

**ECONOMIC ASSESSMENT OF COMMUNITY GARDENS:
A CASE STUDY OF THE YELLOWKNIFE COMMUNITY GARDEN COLLECTIVE**

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1. Introduction

“Gardening ... is an activity that implicitly challenges the corporate food system by creating an activity for people to dirty their hands, grow their own foods, work with their neighbours and generally transform themselves from consumers of food into soil citizens.” (Baker, 1999) This rings particularly true in the Canadian North. Canadians living beyond the 60th parallel are at the mercy of supplies lines, transportation costs and imported food from thousands of miles away. This removes them from direct contact with their food. A community garden project rectifies this problem by putting members in direct contact with their food; by its very existence, it reminds passersby about the reality of local food production. Participation in a community garden further roots citizens in northern communities by strengthening their ties to the physical land and removing the stigma of the Canadian north as a barren tundra wasteland.

However, opponents of community gardening projects point to the high opportunity cost of land used and the low yield by amateur gardeners as examples of the inefficiency inherent in community gardening projects. Individual gardeners possess different levels of agricultural knowledge and, as such, production can vary from extremely efficient to minimal production. Run by volunteers with little focus on the best use of the land, a community garden may prevent valuable investments in commercial or residential buildings.

This case study presents an evaluation of the Yellowknife Community Garden Collective in Yellowknife, Northwest Territories that incorporates an assessment of the economic costs and benefits of community gardening and stakeholder specific

impacts. Yellowknife's community gardening scheme typifies the successful community gardens that have emerged in North American cities over the past two decades. The Yellowknife Community Garden Collective has developed a very large community garden with multiple sites and with more than a decade of existence can be seen as a very successful example of a community garden.

Some of the specific questions being addressed in this valuation include:

1. What is the contribution of the project to the economy of Yellowknife?
2. What is the value of the economic impact on the stakeholders affected by the community garden? Who gains or loses and by how much?

2. Background

2.1 Community Gardens

A community garden is a plot of land where members can grow flowers or food. Community garden set-ups vary widely, ranging from individual plots, side by side, to a communal garden, where all gardeners share in the work and harvest equally. Individual plots, reminiscent of the British allotment system, allow landless people a chance to tend their own gardens. Communal plots, however, appeal to a sense of cooperation. Most gardens are set up as a middle ground: members tend their own plots but communal plots are used for invasive plants, like raspberries, or tall plants, like corn, to prevent shading a neighbor's plot. Members manage the garden, participate in communal maintenance activities and share resources, like watering facilities, tools and walk ways.

Community gardens offer an opportunity to engage in a productive leisure activity. Aside from the physical elements of arable land, watering facilities and pest protection, the success of a community garden is dependent on certain social components. Twiss et al. (2003) found three key factors that contribute to the success of community gardens in California: committed local leadership, involved volunteers and the presence of skill building opportunities for participants. The commitment of the community and a few passionate individuals can determine the success of a community garden almost wholly. Glover, Parry and Shiness (2005) emphasize the importance of volunteers in community gardens. In community gardens, there are rarely, if ever, employees; rather, passionate members committed to the mission of the community garden mobilize to take on challenges. Gardeners also participate in activities linked to their garden but not with the act of gardening specifically, like grant writing, future garden planning, meetings, educational seminars, and harvest festivals. It is these activities that further foster the community and the social capital present within a community garden. Using interviews with gardeners in St. Louis, Glover et al. argue that while community gardeners often lack the financial means for garden improvement, successful gardeners leverage their social ties to better the community garden. By building relationships, the gardeners access skilled workers or expensive tools for free.

However, passionate local garden leadership is not enough on its own to guarantee a successful community garden. Crucial to the success of a garden is secure land tenure. As Holland (2004) explains in her examination of community gardens in the United Kingdom, “despite a growing season of several months, which

gives a short-term feel to a garden, growers often plan for seasons ahead and may regard lack of tenure as a barrier to garden development.” Community gardens in a poor area on the Lower East Side of Manhattan in the 1990s found this same issue. Schemelzkopf (1995) analyzed 75 gardens in the area, and noted that gardens either owned by the collective or in long term leases were marked by “sense of permanency felt by the gardeners, with an abundance of slow-growing trees, perennials, lawns, and features such as benches, gazebos, and paths made of bricks recycled from the demolished buildings” (Schemelzkopf, 1995). Gardens lacking secure tenure still demonstrated commitment by the gardeners, but lacked the investment in long-term capital.

2.2 Agriculture in the Northwest Territories

Can the Northwest Territories support agriculture? Any reader unfamiliar with northern Canada is undoubtedly asking this question right now. In short, the answer is yes.

There are two climate zones in the Northwest Territories: arctic and subarctic. The arctic climate is north of the tree line and tends to have a frost-free period of 60 days annually. The subarctic climate is milder and has substantially more frost-free days. Yellowknife, in particular, has an average of 123 frost-free days annually, which is comparable to the 128 annual frost-free days in Calgary, Alberta, a city situated much further south. Further, growing degree days show that Yellowknife can be compared to the prairies for crop production. A growing degree day takes the mean temperature of the day and subtracts a base temperature to

measure the affect of heat accumulation on a plant's growth. This measurement is used to determine the types of plants that will thrive in an area, as well as the time necessary for crop maturation. For the past thirty years, Yellowknife has averaged 1077 growing degree days annually. For comparison, Edmonton, Alberta averaged 1360. With increasing temperatures worldwide, Yellowknife gardeners have noted an increase of 64 growing degree days on average in the past five years (Yellowknife Community Garden Collective, 2011).

Natural Resources Canada categorizes most of the Northwest Territories as zone 0a on the plant hardiness scale. The plant hardiness scale ranges from 0a for the harshest climate and 9b for the mildest (Natural Resources Canada, 2000). This means that only particularly hardy plants will thrive outdoors in the Northwest Territories. Potatoes, turnips, carrots and cruciferous vegetables, like cabbage and kale, grow well in this zone. Cereal grains, like barely, rapeseed and oats, will grow, though recently developed hardier strains manage better with the occasional summer frost. Berries, from saskatoons to strawberries to raspberries, do quite well in certain areas of the Northwest Territories due to the long hours of summer daylight. Forage including natural hays, red clover and creeping red fescue, can yield up to 50 tons per acre (Territorial Farmers Association, 2000).

Soil quality can be an issue in the Northwest Territories. Naturally, given the breadth of the territory, soil quality ranges from fertile to extremely limited productive capability (Territorial Farmers Association, 2000). The quality of soil matters substantially more to large scale commercial agriculture production. Small gardens can fertilize by hand and compost sufficiently to increase the quality of

already arable soil. In Yellowknife, one of the greatest challenges is the poor quality, acidic soil. To cultivate a successful, large scale garden requires the purchase of additional soil.

Not only do the land and climate make agriculture possible, but also there are over 200 years of precedent for agricultural cultivation in the Northwest Territories. Since 1789, when the first garden was reported in the Northwest Territories, European fur traders and missionaries gardened to supplement their rations and hunting. By 1826, every Hudson's Bay Post tended a garden, even in Aklavik, well beyond the Arctic Circle. An 1828 report shows an impressive variety and quantity from a missionary's garden: barley, potatoes, turnips, carrots, cabbage, onions and peas. Moreover, hay for livestock was also regularly produced. These gardens were "undertaken as a matter of course" - to prevent scurvy, European settlers needed fresh produce (Territorial Farmers Association, 2000).

Up until the mid-twentieth century, gardens continued to be important in supplying food to the people of the Northwest Territories. Transportation remained costly and unreliable; local food was cheaper and fresh. However, as transportation costs fell and the importance of the wage economy expanded, gardening became less and less common (Government of the Northwest Territories, 1990). Purchased food tended towards processed foods and could not match homegrown produce for freshness or nutrition. Now, the Northwest Territories face a resurgence of interest in local, fresh produce; the barrier now is a lack of knowledge on how to cultivate a garden (Government of the Northwest Territories, 2010).

In 2008, the Government of the Northwest Territories and the Government of Canada implemented the Growing Forward policy. This policy committed \$1.3 billion dollars for five years to develop a sustainable agriculture sector in the Northwest Territories. Part of this policy is the Small Scale Foods Program, which commits funds to small agricultural producers. The aim of this program is to “work with communities through a hands-on program which allows for involvement at all levels and provides physical results and development of knowledge” (Government of the Northwest Territories, 2008). Community gardens fall into this category and so can receive funding through this initiative.

Since the Small Scale Foods Program has come into effect, 27 communities have participated. Much of the assistance from the staff at the Small Scale Foods Programs comes not from financial assistance, but in the form of knowledge sharing. For communities without a community garden, staff assist in the identification of appropriate sites and give direction on the next steps in development. For communities with already developed gardens, the Small Scale Foods Program can offer assistance with more sophisticated technology like solar pumps, electric fences and greenhouses.

