

Improving Access to Fresh Vegetables: Home Gardening in a Remote First Nations Community

by

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### **Author's Declaration**

I hereby declare that I am the sole author of this thesis. This is a true copy of the thesis, including any required final revisions, as accepted by my examiners.

I understand that my thesis may be made electronically available to the public.

## **Abstract**

Cultural oppression and marginalization through colonization of First Nation peoples has led to a variety of physical and mental health problems. Regaining health and well-being in these First Nations communities will require interventions sensitive to cultural needs and supportive of traditional practices. Anthropogenic induced climate change has the potential to warm the region around the Hudson and James Bay lowland by 3.9-4.5 °C. This warming will affect both the traditional and conventional food system in the communities on the western James Bay coast. Western James Bay First Nations already face high levels of food insecurity. The traditional food system is becoming weakened as people participate less in hunting activities, and will become further degraded as climate change makes hunting practices more risky and expensive. However, climate warming may provide greater cultivation potential in the region improving local production of produce if these activities are pursued. Home gardening and community gardening have the potential to improve access to fresh vegetables, nutritional choices, and community cohesion if pursued in First Nations communities.

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## **Dedication**

For my grandmother Valarie McCue (1941-2013) who very much inspired this work

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# 1 Background

## 1.1 Food Security

Accessing food in our daily lives involves a framework of opportunity and constraint that impacts our food security. Modern food systems are unnecessarily complex, traditional food systems were relatively simple, and responded to abundances and shortages. Both are susceptible to pressures of climate change. In contrast to the lives of most Canadians, the First Nations people also desire access to traditional country food (food sourced locally).

The most widely used definition of household food security as stated by the FAO (UN Food and Agriculture Organization) (1996) is “when all people, at all times, have physical and economic access to sufficient, safe and nutritious food to meet their dietary needs and food preferences for an active and healthy life.” It is the most comprehensive definition to date although it is continually being challenged and improved. Recently, Pinstrup-Andersen (2009) summarized the current views commonly held about food security as falling short of conceptualizing nutritional security, household access, acquisition, and food allocation behavior. The FAO does recognize the four pillars of food security as availability, stability of supply, access, and utilization (FAO, 2005), which allows for greater appreciation of the intricacies of food security. Acquisition, household nutrition, and household allocation of food can be difficult to measure as food security surveys typically provide information only about access to food (Pinstrup-Andersen, 2009).

Household food security is the easiest to define, although complications still arise.

Household food insecurity is typically measured by indicating households that experience hunger

by one or more members of a household, or where one or more members reduce intake of food because of shortage of money or food (Bickel et, al. 2000). A household may increase its food security on a basic level by producing food at home, accessing emergency relief, improving household income, or for First Nations people accessing traditional food sources.

Creating a definition of “community food security” immediately encounters the problem of defining “community” within each specific context. Depending on the stakeholders a community can exist on many scales. For the purposes of this paper any scale of organization that is not national or household will be considered community level. It has been suggested that food security should be protected on a community level by taking control of a region’s food system through the democratic governance of food resources (Anderson and Cook, 1998). Improving community food security improves access at a household level. Community food security is typically addressed by improving access to nutritious food by more people in a community through community planning, farmer’s markets, community gardens, community kitchens, and food stamp outreach, amongst other strategies (Cohen et, al. 2002; Slater, 2007).

## **1.2 Food Security in Aboriginal Communities**

First Nations people experience a greater than average amount of food insecurity compared to non-Aboriginals in Canada. In a study of off-reserve Aboriginal (defined as First Nations, Inuit, and Metis people) households 33% of households had experienced food insecurity compared to the 9% non-Aboriginal average (Willows et al. 2008). But when socio-demographic risk factors are accounted for, Aboriginal households still experienced greater food insecurity than the non-Aboriginal community (Willows et al. 2008). There is still a marginalization that is not accounted for in Aboriginal households, and access to traditional food could bridge this

disparity. Recent studies have indicated that on-reserve food insecurity is much higher. In one study 70.3% of households surveyed in the First Nations community of Fort Albany had been food insecure in the past year (Skinner et al., 2013). First Nation households experience food insecurity more often than Canadians on and off reserve.

The Dieticians of Canada have recognized that community food security is important in achieving food security for Canadian residents (Slater, 2007). Some ways of addressing community food security is by improving access to nutritious food by more people in a community through community planning, farmer's markets, community gardens, community kitchens, and food stamp outreach, amongst other strategies (Cohen et, al. 2002; Slater, 2007). Community food sharing networks were once an important part of First Nations food security, but food sharing networks are breaking down as youth participate less and less in hunting activities and hunting becomes risky and more expensive due to climate vulnerabilities (Beaumier and Ford, 2010). Even so with the westernization of tastes on reserves, and for many professionals working on reserve who are not Aboriginal, the market foods play an even larger role in food security than traditional food. Still in Fort Albany 63% of residents that participated in a survey reported that food sharing was a coping strategy for accessing food (Skinner et al., 2013). The idea of community is more integrated in the traditional food system than the modern food system because of these sharing networks.

Isolated communities, specifically northern First Nations communities, often face food insecurity as defined as: access to nutritionally adequate food through socially acceptable ways. Barriers to access to nutritionally adequate food, in Fort Albany specifically have been perceived as high prices at the local grocery store, the feeling of disempowerment at the local store, and insufficiently fresh food available (Skinner et al. 2013). Grocery store managers have been

shown to significantly affect the access to nutritionally adequate food. It has been demonstrated in remote Australian Aboriginal communities, that one grocery store manager, through their selective ordering powers and power over the food supply, provided greater nutrient densities when in appointment over others (Lee et al. 1996). In northern Ontario, grocery store managers also control the amount and types of foods ordered into the community, and orders reflect weekly demand (Socha et al. 2011).

Food security for First Nations people is different than non-First Nations Canadians because of the desire for traditional food (locally sourced traditional foods of Canadian Aboriginal peoples). Power (2008) believes in another level of food security beyond community food security deemed “cultural food security”. Food security on First Nations reserves is the outcome of a mix of market food and traditional foods. Historically traditional foods were sometimes plentiful and often scarce and this cycle dictated food security in First Nations communities (Socha et al. 2012). In the past food security in First Nations communities was also the result of community effort utilizing a network of sharing which is now breaking down in many communities (Socha et al. 2012). People living on reserves already do not have sufficient access to the traditional food to meet their food preferences (Schuster et al. 2011), and this effect is felt even greater for those living off reserve. Threats to traditional food access also threaten “cultural food security” in First Nations communities.

This complex interaction between traditional food acquisition and food security makes indigenous traditional food security particularly vulnerable to climate change. According to Beaumier and Ford (2010) in one Inuit community climate change has the potential to affect food security in the community because country foods are an important source of nutrition in the community. Climate change is causing vulnerabilities in traditional food sources for the Inuit

people because climate change is creating unpredictable weather, and unpredictable ice thickness (Furgal and Seguin, 2008). Climate change may become the next great threat to Aboriginal culture and food security in Canada's north.

### **1.3 Aboriginal Health and Well-being**

Traditional food security was based on a long Aboriginal history of living on the land that provided for them. According to Martin (2011) people ate what was available at the time and it was not necessary to make healthy choices, as traditional diets were healthy, and starvation rather than over-consumption was a major risk. This was before colonization brought refined sugars and fats into the diets of the Aboriginal peoples. On top of physical health problems, colonization and associated cultural oppression and marginalization has led to an increased number of mental health problems in Canadian Aboriginal peoples (Kirmayer, et al. 2003). Problems related to well-being, such poor mental and physical health, exist in higher numbers in aboriginal populations in Canada (Statistics Canada, 2012). Well-being can include measures of: housing, income, jobs, community, education, environment, civic-engagement, health, life satisfaction, safety, and work-life balance (OECD, n.d.). Throughout this thesis the term well-being will be referring to perceived feelings of physical health, mental health, and happiness.

