KPU | Institute for Sustainable Food Systems

Yukon Food System Design and Planning Project:

State of the Yukon Food System 2011/2012

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The Institute for Sustainable Food Systems

The Institute for Sustainable Food Systems at Kwantlen Polytechnic University (ISFS) is based on Kwantlen's Richmond campus and operates in conjunction with the Sustainable Agriculture program. The Institute's applied research, extension, and outreach programming focuses on regional-scale, human intensive, ecologically sound food systems as foundational to sustainable community. Our past and current work falls under two categories: MESA projects and Bio-Region Food Systems projects.

Through our MESA ("Municipally Enabled Sustainable Agriculture") projects, we work with municipalities in south-west BC to investigate the direct economic, environmental, and social benefits that could result if municipalities supported small scale agriculture in their communities through policy (such as bylaws allowing urban farming and farm gate sales) and programs (such as education programs and demonstrations). Our work has demonstrated significant potential for increased food security, a reduction of farmland loss to urban sprawl, job creation, and wealth generation.

In our Bio-Region Food Systems projects, we are working to evaluate the potential for a food system sector organized and operating at the eco-region scale and comprised of low input, human intensive, and ecologically sound supply chain components. This eco-regional scale food sector complements the current food system, to improve food self-reliance, minimize environmental impact, improve economic viability of farms and ancillary businesses, contribute to the local economy, create opportunity for the development of small and medium sized businesses and strengthen communities.

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Background on the Yukon Food System Design and Planning Project

Food security is increasingly a concern of all contemporary societies and communities. Rising costs for fuel, production inputs, processing, storage, transportation and marketing have resulted in increasing household food costs. For Canadians, in 2008, when general inflation was 1.3%, overall food cost inflation was 7.3%. Cereal grains products' cost increased 12.4% and the cost of fruits and vegetables a whopping 26.9%. Canada's northern communities experience increased cost of food acutely. The vulnerability of the Yukon was highlighted in July 2012, when the Alaska Highway washed out and Whitehorse grocery stores were emptied of perishable foods within forty-eight hours. Factor in climate change and economic volatility, and no longer can we rely on the global system to provide cheap food.

While the Yukon has a growing agriculture sector, still only about 2% of food consumed in the Yukon is produced in the Yukon. Interestingly, this figure is not unique to the Yukon but much like the majority of North American jurisdictions. We have all have become largely dependent upon a global food system and as such vulnerable to food system perturbation. In other words, most communities and jurisdictions have put all their eggs in one food system basket. As communities and jurisdictions begin to examine alternatives, it is realized that significant economic and community development and small and medium sized business creation potentials exist in the substantive re-regionalization of our food systems. Understanding those potentials and how to achieve them is what the Yukon Food System Design and Planning project is all about.

The Yukon Food System Design and Planning project was conceptualized in August, 2010 when leaders of the Yukon - Canadian Agricultural Adaption Program (CAAP), Yukon Agriculture Association (YAA) and Kwantlen Polytechnic University Institute for Sustainable Food System (ISFS) staff met in Hay River, NWT while attending the Territorial Farmers Association Annual Conference. There, they discussed nascent Yukon agriculture, the significant potential for an expanded Yukon food system sector, and the ability/desire to advance Yukon food self-reliance. They discussed a project to bring forth necessary information and a compelling, data-based argument for public and private sector commitment to and support for concerted development of Yukon's agri-food sector.

Subsequently, IFSF worked with YAA, CAAP, Yukon Agriculture Branch and Agriculture and Agri-food Canada for two years to conceptualize, develop and garner funds for the project. IFSF assembled a project team based in British Columbia and the Yukon. Each project team member has been involved in a research and/or community engagement capacity. The majority of research team members are BC-based while most of the community engagement team members are based in the Yukon.

85% of cash funding for the first phase of the project was garnered from Agriculture and Agri-food Canada's Growing Forward program (locally overseen by the Yukon-CAAP Council). The YAA, as Industry Proponent, contributed the remaining 15% of cash funding. KPU contributed in-kind funding (staff salary and overhead) commensurate with funding from the YAA. The purpose of the federal Growing Forward funding program was to facilitate the ability of agriculture and the agri-based products sector to seize opportunities, respond to new and emerging issues, and pilot solutions to new and ongoing issues in order to adapt and remain competitive.

Through research and community engagement it is the objective of the Yukon Food System Design and Planning Project to build on previous work and existing Yukon expertise to develop:

- A realistic design for a future Yukon food system that improves Territorial and community food security and food self-reliance while fostering economic growth and community development, and
- A plan for its implementation and sustainability.

The outcomes of this project are intended to demonstrate how the Yukon can increase food self-sufficiency through local agriculture and food related business, harvesting of traditional food species, enhance economic, job creation, and business and economic opportunities in the food and agriculture sector, and build increased capacity for community health and environmental stewardship.

It is planned that this project be executed in two overlapping phases. The first encompassing baseline assessment and preliminary system design, and the second to produce a comprehensive Yukon Food System Design and implementation action plan in substantial consultation with the Yukon agriculture and food sector, government and community leadership. At the time of this report's publication, Phase II of the project has not been funded.

All Phase I reports are available for download from www.kpu.ca/isfs. They include:

- The State of the Yukon Food System in 2011/2012 (released in January 2015)
- Report on Agri-Food Industry Engagement (released in January 2015)
- Foundational Yukon Food System Design (released in January 2015)
- Our Food Security Today and Tomorrow in Carcross-Tagish First Nation (released in January 2015)
- Food Security in Tr'ondëk Hwëch'in Nation (forthcoming)
- Report on Yukon Community Food Security Engagement (forthcoming)

Acknowledgements

Many people have contributed to this ambitious project, from conceptualization to execution. We of the Institute for Sustainable Food Systems at Kwantlen Polytechnic feel very fortunate to have connected with and learned so much from so many in the Yukon. We are truly grateful.

Rick Tone (retired Yukon Agricultural Association Executive Director) and Len Walchuck (former Canadian Agriculture Adaption Program Chair) first worked with us to conceive of and plan the project, as well as secure funding. The insight and openness to diverse thinking they exhibited is rare. Once the project began, Len Walchuck's ongoing engagement and guidance was also instrumental. Valarie Whelan (Agriculture and Agri-food Canada), Tony Hill (Yukon Government Agriculture Branch Director), Matt Ball (Yukon Government Agriculture Branch Agrologist), and Bradley Barton (Yukon Government Agriculture Branch Agriculture Research Technician) provided critical guidance and input throughout the duration of the project. Sylvia Gibson (former Yukon Agricultural Association Executive Director) also provided valuable support during the early implementation of the project.

The Yukon Food System Design and Plan project benefited immensely from ongoing review and feedback from Monitoring Committee members: Chief Danny Cresswell (Carcross/Tagish First Nation), Dr. Ansylie Ogden (Yukon Government Senior Science Advisor), Len Walchuck (Canadian Agriculture Adaptation Program), Sylvia Gibson (Yukon Agricultural Association), Alan Stannard (Yukon Agricultural Association), and Bev Buckway (Yukon Agricultural Association).

Similarly we greatly value the willingness of our project Advisory Committee members formed to provide insight and guidance going into the second phase of this project. They are: John Lenart (Dawson area farmer), Joan Norberg (Whitehorse area farmer), Kim Melton (Growers of Organic Food Yukon), Dr. Chris Hawkens (Vice President Research and Community Engagement, Yukon College), and Tony Hill (Yukon Government Agriculture Branch Director). We look forward to their substantial contribution going into phase II.

Technical information and support was graciously provided by Kam Davies (Yukon Government Agriculture Branch Agricultural Lands Technician), Kevin Bowers (Yukon Government Agriculture Branch, Agriculture Development Officer and Supervisor, Meat Inspection), Gary Brown (Yukon Bureau of Statistics), and Sebastien Markley (Yukon Bureau of Statistics).

Community engagement has been and will continue to be a critical element and focus of this project; after all, regional food systems (like all elements of the human economy) should be about and for the people and their communities in that region. We feel extremely fortunate to have partnered with the Arctic Institute of Community Based Research (AICBR) in Whitehorse. This organization is dedicated to facilitating and promoting community-based, Northern-led health research activities aimed at improving the health of Yukon First Nations and non-First Nations residents. Norma Kassi (AICBR Director of Indigenous Collaboration) and Jody Butler Walker (AICBR Executive Director) guided and facilitated our engagement with communities and First Nations in the Yukon. Norma Kassi did a lot of heavy lifting in this regard and taught all of us many important lessons about the Yukon, its peoples and cultures. Katelyn Friendship (AICBR Research Officer) was also very helpful. Lynn Rear and Michelle Parsons

skillfully served as our community coordinators in Dawson and Carcross and Tagish respectfully, setting up interviews. We are very grateful to the many Indigenous and non-indigenous interview participants in Carcross, Tagish, and Dawson.

We very much want to thank the many Yukon farmers who participated in personal interviews and completed the Farmer Survey. Similarly we are grateful to the processors and suppliers who we interviewed in person and by telephone. It is important to acknowledge that Growers of Organic Food Yukon (GoOFY) was instrumental in recruiting farmers for survey participation. Tom Rudge, long time Yukon farmer and food system advocate and GoOFY leader was hugely supportive and provided much valuable guidance.

Additionally we would like to recognize the exceptional leadership of and support received from Chief Danny Cresswell of the Carcross/Tagish First Nation. Chief Cresswell contributed significantly to the early dynamic thinking around this project, its implementation, and its effective, on-going execution.

We express our great gratitude to the First Nations that graciously and enthusiastically agreed to work with us on this project, including Tr'ondëk Hwëch'in First Nation, Na-Cho Nyak Dun First Nation, Carcross/Tagish First Nation and Kluane First Nation.

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Executive Summary

Research Framework

Our research to evaluate and characterize the Yukon's current food system is structured around measuring the status of a series of Food System Objectives and Indicators and to describe the Territorial policy and planning environment in which a local food system is emerging.

"Food System Objectives" describe what a future food system should be and should achieve. They are broad statements that describe desired conditions to be achieved as a result of activities taking place in the food system. The draft Food System Objectives presented in this report have been selected by the research team based on an extensive literature review and are in keeping with a broader objective to develop a food system design that moves towards ecological, economic, and social sustainability.

"Food System Indicators" are qualitative or quantitative instruments that provide specific information on the state or condition of the Food System Objectives. These indicators are used to measure progress towards achieving the Food System Objectives.

Data Collection Methods

The measurement of Food System Objectives and Indicators for this report has relied on secondary data and primary data that has been and is being collected by the Yukon Food System Design and Planning Project team. Throughout this report, several ongoing data collection methods will be referenced: the Yukon Farmer Survey, Farm Production Budget Development, and the Yukon Input Supplier and Food Processor Survey.

Overview of Research Results

OBJECTIVE 1: Increase Territorial Self-Reliance in Agricultural Foods and Sustain Traditional Food Harvest

Food self-reliance is defined as the degree to which the population's food need can be met by food produced in the Yukon. Food self-reliance depends not only on agricultural production but also on the pre- and post-production sectors of the food system which support viable farms.

Indicator 1.1: Degree to which locally grown and harvested food contributes to food consumption and satisfaction of nutritional requirements

To measure this indicator we compared the quantity of food produced commercially in the Yukon to the estimated quantity of food needed to meet the dietary requirements of the Yukon's population. The contribution of Traditional/subsistence food (defined as food that is hunted, fished for, or gathered) to Yukon residents' diets is also be discussed.

Data from the Yukon Farmers Survey and secondary data sources were used to estimate total commercial food production in the Yukon in 2012. We estimate that a total of approximately 568 tonnes of crops and livestock products were produced. After applying commodity conversion and waste factors this amounts to approximately 340 tonnes of food. Over 16,000 tonnes of food are needed to satisfy

food demand adjusted to meet nutritional requirements. We calculated that the Yukon is approximately 2% self-reliant across the whole diet, with self-reliance in vegetables being the highest of all food groups (7.3%). Self-reliance in other food groups is also reported.

The contribution of Indigenous/subsistence food (defined as food that is hunted, fished for, or gathered) to Yukon residents' diets is also discussed. Although we cannot quantitatively assess the amount of Traditional food consumed or needed in the Yukon, several studies and our own community engagement research process point to the importance of Traditional food from a cultural, nutritional, and recreational standpoint (Yukon Health and Social Services, 2012).

Indicator 1.2: Total amount of agricultural land by land quality and Indicator 1.3: Extent to which territorial agricultural land is used for agricultural production

The availability of agricultural land for growing food is a limiting factor to food self-reliance in many parts of the world. In the Yukon, however, there are over 1,000,000 hectares of land that are suitable for agricultural production, and over 63,000 hectares of land that is rated as class 3 and 4 land (suitable for vegetable production) (Rostad et al., 1977). The most recent Census of Agriculture conducted by Statistics Canada in 2011 reported that 10,654 hectares of agricultural land is owned by Yukon farmers or leased by Yukon farmers from governments or others and of this land, 6,893 hectares (72%) is reported as being used for crops and pasture (Statistics Canada, 2011b). This data points to incredible potential from a land availability standpoint for the expansion of agricultural production to meet food consumption needs of the Yukon population.

Indicator 1.4 Water availability on Yukon farms

Water availability for irrigation is essential to many types of agriculture in the Yukon. Irrigation has helped Yukon farmers cope with the arid climate and short growing season and take advantage of long summer daylight hours (Clifton Associates Ltd., 2012). Data from our Yukon Farmer Survey indicates that sources of irrigation water varies across Yukon farms, with wells and rivers being the most common source of irrigation water among survey respondents. Irrigation use by crop type is skewed to favour higher value crops, with the majority of respondents reporting thus far that they irrigate their vegetable, fruit and berry crops but not their field crops. Fruit and berry production tends to be irrigated using manual systems (hose and sprinkler or watering can) rather than more mechanized systems such as drip tape and other systems. This is reflective of the small scale of most fruit, berry, and vegetable acreages in the Yukon.

Indicator 1.5: Degree to which feed, seed, and agricultural fertility inputs are regionally sourced and produced

Food self-reliance depends not only on food production and land availability, but also on the capacity of the pre-production phase of the food system. Pre-production involves the provision of agricultural inputs needed to grow food and raise livestock, such as seed, feed, bedding amendments, and pest management materials. Preliminary data from our Yukon Farmer Survey suggests that the Yukon is highly self-reliant in livestock bedding, livestock feed, and compost. Compared to those inputs, self-

reliance in organic and synthetic fertilizers as well as seeds is much lower, with the majority of these products neither being produced or sourced (purchased) in the Yukon.

Indicator 1.6: Capacity of storage and processing facilities to support year-round supply of regionally produced and harvested foods.

Post-production activities occur after crops are harvested or livestock are taken off the farm or field. For this indicator we used data from the Yukon farmer survey to measured value-added on-farm processing including drying, freezing, canning, slaughter, butchering, and making prepared foods such as pies, cheese, soup, etc., and farmers' access to storage facilities.

33% of survey respondents thus far report doing some type of value-added processing on or off their farm. Both those currently doing value-added processing and those interested in starting describe barriers to engaging in these activities such as time, equipment, space, and money. Only 40% of survey respondents thus far report that their current access to on-farm storage facilities is sufficient. Together, this evidence points to a need to expand the storage and processing capacity on and off Yukon's farms in order to move towards a greater level of food self-reliance in the future.

Indicator 1.7: Farmer access to local markets

The capacity to move food from farm to consumer is critical in a local food system. The marketing of Yukon agricultural products has been characterized in many previous reports as dominated by direct farm-to-consumer channels, and results from our Yukon Farmer Survey corroborate this. Many farmers report interest in selling through marketing channels they do not currently have access to, but describe a number of barriers preventing them from currently doing so. The data indicates a need to further develop marketing channels for Yukon-grown food, both in-direct and direct.

Indicator 1.8: Agricultural land interface with indigenous food harvest land

It is therefore critical to determine how and where agricultural land and used for hunting, fishing, and gathering interfaces. A future Yukon food system with an expanded agricultural land base should not negatively impact the ability to collect Traditional foods. Data collection for this indicator is shared with Indicator 3.3: Wild biodiversity interactions with agriculture. Readers are directed to that indicator.

OBJECTIVE 2: Optimize Soil and Water Quality

To sustain agricultural production over the long-term it is critical to develop management practices that minimize reliance on external inputs and increase soil quality. This challenge is complicated by the need to maintain production and subsequent processing without negatively impacting water and air resources. The production and processing of crops and animals requires a wide range of inputs to ensure growth and quality including energy, water, and nutrients. Reliance on distant resources for water and nutrients, particularly on synthetic fertilizer, can increase the production systems susceptibility to volatile forces outside of the control of the farmer. For example recent fluctuations in energy prices have translated to increased costs for fertilizer and fuel for farmers. Carefully managing the use and recycling of water and nutrients can substantially reduce the reliance on outside inputs.

Production systems that can recycle unused crop biomass and animal manures by returning this organic matter to the soil, either directly or as compost can also improve soil quality. Healthy soil is critical for ensuring long-term agricultural production but can be easily degraded and is extremely challenging to restore.

It is important that efforts to sustain production are not at the expense of other key natural resources particularly air and water. Agricultural practices often result in leaching or runoff of nutrients or other chemicals into water bodies and impair drinking water or habitat. Some practices can also result in impacts on air quality from particulates as a result of tillage or emissions from the application of nutrients. To assess the food systems capacity to ensure long-term productivity without negative impacts to soil, water and air resources we have developed a set of seven indicators that can be evaluated either from readily available data or from the Yukon Farmer Survey that was launched by the project.

Indicator 2.1: Soil Cover Days

Soil Cover Days (SCD's) is a critical indicator of sustainable agriculture systems because it provides a measure of how well soils are protected from wind and water erosion. Soil Cover Days refers to the number of days that soil is covered (by crop canopy, crop residue or snow) throughout the year and is presented as days per year as an area weighted mean. Data for SCDs was collected through the Yukon Farmer Survey. Survey results show that the majority of Yukon farmer respondents (65%) have SCDs that are considered "very high" (>325 days/year) mainly due to snow cover for much of the year.

Indicator 2.2: Irrigation water use

Irrigation Water Use provides a measure of how farmers are managing the use of water for crop production. Statistics Canada reported that only 453 hectares in the Yukon were irrigated in 2010, the majority (71%) of which was for alfalfa, hay and pasture, followed by field crops (20%) and vegetables (2%). Yukon Farm Survey data offers information on the percentage of irrigated land as a portion of productive land for vegetable, fruit and field crop production. The results show that vegetable production has the highest need for irrigated land (even though the total area of production is smaller than field crop).

Objective 3: Increase Biodiversity

Biodiversity, or the variation of life, is a critical component of the functioning of both agricultural and non-agricultural ecosystems, including aquatic, wetland, forest, grassland and alpine ecosystems. Biodiversity can be considered the variation of genes, species or even ecosystems. Biodiversity is important as it directly ensures the multitudes of functions within ecosystems, many of which are essential for human well-being. For example ecological functions are responsible for producing the food we eat and many of the materials we use for clothing and construction, and cleaning the water we drink and the air we breathe. Current research supports the idea that a diversity of organisms is more resistant and resilient to environmental stress than just a few organisms. Ecosystems with high biodiversity are thus able to continue functioning after droughts, storms, and other weather related

perturbations or the introduction of new insects and disease that are likely to be more frequent in a changing climate. The expansion of agriculture into ecosystems such as forests, grasslands and wetlands has resulted in much of the global decline in biodiversity. At the same time agricultural production has been simplified enormously to increase efficiency and now only a relatively few varieties of crops and animals are being cultivated instead of hundreds. An important objective of a sustainable food system is to increase biodiversity both on and off farm.

Changes in biodiversity are challenging to measure because of its broad definition and the resources that it would take to measure accurately. We have identified four indicators that can be readily evaluated given currently existing data. These analyses will indicate that status of biodiversity both within the agricultural system and also the impact agriculture is having on biodiversity of other ecosystems.

Indicator 3.1: Production biodiversity

Production biodiversity (or on-farm enterprise diversity) is a measure of the number of types and varieties of plants and animals involved directly or indirectly in food production. Information for this indicator has been collected through the Yukon Farmer Survey in which 270 crop and livestock varieties were reported (Table 16).

Indicator 3.2: Indigenous food biodiversity

Indigenous food biodiversity is a measure of the variety of living organisms that are harvested in the wild in order to consume, share, sell or trade with others. Commonly, the most productive indigenous food harvesting occurs at ecological transition zones (e.g. river banks), which exhibit high levels of biodiversity (Turner et al., 2003). There continues to be a high level of reliance on indigenous foods by First Nations communities in the Yukon with research showing that for at least some communities, there has been little change over the past 15 years (Schuster et al., 2011). If the food security of these communities is to be maintained, then the future availability of these indigenous foods must be ensured.

Data about traditional food harvesting in First Nations communities was collected during our community engagement process through interviews and focus groups in two First Nations communities. Community members shared their perspective on the importance of Indigenous foods to their culture and way of life and their concerns about the sustainability of wildlife populations in their Traditional Territories and across the Yukon. For further information please refer to our reports on community engagement: “Our Food Security Today and Tomorrow in Carcross/Tagish First Nation”, and two forthcoming reports on food security in Tr’ondëk Hwëch’in First Nation and Yukon more generally.

Indicator 3.3: Wild biodiversity interactions with agriculture

The Wild Biodiversity Interactions (WBI) indicator estimates the extent and range of land use interactions between regional wildlife species and agricultural activity and can be a means of assessing the potential impact on biodiversity as agriculture expands. Yukon Environment has established an extensive GIS database of areas of significance to wildlife of interest in the territory. These Wildlife Key Areas (WKA) include habitat for ungulates, small mammals, waterfowl, raptors and marine species (Yukon Environment, 2009), some of which currently overlap with the Yukon's agricultural areas. The WBI will estimate how much of the WKA actually overlaps with agriculture and the species potentially affected.

The data indicate that Yukon's current agricultural land use is limited to approximately 0.02% of the territory with concentrations of cropland surrounding the city of Whitehorse (YAA, 2013). Only a very small percentage (0.25%) of the agricultural land overlapped with WKAs. The WKAs that did overlap agricultural land, accounted for less than 0.001% of the WKA area for most species.

Indicator 3.4: Pest species prevalence

One of the benefits expected to be conferred by increasing biodiversity in agricultural landscapes is that the impact of pest species will be reduced. While some information is available from the Yukon government on invasive plants (Line et al., 2008), detailed reports and data on the occurrence of pest species on farms in the Yukon, are not readily available. The Yukon Farmer Survey provides additional baseline data on this indicator. Farmers have been asked to report on the frequency of occurrence (annually, every few years, rarely and never) of the following four categories of pests/diseases:

- Weeds or invasive plants,
- Insect pests,
- Wildlife pests,
- Diseases and viruses.

Survey data indicates that the most common pest species are weeds and invasive plants which occur annually. Disease and viruses occur only rarely or never.

OBJECTIVE 4: Reduce and Remove Greenhouse Gas Emissions

Greenhouse gases associated with the Yukon food system are emitted from a number of sources. For this report we have collected data on some of the largest: fossil fuel use (CO_2); beef and dairy cattle enteric emissions and manure (CH4); manure management (N_2O); fertilizer application (N_2O).

Indicator 4.1: Tonnes of CO2 emissions from fossil fuel use, system wide

Fossil fuels are used throughout the food system in food production, processing, storage, distribution and food waste management. Because most of the food consumed in the Yukon is imported from Canada and other countries, we developed values for CO_2 emissions associated with food imports.

Using a method from Kissinger (2013) we developed values for CO_2 emissions per tonne imported food commodity where emission quantities reflect on-farm energy use for production, emissions associated with manufacture of synthetic fertilizers, and shipping. For 2011, the estimated CO_2 emissions associated with a total of 34,166 tonnes food imports to the Yukon is 16,600 tonnes CO_2 from on farm fuel and fertilizer use, and 17,825 tonnes CO_2 from transportation (Table 17).

The Yukon Farmer Survey offers some data on how many farmers use synthetic fertilizer, whether they are engaged in food processing, the type of storage facilities they access, and how far they transport their products to market. These data indicate stages of food production at which fossil fuels are used and should be monitored as Yukon food production expands. At this time, Yukon agricultural food production makes up a very small proportion of total food consumed and associated CO_2 emissions are assumed to be negligible.

Indicator 4.2: Tonnes of CH4 emissions from cattle, manure and food waste disposal

Methane (CH4) emissions from enteric fermentation and manure in Yukon cattle have been estimated. Numbers of cattle are from Statistics Canada (2011) and emissions factors (CH_4 emissions per animal) are from Kebreab, Clark, Wagner-Riddle, & France (2006), and Environment Canada (2011). Total CH_4 emissions for Yukon cattle in 2011 are estimated at 15.5 tonnes (Table 18; Table 19).

The decomposition of organic waste in landfills produces the greenhouse gas methane (CH4). With data from the Yukon State of the Environment Interim Report (2013) and a solid waste composition study of the City of Whitehorse (B. Cable, personal communication) we estimate 195 tonnes of food waste related methane emissions.

Indicator 4.3: Tonnes N2O emissions from manure management and application, and from fertilizer application

Emissions of nitrous oxide, a greenhouse gas, can be released from stored and applied manure. Nitrous oxide emissions also result from application of synthetic fertilizers.

Calculation of emissions from manure management requires information on the amount and type of manure stored under each system and applied on farm. Data from the Yukon Farmer Survey indicate that manure on almost two-thirds of the farms (18 respondents) is stored in compost piles. Two respondents reported container storage and one reported use of a retention pond. The remainder stored it in pens or left it on the pasture. In future research data should be collected from farmers on: manure type (by animal) and quantities per storage method, and on manure application to farmland. With those data and published N2O emissions factors it will be possible to estimate the N2O emissions associated with manure management and application.

Nitrous oxide emissions also result from application of synthetic fertilizers. Thirty-four percent of respondents to the Yukon Farmer Survey reported that they apply synthetic fertilizer in food crop production. To determine associated N2O emissions, quantities of fertilizer applied per hectare of land

must be known. Published N_2O emission factors (kg N_2O produced per kg of nitrogen applied) can then be used to estimate the total N_2O emissions.

OBJECTIVE 5: Reduce the Ecological Footprint of the Yukon Food System

Designing and planning for a food system with a reduced ecological footprint requires an estimate of the ecological footprint of the existing Yukon food system. For any population or system, the ecological footprint accounts for *global hectares (gha)* [hectares of land and sea with world average biological productivity] required to produce renewable resources (like wood products, food crops and hay), to accommodate buildings, and to absorb the carbon dioxide wastes of the system. For the Yukon food system we developed an ecological footprint based on the system's largest components: land for growing crops and pasturing animals, and land to sequester carbon from fossil fuel energy use in food production and shipping.

Indicator 5.1: Ecological footprint of the Yukon food system

Because food produced in the Yukon makes up 1-2% of food consumed in the Yukon (Zapisocky & Lewis, 20120), our ecological footprint estimate is based on Yukon food imports. We developed ecological footprints for each type of food commodity consumed using an approach that accounts for 1) the area of land required to grow/produce the food, 2) the fossil fuel energy used on farm and in production of synthetic fertilizer and, 3) the energy used for transportation of food from production locations to the Yukon (Kissinger, 2013). For each food commodity, the ecological footprint per tonne was multiplied by the quantity consumed in the Yukon in 2011.

The estimated total ecological footprint of food consumption (excluding fish and seafood) in the Yukon in 2011 is 34,339 global hectares, or, 1.01 global hectares per Yukon resident. According to the World Wildlife Fund (2010), only 1.8 global hectares are available per person, to meet all lifestyle needs on an on-going basis. That means that in the Yukon, approximately 56% of the available allocation of globally productive land and sea is currently being used to satisfy food needs.

In future, and as Yukon agricultural food production expands, it will be useful to determine the ecological footprint per tonne of Yukon food product. With those data the ecological burden associated with Yukon foods could be compared to that of imported foods. Depending upon Yukon yields and on farm energy use, Yukon production could have a lower ecological footprint because it would not have the shipping footprint associated with imports. It may be possible to plan for increased Yukon food production in a way that decreases the overall footprint of the food system.

Objective 6: Improve the economic viability of farms and ancillary businesses

Individual farms and ancillary businesses such as suppliers, processors and retailers are the building blocks of a regional food system. To operate, and to attract new entrants to the industry, these businesses must be economically viable. Economic viability means businesses are able to survive under present economic conditions and adapt to new ones. Since the available public data is minimal regarding the agriculture sector in the Yukon, this baseline report gathers data from a variety of sources as well as original surveys created by the Institute of Sustainable Food Systems. The report aims to present the

economic story of the agriculture sector. This will help us understand the current economic status of the agriculture sector including the challenges that farmers and ancillary businesses are facing. As a result, we can provide recommendations to designing a food-secure system that strengthens the viability and adaptability of farms and businesses.

Indicator 6.1: Farm Cash Income

The 2011 agriculture census indicates that total farm gross income was $3.6 million while operating expenses was $3.7 million. Results from the Yukon Farmer Survey present a similar picture. The majority of Territorial farm businesses earn a small amount of profit annually. Many have been losing money as they have not been able to break-even. Hence, it is common for farmers to obtain additional income from other sources. However, it also creates a time constraint since farmers have to divide their time between the off-farm work and on-farm work.

Indicator 6.2: Initial Capital Costs

A significant barrier for new entrant farmers is initial capital costs. For a farm operation, initial costs are fixed, one-time purchases of tangible and intangibles goods in order for the operation to begin production. This indicator focuses on the start-up capital costs as well as the break-even year of a farm business. Land and buildings are the largest part of the initial capital cost, following by machinery and equipment. Many Yukon farms have not broken even. On average, it is estimated that a farm takes 14 years to break even.

Indicator 6.3: Ancillary Business Income

Through the directory list of businesses from the '2013 Yukon Farm Product and Services Guide' and web search, we found that there are 14 agricultural input suppliers, 8 post-production processor, and 13 agricultural service providers located in the Yukon. Every business is located in Whitehorse and nearby towns such as Marsh Lake. According to the Yukon Bureau of Statistics, food service sector has the highest number of businesses in the Territory. However, in term of gross revenue, the food retailers and wholesalers receive the highest share. Yukon Farmer Survey focuses on sources of seed. In general, farmers purchase seed from a variety of sources. In 2012, farmers buy seed from 26 seed companies outside of the Territory.