2.3 The Yellowknife Community Garden Collective

The Yellowknife Community Garden Collective (YCGC) aims to give gardening space to residents interested in growing and harvesting their own organic produce. The first garden began in 1995 with a 22 plots on 791 square meters of land, called the Kam Lake Garden. By 2001, an additional 22 plots were added, for a total of

1466 square meters. By 2008, the YCGC saw sufficient demand to open a garden at a different site. The Old Town Garden, with 18 plots, harvested its first crop in 2009. After the success of the first two gardens, the Yellowknife Catholic School partnered with the YCGC to create a community garden on the Weledeh School property. The fall of 2011 marks the first harvest from this garden. As of 2011, the scheme covered four gardening sites at three separate gardens with over 160 members. Each garden plot is between 20 and 22 meters squared.

Table 1: YCGC's Gardens

Name of Garden	Number of Plots	Size (m²)
Kam Lake	44	1466
Old Town	18	456
Weledeh	19	577
Total	81	2499

For a fee of twenty dollars, a gardener receives a plot ready to garden and access to the community resources. Each plot is shared between two people. Basic gardening tools, like watering cans, wheelbarrows and hand tools, are provided in a shed on each site. Gardeners may also harvest berries from the communal bushes around the garden site.

Gardeners commit to use organic gardening methods and fertilizers, like compost. Members must also maintain their plots with regular weeding and harvest produce regularly. After the final fall harvest, all gardeners must clean their plot. Gardeners are also required to water their gardens with the use of a watering can.

The reason is twofold: first, dragging a hose can cause damage to other plots and second, watering by hand prevents wastage.

The YCGC is committed to food security in Yellowknife. All gardeners must also donate at least one quarter of their produce to charity. To monitor this, gardeners must record the weight of their donations and to which organization they donated. These include the Salvation Army, the Weledeh School Food Program, the Yellowknife Food Bank and more than ten others. To extend the charity beyond the summer months, the YCGC urges members to make at least 80% of the donation hardier vegetables like potatoes, rutabagas and carrots.

Further, all gardeners must participate in community activities to maintain the garden site as a whole. While attendance at these “work-bee” events is recorded, there appears to be no consequence for failing to attend. Gardeners must also participate in the Annual General Meeting by attending themselves or sending a proxy. If a member fails to do so, they lose their right to renew membership the following year.

Gardeners at the Weledeh garden have an extra responsibility: each gardener takes on a student from the school as a garden buddy. The gardener teaches their garden buddy about working in a garden from prepping the soil to planting to harvesting to cleanup. Produce given to the garden buddy counts towards the donation requirements of the YCGC.

The YCGC also offers seminars and informal education on gardening organically and sustainably in northern climates. These seminars allow novice

gardeners or experienced gardeners unfamiliar with the subarctic climate to learn the best techniques for gardening in Yellowknife.

Since 1995, the YCGC has achieved their goals of providing a space to grow organic produce, educating the community about gardening in a northern climate and supporting food security initiatives in Yellowknife. The results of these achievements, however, have an impact beyond the YCGC and its members. To measure the value of the contributions by the YCGC, an economic appraisal will be conducted in the next section.

3. Economic Assessment

3.1 Approach

The economic appraisal of a community garden examines the effect of the garden on the entire community and determines if the community garden increases the net economic benefits accruing to the community as a whole. The aim is to quantify the impact of project and determine if resources are used to maximize net social welfare. The financial cash flow statement does not reflect many of the benefits or costs incurred from a community garden project. Indeed, because there are no market transactions recorded, none of the benefits appear in the financial cash flow statement. To correct for this, I have valued the benefits and costs at the opportunity cost. The description of each follows in the parameters and assumptions section. Then I test the sensitivity of these parameters and determine the variables with the most influence over the viability of the project.

I will analyze the economic net present value (NPV) of the Yellowknife Community Garden Collective from 2009 to 2019. For 2009 and 2010, actual cost data can be used. For 2011 to 2019, costs will be extrapolated from existing data. Benefits and operating costs are tallied as an annual stream; however, set-up costs are paid up front. Two new gardens were set up in 2009 and 2010; however, no new gardens are projected to be set up in the future and so the analysis will focus on the operational benefits and costs of the community garden.

3.2 Assumptions and Parameters

The case study of the Yellowknife Community Garden Collective has been developed based on the following assumptions and parameters.

Value of Labour

Given that volunteer labour benefits the community and the volunteer, valuing a volunteer hour requires accounting for the fact that volunteers are willing to work for no hourly wage. Brown (1999) estimated the opportunity cost of volunteer labour to be one half to six sevenths of the average hourly wage. The lower bound occurs when the volunteer activities are more pleasant than the volunteer's paying employment and the upper bound fits with volunteer activities requiring more skills and responsibilities.

The average unskilled labourer in the Northwest Territories earned \$38,547 in 2006 (NWT Bureau of Statistics, 2008). Given 48 weeks of work annually with an average workweek in Yellowknife of 34.1 hours, the average unskilled worker is

paid \$23.55 hourly in 2006. After inflating to 2009 values, this is \$24.62 per hour. So, the value of the volunteer labour ranges from \$12.31 to \$21.10. I will use a midrange estimate of 65% of the hourly wage or \$15.98 per hour for my base case scenario.

There are other procedures that can be used to measure the value of volunteers, namely the replacement cost method. This values volunteer contributions from the perspective of the organization, if the organization had to pay for their services. However, as far the YCGC is concerned, if volunteer labour was unavailable, it would not be replaced. The quantity or quality of services offered would be significantly reduced or eliminated altogether.

Hours of Labour

The number of hours spent in different activities at the YCGC was determined through correspondence with Dwayne Wohlgemuth, the current manager of one of the YCGC's garden sites. I will use his estimates for the base case scenario and test a range of estimates as well.

There are additional time commitments required by the YCGC. Each gardener must partake in worker bee activities for ten hours per year. Further, each gardener must attend (or nominate a proxy to attend) the annual general meeting, which takes three hours. Finally, each gardener must spend time donating one quarter of his or her produce to a food charity in Yellowknife. If a gardener drops off food three times during the season and each round trip is one hour, then three hours will be spent on donating food. These additional time costs add sixteen hours of labour.

The last time cost is specific to the Wedeleh garden. Because gardeners are paired with a school age child, they must undergo a background check. The background check is free; however, the gardener must drive to the RCMP office twice. The round trip from the school takes 10 minutes. So, taking into account travel time, time spent filling out forms, and time waiting at the RCMP office to garden in the Wedeleh garden requires an additional hour of time.

Value of Leisure

Gardening, for many people, is a leisurely pursuit. For those who see gardening as leisure, there is a willingness to pay for the privilege of gardening, rather than a cost imposed on them by the additional physical labour. For those who choose to participate in a community garden, I will argue that tending one's plot is a leisurely pursuit and so, a participant gains utility from engaging in this activity. Ideally, to measure the willingness to pay for this activity, one could perform a contingent valuation survey with the participants in the YCGC.

However, in this case, I will be using literature to inform the willingness to pay for leisure activities. Namely, Dalenburg, Fitzgerald, Schuck and Wicks (2004) used a contingent value survey in a Rocky Mountain city to measure the national income accounting value of leisure activities. Dalenburg et al. found the willingness to pay for outdoor activities to be \$5.70 per hour on average. Considering the exchange rate in 2004 between US dollars and Canadian dollars was 1.301 (Bank of Canada, 2011) and the conversion to 2009 dollars, the leisure value of tending a garden in Yellowknife is \$8.46 per hour. I will use this value for my base case

scenario and then test a range of estimates for the value of leisure time, including a zero value of leisure.

Hours of Leisure

Each plot requires 100 hours of work throughout the growing season to weed and harvest produce. Each gardener will spend 50 hours tending his or her plot. This estimate, like the labour hours, comes from Dwayne Wohlgemuth and will be used in the base case scenario.

Life of Assets

In the ten-year time span of this analysis, I assume the garden does not need refurbishment. This assumption is realistic, given that the YCGC's first site was set up in 1995 and has not been refurbished or had major capital expenditures up to this point. So, a garden can be expected to have at least a sixteen-year life span. The investment costs are upfront; therefore, for future analysis, it would be valuable to know how long the initial investment will last.

Required Rate of Return

The YCGC aims to have membership and plot rental fees cover all operating expenses; therefore, their target of return is 0%. This does not include set up costs for a new garden. Typically, new gardens are funded through grants. This means the YCGC is aiming for zero profit as an organization.

Opportunity Cost of Land

According to the Land Administration By-law, the city of Yellowknife can lease land for up to 10% of the assessed value annually. To determine the assessed value of the land taken up by the YCGC, one can look at the property tax notice received. As the YCGC was served with a taxation notice of \$3019.00 in 2009 and the mill rate was 18.37%, the assessed value of the three properties rented by the YCGC was \$164,344.04. Using the 10% rule, the city of Yellowknife could charge \$16,344.04 annual rental on this property. Given the YCGC rents 0.1922 hectares of essentially vacant land that requires no maintenance from the city, this rental rate would be equivalent to charging a monthly rental fee of over \$7000 per month on a hectare of land. In the case of the YCGC, this would be a \$1,369.50 monthly lease. This seems rather high given that the YCGC currently pays \$210.00 for both the Kam Lake and the Old Town Garden sites annually.

According to the city of Yellowknife, standard lease rates for non-profit groups are \$600.00 annually. If the land would be rented to another non-profit only and not leased for commercial development, this is the appropriate opportunity cost of land. I will use this value in my base case scenario and test values up to \$16,344.04 annual rental.

