

Growing a farm in a fly-in First Nation community using shipping containers for building infrastructure and capacity

The lack of infrastructure is a factor in food insecurity and poverty in many rural and remote areas world-wide [1]. Where food access is limited, cost-effective solutions are needed to create food-based community food security and community economic development [2]. The “farm-in-a-box” provides an interesting approach to community food security by shipping food growing materials where it is needed for the community to grow its own food on the plentiful land available in remote locations. Community food security is defined as existing “when all community residents obtain a safe, personally acceptable, nutritious diet through a sustainable food system that maximizes healthy choices, community self reliance and equal access for everyone” [3]. This approach considers the root causes of the food system ills – to eradicate hunger, and overall poverty issues.

A farm-in-a-box is a shipping container (s) loaded with materials to start a farm homestead, which also serves as the building skeleton for the greenhouse and chicken brooder as well as the storage for farm equipment. In Canada, the first trial for the farm-in-a-box was in Garden Hill First Nation (GHFN) in 2015, a remote fly-in community in northern Manitoba with limited infrastructure, lack of housing and high food insecurity.

This “farm-in-a-box” is a model that, if successful, can jumpstart food production and local healthy food access in areas that need it most, remote areas with high shipping costs for food and materials and lack of jobs.

Intermodal containers were chosen for this project, as they are known to reduce cargo handling, improve security, reduce damage and loss, and allow freight to be transported faster. These containers are wind and water-proof. The cost of used containers is fairly reasonable at around \$3000 and \$5000 Canadian.

Meechim Inc.

Meechim means food in Ojibway-Cree. Meechim Inc. is a First Nation run food-based social enterprise that was formed by GHFN community members with the help of AKI Energy, Four Arrows Regional Health Authority (FARHA) and the University of Manitoba in 2014. The goals of Meechim Inc. include building infrastructure, growing food, providing youth and adult training and work opportunities as well as endeavoring to grow community food security and sustainable livelihoods. Meechim Inc. endeavors to provide sufficient nutrients, protein and calories for a large segment of the local population of 2,665. Meechim Inc. had planned to build an irrigated permaculture farm including

[1] Information on <http://www.fao.org/docrep/003/w3613e/w3613e00.htm>

[2] S. Thompson, M. Rony, J. Temmer, D. Wood, Pulling in the indigenous fishery cooperative net: Fishing for sustainable livelihoods and food security in Garden Hill First Nation, Manitoba, Canada. *Journal of Agriculture, Food Systems, and Community Development*, 4(3), (2014) 177–192.

[3] M.W. Hamm, A.C. Bellows, Community food security and nutrition educators, *J Nutr Educ Behav*, 2003, 35:37-43.

greenhouse and chicken enclosures as well as incorporating a country foods program, to share hunting, fishing, gathering and other local food. By developing capacity in agriculture through Band sponsored employment training opportunities it will cultivate jobs where there is 76% unemployment [4].

Food security

The definition of the community food security by the 1996 World Food Summit, which defined food security as existing “when all people at all times have access to sufficient, safe, nutritious food to maintain a healthy and active lifestyle.” Problems associated with food access in remote fly-in communities in Manitoba include limited selection of perishable foods, high food prices, escalating transportation costs, uncertainty of travel on winter ice roads, high poverty rates, and a declining use of local country foods [5, 6]. The re-invigoration of local food production is considered key to food access [5]. Community-based approaches are one possible response to tackle food insecurity, alongside business activities, government programs, and social policy [7, 8].

The Setting

GHFN is located on Island Lake in Manitoba, at its north tip, approximately 610 km (380 miles) northeast of Winnipeg (see Figure 1). GHFN is accessible via plane from a nearby island or winter road or a boat from Wasagamack and St. Theresa Point First Nations, both of which are approximately 17 km (11 miles) northeast by boat. The population in this community is escalating rapidly with a median age of 18.9 years. In 2011, the population of GHFN was 2,776, up by 46.3 percent from 1,898 in 2006 [4]. The very high birth rates of this youthful population are creating pressure on available housing. There is a shortage of housing with private dwelling amounting to only 545 families but census families number 640 [18]. Due to lack of housing, the average household has a higher number of people than the Manitoba average of 3.8 at 5.1 [4].