Indicator 6.4: Quantity and Prices for Fresh Local Food

This indicator presents the results from the Yukon Farmer Survey, showing the total quantity and price of all crops and livestock produced and sold in 2012 per 48 farmer respondents. Potato, carrot and beet are the top three vegetables produced in volume. For fruit and berry, Saskatoon berry and raspberry have the highest production. Among livestock, beef cattle and broiler chicken take the largest share of production. Hay (alfalfa and other grass hay) production is about 12,000 tons. The survey results show large price variation among vegetables as compare to livestock products. The results are inconclusive to whether certified organic vegetable products were sold at prices higher than uncertified organic vegetables.

Indicator 6.5: Access to Financial and Other Assistance

Monetary constraint is one of the principal barriers to starting a new farm business or to expanding an established farm business. This indicator explores farmers' potential access to obtain financial aid and other types of assistance. Farm Credit Canada (FCC), Canadian Agricultural Loans Act (CALA), and Growing Forward 2 (GF2) are a few examples of financial assistant sources. Through Yukon Farmer, we find that about one-third of the respondents report to receive additional income from government grants. Other types of assistance include collaboration among farmers such as sharing information, knowledge, and production and processing equipment.

Objective 7: Contribute to the local economy

One of the most important reasons that individuals choose to purchase local food is because of the contribution that they are making towards their local economy (Onozaka, Nurse, & T. McFadden, 2010). In order for a significant labour market to be developed, the agricultural sector must be viable and contribute to the local economy in the long-run. This objective reports on the revenue generated and circulated in the local food system and the local economy as a whole.

Indicator 7.1: GDP Contribution

Through studying GDP statistics, we learn that the value of goods and services in the agri-food system produced within the Territory has been around two to three percent of the total GDP of all industries. However, it is not easy to quantify the extent to which the current agri-food system contributes to the local economy using GDP values. For example, GDP in the food wholesaler components may be induced by imported food products, which are distributed and sold in the local markets. Hence, a significant amount of money may exist in the Yukon economy and yet may not contribute to the local community's economic growth.

Indicator 7.2: Estimated Sales of Yukon Crop and Livestock Production

Based on the Yukon Farmer Survey and secondary data sources, this indicator estimates the total sales generated by vegetable, fruit and berry, livestock and field crop production. The total estimated sales of all crops and livestock (excluding equine, floriculture and nursery industries) in 2012 was $6,281,002. Sale of field crop has the largest share of $3.6 million (58%). Vegetable sale is estimated at $2.03 million. Livestock sale is estimated at $686,042. Fruit and berry generate the small sale of $22,771. Within livestock production cattle, poultry and pig/hog are the largest three products in term of sales.

Indicator 7.3: Household Expenditure on Locally Produced Food

On a macro level, total household consumption expenditure has been increasing every year since 2007. In 2011, food and non-alcoholic beverages accounted for $91.2 million (9 percent of the total expenditure). However these values of food purchase are macro in scale where there is no separation between local and imported food products. To date, no comprehensive data is available to document household expenditure on locally produced food. Survey conducted by the Conservation Klondike Society in Dawson City offer information on household willingness to purchase locally-grown food. In

another survey of Whitehorse consumers (conducted Zapisocky and Lewis), the results show that more than 90% of participants prefer to shop at a food coop.

Objective 8: Create Jobs

Job creation is one of the main objectives of the local economic development. Prospective local employment opportunities mean that residents do not need to leave their homes and seek out-of-territory jobs. Employment earnings will also indirectly induce economy growth through workers' spending. Furthermore, job opportunities for local residents will establish a more sustainable economy where it is less reliant on outside sources for employment. This objective offers information on current employment opportunities in farm and ancillary businesses. The results will help us assess where the potential opportunities may exist as the local food system is strengthened.

Indicator 8.1: Number of agricultural employment opportunities and labour income

Our findings show that the majority of farm operations in the Yukon are relatively small. Owners of farms are farm operators who often do not get paid a regular salary. Net profit at the end of the harvest season provides the income of the farm owner-operators. The opportunities for paid farm employees (employees who are not family members) are limited as farm businesses are small. The wage rate for employees ranges from $10 to $21 per hour; however, those who made more than $15 per hour were very minimal. On average, the wage rate was $14 per hour. Given this average, an average full-time employee on a farm earns approximately $30,000 annually.

Indicator 8.2: Number of Ancillary Business Employment Opportunities and Labour Income

Food service sector is the dominant sector in the agriculture industry in term of gross revenue, number of businesses and total employees. Over all, from 2006 to 2010, the number of employees in the agriculture and agri-food industry increased on average by 5%. More research is needed to obtain additional information regarding employment and labour income of the ancillary businesses in the agri-food system.

Food System Planning, Policy and Governance

In developing a food system design and plan for the Yukon, it is critical to assess existing planning documents to determine the extent to which they support and enable the development of such a system. To undertake the assessment of Yukon plans we have compiled a set of municipal, local area, regional and territorial plans and reviewed the plans to determine how food systems are represented.

Our review revealed that food systems are not well represented in planning documents. Of five food system components, only food production is regularly addressed. None of the planning documents address all components of the food system. Of the six theme areas, economic development and community development were most often represented.

Research Framework

Food System Objectives and Indicators

Our research to assess and characterize Yukon's current food system is structured around measuring the status of a series of Food System Objectives and Indicators and to describe the Territorial policy and planning environment in which a local food system is emerging.

"Food System Objectives" describe what a future food system should be and should achieve. They are broad statements that describe desired conditions to be achieved as a result of activities taking place in the food system. The draft Food System Objectives presented in this report have been selected by the research team based on an extensive literature review and are in keeping with a broader objective to develop a food system design that moves towards ecological, economic, and social sustainability.

"Food System Indicators" are qualitative or quantitative instruments that provide specific information on the state or condition of the Food System Objectives. These indicators are used to measure progress towards achieving the Food System Objectives.

Table 1 provides an overview of the nine Food System Objectives which are being considered in the Yukon Food System Design and Planning Project, and the Indicators used to measure them. In this report, we define "Food System" as agriculture in addition to food harvesting (hunting, fishing, and gathering), food processing and storage, food distribution, food access and consumption, and agricultural inputs (pre-production).

Table 1: Food System Objectives and Indicators

Food System Objectives	Food System Indicators	
1. Increase Territorial self-reliance in agricultural foods and sustain Traditional food harvest (p.24)	1.1	Degree to which locally grown and harvested food contributes to food consumption and satisfaction of nutritional requirements
	1.2	Total amount of agricultural land by land quality
	1.3	Extent to which Territorial agricultural land is used for agricultural production
	1.4	Water availability on Yukon farms
	1.5	Degree to which feed, seed, and agricultural fertility inputs are regionally produced
	1.6	Capacity of storage and processing facilities to support year-round supply of locally produced/harvested foods
	1.7	Farmer access to local markets
	1.8	Agricultural land interface with Indigenous food harvest land
2. Optimize soil, water and air quality (p.38)	2.1	Soil Cover Days
	2.2	Irrigation water use
3. Increase biodiversity (p.43)	3.1	Production biodiversity
	3.2	Indigenous food biodiversity

	3.3	Wildlife habitat interactions with agriculture
	3.4	Pest species prevalence
4. Reduce and Remove Greenhouse Gas Emissions (p.48)	4.1	Tonnes of CO2 emissions from fossil fuel use
	4.2	Tonnes CH4 emissions from cattle, manure and waste disposal
	4.3	Tonnes N2O emissions from manure management and application; fertilizer application
5. Reduce the ecological footprint of the food system (p.48)	5.1	Ecological footprint of the Yukon food system
6. Improve the economic viability of farms and ancillary businesses (p.)	6.1	Farm cash income
	6.2	Initial capital costs
	6.3	Ancillary business income
	6.4	Quantity and prices for fresh local food
	6.5	Access to financial and other assistance
7. Contribute to the local economy (p. Error! Bookmark not defined.**)**	7.1	Gross Domestic Product (GDP) contribution of the agri-food system sector
	7.2	Estimated sales of Yukon crop and livestock production
	7.3	Household expenditure on locally produced food
8. Create Jobs (p. Error! Bookmark not defined.**)**	8.1	Number of agriculture employment opportunity and labour income
	8.2	Number of ancillary business employment opportunities and labour income

Food System Planning and Policy

Recognizing that municipal, regional and territorial plans and policies have a significant influence on the opportunities for local food system development, we also considered it critical to assess existing planning documents to determine the extent to which they support and enable the development of an expanded Territorial food system. Our assessment of these documents is included as the final chapter of this report.

Data Collection Methods

We collected primary data through a *Yukon Farmer Survey* and *Yukon Input Supplier & Food Processor Interview*s. This section provides an overview of each.

Yukon Farmer Survey

The farmer survey was developed by the ISFS research team, reviewed by the ISFS Agriculture-Industry Liaison and Yukon Government Agriculture Branch staff, and pre-tested with several Yukon farmers. The survey gathered information on 2012 Yukon farm production from farms that produce food crops and livestock products. It does not include farms in the the equine, floriculture and nursery sectors. The Yukon Farmer Survey was designed to gather key information that is not collected by the Census of Agriculture such as the quantity of food produced on Yukon farms as well as prices, marketing channels, sourcing of local inputs, and production methods.

Farmers' contact information was retrieved from the Yukon Agriculture Association's Yukon Farm Products and Services 2013 Guide as well as through personal communication regarding additional farmers not listed in the Guide. The YAA and the Growers of Organic Food Yukon (GoOFY) also solicited farmer participation through their contact lists. Farmers had the opportunity to complete the survey on-line, over the phone, by hardcopy via mail, or in person. The survey process began in August 2013 and was completed in February 2014. The survey questions can be found in Appendix I – Yukon Farmer Survey Questionnaire (p.95).

A total of 74 farms were contacted to take the survey. Fifty-one farmers completed the survey (69% rate of completion), 10 farmers chose not to participate, two farmers started but did not complete the survey, and 11 farmers did not respond. Among the 51 respondents, two started their farm operations in 2013 and one's operation was aquaculture focused, so their responses were not included in this report. As a result, the total number of respondents for this survey was 48. Not all respondents answered every question; therefore the total number of responses (denoted by "n") varies between questions. To ensure confidentiality of survey respondents, data is suppressed in cases where it could be used to ascertain the identity of an individual. A separate document entitled "Yukon Food System Design and Planning Project: Report on Agri-food Industry Engagement" reports specifically on the survey results. This report is available at www.kpu.ca/isfs.

Yukon Input Supplier and Food Processor Interviews

In January 2013 and February 2014 interviews with Yukon input suppliers (feed, seed, and compost), food processors (butchers, mobile abattoir operators) and food retailers were conducted by the ISFS project team. A total of nine interviews were carried out in person, by phone and through email. The purpose of the interviews was to gather industry information, identify barriers and challenges to food production and the sale of local farm products, and to solicit views on the prospects for a future Yukon food system. The interviews consisted of closed and open ended questions that were tailored to each type of business. The closed questions allow for comparison of answers among respondents of each business type; the open ended questions allowed the interviewers to pursue details on challenges and opportunities identified by interviewees. A separate document entitled "Yukon Food System Design and

Planning Project: Report on Agri-food Industry Engagement" reports specifically on the survey results. This report is available at www.kpu.ca/isfs.

OBJECTIVE 1: Increase Territorial Self-Reliance in Agricultural Foods and Sustain Traditional Food Harvest

Indicator 1.1: Degree to which locally grown and harvested food contributes to food consumption and satisfaction of nutritional requirements

Food self-reliance is defined as the degree to which the population's food need can be met by food produced in the Yukon. To measure this indicator we compared the quantity of food produced commercially in the Yukon to the estimated quantity of food needed to meet the dietary requirements of the Yukon's population. The contribution of Traditional/subsistence food (defined as food that is hunted, fished for, or gathered) to Yukon residents' diets is also be discussed. As this was a study of the land-based portion of Yukon's food system, fish and seafood are not included in our assessment of food self-reliance.

Quantity of food produced commercially in the Yukon

To our knowledge, no previous study has been conducted to quantitatively measure the total amount of food produced commercially in the Yukon. For the purposes of this study, we define "commercially" as "for sale to others on any scale". Several datasets are available that report on various aspects of Yukon food production but none quantitatively measure the total quantity of food produced in the Yukon.

These include Statistics Canada's 2011 Census of Agriculture, which reports the number of acres in production of major food crops, but we cannot estimate total yield using this dataset because many values are "suppressed" (not published) for confidentiality reasons. The Canadian Centre for Community Renewal calculates in their report "Strengthening Yukon Local Food" (2010) that approximately 2% of market expenditure on food in the Yukon goes towards the purchase of locally produced food, however this figure cannot easily be converted to a quantity of food produced and in addition it includes non-food agricultural products such as bedding and hay. Finally, the Conservation Klondike Society estimated in their "Dawson Community Food Survey and Market Expansion Strategy" (2011) that as much as 8.4% of Dawson-area residents total food purchases are on locally-produced food. Again however, this dollar value cannot be converted to quantity of food produced. In addition, this Dawson specific data cannot be extrapolated across the Territory.

In this study we estimated the total production of crops and livestock products in the Yukon using data collected through the ISFS Yukon Farmer Survey, in which we asked farmers to report the total quantity of vegetables, fruit and berries, livestock products, and field crops that they grew on their farm commercially (defined as "for sale to others on any scale") in 2012, and data gathered from secondary sources including local news articles, interviews with farmers, and representatives from the Yukon Government Agriculture branch. It was beyond the scope of this study to measure food grown for non-market/subsistence purposes (i.e.: in community gardens and greenhouses, backyard gardens, homesteads, etc.) and therefore the final numbers will likely underestimate the total amount of Yukon-grown food that contributes to Yukon diets.

We applied commodity conversion factors and waste conversion factors to our total estimate of crop and livestock production to arrive at an estimated quantity of total food produced (*Table 2*).

Table 2: Estimated total production of foods in Yukon in 2012, by food group

Food Group	Tonnes Food Weight	Tonnes Commodity Weight
Dairy	-	-
Eggs	4.7	5.78
Fats & Oils	-	-
Fruit	2.8	3.86
Grain	0.2	0.39
Legumes	-	-
Meat	19.0	40.8
Vegetables	313.7	517.4
Fish & Seafood	Not assessed (beyond scope of this study)	
Total production (excluding fish and seafood)	*340.4*	*568.2*

Sources: Results from Yukon Farmer Survey and secondary data sources including local news articles, interviews with farmers, and representatives from the Yukon Government Agriculture branch

Quantity of food needed to meet dietary recommendations

To understand the current and future status of food self-reliance in the Yukon we need to know the amount of food required to feed the Yukon population.

To determine the consumption habits of Yukoners and assess how much food would be required to feed the Yukon population, we investigated the feasibility of collecting primary food consumption data through a Food Frequency Questionnaire. After consulting with a number of dieticians and nutritionists regarding the methodology and development of an appropriate survey tool, with a statistician regarding appropriate sample size for the Territory, and considering the expense that conducting such a survey would entail, however, it became clear that collecting primary food consumption data was not feasible. For further details about what consumption survey options were considered, what sample size was estimated we would need for such a survey, and why we ultimately did not conduct the survey, see Appendix II – Food Frequency Questionnaire Methodology.

Therefore to determine the Yukon's food need (defined as the quantity of food needed to meet dietary recommendations within preferred diet parameters), we followed methods developed by Kantor and Buzby et al., wherein the typical dietary pattern of the population is adjusted to meet dietary recommendations. These methods are described fully by *Kantor (1998)* and *Dorward et al. (2014; forthcoming)* and summarized here.

This typical diet was estimated using a Canadian food availability dataset that is developed by subtracting exports, manufacturing, waste, and ending stocks from the total national food supply (Statistics Canada - Agriculture Division, 2007; Statistics Canada, 2011). It has been used as a proxy for the typical diet of British Columbians (British Columbia Ministry of Agriculture and Lands, 2006) and studies of other countries have used similar national datasets in comparable ways. All foods were included in this study except those that are not in Canada's Food Guide and those reported in aggregated categories that cannot be compared to agricultural production data (Table 3).

Table 3: Foods per Food Group in the typical Yukon diet

Fruit & Vegetables				Milk & Alternatives	Meat & Alternatives
Fruit		**Vegetables**			
Apples	Mangoes	Asparagus	Manioc	Dairy	Beans, dry
Apricots	Lemons	Beans, green	Mushrooms		Peanuts
Avocados	Limes	Beets	Peas, green		Beef
Bananas	Oranges	Broccoli	Peppers		Chicken
Blueberries	Papayas	Brussels sprouts	Potatoes		Lamb
Cherries	Peaches	Cabbage	Pumpkins		Pork
Coconut	Pears	Carrots	Radishes		Turkey
Cranberries	Pineapple	Cauliflower	Rutabagas	**Grains**	**Fats& Oils**
Dates	Plums	Celery	Spinach	Barley	Canola Oil
Figs	Prunes	Corn, sweet	Sweet potatoes	Corn	Butter
Grapefruits	Raspberries	Cucumbers	Tomatoes, fresh	Oat	
Grapes	Strawberries	Onions	Turnips	Rye	
Guavas		Lettuce	Tomatoes, processed	Wheat	
				Rice	

The quantity of foods from different Food Groups in the typical diet was then compared to dietary recommendations from Canada's Food Guide. For some Food Groups (Fruit & Vegetables, Milk & Alternatives), the quantity of these foods consumed in the typical diet to not meet Canada's Food Guide recommendations. We therefore adjusted the quantities of food in the typical diet so that they cumulatively met these recommendations. Finally, to derive total need per person (specific to age and gender groups outlined in Canada's Food Guide), waste factors were applied to account for food waste at the household, retail, and institutional levels and the food needed per individual was multiplied by the total population per age and gender group to determine the total food needed given a typical diet satisfying Canada's Food Guide recommendations. Final calculated tonnes of food need for the 2012 Yukon population in outlined in *Table 4*.

Table 4: Quantity (tonnes food weight) of foods needed for the Yukon population in 2012, by food group

Food Group	Total Needed
Dairy	4,794
Eggs	425
Fats & Oils	645
Fruit	3,136
Grain	1,698
Legumes	162
Meat	1,609
Vegetables	4,292
Total	*16,761*

Food self-reliance

To measure food self-reliance, we assume that all food produced in the Yukon is consumed there, and compare the quantity of food produced commercially to the quantity of food needed for the population on a weight basis (*Equation 1*). We calculated that, for the total diet, the Yukon was approximately 2% food self-reliant in 2012. Food self-reliance by food group ranged from 0% for dairy, fats and oils, grain, and legumes, to 0.1% for fruit, 1.2% for meat, 1.1% for eggs, and 7.3% in vegetables (*Table 5*).

Equation 1

$$Yukon\ food\ self\ reliance = \frac{Total\ tonnes\ food\ produced}{Total\ tonnes\ food\ needed} \times 100\%$$

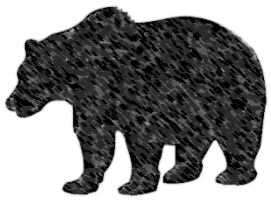
Table 5: Yukon food self-reliance in 2012 by food group

Food Group	Food Self-Reliance
Dairy	0.0%
Eggs	1.1%
Fats & Oils	0.0%
Fruit	0.1%
Grain	0.0%
Legumes	0.0%
Meat	1.2%
Vegetables	7.3%
Fish & Seafood	Not assessed (beyond scope of this study)
Total Diet (excluding fish and seafood)	*2.0%*

Contribution of Traditional/Subsistence Food to Yukon Diets

Traditional/subsistence foods, defined as those that are hunted, fished, or gathered, are an important component of Yukon's food system from both a cultural and nutritional standpoint. While the specific amount of Traditional/subsistence food that Yukoners consume has not been measured, some data is available that allows us to qualitatively assess the degree to which these foods contribute to Yukon diets.

In terms of the number of people engaged in hunting, fishing, and gathering activities, the Yukon Health and Social Services "Yukon 2012 Health Status Report" indicates that over 20% of rural residents and over 8% of Whitehorse residents obtain more than 50% of the food they eat from home-grown or harvested sources. Furthermore, over 30% of Whitehorse residents and over 50% of rural residents report obtaining food through berry picking, hunting, and/or fishing (Yukon Health and Social Services, 2012).



Determining the specific quantity of Traditional/subsistence food that is harvested in the Yukon is not possible as hunting, fishing, and gathering activities are managed or regulated by a number of actors and reporting is not compulsory for all activities or across all practitioners. Hunting of big and small game by non-Yukon residents and Yukon residents who are not Indigenous, for example, is regulated by Environment Yukon. That agency collects data on the number of big game species taken by licensed hunters each year across the Territory. Table 6 summarizes this data for the year 2012.

Table 6: Licensed Harvest of Big Game in Yukon, 2012

	Moose	Caribou	Bison	Sheep	Goat	Deer	Elk	Grizzly Bear	Black Bear
Resident Hunters	411	120	160	80	7	4	10	33	100
Non-Resident Hunters	207	108	2	127	4	0	0	34	12
Total	***618***	***228***	***162***	***207***	***11***	***4***	***10***	***67***	***112***

Source: Yukon Hunting Regulations Summary 2013-14 (Environment Yukon)
(1) Licensed harvest data includes only those animals harvested by non-Native Yukon residents and non-residents.

First Nation and Indigenous Yukon residents are not bound by the same requirements as non-Indigenous Yukoners with regard to licensing and reporting, and data regarding their hunt is collected and disseminated differently by different First Nations Governments. An agreement and strategy for accessing this data (if it is available) will be developed in consultation with our partner First Nations and these will be included in a later version of this report.

Some data on fishing is available from the Survey of Recreational Fishing in Canada, which is conducted every five years by Fisheries and Oceans Canada. The survey is a nationally-coordinated study that collects information to assess the economic and social importance of recreational fisheries to Canada's provinces and territories and provides the most comprehensive and up-to-date information on recreational fisheries activities and harvests in all regions of the country (Table 7).

Table 7: Select Data on Recreational Fishing in Yukon, 2010

Variable	Value in 2010
Licensed Anglers	8,380
Active Anglers	6,755
Number of fish caught (all species)	174,724
Number of fish kept (all species)	36,857

Source: 2010 Survey of Recreational Fishing in Canada (Fisheries and Oceans Canada, 2012)

Indicator 1.2: Total amount of agricultural land by land quality

The 1977 Soil Survey and Land Evaluation of the Yukon Territory, conducted by Rostad e.t al., provides the most comprehensive single dataset available on soil quality for agriculture. The report contains hard-copy maps of the seven regions of the Yukon identified as having potential for agriculture (Dawson-Stewart Crossing-Mayo, Pelly Crossing-Carmacks, Watson Lake, Faro-Ross River, Whitehorse, Takhini-Dezadeash, and Snag), as well as figures reporting on the total land area within these regions that falls into a variety of classifications for Agricultural Capability, Crop Suitability, and Grazing Capability.

Table 8 summarizes findings from the Rostad soil survey. In total, according to that study, the Yukon has almost 1,000,000 hectares of land that is suitable for agricultural production, and over 63,000 hectares of land that is rated as class 3 and 4 land. Due to the Yukon's adverse climate, no soils are rated as Class 1 or 2. According to this study, Class 3 land is suitable for cereal production, Class 5 is suitable for seeded forages, and Class 6 is suitable for native grazing. Vegetable production is most successful on Class 3 and 4 but possible on all of these classes, although the range of vegetables that can be grown decreases, the need to use protective culture (i.e.: greenhouses, hoop houses, etc.) increases, and the management required increases from Class 3 to Class 6 (Rostad, Kozak, & Acton, 1977).

Table 8: Areal Extent of Agricultural Land in Rostad Survey Area, by Agricultural Capability Class

Survey Area	Areal Extent of Agricultural Capability (Hectares)			
	Class 3 and 4	Class 5	Class 6	*Total*
Dawson - Stewart Crossing - Mayo	24,380	166,912	17,238	*208,530*
Pelly Crossing - Carmacks	27,730	143,721	17,127	*188,578*
Watson Lake	10,447	209,267	267	*219,981*
Faro - Ross River	644	31,912	67,235	*99,791*
Whitehorse		73,240	17,472	*90,712*
Takhini - Dezadeash		126,215	14,887	*141,102*
Snag		35,821	2,081	*37,902*
Total	*63,201*	*787,088*	*136,307*	
GRAND TOTAL				**986,596**

Source: Rostad, Kozak, and Acton. 1977. Soil Survey and Land Evaluation of the Yukon Territory. Saskatchewan Institute of Pedology Publications S174.

Rostad, Kozak, and Acton emphasize the significance of microclimates to Yukon agriculture, explaining that some small areas with a favourable aspect may be more suitable for crop production than the capability rating suggests, and vice versa (Rostad et al., 1977). This corroborates anecdotal evidence we have heard from farmers and agricultural experts in the Yukon.

Indicator 1.3: Extent to which territorial agricultural land is used for agricultural production

Error! Reference source not found. and Table 9 report on data from the Census of Agriculture (Statistics Canada, 2011b) regarding agricultural land tenure and land use in the Yukon. According to this data, 10,654 hectares of agricultural land is owned by Yukon farmers or leased by Yukon farmers from governments or others. Of this land, 6,893 hectares (72%) is reported as being used for crops and pasture. According to this dataset therefore, approximately 28% of owned and leased agricultural land in the Yukon was unused for agricultural production at the time of the last census (2011).

Table 9: Agricultural Land Tenure in the Yukon, 2011

Type of Tenure	Area (Hectares)
Area owned	7,606
Area leased from governments	2,688
Area rented or leased from others (1)	X
Area crop-shared from others (1)	X
Land area used through other arrangements	196
Total	***10,654***

Source: Statistics Canada. 2011 Census of Agriculture Yukon

(1) Data suppressed by Statistics Canada to maintain confidentiality

Table 10: Agricultural Land Use in the Yukon, 2011

Land Use	Area (Hectares)
Land in crops (1)	2,450
Summerfallow land	173
Tame or seeded pasture	1,030
Natural land for pasture	3,413
Woodlands and wetlands (2)	X
Area in Christmas trees, woodlands and wetlands	2,946
All other land	635
Subtotal, Land in Crops and Pasture	*6,893*
Total	***10647***

Source: Statistics Canada. 2011 Census of Agriculture Yukon

(1) Excluding Christmas tree area

(2) Data suppressed by Statistics Canada to maintain confidentiality

Although taking into account factors such as government boundaries, wildlife habitat, water availability, proximity to market, etc. would likely reduce the number of hectares within the Rostad survey areas which are practically suitable for agriculture in the future, the data still indicates that land is not a limiting factor for Yukon agriculture or a goal of increasing the degree to which food produced on farms in the region contributes to total food consumption and the satisfaction of nutritional requirements. This is analyzed in greater detail in the Yukon Food System Design and Planning Project: Foundational Food System Design (Institute for Sustainable Food Systems, 2015).

Indicator 1.4 Water availability on Yukon farms

Water availability for irrigation is essential to many types of agriculture in the Yukon. Irrigation has helped Yukon farmers cope with the arid climate and short growing season and take advantage of long summer daylight hours (Clifton Associates Ltd., 2012). Despite the many benefits of irrigation, however, many physical and other development constraints, including adequate water supply infrastructure on and off the farm, access to water and capital, financial returns, technical and institutional support and environmental and regulatory frameworks, have dogged the growth of irrigated agriculture (Clifton Associates Ltd., 2012). In the 2011 Census of Agriculture, 34 Yukon farms reported using crop irrigation, for a total of 453 irrigated hectares (Table 11).

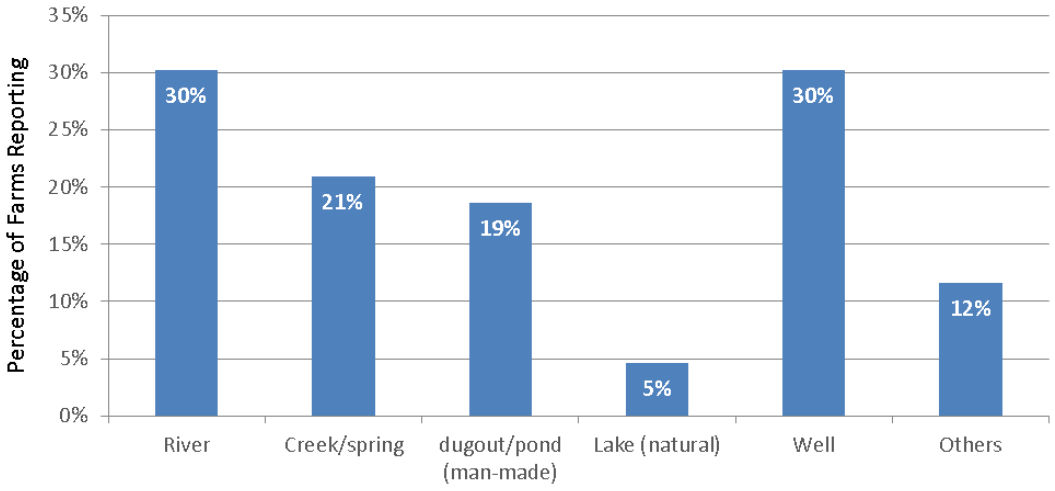
Table 11: Total Area and Number of Irrigated Farms in Yukon, 2011

	Farms Reporting	Total Area (Hectares)
Irrigated alfalfa, hay and pasture	9	323
Irrigated field crops	6	89
Irrigated vegetables	14	11
Irrigated fruit	10	X
Other irrigated areas	3	X
All irrigation use	***34***	***453***

Source: Statistics Canada. 2011 Census of Agriculture Yukon
(1) Data suppressed by Statistics Canada to maintain confidentiality

In the 2012 report "GROWING THE YUKON: A Sustainable Irrigation Development and Management Strategy", Clifton Associates Ltd. provide extensive data regarding the current status of irrigated agriculture in the Yukon and outline a strategy for the expansion if irrigation infrastructure in the future. To complement this data, we collected additional information about water and irrigation availability on Yukon farms through the Yukon Farmer Survey, including the primary source of irrigation water, the percentage of land irrigated, by crop type, and the type of irrigation systems used on vegetable and fruit and berry crops. As shown in Figure 1, sources of irrigation water varies across Yukon farms, with wells and rivers being the most commonly cited source of irrigation water by survey respondents.