Taxation

There are no property taxes paid by the YCGC, as determined by the city council in 2010. However, property taxes in 2009 were estimated to be \$3019.00 for three garden sites. The fourth garden site is on the land of a school and so,

property taxes are paid by the school board, regardless of whether a garden exists on the land or not.

Garden Composition

Table 2 details one possible garden composition. With a garden of this size, the sheer volume of vegetables grown would go to waste if one had consume them all within the growing season; therefore, three quarters of the garden is dedicated to root vegetables that can be easily stored. This paper does not explore the possibility of selling produce grown in the community garden at a farmer’s market. By no means does this represent every garden combination that could possibly be grown in Yellowknife, just one very plausible option.

Table 2: Garden Composition

Vegetable	Amount Planted
Root Vegetables	
Carrot	One jumbo seed packet
Potatoes	Four 2.5 kilogram bags of seed potatoes
Rutabagas	One seed packet
Onions	Two packets of 100 bulbs
Greens	
Leaf Lettuce	One seed packet
Spinach	One seed packet
Herbs	
Dill	One seed packet

Root vegetables dominate the majority of the garden. These are easy to store past the growing season. Further, the Revised Northern Food basket allocates a substantial portion of their perishable food section to root vegetables. For example, a family of four is anticipated to consume nearly eight pounds of potatoes weekly and over four pounds of carrots per week.

Garden Yield

Each plot is between 20 and 22 meters squared. From this, the average yield from each plot is detailed in Table 3. No soil deterioration occurs during the life of the project to impact yield rates. One quarter of output is donated and three quarters is kept for personal or family consumption.

The quantity of produce grown clearly affects the value of production. I will use the yields listed below in my base case scenario and test sensitivity of a 40% change either way.

Table 3: Expected Yield

Vegetable	Expected Yield	Yield per Gardener
Root Vegetables		
Carrot	100 lbs	37.5 lbs
Potatoes	400 lbs	150 lbs
Rutabagas	50 lbs	18.75 lbs
Onions	50 lbs	18.75 lbs
Greens		
Leaf Lettuce	8 bags	3 bags
Spinach	8 bags	3 bags
Herbs		
Dill	20 bunches	7.5 bunches

Value of produce

Food prices are based on food prices in Edmonton, a large Northern Alberta city. Ideally, data from Yellowknife would be used; however, lacking the availability of this data, Edmonton food prices are an ideal substitute. I used price data from the Revised Northern Food Basket to estimate the difference between prices of perishable food in Edmonton and Yellowknife (Ministry of Indian Affairs and Northern Development, 2007). The Revised Northern Food Basket is a bundle of food items that both reflect actual food consumption patterns in northern communities and ideal nutritious consumption patterns. This basket is used to monitor the cost of food in isolated northern communities relative to southern supply points. Yellowknife and Edmonton are both considered southern supply points. From 2005 to 2009, the perishable component of the basket ranged from 12% more expensive to 5% less expensive in Yellowknife. On average, food prices were 2.98% more expensive in Yellowknife. Therefore, I will convert Edmonton prices to Yellowknife prices by increasing them by 2.98%.

There are three prices of food that I will examine. The first is the price of conventional produce. This is the produce one would typically buy in a grocery store. It is readily available and easy to substitute for the produce that would be grown in a garden. However, the produce grown in the YCGC's garden is local and organic produce and this would command a price premium if sold. To reflect the local and organic prices, the same produce was priced at the Edmonton farmer's market. This is the best measure of value for the produce, reflecting both the organic farming methods and the local production. There is also an established literature on

the premium for organic produce. As a baseline, the United States Department of Agriculture has found organic produce is valued at 1.5 to 2 times more than conventional produce. Organic prices are midway between conventional and local, organic prices.

Table 4: Value of Garden Produce in Yellowknife

Type of Produce	Value of Garden Production to Individual Gardener
Conventional produce	\$299.05
Organic produce	\$589.11
Local, organic produce	\$780.05

Discount Rate

I will look at a range of discount rates from 3.25% to 8.23%. The standard discount rate recommended by the Treasury Board of Canada is 7%. Jenkins and Kuo (2007) argue this is too low and recommend a rate of 8.23% to reflect the true economic opportunity cost of capital. However, Boardman, Moore, and Vining (2010) argue that for social discount rates a rate of 3.25% should be used. I will use 7% for my base case scenario and then test a range of scenarios from 3.25% to 8.23% for the effect on the net present value of ten years of the YCGC's activities.

Inflation

The domestic inflation rate in 2009 and 2010 will be as reported by Statistics Canada. After this time period, the domestic inflation rate in Canada is assumed to remain constant at 2% per year. I will test this parameter with sensitivity analysis as well.

Food inflation

From the TD Special Report on the Price of Food, the long-term food inflation average has been 2.2% in Canada. This will be the value used in the base case scenario. This exceeds the average rate of inflation. Food prices can be volatile and Yellowknife is particularly vulnerable to increases in transportation costs of food. Therefore, I will test scenarios where the price of food inflates at rates ranging from 0% to 8% as well.

3.3 Base Case Scenario

In my base case scenario, I will use the following parameters. All values will be in 2009 dollars. The value of labour and leisure are \$15.98 and \$8.76 per hour, respectively and remain so, in real terms, for the duration of the analysis. Each individual gardener spends between 16 and 17 hours per season on labour for the YCGC and 50 hours engaged in gardening for leisure. The garden yield will be valued at organic prices and so each garden will produce \$1,594.95 worth of produce annually. The YCGC does not pay taxes and pays \$210.00 annually for rents; however, the opportunity cost of the land is \$1260 annually. Operating costs remain constant in nominal terms for the duration of the analysis. The discount rate is 7%, inflation moves at a rate of 2% annually while food inflation grows at a rate of 2.2% annually. All values will be tested using sensitivity analysis.

Table 5: Base Case Scenario

	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019
Benefits											
Value of Produce	\$ 70,177.99	\$ 99,373.33	\$ 130,081.01	\$ 130,336.07	\$ 130,591.64	\$ 130,847.70	\$ 131,104.26	\$ 131,361.33	\$ 131,618.90	\$ 131,876.98	\$ 132,135.56
Leisure Time	\$ 38,544.00	\$ 54,312.00	\$ 70,956.00	\$ 70,956.00	\$ 70,956.00	\$ 70,956.00	\$ 70,956.00	\$ 70,956.00	\$ 70,956.00	\$ 70,956.00	\$ 70,956.00
Sum of Benefits	\$ 108,721.99	\$ 153,685.33	\$ 201,037.01	\$ 201,292.07	\$ 201,547.64	\$ 201,803.70	\$ 202,060.26	\$ 202,317.33	\$ 202,574.90	\$ 202,832.98	\$ 203,091.56
Costs											
Capital											
Land	\$ 1,260.00	\$ 1,238.94	\$ 1,214.65	\$ 1,190.83	\$ 1,167.48	\$ 1,144.59	\$ 1,122.14	\$ 1,100.14	\$ 1,078.57	\$ 1,057.42	\$ 1,036.69
Liability Insurance	\$ 661.00	\$ 737.46	\$ 723.00	\$ 708.83	\$ 694.93	\$ 681.30	\$ 667.94	\$ 654.85	\$ 642.01	\$ 629.42	\$ 617.08
Water	\$ 728.96	\$ 716.77	\$ 964.00	\$ 945.10	\$ 926.57	\$ 908.40	\$ 890.59	\$ 873.13	\$ 856.01	\$ 839.22	\$ 822.77
Tool Replacement	\$ -	\$ -	\$ 385.60	\$ 378.04	\$ 370.63	\$ 363.36	\$ 356.24	\$ 349.25	\$ 342.40	\$ 335.69	\$ 329.11
Misc	\$ 117.57	\$ 710.63	\$ 708.54	\$ 694.65	\$ 681.03	\$ 667.68	\$ 654.58	\$ 641.75	\$ 629.17	\$ 616.83	\$ 604.73
Seeds	\$ 1,773.23	\$ 2,456.87	\$ 3,146.85	\$ 3,085.15	\$ 3,024.65	\$ 2,965.35	\$ 2,907.20	\$ 2,850.20	\$ 2,794.31	\$ 2,739.52	\$ 2,685.81
Labour											
Set Up	\$ 7,990.18	\$ 7,990.18	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -
Board	\$ 14,382.32	\$ 14,382.32	\$ 14,382.32	\$ 14,382.32	\$ 14,382.32	\$ 14,382.32	\$ 14,382.32	\$ 14,382.32	\$ 14,382.32	\$ 14,382.32	\$ 14,382.32
Worker Bee	\$ 14,062.71	\$ 19,815.64	\$ 25,888.18	\$ 25,888.18	\$ 25,888.18	\$ 25,888.18	\$ 25,888.18	\$ 25,888.18	\$ 25,888.18	\$ 25,888.18	\$ 25,888.18
Donation Drop Off	\$ 4,218.81	\$ 5,944.69	\$ 7,766.45	\$ 7,766.45	\$ 7,766.45	\$ 7,766.45	\$ 7,766.45	\$ 7,766.45	\$ 7,766.45	\$ 7,766.45	\$ 7,766.45
Annual General Meeting	\$ 4,218.81	\$ 5,944.69	\$ 7,766.45	\$ 7,766.45	\$ 7,766.45	\$ 7,766.45	\$ 7,766.45	\$ 7,766.45	\$ 7,766.45	\$ 7,766.45	\$ 7,766.45
Police Check	\$ -	\$ -	\$ 447.45	\$ 447.45	\$ 447.45	\$ 447.45	\$ 447.45	\$ 447.45	\$ 447.45	\$ 447.45	\$ 447.45
Set Up Expenses	\$ 21,925.14	\$ 21,925.14	\$ 1,928.01	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -
Sum of Costs	\$ 71,338.74	\$ 81,863.35	\$ 65,321.51	\$ 63,253.45	\$ 63,116.15	\$ 62,981.53	\$ 62,849.56	\$ 62,720.17	\$ 62,593.32	\$ 62,468.96	\$ 62,347.04
Benefits - Costs	\$ 37,383.24	\$ 71,821.98	\$ 135,715.50	\$ 138,038.62	\$ 138,431.49	\$ 138,822.16	\$ 139,210.70	\$ 139,597.16	\$ 139,981.58	\$ 140,364.02	\$ 140,744.52

3.4 Results

In the base case scenario, the net present economic value of YCGC operations from 2009 to 2019 is \$880,518.50. This indicates that over ten years the community garden scheme in Yellowknife is hugely beneficial.