First Nation peoples continue to exhibit a higher than average rate of preventable diseases, such as, type 2 diabetes, heart disease, and obesity (Dyck et al. 2010; Young et al. 2000; Katzmarzyk and Malina, 1998; Statistics Canada, 2013). Consumption of fresh fruits and vegetables, as part of a healthy diet is necessary to improve health and well-being. However, barriers to a healthy lifestyle in isolated communities have been reported. Barriers include lack of empowerment over decisions in the community, such as access to food, and lack of access to

organized recreational exercise (Skinner et al. 2005). Fresh vegetables are often unavailable, rotten, and highly overpriced in northern supermarkets. The foods that are consistent with healthy living are simply unavailable to the entire population (Skinner et al. 2005). Improvement in access to highly nutritional food, and exercise could decrease incidence of these chronic disorders in remote First Nations communities, and/or help with the control of these diseases.

Improving health and well-being in First Nations communities will require access to healthy and/or traditional foods, and education on healthy eating. Nutrition education should become a large part of restoring the balance of healthy food choices from the markets and healthy wild foods (Martin, 2011; Kuhnlein and Moody, 1989; Stroink and Nelson, 2009; Isogai et al. 2011).

#### **1.4 Traditional Food and Health Promotion**

First Nations, and Aboriginal communities worldwide are embracing traditional practices for the purposes of health promotion. Health interventions based on improving access to traditional food, and healthy market food is regularly recommended because of the nutritional quality of traditional diets and its cultural relevancy (Frison et al. 2006; Willows, 2005; Socha et al. 2012; Stroink and Nelson, 2009; Kuhnlein and Moody, 1989; Shintani et al, 1991; Fieldhouse and Thompson, 2012). Traditional foods are associated with a healthy lifestyle by First Nations people and other Aboriginal communities (Socha et al. 2012; Fanzo et al. 2013; Martin, 2011). In addition to traditional food being accepted by First Nations as healthy, it is widely accepted as healthy in the academic community (Shintani et al. 1991; Kuhnlein and Moody, 1989).

In a study of food security in a northern Ontario First Nations reserve, Socha, et al. (2012) found that market food was an important source of intake for community members. In

another study that introduced a northern First Nations community to gardening, interviews revealed that market foods actually provided a greater feeling of food security than traditional foods (Stroink and Nelson, 2009). As youth participate less and less in hunting activities, and those activities become expensive and dangerous due to climate change, traditional foods may become a rare source of nutrition (Beaumier and Ford, 2010). The scarcity of healthy traditional foods and the increase in consumption of market foods has affected health in many First Nations communities.

There has been some documentation, and evaluation of the use of traditional foods for health promotion. A study was conducted in the Nuxalk Nation of Bella Coola Island that documented the use of the promotion traditional foods to increase the use of community-based knowledge about the traditional food system, as well as general health promotion (Kuhnlein and Moody, 1989). Traditional food items were shown to be used more and in higher quantity in 1985 than in 1981 after the program was administered (Kuhnlein and Moody 1989). Another study conducted in Hawaii used a traditional high carbohydrate diet to successfully lower the risk of obesity and cardiovascular risk in Native Hawaiian participants (Shintani et al. 1991). The pride of sustaining a cultural diet kept participants on track (Shintani et al. 1991). Both of these studies illustrate that maintaining ones traditional culture can help people stay on track to achieve healthy lifestyles consistent with eating a traditional nutrient rich diet.

Nutritional education, in general, has been described as empowering. When educated about an issue, you make choices based on an analysis and conclusion that you've come to yourself, rather than simply being told what to do, such as, eating a certain diet (Kent, 1988). In a study of a South-East Labrador Inuit community's relationship with food, interviewees reported having greater access to healthy food at the market than before (Martin, 2011). Despite this

increase in access, health has not improved in the community. The elders in this community did not have to make choices about eating healthy when they grew up because food was scarce and having any food was preferable (Martin, 2011). Even though it is perceived that there are more healthy foods available now, lack of education is still acting as a barrier to healthy living. In Fort Albany a perceived lack of empowerment over foods available to the community is a barrier to healthy living by community members as well (Skinner et al. 2005). To ensure the removal of barriers to a healthy living empowerment over food availability, and empowerment through education is necessary.

The cultural oppression that occurred during the colonization of Canada created mental health and social problems in the Aboriginal population in Canada (Kirmayer, et al. 2003). In direct contrast to the methods used in the oppression and colonization of Canadian aboriginal peoples (i.e. loss of land, enforcement of western education, the documentation of knowledge) decolonizing methodologies attempt to maintain traditional learning methods, not to simply record traditional knowledge (Simpson, 2004). Gardening, when paired with traditional teachings, can actually be a decolonizing activity. In the case of the Urban Aboriginal Community Kitchen Garden Project taking place in Vancouver, BC, the program was empowering for the participants. The program was developed for Aboriginal people, by Aboriginal people based on cultural teachings in awareness of colonization and aimed to be “culturally appropriate”. Participants felt affected in their emotion, physical, mental, and spiritual health, the key areas of the medicine wheel, which was taught in the program (the teachings of the medicine wheel relate the 4 directions with emotional, physical, mental, and spiritual health) (Mundel and Chapman, 2010). They also connected with nature and reduced the dependency that colonization had created, both important in the decolonizing component of the program (Mundel



and Chapman, 2010). As access to traditional food resources is being diminished, gardening and cultivating traditional plants can help improve access to this important resource as well as reduce dependency on markets.

If gardening can improve children's affinity for trying new, and ethnic foods, gardening can therefore be supportive of nutritional education, and cultural education. In one study youth participating in an inner-city gardening program were more willing to eat nutritious food and try ethnic foods than those not participating (Lautenschlager and Smith, 2008). Hands on and group activities enhance students learning environments in First Nations communities (Isogai, et al. 2011). Limited success in retention of nutritional information in school children could be related to a lack of reinforcement of the lessons in the home (Gates et al., 2013b). Health promotion in First Nations communities should include a mix of learning and teaching traditional practices, as well as gardening to enhance learning, especially in youth. Gardening can be supportive of both healthy living and de-colonization activity in Aboriginal communities worldwide.

### **1.5 Climate Change in the James Bay Lowland and The Northern Food System**

The Hudson Bay sea ice has a large regional impact on climate. Sea ice that once extended into the summer contributed to significant local cooling that forced the tree line and permafrost line below the Arctic Circle (Rouse, 1991). These effects are easily observed on typical climate maps of Hudson Bay and James Bay, you can see arctic and subarctic temperatures dipping well below temperatures at similar latitude across the rest of the country (Baldwin et al. 2001). The loss of Hudson Bay and James Bay sea ice could potentiate climate change over this geographic region.

Current climate research in the Hudson/James Bay region has utilized traditional knowledge (TK) and western knowledge practices to assess some apparent manifestations of climate effects on the local ecosystem. Unusual fish die-offs, noticed by local fisherman in Fort Albany, and nearby Kashechewan, were documented and compared with corresponding climate data (Hori et al., 2012). Climate data showed the die-offs occurred during a period of unusual heat waves in July 2005 (Hori et al., 2012). It was also reported by local fishermen that warming weather affected the amount of time that fishing nets could be left before the fish would be inedible (Hori et al., 2012). In another example of western science, and TK collaboration diseased fish were reported in Ouje-Bougamau, Quebec, with warming waters being the suspect (Tam et al., 2011). Through interviews combined with regional data it was determined that the onset of the disease could be explained by climate change, though other stressors could not be discounted (Tam et al., 2011). Through the use of TK the effects of climate change on traditional practices, such as fishing, can be monitored.