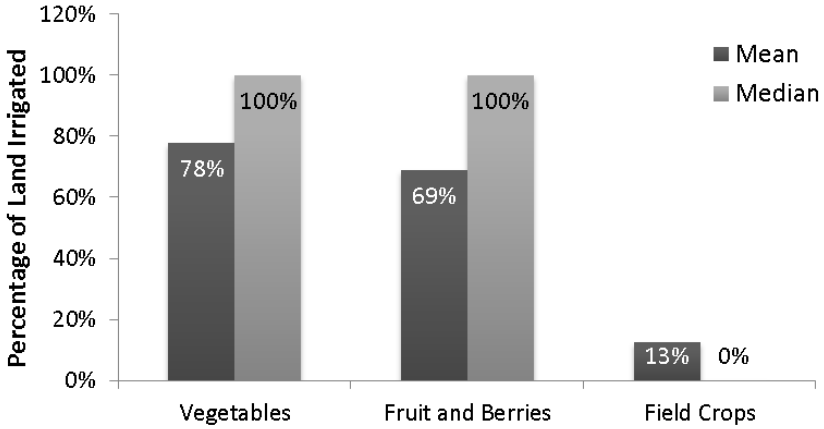
Figure 1: Primary source of farm's irrigation water (n=43)



Source: Yukon Farmer Survey (Institute for Sustainable Food Systems, 2015)

Unsurprisingly, our preliminary data reveals that irrigation distribution by crop type is skewed to favour higher value crops, with the majority of respondents reporting thus far that they irrigate their vegetable, fruit and berry crops but not their field crops (Figure 2).

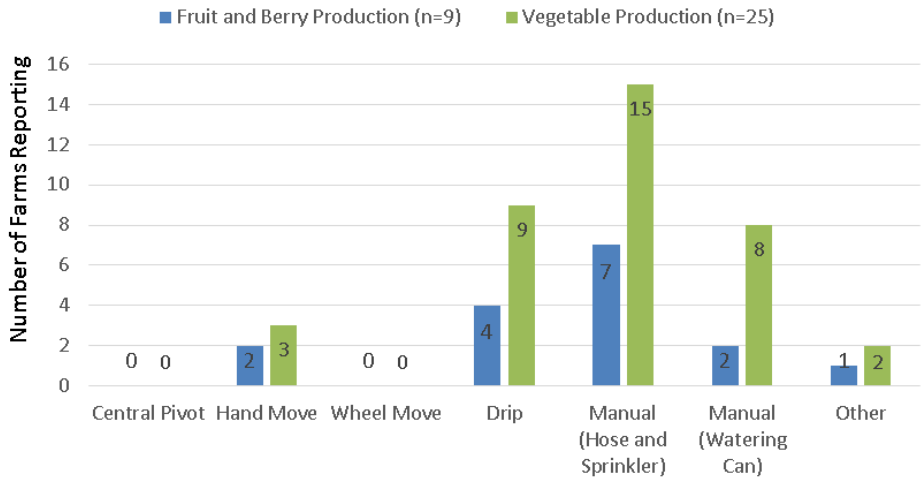
Figure 2: Percentage of land Irrigated, by crop type



Source: Yukon Farmer Survey (Institute for Sustainable Food Systems,

Fruit and berry production tends to be irrigated using manual systems (hose and sprinkler or watering can) rather than more mechanized systems such as drip tape and other systems. This is reflective of the small scale of most fruit, berry, and vegetable acreages in the Yukon (Figure 3).

Figure 3: Irrigation systems used on fruit and berry production and vegetable production (n=9, 25)



Source: Yukon Farmer Survey (Institute for Sustainable Food Systems, 2015)

See also Indicator 2.2: Irrigation water use (p.40) for additional data on irrigation.

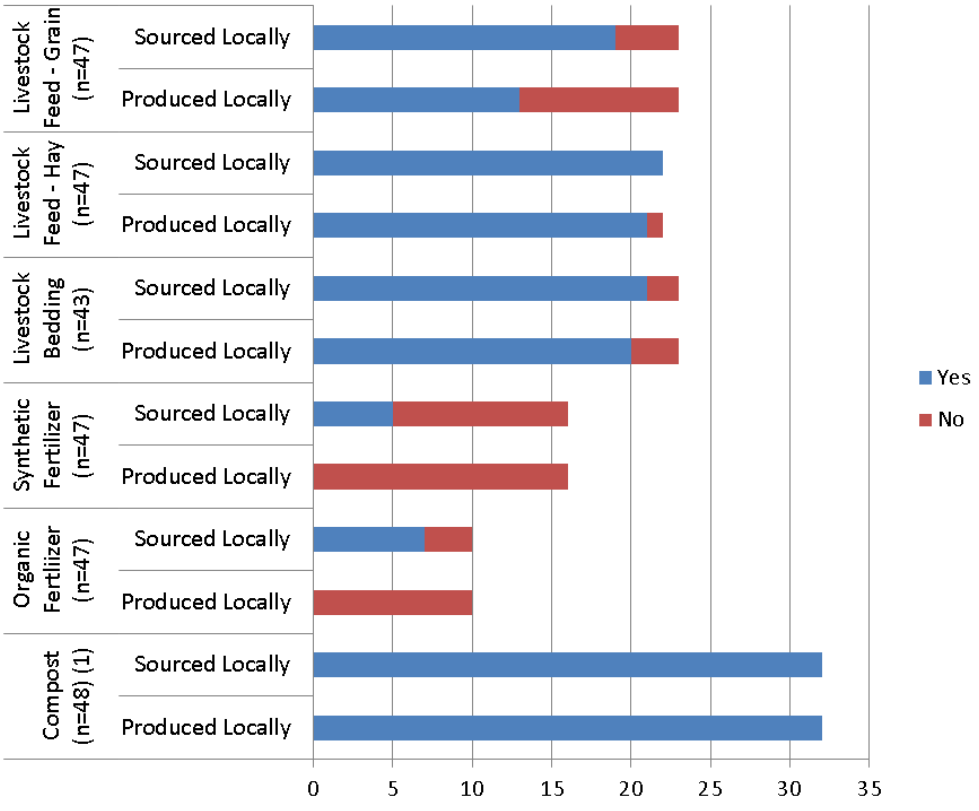
Indicator 1.5: Degree to which feed, seed, and agricultural fertility inputs are regionally sourced and produced

Food self-reliance depends not only on food production and land availability, but also on the capacity of the pre- and post- production phases of the food system. Pre-production involves the provision of agricultural inputs needed to grow food and raise livestock, such as seed, feed, bedding amendments, and pest management materials.

Data reported here is from the Yukon Farmer Survey. Additional data is reported in the Yukon Food System Design and Planning Project: Report on Industry Engagement (Institute for Sustainable Food Systems, 2015).

In the Yukon Farmer Survey we ask farmers to report on the types of inputs they used, where they sourced these inputs from, and whether the input was produced in locally (in the Yukon) or outside the Yukon. Currently we can report on preliminary data for livestock feed (grain), livestock feed (hay), livestock bedding, synthetic fertilizer, organic fertilizer, and compost (including composted manure). This data is presented in Figure 4.

Figure 4: Source and origin of inputs used on selection of Yukon farms (n varies



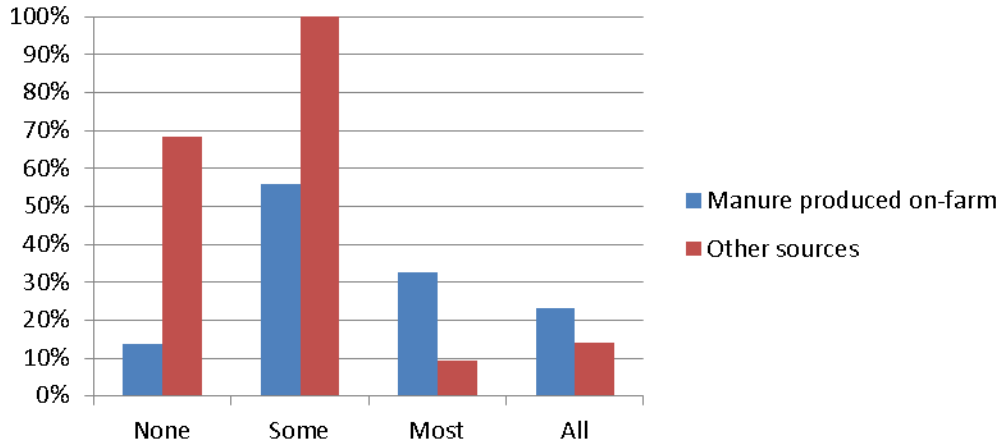
Source: Yukon Farmer Survey (Institute for Sustainable Food Systems, 2015)

As the table illustrates, preliminary data suggests that the Yukon is highly self-reliant in livestock bedding, livestock feed, and compost. Compared to those inputs, self-reliance in organic and synthetic

fertilizers is much lower, with the majority of these products neither being produced or sourced (purchased) in the Yukon.

Knowing that many farms do not rely at all on external fertility inputs, we ask farmers how much of their Nitrogen needs were satisfied by manure produced on their own farm or by using techniques such as cover cropping, using nitrogen-fixing crops, or green manures (Figure 5).

Figure 5: Degree to which on-farm Nitrogen needs are satisfied by manure produced on-farm or by using other techniques (n=44)



Source: Yukon Farmer Survey (Institute for Sustainable Food Systems, 2015)

Finally, we asked farmers which seed companies they patronized. Most of the 38 farmers who responded to this question reported sourcing seeds from more than one place. 42% of respondents (16/38) reported saving their own seeds and/or sourcing seeds from other Yukon farmers.

Indicator 1.6: Capacity of storage and processing facilities to support year-round supply of regionally produced and harvested foods.

As described above, food self-reliance depends not only on food production and land availability, but also on the capacity of the pre- and post- production phases of the food system. Post-production activities occur after crops are harvested or livestock are taken off the farm or field. For this indicator we are interested in value-added post production processing including drying, freezing, canning, slaughter, butchering, and making prepared foods such as pies, cheese, soup, etc.

Our Yukon farmer survey allows us to assess the capacity of Yukon farmers to add value to their crops and store them before sale. Additional data collecting data through the Yukon Input Supplier and Food Processor interviews is reported on in the Yukon Food System Design and Planning Project: Report on Industry Engagement (Institute for Sustainable Food Systems, 2015).

Value-Added Processing

17 out of 51 respondents to the Yukon farmer survey (33%) reported doing some kind of value-added processing of their farm products for sale to the public in 2012.

22 (46%) reported a desire to increase the amount of processing they are currently doing. When asked what would help them do so, these respondents gave a range of diverse responses around the following general themes:

- Increased knowledge of processing techniques,
- Having more time and money available to do value-added processing,
- Having access to more processing and storage space, and
- Having access to more specialized equipment
- Having access to licensed processing facilities at an affordable price
- Having more produce to process.

Storage

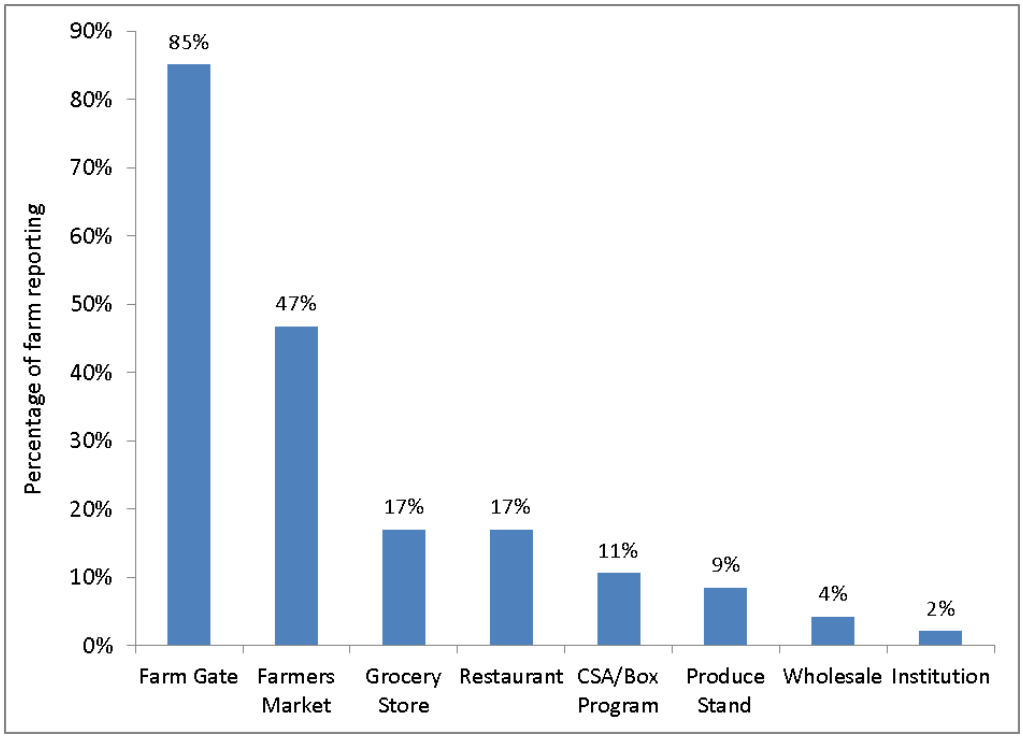
We also asked farmers what kind of on- and off- farm storage space they have access to for their farm products and whether or not that storage space is currently sufficient. While all farmers reported having access to at least one type of on- or off- farm storage facility (including fridge/cold storage, freezer, dry storage, and root cellar), only 40% of the 50 respondents to this question reported that their current access to storage facilities for their farm products was sufficient. Farmers with insufficient storage space reported needing more of all four kinds of storage facilities, with the least demand being for increased freezer space.

This data suggests a gap in of post-production capacity on Yukon farms and a desire for growth of post-production activities by Yukon's farmers.

Indicator 1.7: Farmer access to local markets

The marketing of Yukon agricultural products has been characterized in many previous reports as dominated by direct farm-to-consumer channels (Serecon Management Consulting Inc, TransNorthern Management Consulting, & Research Northwest, 2007; Zapisocky & Lewis, 2010). Results from our Yukon farmer survey corroborate this, with 44 out of 47 respondents (94%) reporting that they sell through at least one type of direct marketing channel and 15 respondents (32%) reporting that they sell through at least one type of indirect marketing channel.

Figure 6: Percentage of farmers selling through various marketing channels (n=47)

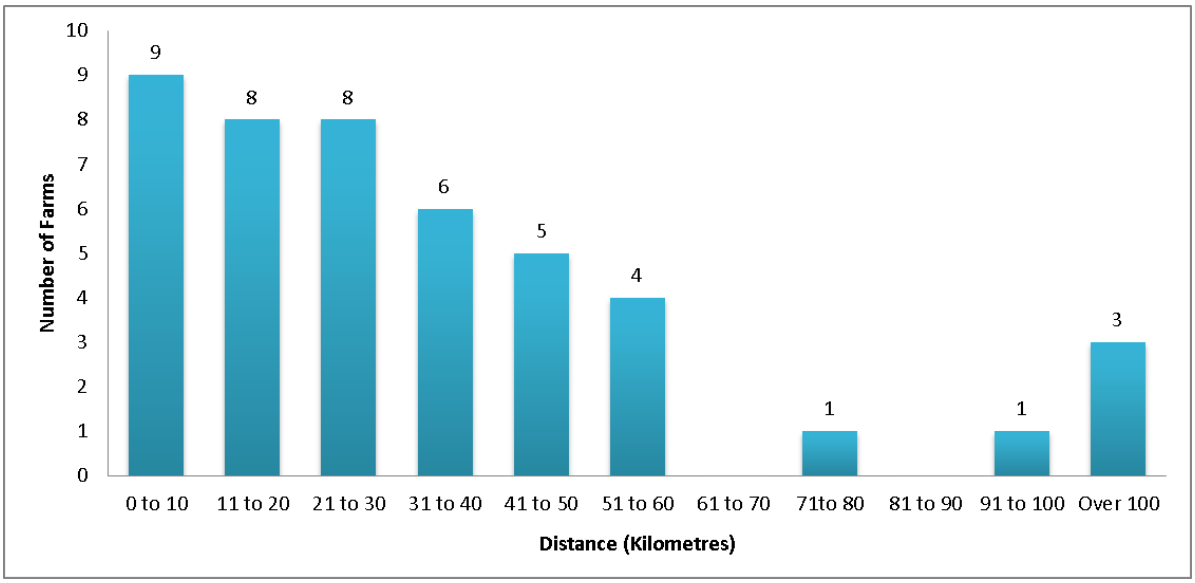


Source: Results from Yukon Farmer Survey (Institute for Sustainable Food Systems, 2015)

Many farmers reported selling through a variety of marketing channels. Figure 6 presents the percentage of farmers selling through various marketing channels. The most utilized marketing channels were farm gate sales and farmers markets. It is evident that it is a challenge for small to medium-sized farms to sell through marketing channels other than the farm gate and farmer markets. Restaurants, institutions, grocery stores and wholesalers often require consistently large amounts of produce, which acts as a barrier to these farmers. On average, farmers sold approximately 60% of their produce at the farm gate, while 25% were sold at farmer markets. Fifty-one percent of the farmer respondents chose to sell their products through only one channel. Forty-five percent utilized between two to four marketing channels. The remaining four percent marketed their products through more than 5 channels.

Selling product at the farm gate does not necessarily mean that customers visit the farms to purchase farm products. Some livestock farms may deliver their meat directly to customers. Others may deliver it to a butcher shop in town (for cutting and wrapping) where customers then pick up the meat. Next we take a look at the distance to markets. According to the 2013 Yukon Farm Products and Services Guide, there were 69 farms listed. Forty six farms (67%) were located within 50 km of Whitehorse, 10 farms (15%) were located in the city of Dawson area and the remaining 13 farms were located elsewhere. Our Yukon farmer survey results also give similar information.

Figure 7: Number of farms by distance to primary market (n=45)



Farmer respondents were asked to report the distance from their farms to their primary markets. Figure 7 illustrates the number of farms by distance to primary market. The results indicate that the majority of farms were located within 60 km of their primary markets. With the main customer base being in Whitehorse, some farmers must travel a fair distance to service those markets.

We also asked farmers if there were any marketing channels they do not currently have access to that they would like to sell through in the future. Forty-seven percent (22/47) of farmers responded yes to this question, and provided a variety of responses regarding what would help them access additional markets. These responses were related to the themes of:

- Marketing and/or networking assistance,
- Access to inspected meat processing/slaughter facilities,
- Increased proximity to other markets such as farmers market and restaurants,
- More time,
- Increased supply of product from their own farm.

Indicator 1.8: Agricultural land interface with indigenous food harvest land

As described, Indigenous/subsistence foods, defined as those that are hunted, fished, or gathered, are an important component of Yukon's food system from both a cultural and nutritional standpoint. It is therefore critical to determine how and where agricultural land and used for hunting, fishing, and gathering interfaces. A future Yukon food system with an expanded agricultural land base should not negatively impact the ability to collect Traditional foods.

Data collection for this indicator is shared with Indicator 3.2: Indigenous food biodiversity

Indigenous food biodiversity is a measure of the variety of living organisms that are harvested in the wild in order to consume, share, sell or trade with others. Commonly, the most productive indigenous food harvesting occurs at ecological transition zones (e.g. river banks), which exhibit high levels of biodiversity (Turner et al., 2003). There continues to be a high level of reliance on indigenous foods by First Nations communities in the Yukon with research showing that for at least some communities, there has been little change over the past 15 years (Schuster et al., 2011). If the food security of these communities is to be maintained, then the future availability of these indigenous foods must be ensured.

Data about traditional food harvesting in First Nations communities was collected during our community engagement process through interviews and focus groups in two First Nations communities. Community members shared their perspective on the importance of Indigenous foods to their culture and way of life and their concerns about the sustainability of wildlife populations in their Traditional Territories and across the Yukon. For further information please refer to our reports on community engagement: "Our Food Security Today and Tomorrow in Carcross/Tagish First Nation", and two forthcoming reports on food security in Tr'ondëk Hwëch'in First Nation and Yukon more generally.

Indicator 3.3: Wild biodiversity interactions with agriculture. See p.43 for baseline results.

OBJECTIVE 2: Optimize Soil and Water Quality

Indicator 2.1: Soil Cover Days

Sustainable agriculture depends on healthy soils. Soil Cover Days (SCD) is a critical indicator of sustainable agriculture systems because it provides a measure of how well soils are protected from wind and water erosion. Soil erosion is problematic because nutrient-rich upper soil layers are removed by wind and water which leads to reduced agriculture production and desertification. Measuring soil erosion is challenging and therefore SCD is typically used as a proxy indicator for how much soil erosion is expected.

Soil Cover Days refers to the number of days that soil is covered (by crop canopy, crop residue or snow) throughout the year and is presented as *days per year as an area weighted mean*. The indicator is estimated by Agriculture and Agri-food Canada (AAFC) in their Sustainability Indicator reports using a series of SCD calendars generated for all crops and ecoregions in Canada and applying those to the soil landscapes of Canada data by crop type (Huffman and Coote, 2010). It is unclear how appropriate these calendars are for the Yukon Territory. Therefore, we collected our own data for this indicator through the Yukon Farmer Survey. This survey specifically asks growers (Part 4 Question 9) 'How many days per year is your soil is covered by crop canopy, crop residue or snow?'

Table 12: Average Number of Soil Cover Days (SCDs) By Cover

Cover type	Average Annnual SCDs
Crop canopy	103
Crop residues on soil surface	49
Snow	201
Total days covered	325

Source: Results from Yukon Farmer Survey (Institute for Sustainable Food Systems, 2015

Survey results found that of the 48 farmers that participated in the farm practice section, 44 responded to the question of soil cover days. Analysis shows the average SCDs of these farmers was 325, most of which was due to snow (Table 12). An average SCDs of 325 is greater than the area-weighted average for Canada (excluding the Territories) which increased from 272 to 291 between 1981-2006 (Huffman and Coote, 2010). The vast majority of Yukon farmer respondents (65%) reported SCDs that are considered "very high" (>325 days/year) by the AAFC rating system and only a small percentage (13%) reporting "very low" (<250 days/year). In 2006 across Canada (excluding the Territories) the majority of land was classified as "high" (300-324 days/year) for SCDs with no land classified as "very low."

Table 13: Soil Cover Day (SCD) Rating, n=48

Rating	SCD range	Percent of Survey
Very high	>=325	65
High	300-324	6
Moderate	275-299	8
Low	250-274	0
Very low	<250	13
Not assessed		8

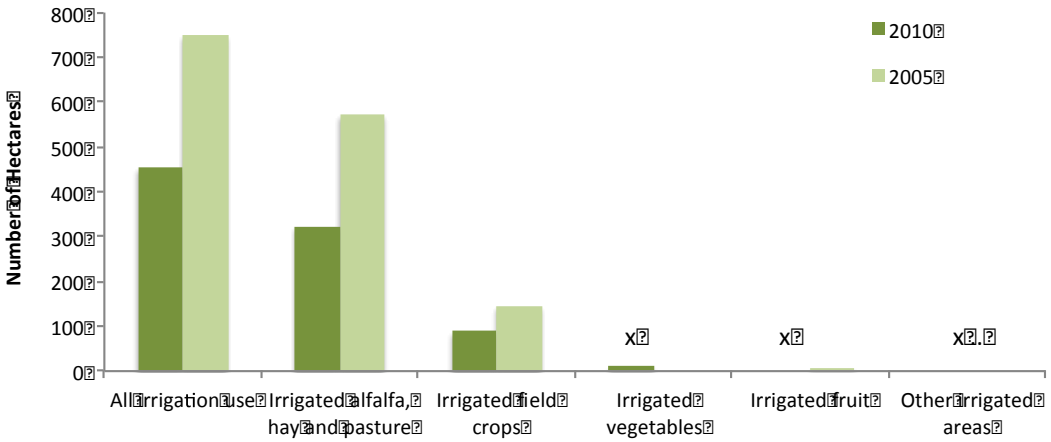
Source: Results from Yukon Farmer Survey (Institute for Sustainable Food Systems, 2015

Indicator 2.2: Irrigation water use

Water is an essential input for food and agriculture. Irrigation water use and efficiency provides a measure of how farmers are managing the use of water. Ideally this indicator would provide information on the amount of water used per unit of agricultural product and be reported as irrigation water (m^3 volume) per crop yield (metric ton).

Previous work by Environment Yukon (Goulding, 2011) reviewed water licenses that are granted based on specific activities as outlined in the 2003 Yukon Water Act. Within these regulations, water licenses for agriculture are required by users who use more than 300m^3/day. The 2006 census reported 19 active agriculture licenses. The Yukon agriculture community typically uses water for four activities including (1) irrigation for crops, (2) potable water for crop washing (3) potable water for livestock and (4) potable water for home use. Similar to the rest of Canada, irrigating crops has the highest water use within the sector (Goulding, 2011).

Figure 8: Irrigated Production in 2005 and 2010



Source: Statistics Canada, 2011 Census of Agriculture, Farm and Farm Operator Data, catalogue no. 95-640-XWE.

Access to water for increased agriculture production has been identified as major limiting factor for expanded production in the Yukon (Goulding, 2011). Statistic Canada (2011a) reported that only 453

hectares in the Yukon were irrigated in 2010, the majority (71%) of which was for alfalfa, hay and pasture, followed by field crops (20%) and vegetables (Figure 8, p.40). The number of hectares that were reported as irrigated dropped by 40% from 2005.

We collected additional data through the Yukon Farmer Survey. Two questions pertaining to irrigation for each type of production (e.g. vegetable or fruit) where asked including: 'What percentage of your land area was irrigated?' and 'What type(s) of irrigation system(s) did you primarily use?'

Table 14: Area of irrigated land for vegetable, fruit and berry and field crop in 2012

	Number of farms	Total production area (acres)	Area irrigated (acres)
Vegetable	25	30.52	15.27 (50%)
Fuit and berry	9	35.56	5.47 (15%)
Field crop	17	1,839.47	238.62 (13%)

Source: Results from Yukon Farmer Survey (Institute for Sustainable Food Systems, 2015

In terms of how much of the productive land for each of these crops was irrigated, land dedicated to growing vegetables was the highest. Table 14 reports the survey results on total area of irrigated land for vegetable, fruit and berry and field crop. For vegetable production, 25 respondents reported 30.52 acres of total production area, half of which was irrigated. Eighteen respondents stated that 100% of their production area was irrigated. Only two respondents reported not to have any irrigated land at all. The rest had irrigated land ranging from 5% to 50% of the total productive land.

For fruit and berry production, the total irrigated land for fruit and berry production was 5.47 acres which accounted to 15% of total productive land. Four (out of 9) respondents reported to irrigated 100% of their productive land. One respondent did not irrigate their land. The rest had irrigated land ranging from 3% to 85% of the total productive land.

Lastly, 76% of the respondents (13 out of 17) producing field crops reported that they did not irrigate their productive land. Only four people irrigated a portion of their productive land ranging from 25% - 60%. The total production area was 1,839.47 acres while only 238.62 (13%) was irrigated.

Table 15 indicates the irrigation systems utilized by vegetable, fruit and berry, and field crop farms. The irrigation systems included under "others" were a fire hose and a stationary hand move.

Table 15: Irrigation systems utilized by vegetable, fruit and berry, and field crop farms

Crop Type	Central Pivot	Hand Move	Wheel Move	Drip	Manual (hose/ sprinkler)	Manual (watering can/ bucket)	Others
Vegetables (n=24)	0	3	0	9	17	10	2
Fruits and Berries (n=8)	0	2	0	4	6	2	1
Field Crops (n=19)	1	1	1	0	1	1	1

Note that one farm can utilize more than one irrigation system, so the numbers of farms do not sum to "n"

Source: Results from Yukon Farmer Survey (Institute for Sustainable Food Systems, 2015

Objective 3: Increase Biodiversity

Indicator 3.1: Production biodiversity

Increasing the diversity of cropping systems has been shown to not only enhance productivity but also increase soil fertility and reduce the need for pest control (Davis et al., 2012). Production biodiversity (or on-farm enterprise diversity) is a measure of the number of types and varieties of plants and animals that are used to provide food.

In the Yukon Farmer Survey respondents were asked to list the types and varieties of plants and animals they produce. Table 16 shows the responses by crop category.

Table 16: Crop and Livestock Varieties, Yukon production 2012

Crop Type	Number of Varieties
Field Crops	12
Fruit	24
Livestock	58
Vegetables	176
Total	270

Source: Yukon Farmer Survey, 2015

Indicator 3.2: Indigenous food biodiversity

Indigenous food biodiversity is a measure of the variety of living organisms that are harvested in the wild in order to consume, share, sell or trade with others. Commonly, the most productive indigenous food harvesting occurs at ecological transition zones (e.g. river banks), which exhibit high levels of biodiversity (Turner et al., 2003). There continues to be a high level of reliance on indigenous foods by First Nations communities in the Yukon with research showing that for at least some communities, there has been little change over the past 15 years (Schuster et al., 2011). If the food security of these communities is to be maintained, then the future availability of these indigenous foods must be ensured.

Data about traditional food harvesting in First Nations communities was collected during our community engagement process through interviews and focus groups in two First Nations communities. Community members shared their perspective on the importance of Indigenous foods to their culture and way of life and their concerns about the sustainability of wildlife populations in their Traditional Territories and across the Yukon. For further information please refer to our reports on community engagement: “Our Food Security Today and Tomorrow in Carcross/Tagish First Nation”, and two forthcoming reports on food security in Tr’ondëk Hwëch’in First Nation and Yukon more generally.

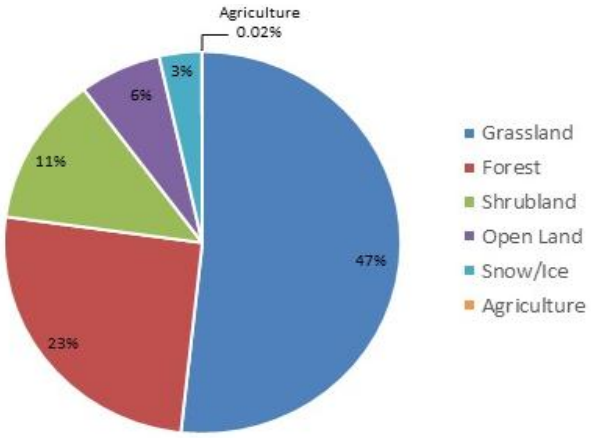
Indicator 3.3: Wild biodiversity interactions with agriculture

The ecology of the Yukon is complex and diverse – both in terms of the range of ecosystems and organisms. Many animals, such as caribou or waterfowl, migrate throughout the Territory while other

species, such as beaver, spend their entire lives within one particular region. Species such as these are integral not only to the vibrancy of the Yukon's natural landscapes but also critical food sources for many communities in the region. As such, land use changes, including those for agriculture, should be weighed against the potential negative impacts on wild species.