Each year from 2011 onwards, the YCGC provides over \$200,000 worth of benefits to participants and the community. In 2011, for example, the YCGC produces \$130,081.01 worth of produce and \$70,956.00 value of leisure time. Recalling that one-quarter of the produce is donated to food security organizations results in donations valued at over \$30,000. From the cost perspective, the value of labour is undoubtedly the biggest cost with nearly \$60,000 worth of volunteer labour contributed to the YCGC. Seeds are the biggest capital cost from an operational perspective; this follows logically, considering all garden infrastructure is built and in place during the set-up phase of a garden. Overall, the net benefits from the YCGC in 2011 are valued at over \$100,000.

3.5 Sensitivity Analysis

Value of Labour

The opportunity cost of labour has a large impact on the net present value of the YCGC. Raising the value of labour from \$15.38 in the base case scenario to \$20.00 decreases the net present value by 12.97%. Similarly, lowering the value of labour to \$11.00 increases the net present value by 11.70%. This reflects, in particular, the importance of the value of the YCGC board's work.

Table 6: Sensitivity Test of the Value of Labour

Labour Price	NPV
\$10.00	\$1,042,722.28
\$11.00	\$1,018,015.16
\$12.00	\$993,308.04
\$13.00	\$968,600.93
\$14.00	\$943,893.81
\$15.00	\$919,186.69
\$16.00	\$894,479.58
\$17.00	\$869,772.46
\$18.00	\$845,065.35
\$19.00	\$820,358.23
\$20.00	\$795,651.11
\$21.00	\$770,944.00
\$22.00	\$746,236.88

Hours of Labour

The hours of labour engaged in work bee activities are the most variable. As this number increases, the NPV of the community garden falls. An increase from ten hours per member annually to fifteen hours causes a nearly \$90,000 decrease in the ten year NPV of the community garden.

Table 7: Sensitivity Test of the Hours of Labour

Hours of Labour	NPV
5	\$969,404.11
10	\$880,518.51
15	\$791,632.91
20	\$702,747.31
25	\$613,861.71
30	\$524,976.12

Value of Leisure

The net present value is highly dependent on the value of leisure derived from gardening. For example, if leisure is omitted completely from the valuation process,

then the net present value of the community garden for ten years falls by more than one half to \$407,718.06. A one dollar increase in the value of leisure from the base case results in a seven percent increase in the net present value of the project.

Table 8: Sensitivity Test of the Value of Leisure

Value of Leisure	NPV
\$-	\$393,271.68
\$6.00	\$727,002.38
\$7.00	\$782,624.17
\$8.00	\$838,245.95
\$9.00	\$893,867.74
\$10.00	\$949,489.52
\$11.00	\$1,005,111.31
\$12.00	\$1,060,733.09
\$13.00	\$1,116,354.88
\$14.00	\$1,171,976.66

Hours of Leisure

Some gardeners may spend more time in their garden. The YCGC estimates that each gardener spends fifty hours in their plot; if, on average, gardeners increase time spent in the garden, then the NPV of the community garden project increases as well. Increasing time spent in the garden by five hours per gardener from the base case increases the ten year NPV by nearly \$50,000.

Table 9: Sensitivity Test of Hours of Leisure

Hours of Leisure	NPV
0	\$393,271.68
40	\$783,069.14
45	\$831,793.83
50	\$880,518.51
55	\$929,243.19
60	\$977,967.88

Conversely, if the value of leisure time is zero, then the NPV falls to \$407,718.06, which is still a substantially positive number. This is a key factor in this analysis. A positive valuation of leisure is not necessary for the project to have a positive net present value.

Opportunity Cost of Land

If the opportunity cost of land is equivalent to the YCGC's current rental payments of \$200.00 annually, the net present value of the gardening project increases slightly. However, if the opportunity cost of land is \$16,344.04, as reflected by the City of Yellowknife's property tax statement, then the net present value of the YCGC falls by over \$200,000. The true opportunity cost of the land used in this project is a key contributor to the economic value. Moreover, it is easy to see that in cities with very high opportunity costs of land, like Toronto, the benefits of a community garden project may be too low to justify foregoing commercial development.

Table 10: Sensitivity Test of Opportunity Cost of Land

Opportunity Cost of Land (Annually)	NPV
\$200.00	\$886,325.59
\$1,200.00	\$880,518.50
\$16,344.04	\$651,951.25

Value of produce

If the opportunity cost of produce is actually lower, reflecting the price of substitute produce, then the NPV falls to \$431,616.51. However, if the opportunity

cost is that of local, organic produce, then the NPV increases by over a quarter of a million dollars to \$ 1,154,825.21.

This variable has the biggest impact on the NPV of the project. A high value of produce increases the value of the project substantially.

Table 11: Sensitivity Test of Value of Produce

Value of Produce	NPV
Conventional	\$431,616.51
Organic	\$880,516.12
Local, Organic	\$1,154,825.21

The value of produce also reflects yield rates from the garden. If yield from the garden fell by 20%, then the NPV of the community garden falls by 20% as well. This correlation shows that yield rates are key to the value of the community garden.

Table 12: Sensitivity Test of Yield Rates

Yield Rates	NPV
-40%	\$521,394.18
-20%	\$700,955.15
0%	\$880,516.12
+20%	\$1,060,077.09
+40%	\$1,239,638.06

Further, table 13 illustrates the importance of both the value of leisure and produce in this analysis. If we assume that leisure has an economic value of zero, then all the benefits in this analysis come from the value of the produce. If this produce is valued at conventional levels, then the net present value is -\$55,630.32. While this value is negative, it is derived calculating a single benefit from this

project. Moreover, when produce is value at organic or local, organic values, then the net present value of the analysis becomes substantially positive.

Table 13: Sensitivity Test of Value of Produce if assume Zero Value of Leisure

NPV if Leisure = 0	
Conventional Produce	\$ (55,630.32)
Organic Produce	\$ 393,269.29
Local, Organic Produce	\$ 667,578.38

Discount Rate

Using the Treasury Board’s recommendation of a discount rate of 7% gives a net present value found in the base case. The alternative discounts rates of 3.25% and 8% results in higher and lower net present values, respectively. However, all result in positive net present values and the key factor in this case would be to ensure that in a comparative analysis the chosen discount rate was used consistently.

Table 14: Sensitivity Test of Discount Rate

Discount Rate	NPV
3.25%	\$1,096,177.66
7.00%	\$880,518.51
8.23%	\$822,676.66

Inflation

An increase in inflation lowers the NPV of the community garden. Inflation, however, is an exogenous factor. Therefore, to best manage this risk is to be aware of the potential impact and monitor it carefully.

Table 15: Sensitivity Test of Inflation Rates

Inflation	NPV
0%	\$947,560.09
1%	\$912,867.80
2%	\$880,518.51
3%	\$850,317.88
4%	\$822,090.09
5%	\$795,675.91
6%	\$770,930.93
7%	\$747,724.01
8%	\$725,935.96

Food inflation

For every percent increase in food inflation, the NPV of the project increases by approximately 5%. If food inflation is very high, the garden produce is more valuable and, therefore, community gardening is a more attractive prospect.

Table 16: Sensitivity Test of Food Inflation Rates

Food Inflation	NPV
1%	\$ 658,220.31
2%	\$ 689,244.05
3%	\$ 722,022.38
4%	\$ 756,656.76
5%	\$ 793,254.17
6%	\$ 831,927.41
7%	\$ 872,795.31
8%	\$ 915,983.13
9%	\$ 961,622.75
10%	\$ 1,009,853.06

4 Stakeholder Analyses

Stakeholder analysis examines how the benefits and costs are distributed to parties affected by the project. In this case, three groups of stakeholder are

identified: the YCGC, individual gardeners and the City of Yellowknife. By identifying to whom the costs and benefits accrue, we can further analyze the overall value of the project.

