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## The Kuujjuaq Greenhouse Project: Developing a New Type of Northern Food System

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### Abstract

Inuit villages in Nunavik currently face complex social challenges as well as food security issues related to the availability, quality, and cost of fresh fruit and vegetables. In order to address these issues, research is being conducted on the development of a greenhouse-based, local food system model that could adequately respond to the social, economic and environmental needs of modern Inuit society. Since 2009, researchers, government bodies and community stakeholders have been facilitating and documenting the development of a greenhouse pilot project in Kuujjuaq, Nunavik, and, during the summer of 2011, a number of successful horticultural micro-projects were implemented.

### Keywords

Greenhouses; Nunavik, Inuit; Local Food; Arctic Sustainable Development.

### Résumé

Les villages inuit du Nunavik sont présentement confrontés à de nombreux défis sociaux de même qu'à une grande insécurité alimentaire liée à la disponibilité, à la qualité et au coût des légumes et des fruits frais. Pour répondre à ces problèmes, la recherche se penche sur le développement d'un système alimentaire local, basé sur la culture en serre, qui répondrait adéquatement aux besoins sociaux, économiques et environnementaux de la société inuit moderne. Depuis 2009, chercheurs, instances gouvernementales et acteurs communautaires ont contribué au développement d'un projet pilote de culture en serre à Kuujjuaq, au Nunavik, et ont documenté sa mise sur pied. Plusieurs micro-projets d'horticulture ont ainsi été implantés avec succès à l'été 2011.

### Mots-clés

Culture en serre; Nunavik; Inuit; aliments locaux; développement durable de l'Arctique.

### Resumen

Los pueblos inuit de Nunavik se enfrentan actualmente a muchos retos sociales, así como a una gran inseguridad alimentaria ligada a la disponibilidad, la calidad y el precio de las verduras y frutas frescas. Para abordar estos problemas, la investigación se centra en el desarrollo de un sistema local de alimentos, basado en el cultivo en invernadero, que respondería adecuadamente a las necesidades sociales, económicas y ambientales de la sociedad moderna Inuit. Desde 2009, investigadores, organismos gubernamentales y organizaciones comunitarias han contribuido al desarrollo de un proyecto piloto de cultivo en invernadero en Kuujjuaq, Nunavik, y documentado su desarrollo. Varios microproyectos de horticultura se han implantado con éxito en el verano de 2011.

### Palabras claves

Cultivo en invernadero; Nunavik; Inuit; alimentos locales; desarrollo sostenible del Ártico.



## INTRODUCTION

Rapid “modernization” in the Arctic over the last several decades has brought about significant changes in the Canadian North. Inuit villages in Nunavik currently face complex social, economic and environmental challenges as well as food security issues related to the availability, quality, and cost of fresh fruit and vegetables. The research presented in this paper seeks to address these issues by asking the question: “Can a new type of local food system—based on the principles of ecological design—lead to the creation of greater food security in northern communities while simultaneously contributing to the reinforcement of community capacity?”

The dominant theme of this research is sustainable development in remote communities, and, within this framework, the concepts of local food, ecological design, and community capacity building in the Canadian North are being studied in detail using an action research methodological approach. More specifically, this research focuses on the development of a greenhouse pilot project in the Inuit village of Kuujjuaq, with the end goal being the creation of a northern agricultural model via the co-production of knowledge with local research partners.

The territory targeted by this research is the Canadian North, with a particular focus on Nunavik, the Arctic region of the Province of Québec (for a map of Nunavik, see Figure 1). There are presently over 10,000 Inuit in Nunavik (and approximately 1,000 non-Inuit) living in 15 villages along the Ungava Bay, Hudson Strait and Hudson Bay coastlines (Makivik Corporation 2012). These communities are situated between 1,000 and 1,900 kilometres from Montreal, and since there is no road network connecting these communities to each other, nor to the South, year-round air service and seasonal maritime service are the principal modes of transport in Nunavik (Makivik Corporation 2012).

The fieldwork portion of this project is taking place in the village of Kuujjuaq, the administrative centre of Nunavik (see Figure 1). Kuujjuaq is the ideal place to conduct this research, as it is the largest settlement in the region (with a population of 2,300) and a critical transportation and information hub. Modern-day Kuujjuaq can be characterized as a thriving, rapidly growing village with a population that takes pride in traditional Inuit culture and local initiatives. Kuujjuaq is a dynamic northern community that has the ability to successfully combine modern innovations with traditional mores.