Yukon's current agricultural land use is limited to approximately 0.02% of the Territory (Figure 9) with the highest concentration of cropland surrounding the city of Whitehorse (YAA, 2013). The majority of farmland is pasture or hay and still contains a substantial amount of woodlands and wetlands (Statistics Canada, 2011).

Figure 9: Land Cover of the Yukon Territory



Data Source: Latifovic et al.,

The Wild Biodiversity Interactions indicator measures the extent and range of land use interactions between wildlife species and agricultural activity. Yukon Environment has established an extensive GIS database of "Wildlife Key Areas" (WKA), which are areas of significance to wildlife including ungulates, small mammals, waterfowl, raptors and marine species (Yukon Environment, 2009). Observations are collected through surveys as well as local knowledge in order to estimate the areas of significant habitats. Although the WKA can only provide an approximation of range, the data provides insight into the types of important wildlife land uses around the communities of the Yukon.

To estimate the extent and range of wild biodiversity interactions, agricultural land use was approximated using data from the Census of Agricultural (Statistics Canada, 2011) and the Yukon Agricultural Association Yukon Farm Products & Services (YAA, 2013). The average farm size in the Yukon, including non-production lands such as woodlands and fallow, is 80.49 hectares with 80% of farms less than 97 hectares. This farm size was applied to the each of the 73 Yukon farm locations in the Products & Services guide to generate an estimated area of agricultural land use. The total area generated accounted for 92% of the 2011 farmland listed in the Census of Agriculture.

The agricultural lands were then compared to the spatial distribution of WKAs in the territory. The amount of overlap between agricultural lands and WKA was calculated for each species and this overlap was compared to the total range for that species in the Yukon.

The WKAs found to be within agricultural areas include:

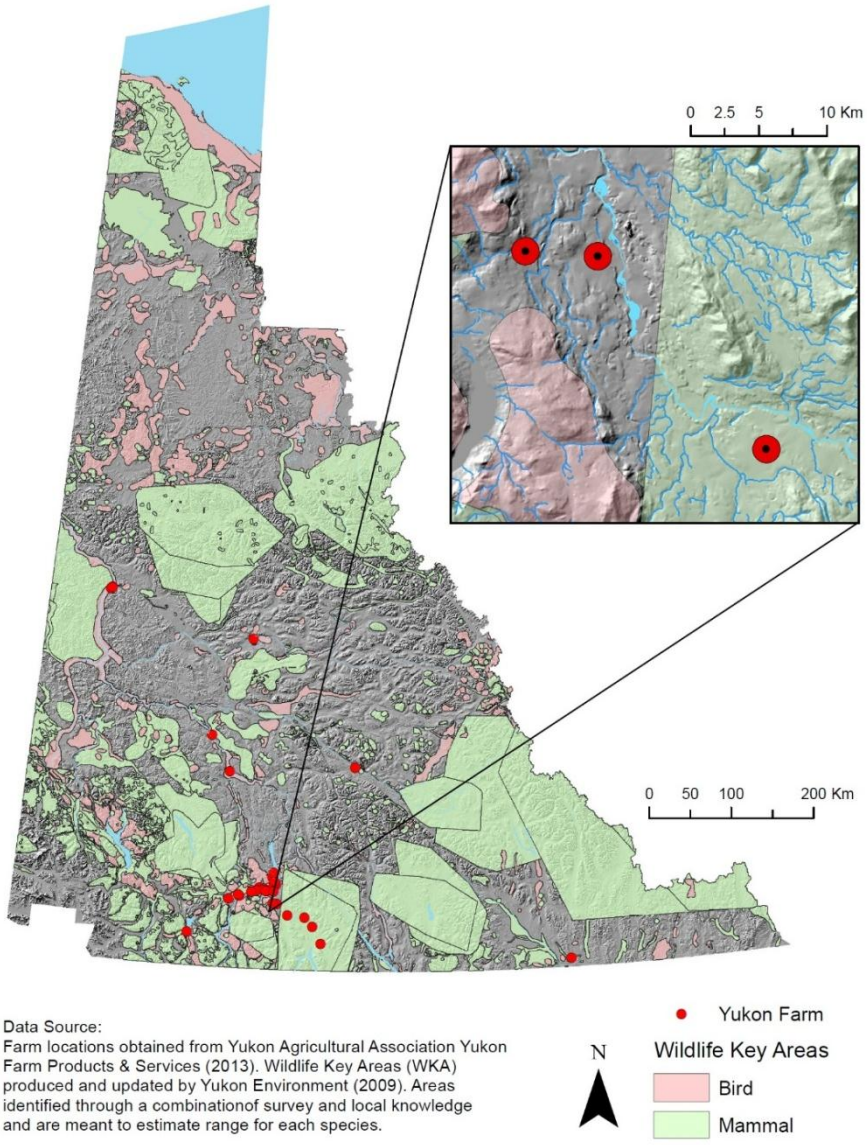
- 11 terrestrial groups
    - 5 birds: alpine raptors, golden eagles, bald eagles, peregrine falcons and other raptors
    - 6 ungulates: elk, moose, mule deer, thinhorn sheep, woodland caribou and barren-ground caribou

- 5 wetland groups
    - 3 waterfowl: ducks, geese and swans
    - 2 small mammals: beavers and muskrats

Despite the diversity of WKAs overlapping agricultural land, these areas of overlap accounted for a very small percentage of the total WKA for each species (less 0.001% in most cases). The total WKA overlap with the agricultural land accounted for less than 0.25% the total farmland in the Yukon. This is shown graphically in Figure 10.

Currently, the extent of the Yukon's farmland is very small as compared to the land base as well as the significant wildlife areas identified by Yukon Environment. The agricultural sector currently has a small physical impact on these habitats. However, as the sector grows, care must be taken in farm management to minimize the potential for degradation of adjacent lands and waterways for the protection of the Yukon's rich biodiversity.

Figure 10: Farms and Wildlife Key Areas of the Yukon



Indicator 3.4: Pest species prevalence

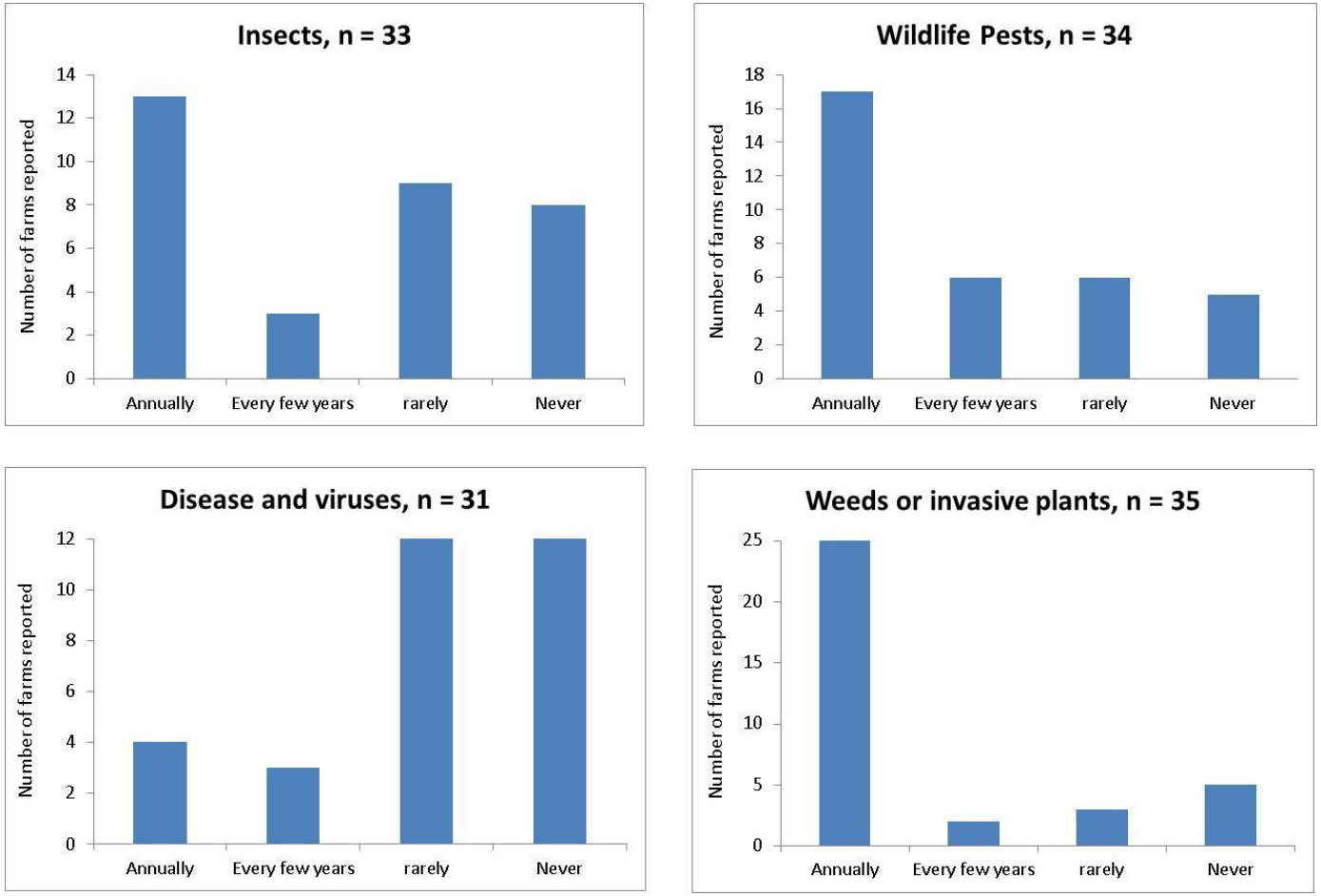
One of the benefits expected when biodiversity in agricultural landscapes is increased is that the impact of pest species will be reduced. While many factors such as management practices, resistance/susceptibility, weather conditions etc., influence the occurrence of pests, maintaining high levels of biodiversity may contribute to a reduction in costs associated with pest management as well as enhance food quality and yields (Davis et al., 2012).

The development of strategies to reduce disease and pest risk is one of the ten key priority areas selected for implementation in the Multi-Year Development Plan for Yukon Agriculture and Agri-Food 2008-2012 (Serecon Management Consulting Inc. et al., 2007). Minimizing the frequency and occurrence of pest species is considered to be a highly desirable attribute of a sustainable food system and while some information is available from the Yukon government on invasive plants (Line et al., 2008), detailed reports and data on the occurrence of pest species on farms in the Yukon, are not readily available. Farmers were asked to report on the frequency of occurrence of the following four categories of pests/diseases:

- Weeds or invasive plants
- Insect pests
- Wildlife pests
- Diseases and viruses.

Figure 11 summarizes the frequency of occurrence of four types of the above pest species. The most common pest species are weeds and invasive plants. Twenty-five respondents out of 35 (71%) reported to have weed and invasive plant problem annually. The second and third most common pest species are wildlife pests and insects with 50% and 39% of the respondents reporting their annual occurrence respectively. The least common pests are disease and viruses. Seventy-seven percent of the respondents reported to never or rarely have the disease or virus problems.

Figure 11: The frequency of occurrence of four types of pest species



Source: Results from Yukon Farmer Survey (Institute for Sustainable Food Systems, 2015

OBJECTIVE 4: Reduce and Remove Greenhouse Gas Emissions

Greenhouse gases associated with the Yukon food system are emitted from a number of sources. For this report we have collected data on some of the largest: fossil fuel use (CO_2); beef and dairy cattle enteric emissions and manure (CH4); manure management (N_2O); fertilizer application (N_2O).

Indicator 4.1: Tonnes of CO_2 emissions from fossil fuel use, system wide

Fossil fuel energy is used throughout the Yukon food system (Yukon food production and food imports). On farms, fossil fuels power farm vehicles, machinery and equipment; fossil fuels are used in the manufacture of synthetic fertilizers. At other stages of the food system fossil fuels are used in food processing, packaging, and sometimes for storage. Food transportation from the farm to the market is almost exclusively fossil fueled (truck; rail; ship; airplane). Food waste is most commonly collected by fossil fueled vehicles.

For food imports to the Yukon, data are available and have been compiled for fossil fuel use on farm, for synthetic fertilizer manufacture, and for shipping to the Yukon. Some data related to fossil fuel use in Yukon food production, processing and transportation have been collected as part of the Yukon Farmer Survey and they are discussed here.

CO_2 emissions from fossil fuel energy use on farm, foods imported to Yukon

Food commodities are imported to the Yukon from a number of countries and Canadian provinces. We developed CO_2 emissions values per food commodity using average on-farm fuel use data from Canada's major food import sources (by food commodity) and for Canadian farm production practices (see Kissinger, 2013 for method). For the Yukon, we estimated on-farm fuel use CO_2 associated with the total food imported to the territory in 2011. Total food imported was assumed to be the total food available to Yukoners in 2011, which we assumed was consistent with Canadian average food availability per person in 2011 (Statistics Canada, 2013a). Table 17 presents food commodities by group and the associated on-farm CO_2 emissions (fossil fuel use and fertilizer manufacture). For beef and other meat products, CO_2 on farm accounts for energy use in livestock feed production. Due to limitations of data on energy used for production of greenhouse vegetables, all vegetables have been have been assigned fuel use associated with field production. As such, on farm CO_2 for vegetables is likely underestimated.

CO_2 emissions from transporting foods to the Yukon

To estimate CO2 associated with shipping food to the Yukon for consumption we began with the CO_2 per tonne food shipped to and within Canada (see Kissinger, 2012 for method and data). We then added emissions from transportation between major Canadian centres to the Yukon. Shipping within Canada to the Yukon was assumed to be by truck. Interprovincial trade data (Statistics Canada, 2013) by retail sales value identify Ontario, Alberta, British Columbia, Manitoba and Quebec as the major Canadian sources of food shipped to the Yukon. We assumed the per province proportion of total dollar value was equal to the per province total tonnes shipped. We determined the road distances (km) between the major exporting centre in each of these provinces and Whitehorse, and multiplied the distance by

the estimated tonnes of food shipped. CO_2 emissions associated with the transport of food to the Yukon in 2011 are reported in Table 17.

Table 17: CO2 emissions on farm and transportation of food imported to and consumed in the Yukon, 2011

Food Type	Quanitity consumed (t)	CO2 on farm (t)	CO2 food transportation (t)
Fruit	5,057	703	2,638
Vegetables	8,089	1,567	4,221
Grain	2,969	646	1,549
Meat alternatives	188	0	98
Eggs	519	116	271
Milk and dairy products	11,359	1,590	5,926
Beef	1,161	2,868	606
Poultry, pork and lamb	2,308	585	1,204
Oil	1,744	711	910
Sugar	771	74	402
Total	34,166	16,599	17,825
Sources: Statistics Canada, 2013a			

CO2 emissions from food produced in the Yukon

As with foods imported to Yukon for consumption, CO_2 emissions from fossil fuel use arise throughout the stages of food production, processing, packaging and distributing in the Yukon. The Yukon Farmer Survey offers some initial data on how many farmers use synthetic fertilizer, whether they are engaged in food processing, the type of storage facilities they access, and how far they transport their products to market.

Of 47 survey respondents, 34% reported using synthetic fertilizer, and of those, over half get the fertilizer from Alberta. CO2 emissions are associated with manufacture of synthetic fertilizer and in transportation of the fertilizer to the farm.

Seventeen respondents to the Yukon Farmer Survey reported that they engage in some form of food processing. Processing activities include canning, dehydrating, slaughter, butchering, and soup making. Almost all processing occurs on farm. Fuel sources to power equipment were not identified.

Some types of food storage facility also require energy, particularly cold storage and freezers. Twenty-four survey respondents reported on farm refrigeration; 27 reported on farm freezers; 16 reported access to off farm cold storage and freezers.

The majority of survey respondents reported a distance of less than 60 to their major market (see Figure 7).

As the survey data do not include quantities of fossil fuel use for processing, storage and transportation, it is not possible to estimate CO_2 emissions per tonne food commodity as we did for food imports. However, the data indicate stages of food production at which fossil fuels are used and should be monitored as Yukon food production expands. At this time, Yukon agricultural food production makes up a very small proportion of total food consumed in the Yukon. As such the contribution to overall emissions of CO_2 is negligible.

With more detailed data on fossil fuel energy used in Yukon food production, and the data on fossil used for imported foods, it may be possible to plan for reductions in the overall food system.

Indicator 4.2: Tonnes of CH_4 emissions from cattle, manure and food waste disposal

Emissions from Cattle and Manure

Ruminant livestock such as cattle, produce methane (CH_4) emissions as a result of enteric fermentation. The quantities of emissions produced are influenced by a range of factors including composition of diet, local temperature, and genetic factors such as efficiency of feed digestion (Kebreab, Clark, Wagner-Riddle & France, 2006). In the Yukon, the beef cow diet is comprised of pasture feeding in the summer and hay, silage, grain and pasture feeding in the winter (Serecon, 2007). The quantities of emissions produced by an animal over the course of a year can be determined by multiplying the number of animals by a CH_4 emissions conversion factor. The Intergovernmental Panel on Climate Change (IPCC) has developed a set of default CH_4 emissions based on global average emissions (Tier 1 conversion factors) and proposed a method for determining more nationally-relevant emissions factors (Tier 2).

Table 18 presents estimates of emissions associated with Yukon cattle, using Tier 2 emission factors developed for Canada (Kebreab et al., 2006). The numbers of animals listed in Table 18 are from Statistics Canada, Census of Agriculture 2011. The Census data reports the number of “cows” but suppresses the distinction between dairy cows and beef cows to respect producer confidentiality. For the category “cows” we use the emission factor for beef cows to err on the side of under-representing rather than over-representing emissions. The beef cow emission factor is approximately 30% lower than the factor for dairy cows (Kebreab et. al, 2006).

Table 18: Enteric methane (CH4) emissions from Yukon cattle

Cattle	Number	Emissions Factor	Total CH4 Emissions
		Kg CH4 per head per year	Kg
Calves	51	39.9	2034.9
Heifers (beef herd replacement;slaughter)	35	62.9	2201.5
Cows (beef and dairy)	94	90.4	8497.6
Steers	25	56.1	1402.5
Bulls	8	93.5	748
Total			14884.5

Data sources: Statistics Canada, Census of Agriculutre 2011; Kebreab et al. 2005

Methane emissions also arise from cattle manure. Conversion factors associated with cattle subcategories (Environment Canada, 2011), and total estimated emissions are reported in Table 19 . The emissions factor associated with dairy cattle is higher than that of beef cattle. Because Statistics Canada data do not disaggregate beef and dairy, we have used the beef emissions factor. Therefore the total should be understood to under-represent the total emissions associated with the number of animals reported in 2011.

Table 19 Methane (CH4) emissions from cattle manure

Cattle	Number	CH4 Emissions factor kg/animal/yr	Total Emissions 2011 kg
Cows (beef and dairy)	95	3.3	313.5
Calves	51	1.5	76.5
Heifers, beef her replacement and slaughter	35	2.1	73.5
Steers	25	2.1	52.5
Bulls	8	3.4	27.2
Total			543.2

Data Sources: Statistics Canada, Census of Agriculture 2011; Environment Canada, 2011

Emissions from Food Waste Disposal

The decomposition of organic waste in landfills produces the greenhouse gas methane (CH_4). The Yukon State of the Environment Interim Report (2013) presents Environment Canada data showing that greenhouse gas emissions from 'solid waste on land' for the Yukon, were 1.5 kilo tonnes of CO_2e (carbon dioxide equivalent) in 2010. What percent of these emissions can be attributed to food waste? A solid waste composition study for the City of Whitehorse reported that in 2010, 13% of waste in the landfill was food waste (B. Cable personal communication). The City of Whitehorse does not represent the

whole of the Yukon, and unlike most other communities it has organic collection. Therefore, attributing its 13% food waste figure to the Yukon solid waste emissions yields a conservative estimate of 0.195 kilo tonnes for Yukon food waste related methane emissions.

Indicator 4.3: Tonnes N_2O emissions from manure management and application, and from fertilizer application

Emissions of nitrous oxide (N2O), a greenhouse gas, can be released from stored and applied manure. Animal type and method of manure storage affect the quantity of emissions released. In Canada manure from livestock is commonly stored in liquid form (14%) and solid form (69%); approximately 24% of livestock deposit manure directly to pasture (Kebreab et. al 2006). In the 2011 Census of Agriculture Yukon farmers report 1,249 hectares of land on which manure is spread naturally by grazing animals; 1,521 hectares on which composted or solid manure is incorporated into the soil; 62 hectares of land on which solid or composted manure is deposited but not incorporated. There are no reports of liquid manure applied to soil in any form.

Calculation of emissions from manure management requires information on the amount and type of manure stored under each system and applied on farm. Data from the Yukon Farmer Survey indicate that manure on almost two-thirds of the farms (18 respondents) is stored in compost piles. Two respondents reported container storage and one reported use of a retention pond. The remainder stored it in pens or left it on the pasture. In future research data should be collected from farmers on: manure type (by animal) and quantities per storage method, and on manure application to farmland. With those data and published N2O emissions factors it will be possible to estimate the N2O emissions associated with manure management and application.

Nitrous oxide emissions also result from application of synthetic fertilizers. Thirty-four percent of respondents to the Yukon Farmer Survey reported that they apply synthetic fertilizer in food crop production. To determine associated N2O emissions, quantities of fertilizer applied per hectare of land must be known. Published N_2O emission factors (kg N_2O produced per kg of nitrogen applied) can then be used to estimate the total N_2O emissions.

OBJECTIVE 5: Reduce the Ecological Footprint of the Yukon Food System

Designing and planning for a food system with a reduced ecological footprint requires an estimate of the ecological footprint of the existing Yukon food system. For any population or system, the ecological footprint accounts for *global hectares (gha)* [hectares of land and sea with world average biological productivity] required to produce renewable resources (like wood products, food crops and hay), to accommodate buildings, and to absorb the carbon dioxide wastes of the system. For the Yukon food system (food produced and imported to the Yukon) we developed an ecological footprint based on the system's largest footprint components: land for growing crops and pasturing animals, and land to sequester carbon from fossil fuel energy use in food production and shipping.

Indicator 5.1: Ecological footprint of the Yukon food system

Given that foods produced in the Yukon make a very small contribution to the Yukon food system (approximately 2%) (Zapisocky & Lewis, 20120), for this report we developed an estimate of the ecological footprint associated with food consumed in the Yukon and all food is assumed to be imported from Canadian provinces, and from outside Canada. Quantity and types of food consumed in the Yukon (2011) were determined from national food availability (Statistics Canada, 2013a) data and Canada's Food Guide (see Indicator 1.1). Fish and seafood are excluded from this calculation.

We developed ecological footprints for each type of food commodity consumed (gha/tonne food commodity) using an approach that accounts for 1) the area of land required to grow/produce the food, 2) the fossil fuel energy used on farm and in production of synthetic fertilizer and, 3) the energy used for transportation of food from production locations to the Yukon (Kissinger, 2013). For each food commodity, the ecological footprint per tonne was multiplied by the quantity consumed in the Yukon in 2011.

The ecological footprint associated with food consumed in the Yukon is reported in Table 20 by food category. The Table shows the quantities of land (in global hectares) required to produce the food, the quantities of land required to sequester carbon emissions associated with its production and transportation, and the total ecological footprint.

Table 20 Ecological footprint of Yukon food consumption (2011) excluding fish and seafood

Food Commodity	Quantity Consumed	Ecological Footprint Total	Ecological Footprint of production (land and on-farm energy)	Ecological footprint of shipping
	(t)	(gha)	(gha)	(gha)
Fruit	5057	1,536	767	769
Vegetables	8090	3,604	2,690	914
Grains	2911	2,797	2,450	347
Milk and dairy products	11359	2,634	1,567	1068
Eggs & meat alternatives	707	1,448	1,448	
Beef	1161	12,830	12,397	432
Poultry, lamb and pork	2308	6,800	6,800	
Oil	1744	2,559	2,340	220
Sugar	771	130	42	88
Total	**34,108**	**34,339**	**30,501**	**3,838**
Sources: Statistics Canada, CAN SIM Table 002-0011				

The estimated total ecological footprint of food consumption (excluding fish and seafood) in the Yukon in 2011 is 34,339 global hectares, or, 1.01 global hectares per Yukon resident. According to the World Wildlife Fund (2010), only 1.8 global hectares are available per person, to meet all lifestyle needs on an on-going basis. That means that in the Yukon, approximately 56% of the available allocation of globally productive land and sea is currently being used to satisfy food needs.

Meat, in particular beef, although consumed in smaller quantities than fruit, vegetables and milk and dairy products by weight, has the largest ecological footprint. This is because the ecological footprint of meat accounts for the land and energy used in producing feed (grain and pasture) for animals from birth to slaughter.

Transportation of food from outside of Canada and from Canadian provinces to the Yukon, contributes over 11% to the total ecological footprint.

In future, and as Yukon agricultural food production expands, it will be useful to determine the ecological footprint per tonne of Yukon food product. With those data the ecological burden associated with Yukon foods could be compared to that of imported foods. Depending upon Yukon yields and on farm energy use, Yukon production could have a lower ecological footprint because it would not have the shipping footprint associated with imports. It may be possible to plan for increased Yukon food production in a way that decreases the overall footprint of the food system.

Objective 6: Improve the economic viability of farms and ancillary businesses

Individual farms and ancillary businesses such as suppliers, processors and retailers are the building blocks of a regional food system. To operate, and to attract new entrants to the industry, these businesses must be economically viable. Economic viability means businesses are able to survive under present economic conditions and adapt to new ones. Indicators in this objective illustrate the present state of the Yukon farming and related businesses. Since the available public data is minimal regarding the agriculture sector in the Yukon, this baseline report gathers data from a variety of sources as well as original surveys created by the Institute of Sustainable Food Systems. The report aims to present the economic story of the agriculture sector. This will help us understand the current economic status of the agriculture sector including the challenges that farmers and ancillary businesses are facing. As a result, we can provide recommendations to designing a food-secure system that strengthens the viability and adaptability of farms and businesses.

Indicator 6.1: Farm Cash Income

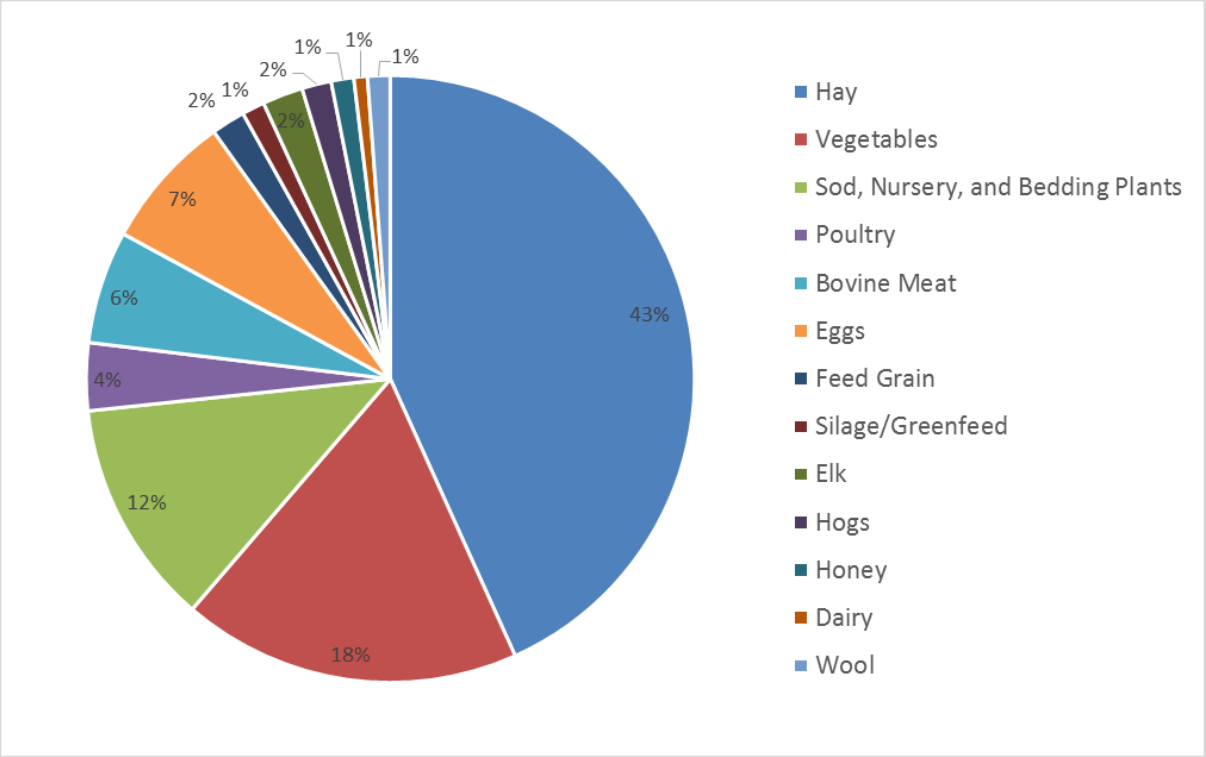
There are two methods to measure farm profitability: net cash income and net farm income. Net cash income represents the total direct cash in-flows and out-flows of farm revenue. It can be calculated by subtracting operating expenses from gross farm receipts. On the other hand, the net farm income takes into account non-monetary transactions of farm business, i.e. the income-in-kind and depreciation charges[1]. It can be measured by adding the income-in-kind and subtracting the depreciation charges to the net cash income. Due to the lack of data on income-in-kind and depreciations, the net cash income is used as a proxy for the net farm income to represent farm profitability.

Before we can calculate the total net cash income for all Yukon farms, we need to identify the total gross farm receipts (aka gross cash income) and total operating expenses. Total gross farm receipts are the total sales of agricultural products (total crop and livestock receipts) as well as program payments to support farm operations. Total operating expenses are the sum of all expenses paid for goods and services used in farm production. It does not include depreciation and capital costs.

Yukon agriculture represents a small, but important sector in the overall Yukon economy. In 2010, agricultural production generated $3.69 million dollars in farm receipts (Statistics Canada, 2012). Serecon Management Consulting Inc. et al. (2007) estimated the percentage of gross farm receipts by farm product types as shown in Figure 12 (page 56). Hay is one of Yukon's major agricultural products. Together with alfalfa and oats, they constitute just over 93 percent of total land in production. Estimates show that these forage crops represented almost half (43 percent) of farm receipts and were valued at $1.8 billion in 2010 (Statistics Canada, 2011; Serecon Management Consulting Inc. et al., 2007).