Not only housing is limited, but other infrastructure, with the community lacking any community centre, library or other public meeting place. As well the quality of housing is poor without piped water and sewage. 54% of homes have water trucked to cisterns or barrels; 49% have no service. Only 18% of adults have completed high school with 5%

[4] Information on <http://www12.statcan.gc.ca/nhs-enm/2011/dppd/aprof/>

[5] S. Thompson, A. Gulrukh, M. Ballard, B. Beardy, D. Islam, V. Lozeznik, K. Wong, Is community economic development putting healthy food on the table? Food sovereignty in northern Manitoba's Aboriginal communities. *Journal of Aboriginal Economic Development*, 7(2), (2011) 14–39.

[6] Information on http://home.cc.umanitoba.ca/~thompso4/harvestinghope_doc.html

[7] E. M. Power, Combining social justice and sustainability for food security. In M. Koc, R. MacRae, L. J. A. Mougeot, & J. Welsh (Eds.), *For hunger-proof cities: Sustainable urban food systems*, IDRC Books, Ottawa 1999, pp. 30–37.

[8] E. M. Power, V. Tarasuk,. The impact of income on healthy eating in Canada. *Health Canada Policy Forum*, 60. (2006, March).

having a college education.

Despite the high population growth, GHFN has preserved its language, culture, and traditions. Most people (60%) speak Ojibway-Cree fluently with 14 percent speaking Cree as both their mother tongue and the language spoken at home. In addition to valuing their language and social customs, hunting and fishing traditions remain strong [9]. Hunting traplines, which were assigned to each family by the colonial government centuries ago to maximize the number of furs being traded to the Hudson Bay Company, are still used for sustenance despite often being located hundreds of kilometers away from the community or even in another province.

Garden Hill FN has a history of gardening, which gave the community its name. Although gardening is not popular now in the community or for the last two generations, their grandparents or great grandparents relied on gardening as well as hunting, fishing and gathering. To deal with the difficulties of the climate and soil, a type of permaculture was used so that they were working with nature to care for earth and people through an ethic of giving back (Connor, 2014) [11]. Unlike conventional gardening techniques, permaculture is based on the local indigenous agriculture, culture and environment. Food sources should be resilient. Garden Hill FN has discontinuous permafrost, poor soils, and a short growing season at the northern edge of the boreal forest with temperatures dipping to below -40 degrees Celsius in winter.

The Need for Meechim Inc. at Garden Hill First Nation: Food Security

88 % of GHFN households were found to be very food insecure, which is approximately ten times the Canadian average in 2009 [9, 10]. Food security occurs “when all people, at all times, have physical and economic access to sufficient, safe and nutritious food that meets their dietary needs and food preferences for an active and healthy life” [12]. Many families are too poor to afford healthy food, as retail food is very costly with limited selection of healthy foods, high transportation costs and a scarcity of any employment opportunities. Since the only nearby grocery store is located on an island across from GHFN, food adds a \$12 boat trip to the already high cost of food. High-impact food programs are needed to prevent the dire health consequences of food insecurity, in a community where 631 residents or 24% of the population, are on the diabetes registry this community is in need of healthy food opportunities [13].

[9] S. Thompson, A. G. Kamal, M. A. Alam, J. Wiebe, Community development to feed the family in northern Manitoba communities: Evaluating food activities based on their food sovereignty, food security, and sustainable livelihood outcomes. *Canadian Journal of Nonprofit and Social Economy Research*, 3(2), (2012).43–66.

[10] Information on http://www.hc-sc.gc.ca/fn-an/alt_formats/hpfbdgpsa/pdf/surveill/income_food_sec-sec_alim-eng.pdf

[11] C. Connor, *Grow a Sustainable Diet: Planning and growing to feed ourselves and the earth*. Gabriola Island: New Society Publishers (2014).