In a study of food security in an Inuit community, traditional foods were reported to be an important nutrient source in the community, and therefore climate change has the potential to affect traditional food security (Beaumier and Ford, 2010). Food sharing networks are reportedly breaking down as youth are participating less in hunting activities and hunting becomes risky and more expensive due to climate vulnerabilities (Beaumier and Ford, 2010). Coping mechanisms for this inadequacy could possibly create future vulnerabilities, since liquidating items, including those used in hunting activities, is often used to buy food (Beaumier and Ford, 2010). In contrast food sharing is reported to be a well-used coping strategy for food shortage in Fort Albany, especially for traditional food (Skinner et al., 2013). Beaumier and Ford (2010) suggest that nutritious store foods be subsidized to substitute for reduced access to traditional foods, and food

security stress, as the climate changes (Beaumier and Ford, 2010). The food system in the western James Bay region could be affected in comparable ways by climate change.

Market food availability throughout the year in the communities on the western coast of James Bay is solely dependent on air transport, except during the winter when a seasonal ice road is used, and during the ice-free season when boat and barge are sometimes available. The future conditions of ice roads in the James Bay area have not been evaluated. Temperature models predict a 3.9-4.5 °C warming scenario (in 2040-2069, corresponding to a double the current atmospheric CO<sub>2</sub> level scenario) for the Hudson Bay region (Gagnon and Gough, 2005). Roads built on ice are vulnerable to climate change as ice road thickness varies year to year, as well as duration of ice road operations, and with climate change in the arctic the number of yearly ice free days will increase (Lonergan et al. 1992). The warming scenarios offer a consistent perspective of a shortening winter with local knowledge that river freeze-ups are happening later and spring break-ups are becoming unpredictable (Ho et al. 2005). Inconsistencies in the weather may also affect the traditional food system because climate change will increase vulnerability/unpredictability of “ski-doo” trails, as well as animal migrations (Furgal and Seguin, 2008). With these vulnerabilities, winter and early spring shipment into the community will become more unpredictable resulting in more expensive goods, as airfreight will have to be utilized.

Much of this evidence points to an increasingly vulnerable/unpredictable transportation system in Fort Albany. This in turn makes the conventional food system, and traditional food system, that is relied upon daily by the local population vulnerable. Food price increases, and climate change, generate shocks to food security (Gregory et al. 2005), which will likely become

more common in Fort Albany because of an increasingly expensive transport system, and vulnerabilities in accessing traditional food sources.

The concept of the expansion of agriculture into the north comes to mind when climate warming is mentioned, but the idea must be met with caution. Carbon emission during land use change, from forest or natural soils to agriculture, is a major contributor to greenhouse gases (Lal, 2004). The James Bay lowland is in a vast area of wetland, and many communities are surrounded by forested bog, open bog and fen. Wetlands store a substantial amount of CO<sub>2</sub> and disturbance of these could contribute significantly to atmospheric CO<sub>2</sub> levels (Mitsch and Gosselink, 2007, 313-332). If agriculture is to be expanded into the north it remains the responsibility of the communities not to exacerbate climate change though responsible farming practices and use this opportunity to contribute to sustainability (Gregory et al. 2005). Many factors other than climate change are contributing to food insecurity, but adapting to reduce the vulnerability of food systems is necessary through increasing agricultural pursuits (Gregory et al. 2005).

Plants have physiological hurdle in which temperature can either kill a plant, or affect growth rate. Temperature can also affect a plants ability to create pollen, fruit, or the ripening of fruit. For example, the tomato can only set fruit between 15 and 21 °C (Bauer et al. 2009). Each plant is adapted in this way to grow in native climates and so have a maximum temperature, and minimum temperature required for development. As the minimum temperature in the subarctic is affected, increased most likely in the study area by 3.9-4.5 °C, there is potential for a greater variety of plants to be cultivated in the southern James Bay area, as well as the extension of the growing season. Growing degree days (GDD) are a universally accepted measure of the cumulative heat requirements of crops used to predict the suitability of climate for particular

crops (Small, 2012). This “accumulation” of heat over the season is affected by both the temperature and the length of the season since it relies on the days above a minimum growth temperature, and often also includes a maximum temperature, which may be irrelevant in the study area for most crops. If the climate warms, the increasing the number of GDD in the James Bay region crop production will be improved here.

Subsistence farming, not agriculture, has increasing potential to expand northwards and takes into consideration the responsibility of communities to not intensify climate change. Complex socio-ecological systems have been built up to resist environmental variability, but have created a vulnerable global system (McNeill and McNeill, 2003; Constanza et al., 2007). Diversifying resources, like crops, will build adaptive capacity in communities allowing the community to combat biophysical and socio-economic shocks (Leach et al., 2012). Promoting sustainable family farming and fostering community development by promoting local production of food is a positive step in improving community food security, as recognized by the Dietitians of Canada’s public policy statement of community food security (Slater, 2007). This as part of the broader application of national food security can help improve long-term community food security.

## **1.6 Home gardening and Community Gardening**

The most basic ways to improve household food security are producing food at home, accessing emergency relief, improving household income, or, within First Nations communities, gaining access to traditional foods. Community gardens and home gardens have been suggested as a strategy to improve food security, and are a way to improve community resilience as well (Kantor/USDA, 2001; Buchmann, 2009). A community garden is a piece of vacant land

gardened cooperatively by a group of many individuals. These are built most often in urban areas where many people do not own property. Home gardens are popular in rural areas, and suburban areas where residents tend to have more personal outdoor space.

Home gardens in Cuba have been able to dramatically increase access to food by Cuban people after a severe economic slump in the early 90's (Altieri et al. 1998). Subsistence activities have been shown time and again to assist communities in crisis and chronic hardship (Omohundro, 1985; Buchmann 2009). Fuel prices will continue to rise and since fuel is intimately linked to food costs and accessibility in the far north, a food crisis is inevitable. The potential for subsistence agriculture to improve household food security in the north will improve as the climate warms.

It is well established that gardening can improve a family's nutritional situation. The use of community and school gardens for health education can increase children's fondness for vegetables and knowledge of healthy eating better than classroom education (Lautenschlager and Smith, 2008; Viola, 2006; Heim et al. 2009, Morris and Zidenberg-Cherr, 2002). In one study, children who participated in a 10-week gardening program were more likely to cook and willing to try new foods after participating (Lautenschlager and Smith, 2008). Hands-on learning is a proven method in First Nations communities and hands on activities have been recommended to enhance the learning environment (Isogai et al. 2011). In another study that took place in Toronto, community garden researchers reported that participants find they eat more vegetables because of the gardening activities (Wakefield et al. 2007). Having a garden or participating in home gardening has the potential to improve personal and household nutritional habits.

When researchers study gardening undertakings there are often many benefits revealed that are not related to physical health. For example participants who gardened in a Toronto

community garden reported positive feelings of relaxing, calming, and de-stressing (Wakefield et al. 2007). Reports of relaxation, de-stressing, “staying active”, and other positive indications of mental health are often reported when garden participants are interviewed (Patricia, 2011; Slater, 2001; Van den Berg et al. 2010). McGrath-Hanna et al. (2003) hypothesized that mental health has declined in circumpolar people due to poor diet, since they experienced change from predominantly traditional diets to modern diets. It is suggested that there is a link between diet and brain function that is having this effect on the mental health in the circumpolar population (McGrath-Hanna et al. 2003). Evidence of improvements in mental health due to the activity of gardening, and the connection between mental health and diet affirms the concept that maintaining a garden might improve overall health.

