

Local Food Production in Northern and Remote Communities

[Part 2 of CTCG's Planning For Prosperity Series]

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CTCG's Planning for Prosperity Series

#1

Remote Community Energy Planning

The power of planning in Canada's remote communities, where diesel use costs more than just dollars. **[June 2012]**

#3

To Be Determined

Let us know a cleantech topic relevant to rural and remote communities, and we'll develop a briefing paper on the subject. Let us know what's on your mind! **[Mid-2013]**

By fortifying the resilience of community food systems, we build a diverse, and robust national food system.

There is growing interest—particularly in Canada's North—in the concept of regional food security, meaning when all people, at all times, have access to sufficient, safe, and nutritious food to maintain a healthy and active lifestyle. Food security represents a potentially critical issue for those remote communities beset by accessibility issues and reliant on long transport routes for their food supply.

Food insecurity is a complex and systemic problem that requires efforts to address the financial, social, environmental, geographic, and policy barriers to reliable and nutritious food supply. Certainly, critical aspects of the solution include local capacity building, traditional foods, education, and in some cases the opportunity may exist to develop community or commercial greenhouses for the local production of fruits and vegetables.



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CTCG is a neutral, not-for-profit organization comprised of public and private sector partners who are collaborating to develop and deploy clean energy solutions within remote communities.

55 - 80% of people in the Arctic have difficulty finding enough to eat.



It is not uncommon for fruit and vegetables in some remote communities to cost upwards of five times that of urban communities. Over 80 remote northern communities in Canada receive perishable food items such as fruit and vegetables through Nutrition North Canada, a program that provides subsidies for food shipped by air.

While local food production might help to alleviate some access issues in these communities, most remote and northern Canadian communities experience long, cold and dark winters—hardly ideal growing conditions. Given this, and a host of other logistical challenges, year-round local food production has traditionally been viewed as unfeasible.

However, advances in Controlled Environment Agriculture (CEA) have presented themselves as viable options for creating a local food supply in regions of the world considered otherwise inhospitable growing environments. From arid deserts to outer space, the technology now exists to grow food in almost any environment.

CEA attempts to account for hostile outside growing conditions through integrated techniques and technologies

to control all aspects of the internal growing environment, including lighting, temperature, nutrients, hydroponics, and air control.

The challenge remains to address these variables at a cost that is less than that of income from vegetable sales. While a few community greenhouses are scattered across Canada's North, year-round commercial operations have never been successfully accomplished without subsidy.

Greenhouses are notoriously risky financial endeavors, and while they offer a number of potential benefits to a community, it is vital to consider the financial risks, particularly when public funds are being contributed.

The following pages provide a cursory outline of the analysis required prior to undertaking a community greenhouse. Broadly speaking, an enterprise budget outlining potential costs and revenues is the first step in determining the viability of the project.

Community Greenhouses

Benefits:

- Fresh, local foods
- Higher nutritional value than imports
- Increased community self-sufficiency & resilience
- Employment & capacity building
- Community investment
- Reduced food transport GHG emissions
- Neutral forum for interaction & social inclusion

Barriers:

- High operation & maintenance costs
- Lack of available expertise
- Limited revenue generating potential
- Small production results in low economies of scale



Where to Start?

Assessing the costs and benefit to your community

Determine Market Demand

The most common vegetables grown in Canadian commercial greenhouses are tomatoes, cucumbers, lettuce, and sweet peppers. The first step in determining the size and type of greenhouse required is to better understand what vegetables are most desired in the community. Given the size and needs of remote communities, poly-cultivation (growing more than one vegetable) will likely be preferred. Grocery suppliers or government agencies may be able to provide estimated consumption rates. Once *consumer* demand is known, *community* demand can be estimated by multiplying by the total population size.

Establish Preliminary Greenhouse Size

Preliminary sizing for the greenhouse can be established by scaling the production facility to meet local demand. This is the most logical method of determining size, given that sizing a facility where yields exceed demand will compromise economic feasibility. A community may want to look at several production scenarios to determine the economic viability of meeting all or a portion of demand. Estimated greenhouse size is based upon community vegetable demand, divided by typical greenhouse yield. Government agencies or greenhouse suppliers may be able to provide yield data. Remember that most yield data is based on intensive commercial agriculture and should be used thoughtfully, as the high production achieved in these conditions cannot be reasonably expected from a community greenhouse.