FIGURE 1: MAP OF NUNAVIK



Source: <http://www.makivik.org...>

## 1. CONTEXT

Given the constraints imposed by the location of their settlements, populations in Arctic communities have difficulty procuring fresh produce that is regularly available, of acceptable quality, and reasonably priced (Chan *et al.* 2006, Willows 2005, Caulfield 2002). As well, Blanchet and Rochette (2008) note that in Nunavik the overall consumption of fruit and vegetables is generally low, and the results of a study done in Nunavut suggest that increased food security could be gained through better access to cheaper, higher quality market food—especially fruit and vegetables (Chan *et al.* 2006).

In response to the lack of accessible, appealing fresh produce, several communities in the Canadian Arctic have developed greenhouse projects over the last decade. The most prominent among these are the Iqaluit Community Greenhouse and the Inuvik Community Greenhouse. Other examples of northern greenhouse initiatives include the following: a small commercial operation in the community of Narsaq in South Greenland; a community greenhouse in Little Salmon, Carmacks First Nation (Yukon); greenhouse research activities in Whapmagoostui-Kuujuarapik (Nunavik), on Devon Island (Nunavut), and in Qaqortoq (South Greenland); and a series of commercial greenhouse operations of varying sizes and scales in Finland, Iceland and Alaska (USA).

While farming has never been considered a traditional activity among Canadian Inuit, there are a series of historical precedents for agriculture in Nunavik. For example, a number of small greenhouses were built by missionaries and Hudson's Bay Company employees in the past, and there were also several government-funded experimental projects (i.e. small-scale muskox and chicken farms at Old Fort Chimo). As well, over the years, Kuujuaamiut (residents of Kuujuaq) have built and maintained a number of small garden plots, cold frames and modest private greenhouses where vegetables and flowers are grown.

The municipality of Kuujuaq already has a small greenhouse that currently shelters a seasonal community garden. Unfortunately, this volunteer-dependent initiative currently lacks the resources needed to reach its full potential. Recently, however, a number of organizations working at the local, regional and provincial levels have demonstrated interest in concretely backing a pilot project that would involve not only improving and expanding this greenhouse, but also developing several other associated horticultural micro-projects. This pilot project is envisioned by the promoters as the first step in

a budding regional "agro-food development strategy," a strategy that could eventually involve the setting up of other greenhouse projects which could be developed and tailored specifically to meet the needs of individual northern communities.

It is important to note that, while the majority of municipalities in the Canadian Arctic face considerable challenges associated with obtaining good quality and reasonably priced fresh fruit and vegetables, this is not entirely the case in the village of Kuujuaq. When residents and local leaders were interviewed regarding their perceptions of greenhouse-based food production systems in 2009, it was discovered that, while the idea of producing fresh food locally was acceptable, and even desirable, it was the potential social benefits that a greenhouse project could have in the village that generated the most interest.

## 2. PRINCIPAL CONCEPTS USED TO DEVELOP AND MOBILIZE THIS RESEARCH

### 2.1 Local food movement

The local food movement is a social phenomenon that is gaining more ground worldwide each year. At the root of this movement are initiatives that are often referred to as either Community-based Food Systems (CFSs) or Local Food Systems (LFSs). Collectively, these initiatives are understood to be collaborative efforts to build locally-based food systems and economies (Peters 1997). The term "local food" is often used to refer to food produced near its point of consumption in contrast to the modern/dominant mainstream food system (Deverre and Lamine 2010). While for many the concept of local food may be new, it is important to underline that this concept is essentially a resurgence of old ways, moulded to fit new realities. As well, when local agriculture and food production are integrated into a community, food becomes part of the community's problem-solving capacity rather than just a commodity that is bought and sold (Heller 2005).

While for Canadians living in the South, the concept of local food may still be new, to those living in the North, it is a concept that has always been part of the Inuit way of life. Traditionally, Inuit have always relied on what is essentially a local food system: food harvested from the land. It is only in recent decades that food imported from elsewhere has come to play an important role in the average northern diet. Since LFSs present many similarities to Inuit food systems, it is therefore not inconceivable that a new (modern) type of local food system—centred on the production of what are commonly termed “market foods” in the North—could mesh well with traditional Inuit ways of creating food. Within this cultural framework, a new mode of local food production (northern horticulture) could also be seen as a way to sustainably augment the carrying capacity of the land to adequately support the rapidly growing population of Nunavik.