[12] Information on <http://www.fao.org/docrep/003/w3613e/w3613e00.htm>

[13] S. Thompson, M. Rony, J. Temmer, D. Wood, Pulling in the indigenous fishery cooperative net: Fishing for sustainable livelihoods and food security in Garden Hill First

Sustainable Livelihoods Assessment

A sustainable livelihood is a useful analysis for this research considering five assets or dimensions: natural, physical, human, financial and social assets. The definition of sustainable livelihoods is “the assets, the activities, and the access to these (mediated by institutions and social relations) that together determine the living gained by an individual or household” [14]. Processes (e.g., laws, policies, societal norms and incentives) and institutional structures (e.g., rules, customs, etc.) at multiple levels (individual, household, community, regional, government, multinational corporations) affect assets [14, 15]. Livelihood strategies require that people considering their external environment, which they have little control over, including trends, markets, and politics over which they often have little control [16, 17]. The amalgam of assets, policies and factors are complex causing poverty and underdevelopment on First Nation reserves [18, 9].

Methods

Faculty and graduate students collaborated with Meechim Inc., AKI Energy and GHFN chief and council regarding a work employment training program. This holistic mixed methods approach included video research with Meechim Inc. workers, AKI Energy and GHFN community members, as well as participating in the building of the greenhouse and chicken brooder; field visits and field trials. The sustainable livelihoods analysis is applied to determine how the farm-in-a-box improved livelihoods and a documentation of the history.

Building Meechim Inc.

Nation, Manitoba, Canada. *Journal of Agriculture, Food Systems, and Community Development*, 4(3), (2014), 177–192.

[9] S. Thompson, A. G. Kamal, M. A. Alam, J. Wiebe, Community development to feed the family in northern Manitoba communities: Evaluating food activities based on their food sovereignty, food security, and sustainable livelihood outcomes. *Canadian Journal of Nonprofit and Social Economy Research*, 3(2), (2012).43–66.

[14] F. Ellis, *Rural livelihoods and diversity in developing countries*. Oxford, UK: Oxford University Press. (2000).

[15] M. A. Brocklesby, E. Fisher, Community development in sustainable livelihoods approaches – an introduction. *Community Development Journal*, 38(3), (2003), 185–198.

[16] R. Chambers, G. R. Conway, *Sustainable rural livelihoods: Practical concepts for the 21st century* (IDS Discussion Paper No. 296). Brighton, UK: Institute of Development Studies, 1992.

[17] Information on http://www.efls.ca/web/resources/DFID_Sustainable_livelihoods_guidance_sheet.pdf

[18] M. Ballard, *Flooding sustainable livelihoods of the Lake St Martin First Nation: The need to enhance the role of gender and language in Anishinaabe knowledge systems* (Doctoral thesis). Natural Resources Institute, University of Manitoba, Winnipeg, Manitoba, 2012.

The findings first document the history of Meechim Inc. beginnings to study its critical initial stages of development. In August 2014, after many years of working with them on many food issues, we started discussing with GHFN a farm homestead with AKI Energy and GHFN members. In September 2014, the band with community members had designated a site for the farm and bulldozed its 15 acres of young forest regrowth. At that time, University of Manitoba took soil samples, which found nitrogen and phosphorous depleted clay soils with little organic matter as the little had been scrapped off. That fall students and Dr. Thompson from Natural Resources Institute started meeting with GHFN, AKI Energy and Four Arrows Regional Health Authority (FARHA) on planning the farm and markets.

After AKI Energy and University of Manitoba students and faculty met with the chief and council in GHFN, a small market survey in GHFN was first undertaken in 2014 by AKI Energy. The survey showed that a family of five in GHFN spends, on average, \$1000 each month for purchasing food from the Northern Store, which is on the neighbouring island and costly to boat taxi too at \$12/person round-trip. With 548 households in the community, at least \$7 million/year is being spent on food in GHFN. To further test the market but while also making efforts to feed the community, AKI Energy and Meechim flew fruits, vegetables and meat up to sell at a monthly market starting in winter 2014. At that time they had to purchase the food at retail prices with a 30% markup by Harris Meats to benefit from this organization's freight subsidy through Nutrition North. The cost for food was not cheap but was considerably cheaper than the Northern Store, for example offering \$3.50 for a dozen eggs, \$1.00 for one onion, \$2.50 for two pounds of carrots, etc.