[1] Income-in-kind is defined as "the value of agriculture commodities produces on farms and consumed by the individuals living on these farm operation". Depreciation charge is defined as "loss in fair market value of the capital assests". (Statistics Canada, 2013)

Figure 12: Percentage of gross farm receipts by agricultural commodities



Source: Serecon Management Consulting Inc. et. al., 2007

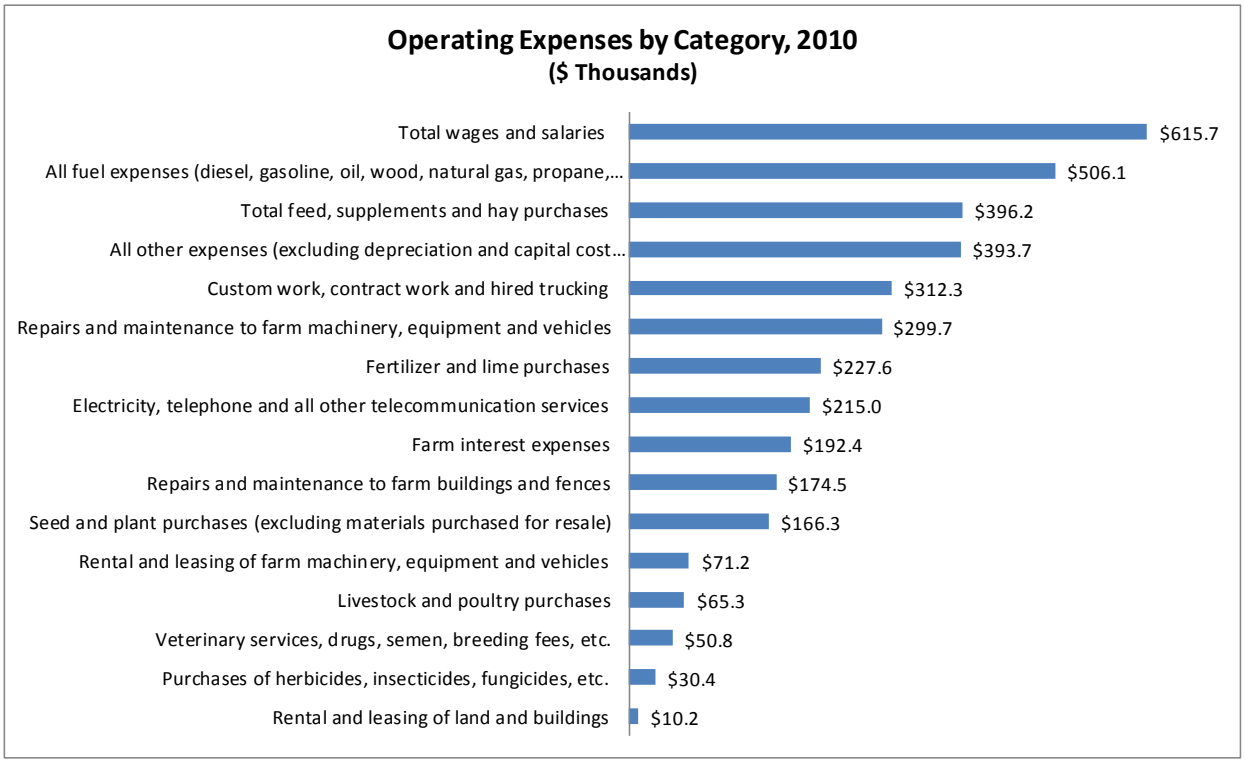
Vegetables represent the second largest agriculture commodity. The 2011 Census of Agriculture reports that 24 farms produced mixed vegetables on 33 acres in the Yukon in 2011 (Statistics Canada, 2012). In total, it is estimated that producers sell $750,000 worth of vegetables annually (Serecon Management Consulting Inc. et al., 2007).

Beef and poultry sales generate roughly $400,000 annually (Serecon Management Consulting Inc. et al., 2007). Yukon consumed beef is estimated between 90 and 140 heads of cattle and has a fairly small market due to the increased cost of production (Statistics Canada, 2011). Beef consumption in the Yukon is significant and local production is estimated to satisfy only one to two percent of overall demand (Serecon Management Consulting Inc. et al., 2007). Significant barriers exist to expanding beef production, particularly around the economic viability and competitiveness of locally raised beef relative to imports.

A significant market also exists for the poultry industry. Research indicates that the demand for poultry consumption is 500,000 birds annually (Ball, Hill, & Whelan, 2010). In 2006, roughly 3,750 chickens were slaughtered and this figure increased by 72% to 5,205 in 2011 according to the Agricultural census (Statistics Canada, 2012). A cooperative mobile chicken processing unit, purchased in 2007, may have enabled this increased production. Direct farm receipts for poultry were estimated to be $150,000 in 2008 (Serecon Management Consulting Inc., Transnorthern Management Consulting, & Research Northwest, 2007). More research is needed to identify current farm receipts of poultry products as a result of the increased post-production capacity.

Operating expenses account for a large portion of the gross cash income because the nature of farming is capital and labour intensive. Operation expenses are highly variable according to crop, management structure, soil quality, weather and other variables. In 2010, all farm types in the Yukon spent a total of $3.73 million in operating expenses. The top three categories in expenses were wages and salaries (17 percent), fuel expenses (14 percent) and feed, supplements and hay purchases (11 percent). Figure 13 shows operating expenses by categories.

Figure 13: Operating expenses by category of all farm types, 2010



Source: Statistics Canada, 2011 Census of Agriculture, Farm and Farm Operator Data, catalogue no. 95-640-XWE.

Together, non-family wages and salaries, family member wages and salaries and custom work, contract work and hired trucking comprise the biggest agricultural production expense categories. In 2010 wages, salaries and hired custom, contract and trucking service costs totaled $928,091. In the Yukon, we can assume most wages, salaries and custom work fees go to Yukon residents[2]. A majority of these wages and fees are likely spent locally within the Yukon economy. Similarly, expenditure on the maintenance and repairs of farm machinery, equipment and vehicles, at $299,717 in 2010, would be partly comprised of wages to local repair people with the rest spent on parts brought to the Yukon from elsewhere in Canada and the US.

The second largest agricultural expense in 2010 was fuel in the amount of $506,111. Fuels reported in this category include: diesel, gasoline, oil, wood, natural gas, propane and other. From 2006 to 2009, the Yukon Agricultural Branch investigated oilseed production as potential bio-fuel crops (Yukon Agriculture Branch, 2010) where canola (*Brassica* napus), flaxseed (*Camelina sativa*) performed favourably in field trials. Economic analysis of the trial yields however showed low potential net earnings (approximately

[2] In 2012, two farm workers came to the Yukon through the Seasonal Agriculture Workers Program. Six more farms were interested in participating in the program. (Personal Communication; Matt Ball, Jan. 16, 2013)

$400/ha) when diesel was priced at $1.10/litre. The 2011 agricultural census reported zero canola and flaxseed production (Statistics Canada, 2012). Fuel prices have a significant impact on farm choices as much of the farm work is done by using machines. Hence farmers are constantly taking into account of fuel prices when making farm operation decisions. To lessen the burden of fuel costs to farmers, the government offers a fuel tax-credit program that helps them offset a portion of the cost of fuel (Yukon Government, Department of Finance, 2011).

Feed, supplements and hay are the next biggest agricultural expense to Yukon famers, totaling $396,247 in 2010. In addition to being an important input for farmers, hay is also the largest agricultural product grown in the Yukon; both in terms of acreage and value. In 2009, it is estimated that hay production yielded $1.8 million in gross annual revenue and was about 75 percent of the Yukon's seeded crop land (Ball, Hill, & Whelan, 2010). Much of that hay is estimated to have been sold in the Yukon (Statistics Canada, 2013). Hay bought as feed for horses off-farm (by outfitters, guides and equestrians) is not included in farm operating expenses. This may account for the discrepancy between feed costs to farms which is at approximately $400,000 and the value of hay produced in the Yukon at $1.8 million.

Next, the net cash income is calculated by subtracting operating expenses from gross cash income as shown in Table 21. This figure expresses the agricultural sector's total cash available for the payment of debt, withdrawal or investment (Statistics Canada, 2013). Since 2000, net cash income has been negative due to operating expenses for Yukon's agricultural industry being substantially significant. Yukon farm businesses have been losing money over the past decade; however, it is worth noting that the loss has become smaller over the years. Note that the dollar values reported in Table 21 includes incomes and expenses of all farm types including equestrians and nursery and bedding plant farms.

Table 21: Gross cash income, operating expenses and net cash income by all farm types

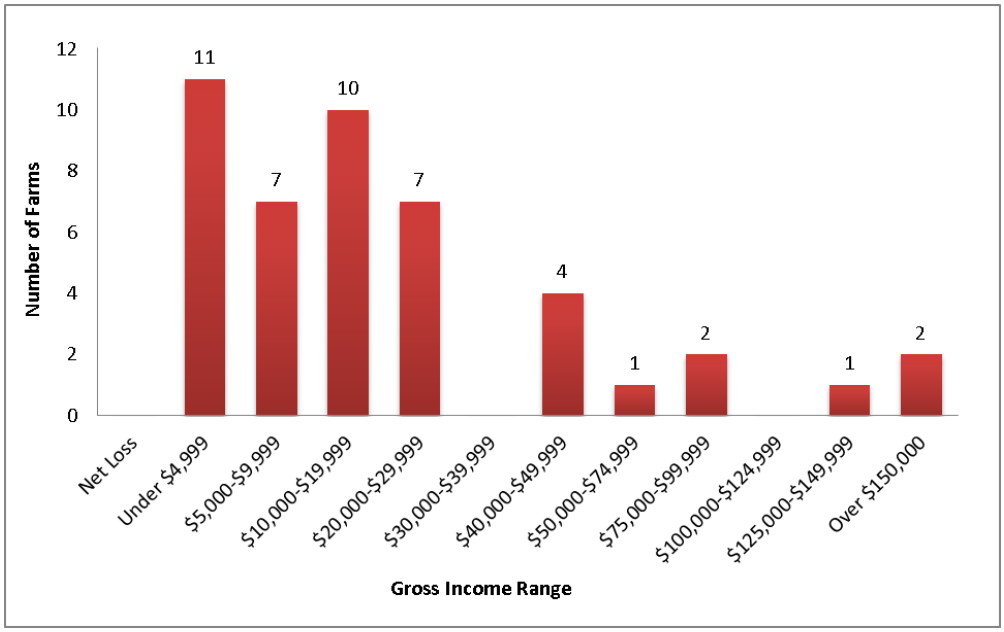
	2001	2006	2011
Gross Cash Income	$4,194,864	$4,080,385	$3,689,642
Operating Expenses	$4,748,443	$4,258,435	$3,727,611
Net Cash Income	($553,579)	($178,050)	($37,969)

Source: Statistics Canada, 2011 Census of Agriculture, Farm and Farm Operator Data, catalogue no. 95-640-XWE.

We are however, only interested in farms that produce food commodities. Therefore, we have gathered updated information from the Yukon farmer survey on the farms' gross cash income and net cash income to see how farm businesses have performed in the previous year. Figure 14 and Figure 15 (page 59) present the number of farms in each gross and net cash income range in 2012. Even though Yukon farmers earn fairly reasonable amounts of gross cash income, in actuality, their net revenue is far below than what is needed to sustain a farming family.

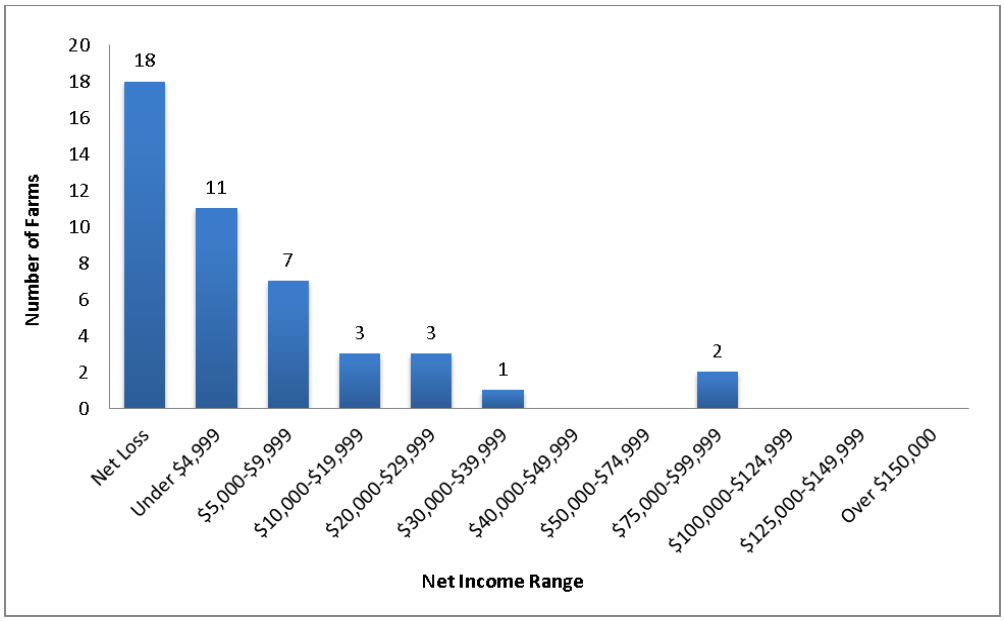
We received a total of 45 responses that reported on their cash income. Thirty-nine of 45 farmer respondents (87%) reported net income in 2012 to be lower than $20,000. Eighteen farms (40%) reported losses during the 2012 production year. If the source of household income came solely from farming, more than 80% of farm business owner/operators would be earning below the 2011 low-income cut-offs for a family of 2 (Statistics Canada, 2013).

Figure 14: Number of farms by gross income range in 2012 (n=45)



Source: Results from Yukon Farmer Survey (Institute for Sustainable Food Systems, 2015)

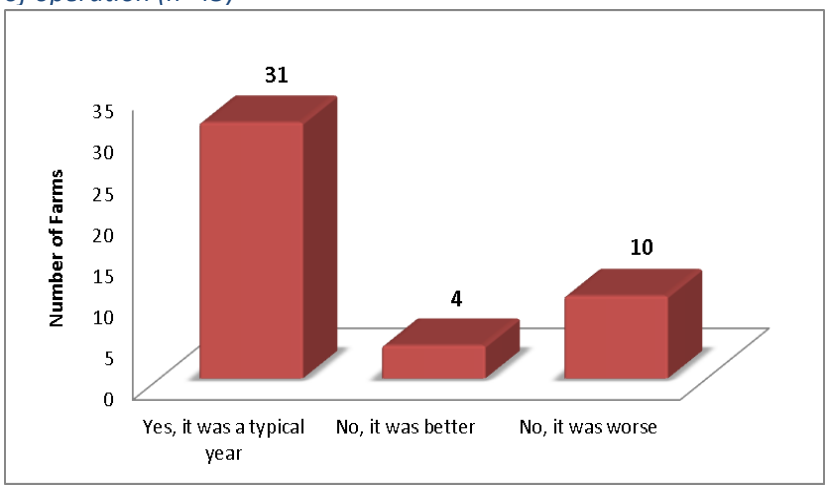
Figure 15: Number of farms by net income range in 2012 (n=45)



Source: Results from Yukon Farmer Survey (Institute for Sustainable Food Systems, 2015)

To gain a better understanding of farm business financial characteristics, respondents were asked whether their 2012 farm cash income represented income for a typical year of operation. Figure 16 presents the respondents' answer to whether 2012 was a typical year of operation. Thirty-one farms (70%) stated that 2012 was a typical year while 10 farms (22%) indicated that cash income was lower than usual. Of the 18 farms that lost money during 2012, half of the farmer respondents indicated that it was a typical year. However, it is important to keep in mind that for some farms losses could be attributed to business start-up and preparation costs: survey results showed that 11 farms began operation after 2010.

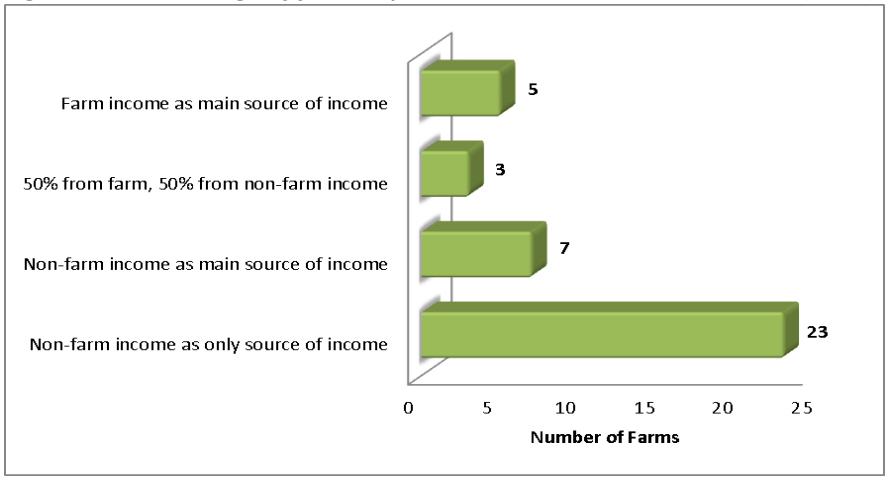
Figure 16: Respondents' answers to whether 2012 was a typical year of operation (n=45)



Source: Results from Yukon Farmer Survey (Institute for Sustainable Food Systems,

Survey results indicate that farm income was small, likely insufficient to sustain a family. Therefore, it is not surprising to find that many farmers received income from other sources such as off-farm work, government grants, and donations. Figure 17 presents the number of farms by household income sources. Nearly 80% of respondents indicated that non-farm income was their main source of household income. The percentage of farm income as part of the total household income ranged from less than one percent to 95%.

Figure 17: Percentage of farms by household income sources, 2012 (n=38)



Source: Results from Yukon Farmer Survey (Institute for Sustainable Food Systems, 2015)

Indicator 6.2: Initial Capital Costs

As shown in the previous indicator, operating expenses account for a substantially large portion of the gross cash income. In some cases, they are larger than gross income resulting in farm losses. While operating expenses are costs incurred during farm operation and change as level of production alters, another significant barrier for new entrant farmers is initial capital costs. For a farm operation, initial costs are fixed, one-time purchases of tangible and intangibles goods in order for the operation to begin production. Generally, capital costs for farm businesses are purchases of land, livestock, equipment, building and infrastructures. This indicator focuses on the start-up capital costs as well as the break-even year of a farm business.

Table 22: Total farm capital costs by category

	2006	2011
Total Farm Capital Cost	$66,118,480	$86,563,618
Land and Buildings	$55,956,890 (84.63%)	$75,365,745 (87.06%)
Farm Machinery and Equipment	$9,019,750 (13.64%)	$9,749,600 (11.26%)
Livestock and Poultry	$1,141,840 (1.73%)	$1,448,273 (1.67%)

Source: Statistics Canada, 2011 Census of Agriculture, Farm and Farm Operator Data, catalogue no. 95-640-XWE.

The total initial farm capital cost consists of the costs of (i) land and buildings, (ii) farm machinery and equipment and (iii) livestock and poultry. As shown in Table 22, the major initial capital cost is the purchase of land and buildings. On average, the total initial farm capital cost for a typical farm is around $665,873.98. The average land and building cost is about $579,736.50 while the farm machinery and equipment and livestock and poultry costs are $74,996.92 and $11,140.56 respectively[3]. The numbers in parentheses in Table 22 represent each type of capital cost as a percentage of the total initial capital cost. As observed in both Census years, land and buildings accounted for the majority of capital costs: 85% in 2006 and 87% in 2011. While the other two categories remained relatively similar for both years and the total of the two accounted for less than 15%. Note that the initial farm capital costs shown above include capital costs from all farm types. Results should be interpreted with care as a vegetable farm does not incur livestock and poultry costs. However, detailed data for the Yukon is not available for initial capital costs by farm types.

Nonetheless, high initial capital costs could prove very difficult for a new farmer to venture into a new agriculture business. Additionally, while some financial institutions offer agriculture loan programs for farmers to purchase start-up capital, a part of their income would be needed to pay of interest and the debt. Depending on the loan size, interests and payments could be substantial to a farm's operation expenses and put further pressure to the operation. As show in the previous indicator, several farming operations already lie in the negative spectrum of the net cash income range. Therefore, the question is: how many years would it take an average Yukon farmer to reach a break-even point in their farm business?

[3] The calculation is based on 130 farms responded to the Census of Agriculture 2011

One of the survey questions asked respondents whether their businesses have broken-even and the number of years it took to break-even. Slightly less than 50% (14) of respondents indicated that their farms had broken even. On average, respondents estimated it took a farm 14 years to break even. Eighteen farms stated that their farms had yet to break even. Of these, 11 farms only began their operations in 2010, which could be considered as still in the start-up phase. Note that many farmers had difficulty answering this question as they never viewed their farms as a business but a lifestyle and the farms were considered their homes.

Survey results show that reaching a break-even point is a struggle to many Yukon farmers. Given that land and building purchases account for the largest portion of initial capital costs, we surveyed about how farmland was acquired in Yukon. There are two ways to obtain land for agriculture production in the Yukon: 1) through the private market and 2) through the Yukon Government Agriculture Land Program. Assumingly, land purchased through the private market is more expensive than through the Agriculture Land Program; hence, this could affect the economic viability of starting a farm in the Yukon.

The Government program that supports farmers with land purchases is 'The Yukon Underutilized Land Initiative' that is funded by the federal-provincial-territorial Growing Forward 2. This initiative is for farmers who have agriculture-titled land prior to April 2003 and is under forest re-growth. For these farmers, if they wish to prepare their lands for agriculture production, they can apply for financial assistance from this initiative where they could "receive up to 60 percent of projected costs to a maximum of $250 per hectare" (Yukon Government, 2013).

Table 23: Number of farms and amount of farmland by land acquisition, 2012 (n=40)

	Number of Farms Reported	Total Area (Acres)
Private Market	25	2639
Government "Agriculture Land Program"	13	2385
Past Government Programs	2	180

Source: Results from Yukon Farmer Survey (Institute for Sustainable Food Systems, 2015)

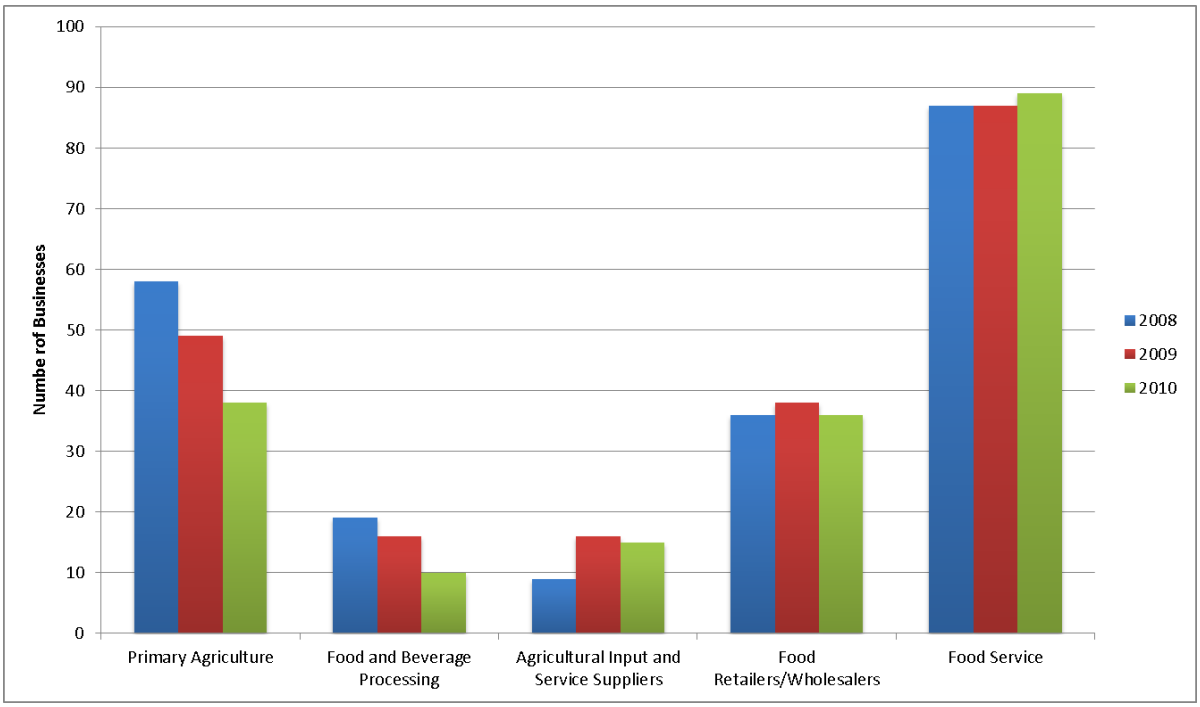
Table 23 displays the number of farms and the amount of owned farmland (leased land is not included) that was purchased through three different mechanism. The total amount of land bought through the private market and through the Agriculture Land Program is similar, with a difference of about 300 acres. However, the number of farms purchased through private sale, 25 farms (48%), is almost twice the number purchased through the Yukon Government's Agriculture Land Program, 14 farms (27%). Two farms (0.4%) purchased their land through past government programs. Note that the amount of land released though the Agriculture Land Program (or 2385 acres) is much smaller than the total amount of land released through this Program (or approximately 34,000 acres). This is because the survey only represented area for food-production farms in the Territory.

Indicator 6.3: Ancillary Business Income

Ancillary businesses refer to pre- and post-production enterprises such as input suppliers, processors and retailers. Together with local farmers, they are the key components of the local food systems. Through the directory list of businesses from the '2013 Yukon Farm Product and Services Guide' and web search, we found that there are 14 agricultural input suppliers, 8 post-production processor, and 13 agricultural service providers located in the Yukon. Every business is located in Whitehorse and nearby towns such as Marsh Lake.

The agricultural and agri-food industry consists of five main sectors: 1) primary agriculture, 2) food and beverage processing, 3) agricultural input and service suppliers, 4) food retailers/wholesalers and 5) food service (Agriculture and Agri-Food Canada, An Overview of the Canadian Agriculture and Agri-Food System, 2013). According to the 2010 Yukon Business Survey conducted by the Yukon Bureau of Statistics, the numbers of establishments in these five sectors are shown in Figure 18.

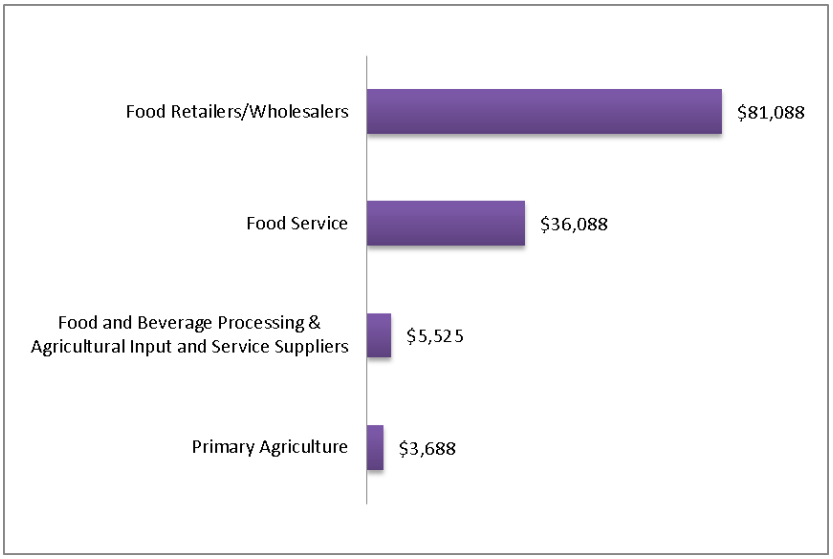
Figure 18: Number of businesses by category in the agriculture industry, 2010



Source: Bureau of Statistics, Yukon Business Survey, 2010

In total, the number of businesses in the agricultural and agri-food industry declined by 10% from 2008 to 2010. Of which, businesses in primary agriculture (34%) and food and beverage processing (47%) decreased the most. Businesses in the agricultural input and service suppliers almost doubled from 2008 to 2010. Food services accounted for almost 50% of the whole agricultural industry in 2010, and they had been steady in number of businesses over the years. The number of businesses in food retailers/wholesalers stayed the same over the years and they accounted for 40% of the whole agricultural industry. Despite, the sector of food retailers/wholesalers generated more gross revenue compared to food services as show in Figure 19 (page 64).

Figure 19: Total gross revenue by sub-industry, 2010



Source: Bureau of Statistics, Yukon Business Survey, 2010

The agricultural and agri-food industry generated a total of $126,388 in gross revenue in 2010 where food retailers/wholesalers and food services sectors accounting for more than 90% of the industry total revenue. In terms of revenue range, more than 50% of all businesses in the industry generated less than $100,000 in gross revenue. Only about 20% of all business generated more than $500,000 in annual gross revenue.

The Yukon Farmer Survey focused on three particular agriculture input: feed, seed and compost. The results may be able to shed some light on the source and Yukon's self-reliance of agricultural inputs.