4.1 Yellowknife Community Garden Collective's Perspective

In the base case scenario, the YCGC has a negative net present value of \$111,973.52. This reflects the value of unpaid volunteer labour. As seen in table 17, while the YCGC covers their financial expenses with membership dues, the value of volunteer work is very high in this organization and is not covered by membership dues. One way to look at this is that the board of the YCGC contributes over \$14,000 worth of volunteer labour annually to running the YCGC. This is a hugely valuable contribution and the replacement cost for this work would certainly be greater than \$14,000.

The YCGC's goal is to cover its operating expenses through membership fees. This is currently achieved and so long as costs remain constant, this looks to be possible in the future. The greatest risks to this goal would be an increase in rental costs. Membership dues are \$20 per person and the YCGC is very uninterested in raising the cost of membership.

Moreover, another threat to the YCGC would be the loss of dedicated volunteers. The value of volunteer labour from this case study echoes Twiss et al.'s results: dedicated volunteers are the foundation of a community garden's success.

Table 17: Yellowknife Community Garden Collective's Perspective

	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019
INFLOWS											
Membership dues	\$1,760.00	\$2,438.54	\$3,123.37	\$3,062.13	\$3,002.09	\$2,943.22	\$2,885.51	\$2,828.94	\$2,773.47	\$2,719.08	\$2,665.77
Donations	\$20,000.00	\$18,275.00	\$1,928.01	\$-	\$-	\$-	\$-	\$-	\$-	\$-	\$-
Bank Interest	\$2.96	\$-	\$-	\$-	\$-	\$-	\$-	\$-	\$-	\$-	\$-
Misc	\$20.00	\$-	\$-	\$-	\$-	\$-	\$-	\$-	\$-	\$-	\$-
Total Inflows	\$21,782.96	\$20,713.54	\$5,051.38	\$3,062.13	\$3,002.09	\$2,943.22	\$2,885.51	\$2,828.94	\$2,773.47	\$2,719.08	\$2,665.77
OUTFLOWS											
Operating Expenses											
Lease	\$210.00	\$206.49	\$202.44	\$198.47	\$194.58	\$190.76	\$187.02	\$183.36	\$179.76	\$176.24	\$172.78
Liability											
Insurance	\$661.00	\$737.46	\$723.00	\$708.83	\$694.93	\$681.30	\$667.94	\$654.85	\$642.01	\$629.42	\$617.08
Water	\$728.96	\$716.77	\$964.00	\$945.10	\$926.57	\$908.40	\$890.59	\$873.13	\$856.01	\$839.22	\$822.77
Tool Replacement	\$-	\$-	\$385.60	\$378.04	\$370.63	\$363.36	\$356.24	\$349.25	\$342.40	\$335.69	\$329.11
Misc	\$117.57	\$710.63	\$708.54	\$694.65	\$681.03	\$667.68	\$654.58	\$641.75	\$629.17	\$616.83	\$604.73
Labour											
Board	\$14,382.32	\$14,382.32	\$14,382.32	\$14,382.32	\$14,382.32	\$14,382.32	\$14,382.32	\$14,382.32	\$14,382.32	\$14,382.32	\$14,382.32
Set Up Expenses											
Capital	\$21,925.14	\$21,925.14	\$1,928.01	\$-	\$-	\$-	\$-	\$-	\$-	\$-	\$-
Labour	\$7,990.18	\$7,990.18	\$-	\$-	\$-	\$-	\$-	\$-	\$-	\$-	\$-
Total Outflows	\$46,015.17	\$46,669.00	\$19,293.92	\$17,307.41	\$17,250.06	\$17,193.83	\$17,138.70	\$17,084.65	\$17,031.67	\$16,979.72	\$16,928.79
Inflow - Outflow	\$(24,232.21)	\$(25,955.46)	\$(14,242.54)	\$(14,245.28)	\$(14,247.97)	\$(14,250.60)	\$(14,253.19)	\$(14,255.72)	\$(14,258.20)	\$(14,260.63)	\$(14,263.02)

4.2 Individual Gardener's Perspective

Individual gardeners participating in the YCGC benefit the most, with a collective surplus of \$832,743.32. Annually each gardener gained over \$700 in net benefits from participation in the community garden. The benefits are derived from the value of the produce and the value of leisure. This analysis accounts only for these two benefits. If other benefits like community cohesion, health factors, and others were included, I would anticipate the net benefits to increase.

Costs

Each gardener incurs some costs by gardening with the YCGC. The rental fee for a plot of land is \$20.00 per user. The cost of seeds per gardener, as stated in the assumptions, will be \$19.43.

The YCGC bylaws require all gardeners use only approved organic fertilizers. These include bone meal, compost and manure, among others. Compost is provided free of charge at each site. A gardener will likely use the available free compost as opposed to purchasing compost or other fertilizer elsewhere. The opportunity cost of this compost is would be the price of purchasing compost elsewhere in Yellowknife. National Geographic recommends 0.6 kilograms of compost for each square meter of garden in poor quality soil(Douglas, 2010). So in an 11 meter squared garden, 6.5 kilograms of compost will be required. The average price for compost in Yellowknife was \$0.22 per liter, with prices ranging from \$0.17 per liter to \$0.33 per liter, (Ecology North, 2008) compost would cost an average of \$6.50.

Donation

All gardeners must donate one quarter of their produce to food security organizations in Yellowknife. Each gardener donates nearly \$200 worth of produce annually.

Other capital costs

Pest management is not a major concern in Yellowknife. Larger pests, like deer and human vandals, are kept out of the plots by the fence in place.

Frost arrives in the first week of September, but with declining hours of daylight, the gardening season is essentially over. A typical gardener does not need to invest in any cold protection.

Table 18: Individual Gardener's Perspective

	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019
INFLOWS											
Value of Produce	\$70,177.99	\$99,373.33	\$130,081.01	\$130,336.07	\$130,591.64	\$130,847.70	\$131,104.26	\$131,361.33	\$131,618.90	\$131,876.98	\$132,135.56
Value of Leisure	\$38,544.00	\$54,312.00	\$70,956.00	\$70,956.00	\$70,956.00	\$70,956.00	\$70,956.00	\$70,956.00	\$70,956.00	\$70,956.00	\$70,956.00
Total inflows	\$108,721.99	\$153,685.33	\$201,037.01	\$201,292.07	\$201,547.64	\$201,803.70	\$202,060.26	\$202,317.33	\$202,574.90	\$202,832.98	\$203,091.56
OUTFLOWS											
Rental	\$1,760.00	\$2,438.54	\$3,123.37	\$3,062.13	\$3,002.09	\$2,943.22	\$2,885.51	\$2,828.94	\$2,773.47	\$2,719.08	\$2,665.77
Seeds	\$1,773.23	\$2,456.87	\$3,146.85	\$3,085.15	\$3,024.65	\$2,965.35	\$2,907.20	\$2,850.20	\$2,794.31	\$2,739.52	\$2,685.81
Value of Donated Produce	\$17,544.50	\$24,843.33	\$32,520.25	\$32,584.02	\$32,647.91	\$32,711.92	\$32,776.07	\$32,840.33	\$32,904.73	\$32,969.24	\$33,033.89
Labour											
Worker Bee Donation	\$14,062.71	\$19,815.64	\$25,888.18	\$25,888.18	\$25,888.18	\$25,888.18	\$25,888.18	\$25,888.18	\$25,888.18	\$25,888.18	\$25,888.18
Drop Off Annual	\$4,218.81	\$5,944.69	\$7,766.45	\$7,766.45	\$7,766.45	\$7,766.45	\$7,766.45	\$7,766.45	\$7,766.45	\$7,766.45	\$7,766.45
General Meeting	\$4,218.81	\$5,944.69	\$7,766.45	\$7,766.45	\$7,766.45	\$7,766.45	\$7,766.45	\$7,766.45	\$7,766.45	\$7,766.45	\$7,766.45
Police Check	\$-	\$-	\$447.45	\$447.45	\$447.45	\$447.45	\$447.45	\$447.45	\$447.45	\$447.45	\$447.45
Total Outflows	\$43,578.07	\$61,443.78	\$80,659.01	\$80,599.83	\$80,543.19	\$80,489.03	\$80,437.32	\$80,388.00	\$80,341.04	\$80,296.39	\$80,254.00
Inflows-Outflows	\$65,143.92	\$92,241.55	\$120,378.00	\$120,692.24	\$121,004.45	\$121,314.67	\$121,622.94	\$121,929.33	\$122,233.86	\$122,536.59	\$122,837.56

Benefits

Health Benefits

As the most obvious fruit of their labour, each gardener receives a large amount of fresh, organic produce. Alamo, Packnett, Miles and Kruger found community gardeners in Flint, Michigan consumed 1.4 more servings of vegetables and fruits compared to non-participants. Further, community gardeners were nearly four times more likely to consume the recommended five serving for fruit and vegetables. The results held for family members of the gardeners as well. A survey of the Philadelphia urban gardening project found similar results; in particular, Blair (1991) found that gardeners replaced sweetened drinks and foods with garden produce. This is a double win, as healthy, fresh garden produce is replacing the least healthy dietary components.

Community gardening increases access to organic produce. If this is a rarity in Yellowknife, then this adds to the variety of foods that a gardener can consume.