## 2.2 Ecological design

Ecological design is an emerging movement that employs “nature’s operating instructions” in the design of sustainable anthropocentric systems. As defined by John Todd and Nancy Jack Todd, ecological design is “design for human settlements and infrastructure that incorporates principles inherent in the natural world in order to sustain human populations over a long span of time; adapting the wisdom and strategies of the natural world to human problems” (Jack Todd 2005: 161). Van der Ryn and Cowan (2007: 33) refer to ecological design as “any form of design that minimizes environmentally destructive impacts by integrating itself with nature’s processes,” and Orr (2002: 20) describes ecological design as “the careful meshing of human purposes with the larger patterns and flows of the natural world and the study of those patterns and flows to inform human action.” Within the context of this research, it is important to underscore the fact that all of the abovementioned definitions contain elements that are consistent with Aboriginal ways of

viewing the human/nature interrelationship. As well, ecological design also regularly incorporates traditional knowledge into modern production systems. According to Todd, Doshi and McInnis (2010: 8), the end goal of ecological design is to create vibrant, diversified economies that are founded on principles of environmental stewardship, sustainable development, and social justice. These objectives and principles are all elements that have been identified as being among the essential components and goals of the Kuujuaq greenhouse pilot project.

## 2.3 Community Capacity Building

Community Capacity Building, commonly referred to as CCB, is a process whereby local partners add value to communities. It is about developing the capacity of communities to respond to their own challenges and opportunities (DITRD 2012). The heart of capacity building is people, and capacity is simply the ways and means needed to do what has to be done (Frank and Smith 1999). In a document produced for the Arctic Council Sustainable Development Working Group, Gregorich states that: “Capacity building is making sure that individuals, communities, businesses, industries, institutions, governments, and other organizations, have the information, knowledge, and skills they need to solve today’s problems and adapt to change in a way that protects resources for future generations” (2004: 4). Capacity, or lack thereof, is reflected in the people, economy, environment, culture, attitude and appearance of the community (Frank and Smith 1999), and includes attributes that empower a community to effect social change (Fletcher, McKennitt and Baydala 2007).

## 3. OBJECTIVES AND HYPOTHESIS

The general objective of this research, which is based on an action research approach, is to develop a community-based northern agricultural model that addresses the food security needs, social challenges, and environmental issues of Arctic communities in a sustainable,

culturally appropriate manner. The specific objective of this project is to participate in and document the development of the greenhouse pilot project in Kuujuaq, and, through this process, to develop potential alternatives to the current food system in Nunavik.

The working hypothesis underpinning this research is that a new type of greenhouse-based local food system in Nunavik can be a sustainable, culturally appropriate initiative (that can contribute to community capacity development) if it is informed by ecological design, grounded in Inuit praxis, and developed in a manner that meets the distinctive current and future needs of Inuit communities.

#### 4. METHODOLOGY

It is important to note here that this research focuses on one particular community in Nunavik, and that the protocol and methodology are site specific. It is also important to mention that the greenhouse project is in fact the motor that is driving this action research, and that this work is not only an academic exercise, but also an initiative that will lead to the creation of concrete, practical knowledge as well as permanent infrastructure in the community of Kuujuaq. This initiative, structured around an academic research project, is not only a tool for knowledge creation, but will also concretely respond to the needs of the community of Kuujuaq in a context where it is imperative to respond and adapt effectively to change.

The academic paradigm within which this research is being elaborated is that of Community-Based Participatory Research, a type of action research that is often referred to simply as "CBPR." The Harvard Clinical and Translational Science Centre (2012) defines CBPR as "[...] an emerging orientation to research which involves scientific inquiry that equitably involves both community stakeholders and investigators at all levels of the research process from design to

dissemination. CBPR involves a partnership between the community and the investigator(s) where each group shares equal ownership of the process and products of research collaboration."

Most often applied in the fields of public health and social work, CBPR methodology has emerged over the past several decades as an alternative research paradigm that combines education and social action (Wallerstein and Duran 2006). This innovative, flexible and adaptable orientation to research, built upon foundations laid by Paulo Freire and Kurt Lewin (Israel *et al.* 2001), focuses on relationships between academic and community partners where principles of co-learning, mutual benefit and long-term commitment are prioritized. As underscored by Israel *et al.* (2001), CBPR is a partnership approach to research that equitably involves community members, organizational representatives and researchers in all aspects of the research process.

Consistent with, and complementary to, the CBPR approach is the concept of Inuit Qaujimaqatunangit. Often simply termed "IQ," this concept also plays a fundamental role in this research process. IQ is essentially traditional knowledge that is consistent with the beliefs, customs, values and the language of Inuit; it is a long-standing code of behaviour based on time-honoured values and practices (Government of Nunavut 2012).

