanic Market. This is practiced throughout much of the west coast. New Brunswick is 39% Hispanic (U.S. Census Bureau). Community members who would like to grow traditional crops from their homeland may benefit by growing in a high tunnel, which creates a simulated environment that allows warmer climate crops to be started earlier in the growing season. They may then be able to sell those crops at the NBCFM. How the community gardeners choose to use the high tunnels will no doubt evolve over time as they try different plants for different purposes.

High tunnels can enhance urban agriculture in the city and encourage community partnership. Building a high tunnel system on Rutgers’ owned land presents a chance to expand the partnership between the university and the community enhancing opportunities to work together and learn from each other to help develop local food systems in New Brunswick. Working in partnership enables community residents to share what they know with Rutgers faculty, staff, and students, and vice versa. This type of collaboration provides a working example of an urban gardening and education university and community partnership.

**High Tunnels in an Urban Environment**

While it is common to find private backyard gardens and community raised beds, urban agriculture in New Brunswick remains a relatively informal activity. A search of the City’s Master Plan yielded zero relevant hits for the terms: food, agriculture, produce, vegetable(s), or garden (Community Development Food Studio, Fall 2011). Presently, New Brunswick organizations like Elijah’s Promise pool volunteers and limited resources to serve thousands of meals and train individuals for careers in the food industry. Unfortunately, the capacity for Elijah’s Promise to address local food security is constrained by the amount of city land available and permitted for urban growing. Constructing a high tunnel in New Brunswick can bring together the many already-practicing urban growers and expand local knowledge around growing healthy foods, and it can serve as an example for future projects. The process of constructing a high tunnel in New Brunswick effectively shifts the community’s current urban growing practices from an informal activity to a formally approved use.
To build a structure in New Brunswick, an individual, or organization, must obtain site plan approval and construction permits. High tunnels were used in urban areas during the Great Depression to increase urban food production. In the decades since, food is grown mostly outside of cities. Today, few cities have zoning rules that facilitate urban agriculture. While many localities are changing rules to encourage urban agriculture, erecting and growing in a high tunnel still requires a tremendous amount of work to navigate local land use rules. While high tunnels are commonly classified as temporary or semi-permanent greenhouse structures, owners rarely remove and reinstall them. As such, high tunnels must be built to support wind and snow loads common to the host geographic region. In rural settings, high tunnels can be built away from public right-of-ways and adjacent structures. The structural integrity of high tunnels in rural settings will have limited implications for individual or household safety. However, in densely populated areas, the physical integrity of high tunnels, and indeed all built structures, presents significant implications for public safety. Local building departments are charged with the responsibility for reviewing structural integrity and approving the final built form. The process for obtaining building permits is separate from the process for obtaining planning and zoning approvals. Therefore, even in those urban jurisdictions where agriculture is a permitted use, urban growers looking to install high tunnels will be required to obtain building permits.

The Fall 2011 Community Development Food Studio reviewed the New Brunswick Zoning Code and the regulations governing land use. The review revealed that “agricultural research” is a “Principal Permitted Use” in the City’s “Educational Institutional Zone.” In no other instance is agriculture expressly identified as a permitted principal use. The review also revealed that greenhouses are listed as a “Permitted Accessory Use” in a number of the City’s zoning districts, including “Residential Zones” and “Commercial Zones.” As high tunnels are characterized as semi-permanent greenhouse structures, residents and commercial businesses are permitted by the New Brunswick Zoning Code to construct high tunnels as “Accessory Structures.” However, in order to construct a high tunnel as a principal structure a “use variance” from the City’s Zoning Board is required.

Identifying a Site

The process of identifying a suitable lot to construct a high tunnel for Elijah’s Promise began during the Fall 2011 Community Development Food Studio. Vacant spaces in downtown New Brunswick were considered based on their physical characteristics such as size, slope and proximity to existing urban growing operations. The vacant lot at 15 Nielson Street, across from Elijah’s Promise’s Shiloh Community Garden, was deemed physically suitable for the installation of up to ten 18’ by 40’ high tunnels. Following the research completed by the Fall 2011 Studio, the Spring 2012 Studio began its efforts by exploring the regulatory and logistical steps required to construct a high tunnel system at 15 Nielson Street.