Out of 27 farms that reported their stock feeding regime, about 55% indicated that they produced a certain amount of feed on their own farm (either hay or grain). Those who did not produce their own feed would trade or buy from local farms, purchase from local businesses or order directly from businesses outside the Territory. Note however that local businesses do not carry feed produced from Yukon farms. Feed sold at local businesses is ordered and shipped from either Alberta or British Columbia weekly. This is because commercial feed has been standardized and certified (e.g. natural or organic) while Yukon feed stocks are believed by some farmers to vary in nutritional quality and consistency (personal communication, Feb 17-18, 2014). Not every respondent reported the amount of feed used in their livestock production operation. Table 24 shows the amount of hay and grain (local and non-local) used in the 2012 production year by survey respondents

Table 24: Total feed required by a group of farmer respondents in 2012

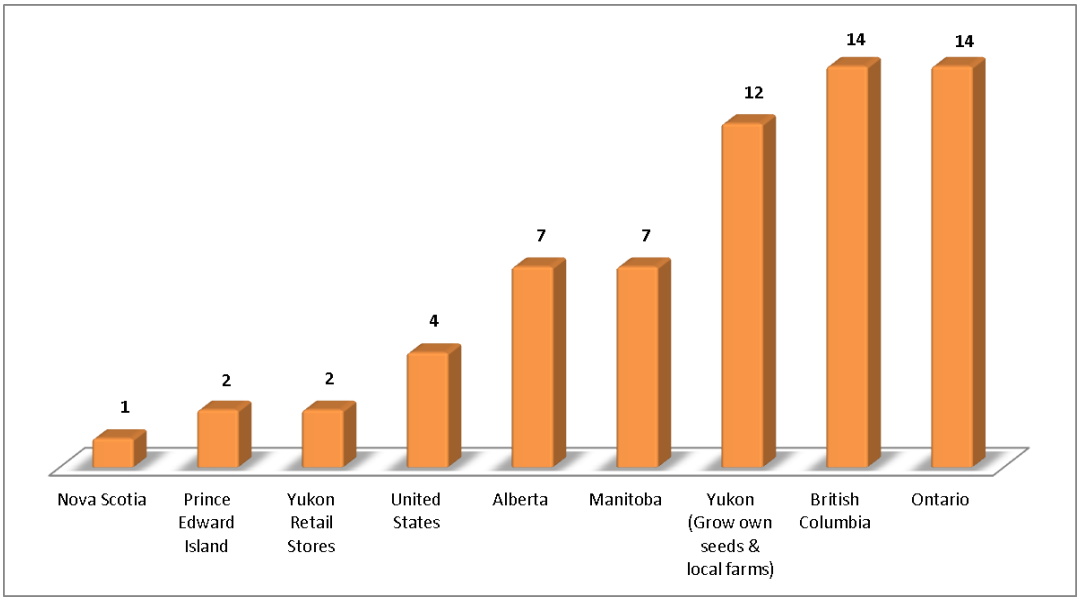
	Quantity (tons)	Number of Farms Reported
Hay	240	16
Grain	51	17

** Feed required by the equine industry is not included*

Source: Results from Yukon Farmer Survey (Institute for Sustainable Food Systems, 2015)

Within the Yukon, farmers reported growing their own seed, buying from local farms, purchasing from local businesses, and/or importing from businesses outside of the Territory. Eight farmers reported having grown and saved their own seed. In general, farmers purchase seed from a variety of sources. Figure 20 shows the sources of seeds acquired for farm use. Seed companies from British Columbia and Ontario were among the most common sources from which farmers ordered seed. Note that local businesses only carry imported seeds from Alberta and British Columbia. The order is placed only once a year in preparation for spring planting (personal communication, Feb 17-18, 2014).

Figure 20: Number of farms by source of seed inputs in 2012 (n=36)



Source: Results from Yukon Farmer Survey (Institute for Sustainable Food Systems, 2015)

We have no indication of the ratio between Yukon produced seed and imported seed used but think it reasonable to suppose that the vast majority is imported. Local seed companies/farm, identified by farmer respondents, included C&D Feeds and The Feed Store/Pet Junction and Yukon Grain Farm located in Whitehorse. Other seed companies (from out of the Territory) from which farmer respondents bought seeds were:

Boundary Garlic (BC)
Champion Feeds (AB)
Dominion Seed House (ON)
Denali Seeds (AK, USA)
Dynamic Seeds Ltd. (AB)
Foster's Seed and Feed in Beaver Lodge (AB)
Full Circle Seeds (BC)
Gourmet Seeds International (NM, USA)
Heritage Harvest Seeds (MB)
High Mowing Organic Seeds (VT, USA)
Johnny Selected Seeds (ME, USA)
JVK Seeds (BC)
McFayden (MB)
Peace River Farms (AB)
PrairerTech Propagation (AB)
Pumpkin Moon (NS)
Richter's Herbs (ON)
Salt Springs Stellar Seeds (BC)
Stokes Seeds (ON)
Stellar Seeds (BC)
The Cottage Gardener (ON)
Thompson and Morgan (ON)
T&T Seeds (MB)
Veseys (PEI)
West Coast Seeds (BC)
William Dam Seeds (ON)

While survey respondents indicated that much of the feed and seed were sourced from outside of Yukon, compost and manure needs were sourced locally. The major sources of compost and manure came from on- farm, neighbouring farms, local bakery, and a local compost business (located in Whitehorse). Among the 32 farms reporting compost use, 22 farms reported that a total of 880 tons of compost was used in 2012.

In terms of manure storage, almost two-thirds of the farms (64%) left manure in a compost pile. The rest either stored it in the pen or left it on the pasture. Very few farms stored manure in a contained storage or retention period. The main usage of manure was to be spread on cropped fields or pasture. In addition to the storage and usage of manure, we were interested in knowing whether manure was a good source for satisfying nitrogen needs. According to survey respondents, manure was able to satisfy some to all of the nitrogen needs. In some cases, nitrogen needs were satisfied from using other techniques, but manure was still the main component.

Indicator 6.4: Quantity and Prices for Fresh Local Food

Ideally, we would like to compare retail/farm-gate prices and retail/farm-gate quantities for agricultural commodities mentioned in the Yukon farmer survey. The difference (or indifference) in prices may provide us with insights on the agriculture sector's competitiveness, availability and affordability of fresh local food. However, historic prices of fresh produce are not available on public databases, thus we are unable to analyze of trends. So, this indicator presents data of quantity and prices of selected agricultural commodities that have been reported by respondents from the farmer survey.

The data gathered on total production from the farmer survey is the closest and most recent estimation of the Yukon agriculture sector. This includes the quantity and price of crop and livestock products produced and sold by survey respondents. Note that not every farm in Yukon participated in the survey. As such the total quantities presented in this report do not reflect total Yukon production. However, it shows an estimate of the production quantity based on the farms that completed the survey, implying a minimum production capacity of Yukon farms in 2012.

Total Production of Crops and Livestock Produced by 48 Farmer Respondents in 2012

Table 25 and Table 26 show the total quantity of all crops and livestock produced and sold in 2012 per 48 farmer respondents. The total quantities presented in these tables do not reflect that of the total production of Yukon agriculture sector. Despite that, the intention of this table is to provide an indication of Yukon farms' production capacity. (Additional information on the estimated total production capacity in Yukon for grass hay, beets, carrots, potatoes, raspberries, Saskatoon berries, beef cattle, broiler chickens and pigs can be viewed in Table 27: Estimation of total production of selected products, 2012 (page 70).

Table 25: Total quantity of vegetables produced and sold by 24 farms in 2012

	Number of Farms Reported	Quantity (lbs)
Beans	6	200
Beets	12	1,969 *
Brocolli	13	1,428
Brussel Sprouts	2	10
Cabbage	14	2,912
Carrots	18	11,090 *
Cauliflower	5	366
Cucumber	7	539
Eggplant	1	20
Kale & Collards	15	1,260
Leeks	2	25
Lettuce & Salad Greens	13	2,645
Onions	10	1,410
Parsnips	4	52
Peas	12	1,032
Peppers	3	35
Potatoes	15	14,392 *
Radish	10	829
Rutabaga & Turnips	8	363
Spinach	13	553
Squash & Pumpkins	2	--
Swiss Chard	12	476
Tomatoes	11	4,051
Zucchinis & Summer Squash	10	1,060

* additional information on estimated quantity of production is provided in the next section

-- *missing information due to lack of responses*

Source: Results from Yukon Farmer Survey (Institute for Sustainable Food Systems, 2015)

Table 26: Total quantity of fruits and berried (by 8 farms), field crops (by 19 farms) and livestock (by 21 farms) produced and sold in 2012

	#of Farms Reported	Quantity (lbs)
Haskaps, blue honeysuckle	3	37
Raspberries	4	136 *
Rhubarb	4	188
Saskatoon Berries	2	9 *
Strawberries	3	244
Others (grapes and apples)	2	215

	# of Farms Reported	Quantity	Unit
Alfalfa, alfalfa mix hay	2	1000 *	bales
Other Grass Hay	15	1,196 *	metric tons
		3,910 *	bales
Oats (seed, grain for livestock, green feed)	3	695,380	lbs
Other Field Crops (barley, wheat)	2	850	lbs

	# of Farms Reported	# of Animals on Farms	Quantity Sold	Unit
Bees	2	6 (colonies)	275	lbs of honey
Cattle - Beef	4	36	6,430 *	lb/meat, bone-in
Cattle - Dairy	1	x	x	litres of milk
Chickens - broilers	13	6,925	12,617 *	lb/meat, bone-in
Chickens - laying hens	13	741	9,139	dozens
Goats (meat)	x	27	200	lb/meat, bone-in
			4	per animal
Goats (milk)	1	x	x	litres of milk
Pigs	8	80	11,414 *	lb/meat, bone-in
Sheep	2	42	450	lb/meat, bone-in
Turkey	8	3,087	4,749	lb/meat, bone-in
Other Livestock (bison, elk, and rabbit)	2	35	2,060	lb/meat, bone-in

* *additional information on estimated quantity of production is provided in the next section*

x *data suppressed due to confidentiality*

Source: Results from Yukon Farmer Survey (Institute for Sustainable Food Systems, 2015)

Estimation of Total Production of Selected Products

The production quantities grass hay, beets, carrots, potatoes, raspberries, Saskatoon berries, beef cattle, broiler chickens and swine[4] presented in Table 25 and Table 26 did not present a good estimate of the production capacity of Yukon farms because 1) several larger producers did not participate in the survey and 2) some respondents chose not to provide yield information. In order to present a better estimate of production quantity of these products, additional information on production quantity was gathered through secondary sources including local news articles, interviews with farmers, and representatives from the Yukon Government Agriculture branch. Therefore, by combining the survey results and additional secondary data, we are able to offer a better estimate of Yukon's production capacity for these products as show in Table 27. Note that the quantity of livestock presented in the table refers to the quantity of meat sold and not the total quantity of all animal on farms.

Table 27: Estimation of total production of selected products, 2012

Livestock	**# on farm**	**quantity**	**unit**
Chickens - broilers	10,125	27,017	lb of meat, bone-in
Pigs	110	17,532	lb of meat, bone-in
Beef Cattle	98	55,070	lb of meat, bone-in
		quantity	**unit**
Field Crop			
Hay		12,000	tons
Vegetable			
Beets		25,117	lbs
Carrots		176,437	lbs
Potatoes		896,241	lbs
Fruit and Berry			
Raspberries		2,136	lbs
Saskatoon Berries		8,009	lbs

Source: Results from Yukon Farmer Survey (Institute for Sustainable Food Systems, 2015)

Notes:

1. *For grass hay, the total acreage in production is approximately 6,000 acres, of which 1,500 acres are under irrigation. Yield differs between irrigated land and dry land production. Irrigated land averages to about 3.5 tons/acre and dry land averages to about 1.5tons/acre. In total, the estimated Yukon grass hay production is 12,000 tons annually.*
2. *For livestock production, the following assumptions were applied in the calculation of the total productions:*
    - *The average cold-trimmed weight was used for beef cattle at slaughtering age.*
    - *General Canadian conversion rates from Statistics Canada were used to convert 'acres to pounds' and 'number of head to pounds'.*
    - *The total number of animals (for beef cattle, pigs and chicken broilers) on the farms was slaughtered for meat consumption. Therefore, not taking into account the possibility of farmers saving a portion of the herd for the following year.*

[4] We focus on these products as recommended by a representative from Yukon Government Agriculture Branch

Price Variation of of Crops and Livestock Produced by 48 Farmer Respondents in 2012

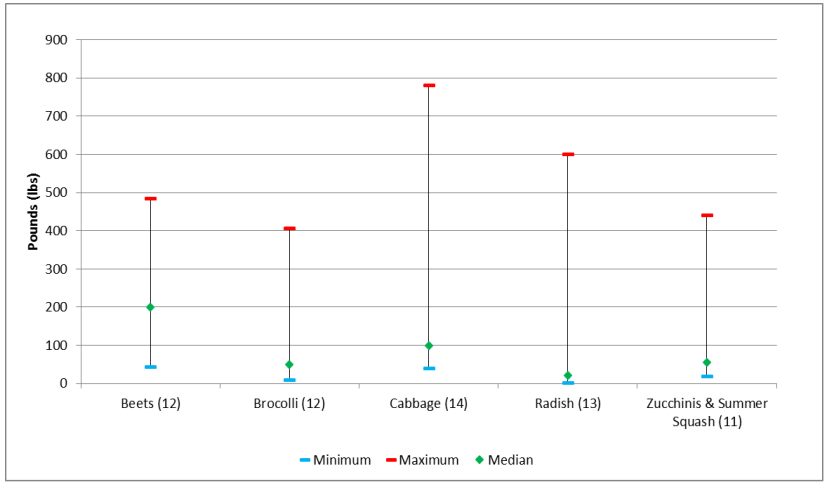
Next we provide a more in-depth look at the production details of specific vegetable, livestock and field crop types across farms. In the survey, each farm was asked to report the quantity and price of each crop produced from their farm. Figure 21, Figure 22, Table 28 and Table 29 summarize a range of quantity produced and price sold by reporting farms. In Figure 21, the light blue line denotes the amount of production reported by a farm that produced the least amount in that particular crop group while the red line denotes the maximum amount of production reported by a farm that produced the most. Similarly, in Figure 22, the light blue and red lines report the minimum and maximum prices received by reporting farms in each crop group. The green dot (in both Figure 21 and Figure 22) denotes the median amount of production and price. A median quantity (or price) implies that half of the reporting farms produced (or set price) less than this amount and the other half produces (or set price) great then this amount. While not shown in the figures, the average production and price are a mid-point between the light blue and red lines. Lastly, the numbers in parentheses indicate the number of farms who reported to produce those crops.

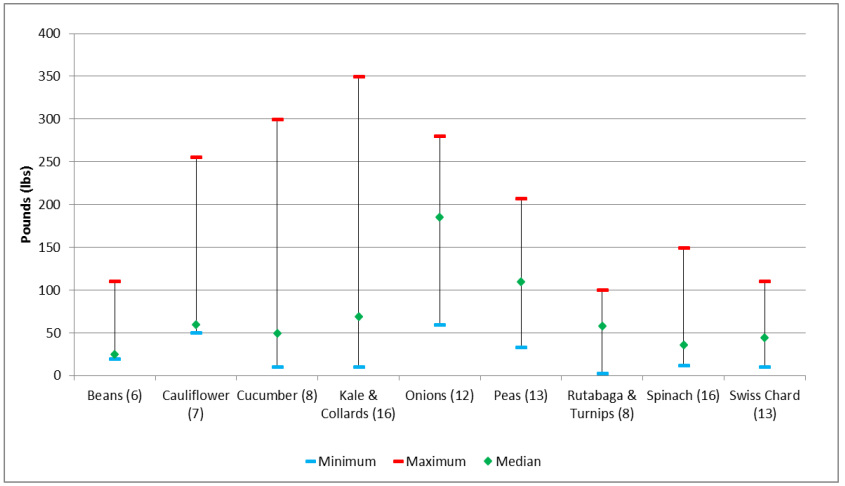
For example, as shown in Figure 21, there were 14 farms out of 48 responses that reported producing cabbage in 2012. The largest farm produced close to 800 pounds while the smallest farm produced slightly less than 50 pounds. The median quantity of cabbage production was approximately 100 pounds. The largest variation of quantities is especially apparent in carrot and potato, tomato, and lettuce and salad greens. Note however that the median quantities reported for these crops were very small compared to the average values (the green dot is below the mid-point) meaning that the production amount by most of the farmer respondents was actually lower than the average values. This implies that most farms in the Yukon have small production scale.

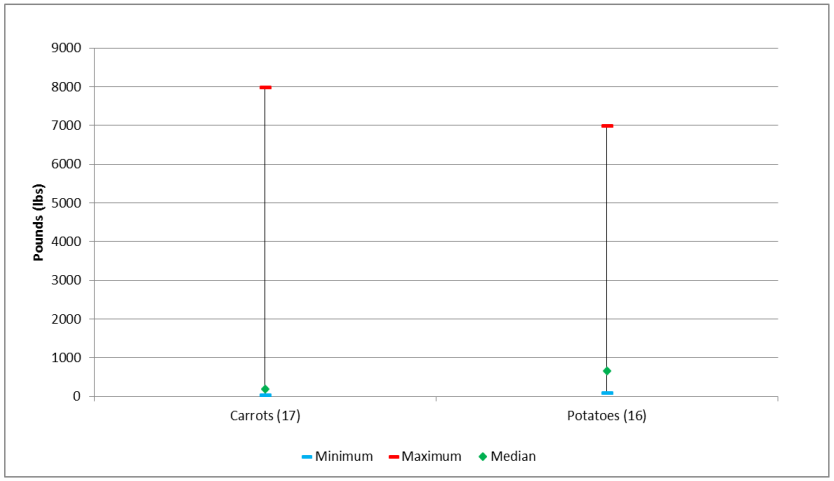
Figure 22 presents the prices at which all the farmers sold their vegetable crops. Price structure is affected by many factors such as distance to market, production method, quantity and the market avenue. Except for one farm, the production practice of the 23 vegetable farms (96%) was reported to be either certified organic or uncertified organic. (The term uncertified organic was used to describe a farming practice that followed organic production method but did not receive organic certification.) The survey results were inconclusive to whether certified organic vegetable products were sold at prices higher than uncertified organic vegetables.

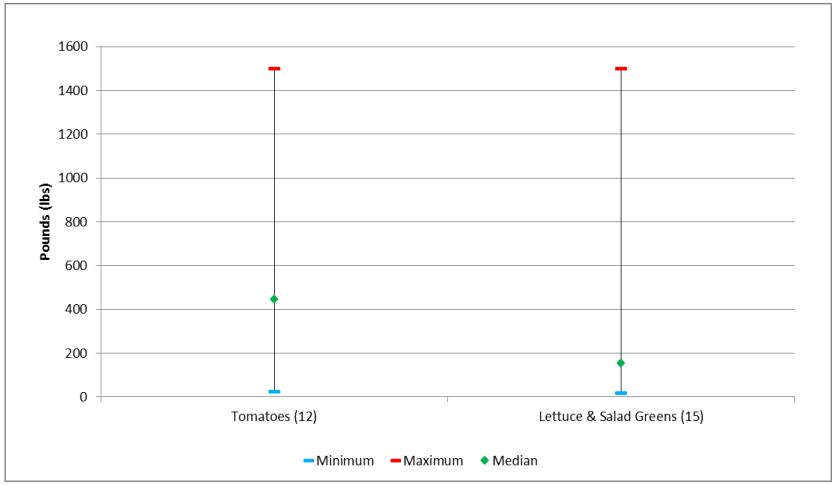
For example, certified organic pea pricing ranged from $9 to $18, while uncertified organic peas ranged from $1 to $10. Likewise for spinach, certified organic ranged from $8 to $10, while uncertified organic ranged from $1 to $5. On the other hand, the price for certified organic potatoes ranged from $1.5 to $2 while the price for uncertified organic potatoes ranged from $1 to $2. Similarly, the price range for certified organic carrot was $3 to $8 while the price range for uncertified organic carrot was $2 to $8.

Figure 21: The minimum, maximum and median quantity of selected local vegetable production



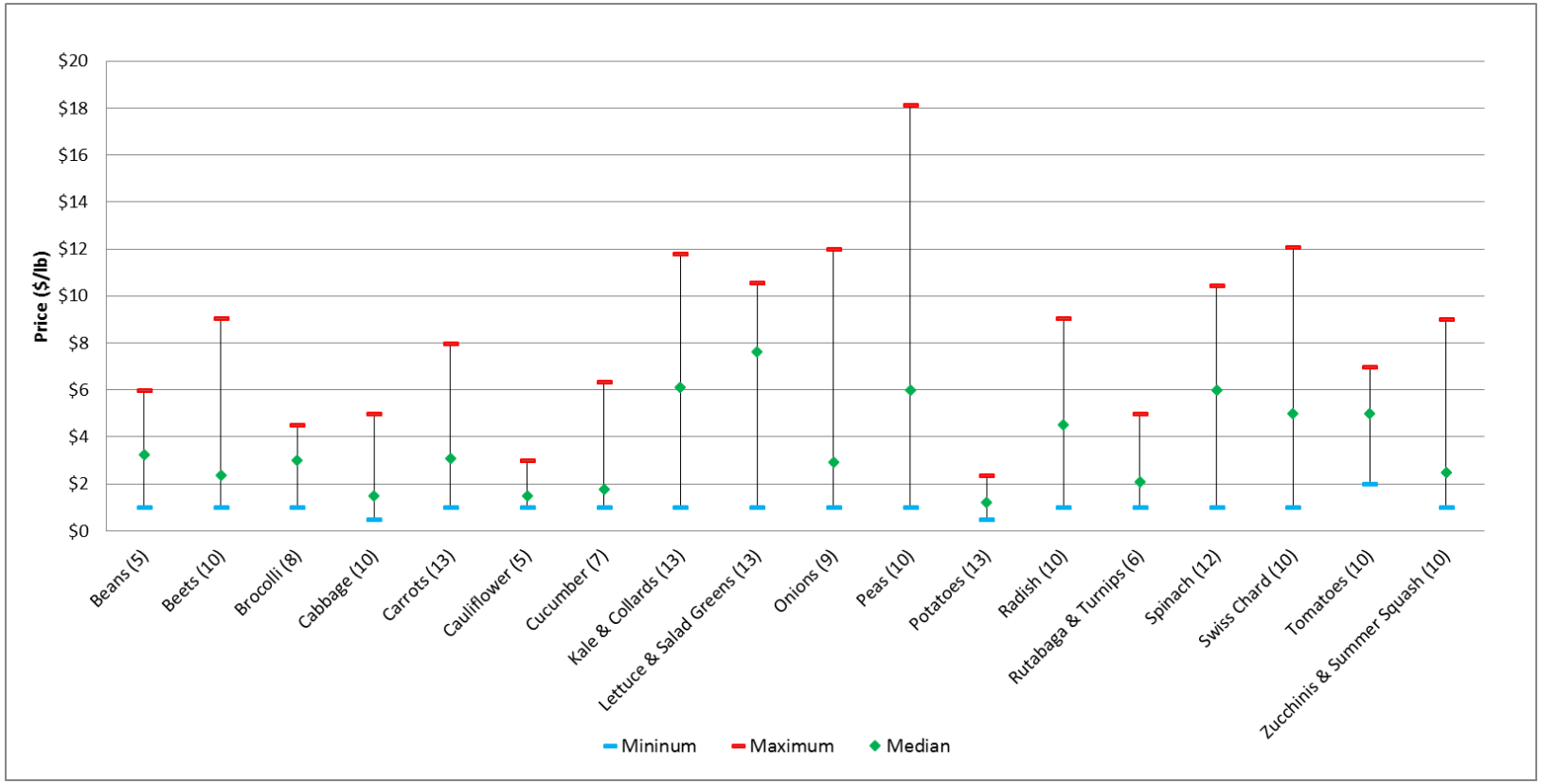






Source: Results from Yukon Farmer Survey (Institute for Sustainable Food Systems, 2015)
Note: The numbers in parentheses represent the number of farms reported.

Figure 22: The minimum, maximum and median price of selected local vegetables



Source: Results from Yukon Farmer Survey (Institute for Sustainable Food Systems, 2015)
Note: The numbers in parentheses represent the number of farms reported.

Table 28: The minimum, maximum, median and average quantity and price of selected local livestock production

QUANTITY	# of Farms Reported	Minimum	Maximum	Median	Units
Chicken (laying hens)	14	100	2890	300	dozen
Chicken (broilers)	14	196	3000	611	lb/meat, bone-in
Turkey	8	84	2600	400	lb/meat, bone-in
Sheep	2	150	300	225	lb/meat, bone-in
Pigs/hogs	9	250	3750	1225	lb/meat, bone-in
Beef Cattle	4	3200	3230	3215	lb/meat, bone-in
PRICE	**# of Farms Reported**	**Minimum**	**Maximum**	**Median**	**Units**
Chicken (laying hens)	13	$4.50	$7.00	$6.00	$/dozen
Chicken (broilers)	14	$2.50	$5.50	$5.00	$/lb/meat, bone-in
Turkey	8	$2.50	$7.00	$4.75	$/lb/meat, bone-in
Sheep	2	$5.00	$7.00	$6.00	$/lb/meat, bone-in
Pigs/hogs	9	$3.45	$5.50	$3.75	$/lb/meat, bone-in
Beef Cattle	4	$4.50	$5.00	$4.75	$/lb/meat, bone-in

Note: Data for elk, bison, dairy cattle, rabbit and bees are supposed due to confidentiality
Source: Results from Yukon Farmer Survey (Institute for Sustainable Food Systems, 2015)

Table 28 shows the quantity and price variation in livestock production. Note that price variation for livestock products was much smaller than that of vegetable products. Possibly this was due to the fact that almost all livestock products were sold at the farm gate (because of stricter regulations regarding selling at retail stores) resulting in prices that were more consistent. In contrast, vegetables were sold through many different channels such as at farm gates, at farmers' markets, restaurants and retail stores which could possibility account for the more substantial price variation for vegetables.

Table 29: Quantity and price variation for grass hay

Unit	Quantity			Price		
	Minimum	Maximum	Average	Minimum	Maximum	Average
Metric Tons	10	400	133	$180	$380	$289
Bales	150	1500	782	$7	$12	$10

Source: Results from Yukon Farmer Survey (Institute for Sustainable Food Systems, 2015)

There were only a few farmer respondents that produced agronomic (field) crops: barley, oats, rye, wheat, alfalfa and alfalfa mix hay and other grass hay. There were 15 farms that produced grass hay, mainly smooth brome grass. Table 29 shows the quantities and price in metric tons or bales because these were how farmers reported them in the survey. In that the weight per bale hay is dependent on so many factors, conversion was not made to avoid misrepresentation of data; therefore, both are presented. The summation of grass hay production in metric tons and bales is the total amount of grass hay produced.

Indicator 6.5: Access to Financial and Other Assistance

Monetary constraint is one of the principal barriers to starting a new farm business or to expanding an established farm business. As covered in previous indicators, the picture shows that Yukon farmers struggle to make a decent income from solely their farm businesses and on top of that, the cost to purchase capital is substantial. Therefore, this indicator explores farmers' potential access to obtain financial aid and other types of assistance.

In terms of direct financial assistance to a farmer's operations, there are several governmental grants and financial institutions that provide the assistance as follows:

Farm Credit Canada (FCC) is the leading agriculture financial institution providing "financing, insurance, software, learning programs and other business services to producers, agribusiness and agri-food operations". They are committed to supporting and to providing the financial assistance needed in order to strengthen the economic viability of agricultural producers and businesses (Farm Credit Canada, 2013). From personal communication with a Farm Credit Canada (FCC) representative, we have learned that there is no on-field FCC branch in the Yukon Territory. However, if farmers are interested in applying for a loan, representatives from the FCC headquarters office will connect them with the closest local branch which is most likely to be in the provinces of British Columbia or Alberta. We have inquired about data on the number of loan approvals and amounts from FCC, but we are still waiting for the results.

Another source of financial aid is the federal Canadian Agricultural Loans Act (CALA), a loan guarantee program that provides farmers with easier access to credit from third party financial organizations or institutions. The objective of the program is to "establish, improve, and develop farms; while Agricultural co-operatives may also access loans to process, distribute, or market the products of farming". The Government of Canada aims to "[support] the renewal of the agriculture sector and [enable] co-operatives to better seize market opportunities" through this program. Once registered under this program, farmers can apply for loans through third party organizations such as banks (TD Canada Trust, Royal Bank of Canada, Scotia bank, government institutions, etc.). Through this program, the government guarantees a repayment of 95% of to the loan to the lender; and as for loan limits, they differ depending on the purpose (Agriculture and Agri-Food Canada, 2013). After inquiring about loan applications with a representative from CALA, data shows that no farmers in the Yukon has applied for this financial assistance in at least the past five years.

A recently resigned agreement, Growing Forward 2 (GF2), is a federal-provincial-territorial initiative that provides funding for a range of agriculture-related projects effective from April 2013 to March 2018. The objective of GF2 is to enhance the Canadian agriculture industry to become "profitable, sustainable, competitive and innovative" and is effective in responding and adapting to changing circumstances and trends. Though this initiative supports many research-based projects as well, GF2 also offers a wide variety of programs that can directly aid farmers (Yukon Government, 2013).

Eligibility varies depending on the specific program that an individual is applying to, but in general, one must be an agricultural producer or processor operating within the Yukon. The products must also be for commercial sales, or a business plan is required to be submitted to demonstrate commercial viability by 2018 (Yukon Government, 2013). For further details on the funding amount, please refer to the website: http://www.emr.gov.yk.ca/agriculture/program_eligibility.html.

There are several programs under GF2 that can directly support farmers in operation include 'Reclamation of Yukon Land' and 'Underutilized Land'. These two programs focus on the preparation

work on a piece of land intended for agriculture purposes. Preparation work could include the removal of abandoned fences or debris, trees and rocks and seedbed preparation, etc. There are also programs that focus on training and connecting farmers such as 'Agriculture Training', 'Agriculture Internship', 'Farm Mentorship' and 'Agriculture Education'. For those who wish to expand their marketing channels and competitiveness in the sector, there are programs that provide financial aid for marketing purposes such as 'Market Development', "Agriculture Development' and 'Planning and Advising Agri-business' (Yukon Government, 2013). Additional funding programs can be found on the GF2 website: http://www.emr.gov.yk.ca/agriculture/funding_programs.html.

Different from FCC, CALA and GF2 where they have available funds and loans for farmers to start up a farming business, the Canadian Agricultural Adaptation Program (CAAP) aims to support the research and facilitation of agribusiness innovation. With the agriculture industry changing at such a fast pace, agribusinesses need to advance alongside new technology and ideas and seize opportunities to remain competitive in this industry. Therefore, this program provides funding for "eligible projects identified and carried out by the agriculture, agri-food and agri-based products sector" (Agriculture and Agri-Food Canada, 2013). This program is effective from 2009 to 2014; however, project applications have already been closed. Although this program doesn't provide direct financial assistance to farmers, the YAA/CAAP Council in the Yukon has effectively approved of eight agriculture-related projects: one completed in 2010, two completed and five ongoing from 2011 and one on-going project from 2012 (Yukon Agriculture Associaition, 2013). This shows that the Yukon community is passionate about agriculture and strives to improve all aspects of the sector.

To gain a better understanding of the financial status of farming families in the Yukon, we gathered data on the number of farms that received government grants in 2012 through the farmer survey. From the 43 responses for this question, 14 farms (33%) received additional income from government grants. On average, government grants accounted for a mere three percent of total household income. Though half of the respondents had financial aid from the government, the amount is not significant.