Shifts are happening worldwide from a focus on alleviating malnutrition to a focus on increasing dietary diversity. People worldwide are becoming more and more dependent on a few high-energy staples, which is increasing rates of non-infectious disease. Steyn et al. (2005) showed that dietary diversity accurately predicted nutrient adequacy using 24-hour diet recall surveys. The activity of gardening alone has been shown to increase ones dietary diversity, which is directly linked to your nutrient intake (Steyn et al. 2005; Cabalda et al. 2011). There is also mounting evidence that dietary diversity can support biodiversity conservation, and agricultural biodiversity (Johns and Eyzaguirre, 2003; Frison et al. 2006). Having a diverse diet and reducing the dependence on a few high-energy staples is beneficial to ones health, and the environment.

Socha et al. (2012), suggests that gardening in northern First Nations communities is an activity that would link healthy eating, well-being, physical activity, and a connection with the land. The outcomes of gardening activities like connecting with nature, reducing dependency,

and the community created - when gardeners socialize - are important in a decolonizing approach to food security (Mundel and Chapman, 2010; Slater, 2001). The many benefits to physical, mental, and community health make gardening a practical approach to improving food security in Aboriginal communities.

### **1.7 Gardening in Canadian Aboriginal Communities**

As gardening becomes increasingly recognized as an activity that is supportive of more than the acquisition of food, it is being promoted more in First Nations communities. Gardening has been known to gather people together to provide personal, and community support (Slater, 2001). These First Nations communities are interested in alternative health promotion activities that are culturally appropriate. Gardening activity can join the other decolonizing actions taken in First Nations communities anxious to recreate their identities.

One First Nations community in northwestern Ontario is embracing gardening and traditional knowledge lessons to help build a sustainable local food system. Stroink and Nelson (2010) using a self-rated knowledge survey assessed food, food security, and personal health and wellness in a First Nations community that was receiving gardening and traditional knowledge workshops. The results from this survey found that access to local food was not associated with a personal feeling of food security, but was associated instead with accessing the dominant food system (Stroink and Nelson, 2010). The authors also found other benefits to health and wellness related to gardening, or traditional activities taught in the workshop (Stroink and Nelson, 2010). Feelings of self-reported health, life satisfaction, and social capital were all associated with valuing local foods in the study (Stroink and Nelson, 2010). While there was no association between gardening, or traditional practices, and a secure source of food, the other contributions



to wellness are notable. The practice of keeping a home garden has the potential to contribute to personal health and wellness, and possibly household food security.

Another Aboriginal gardening project aimed to be a "culturally appropriate health promotion project", the program was developed for Aboriginal people, by Aboriginal people based on cultural teachings, in awareness of colonization. The colonization of Canadian Aboriginal peoples was achieved through community deconstruction and should be address through increasing cultural identity (Kirmayer, et al. 2003). The programs had Aboriginal volunteers participating in gardening, and cooking workshops guided by the teachings of the medicine wheel at a UBC farm. Participants felt affected in their emotional, physical, mental, and spiritual health, and related this to key areas of the medicine wheel, which was taught in the program (Mundel and Chapman, 2010). They also connected with nature, cultural teachings, and the program reduced dependency that colonization had created (Mundel and Chapman, 2010). Participants were empowered by the fact that they were making their own decisions on how they want to learn and what they take from the project; they were not being told what to think of the results (Mundel and Chapman, 2010).

The Province of Manitoba used gardening as a main component of an initiative called Northern Healthy Foods Initiative funded by the Government of Manitoba. The program also included greenhouse pilot projects, school nutrition programs, and food preservation initiatives that supported the creation of over 1000 gardens in communities, including First Nations in remote northern Manitoba (Fieldhouse and Thompson, 2012). This program faced challenges against a short growing season, poor soil, maintenance of equipment, and the need for more skill development in production and preservation within the community (Fieldhouse and Thompson,

2012). While the authors do not provide an evaluation of the programs success, adoption of this activity to expand into 1000 gardens across the province speaks to its acceptance.

Home gardening, as well as community gardening supports the gathering of a community for an equitable cause. The gathering that gardening produces strengthens groups of people and empowers decolonization activities (Mundel and Chapman, 2010; Slater, 2001). These social benefits, as well as the effects on health and well-being associated with gardening, substantiate the importance of garden programming in communities that do not currently pursue this potentially successful activity.

## **1.8 Nutrition Studies in the Mushkegowuk Territory**

Fort Albany is the community of focus of this thesis. It is a Cree community of approximately 850 residents. It is located 20km from the western coast of James Bay, Ontario, Canada, within the Mushkegowuk Territory; this territory consists of the Cree communities on the James Bay coast, as well as inland communities. Traditional lifestyles in this community are in danger due to large climate fluctuations that will escalate with continuing anthropogenic climate change. Communities on Hudson Bay and James Bay, northern Ontario, Canada, have honed their traditional knowledge to deal with yearly fluctuations, but recent climate change amplifies these and will challenge the adaptive capacity of traditional cultures in the region. As much as climate change affects traditional lifestyles it also challenges modern conveniences currently enjoyed in these subarctic communities. As the weather becomes unpredictable, the reliability of an ice road that the community relies on to deliver modern conveniences, and a barge are compromised.

Current trends in climate change predict a warming of 3.9-4.5 degrees in the region around Hudson Bay (Gagnon and Gough, 2005). This will impact the western coast of James Bay, since a seasonal road services it in the winter. Seasonal roads can become vulnerable due to climate warming (Lonergan et al. 1993) including the seasonal roads that service the communities on the western coast of James Bay. These weather vulnerabilities will also affect traditional lifestyles as hunting becomes risky with unpredictable changes in the weather (Furgal and Seguin, 2008). The seasonal roads that provide healthy market foods will have a reduced capacity to ship market food and other conveniences into the community because of a shorter ice road season.

The consumption of a healthy diet is of importance as higher rates of preventable diseases such as type 2 diabetes, heart disease, and obesity characterize health in First Nation communities in Canada (Dyck et al. 2010; Young et al. 2000; Katzmarzyk and Malina, 1998; Statistics Canada, 2013). This has prompted interest in studying the roots of these difficulties in First Nations communities; however, until recently food security in First Nations people on reserve had not been studied.

In a recent survey of food security of on-reserve households in Fort Albany First Nation 70.3% of the households surveyed had experienced some food insecurity (Skinner et, al. 2013). When select socio-demographic characteristics that are consistent with an increased risk of food security (e.g., lone parent households) were analyzed there was no significant difference in these risk factors for household experiencing food insecurity and those not, in Fort Albany (Skinner et, al. 2013). This was consistent with Willows et, al. (2008) who found that after adjusting for confounding risk factors, First Nations households off-reserve were still experiencing a higher rate of food insecurity than non-First Nations households. While neither study deemed these

findings conclusive of an actual association, the pattern still exists without explanation that First Nations communities experience higher levels of food insecurity independent of the higher numbers of socio-demographic risk factors.

A number of nutritional studies in the Mushkegowuk Territory included the community of Fort Albany as well. Three studies have assessed the impact of a school snack and nutrition program targeting vegetable and dairy intake undertaken at the local school. The studies found that retention of nutrition education was fair, but long-term retention was not good (Gates et al., 2013a; Gates et al., 2013b; Skinner et al., 2012). The authors suggest that barriers to change needed to be addressed to improve these initiatives (Gates et al., 2013a; Gates et al., 2013b; Skinner et al., 2012).

In addition, in the Mushkegowuk Territory a study of body mass index (BMI) and the influence of sleep and screen time was conducted. It was found that a greater number of obese boys spent more than 2 hours of screen time per day, and also had TV's in their rooms more often (Gates et al., 2013c). This study stresses the need for increased options for organized, and unorganized outdoor recreational activity in First Nations youth in this community.