Gardening is considered a moderately active activity. Each garden plot requires one hundred hours of tending per season. With two people tending each plot, each gardener will spend 50 hours on average engaged in moderate activity. Moreover, worker bee activities are also moderately active and each gardener will spend 10 hours on these per growing season. This means that each gardener will spend an additional 60 hours engaged in moderate physical activity.

Gardening in a community garden brings like-minded community members together. This builds social capital by offering opportunities for engagement with the community and leadership activities. Baker (2004) notes the increased

socialization amongst participants in four different community gardens in Toronto. On a very basic level, gardening with a group helps to alleviate loneliness.

Both physical and mental health benefits are difficult to measure without directly measuring health of garden participants and non-participants. While an individual benefits most directly from increased physical health, the community also benefits from a lowered probability of illness from this individual with decreased health costs. Using surveys of garden participants and non-participants similar to Alamo et al. or Blair, one could determine the health outcome due difference in vegetable consumption. From this and the cost of community gardens to the government, one could use a cost effectiveness analysis to determine the societal cost of increasing vegetable consumption. This cost could be compared to the success of other healthy eating intervention.

Coping Cost Method

As an alternative methodology to determine a lower bound for the consumer surplus provided by the YCGC to an individual gardener, I will use the coping cost method. In simplest terms, the YCGC offers a place for people to rent garden plots for a year. If the community garden did not exist, then what would someone have to pay to undertake this activity? By asking this question, I can calculate the coping cost or the cost of engaging in the substitute for this activity. The economic costs, in this case, are from the perspective of the individual gardener. When compared with the cost of gardening with the YCGC, I can then approximate the consumer surplus.

Currently, there is no market for the product the YCGC offers at a higher price. So, I assume that the cost of undertaking this activity is prohibitive. Therefore, the price is at least the choke price or the price where the demand for the item has shifted to zero. The community garden rents garden plots to 162 members annually; this means that the lowered cost of gardening increases demand by 162 people. From this change in price, I can calculate the lower bound for consumer surplus.

Land Rental

An individual gardener rents a plot of 22 meters squared from the YCGC to be shared with one other gardener. Therefore, I will assume that the gardener rent an 11 meter squared piece of land. Realistically, renting a parking stall sized piece of lands is essentially impossible. More likely, a gardener would be borrowing the garden space from a friend or squatting. This creates a sense of transiency to the garden but is free.

To reflect the opportunity cost, I will use the opportunity cost of a garden site to the YCGC. Between the Kam Lake garden and the Old Town Garden, there are 62 gardens and the opportunity cost is \$630 annually in my analysis. So, the opportunity cost of each garden plot, shared between two gardeners is \$20.32. This leads to \$10.16 in opportunity cost per gardener.

Garden Construction

If one is ambitious to set up their own garden in Yellowknife, they are likely to use raised beds. A raised bed is essentially a large soil container above ground. In

Yellowknife, raised beds correct for the subarctic climate as they warm more quickly in spring, permitting earlier planting. Further, Yellowknife tends to have poor quality, acidic soil and in a raised bed, the gardener chooses the mix of soil needed.

To build a raised bed of 11 meters squared, certain supplies are required: lumber, screws and mesh. The costs are based on the costs in Edmonton, Alberta. Given the extra transportation costs to Yellowknife, the price of lumber, screws and mesh will likely be inflated. The cost of lumber will be \$100, screws will cost an additional \$30 and the cost of mesh will be \$15. The total supply cost will be \$145. Further, I assume that the gardener undertaking this project has his or her own drill or screwdriver.

One must fill a raised bed with soil to grow a garden. Soil for the Yellowknife Community Garden Collective cost \$58.85 per cubic meter to purchase and transport. However, it is unrealistic that an individual would be able to purchase such a bulk quantity of soil and receive a discounted price. A more realistic scenario has an individual filling their garden with bagged potting soil. Fill a raised bed of 11 meters squared has a depth of 0.30 meters, requires 1019 liters of potting soil. Potting soil from Canadian Tire is sold in bags of 28 liters for \$4.00, then the gardener will purchase 36 bags of soil for a cost of \$144.00.

Compost

It is typical for gardeners to increase the quality of the soil by using fertilizer. To be comparable to the YCGC, organic gardening methods will be compared. Given

that I assumed the gardeners of the YCGC use compost for their gardens, the coping cost of not having free compost available will be calculated as well. National Geographic recommends 0.6 kilograms of compost for each square meter of garden in poor quality soil (Douglas, 2010). So in an 11 meter squared garden, 6.5 kilograms of compost will be required. The average price for compost in Yellowknife was \$0.22 per liter, with prices ranging from \$0.17 per liter to \$0.33 per liter, (Ecology North, 2008) compost would cost an average of \$6.50.

Tools

The YCGC budgets \$100 annually for tool replacement. To set up a garden, a gardener would need to purchase tools as well. While tools are a club good, meaning they are excludable, non-rival goods up to the point of congestion, an individual gardener is unlikely to need as many as an entire collective. To set up a garden, an individual will spend at least \$50 on tools.

Water

If an outdoor tap does not exist, then the gardener will have to pay for the installation. However, I will assume an outdoor tap exists and the gardener does not have to pay for the installation. In the 2009 growing season, the YCGC spends on average \$11.84 per plot on water. An individual gardener with a half size plot would spend \$5.92.

Labour

To manage the crops in this garden, an individual gardener would spend the same amount of time as a gardener managing crops in a garden rented from the YCGC. A gardener would have to spend at least 20 hours to building a raised bed and setting up a new garden. It is also important to note the assumption that a gardener would have the construction skills to build raised beds; while not an overly complex task, it could be intimidating and frustrating to a novice.

Realistically, an individual who has no carpentry experience may not even attempt this task. This alone may be the barrier to gardening. However, one would not need to engage in 10 hours of work bee activities, attend the annual general meeting or drop any food off for donation. These tasks total a gardener renting from the YCGC 16 hours per growing season. From this estimation, a gardener will work an additional 4 hours of labour by constructing an individual garden.

Donation

The YCGC imposes a requirement that all gardeners donate a minimum of one quarter of their produce to charity. In addition to the time spent dropping off the donations at food security organizations, a gardener also will not be able to consume the produce that is donated. A gardener not connected with the YCGC will consume all of the produce grown. This simple calculation of value does not account for the feeling of altruism or the basic needs externality experienced by gardeners donating their produce to charity. Therefore, by not including this additional value, the coping cost calculations are biased downwards. With access to the gardeners at

the YCGC, one could perform a contingent valuation survey to measure the value they receive from the charitable act of donating to food security organizations in their community.

Table 19 details the differences in costs between a gardener with the YCGC and a gardener undertaking coping costs.

Table 19: Coping Costs

Cost	YCGC	Coping	Difference
Capital			
Land Rental	\$20.00	\$10.16	\$ (9.84)
Water	\$0.00	\$5.92	\$ 5.92
Soil	\$0.00	\$144.00	\$ 144.00
Seeds	\$19.43	\$19.43	\$ -
Tools	\$0.00	\$100.00	\$ 100.00
Compost	\$0.00	\$1.43	\$ 1.43
Lumber	\$0.00	\$100.00	\$ 100.00
Screws	\$0.00	\$30.00	\$ 30.00
Mesh	\$0.00	\$15.00	\$ 15.00
Labour Hours			
Work Bee Activities	10	0	-10
Donation Drop Off	3	0	-3
Annual General Meeting	3	0	-3
Building raised beds	0	20	20
Total Hours of Labour	16	20	4
Value of Labour (per hour)			
\$ 15.98	\$255.69	\$ 319.61	\$ 63.92
Donation	\$199.37	\$0.00	\$ (199.37)
Total	\$526.48	\$785.55	\$ 259.06

Results

From Table 19, the price of constructing a garden of one's own is ranges from \$265.43 more expensive than renting a garden plots from the YCGC, including the value of labour time. The range depends on the value of produce and the value of labour. If I assume a linear demand curve and assume that the choke price is the cost of setting up a garden and that at a price of \$265.43 less, 162 people demand garden plots, then the consumer surplus for all individual gardeners ranges from \$21,499.64 annually.

The consumer surplus accounts only for the lowered cost of gardening associated with the YCGC. This consumer surplus fails to account for any of the additional benefits from belonging to the YCGC, like the educational seminars offered, the community engagement, the socialization aspect, and the altruistic value of donations. Because of this, the coping cost method produces a lower bound for the surplus individual gardeners derives from the YCGC.

Compared with the economic analysis methodology where each gardener received over \$700 worth of net benefits annually from participation in community garden, a gardener using the coping cost methodology would receive closer to \$400 worth of benefits. However, people do not choose to engage in this activity. The question then is why? There is a selection bias from the YCGC. Members who choose to participate likely have a high value of leisure derived from gardening. If a person chooses not to participate, then we can assume that they may even view gardening as a labour activity, rather than a leisurely pursuit. This would mean the act of gardening imposes a cost on them, rather than a benefit.