Our first step was to correspond with the City of New Brunswick Department of Planning and Development. We learned that Elijah’s Promise would be required to apply for site plan approval to construct a high tunnel on any privately owned lot in New Brunswick. Furthermore, we learned that because agriculture is not a principal permitted use in the City’s R-6 Multifamily District a “use variance” would be required from the Zoning Board of Adjustment. Application forms for site plans and variances are available at the city’s website. In reviewing these forms we learned that variance applications typically require the participation of professional consultants, such as land surveyors, engineers, architects, planners and attorneys. While many New Brunswick officials support Elijah’s Promise’s multifaceted efforts to improve the quality of life for local residents, the current site plan and variance application processes are not suited for constructing a high tunnel as a principal lot structure. If the City Zoning Code identified
Figure 3: Growing and Growable Places in New Brunswick

Urban Ag Sites

- **Growing**
- **Growable Site**

Source: New Brunswick Department of City Planning
greenhouses as a permitted principal use, then Elijah’s Promise could submit a site plan application that met the bulk planning requirements for structure setback, size, height, etc. and not require a “use variance.” Submitting a site plan application that does not require variances can significantly limit the need for professional consultants and subsequently reduce costs associated with the application process. It should be noted that all site plan applications and construction permits require escrow fees to cover the cost of planning and construction review.

Our correspondence with Planning and Development also revealed the importance of ownership and indemnification. Applicants seeking planning approvals and construction permits must illustrate that they are applying for site improvements as the property owner or on behalf of the property owner. The lot at 15 Nielson Street is owned by The Community Builders. If Elijah’s Promise decides to contract with professional consultants and apply for a “use variance” to construct a high tunnel at 15 Nielson Street, Elijah’s Promise will need to enter into an agreement with The Community Builders. This form of agreement typically identifies the responsible party for maintaining and operating the property, the extent of liability for each party, and the length of agreement.

In light of the challenges associated with constructing a high tunnel at 15 Nielson Street we met with Elijah’s Promise to revisit the objective and consider other locations. As mentioned above, the New Brunswick Zoning Code permits the construction of greenhouses as an accessory use in the City’s residential and commercial districts. But while installing a high tunnel over the existing raised beds at Shiloh Community Garden could significantly ease the approval and permitting process, we believe this falls short of the goal to expand urban agriculture in New Brunswick. The Fall 2011 survey of growing and growable sites also identified the lot of the New Brunswick Community Farmers Market as physically suitable for adding additional growing space. The property is owned by Rutgers University and therefore it is exempt from city approvals.

**High Tunnels at the NB Community Farmers Market**

The New Brunswick Community Farmers Market is located at 178 Jones Avenue. The site consists of multiple 4’ by 8’ raised beds, a single 15’ by 90’ raised bed, and a wooden pavilion. As illustrated by the concept layout in Appendix A, the lot at 178 Jones Avenue can accommodate two 26’ by 40’ high tunnels. The concept plan was developed with assistance from the Rutgers New Jersey Agricultural Experiment Station (NJAES). The high tunnels are placed in relation to the pavilion, the raised beds, and the surrounding trees. The proposed location optimizes sunlight and wind for ventilation and is large enough to accommodate additional high tunnels in the future. There is also the potential to harvest rainwater for irrigation by designing stormwater collection systems. The concept plan was submitted to the Rutgers University Office of Facilities & Capital Planning for approval. Construction is expected to be carried out in summer 2012.
Obtaining a Quote for Materials

The materials for constructing high tunnels are simple but sizing and assembling the materials to support specific wind and snow loads requires familiarity with structural design calculations and geographic conditions. After completing a web search, we identified a vendor, XS Smith, with experience manufacturing permanent and semi-permanent greenhouse structures in New Jersey. We contacted XS Smith to provide us with an estimate for procuring materials for a 21’ by 40’ high tunnel. We received a quotation of approximately $4,500 to procure materials and a separate quote of $1,500 for XS Smith to prepare a set of permit drawings to be signed and sealed by a New Jersey Licensed Professional Engineer. Permit drawings would be required if Elijah’s Promise decided to construct the high tunnel at 15 Nielsion Street.