Two major themes have emerged from the literature in regards to improving health and wellness in First Nations communities: improving access to healthy and/or traditional foods by addressing barriers, and education in healthy eating. First Nations people and other Aboriginal communities perceive traditional foods as healthy, as does much of the academic community (Socha et al. 2012; Fanzo et al. 2013; Martin, 2011; Shintani et al. 1991; Kuhnlein and Moody, 1989). Lack of nutritional education is in part preventing Aboriginal communities from making healthy choices in the market. Nutritional education can be very empowering to give you a choice about food rather than simply being told what to do (Kent, 1988; Martin, 2011). Gardens

are very supportive of nutrition education, and when combined are more effective than classroom education alone (Lautenschlager and Smith, 2008; Viola, 2006; Heim et al. 2009, Morris and Zidenberg-Cherr, 2002). Being introduced to home gardening skills will empower community members by providing access to fresh fruits and vegetables, access to low impact recreation, and increased empowerment with access to market food.

The purpose of this thesis is to explore the potential of increasing household food security and access to fresh foods in the isolated, subarctic, First Nations community of Fort Albany through the use of home gardens. An approach not studied yet in First Nations communities. Few contemporary gardens exist in Fort Albany, although some gardening and small-scale agriculture existed historically in the community (Spiegelaar, 2013). Home gardens and community gardens have been used to alleviate food insecurity in tropical, temperate, rural and urban environments, but not so in subarctic climates.

## **2 Methods and Results**

### **2.1 Methods**

#### **2.1.1 Study Site**

The community of Fort Albany is a First Nations located on the Albany River 20km inland from the coast of James Bay. There are approximately 850 residents; mainly Cree band members, and out-of-town professionals working in the community. The community is accessible only by airplane year round, boat or barge during the ice-free season, and by a temporary winter ice road. The community is surrounded by the James Bay Lowland, part of North America's largest wetland complex (Mitsch and Gosselink, 2007, 70-72). Three retail outlets service the community. The largest is the Northern store, which is a complete grocery store that also sells some household items and gas. There are also two independently owned "variety stores" that stock some non-perishable foods, frozen foods, gas, as well as confectionaries and cafe.

#### **2.1.2 Participant Recruitment**

In June of 2012 the residents of Fort Albany were invited to participate in the study during a local farmers market, and then through word of mouth. Participants were informed of the study and its purposes, and provided verbal consent. They agreed to participate in the skill building activities held throughout the summer, and an interview that was to occur in the fall. Gardening skills were taught to voluntary participants through workshops and hands-on instruction in their own home gardens. Participants were provided with the equipment and

knowledge required to maintain a small household vegetable garden. They received help in building a 4x8 foot garden using locally-cut timber, and contaminant-free soil. Fences were built around the gardens because of concerns for local dogs digging in the gardens, and children as well. There were also tools available for use by gardeners.

The seeds provided for use were selected for their ability to grow in the climate based on the number of days to maturity. Vegetable varieties and flowers that are cold hardy, frost resistant, and have a short season were brought to the community as seeds. Participants chose to plant vegetables they normally eat, or would like to try to grow. The gardens were to be tended by the homeowner for the summer. Research team members including community team members were available throughout the summer growing season to offer assistance in learning how to weed and care (e.g., mound potatoes) for their gardens. Gardeners harvested the vegetables when ready (e.g., green beans and lettuce) throughout the summer. In the fall, the gardeners harvested their potatoes, and interviews were conducted about participant experiences.

Starting in spring of 2013 the same study was repeated, beginning with the contacting of previous gardeners to obtain their interest in planting their gardens again. A workshop that would be held in a local garden was advertised through social media. The workshop helped in the recruiting of new participants that were interested in gardening. After collecting contact information each gardener was contacted and helped to build raised wooden garden beds, filled with local uncontaminated soil as in 2012. The participant also received a hand trowel, watering can, and gardening gloves. The second year, due to logistical problems with attaining materials, there were no new fences built.

### **2.1.3 Gardening Methods**

The growing season is short in the study area because of the influence of the Hudson and James Bay water bodies. Anything that will promote early germination will help make up for the shorter season. Compared to in-ground gardening, soil in a raised garden bed will warm up sooner in the spring, and remain warm longer at the end of the season. This allows for the earlier germination of seeds outdoors. Other benefits to gardening in a raised bed include: fewer problems with weeds, excellent drainage, regulation of soil medium, and reduction of soil compaction. Because of the wet conditions of some participant's properties that were investigated, raised beds were the only option for a garden. There were also many properties with poor soil conditions, fill under 2-6 inches of top soil, so using a raised bed allowed for rich organic soil to be imported from another part of the community.

### **2.1.4 Data Collection**

Field notes with records of interactions, conversations, and opinions expressed during the building, planting, and harvesting of gardens was kept throughout the project. Community members of Fort Albany First Nation who participated were interviewed about their experiences gardening. A semi-directed interview approach was used to interview participants. This interview style works best to allow the interviewer to really understand that person's point of view, and works best in marginalized groups (Esterberg, 2002, 87-88).



### **2.1.5 Qualitative Data Analysis**

Interviews were audio recorded, if allowed, and transcribed by the primary researcher verbatim. The text copy of the interview was read and coded by one individual using HyperRESEARCH software, and one researcher by hand-using an open coding method. The open coding allowed key themes to come out of the interview naturally (Esterberg, 2002, 158-159). Descriptive codes were created and major themes conceptualized based on responses given (Saldana, 2009).

## **2.2 Results**

In 2012, 13 people showed interest in having a garden, and a garden was built for each of them. Of these people, 6 followed through to the planting stage. In 2013, 7 new gardens were built, and for a total of 6 (2 new) that completed planting that year. The reasons why some gardens did not make it to the planting stage varied. Some were interested in planting their garden on their own and did not have the time to do it. Others were travelling so we could not help them plant their gardens. Ten interviews were taken with nine different participants between the years 2012-13. Two people who gardened were not available during the interview stage, due to travelling or family commitments.

### **2.2.1 Well-being**

Well-being was by far the most reported outcome participants reported not greater access to fresh food. Participants often reported finding that the activity was stress relieving, and relaxing:

...and then that time you spend doing it, you know just working on it, it's a good feeling. And that stress I have, it takes everything away while your just doing it, and then working on it. (Participant 7)

...Because it keeps me busy. I like the responsibility. It keeps me active. Also I like, I enjoy learning on how to do it. (Participant 4)

I think one of the effects is that we did it again this year, gardening, and we found that it was very rewarding to have some stuff grow in our garden. (Participant 6)

And the first thing in the morning when you get up it's, and when you get up after that you have your tea and then you go out, and then you go look at your garden. That's what I did; go look at it ... (Participant 7)

Some reported a real joy in caring for the garden, and compared it to caring for a child:

It was good to see things growing. Like you know when you look at things, like when you see something growing it's like how your kids grow you know what I mean. It was that positive feeling. (Participant 7)

All right it's contagious. I find that it's very soothing doing this. It's very relaxing after a while. It's not a chore for me. It's like ahhh I need to do something and I find that doing

that relaxes me. And I have stress relief after because it's like taking care of your baby I guess, and you have to go take care of the baby. And then after you're done that you feel better. And doing things I found that very relaxing, stress reliever, for me that's what I find. Maybe that's why I like it. (Participant 6)

### **2.2.2 Children**

Including children in their gardening activity was consistently reported. It was clear that there are some who enjoyed the family time that came with gardening, while others considered it important to include children in these activities. It is not clear whether this activity was shared because it was considered supportive of nutritional habits, teaching healthy lifestyles, or that growing food is important.

So I was interested like in, [getting] some, maybe a target group in the school. Like maybe older ones even. Or even families that are interested, not necessarily older ones. (Participant 8)

...and for me it was the kids seeing, looking at it, and teaching them about things, and how often we should water and stuff like that. (Participant 6)

Parents weren't always the ones trying to involve the children. The children themselves often wanted to be involved, and were very intrigued by growing things that they can eat.