Meechim Inc. is making food accessible to the community, immediately, by selling non-local healthy food at cheaper prices than the only store – the Northern Store -- as a non-profit social enterprise business. The produce purchased for sale started small at \$1000 to \$2000 in the winter of 2014/2015, for the first few trials, but grew rapidly to be \$20,000 of food sales/market day in the summer of 2015. The Meechim market day is strategically chosen to co-ordinate with paydays, welfare days and/or child and family cheque deliveries to allow people to get better more healthy food for their money. The market was held in the radio/television station in the 2014/2015 most of the year, with it acting as a home shopping channel, paying local people for sales and shipping (see Photo 1). This summer, AKI Energy applied for the Nutrition North freight subsidy for Meechim Inc., which they received in the summer of 2015, to make the prices more accessible to community members, charging only a small markup to cover local labour costs and other costs, with a small margin going to build the market into a full time enterprise and towards getting it to other communities. Only fish is local at this point but chicken, potatoes, tomatoes, beans and other agriculture products will soon be available at GHFN locally.



Figure 1: Meechim Inc. Health Food Market held in the Radio/Television Station

The Farm-in-a-Box

To provide community food security, Meechim Inc. is seriously focusing on growing enough calories, protein and calcium to meet the dietary needs of their population. Realizing the climate and soil challenges, to better feed the community, different permaculture approaches were employed. After several meetings that included GHFN, AKI Energy, Four Arrows Regional Health Authority (FARHA) and community members, the materials were decided on and bought for the farm-in-a-box.

Shipping containers were driven up on the winter ice road required to access fly-in communities by road vehicle. In GHFN two forty-foot intermodal freight containers were driven up on winter roads to a remote, fly-in northern community to start a farm homestead on 15 acres for the first year of planting. One truck hauled two freight containers and a three-season camper that included a kitchenette, refrigerator, bathroom and beds. The rail cars were bought, filled and shipped up just before the ice winter roads ended in March 2015.

Contents in the shipment to GHFN included a tractor, building materials for a greenhouse, office, electric fence and chicken tractor materials, chicken feed for 1200 chickens, low speed two passenger utility electric standard (24 volt, 5.5 hp), two cisterns, irrigation hoses, two 3000 watt diesel generators, solar energy panels/batteries and other farming tools. Three solar panels with four deep cell 12 volt batteries were thought to provide enough light for office and electric fence. See photo 1 to show how the cisterns and intermodals and trailer were shipped in a two transport truck and one ford truck convoy on winter road. Since the shipments were sent up several months before the program started, vandalism was a concern, with the shipping container doors locked up. People were able to break in but nothing valuable was stolen only safety equipment.



Figure 2: Trucking farm-in-a-box on winter roads to Garden Hill First Nation
Photocredit: Robert Guilford

The work on-site at the farm only began May 19th, 2015, to build the homestead prepare the soil for planting and irrigation just in time for the short growing season. To jumpstart building the homestead a work crew came from University of Manitoba, AKI Energy and Meechim Inc, as well as a professional film person coming for the first two weeks, with a focus on greenhouse building, to observe and photograph. First, the water cistern was set up on a platform on top of the railcar, which was filled by the community's water truck, to gravity-feed water hoses as shown in Figure 3. Another cistern was located at the top of the farmstead, which was filled from the nearby lake by a gasoline operated water pump but then gravity fed some driplines and a hose to irrigate the farm.



Figure 3: Installing gravity fed water system for railway car, greenhouse, etc.