The initial quotation itemized materials and parts that we were unfamiliar with such as polyethylene fasteners, end wall framing and four-year clear polyethylene. The quotation also provided a number of options for doors and heating features. To make certain the quotation included materials that met with our intended application we reviewed the quote with NJAES personnel. NJAES provided guidance with regards to polyethylene fasteners, end wall framing and door options. We decided that for our application, heating was unnecessary. NJAES explained that the polyethylene film-covering functions as a barrier to ultraviolet light. The quotation identified a four-year clear polyethylene cover because the ultraviolet protection provided by the cover diminishes over time. Following correspondence with NJAES, we requested a revised quotation from XS Smith for two 26’ by 40’ high tunnels. The revised quotation is attached as Appendix B.

Next Steps

Prior to constructing high tunnels at the New Brunswick Community Farmers Market, approvals are required from the Rutgers University Office of Facilities & Capital Planning. In addition, the Rutgers University Purchasing Policy requires that all purchases between $5,001 and $40,000 be competitively bid through either a formal or informal process. To facilitate the approval and bidding processes, the Studio developed preliminary bid documents including concept layout and material specifications. The preliminary bid documents, attached here as Appendix A, should be submitted to the RU Office of Facilities & Capital Planning. The Studio anticipates that adequate information has been provided to initiate the approval and purchasing processes and looks forward to participating in construction of two high tunnels at the New Brunswick Community Farmers Market.

Successful installation of high tunnels will create opportunities to expand urban agriculture in New Brunswick. The New Brunswick Community Gardening Coalition, which includes representatives from Elijah’s Promise, Unity Square Partnership, and New Brunswick Community Farmers Market, can partner with Rutgers NJAES and faculty from Cook College to teach growing techniques to university students and local residents. University students can gain real experience in urban growing. Local residents teamed with university students and faculty members can learn new methods for growing in New Brunswick. Organized high tunnel workshops can attract students, local residents and businesses to the farmers market and stimulate trade of freshly grown, local produce.

Properly operated and maintained, the proposed high tunnel system will present a model for New Brunswick officials. Professionals from the Department of Planning and Development will have the opportunity to observe urban agriculture as a principal use in New Brunswick. Professionals from the Building Department will have the opportunity to observe the structures’ capacity for withstanding local
wind and snow loads. Constructing high tunnels at the New Brunswick Community Farmers Market will facilitate the expansion of urban agriculture and inspire community groups and city officials to replicate the model at other New Brunswick sites.

Figure 4: Rendering of the Community Learning Space at the NB Community Farm Market, Spring 2012
CD Studio
The High Tunnel Project is part of the Food Security and Community Economic Development Spring 2012 Studio at the Edward J. Bloustein School of Planning and Public Policy. The proposed High Tunnel System will be a community outreach center for urban agriculture in New Brunswick. The studio team is working with Elijah’s Promise to create a high tunnel system centered around community engagement and economic development. Urban agriculture has a variety of potential benefits to any city environment, including carbon sequestration, mitigating urban heat effects, job training, education, entrepreneurial business development, as well as food security goals.

The structure is comprised of a series of metal or PVC piping semi-circle or “hoop” shapes that are pushed into the ground or anchored to a foundation. The piping is secured directly into the ground rather than using concrete and is covered in plastic or shade cloth depending on season and growing needs. The cover provides a controlled environment using the greenhouse effect to grow anything from seedlings to permaculture. Hoop houses are well suited for the production of red peppers, basil, cut flowers, raspberries, strawberries, salad mix, baby spinach, tomatoes, melons, and, with enough vertical clearance, dwarf tree crops.