4.3 City of Yellowknife's Perspective

Value of Produce to Charity

This is the only benefit measured specifically by this study. Each gardener donates a minimum of 25% of his or her produce to a charitable food security organization. With fresh, donated produce the food security organization purchases less food for their programs. This is a benefit to the lowest income citizens of Yellowknife. "The Yellowknife, Ndilo and Dettah Food System Assessment and Community Food Action Plan" (2010) strongly recommended increasing public access to locally grown foods for the sole reason of food security. As seen in table 18, from 2011 onwards, the YCGC donates over \$30,000 worth of produce. This more than compensates for the foregone taxes and opportunity cost of land used by the YCGC.

Educational Seminars

The YCGC offers three seminars annually on gardening that members and non-members can attend free of charge. The value of these seminars is not included in this analysis. However, to value the educational seminars, one could look to a substitute; the Government of the Northwest Territories provides educational seminars to communities participating in its Small Scale Foods program. In fact, education is one of the most requested services. One could look at the wage of the employee providing these seminars and the amount of preparation time to put together a seminar to determine a cost for an education seminar. The benefit would

be reflected in the value participants receive from these seminars or their willingness to pay for education.

Garden Buddy Program

To value the Garden Buddy Program, the value of one on one garden coaching will be used. If each garden buddy spends one hour per week during the garden season, which is 123 days, then there will be 18 hours of coaching occurring. To accurately measure, one could look at comparable prices for one-on-one tutorials or coaching in Yellowknife and use that price.

Environmental Benefits

To determine if the YCGC vegetables are more environmentally beneficial, one could perform a life cycle assessment on the substitute food and the garden produce. A life cycle assessment measures all environmental impacts associated with all stages of a vegetable's "life," from planting to transporting to consumption. The United States Department of Agriculture cautions that preliminary life cycle assessments of food systems have been inconclusive about the emission reduction associated with local food.

Property Value

Voicu and Been find that community gardens in New York City tend to be opened in poorer neighborhoods. Within five years, a community garden drives prices of nearby properties up by 9.4%. Further, the increased tax revenues from

the increased property values results in, on average, half a million dollars per garden in New York.

If community gardens are located in an area with mainly rental or homeowner occupancy, then the effects may vary. Homeowners are likely to be more invested in initiatives that increase their property value and, further, homeowners are more likely to remain in the same area for longer. However, renters may be more interested in community gardens, specifically as they are more likely to lack a private area to cultivate a garden. Moreover, the low cost nature of gardening as a leisure activity may appeal to renters more than homeowners, as homeowners tend to have higher incomes. With a higher income, the low cost nature of gardening may not be particularly appealing and a homeowner's food budget is likely to be larger than a renters. Voicu and Been acknowledge that given renters tend to live in poorer neighborhoods than homeowners, it may be difficult to separate the variation in community garden impacts.

The value of the YCGC scheme to the City of Yellowknife is likely underestimated by this analysis, as it does not measure more subjective values like environmental benefits or increases in property values. However, even accounting for this, in most years, the City derives a positive net present value from the YCGC's community garden scheme.

Table 20: City of Yellowknife's Perspective

	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019
INFLOWS											
Rent	\$(1,050.00)	\$(1,032.45)	\$(1,012.20)	\$(992.36)	\$(972.90)	\$(953.82)	\$(935.12)	\$(916.78)	\$(898.81)	\$(881.18)	\$(863.91)
Taxes	\$(3,019.00)	\$(2,968.53)	\$(2,910.33)	\$(2,853.26)	\$(2,797.32)	\$(2,742.47)	\$(2,688.69)	\$(2,635.97)	\$(2,584.29)	\$(2,533.62)	\$(2,483.94)
Value of Donated Produce	\$17,544.50	\$24,843.33	\$32,520.25	\$32,584.02	\$32,647.91	\$32,711.92	\$32,776.07	\$32,840.33	\$32,904.73	\$32,969.24	\$33,033.89
Total inflows	\$13,475.50	\$20,842.35	\$28,597.72	\$28,738.40	\$28,877.69	\$29,015.63	\$29,152.25	\$29,287.57	\$29,421.63	\$29,554.44	\$29,686.05
OUTFLOWS											
Maintenance on land	\$-	\$-	\$-	\$-	\$-	\$-	\$-	\$-	\$-	\$-	\$-
Grants	\$20,000.00	\$3,933.14	\$-	\$-	\$-	\$-	\$-	\$-	\$-	\$-	\$-
Total Outflows	\$20,000.00	\$3,933.14	\$-	\$-	\$-	\$-	\$-	\$-	\$-	\$-	\$-
Inflows - Outflows	\$(6,524.50)	\$16,909.21	\$28,597.72	\$28,738.40	\$28,877.69	\$29,015.63	\$29,152.25	\$29,287.57	\$29,421.63	\$29,554.44	\$29,686.05

5. Conclusions

The objective of the YCGC is to give gardening space to residents interested in growing and harvesting their own organic produce. While some assert that “community gardens may be more about community than they are about gardening,” in fact this analysis finds that the measurable economic benefits overwhelmingly outweigh the economic costs of the YCGC (Parry et al., 2005).

The individual gardeners in the project directly benefit the most, attaining both a large volume of organic produce and leisure benefits from their participation. The City of Yellowknife benefits mainly from the charitable donations from the YCGC. These donations can certainly be considered marginal, given that they would not have occurred without the project. Benefits to be measured in further study include the lowered maintenance fees from renting land to the YCGC, the opportunity cost of land

The YCGC board, however, invests substantial labour into the success of the gardens and receives no payment for their work. The economic cost, then, to the YCGC board is negative. Following from this comes one of the greatest risks to the success of the YCGC: the commitment of skilled volunteers. The recruitment and retention of dedicated volunteers is necessary to the success of this project. Without the institutional framework in place by the YCGC board, none of the benefits can be derived.

Another great risk to the viability of the project, from a financial perspective, would be increases in rent to reflect the private opportunity cost of land. Currently, the YCGC pays less than the non-profit opportunity cost of land and significantly less

than the private opportunity cost of land; changes in rental fees to reflect the opportunity cost of land could send rent eighty times higher than it currently stands. This would affect the price of membership fees dramatically and most certainly jeopardize the YCGC's future. The City of Yellowknife would derive the benefits from renting the land for its opportunity cost; however, it would forego the annual benefits from the YCGC's food donations.

The sensitivity results demonstrate the importance of the value of the produce and leisure to the benefits of the project. As the value of produce falls to conventional levels, the net present value of the project remains strictly positive, but falls by over one half. However, when leisure has no economic value, the project still remains strictly positive when produce is valued as organic or local, organic produce. Valued as conventional produce, the community garden has a negative net present value. These benefits, however, are the only two benefits measured by this study. Further analysis would include the value of educational programs, mentorship, community activities, environmental benefits, and health benefits among others. Moreover, policy options to achieve the same goals as community gardens should be evaluated for effectiveness. Given the limited scope of this study, the significantly positive net present value in the base case bodes well for further, more inclusive investigations.

6. Works Cited

- Alaimo, K., Packnett, E., Miles, R., & Kruger, D. (2008). Fruit and vegetable intake among urban community gardeners. *Journal of nutrition education and behavior, 40*(2), 94-101.
- Alvarez-Farizo, B., Hanley, N., & Barberan, R. (2001). The Value of Leisure Time : A Contingent Rating Approach. *Journal of environmental Planning and Management, 44*(5), 681-699.
- Alternatives North. No Place for Poverty: Anti-Poverty Workshop. 2010.
- Armstrong, D. (2000). A survey of community gardens in upstate New York: implications for health promotion and community development. *Health & place, 6*(4), 319-27.
- Baker, L. (2004). Tending Cultural Landscapes and Food Citizenship in Toronto's Community Gardens. *Geological Review, 94*(3), 305-325.
- Bank of Canada. Daily Noon Exchange Rates: 10-year Lookup. 2011.
- Bilgic, A., Florkowski, W. J., Yoder, J., & Schreiner, D. F. (2008). Estimating fishing and hunting leisure spending shares in the United States. *Tourism Management, 29*, 771-782.
- Boardman, A. E., Moore, M. A., & Vining, A. R. (2010). The Social Discount Rate for Canada Based on Future Growth in Consumption. *Canadian Public Policy, 36*(3), 325-343.
- Brown, E. (1999). Assessing the Value of Volunteer Activity. *Nonprofit and Voluntary Sector Quarterly, 28*(1), 3-17.