Drawing inspiration from CBPR and IQ methodologies, research in the community of Kuujuaq has so far involved closely following/monitoring the development of the greenhouse pilot project. To date, the majority of the information presented here has been collected using a participatory approach whereby the author spent several months in the community actively working on the development and mobilization of the aforementioned pilot project. Continued contact with all of the project stakeholders, to



continue to further expand this initiative, has also provided unprecedented opportunities for qualitative data collection.

## 5. PROJECT DEVELOPMENT AND RESULTS OF THE KUUJJUAQ GREENHOUSE PROJECT PHASE 1 (2011)<sup>1</sup>

### 5.1 Project development

During the summer of 2011, many advances were made in the development of the Kuujjuaq Greenhouse Project. In late spring and early summer, community members began planting their garden beds in the existing greenhouse, and plans to develop other horticultural micro-projects associated with the greenhouse began to take shape. Over the course of the summer of 2011, the community of Kuujjuaq put in place many of the different aspects of the greenhouse project that had been on the table since the initial research (funded by the Quebec Horticultural Council) began in 2009. To date, there are eight horticultural micro-projects: five actively in operation, and three in the process of emerging. The five active projects are: 1) the community garden in the existing greenhouse; 2) a composting project with the two local food stores; 3) a horticultural therapy project with the “Supervised Apartments” (a community home for people with mental health issues); 4) a potato test bed in collaboration with the Quebec Horticultural Council and Progest (a potato research centre); and 5) the planning of the construction of a second greenhouse. The three emerging projects are: 1) youth employment and training with Youth Employment Services; 2) curriculum development with the Kativik School Board; and 3) hydroponic trials. The Regional and Local Development Department of the Kativik Regional Government funded the

development of all of these initiatives. The Northern Village of Kuujjuaq (which owns and maintains the existing greenhouse) administered these funds and also contributed financially and “in kind” to the project.

One aspect of Phase 1, to which a significant amount of time and energy was allotted in 2011, was the creation of “The Kuujjuaq Agricultural Project Steering Committee.” This organizational body (which would oversee the development and implementation of the eight individual micro-projects previously identified) has yet to be officially put in place, but all of the groundwork has been done, including confirmation of the organizational structure by the principal stakeholders and the writing of a draft set of committee by-laws. In this organizational model, the steering committee would be made up of representatives from the Regional and Local Development Department of the Kativik Regional Government, the Northern Village of Kuujjuaq, Université Laval, the eight executive committees (representing each of the eight micro-projects), and representatives of local and regional organizations that have a vested interest in the development of bio-food and/or community projects in Kuujjuaq and Nunavik. These could include Makivik Corporation, the Kativik Environmental Advisory Committee, the Nunavik Regional Board of Health and Social Services, and representatives from the Nayumivik Landholding Corporation and Kuujjumiut Inc.

On another note, it is important to mention that, while the Kuujjuaq Greenhouse Project is essentially a community project, its development is being closely watched by two groups of observers/supporters. These groups are the Nord-du-Québec Bio-Food Network (an association of Inuit, Cree and Jamesian organizations), and the “Bio-food Sector” of the Québec Government’s “Plan Nord” program. These two groups have pledged support for the Kuujjuaq project and have become important partners in the long-term development of this initiative.

<sup>1</sup> At the time that this document was written, this research was still ongoing; as such, the results presented here can only be considered partial or preliminary. That being said, the data obtained thus far are significant in that they prove that there exists a real interest in this type of initiative, and that from a technical perspective the development of all aspects of this project is entirely feasible.

The following subsections will provide overviews of the results achieved to date in the development of the eight micro-projects that form the foundation of the Kuujuaq Greenhouse Project.

## 5.2 Results of Phase 1 of the Kuujuaq Greenhouse Project

### 5.2.1 Existing garden

The existing greenhouse in Kuujuaq is home to a community garden that has been operating for approximately twenty years. While the garden has no official group or organizational body responsible for its day-to-day operations (i.e. membership/waiting list, distribution of garden beds, etc.), it has operated well enough in the past through the sustained efforts of a few dedicated community members. As well, the Northern Village of Kuujuaq takes care of all of the building maintenance, ensures an adequate supply of water and electricity, and also insures the building.