High Tunnels mitigate the risk of growing crops earlier in the season (extending the growing season by six weeks on either side) and increase harvest quality by protecting crops from extreme weather conditions such as wind, frost, sudden temperature fluctuations, and heavy storms. They protect crops from disease and pest infestation which make them ideal for producing heirloom and specialty vegetables and spices. Hoop houses isolate produce from harmful pathogens by providing a barrier to airborne contaminants and its siding can prevent contamination from soil and water runoff vectors.
Bid Specification for Two (2) High Tunnels at the New Brunswick Community Farmer’s Market

1.0 General. This bid shall consist of the purchasing and delivering of all materials necessary to construct two (2) High Tunnels at the New Brunswick Community Farmer’s Market located at 178 Jones Avenue, New Brunswick, New Jersey. For the purpose of this specification a high tunnel may be considered a semi-permanent greenhouse structure. The successful bidder shall provide all necessary Assembly Instructions and Detail Drawings. Assembly of high tunnels shall be completed by others.

2.0 Design. Each high tunnel shall be approximately 26’ x 40’, gothic roof profile, and designed to meet a snow load of 30 psf and wind speed of 100 mph, unheated. The structures shall not require foundations. The structures shall be designed to comply with the criteria for exemption from building permits per the Unified Construction Code (UCC) Sub Code for Commercial Farm Buildings. Ventilation shall be provided by manual roll-up walls with a minimum ventilation height of 6’. Double-doors shall be provided at both ends of each high tunnel.

3.0 Drawings. Detail Drawings and Assembly Instructions shall be provided by the successful bidder. Permit drawings are not required.

4.0 Materials. Materials shall meet the following.

4.1 Cover. Roof cover for gothic profile shall be single-layer, 6 mm polyethylene film with infrared barrier and condensation protection. Cover shall provide UV protection for a minimum of 4 years.

4.2 Fasteners. Wire lock side polyethylene fasteners shall be included.

4.3 End Wall Framing and Glazing. End wall framing and glazing shall be for 8 mm, clear, polycarbonate panels, and include opening for 6’ double-hinged doors.

4.4 Doors. Exterior doors shall be 6’ x 7’ double-hinged doors with built-in locks. Doors must be appropriate for outdoor installation.

4.5 Manual Roll-up Walls. Manual roll-up walls shall have a minimum ventilation height of 6’. Include manual gearbox assembly with gearbox, handle and shaft. Include webbing, buckles, post, roller guide, pipe straps, roller tube, polyethylene fasteners, and hardware. Provide wooden header if necessary. Assembly Drawings for manual roll-up walls and gearbox assembly shall be provided.

4.6 Baseboards. Provide treated lumber baseboards for (2) 26’ x 40’ high tunnels.

4.7 Foundations. Non-required.

4.8 Hardware and Other. All necessary materials, hardware, detail drawings and assembly instructions shall be provided.

5.0 Utilities. No utilities services are required.
6.0 Site Preparation. Site preparation consisting of minor grading and placement of soil shall be completed by others.

7.0 Payment. Payment shall be made on a **lump sum** basis for purchase and delivery of **all** necessary materials, hardware, detail drawings and assembly instructions required for (2) 26’ x 40’, gothic profile high tunnels. If it is determined during installation that necessary materials are missing, then the successful bidder shall be required to deliver all missing materials at no additional cost.
1. THIS DRAWING SHOWS THE APPROXIMATE LOCATION OF TWO (2) PROPOSED HIGH TUNNELS AT THE NEW BRUNSWICK COMMUNITY FARMERS MARKET, 178 JONES AVENUE (BLOCK 233, LOT 1).

2. DIMENSIONS ARE PROVIDED FOR HIGH TUNNELS AND PROPERTY LINE SETBACKS.

3. PROPERTY AND RIGHT-OF-WAY LINE ARE OBTAINED FROM CITY OF NEW BRUNSWICK TAX MAP, SHEET 83.

4. 2007 AERIAL PHOTO OBTAINED FROM NEW JERSEY GEOGRAPHIC INFORMATION NETWORK.