When we were doing that, when the kids seen it they got excited, the small little ones, they got really excited seeing everything growing and they would tell their little friends and tell them not to go in that yard. And we went away, and the other thing that the little kids would say is that “oh, what about the garden,” “oh, don’t worry somebody is taking care of it...” They seen those little things come out and they got excited. And now they are asking, today they are asking, “When can we take out the potatoes?” And the other thing is when we eat the lettuce, they are like “holy cow where does this come from,” “it comes from there,” and they are excited. (Participant 6)

And I also get my grand kids to help me out, and we do it together, and my daughter too. And they can water the garden as well. And it's enjoyable because you get to spend time with family too. (Participant 4)

I think it's that, that pot, you know how you put it in that, and you sprinkle water. I think that's what they like, they came downstairs and took up water and they made a mess a few times going in and out. But it was good; they got involved with it too. And they really wanted me to put that fence around it... So I said, no I'll wait till next year. We will start in May or something I told them. And they were looking foreword to it. (Participant 7)

### **2.2.3 Promotion**

Promotion of the home gardening was a very important subject in the interviews. It was mentioned many times through the interviews, despite never being directly asked about the

promotion of their gardens. Some participants had inquiries when individuals noticed the garden on their lawn, and were curious. Many participants felt the need to share their experiences with their family and friends, as well as on social media platforms like Facebook.

So I'm talking to my family, that's the other thing I'm doing is I'm talking to my siblings, my sisters. Telling them how simple it is and they sound very interested, and they sound very interested in what I was doing. And they were asking me “why are you in the back?” “Nothing I'm just doing this and that with gardening.” And they are very interested. So they might try it next year. (Participant 6)

And I think that is one of the things I tried to do is I tried to promote it by using Facebook, taking pictures of it. Like I said, when the kids came out and helped me take out some potatoes, they would come running out with their video cameras. I don't know if they posted that on Facebook, I hope they did. (Participant 6)

Well the girls, my daughters, they were helping out. They were interested; they got interested in doing it too. (Participant 7)

People were also approaching the gardeners from other communities who saw the gardens in the yards, and were curious about them. Gardeners were always happy to share their stories.

People were interested from other places, because I had posted those pictures on Facebook when we planted the seeds. The people, a couple people asked me “how is your

garden growing,” and “how are your vegetables doing?” You know. And I would say “I will post pictures after.” I never really did tell them I don't know how to weed, and I don't know how to maintain my garden. (Participant 8)

There was this friend of mine from [Kashecewan], they were interested in doing it eh. They were, they say, they seen it, and then they were asking me what I was doing with that. Thinking what is this? And I explained to her, and then “really?” ... And there was another lady, and they “said oh my goodness you guys are doing lots for your community. Like you have farmers market, and you guys are having gardening, doing your gardening and all that.” And I was just explaining to her about my situation. Like what happened... what I experienced with my grandchildren. They were in it, like I said “I seen, like I seen people on their yards with these boxes. And I was wondering what they were. I was wondering what you guys were doing there with planting, and see what grows.” (Participant 7)

One participant did report feeling embarrassed to be seen gardening, but still shared her story through Facebook.

...I tried to tell my son to water my garden and all that and he would say when. “I'll do it at night when there is nobody watching.” Like it was kind of, even myself, when I would water I would kind of feel embarrassed, because I don't know. Because it's something new I guess. It's more associated with the white culture, the gardening thing. Because we were never really, how do you say that, horticultural... So anyway I was even trying to

water at night at times. And then I finally just said oh well, what the heck, I'll just water anyway and I would be watering my plants, my seeds. (Participant 8)

#### **2.2.4 Skills and Improvements**

Some of the community gardeners were not satisfied with the variety of foods that were able to grow in the Fort Albany climate. They requested things like tomatoes, corn, pumpkin and peppers. Participants who saw the benefit to growing food for their homes mentioned building, or acquiring a greenhouse for the home or community. They wanted a greenhouse so that a greater variety of vegetables could be grown, because their taste could not be satisfied by the conventional raised bed garden. There is also a reported lack of skills that each gardener is experiencing. Many had trouble identifying vegetables, and weeds. Some reported needing more knowledge of watering, weeding, and harvesting.

I was afraid to pull things out that I wasn't supposed to pull out. (Participant 8)

Maybe that is where people will need the training is how to water properly. You know show us how, how to check, that's what. I didn't have that information. And I'm scared to overflow it, or I was wondering if I was putting enough water. Just the watering I think. Plus the, what you guys did there, taking off the weeds. (Participant 4)

When asked how the gardening program could be extended into the future many participants said they would be willing fund their own garden. Other opinions included funding from health services, grants, the First Nations, fundraising, and incorporating volunteer workers.

## 3 Discussion

### 3.1 Well-being

The experiences reported in this study were rarely related to healthy eating, or an increase in access to food, but were instead related to mental health, bringing family together, and a good feeling about watching something grow. This finding is similar to what Stroink and Nelson (2010) found in their survey of a gardening program in a First Nations community. Access to local food was not associated with a personal feeling of food security but was associated instead with accessing the dominant food system (Stroink and Nelson, 2010). The authors did find benefits to health and wellness that were related to gardening, or traditional activities taught in the workshop (Stroink and Nelson, 2010). Perhaps the participants in both studies do not yet have the confidence in their knowledge of garden food production that other communities with longer histories of horticulture have.

The personal benefits experienced in Fort Albany participants are characteristic of those reported in other studies on the effects of home gardening. Home/community gardeners when surveyed often report feelings such as relaxation, stress relief, and “staying active” (Carney, 2011; Slater, 2001; Van den Berg et al. 2010). In an Oregon Hispanic community, gardeners reported that gardening brought them relaxation, enjoyment or reduced stress (Carney, et al. 2011). Many of the participants in the Fort Albany gardening project reported the same feelings of stress relief, relaxation and enjoyment. They also reportedly “like[d] the responsibility” (participant 4) that they felt having the garden. Participants also compared caring for the garden to caring for a baby. The responsibility toward the garden was considered a positive feeling by the gardeners.



Stress relief and relaxation is related to mental health. There is evidence that a decline in mental health is linked to declining traditional diet, in circumpolar peoples (McGrath-Hanna, et al. 2003). The decline in mental health occurred at the same time that a changing diet led to increased health problems (McGrath-Hanna, et al. 2003). Mental health of Canadian First Nations, and Inuit, is more often perceived as poor, and less often self-reported as good or excellent, than non-identifying Canadians (Statistics Canada, 2013). These communities are in need of activities that can improve mental health.

Tending a garden can improve nutrition, relieve stress, and provide relaxation. Nutrition is now linked to mental health in circumpolar peoples (McGrath-Hanna, et al. 2003). Home gardening and community gardening as an activity has the potential to improve mental health status, if not food security, in First Nations communities.

### **3.2 Involvement of Youth**

Many participants had young children, or grandchildren, living in their homes during the study. The participants were motivated to involve children in their gardening. These parents and grandparents must view these activities as a pastime that could enrich the lives of their children in some way. The family time spent together was also important. As one participant put it “[Gardening is] enjoyable because you get to spend time with family too” (Participant 4). As a family activity, gardening can improve bonds, and knowledge transfer not only about gardening, but perhaps cultural traditions as well.

Often times the children involved themselves in these activities, while the parents were gardening. Many times it was reported that kids were “excited” during harvesting activities.

They were also very interested in helping to plant and water the gardens. The results of this study shows that young children like to actively participate in gardening activities.