During the summer of 2011, much effort went into developing a basic organizational structure for the creation of a “greenhouse committee,” and, to this end, many seemingly mundane, but essential, tasks were accomplished. For example, a list of all of the gardeners with their contact information was produced; the garden beds were all attributed numbers, and plastic number tags were affixed to the walls of the greenhouse above the individual beds; and a “greenhouse map” with the names of all of the gardeners matched to their beds—an essential tool for many administrative tasks—was created. As well, a meeting was held on August 24, 2011 to discuss the formation of a future “greenhouse garden committee” that would be responsible for overseeing the general operations of the community garden. Following the meeting, the minutes were sent out in order to collect feedback from the gardeners and other stakeholders. The Iqaluit Community Greenhouse Society was also contacted for advice on how to move forward with the task of

creating a committee. The next step in the Kuujuaq Greenhouse Project will be to hold a meeting (a type of “Founding General Assembly”) with all of the gardeners in order to set up the committee and to plan for upcoming seasons.

On a more practical note, a number of repairs to the greenhouse were completed during the summer of 2011. The “fan-jet” ventilation system was relocated, the roof louvers (an essential component of the automatic ventilation system) were repaired, and the plumbing system was retrofitted and repositioned to make it more easily accessible for all users. As well, a number of new garden tools (shovels, rakes, pitchforks, hand tools, etc.) were purchased for communal use in the greenhouse.

During the summer of 2011, a significant amount of time and energy also went into the collection of data pertaining to the types of crops grown in the greenhouse. Data collection sheets were created, and all of the gardeners were invited to supply details pertaining to their vegetables (i.e. cultivar, date seeds sown, use of fertilizers, and total weight of harvest). The overall goal of this part of the project was to determine which crops and cultivars grow best in the greenhouse—data that will be very useful in the future for planning other projects, and that will be immediately useful in the short term for gardeners wanting to plant the most appropriate crops for Kuujuaq. As well, data pertaining to vegetables, the local weather, and temperatures inside the greenhouse were also recorded on a daily basis, and soil tests were begun on the garden beds. It is worth noting that, from late July to mid-August, temperatures regularly soared to above 30 degrees Celsius in the greenhouse, and occasionally even surpassed 40 degrees.

Table 1 provides a summary of the findings, based on data collected in the Kuujuaq greenhouse during the summer of 2011.

**TABLE 1: SUMMARY OF KUUJJUAQ GREENHOUSE CROPS – 2011**

<b>Best Crops:</b> Were easy to grow, did well and produced a significant volume in a small space	<b>Good Crops:</b> Were easy to grow and did very well	<b>Possible Crops:</b> Were possible to grow, but often required an early start at home, and/or did not produce all that well (either quality or quantity)
<ul style="list-style-type: none"> <li>- Lettuces</li> <li>- leaf</li> <li>- romaine</li> <li>- arugula</li> <li>- chicory</li> <li>- mixed greens</li> <li>- mizuna</li> <li>- tah-tsai</li> <li>- Spinach</li> <li>- Swiss Chard</li> <li>- Herbs</li> <li>- parsley</li> <li>- coriander</li> <li>- basil</li> <li>- oregano</li> <li>- chives</li> <li>- dill</li> <li>- mint</li> </ul>	<ul style="list-style-type: none"> <li>- Radishes</li> <li>- Potatoes</li> <li>- Carrots</li> <li>- Beets</li> <li>- Onions</li> <li>- Zucchini</li> <li>- Bok Choi</li> <li>- Peas</li> <li>- Beans</li> <li>- Shallots</li> </ul>	<ul style="list-style-type: none"> <li>- Tomatoes</li> <li>- Cherry Tomatoes</li> <li>- Cucumbers</li> <li>- Peppers</li> <li>- Ground Cherries</li> </ul>

The overall conclusion is that crops that enjoy relatively cool temperatures do very well—hence the prolific production of lettuce and herbs (see Figure 2). One interesting result that emerged from the data was the fact that it was possible to continue harvesting certain varieties of lettuce, spinach and herbs well after the temperature had begun to dip below 0 degrees Celsius at night. The first “minus 1 degree” of the season was recorded on September 5, and the last peas were harvested on September 15, the last parsley on October 2, and the last lettuce and spinach on October 6.

It is also interesting to note that in some cases a small number of plants have the potential to yield a significant volume of produce by the end of the season. For

example, 6 lettuce plants (cultivar: Grand Rapids) yielded 7.1 kg over the course of the summer; 6 spinach plants (cultivar: *Tetragonia tetragonioides*) yielded 4.25 kg; and a one-metre-long row of densely planted radishes yielded 1.27 kg as early as July 21. As well, zucchinis grew to sizes worthy of any garden in southern Québec!