In addition to direct financial assistance mentioned above, there are other types of assistance available to support farming businesses. The Agriculture branch in the Yukon Government and the Yukon Agriculture Association (YAA) strive to enhance the agriculture sector by supporting and facilitating projects, building strong connections and relationships within the sector and in some cases providing necessary funding. Furthermore, of the 51 responses that we have received, 38 farms (61%) stated that they have a collaboration relationship with other farmers. The majority indicated that collaboration included sharing information, knowledge, new ideas and production and processing equipment. Many mentioned that the YAA is a great source of information and network opportunities.

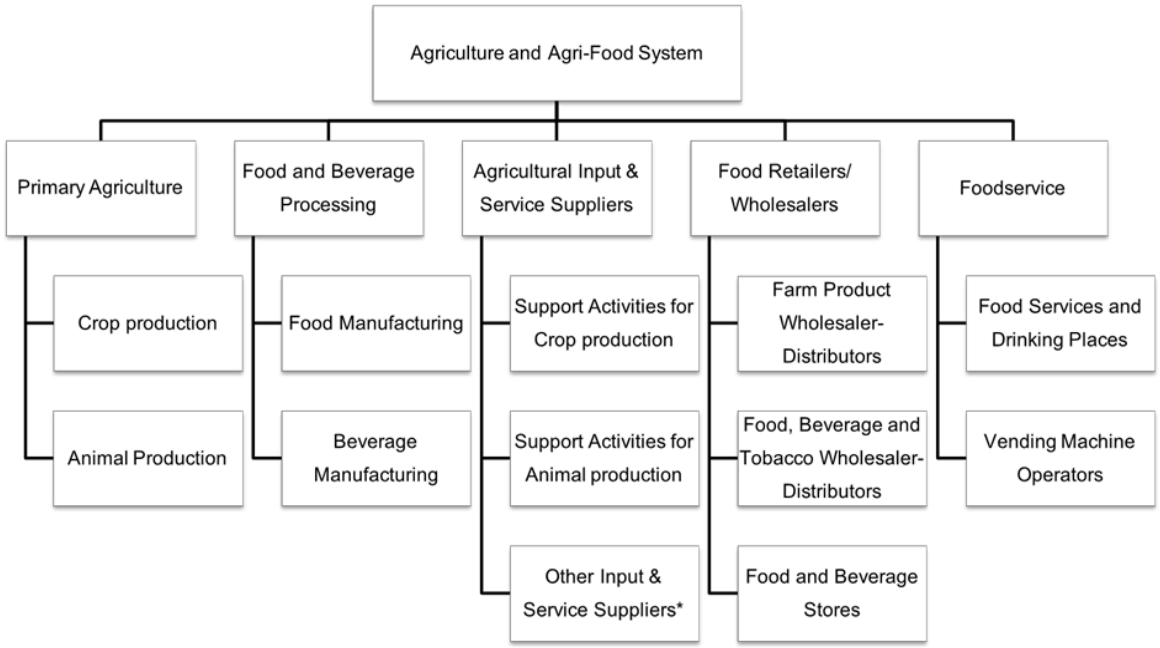
Collaboration among farmers is one of the key components to achieve economic viability of farm business in the Yukon. Not only does it create a sense of a community, but it also helps alleviate certain financial burdens. A farmer may have an opportunity to start or expand their businesses with fewer financial risks or investments. Additionally, collaboration may lead to an easier access to the local food supply chain and markets. For example, a group of farmers are more likely to form a reliable source of food supply available to institutions than one farmer alone.

Objective 7: Contribute to the local economy

One of the most important reasons that individuals choose to purchase local food is because of the contribution that they are making towards their local economy (Onozaka, Nurse, & T. McFadden, 2010). In order for a significant labour market to be developed, the agricultural sector must be viable and contribute to the local economy in the long-run. This indicator attempts to report the revenue generated and circulated in the local food system and the local economy as a whole.

The following flow chart (Figure 23) shows how the Canadian agriculture and agri-food system is categorized into five components: primary agriculture, food and beverage processors, agriculture input and service suppliers, food retailers/wholesalers and food service establishments (Agriculture and Agri-Food Canada, An Overview of the Canadian Agriculture and Agri-Food System, 2013). The system is categorized according to the North American Classification System (NAICS) with crop and animal production being referred as primary agriculture operations and all the other components are referred as ancillary businesses.

Figure 23: Industries in agriculture and agri-food system



Source: Adapted from Agriculture and Agri-Food Canada. 2013. "An Overview of the Canadian Agriculture and Agri-Food System" (page 141-142). Publication 11279E. Catalogue A38-1/1-2010E-PDF

** Other Input & Service Suppliers include: (1) Pesticide, Fertilizer and Other Agriculture Chemical Manufacturing, (2) Farm, Lawn and Garden Machinery and Equipment Wholesaler-Distributors, (3) Agricultural Supplies Wholesaler-Distributors, (4) Agricultural Implement Manufacturing, (5) Farm Product Agents and Brokers, (6) Food, Beverage and Tobacco Agents and Brokers, (7) Nursery and Garden Centres, (8) Refrigerated Warehousing and Storage, and (9) Farm Product Warehousing and Storage*

Indicator 7.1: GDP Contribution

Sector gross domestic product (GDP) of the agriculture industry is the total market value of the goods and services produced within the regional food sector in a given period of time. Growth in the sector's GDP over time indicates an increase in regional agricultural and ancillary business activity.

Since the agriculture industry in the Yukon is fairly small and many of the farms are of small-scale, much of the data are not publicly available due to confidentiality reasons. This is applicable to GDP data of the Yukon as observed in Table 30. Unfortunately, due to the suppressed data, we are unable to calculate the total GDP for "Total Agri-food System". The closest industry we can look at is "Agriculture, forestry, fishing and hunting" where its GDP was $3.7 million, accounting for only a mere 0.2 percent of total industries. In terms of growth, GDP showed no growth compared to last year and it has actually decreased from $4.3 million in 2010. Hence, agriculture is presumably even smaller than 0.2 percent of total industries showing how little it is currently contributing to the economy of Yukon.

Table 30: Total gross domestic product (GDP) of the agri-food system by NAICS, chained 2007 dollars, dollars x $1,000,000

	2007	2008	2009	2010	2011	2012
All Industries	$1,758.8	$1,916.9	$2,063.9	$2,182.3	$2,324.3	$2,403.7
Total Agrifood System	--	--	--	--	--	--
Primary Agriculture	x	x	x	x	x	x
Food and Beverage Processing	x	x	x	x	x	x
Agricultural Input & Service Supplies	$0.0	$0.0	$0.0	$0.0	$0.0	$0.0
Food, Beverage and Tobacco Wholesaler-Distributors	$23.5	$25.5	x	x	x	x
Food and Beverage Stores	$20.8	$22.7	$23.4	$25.6	$25.9	$25.6
Food Service	$18.2	$18.4	$21.8	$23.1	$24.0	$23.6

x Suppressed to meet the confidentiality requirements of the Statistics Act

Source: Statistics Canada. Table 379-0030 - Gross domestic product (GDP) at basic prices, by North American Industry Classification System (NAICS), provinces and territories, annual (dollars), (accessed: October 25, 2013)

It is worth noting the zero dollar contribution of "Agriculture input and service suppliers". This indicates that there are no agriculture input supply businesses in the Yukon. Data collected on seed sourcing through our Farmer Survey corroborates this. Despite a few farms indicating that they obtained seeds from a local store, it is highly probable that the seeds were imported from a non-Yukon seed business and sold through a local retailer.

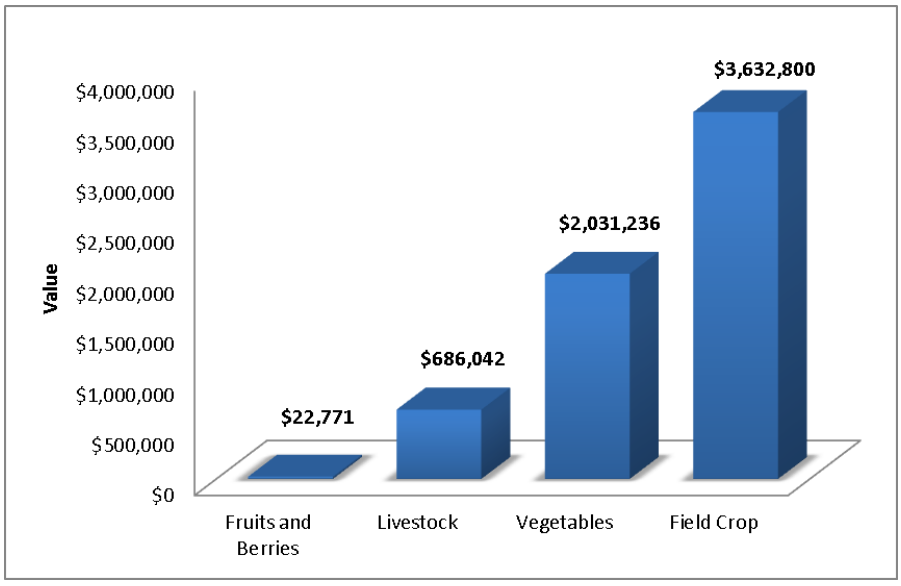
Due to the nature of GDP, we cannot quantify the extent to which the current agriculture and agri-food system contributes to the local economy. For example, GDP in the food retail store and wholesaler components may be induced by imported food products which are distributed and sold in the local markets. This implies that a significant amount of money exits the Yukon economy and may not contribute to the local community's economic growth.

Indicator 7.2: Estimated Sales of Yukon Crop and Livestock Production

This section presents the estimated sales of crop and livestock productions in the Yukon in 2012 based on 48 farmer respondents and additional secondary data sources. These values represent the contribution of the crop and livestock sector to the local economy. The value of sales for each product was calculated using the quantity of production and price reported by each farmer respondents. The median price for a particular product was used in cases where: 1) farmer respondents did not report their sale price and 2) quantity of production of a product was gathered from secondary sources.

The total estimated sales of crop and livestock (excluding equine, floriculture and nursery industries) in 2012 was **$6,281,002**. Figure 24 presents the values of sales generated by fruit and berry, livestock, vegetable and field crop industries. The field crop sector generated the highest sales, accounting for 58% of all crop and livestock sales, followed by the vegetable sector (32%) and the livestock sector (9%). The smallest sector in term of sales was fruit and berry sector.

Figure 24: Total sales generated by fruit and berry, livestock, vegetable and field crop industries in 2012

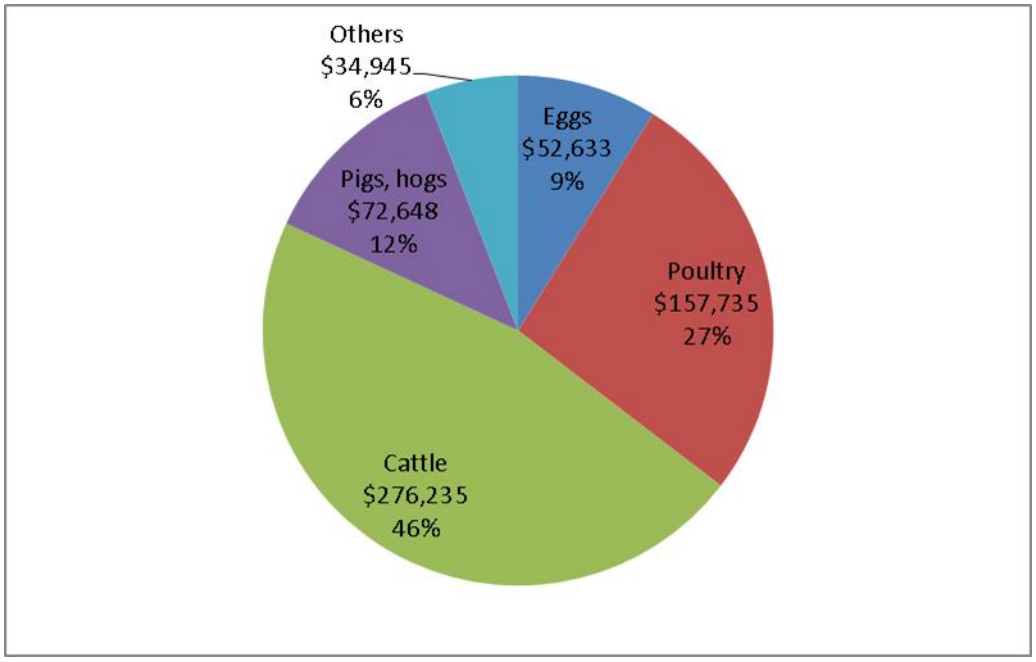


Source: Results from Yukon Farmer Survey (Institute for Sustainable Food Systems, 2015)

Crop production generated a total of $5,868,806 in 2012 (90% of the total value of the crop and livestock sector). Production of alfalfa and grass hay was the largest contributor in the field crop sector. (Note that even though the analysis excludes equine industry, it was not possible to exclude hay production for horse fodder.) The major sales generated in the vegetable sector came from potato and carrot. Within the fruit and berry sector, Saskatoon Berry generated the highest sales in 2012 compared to any other type of fruit.

Figure 25 illustrates total sales by livestock types in the livestock sector. Cattle production (beef and dairy) generated the highest gross sale of $276,235 accounting for 46% of the total value of livestock. Poultry (chicken broilers and turkey), pigs and eggs (laying hens) accounted for 27%, 12% and 9% respectively. Other livestock including bee/honey, rabbit, sheep, goat and elk production generated $34,945 or 6% of the total livestock industry in 2012.

Figure 25: Total sales in livestock industry by livestock types, 2012



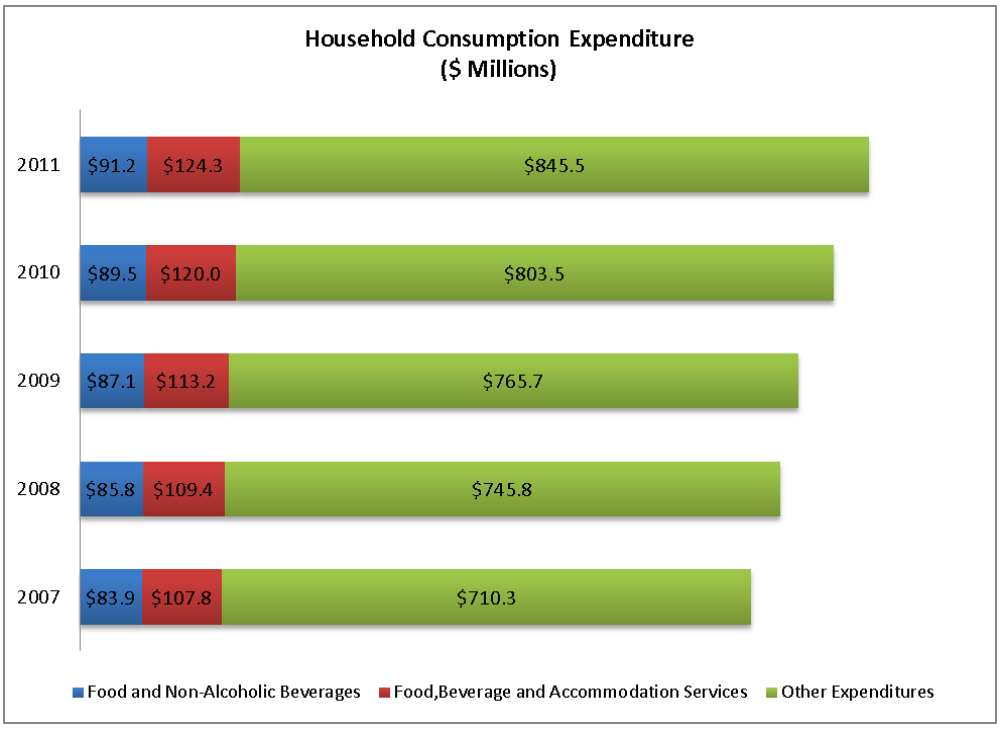
Source: Results from Yukon Farmer Survey (Institute for Sustainable Food Systems, 2015)

Indicator 7.3: Household Expenditure on Locally Produced Food

Though GDP measures the final value of all goods produced in the region, it does not show the actual dollars that circulates within the economy. To narrow down to the focus of our research, measuring the household expenditure and consumption of agriculture crops in the Yukon will give us an indication of the size of the market for locally-produced goods.

Data from Statistics Canada (Figure 26) shows household consumption expenditure on food that is calculated by summing the total household purchases of food from stores, farmers markets, stands and other non-service establishments. It includes both fresh and processed foods. On a macro level, total household consumption expenditure has been increasing every year since 2007, with a total expenditure of $1.06 billion in 2011. Of the total, 'food and non-alcoholic beverages' accounted for $91.2 million (9 percent), 'food, beverage and accommodation services' was $124.3 million (12 percent) and the remaining was on other types of expenditures. Specifically, over the past five years, growth in food and non-alcoholic beverages showed a steady increase of two percent.

Figure 26: Household consumption expenditure

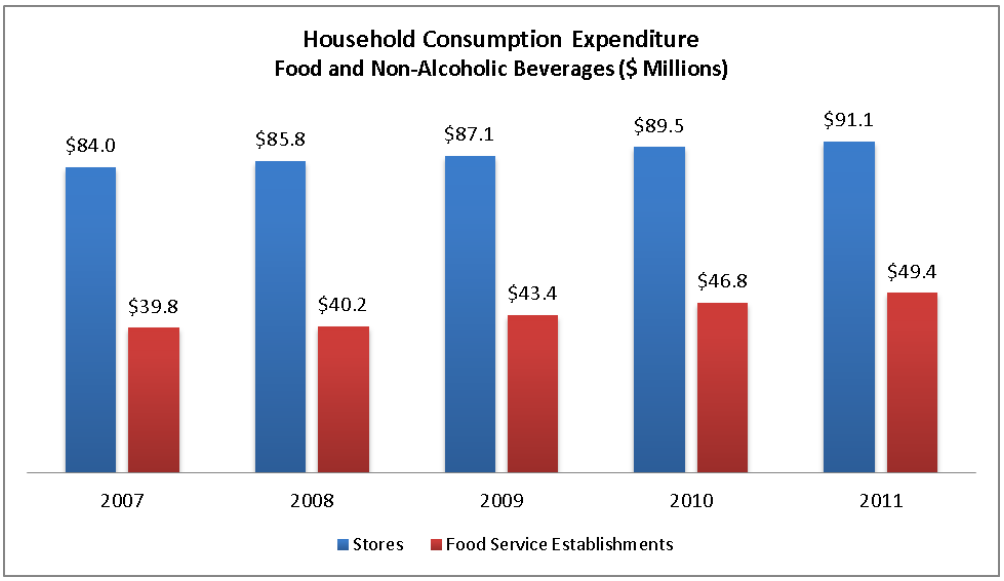


Source: Statistics Canada. Table 384-0041 - Detailed household final consumption expenditure, provincial and territorial, annual (dollars). (accessed: October 25, 2013)

Note that these values of food purchase are macro in scale where there is no separation between local and imported food products. For example, in 2011, even though Yukon residents spent over $90 million in food and non-alcoholic beverages, the actual spending on locally produced food may have been much lower due to imported food. Therefore, the $90 million spending may generate minimal impact to the local economy. Additionally, the data cannot be further categorized by food groups.

Figure 27 shows the total household expenditure on food and beverages at stores and food service establishments which includes restaurants, refreshment stands, snack bars, vending machines, mobile canteen and caterers coffee wagons. Since 2007, expenditure from stores showed an average increase of two percent, while food service establishments showed an average of six percent increase. With increasing population, we are expecting these figures to continue to climb in the future years. In 2011, expenditure on all foods and non-alcoholic beverages totaled at $140.5 million with $91.1 million (65 percent) from stores and $49.4 million (35 percent) from service establishments. (Note that "food service establishment expenditure" includes spending on food as well as service.)

Figure 27: Household expenditure on food and non-alcoholic beverages in stores vs. food service establishments



Source: Statistics Canada. Table 384-0041 - Detailed household final consumption expenditure, provincial and territorial, annual (dollars). (Accessed: October 25, 2013)

One drawback to this set of data is that it does not include expenditure by government agencies or non-profit institutions serving households. For example, food services by publically operated long-term care facilities are not captured.

In addition to expenditure on food in stores and service establishments, we also need to consider the number of households that obtain food from home-gardening or harvested sources. Since the Yukon is a relatively remote territory with towns sparsely located, food tends to be rather expensive, especially in rural and northern communities. From the "Yukon Social Inclusion Household Survey" conducted in 2010, results showed that "over 20 percent of rural residents and over eight percent of Whitehorse residents obtain more than 50 percent of the food they eat from home-grown or harvested sources" (Yukon Government, 2011). Table 31 presents the percentage of households in rural areas and the city of Whitehorse that obtain food from all these different sources.

Table 31: Percentage of households that obtain food from home-grown or harvested sources, 2011

	Whitehorse	Rural
Gardening	34%	44%
Animal Farming	7%	7%
Berry Picking	33%	52%
Hunting	33%	58%
Fishing	44%	62%

Source: Yukon Social Inclusion Household Survey, 2010 & Yukon 2012 Health Status Report Focus on Children and Youth.

Results from the Yukon Social Inclusion Survey shows that a high proportion of households, in Whitehorse and in the rural areas, do some sort of gardening/picking/hunting for self- consumption. Hence, when we consider the expenditure of on local food in the Yukon, though not reported, the value of home-gardening/farming cannot be neglected.

As part of the survey, we asked farmers to indicate how much of their food production is sold, given away, kept for self-consumption and wasted. Most farmers are most likely to keep a certain portion of farm products for household consumption. Farm owners/operators do not pay themselves wages or salaries; hence, the food they keep is their income in-kind. Almost all the farmers would keep a portion of their food for themselves in the four categories of food: vegetables, fruits and berries, field crops, and livestock.

From the results, most farmers produced vegetables and livestock with only a few growing fruits and berries and field crops. For vegetable farms, on average, 53% of their production were sold 36% was kept for self-consumption. For livestock farms, about 72% was sold and 19% kept for self-consumption. For fruits and berries, 61% was sold with 25% kept for self-consumption. Lastly, 61% of the field crop production was sold on average and 37% was kept for self-consumption. The remaining portions were either given away or discarded as waste.

Referring to Indicator 6.4: Quantity and Prices for Fresh Local Food, we know that product prices can vary immensely, especially for certain crops. Reasons could be due to the small number of farmers in the Yukon and that the majority of farmers do not produce a large amount. This could allow farmers to set a higher than normal price, especially if demand for local food is present. Currently, a comprehensive assessment of demand for Yukon-grown food has not been conducted, but a few existing studies point to evidence that this demand does exist.

The 2007 "*Multi-Year Development Plan for Yukon Agriculture and Agri-Food"* reports that the tourist industry places a high value on meat and specialty products like locally produced jerky (Serecon Management Consulting Inc., Transnorthern Management Consulting, & Research Northwest, 2007).

Zapisocky, M., & Lewis, M. (2010) conducted an online survey of 97 consumers in Whitehorse and surrounding communities on buying habits and preferred methods of shopping for local food. The results show that more than 90% of participants preferred to shop at a food coop while an organized box of local food was the least favorite.

In a survey of 106 Dawson City households conducted by the Conservation Klondike Society in 2011, 62 percent of respondents indicated that they wanted to purchase more locally-grown food. Availability and accessibility of locally-produced foods were reported as the biggest barriers to increasing local food consumption. One of the easiest ways to purchase locally-grown food in Dawson City is at the Farmer's

Market; respondents to the same survey indicated they attended the farmer's market five times per market garden season and that they would pay an average of 16.6 percent more than non-local products for a locally-produced equivalent (Conservation Klondike Society, 2011).

Complementing the study conducted by the Conservation Klondike Society, we posed questions regarding the selling capacity of each individual farm in our farmer survey as well. Not only does this give us an idea of the selling capacity, but it indirectly shows consumer demand of products grown by these local farms. Of the 48 responses that we have received, 40 farms indicated that they were able to sell all that they grew in 2012; even for the farms that made a negative net income. In regards to future expansion for the farm, the majority, 29 farms, stated that they have plans to expand their farms within the next 5 to 10 years, 16 stated that they would stay the same size and only six stated that they would shrink in operation size. The main reason that the farms have decided to shrink the operation was because of retirement plans.

As for increasing the growing and selling capacity, 34 of 48 respondents indicated that they want to increase selling capacity in the future. When asked to elaborate on factors that could increase their capacities, some suggested that the community needs more support in the organic movement and that the public needs to have the willingness to pay for locally grown, organic foods; farms need better resources for marketing their products; the community needs to be educated about the value of local food as opposed to relying on imported foods and seeking for the lowest priced foods and lastly, institutions such as the government, schools and hospitals should highlight the importance of local foods.

Although farms indicated that there still needs to be higher demand from consumers for locally-grown organic foods in the community, the study done by the Conservation Klondike Society and preliminary results from our survey both prove evidence that the market for local foods is in fact present and strong. Furthermore, it seems that consumers who are willing to purchase local foods is not that responsive to price fluctuations. As shown in the price tables in Indicator 6.4: Quantity and Prices for Fresh Local Food, prices can take on a wide range, but the fact that all farms are still able to sell all that they grow at all price level means that consumers have a high willingness to pay.

Results from the Yukon Social Inclusion Survey shows that a high proportion of households, in Whitehorse and in the rural areas, do some sort of gardening/picking/hunting for self- consumption. As for farmers themselves, our preliminary results also show that farmers kept a certain portion of their produce for self-consumption. Hence, when we consider the expenditure of on local food in the Yukon, though not reported, the value of home-gardening/farming cannot be neglected.

Objective 8: Create Jobs

In addition to the monetary contribution that a local food system generates to the Yukon economy, the impacts on employment are equally important. Jobs creation is one of the main objectives of the local economic development. Prospective local employment opportunities mean that residents do not need to leave their homes and seek out-of-territory jobs. Employment earnings will also indirectly induce economy growth through workers' spending. Furthermore, job opportunities for local residents will establish a more sustainable economy where it is less reliant on outside sources for employment. This objective offers information on current employment opportunities in farm and ancillary businesses. The results will help us assess where the potential opportunities may exist as the local food system is strengthened.

Indicator 8.1: Number of agricultural employment opportunities and labour income

This indicator discusses three types of employment opportunities presented in a farm business: paid employee, apprentice and farm operator. Paid employees are generally non-family member workers who may hold permanent or temporary/seasonal positions on farms. Apprentice or volunteers may receive income in-kind (such as room and board) instead of monetary payments in exchange for knowledge and on-the-job training pertaining to a farm business. Finally, farm operator manages the operation of the farm. Often times a farm owner is also a farm operator. Depending on the preferences of the owner-operators, they may or may not choose to pay themselves a salary. Statistics on each type of employment opportunity are presented below in Table 32.

Table 32: Paid work on Yukon farms, 2011

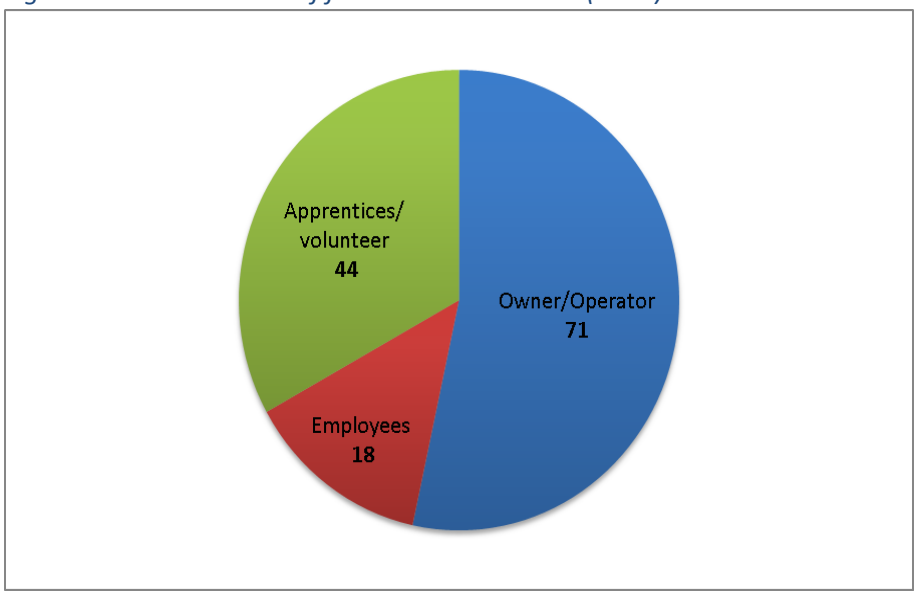
	Farms Reporting	# Employees	# Weeks for All Employees
Paid work on a year-round basis (full-time or part-time)	14	22	602
Paid work on a seasonal or temporary basis	21	35	463
Total number of employees	31	57	
Total weeks of paid work	31		1065

Source: Statistics Canada, 2011 Census of Agriculture, Farm and Farm Operator Data, catalogue no. 95-640-XWE.

The opportunities for paid farm employees are somewhat limited in the Yukon. Of 130 farms, only 31 farms reported employment opportunities with 57 employees in 2011. That is, on average (base on the total of 130 farms), only one in two or three farms employed one employee per farm. These results suggest that most farm businesses in the Yukon are small-scale production and are mainly operated by owner-operators with little need for additional employees.

The Yukon farmer survey suggests a similar picture. Figure 28 shows the total number of farm workers: owner/operator, employee and volunteer/apprentice.

Figure 28: Total number of farm workers in 2012 (n=48)



Source: Results from Yukon Farmer Survey (Institute for Sustainable Food Systems, 2015)

Seven farms of 48 farms (who responded to the survey) hired a total of 18 paid-employees in 2012. The majority of the 18 employees, 60%, were seasonal workers working up to 6 months a year. The remaining 40% were year-round employees. In terms of hours worked, there was not much difference in weekly work hours between seasonal and year-round workers. With the exception of only two employees, all other paid employees were full-time, meaning that they worked at 40 hours a week. The wage rate ranges from $10 to $21 per hour; however, those who made more than $15 per hour were very minimal. On average, the wage rate was $14 per hour. Given this average, an average full-time employee on a farm earns approximately $30,000 annually.