5. EXISTING LOT FEATURES BASED ON MARCH 2012 SITE VISIT.

6. PROPOSED HIGH TUNNELS SHALL NOT REQUIRE UTILITY SERVICES.
Appendix B: XS Smith Revized Quote

FOR: Elijah's Promise
  Attn: Michael Cassidy
  New Brunswick, NJ 08901

  Tel:
  Fax:
  Email: mike.cassidy1023@gmail.com

QTY  UNIT PRICE  TOTAL

STRUCTURE
2  Sun King Plus Wire Lock 26' x 40' Freestanding Greenhouse $ 2,899.20   $ 5,798.40
   consisting of:
   • Gothic Roof Profile
   • 1.315" O.D. Ridge
   • 1.315" O.D. Purlin; 1 run per side of ridge
   • 1.660" O.D. Bows; 4' on center
   • Double Spline Mounted on End Bows
   • 1.900" O.D. x 50" Posts; 4' on center
   • Sun King 26 W-Truss Sets; 4' on center, excluding end bows
   • Wire Lock Side Polyethylene Fasteners Included
   • Plated Steel Hardware
   • Assembly Instructions and Drawing
   • Customer to provide 2" x 10" wooden baseboard
   • House designed to meet 30lb snow load and 100mph wind speed
     for unheated structure, single layer poly, and non-public access

4  Sun King 26 Endwall Framing and Glazing Package for 6' 8mm Polycarbonate Panels $ 765.75   $ 3,063.00
   • Includes double door openings (1 per end)
   • Does NOT include equipment openings

DOORS: Various sizes available. Doors listed used as reference.
2  6' x 6'-8" Double Hinged Door $ 533.65   $ 1,067.30
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COVERING: Single Layer 6mil 4 Year THERMAL Polyethylene Film
Top (1): 38' Ground-Ground Distance (approximate)
  2  42' x 100' 6mil 4 Year THERMAL Poly SHEET $ 414.45  $ 828.90

COVERING- 8mm Twinwall Clear Polycarbonate Panels
End Walls (2)
  8  71-1/2" x 8'-0" Clear Panels $ 58.80  $ 470.40
  8  71-1/2" x 11'-0" Clear Panels $ 80.85  $ 646.80
  4  71-1/2" x 12'-6" Clear Panels $ 91.90  $ 367.60
  1  Crating Charge $ 120.00  $ 120.00

VENTILATION
  4  3/4' x 40' Manual Roll Up for 1.660" Bow, Freestanding House $ 351.45  $ 1,405.80
    • Includes manual gearbox assembly with gearbox, handle and shaft
    • Includes webbing, buckles, post, roller guide, pipe straps,
      roller tube, poly fastener, hardware, and assembly drawing
    • Customer to provide 2" x 8" wooden header

HEATING: N/A
BENCHES: Various options available
INSTALLATION: By customer

MATERIALS TOTAL $ 13,768.20
NJ Sales Taxes are NOT Included and May be Applicable

OPTIONS
VENTILATION
  2  3' x 40' Manual Roof Vent $ 1,106.25  $ 2,212.50
    • Includes manual gearbox assembly with gearbox, 6'-6" hand crank and shaft adapter
    • Customer responsible for any field modifications required, including folding of polyethylene film to fit in vent extrusion

SHIPPING / DELIVERY- Based on commercial delivery.
  XSS Shipping Estimate FOB NC Factory to Zip Code 08901 $ 1,070.00
  Polyethylene Shipping Estimate to Zip Code 08901 $ 140.00
  Polycarbonate Shipping Estimate to Zip Code 08901 $ 260.00

PRODUCT AVAILABILITY
Currently 4 weeks from receipt of deposit

Page 2 of 3
TERMS
1/3 deposit required. Balance prior to shipping. Major credit cards and personal checks accepted. Quote valid for 15 days

ADDITIONAL PROJECT CONSIDERATIONS BY CUSTOMER

PERMITS: For all building
GRADING: Of proposed project site to level
STONE: For grading area and inside greenhouse
LUMBER: For baseboards and framing, if wooden
CONCRETE: For end wall studs, if needed
ELECTRICAL: For all equipment
HEATING: Services and all connections
PLUMBING: For watering
APPENDICES

DEFINITIONS

Aggregation – the movement and organization of moving the produce from the farms to a central location

Active coordination – a full time management position which organizes all activities between value chain participants (these are the producers, processors, distributors, and buyers) to ensure that everything is completed in a timely, efficient manner (USDA: Regional Food Hubs, 2011).