Overall, the 2011 garden season proved to be very successful. Significant advances were made in the steps taken toward creating a greenhouse committee, and the majority of the gardeners were happy with the results that their garden beds yielded. The data that were collected with the assistance of the gardeners served to back up anecdotal evidence regarding the types of crops that do well in the greenhouse, and many of the



technical problems with the greenhouse structure were addressed.

**FIGURE 2: KUUJJUAQ COMMUNITY GREENHOUSE – JULY 2011**



Photo: Ellen Avard

### 5.2.2 Compost collection

Creating compost has been on the minds of those involved with the greenhouse since the beginning of this project. The reason for this stems primarily from the need to address the lack of useable soil in Kuujuaq; the locality is characterized by mostly sandy and rocky substrate. In the past, gardeners have had to order bags and palettes of soil from the South—with some having incorporated as much as \$1,000 worth of potting soil into their individual garden beds. Over the summer of 2011, a composting pilot project was put in place to test the feasibility of composting on a relatively large scale. To this end, a composting site was constructed (using

predominantly reclaimed materials) next to the greenhouse, and a small ATV trailer was purchased to help collect vegetable waste from the two food stores in the community.

Store managers and produce managers at both Newviq'vi and Northern Stores were very willing and eager to participate, in noting that it was a very positive means of reducing waste, as well as a way to contribute to the community. After having purchased new, clean garbage pails to collect the vegetable waste in the storerooms—keeping the waste “odour free” and “bug free” was an important consideration, given that it was to be stored temporarily in food preparation areas—and having agreed upon a schedule with the produce managers, volunteers collected the waste three times a week for a period of two and half months, i.e. from August 2 through to October 14.

When creating compost, it is necessary to combine a source of carbon (dry/brown organic material) with the wet/green vegetable waste for proper bacterial and chemical decomposition to occur. In the South, carbon is often added to compost piles in the form of leaves; this resource is however very scarce in Kuujuaq. To meet the carbon needs in the Kuujuaq compost pile, shredded office paper (also a tree-based product) was substituted. The office paper was obtained with the help of the Kativik Environmental Advisory Committee (KEAC), an organization that has been keen on observing the progress of the greenhouse project because of its obvious bent toward sustainable development. The KEAC was quick to underline the fact that composting not only is a means of creating a very rich type of soil, but could also be a very effective way to reduce waste in Nunavik communities—communities that are increasingly interested in evaluating new methods of diverting waste from their landfill sites.

A data collection log was created for this pilot project, and information pertaining to the

amount of vegetable waste collected as well as the amount of paper, water and compost accelerator used to build each new weekly pile was recorded each collection day. Notes pertaining to humidity levels and pile temperatures were also recorded, as were the dates when the weekly piles were turned. In sum, an average of approximately one medium-sized (75-litre / 25-gallon) garbage pail of vegetable waste was collected per day, and this waste, collected over the summer, has yielded approximately 1 cubic metre of useable compost that will be incorporated into the greenhouse garden beds in the spring of 2012.

As a complement to this larger pilot project, two small compost bins were also constructed adjacent to the greenhouse in order to address the desire of many gardeners (and other Kuujjumiut) to compost their household food scraps and waste plant material from the garden beds. Several individual household compost bins (built by enthusiastic northern gardeners) were observed throughout the summer as well, in order to learn from the residents' experience. Finally, a small-scale (household, under-counter) vermicomposting experiment was also launched this summer and produced some very positive (albeit short-term) results. This positive outcome is consistent with anecdotal evidence gained from several residents who have been composting with this type of worm-based system in the North for a number of years.

Finally, discussions with the management of the hospital cafeteria and the restaurant at the Kuujjuaq Inn have shown a real interest on their part in participating in the composting project as well. These multiple aspects of the compost pilot project illustrate the fact that there is a genuine interest in the community in this type of initiative—an initiative that responds not only to a need for soil creation for gardeners, but also to environmental concerns as well.

### **5.2.3 Supervised Apartments**

The Supervised Apartments are essentially a group home for men and women living with mental health issues in Kuujjuaq. In the fall of 2010, the manager of the Apartments inquired about the possibility of mounting a small project to introduce gardening to the residents of the home, and, in July 2011, plans began to take shape for a small indoor garden.

Using the concept of “horticultural therapy” as a jumping-off point, a simple project using indoor window boxes was designed. All the materials and seeds (fast-growing lettuces and herbs) were ordered, and upon reception of these at the end of August, the first boxes were planted and installed on the window sills in the Apartments. As well, data collection sheets were also created to collect the same types of data that were noted in the greenhouse (cultivar, date seeds sown, total weight of harvest). Of the nine residents, two actively participated in the planting, and four others watched; there seemed to be a genuine interest in and curiosity about the project.