Create Enterprise Budget

Generally speaking the enterprise budget will consist of estimating the annualized costs of the greenhouse, and deducting them from the predicted revenues. Project

(Continued)

Greenhouse Vegetable	Per Capita Demand (kg/yr)	Yield (kg/acre)
Peppers	3.23	80,937
Tomatoes	8.3	202,343
Cucumbers	4.24	145,687
Lettuce	11.05	83,348

Sample Greenhouse Vegetable Demand and Yield Data from the 'Multi-Year Development Plan for Yukon Agriculture & Agri-Food 2008-2012'

Reducing heating costs alone does not significantly improve the economic viability of greenhouses in unsatisfactory growing environments.

costs can be understood to include the up-front capital costs (e.g. purchasing the greenhouse structure, buying land, etc.) and on-going operations and maintenance (O&M) costs (e.g. utility costs, replacement materials, salaries, etc.). Greenhouse suppliers may be able to provide estimates for these costs; CTCG is also able to supply cost estimates upon request.

Potential revenue consists of the income produced from the sale of the vegetables. It can be estimated by multiplying projected greenhouse yield by the expected sale price. The smaller scale production expected in these communities, suggests that farm gate sales (selling at the greenhouse location), farmers' markets, and direct sales to retail stores are more viable channels than the wholesale market.

Small communities may be able to secure a higher price for their produce than traditional growers given that they are selling directly to consumers. Unfortunately, the small scale of production suggests that it may be nearly impossible to recoup enough revenue from sales to cover ongoing costs.

Over the lifetime of a project O&M costs represent the single greatest challenge to a project's economic viability. Consider that many remote and northern Canadian communities experience very cold and dark climates. The practical implications of this are that heating and electricity costs are likely to be much higher than that of typical southern greenhouses. Further, the costs of replacement materials and supplies are subject to longer transport distances that incur high logistics costs. A single

greenhouse in a northern Canadian community can have yearly O&M costs in excess of \$300,000.

While it may be tempting to conclude that available grants and funding towards the upfront capital of these projects will improve the viability of the ventures, of greater importance is determining how to address the ongoing O&M costs. Advanced technology in the form of renewable energy, LED lighting, thermal screens, hydroponics, and computerized environmental controls may offer solutions to increasing efficiency and reducing operating costs. These technologies will also likely require higher up-front costs and add a greater degree of technical uncertainty to the project.

There has been much interest around utilizing locally available biomass as an inexpensive heat source for community greenhouses. However, studies have concluded that reducing heating costs alone does not significantly improve the economic viability of greenhouses in unsatisfactory growing environments. For the ventures to be successful, other financial variables must also be improved. This can include a significant increase in greenhouse commodity prices, an increase in transportation costs for competing southern grown produce, or reduced operating costs, including electricity and labour. There may be a better business case to be made in remote and fly-in communities. The Nutrition North Program currently has a fixed yearly subsidy budget of \$53.9M. It is worth exploring how local food production might work to offset these costs



Seeing More Than Just Financial Value.

For many communities, a greenhouse is unlikely to be a financially lucrative undertaking. In determining the viability of such a facility, the community may also wish to consider the intrinsic value that such an operation could offer. A commercial greenhouse may serve to offer a sense of community pride, increase health and overall community wellness, and become an identifying mark that could boost tourism appeal.

Indeed, research has shown a number of other community benefits ranging from cultural integration, to providing psychological value and light therapy for the management of Seasonal Affective Disorder.

Community Capacity Building

Capacity building is about developing the ability of communities to respond to their own challenges and opportunities. The Carmacks Greenhouse in the Yukon is an instructive example of this. Not only has the greenhouse become the second largest tourist attraction in Carmacks, it has also raised the town's community spirit. Initially centered on addressing food security concerns in the small northern community, the seasonal greenhouse, received initial funding from the Territorial and Federal Governments, and has now been permanently adopted by the Little Salmon Carmacks First Nation. All produce gets shared—part goes to community members in the Carmacks diabetes program, part goes to the First Nation

for local events, and part is sold farm gate style to tourists and locals. The greenhouse has also given extra vegetables to the local school lunch program

Greenhouse operations also provide beneficial community opportunities for skills development and education. Agriculture is an often-used teaching tool to promote education and social reintegration. The greenhouse project at Yukon College in Whitehorse offers an example of a skills for employment program where the greenhouse is used as a platform for learning construction and greenhousing techniques.