Gardening activities seem to reinforce lessons about healthy eating, and improve their inclination to try new foods (Morris and Zidenberg-Cherr, 2002; Heim, et al. 2009). Gardening could be used in the home to help children become interested in trying new foods. It can also provide some extra curricular activity that as participant 2 put it "...Growing food, number one, people will be busy in this healthy activity. Otherwise what they do here, they don't have any other activities." Gardening can provide low impact, outdoor activity needed to combat high amounts of screen time experienced in this community (Gates et al., 2013c)

There were also suggestions that there should be garden education at the local public school, in high school, and elementary school levels. It is well documented that youth who garden are more willing to eat vegetables, and through nutritional education combined with gardening have a greater knowledge of health foods than classroom learning alone (Lautenschlager and Smith, 2008; Viola, 2006; Heim et al. 2009, Morris and Zidenberg-Cherr, 2002). Gardening will provide organized activity, and nutrition education support, if used in a school, or home setting.

### **3.3 Promotion and Pride**

Many participants felt the need to promote and share their gardening experiences. Despite never being asked about garden promotion, the participants were inclined to speak about it during the interviews. This urge to share demonstrates the pride and acceptance, of this activity in their lives. The participants simply want others to experience the personal benefits they know comes from tending a garden. When asked what improvements could be made to the gardening

program, a few responded by saying that more promotion of the program activity was needed. To them the promotion of current gardening activities is the best way to increase these activities within their community.

Both household pride and community pride are encouraging effects of home gardening. Some gardeners had a member of another nearby First Nations community approach them and compliment their efforts. One gardener experienced somebody telling her: "...oh my goodness you guys are doing a lots for your community. Like you have farmers market, and you guys are having gardening, doing your gardening and all that" (Participant 7).

The topic of community pride consistently emerges in studies related to the benefits of community/home-gardening. In a study of 20 upstate New York community gardens, more than half of the garden coordinators reported that their gardens improved resident's attitudes, and ownership, towards their neighborhoods (Armstrong, 2000). One third of the gardens in the New York state community gardens study reported more community organization towards other neighborhood issues, especially in low-income neighborhoods (Armstrong, 2000). Home gardens, like the ones tended in Fort Albany, have also been shown to create bonds between gardeners within a community, based on the shared interest of gardening (Slater, 2001). Community deconstruction, through eliminating culture and family, lead to increased mental health problems, and decreased cultural identity in Canadian Aboriginal populations (Kirmayer, et al. 2003). Having a gardening club improves community cohesion, as well as ownership over community ascetics.

When Kuhnlein, et al. (2006) compared 12 diverse indigenous communities, their food systems, well-being, and health, they found some similarities between what community leaders envisioned. Every leader accepted that local, indigenous food systems should be encouraged, and

be made into sources of community pride (Kuhnlein, et al. 2006). Cultivated gardens are not indigenous to Fort Albany, but traditional plants can be cultivated, and local cultivation of market foods has the potential to foster community pride. Future garden projects should focus on presenting gardeners achievements and building pride in individuals who garden, as well as the whole community for embracing this practice. The promotion of gardening in this way could accelerate the activity throughout this community, and others.

### **3.4 Skills and Improvements**

Gardeners often reported that they lacked the skills to garden effectively. Most gardeners were positive, and enjoyed the experience despite this. Specifically the gardeners requested more lessons on how to identify weeds, how to water their gardens, and when/how to harvest vegetables. The difference between gardens that were carefully tended and gardeners who lacked maintenance skills is vast. This is illustrated in photograph 1, and 2. Photograph 1 is the garden of a second year gardener, who was extremely involved in garden maintenance. In the garden potato plants, onions, carrots, lettuce, zucchini, and nasturtiums flourish. You can see that the plants are well weeded, and spaced. Photo 2 is a garden owned by a novice gardener, who reported that the only maintenance they performed was water. There are still potato plants growing well, but carrots, and onions were out-competed by weeds. The success of gardener 1 is far greater, however potatoes grew well in both conditions because of their hardy nature.



Photo 1. A well tended, second year gardener's garden. Potato plants, onions, carrots, lettuce, zucchini, and nasturtiums flourish.



Photo 2. This garden was infrequently tended. Potatoes are growing well, but other vegetables were out-competed.

It was noted in a past survey, of gardening in Fort Albany, that people were concerned with the time it takes to tend a community garden (Spiegelaar, 2011). It was also noted that the introduction gardening activities that came with the residential school in Fort Albany interfered with time that was once used for traditional harvesting (Spiegelaar and Tsuji, 2013). For one gardener having the garden right next to the house was a benefit, and thought that having to visit a community garden that is on the outskirts of the community would be difficult. His experience was that a small garden near the home was very easy to tend, in his words:

“... we did it last year and I thought it was pretty easy and not that much maintenance to it. You know you just have to go out there and weed. And it's a small plot. I didn't even take 5 minutes to go in there and check out and pull them out and you are done for that day, and you go back and check again a week later, nothing there, good” (Participant 6).

Community gardens are routinely created in developed countries, in areas where residents have limited access to property, such as urban environments. Studies on the effects of home gardens more often take place in developing countries, in urban and rural areas. Many of the participants work full time so the convenience of having a garden close to home is desirable. People would have to be willing to walk from their homes to a local center with a community garden, if there is an appropriate spot in town. If not then a location farther from the center of town would have to be used, making it even less convenient for people who work full time. The ease of having a garden close to the home is seen as an advantage. Most members of this community live on small properties that could support a garden bed. Some properties have their limitations, and so both community gardens and home gardens are viable options here.

Many participants were disappointed by the selection of vegetables that are able to grow easily in their climate. Some report that they are used to eating corn, bell peppers, pumpkin, squash, and tomatoes, and would like to see those grown in the community. This thinking often led them to inquire about having greenhouses in the community, or building an individual greenhouse for themselves.

### **3.5 Food Security**

There was no reported increase in access to fresh fruits and vegetables during his study. This benefit may not have been reported because the use of semi-directed interviews. There also may

have been no effects felt because of the size and success of the gardens. This result is consistent with some other gardening studies in First Nations communities. Stroink and Nelson (2009) found that gardening, and traditional activities were not related to a higher sense of food security. Instead those activities were related to other personal benefits, such as life satisfaction, and self-reported health (Stroink and Nelson, 2009). A higher sense of food security was related to accessing market foods in that community (Stroink and Nelson, 2009). There could have been a lack of confidence in the new gardening skills to be able to improve food security in both cases.

Food security has been found to improve after taking part in gardening programs in other studies. After participating in a community garden program for two seasons, Hispanic gardeners in Oregon increased the frequency of vegetables eaten in their family compared to before participating in the program (Carney, et al. 2011). This Oregon program also reported that concern about food security dropped for the participants after participating in the two-year gardening program (Carney, et al. 2011). Producing food at home, and learning gardening practices, although not proven effective in First Nations communities yet, has the potential to improve food security in households.

Given the added complication of cultural food security, and cultural preferences, total food security cannot be attained through conventional gardening unless traditional plants are incorporated. Many people in the community are concerned with having access to local berries. It was revealed in interviews, and conversations with participants, that planting berries in the gardens is something that is desired. It is obvious that berries are very popular in this community. While at the local market helping with the distribution of food boxes it was observed that the berries and fruit were sold-out first. This may be a testament to the fact that fruit at the Northern supermarket is of poor quality, or that the community has a strong preference for berries and



fruit. There has been expressed interest from garden participants in Fort Albany that they would like to bring traditional plants closer in to town, even to be planted on their own properties. With the cultivation of traditional plants, the expansion of gardens, and addition of greenhouses residents of Fort Albany could begin meeting their needs for conventional, and traditional food locally.

### **3.6 Crop Potential**

Crop potential in the study area is already quite extensive and might improve if climate change model predictions for the region are accurate. There are many crops that are already adapted to cool growing conditions. Other than planting exclusively cold tolerant crops there are also ways to mitigate harsh temperatures to allow hot crops to grow. Many important food crops that people eat regularly are able to grow in Fort Albany, for example potatoes. There are still many crop types that people here enjoy regularly that cannot be grown.