Auction market – a method of food distribution by which individuals or organizations can buy from hundreds of farmers through a bidding process

Co-packer - the client will provide the recipe for a product and the co-packer will provide the resources, most importantly a facility and labor

Cold line processing – post-harvest processing, including washing, grading and packaging of produce

Cold storage - post-harvest handling of produce and its packaging

Community food hub – provide the same core activities as food hubs but they also seek to develop community economic development and community food security outcomes

Community Supported Agriculture (CSA) – a group of individuals who pledge support to a farm operation. Members or "share-holders" of the farm or garden pledge in advance to cover the anticipated costs of the farm operation and farmer's salary and are paid in return with shares of the farm’s produce throughout the growing season (National Agricultural Library: CSA, 2012)

Consumer food hubs – online buying clubs that connect consumers with producers. Also called a “virtual hub”, groups of consumers operate as the aggregator and distributer

Distribution – the process of moving goods and services from one location to another using some form of transportation

Food economy – The entire food industry including the economic effects of growing food, processing food, distributing food, food sales, either wholesale or retail, and food service.

Food hub – A business or organization that actively manages the aggregation, distribution, and marketing of source-identified local and regional food products primarily from small to mid-sized producers to wholesalers, retailers, and/or institutional buyers (USDA: Overcoming Barriers, 2012).

Gleaning – the collection of crops from farmers’ fields that have already been harvested or on fields where it is not economically profitable to harvest

Greenmarkets – an open-air market that sells farm fresh produce and products to consumers

Mid-sized farmer – a farmer with a gross income of up to $750,000 yearly (USDA: Value Added Grant, 2011)
COMMUNITY FOOD SECURITY AND ECONOMIC DEVELOPMENT

Non-profit food hub – organized by a nonprofit organization. Non-profit food hubs assist small and medium-scale producers by providing them with distribution and marketing services and opportunities to create new wholesale market

Permanent facilities – a permanent structure that houses the different services, processes, and storage of the produce before it is sold

Processing facilities - a facility that allows access to certified equipment and possible storage for processing of raw produce. Many different models exist from shared kitchen use to business incubation

Producer food hubs – either individual or group of producers, that carry out their own aggregation and distribution functions instead of relying on a third party

Restaurant Supported Agriculture (RSA) – works the same way as a CSA except that restaurants pre-pay their share of the produce, bringing an immediate revenue to the farmers (Klemperer, 2009)

Retail-driven food hubs – retailers work with networks of farmers to supply seasonal produce and other food products to local grocery stores, restaurants, buying clubs or cooperatives

Small-sized farmer – A farmer with less than $250,000 gross receipts, annually (National Agriculture Library: Small Farms, 2012)

Value-added product – transforming raw produce into another product, which is sold for higher than the commodity price. An example is tomatoes used for salsa, sauces of ketchup

Virtual food hubs – see consumer food hubs
ACRONYMS

CEZ – Cumberland County Federal Empowerment Zone

CFH - Community Food Hub

CRDA – Casino Redevelopment Authority

CSA - Community Supported Agriculture

CSB - Community Supported Bread program

CSM - Community Supported Meal program

EMC - Eastern Market Corporation

FAH - Farmers Against Hunger

FFS - Fresh Food Share

FIC – Rutgers Food Innovation Center

LSA - Locally Supported Agriculture

NB - New Brunswick

NBCFM - New Brunswick Community Farmers Market

NBCGC - New Brunswick Community Gardening Coalition

NBIA – National Business Incubation Association

NJAES – New Jersey Agricultural Experiment Station

NJDA - New Jersey Department of Agriculture

NJBIN – New Jersey Business Incubation Network

OFC - Oklahoma Food Cooperative

RAH - Rutgers Against Hunger

RSA - Restaurant Supported Agriculture

USDA - United States Department of Agriculture
WORKS CITED

HIGH TUNNELS


Jett, Louis W. 2004 “Production of tomatoes within a high tunnel.” Department of Agriculture: University of Missouri.


IMAGE CREDITS


HIGH TUNNELS