An immediate priority was building a functional brooder for the arrival in the first week of 700 one-day old broilers and layers in the railway container to allow for temperature control when the outdoor temperatures were dipping below zero each night in mid May until early June. However, with time-lapse and other cameras all pointed at the greenhouse, the brooder building was neglected and done hastily. With building materials still filling most of the railcar, only the back half of the railway car was installed with three poultry nibbler waterers and six infrared lamps powered by the generator to maintain the temperature of 35°C for the first week, reducing 3°C each week until the ambient temperature was reached. Although it was not a highly functional brooder, as it was not spacious, safe, easy to move in not easy to clean, as well as lacking ventilation, it was inexpensive. For better survival rates and biosafety, a maximum of 365 to 275 birds in the sixty-foot railcar (574 foot square) to provide a minimum of 1.5 to 2 feet square/chick, feeders, large sized water buckets and an aisle for easy access for workers to clean, water and fill feed bin without creating biosafety issues. As it was, workers had to walk around electrical wire and on chicken manure to feed and fill with the water the too small water bucket that drained into all the poultry nibbler waterers at least six times a day. Some design improvements were made for the second batch and the number of chicks was reduced to 500, which was still higher than ideal but better.



Figure 4: Brooder for baby chicks in railway car

Not only was the house being built but also the soil building occurred to grow potatoes, beans and greens as well as perennials including raspberry and apples. For the clay soil, which is deficient in phosphorus and nitrogen, to be improved, the soil needs organic matter and nutrients, which would benefit from livestock manure or other means. Other possibilities and ways to enrich are green manure, composting efforts, and/or hugelkultur. With the abundance of trees in this boreal forest area and the lack of organic matter in soil, hugelkultur, which incorporates tree materials into the soil as it rots increasing soil temperature, providing room for roots, and holds water. This green manure crop includes legumes to fix atmospheric nitrogen in their root nodules to make it available to plants, and will be plowed under to incorporate organic matter and nutrients into the soil (Connor, 2014) [11].

Analysis

Human Assets Human assets increased with GHFN workers mastering a wide variety of construction skills and agriculture skills. Workers engaged in vegetable production, berry production and carpentry to build a greenhouse and chicken brooder, as well as irrigation system. Interns developed skills in animal husbandry from day olds to butchering as well as participating in the full cycle of crop production from starting seeds, watering, weeding and harvesting, as well as. The overload of work in the early spring building the farm

[11] C. Connor, *Grow a Sustainable Diet: Planning and growing to feed ourselves and the earth*. Gabriola Island: New Society Publishers (2014).

homestead and planting resulted in the work site becoming a boot camp and could have been organized better with more planning.

Social Assets and Belonging Social assets are about belonging and feeling a connection with others, which facilitate cooperative action, sharing, bonding and social bridging, to others in powerful positions that can enable future work [19, 20]. The worker developed a positive sense of community belonging and pride in their community feeling that their garden work was going to feed the community. Workers built social assets by creating bridges and networks with University of Manitoba students, AKI Energy, FARHA and others as well as personnel from government and funding agencies.

Natural asset Natural assets include seeds, plants, soil, water, land access and other aspects of food production and supply. The decentralization of food supply, which is part of indigenous values, is part of the Meechim Inc. Using permaculture they are working carefully with nature will yield more natural capital.

Physical assets has established both gardens, greenhouse and infrastructure, which represent physical assets. Meechim Inc. has free access to a fifteen acre land base to grow food..

Financial assets Natural and human capital has been changed into financial capital, through market sales and providing paid employment training for five community full-time workers hands, one local supervisor and one local manager. As well, the idea of the farm-in-a-box garnered \$300,000 in provincial grants and also for research purposes the university of Manitoba was able to contribute another \$60,000 in labour and materials. Although there is no on-going funding the chicken and vegetable sales are expected to provide an on-going revenue stream.

Conclusion:

Meechim Inc. complies well with the definition of the Social Enterprise Council of Canada as *“businesses owned by nonprofit organizations, that are directly involved in the production and/or selling of goods and services for the blended purpose of generating income and achieving social, cultural, and/or environmental aims. Social enterprises are one more tool for non-profits to use to meet their mission to contribute to healthy communities.*

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<http://www.socialenterprisecanada.ca/learn/nav/whatisasocialenterprise.html#sthash.UbLLeKm3.dpuf>

[19] L. Brendtro, M. Brokenleg, S. Van Bockern, The Circle of Courage. Beyond Behavior, (2), (1991), 5-12.

[20] L. Brendtro, M. Brokenleg, S. Van Bockern, The Circle of Courage and Positive Psychology. Reclaiming Children and Youth, (14), (2005). 130-136.