Some techniques may allow certain crops to grow in the north with some assistance. For example, the reason why tomatoes do not ripen in Fort Albany is likely because of cool nights, which interfere with pollen formation and fruit ripening (Bauer et al. 2009). If it is not warm enough, or too hot, tomatoes will not develop pollen properly. The temperature at night cannot drop below 12 °C or no fruit will set, so the plants can be kept warm in certain ways (Bauer et al. 2009). These plants would also require seeding inside, or purchase of seedlings. Some techniques such as growing in raised beds, mulching, or growing in some form of greenhouse cover, can extend the season in cool climates to accommodate tomatoes.

The “accumulation” of heat over the season, measured as growing degree days (GDD) is affected by both the temperature and the length of the season since it relies on the days above a

minimum growth temperature. For most crops, when calculating GDD, a base temperature of 0 or 5 °C is used. If the climate warms thus increasing the number of GDD in the James Bay region, crop production will be improved here. According to the government of Canada GDD map there are 750-1000 GDD (5°C base) in Fort Albany based on climate averages from 1940-1971. Baldwin, et al. (2001) reports 1000-1100 GDD (5°C base) in the region around Fort Albany in the text “Physical Geography of Ontario”.

Local weather data can be used to predict which vegetables are currently able to grow in the region. As climate warms in the region this potential may increase to include greater varieties of vegetables. GDD are not however the only factor in crop success, as illustrated in the earlier tomato example GDD calculations with a 5 °C base do not sufficiently predict the success of certain crops. For the prediction of crops such as corn, tomatoes, cucumbers, and other hot crops GDD calculations with a base of 10-15 °C would need to be calculated as well in the region.

Throughout the study there was always success in growing potatoes and beans in the raised beds and in ground beds in Fort Albany. Carrots, and broccoli have been grown successfully in select gardens. Turnips and lettuce are always very successful in the raised beds, and in ground. Tomatoes and corn were not attempted because of the climate, but seasoned community gardeners have reported that tomatoes from seedlings, and corn, have never been successful in the community. Table 1 summarizes crops that grew in Fort Albany in 2012-2013.

Table 1. List of crops, and varieties that have been grown in Fort Albany in 2012-2013. The feasibility of the crops ability to grow in Fort Albany is based on the number of frost-free days in Moosonee (104 days in 2013) and seed manufacturers advised days to harvest. In the final column varieties that were grown to maturity outside either in 2012 or 2013 are indicated.

Crop	Variety	Days to Harvest	Feasibility	Success to date
Carrots	Baltimore Hybrid	65	y	y
	Danvers #126	65	y	n
Lettuce	Salad Bowl	50	y	y
Head Lettuce	Great Lakes 659	85	y	y
Onions	Yellow Spanish set			y
	Yellow Dutch set			y
	Green Banner	55	y	n
Zucchini	Black Beauty Organic	55	y	y
Snow peas	Oregon sugar pod	63	y	y
Peas	Strike	55	y	y
Turnip	Purple top white globe	60	y	y
	Just Right Hybrid	65-70	y	y
Pumpkin	Seneca Longface Hybrid	115	n	n
Nasturtium	Dwarf Jewel Double Mixture			y
Cucumber	Iznik Hybrid	48	y	n
Broccoli	Calabrese Organic	70-80	y	y
	Chief Hybrid	52	y	n
Beans	Provider	50	y	y
Potato	Shepody	90-110	y	y
	Norland	70-90	y	y
Tomato	Sub Arctic Plenty	55	y	n
Corn	Peaches and Cream Early	70		
	Hybrid		y	n

Modern lifestyles leave little time to travel to forage for berries, so some residents of Fort Albany want berries to be grown closer to town. However wild plants may require a diverse set of requirements that prevent them from being planted right in town. For example raspberries require sandy well-drained substrate with plenty of organic matter (Handley, 2006). Strawberries are often specified when asked what plants they would like to see in the gardens. These plants would require slightly acidic peat medium to grow in, which is readily available in the study area. The cultural and the nutritional aspect of traditional diets can improve health if these practices are reincorporated into modern life (Frison et al, 2006; Willows, 2005; Socha et al. 2012; Stroink and Nelson, 2009; Kuhnlein and Moody, 1989; Shintani et al, 1991; Fieldhouse and Thompson, 2012).

Lastly, keeping in mind the responsibility of communities not to intensify climate change, subsistence farming, not agriculture, has increasing potential to expand north. Agriculture is destructive, and shipping routes are deficient in Fort Albany, so this option is undesirable.

## **4 Conclusions and Recommendations**

The process of introducing home gardening to participants in this remote First Nations community has shown that this activity can be a highly beneficial for both the adults and children in the household. Tending a garden has the potential to decrease stress levels, provide relaxation, provide low impact activity, provide fresh vegetables, and improve community cohesion. Throughout the interview process participants reported that the activity of gardening provided relaxation, and improved stress levels. These improvements in mental health, combined with the potential to improve diet, make this a highly attractive activity in communities that have suffered from greater mental, and physical health problems than the Canadian average (Statistics Canada, 2013).

The gardeners who had children living in their homes often reported the excitement that children had during harvesting activities, planting, watering, and watching the garden grow. The children involved themselves in these activities as the adults were working. Gardening activities enhance nutritional education in youth making it more effective (Heim et al. 2009, Morris and Zidenberg-Cherr, 2002). Previous studies have shown that classroom learning of a nutritional program did not improve knowledge or habits long term (Gates et al., 2013a; Gates et al., 2013b; Skinner et al., 2012). Parents and grandparents can use home gardening to enhance nutritional education. The involvement of teaching children, and increased family time can increase family values, and cultural identity needed to support decolonization.

Each gardener had a sharing story. Promoting their gardens was a common theme, and therefore seems to be important. Home/community gardening, through its contribution to sharing, can improve community cohesion, and promote community organization (Armstrong,

2000; Slater, 2001.) Through sharing personal accomplishments, personal and community pride can be built. Any future garden projects should include sharing as a major component.

Whereas a home garden provides convenience, community gardens provide an opportunity for sharing and learning. Community gardening is more common in urban environments where land is scarce. The culture of community gathering in First Nations communities and the need for continued community reconstruction strongly supports the concept of community gardens in First Nations communities. Neither garden style would provide an ideal model, but a combination of both would be most appropriate.

The use of native plant species is imperative if berry cultivation activities are to be pursued, by transplanting berry plants and not importing foreign varieties. These would also have the advantage of being well adapted to the local environment. In the case of promoting traditional foods, there is outstanding evidence that traditional food systems originally provided diverse diets out of necessity for nutrition, and sustainability (Fanzo, et al. 2013). The contribution of local plants as well as the encouragement of consumption of any traditional foods has the potential to improve nutrient intake. The potential for gardening activities to support nutrition in remote First Nations communities is extensive.

Climate change is likely to make northern food systems more vulnerable through the weakening of traditional and modern food systems. Promoting sustainable family farming, and diversifying resources will build adaptive capacity allowing the community to combat biophysical and socio-economic shocks (Leach et al., 2012). The diversity of crops that can be grown in Fort Albany already sufficiently satisfies most tastes in the community. However some specialized cultivation techniques can be explored to allow some hot crops (e.g., tomatoes, and peppers), to be grown in Fort Albany.

Aboriginal populations worldwide are embracing alternative health interventions. Incorporating traditional practices, education, and community gathering all promote personal and community empowerment (Mundel and Chapman, 2010; Slater, 2001; Kent, 1988). Home gardening provides many benefits to personal, and community health, and has the potential to become a culturally appropriate health intervention in warming subarctic climates.

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