- Chen, W. Y., & Jim, C. Y. (2008). Cost – benefit analysis of the leisure value of urban greening in the new Chinese city of Zhuhai. *Cities*, 25, 298-309.
- Curry, N. (1982). Equity effects in the estimation of leisure benefits. *Tourism Management*, 83-90.
- Dalenberg, D., & Fitzgerald, J. M. (2004). How Much Is Leisure Worth ? Direct Measurement with Contingent Valuation. *Review of Economics of the Household*, 351-365.
- Douglas, Ellen. (2010) How Much Compost Should I Add to My Garden Soil? *National Geographic*.
- Duncan, B. (1999). Modeling charitable contributions of time and money. *Journal of Public Economics*, 72(2), 213-242.
- Ecology North. Study of Options for a Centralized Composting Pilot Project in the City of Yellowknife. 2008.
- Feather, P., & Shaw, W. D. (1999). Estimating the Cost of Leisure Time for Recreation Demand Models. *Journal of Environmental Economics and Management*, 38, 49-65.
- Glover, T. D., & Parry, D. C. (2005). Building Relationships , Accessing Resources : Mobilizing Social Capital in Community Garden Contexts. *Building*, 31(4), 450-474.
- Govekar, P. L., & Govekar, M. a. (2002). Using Economic Theory and Research to Better Understand Volunteer Behavior. *Nonprofit Management and Leadership*, 13(1), 33-48. doi:10.1002/nml.13104

- Govindasamy, R., & Italia, J. (1996). Predicting Willingness-to-Pay a Premium for Organically Grown Fresh Produce.
- Government of the Northwest Territories. Department of Industry, Tourism and Investment. Canada/Northwest Territories Agriculture Policy Framework Agreement: Small Scale Foods Program. Interim Report. 2008.
- Government of the Northwest Territories. Economic Development and Tourism. Agriculture in the Northwest Territories - Status and Development Direction. 1990.
- Government of the Northwest Territories. Growing Forward: Small Scale Foods Program Community Gardening Initiative. 2009/2010 Annual Report. 2010.
- Green, D. H., & Green, M. B. (1987). The Food Retailing Structure of the Northwest Territories. *Arctic*, 40(2), 123-130.
- Guthman, J. (2004). Back to the land: the paradox of organic food standards. *Environment and Planning A*, 36(3), 511-528.
- Holland, L. (2004). Diversity and connections in community gardens: a contribution to local sustainability. *Local Environment*, 9(3), 285-305.
- Jamison, M. S. (1985). The Joys of Gardening: Collectivist and Bureaucratic Cultures in Conflict. *The Sociological Quarterly*, 26(4), 473-490.
- Jaradiatz, S., Munizaga, M., Greeven, P., Guerra, R., & Axhausen, K. (2008). Estimating the value of leisure from a time allocation model. *Transportation Research Part B: Methodological*, 42(10), 946-957.
- Jenkins, G. P. (1999). Evaluation of Stakeholder Impacts in Cost Benefit Analysis. *Assessment*.

- Jenkins, G., & Kuo, C. (2007). The Economic Opportunity Cost of Capital for Canada - An Empirical Update. *Working Paper*.
- Johnson, M. (1966). Travel time and the price of leisure. *Economic Inquiry*, 4(2), 135-145. Wiley Online Library.
- Jolly, D. A. (1991). Differences between buyers and nonbuyers of organic produce and willingness to pay organic price premiums. *Journal of Agribusiness*, 9(1). Agricultural Economics Association of Georgia.
- Kantor, L. S. (2000). Community Food Security Programs Improve Food Access. *Food Review*, 24(1), 20-26.
- Kentner, N., Agent, E. Y., & County, C. (2003). The Cost and Benefits of Volunteers. *Direct*.
- Kokoski, M. F. (1987). Indices of Household Welfare and the Value of Leisure Time. *Review of Economics and Statistics*, 69(1), 83-89.
- Larson, D. M. (1993). Separability and the Shadow Value of Leisure Time. *American Journal of Agricultural Economics*, 75(3), 572-577.
- Larson, D., Shaikh, S., & Layton, D. (2004). Revealing Preferences for Leisure Time from Stated Preference Data. *Agricultural Economics*, 86(May), 307-320.
- Lee, K., & Kim, I.-moo. (2005). Estimating the value of leisure time in Korea. *Applied Economics Letters*, 12(July), 639-641.
- Loring, P., & Gerlach, S. (2010). Outpost Gardening in Interior Alaska: Food System Innovation and the Alaska Native Gardens of the 1930s through the 1970s. *Ethnohistory*, 57(2), 183-199.

- Loring, Philip, & Gerlach, S. (2010). Outpost Gardening in Interior Alaska : Food System Innovation and the Alaska Native Gardens of the 1930s through the 1970s. *Ethnohistory*, 2(Spring 2010).
- Loureiro, M., & Hine, S. (2001). Discovering Niche Markets: A Comparison of Consumer Willingness to Pay for Local, Organic and GMO-free Produce. *American Agricultural Economics Association Meetings*.
- Lutra Associates. (2010). Yellowknife , Ndilo and Dettah Food System Assessment and Community Food Action Plan: Final Report.
- Maguire, K. B., & Owens, N. (2004). The Price Premium for Organic Babyfood : A Hedonic Analysis.
- Menchik, P. L., & Weisbrod, B. A. (1987). Volunteer Labour Supply. *Journal of Public Economics*, 32(2), 159–183. Elsevier.
- Merzlaya, G. E., Stepanov, A., & Fedorov, A. (2008). Growing potatoes above the arctic circle. *Russian Agricultural Sciences*, 34(6), 373-376.
- Mills, P. F. (1994). The agricultural potential of northwestern Canada and Alaska and the impact of climatic change. *Arctic*, 47(2), 115–123.
- Ministry of Indian Affairs and Northern Development, Government of Canada. (2007). The Revised Northern Food Basket.
- Mook, L. (2010). Third Sector Research. (R. Taylor, Ed.). New York, NY: Springer New York.
- Mook, L., Richmond, B. J., & Quarter, J. (2009). Calculating the value of volunteer contributions for financial statements. *The Philanthropist*, 18(1), 71–83.
- Natural Resources Canada. Plant Hardiness Zones in Canada. 2000.

- NWT Bureau of Statistics, Strategic Planning Branch. Income and Earnings: 2006 Census. 2008.
- Oberholtzer, L., Dimitri, C., & Greene, C. (2005). Price Premiums Hold on as U.S. Organic Produce Market Expands. *Electronic Outlook Report from the Economic Research Service*, 1-22.
- Onozaka, Y., Bunch, D., & Larson, D. (2006). What exactly are they paying for? Explaining the price premium for organic fresh produce. *Update: Agricultural and Resource Economics*, 9(6), 1-4.
- Parry, D., Glover, T., & Shiness, K. (2005). "Mary, mary quite contrary, how does your garden grow?": examining gender roles and relations in community gardens. *Leisure Studies*, 24(2), 177-192.
- Power, E. M. (2008). Conceptualizing food security for aboriginal people in Canada. *Canadian Journal of Public Health*, 95-97. Retrieved from <http://www.ncbi.nlm.nih.gov/pubmed/18457280>
- Robinson, S. (2010). Humble Dream: An Historical Perspective on Yukon Agriculture Since 1846. *The Northern Review*, 32, 135-167.
- Rosol, M. (2010). Public Participation in Post-Fordist Urban Green Space Governance: The Case of Community Gardens in Berlin. *International Journal of Urban and Regional Research*, 34(3), 548-563.
- Schmelzkopf, K. (1995). Urban Community Gardens as Contested Space. *Geographical Review*, 85(3), 364-381.
- Sharma, S., De Roose, E., Cao, X., Pokiak, A., Gittelsohn, J., & Corriveau, A. (2009). Dietary intake in a population undergoing a rapid transition in diet and

- lifestyle: the Inuvialuit in the Northwest Territories of Arctic Canada. *Canadian Journal of Public Health*, 100(6), 442-448.
- Shaw, W., & Feather, P. (1999). Possibilities for Including the Opportunity Cost of Time in Recreation Demand Systems. *Land Economics*, 75(4), 592-602.
- Steinberg, R. (1990). Labour Economics and the Nonprofit Sector: A Literature Review. *Nonprofit and Voluntary Sector Quarterly*, 19(2), 151-169.
- Steinberg, T. (2008). Reviews. *Canadian Historical Review*, 89(4), 581-622.
- Territorial Farmers Association. A History of the Development of Agriculture in the N.W.T. 2000.
- Territorial Farmers Association. State of the Industry 2000. 2001.
- Treasury Board of Canada. Canadian Cost-Benefit Analysis Guide: Regulatory Proposals. 2007.
- Twiss, J., Dickinson, J., Duma, S., Kleinman, T., Paulsen, H., & Rilveria, L. (2003). Community gardens: lessons learned from California Healthy Cities and Communities. *American journal of public health*, 93(9), 1435-8.
- Wolozin, H. (1974). Economic Role and Value of Volunteer Work in the United States: An Exploratory Study. *Work*, 23-42.
- Yellowknife Community Garden Collective. 2007 AGM Minutes. 2007.
- Yellowknife Community Garden Collective. 2008 AGM Minutes. 2008.
- Yellowknife Community Garden Collective. 2009 AGM Minutes. 2009.
- Yellowknife Community Garden Collective. 2010 AGM Minutes. 2010.
- Yellowknife Community Garden Collective. Garden Gazette: Spring 2011. Volume 17(1). 2011.

Yellowknife Community Garden Collective. Garden Gazette: Spring 2010.

Volume 16(1). 2010.

Yellowknife Community Garden Collective. Garden Gazette: October 2009. Volume

15(2). 2009.

Yellowknife Community Garden Collective. Garden Gazette: April 2009.

Volume 15(1). 2009.

Yellowknife Community Garden Collective. Garden Gazette: October 2008.

Volume 15(1). 2008.

Yellowknife Community Garden Collective. Request for Property Tax Exemption for

Land Leased by the Yellowknife Community Garden Collective. 2011.

Yellowknife Community Garden Collective. 2009 YCGC Balance Sheet. 2010.