Future plans for the Supervised Apartments include constructing a shelving unit on a sunny wall in one of the living rooms to maximize growing space, and installing window boxes on the outside of the home to grow flowers such as nasturtiums (which are fast-growing, hardy, and edible). Also, there is an ideal location in front of the Apartments where a few small cold frames could be constructed and used for growing other types of vegetables and/or flowers.

### **5.2.4 Potato production**

Since the beginning of the greenhouse project study in 2009, it was clear that potatoes were among the most consumed vegetables in the North. So it comes as no surprise that there is a great deal of interest in exploring the possibility of producing potatoes in Kuujjuaq, something that a

number of intrepid local gardeners have already proven is possible in the sandy soil around town. To this end, with the help and advice of the Quebec Horticultural Council and two bags of seed potatoes donated by Progest (a potato research centre in southern Québec), preliminary trials were undertaken in the greenhouse this summer.

Two experimental varieties were planted on July 20, and, for the purpose of data collection, they were labelled “Variety 1” (V.1) and “Variety 2” (V.2). In the “Variety 1” bag, there were 20 big potatoes and 17 small potatoes that were planted (two rotten ones were discarded). In the “Variety 2” bag, there were 10 big potatoes and 110 small potatoes that were planted (one rotten one was discarded). The first shoots began to appear on July 28 (V.1) and July 30 (V.2), and by August 11, the V.1 plants had an average of 5 leaves and were approximately 25 cm high. On the same date, the V.2 plants had an average of 4 leaves and were approximately 25 cm high as well. Overall, the V.1 plants were slightly bigger and heartier than the V.2 plants at this stage. By August 21, the V.1 plants had an average of 6 leaves, and the V.2 plants an average of 5 leaves. By August 29, the V.2 plants had surpassed the V.1 plants in height, but they began showing signs of “leggy-ness.” By August 30, the first flowers began to appear on the V.2 plants, and the V.1 plants followed several days later. Fertilizer (20-20-20: 50 grams in 5 litres of water) was applied to both varieties on August 9, 19, and 25, and on September 1.

The potatoes were harvested on October 8—80 days after having been sown. The potatoes were of very acceptable size and generally of good quality; it was however impossible to evaluate the total weight of the harvest because a large number had been stolen! 3.85 kg of V.1 potatoes were left in the bed and 4.1 kg of V.2 potatoes. However disappointing it may be to not see the final results of this experiment, if we look at this

from another angle, it seems that potatoes are a hit in Kuujuaq, and this can only serve to positively reinforce future plans for outdoor field trials.

### **5.2.5 Construction of a new greenhouse**

One of the main problems at the existing greenhouse in Kuujuaq is that there is just not enough space—there are more people interested in gardening in the greenhouse than there are garden beds available: hence the interest in the community regarding the construction of another structure. Since this is such a big undertaking, it was initially thought that it would be several years before plans for a second greenhouse could be envisioned. However, during the summer of 2011, the Municipal Public Works Department of the Kativik Regional Government came forward with an offer to finance 80% of the cost of a new greenhouse. This department would also be able to undertake all aspects of project management associated with this endeavour.

Some of the main elements that need to be addressed in the near future include: getting final approval for this project from all of the different levels of government as well as from local administrative bodies such as the Landholding Corporation; the remaining 20% of the financing must be secured; the possible re-use of the greenhouse frame that was formerly used at the old swimming pool has to be evaluated; the different types of foundation “pads” that could be used must be researched and investigated (the use of prefabricated, modular concrete pads has been proposed); enough soil to fill the garden beds has to be found (collecting local topsoil from recent construction sites seems to be a viable option, and this is an opportunity that should not be wasted since useable soil is so rare around town); and the vocation/division of space in this new greenhouse has to be decided upon (i.e. more community garden beds, garden beds for youth/elders, an experimental hydroponic system, etc.).

In response to the mobilization of this aspect of the project, several residents have also put forth the idea of partially funding, or otherwise supporting, the construction of small greenhouses that residents could install next to their homes instead of going to a community greenhouse. This could perhaps be an interesting way to help to meet the increasing demand for gardening space in Kuujuaq in the near future.

### 5.3 Youth Employment Services (YES)

An issue that repeatedly comes up in discussions about the greenhouse project is the importance of involving local youth in as many ways as possible. To this end, contact was made with the Coordinator of the Youth Employment Services (the youth development office that is run out of the Sustainable Employment Department of the Kativik Regional Government) in the spring of 2011. Over the summer, two official meetings were held to discuss possible projects that would be best suited to local youth, as well as to help to meet the overall goals of the greenhouse project.