Economic Development

Greenhouses require full and part time staff for operating, monitoring, harvesting and packaging. Depending on the crops selected there may also be a need for value-added processing staff, for example creating local artisan salsa or pickled products. The direct employment benefits of a small community greenhouse are likely to be small—perhaps one to two full time

employees.

However, peripheral economic development might include the need to employ local trades for greenhouse construction and maintenance. From a community perspective, these jobs will add to the direct supply of income circulating within the community, and any effect to increase the circulation of capital in small economies will generate a multiplying effect.

Community Health

Food that is grown locally, ripened on the vine, and picked just hours before reaching market, is much more nutritious and appetizing. Improving community access to fresh and nutritious vegetable options is likely to improve overall health and wellbeing, particularly when incorporated as part of a larger health and education awareness campaign.

“It makes such a difference to have fresh, local food – food that’s clean, healthy, and contributing to your community. Nothing tastes better.”

-Dawn Charlie,
Carmacks Greenhouse
Carmacks, YT





What's Next?

If the community sees value in moving forward with a potential greenhouse project there are several next steps that should be considered:

Business & Operations Plan

Detailed analysis including cost assessments, market summaries, production plans, siting considerations, environmental impacts, and risks are required before any firm financial commitments should be made.

Hire a Greenhouse Manager

Expertise is required to conduct the market analysis, business planning, and greenhouse design. Identifying what local capacity (if any) exists to fill this role requires particular attention.

Consortium Building

Convene local stakeholders and subject-matter experts to help guide project development.

Site Visits

Many greenhouse operators are happy to offer their knowledge and experience to communities just starting out. Visiting an operating commercial greenhouse will help to demonstrate the realities of intensive agricultural production and provide important best practices.

Pilot Project

Finding labour, learning production techniques, and developing markets, is a difficult undertaking for novices. It is suggested that communities minimize their risk by starting small and escalating production as their confidence grows.

Questions?

CTCG is happy to provide assistance to communities exploring local food production. We are able to offer guidance, introductions, resources, references, and potential funding sources.

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<http://www.bonsaimary.com/small-greenhouse-not.html>
Pepper Price (Clyde River, Nunavut):
<http://nunavutfoodprice.tumblr.com/>
Whistler, BC Community Greenhouse:
<http://tweedtelegraph.com/2012/03/>
Carmacks, YT Greenhouse: <http://www.aadnc-aandc.gc.ca/eng/1316035307529/1316035378955>
Igiugig, Alaska Community Greenhouse:
<http://www.alanaustrerman.com/?p=1838>
Inuvik, NWT Community Greenhouse:
http://arcticlisse.blogspot.ca/2012_08_01_archive.html



CLEANTECH COMMUNITY GATEWAY



Mission

Our mission is to create opportunities to develop innovative, clean technology projects that assist remote communities to transition towards sustainable green economies.

Vision

Our vision is to be a catalyst in propelling British Columbia and Canada to become a powerhouse for clean energy solutions through building unique capabilities around system integration in remote communities.

What We Do

CTCG works with communities to identify and develop clean energy strategies and models based on locally available resources, and provide them with the tools and assessments they need to implement beneficial energy solutions.

By developing relationships with all levels of government and industry, CTCG is able to ensure that remote communities have the resources required to move projects through development, and that clean technology companies create solutions tailored to the identified needs of the community.

CTCG also assists in coordinating and aligning funding from various government programs, and in attracting investment to support the development of projects.



Tools & Assessments

CTCG is able to create custom tools and assessments for communities. Past assistance has included:

- Energy Systems Modeling (HOMER software)
- Renewable Energy Financial Analysis (RETScreen Software)
- Natural Resource Assessments (e.g. biomass inventories)
- Feasibility Studies for Various Clean Technologies (including community greenhouses)
- Business Plans
- Funding Identification and Application Guidance