The following is a list of “projects involving youth” that could easily be developed in the near future:

- Compost collection and manipulation (turning over on a weekly basis).
- Building, planting and maintaining window boxes and planters that could be installed on and around municipal buildings (flowers could include such cultivars as nasturtiums, dwarf sunflowers and pansies, as well as local native plants).
- Maintaining an experimental hydroponic system (in the new greenhouse, perhaps).
- Planting and maintaining a collective garden (in the new greenhouse, perhaps), and possibly selling/donating produce (lettuce, herbs, etc.) to local stores or institutional kitchens (the Elders Home / daycares).
- Building small-scale greenhouses (for sale to local residents or for use by YES).

- Participation in the construction of the new greenhouse.
- Participation in the operation of the potato production project.
- Growing and planting native tree, plant and grass seedlings for re-vegetation of the village (i.e. around new construction sites).

### 5.4 Kativik School Board

Closely related to the theme of integrating youth into the greenhouse project is the concept of working with schoolchildren. As early as the fall of 2009, staff and administrators of the Kativik School Board (KSB) expressed interest in incorporating elements of gardening and greenhouses into the curriculum; it was noted that such things could mesh well with the schoolwork of any age group—from preschool to high school.

In the spring of 2011, several informal discussions were held with one of the KSB Pedagogical Counsellors, and one official meeting was organized during the summer of 2011 to discuss the potential for incorporating gardening into the Nunavik school curriculum. Many models for this type of project exist; one of the most promising is the “Earth Box Kids” program. Developed in Canada, this program has already been implemented in Aboriginal communities in the West and could easily be modified to fit realities in Nunavik.

### 5.5 Hydroponic production

While the Kuujuaq Greenhouse Project focuses mostly on community-based social development, one of the long-term goals of this endeavour is to eventually produce fresh food on a reasonably large (village) scale. Since the challenges associated with soil and substrates are many in Nunavik, it is logical to begin investigating the potential of hydroponic technologies for eventual use in a commercial-size venture. To this end, initial planning for the development of a series of pilot projects (of different scales and different



models) has begun in order to test “proof of concept” for these types of systems in Nunavik.

To date, Kuujjuamiut Inc. has agreed to participate in the maintenance and operation of one of the test systems. This hydroponic system would be installed at the Kuujjuaq Forum—in a location where the public could view and learn about this type of agricultural technology. As well, the new greenhouse could also have a certain space allocated for a hydroponic pilot project, and this experimental system could perhaps be maintained by local youth working with Youth Employment Services. The hydroponic element of the greenhouse project is still in its infancy, but there is a lot of interest surrounding this modern agricultural technology—a technology that could certainly be adapted to meet the needs of all Nunavummiut.

## CONCLUSION

Certain aspects of the food security issues faced in Inuit communities could be comprehensively addressed by the development of a new type of local food system in the North—a system centred around locally owned, locally managed greenhouses. Whether they eventually take the form of community gardens, vocational centres or commercial operations, greenhouses (and other types of associated horticultural projects) are places where community capacity can be fostered and strengthened. By incorporating elements of ecological design into all aspects of the development of a local food system, social, economic and environmental benefits to communities can be maximized. By working within the CBPR research paradigm, and by drawing upon resources from all levels of government, from ethnic and non-ethnic organizations, as well as from specialized NGOs, local greenhouse projects can become places for engaged stakeholders to

work together toward a sustainable future in the Canadian North.

While the results obtained in Kuujjuaq this past summer were overwhelmingly positive on almost all fronts, it is important to keep in mind that there are still many challenges associated with the development of this project. As with any new project, continuous communication and knowledge sharing between all stakeholders and observers/supporters are of the essence, as is keeping the public well informed.

Judging by the interest and support that have been manifested since 2009 by different organizations and institutions (from both the public and private sectors), this project has enormous potential—potential that can be realistically developed in a sustainable manner, and that can bring about positive change in northern communities.

In conclusion, during the summer of 2011 many different stakeholders came together and invested time, energy and money in the Kuujjuaq Greenhouse Project. Based on the interest that has been demonstrated to date, it seems logical to conclude that greenhouses (and associated horticultural projects) definitely have a future in the Canadian North, and that Nunavik is well positioned to be a leader in this domain.

On a final note, I extend a special thank you to all of those in Kuujjuaq—too many to name—who have supported the development of this initiative and have helped to make the Kuujjuaq Greenhouse Project a success thus far: Nakurmiik!



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