Data from the 2011 Census of Agriculture does not present information on volunteers/apprentices in the Yukon. Therefore we obtained work commitment data of apprentice and volunteers from our farmer survey. Next, we present the data that we have gathered to date on the numbers of months worked per year, hours worked per week and the wage rates paid.

Based on the 48 farm responses, there were a total of 44 apprentices and/or volunteers in 2012; this makes up one-third of the farm labour force (from the survey). The information on the origins of the apprentices and volunteers was not provided in the survey. However, from personal communications, several farmers shared that many volunteers came from all over the world through the international World Wide Opportunities on Organic Farms (WWOOF) organization.

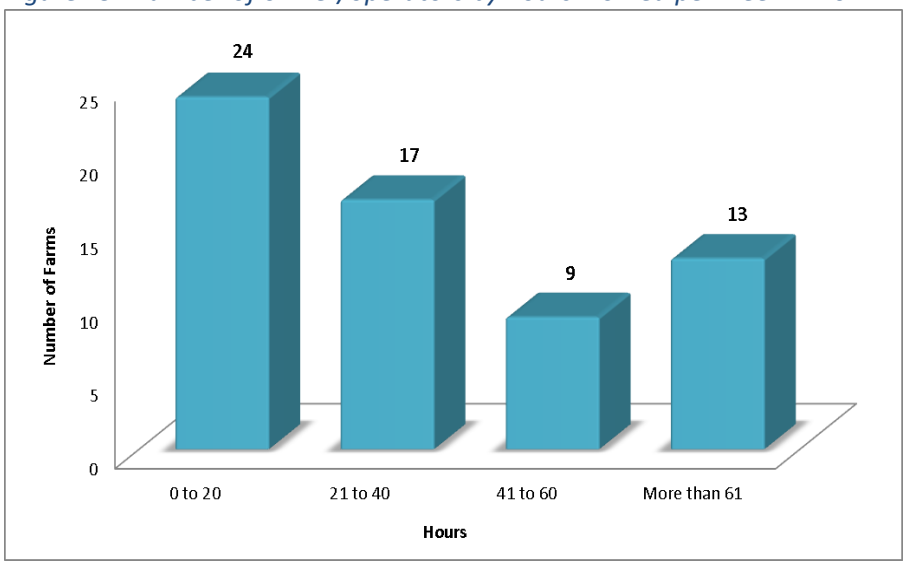
As volunteers and/or apprentices are not paid employee, they have the flexibility to choose the length of their stay. The duration of their stay ranged from one month to a whole year. In 2012, a few people stay for the year while most of the volunteers and/or apprentices stayed for less than 6 months. It is presumed that volunteers were the ones who stayed for a shorter time while apprentices stayed for the whole growing season so they could learn farming practices from the start till the end. As for hours worked, unlike employees, the range was large; it ranged from four hours to 80 hours per week. From

our survey responses, exactly half the volunteers/apprentices worked less than 20 hours and half worked more. Since there is great flexibility in the nature of volunteering, it all depends on what the farms needs to be done and in return of labour, the farmers would usually provide food and accommodation.

Finally, the last group in the labour force is the farm owner-operators. Based on 46 responses pertaining to this question, exactly half of the farms had only one owner-operator while the remaining half had two owner-operators. A mentioned above, a small number of employees were employed on farms, thus suggesting that most farms in Yukon are traditionally family-run. These results indicate that the Yukon agriculture has a relatively low impact on employment in the economy.

When asked about the hours of work for each farm owner/operator, respondents' reported work hours varied from 2 hours to 98 hours per week. Figure 29 shows the number of owner/operators by hours worked per week. On average owner/operators worked approximately 40 hours per week on farm. A number of farmers worked more than 60 hours.

Figure 29: Number of owner/operators by hours worked per week in 2012



Source: Results from Yukon Farmer Survey (Institute for Sustainable Food Systems, 2015)

In term of wage rates paid to farm owner-operators, it is common for farm owner-operators not to pay themselves a monthly salary or wage. Only five farm owner-operators reported to pay themselves. The rate of pay varied from $400 to $5,000 per month. Often farm owner-operators are paid in the forms of food kept for self-consumption and net revenue at the end of the farming year. As a result, the economic cost of time is often overlooked.

Indicator 8.2: Number of Ancillary Business Employment Opportunities and Labour Income

Table 33 shows the employment statistics of the five sectors in the agricultural and agri-food industry. Many of these jobs are not dependent upon the local food system, but represent the employment opportunities that currently results from Yukon's involvement with the national and global food systems. Developing the Yukon's local food production and post-production capacity could generate significant forms of income outside direct production. Processing and retail outlets are critical components of a regionalized food system and will be a key part of the development of the Territorial food system (Onozaka, Nurse, & T. McFadden, 2010).

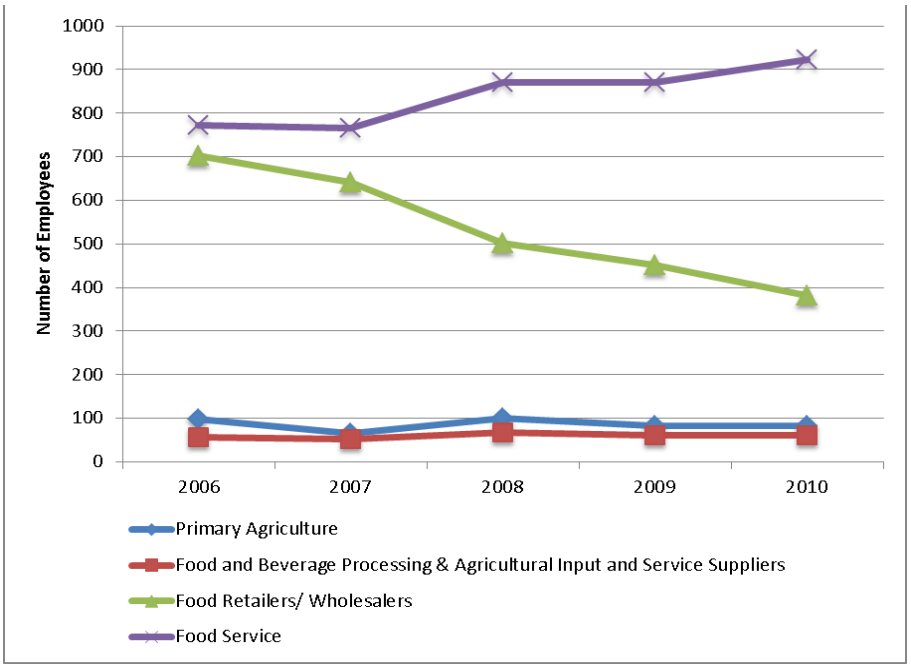
Table 33: Employment in the Agriculture and Agri-food Industry

	2006		2007		2008		2009		2010	
	Number of Business reporting	Total Employees	Number of Business reporting	Total Employees	Number of Business reporting	Total Employees	Number of Business reporting	Total Employees	Number of Business reporting	Total Employees
Primary Agriculture	59	99	35	65	49	101	36	83	34	83
Food and Beverage Processing & Agricultural Input and Service Suppliers	18	57	12	52	23	67	18	62	21	61
Food Retailers/ Wholesalers	41	703	38	642	35	502	36	452	34	381
Food Service	86	773	80	765	79	870	80	870	83	923
All Agricultural and agri-food industries	204	1632	165	1524	186	1540	170	1467	172	1448

Source: Bureau of Statistics, Yukon Business Survey, 2010

The number of total employees decreased by 11% between 2006 and 2010, while during the same time, the number of businesses reporting also decreased by 16%. Within the agriculture and agri-food industry, the majority of employees were hired in the sectors of food service (64%) and food retailers/wholesalers (26%) in 2010. While primary agriculture accounted for 6%, and the remaining 4% in food and beverage processing and agricultural input and service suppliers.

Figure 30: Number of employees in the agriculture and agri-food industry



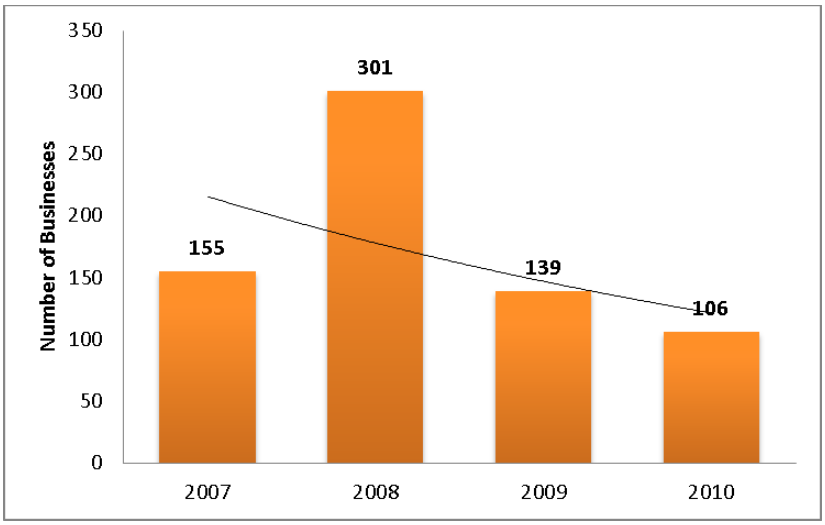
Source: Bureau of Statistics, Yukon Business Survey, 2010

Food service sector is the dominant sector in the agriculture industry in term of gross revenue, number of businesses and total employees. Figure 30 shows the number of employees in the agriculture and agri-food industry from 2006 to 2010. Over a five year period, the number of employees increased on average by 5%. In contrast, the number of employees in the food retailers and wholesalers, the second largest sector in the agri-food industry, has declined by 14%. The employment in the other two sectors stayed quite steady over the 5 years without any significant changes.

To fully assess the employment status in the economy, the demand side of the labour market is equally essential. This is important to know where the employment gap is in the economy. It allows us to match vacant jobs to the skills of the unemployed. Furthermore, this gives an economic indication on the sectors that are striving well, have potential for growth; as well as the sectors that are not faring well in which they might need assistance.

In the agricultural and agri-food industry, 26% of all businesses reported having difficulty in finding employees in the past 6 months in 2010. Specifically, food service is the sector with the most businesses reporting difficulty in finding employees; they accounted for almost 60% of all reports.

Figure 31: Number of current vacancies in the agricultural and agri-food industry



Source: Bureau of Statistics, Yukon Business Survey, 2010

Figure 31 presents the number of current vacancies in the agricultural and agri-food industry. The number of vacancies in this industry has decreased. Despite the spike in vacancies in 2008, the expected forecast of vacancies in the economy is downward trending (denoted by the black line in Figure 31). Due to a lack of in-depth information, we cannot further analyze in which sector these vacancies are derived from. Also, this report lacks information from the unemployment aspect, thus being unable to conclude whether the vacancies are due to a lack of skill set or a lack of workers in general.

Food System Planning, Policy and Governance

Municipal, regional and territorial plans help to shape the policies that determine land use, zoning and urban design. In relation to food systems, these plans "influence the opportunities for food production on public and private land; commercial and community food processing facilities; local distribution networks; food retail diversity, density, and location; and commercial and private compositing operations" (Hodgson, 2012). In developing a food system design and plan for the Yukon, it is critical to assess existing planning documents to determine the extent to which they support and enable the development of such a system.

To undertake the assessment of Yukon plans we have:

1. Compiled a set of municipal, local area, regional and territorial plans (Table 34, p.92) and,
2. Reviewed the plans to determine how food systems are represented.
    a. How often food systems are addressed in policy;
    b. Which food system components (production, processing, storage and distribution, consumption and waste management) are addressed in policy;
    c. How frequently the following food system themes are addressed in policy: ecological sustainability, economic development, community nutrition, community development, Indigenous perspectives, and land use. Ecological sustainability, economic development and community nutrition are themes from which the project's nine food system design objectives are drawn. Community development and integration of Indigenous perspectives have been identified as project design goals. Land use (what uses are permitted and prohibited) has critical implications for food systems; and
    d. How often food system themes and components are addressed in non-policy terms (in vision statements, descriptions, goals, objectives, principles etc.).

Our review revealed that food systems are not well represented in planning documents. Of five food system components, only food production is regularly addressed. None of the planning documents address all components of the food system. Of the six theme areas, economic development and community development were most often represented.

Our review of the documents is an initial assessment of trends. Six integrated community sustainability plans (Carmacks, Dawson City, Faro, Mayo, Haines Junction, Watson Lake, Whitehorse and Yukon Unincorporated) remain to be included.

Table 34: Documents Reviewed

Location	Document Type
Yukon Territory	Yukon Agriculture Policy Agriculutral Development Plan
Peel Watershed	Land Use Plan
Klondike Valley	Land Use Plan
North Yukon	Land Use Plan
Carcross	Local Area Plan
Deep Creek	Local Area Plan
Golden Horn	Local Area Plan
Hot Springs	Local Area Plan
Mt. Lorne	Local Area Plan
Carmacks	Official Community Plan Zoning Bylaws
Dawson	Official Community Plan Zoning Bylaws Sustainability Plan
Faro	Official Community Plan Sustainability Plan
Mayo	Official Community Plan
Teslin	Official Community Plan Zoning Bylaws Sustainability Plan
Watson Lake	Zoning Bylaws
Whitehorse	Official Community Plan Zoning Bylaws

The documents can be divided by type into policy and non-policy documents. Policy documents include official community plans and local area plans; they set policies to guide future land use. Municipal zoning bylaws are used to put plans and policies into effect. The 2006 Yukon Agriculture Policy document sets out the Yukon government's policies and procedures for agriculture in the Territory. Documents that do not include policies but instead determine principles and set goals are regional land use plans; integrated community sustainability plans; and the Yukon Agriculture Multi-Year Development Plan. Planning and policy documents created by and pertaining solely to Yukon First Nations communities and lands are not included at this time. An agreement and strategy for accessing and analyzing these documents will be developed in consultation with our partner First Nations and these will be included in a later version of this report.

Methods for Document Analysis

Each document was read by at least one of two researchers, and food system related themes and components were identified and categorized using a coding system.

Coding Strategy

We developed a set of codes that included food system themes and food system components, and codes to identify documents by type and community name (Figure 32) to increase the likelihood of consistent coding among researchers (Berke and Godschalk, 2009).

Figure 32: Codes used in scan

Document Location	Document Type	Food System Theme	Food System Component
•Yukon Territory •Peel Watershed •Klondike Valley •North Yukon •Mt. Lorne •Carcross •Carmacks •Dawon City •Faro •Marsh Lake •Mayo •Teslin •Watson Lake •Whitehorse	•Agricultural Vision Policy •Agricultural Development Plan •Land Use Plan •Local Area Plan •Official Community Plan •Sustainability Plan •Zoning Bylaws •Strategic Plan	•Economic Development •Community Nutrition •Ecology •Community Development •Indigenous Communities •Land Use Planning	•Production •Processing or Storage •Distribution and Sales •Consumption •Waste Management

To administer the coding we used qualitative analysis software called Atlas.ti. With the software we were able to code multiple categories at once and identify connecting themes throughout the document.

Initial Results

Results presented in this section identify the largest trends in data analyzed.

Food System Themes and Components in all Documents

We used Atlas.ti's analysis tools to query all of the documents for food system related themes and components. The two territorial documents, the Agriculture Vision and the Agriculture Development Plan, display the highest numbers of themes and components. In the case of the Agriculture Vision, the result might be explained by the fact that the document focuses specifically on agricultural production which is a component of the food system. Official community and local area plans by comparison, focus on multiple land use issues. Among municipalities Dawson City and the City of Whitehorse stand out with the highest numbers of policies and statements related to food systems. Of the local area plans, the Mt. Lorne and Deep Creek plans stand out, each with 24 incidences of food system related themes and components.

Table 35: Incidence of food system themes and components

Location	Document Type	Total for Each Document
Yukon Territory	Yukon Agriculture Policy	111
	Agriculutral Development Plan	39
Peel Watershed	Land Use Plan	19
Klondike Valley	Land Use Plan	16
North Yukon	Land Use Plan	6
Carcross	Local Area Plan	4
Deep Creek	Local Area Plan	24
Golden Horn	Local Area Plan	19
Hot Springs	Local Area Plan	16
Ibex	Local Area Plan	21
Mt. Lorne	Local Area Plan	24
Carmacks	Official Community Plan	3
	Zoning Bylaws	5
Dawson	Official Community Plan	12
	Zoning Bylaws	8
	Sustainability Plan	9
Faro	Official Community Plan	3
	Sustainability Plan	0
Mayo	Official Community Plan	0
Teslin	Official Community Plan	6
	Zoning Bylaws	6
	Sustainability Plan	3
Watson Lake	Zoning Bylaws	2
Whitehorse	Official Community Plan	6
	Zoning Bylaws	6
Total		**368**

Policies and Zoning Bylaws Related to Food System Themes

To determine the number of policies and zoning bylaws related to food system themes we queried all policy and zoning documents. As shown in Table 36 (p.96), the Land Use theme is most heavily represented. Most of the policies aim toward protection or enhancement of agriculture by preserving agricultural land or finding ways to put more agricultural land into production. Land use policies address almost exclusively, production specific guidelines.

Next to Land Use, the theme of Economic Development is most frequently identified. Most Economic Development related policies address the need to make agriculture more economically viable in the Yukon. Policies support increased marketing and sales of Yukon agricultural products, and more employment opportunities related to agriculture.

The least commonly identified themes are 'Community Nutrition' and 'Indigenous Communities'. Food and agriculture are essential to community health and nutrition yet there are only four policies between two documents that identify a need for community access to nutritious and safe food. There are also few 'Indigenous Communities' food system related policies. Eight policies were identified and most of them suggest a need to allocate appropriate land for subsistence harvesting. This result may be partially explained by the fact that planning documents pertaining solely to First Nations peoples and lands have not been included in this review.

Table 36: Number of policies related to food system themes

Location	Type of Document	Indigenous Communities	Land Use	Economic Development	Ecology	Community Nutrition	Community Development	Total for Each Document
Yukon Territory	Yukon Agriculture Policy	2	51	24	13	3	23	116
Carcross	Local Area Plan							0
Deep Creek	Local Area Plan	7	12		1	1	1	22
Golden Horn	Local Area Plan	1	9	2	1			13
Hot Springs Road	Local Area Plan	1	9	2				12
Ibex	Local Area Plan		16	1				17
Mt. Lorne	Local Area Plan		20					20
Carmacks	Official Community Plan		2					2
	Zoning Bylaws		5					5
Dawson	Official Community Plan		4	1	1		3	9
	Zoning Bylaws		7					7
Faro	Official Community Plan		3					3
Mayo	Official Community Plan							0
Teslin	Official Community Plan							0
	Zoning Bylaws	1	4					5
Watson Lake	Zoning Bylaws		5					5
Whitehorse	Official Community Plan		8					8
	Zoning Bylaws		2	2				4
Theme Total		**12**	**157**	**32**	**16**	**4**	**27**	**248**

Policies Related to Food System Components

To determine the number of policies related to food system components we queried the policy and zoning documents. As shown in Table 37, the vast majority of the food system related policies focus on the production stage of the food system. Many of the policies are about the need to increase the production of specific crops, to increase the productivity of agricultural land, and to ensure that production does not negatively impact ecological surroundings.

Table 37: Number of policies related to food system components

Location	Type of Document	Production	Processing or Storage	Distribution and Sales	Consumption	Waste Management
Yukon Territory	Yukon Agriculture Policy	46	1			
Carcross	Local Area Plan					
Deep Creek	Local Area Plan	9				1
Golden Horn	Local Area Plan	2				
Hot Springs Road	Local Area Plan	7	1			
Ibex	Local Area Plan	12				
Mt. Lorne	Local Area Plan	18				
Carmacks	Official Community Plan	1				
	Zoning Bylaws			2		
Dawson	Official Community Plan	4		1		1
	Zoning Bylaws					
Faro	Official Community Plan	3	1			
Mayo	Official Community Plan					
Teslin	Official Community Plan					
	Zoning Bylaws	4				
Watson Lake	Zoning Bylaws	1				
Whitehorse	Official Community Plan	6				
	Zoning Bylaws					
Component Total		**113**	**3**	**3**	**0**	**2**

Discussion

The results of the review and analysis of 25 planning documents indicate that the complete food system is not well represented in territorial and municipal policies and plans. A high percentage of the policies identified deal only with the production component of the food system and make little to no mention of processing or storage, distribution and sales, consumption or waste management. Also, policies are centered largely on land use issues such as better use of agricultural land or affordable agricultural land. Community development, nutrition, ecology and Indigenous communities are under-represented themes.

Further Research

The integrated community sustainability plans for Carmacks, Dawson City, Faro, Mayo, Haines Junction, Watson Lake, Whitehorse and Yukon Unincorporated should be coded and added to the review.

Appendix I – Yukon Farmer Survey Questionnaire

NOTE: Included here are the questions asked in the Yukon Farmer Survey. For the sake of brevity, response options are not included. A full version of the survey, including response options, is available upon request.

PART ONE: General Farm Information

1. Name, and Farm Contact Information
2. What is your position on the farm?
3. What year did this farm first begin operating on a commercial basis? By “commercial basis” we mean “producing crops and/or animal products, on any scale, for sale to others”.
4. For approximately how many years have you personally been farming?
5. How much farmland do you (or the farm owner-operator) own, lease from a private landowner, or access through a Yukon Government Grazing Lease? Please indicate units (acres / hectares / sections) by circling the one you use.

If you do not own farmland, please skip Question 6 and proceed directly to Question 7.

6. If you own farmland, did you buy it off the private market or through the Yukon Government Agriculture Branch's "Agriculture Land Program"?
7. Approximately how much of your farmland was in production in 2012?

If you use 100% of your farmland, please skip Questions 8, and 9 and proceed directly to Question 10.

8. Why didn't you use all of your land for production in 2012?
9. Would you be willing to allow someone else to farm some of that unused land? For example, a beginning or young farmer who otherwise might not be able to access farmland. If you would like, please add any comments about your answer.
10. Within the next 5 - 10 years, do you anticipate that your operation will expand, stay the same size, or shrink?

PART TWO: Farm Finances and Employees

1. In 2012, not including the owner-operator(s), did you have employees, volunteers, and/or apprentices working on this farm? Please check all that apply
2. In 2012, how many hours per week did the owner-operator(s), employees, and/or volunteers work on any aspect of the farm business, including field work (planting, weeding, harvesting, etc.), office work (record keeping, planning, etc.), and marketing (selling, delivering, packing CSAs, etc.)?
3. Is the availability of farm employees a limiting factor for your business?
4. What were the approximate total GROSS receipts (total income) of your farm in 2012? Do not include off-farm income in the amount you report.

5. What were the approximate NET receipts (total income minus fixed and variable expenses) of your farm in 2012? Do not include off-farm income in the amount you report.
6. Was 2012 a typical year for your farm in terms of profitability?
7. How many years has it taken for your initial investment in farmland and infrastructure to pay off (i.e., for your business to "break-even")? If your business hasn't broken even yet, how much longer do you expect it will take to do so?
8. Do you receive any off-farm income and/or other sources of funding for your farm such as government payments or grants? Please check all that apply.
9. Approximately what percentage of your total household income do the following sources of income make up? Please report an approximate percentage

PART THREE: Farm Production In 2012

Please skip any sections about types of production that do not apply to your farm. For example, if you did not grow vegetable crops for sale in 2012, skip the section on vegetable production.

1. Which of the following agricultural products did you produce on your farm in 2012 for sale to others? Please check all that apply.
2. Overall, what percentage of each agricultural product indicated above did you sell, give away, keep for yourself, and "waste"?

Vegetable Production in 2012: The following section is about the vegetables you grew on your farm for sale to others last year (2012).

1. In general, how would you describe your vegetable production method?
2. In 2012, did you grow any of your vegetable crops under protected culture such as hoop-houses, greenhouses, row-cover, cloches, cold-frames, or other?
3. What was the total amount of land you had in vegetable production in 2012?
4. What percentage of your vegetable crop area was irrigated?
5. What type(s) of irrigation system(s) did you primarily use on your vegetable crops? Please check all that apply.
6. Which of the following vegetables did you grow on your farm commercially in 2012? Beside the checkbox, please indicate the specific variety you grew (ex: "Carrots" - "Nantes Coreless"). By "commercially", we mean producing for sale to others on any scale.
7. Please tell us a little more about the vegetable crops you grew in 2012. Use the table below to fill out the following information:
8. How much of each vegetable crop did you produce in 2012?
9. What was your average price for each vegetable crop in 2012?

Fruit and Berry Production: This section is about the fruit and berries you grew on your farm for sale to others last year (2012).

1. In general, how would you describe your fruit and berry production method?

2. In 2012, did you grow any of your fruit or berry crops under protected culture such as hoop-houses, greenhouses, row-cover, cloches, cold-frames, or other?
3. What was the total amount of land you had in fruit/berry production in 2012?
4. What percentage of your fruit/berry crop area was irrigated?
5. What type(s) of irrigation system(s) did you primarily use on your fruit/berry crops? Check all that apply.
6. Which of the following fruit and berries did you grow on your farm commercially in 2012? Beside the checkbox, please indicate the specific variety you grew (ex: "Blueberries - Duke"). By "commercially", we mean producing for sale to others on any scale.
7. Please tell us a little more about the fruit and berry crops you grew in 2012. Use the table below to fill out the following information:
8. How much of each fruit and berry crop did you produce in 2012?
9. What was your average price for each fruit and berry crop in 2012?

Field Crop Production: This section is about the field crops you grew on your farm for sale to others last year (2012).

1. In general, how would you describe your field crop production method?
2. What was the total amount of land you had in field crop production in 2012?
3. Amount of land in field crop production was _____.
4. What percentage of your field crop area was irrigated?
5. What type(s) of irrigation system(s) did you primarily use on your field crops?
6. Which of the following field crops did you grow on your farm commercially in 2012? Beside the checkbox, please indicate the specific variety you grew (ex: "Wheat" - "Alvena"). By "commercially", we mean producing for sale to others on any scale.
7. Please tell us a little more about the field crops you grew in 2012. Use the table below to fill out the following information:
8. How much of each field crop did you produce in 2012?
9. What was your average price for each field crop in 2012?

Livestock Production: This section is about the livestock you raised on your farm for sale to others last year (2012).

1. In general, how would you describe your livestock production method?
2. What was the total amount of land you had dedicated to livestock production in 2012?
3. In 2012, how much (approximate %) of your livestock feed needs were satisfied by...
4. Which of the following livestock did you raise on your farm commercially in 2012? Beside the checkbox, please indicate the specific breed you raised (ex: "Laying Hens" - "Red Rock"). By "commercially", we mean producing for sale to others on any scale.
5. Please tell us a little more about the livestock you raised in 2012. Use the table below to fill out the following information:
6. How many of each livestock type did you have on your farm in 2012?
7. How much meat/milk/eggs did you produce in 2012?

8. What was your average selling price for meat/milk/eggs in 2012?

PART FOUR: Production Practices

1. Please indicate which of the following general types of inputs you use on your farm, and where you get them from. If possible, provide an estimate of how much you use.
2. Please list all the places/companies where you get your seeds.
3. How often do you encounter the following general types of pests on your farm?
4. What is the source of your irrigation water?
5. How do you store the livestock manure produced on your farm?
6. What do you do with the livestock manure produced on your farm?
7. Approximately how much of your Nitrogen needs are satisfied by manure produced on your farm?
8. Approximately how much of your Nitrogen needs are satisfied by using techniques such as cover cropping, using nitrogen-fixing crops, or green manures?
9. How many days per year is your soil is covered by crop canopy, crop residue or snow?

PART FIVE: Storage and Value-Added Processing

1. Did you do any value-added processing of your farm products for sale to the public in 2012?

If you answered NO to Question 1, please skip Questions 2 to 5 and proceed directly to Question 6.

2. Which of the following types of value-added processing did you do?
3. What processing equipment did you utilize and is this equipment located on or off your farm?
4. Approximately what percentage of your total farm income came from sales of your value-added products last year?
5. Did you hire any employees specifically to help with value added processing?
6. Do you want to do more value-added processing?
7. If you answered yes to question 6, what would enable you to do more value-added processing?
8. Do you have access to any of the following storage facilities for your farm products? (Fridge/cold storage, freezer, dry storage, root cellar)
9. Is your current access to storage facilities for your farm products sufficient?
10. Please tell us about where you sell your farm products. How much of your product is sold through each of the following channels? (Farmers markets, CSA, farm gate, wholesale, grocery store, institution, restaurant, fruit/vegetable stand)
11. Are there any marketing channels which you don't currently sell through that you would like to in the future?
12. Do you sell any of your vegetable crops, fruit, or berries outside of the growing season?

If you answered NO to Question 12, please skip Questions 13 and 14 and proceed directly to Question 15.

13. Do you charge higher prices for these crops or animal products when you sell them outside the growing season?
14. Where do you store the crops or animal products that you sell outside of the growing season?
15. Approximately how far away is your farm from your primary market (where you sell the most of your products)?
16. Is the distance of your farm from your primary market a barrier/challenge to your success?
17. Are you able to sell all that you grow?

If you answered NO to Question 17, skip Question 18 and proceed directly to Question 19.

18. If you were confident that there was sufficient demand for your farm products, could you grow and sell more?
19. What would it take for you to be able to sell all that you grow?
20. Do you collaborate in any way with other farmers to overcome the challenges of farming in the Yukon?
21. Do you know any other farmers who aren't listed in the Yukon Farm Products Guide who might be willing to participate in our survey?
22. We are hoping to visit some farms this summer or fall. Would you be interested in having one or two of our research team members visit your farm?

Appendix II – Food Frequency Questionnaire Methodology

A key objective of the baseline assessment was to determine what foods the population of Yukon is consuming, particularly specific types and amounts of foods. To our knowledge, this data has not been collected. The 24-hour food recall and food frequency questionnaire (FFQ) are the most common instruments used to assess dietary intake (Willett, 1998).

Twenty-four hour food recalls require subjects to complete 30-45 minute interviews, on at least two occasions, on different days of the week. The interviewers must be well trained with a strong understanding of both survey methods and foods available in the region. A significant amount of data entry is required as each food must be entered and coded for analysis. With the added resources and time required, we determined that this tool was not appropriate for our study.

The FFQ is a well-defined list of foods and respondents are asked to indicate the frequency with which they consume each item over a specific time period (Health Canada, 2006). Administration and processing of the FFQ is significantly less intensive than the 24-hour recall as the questionnaires can be self-administered online. The food list must include the most commonly consumed foods with the appropriate wording, while still maintaining a limited number of foods.

Developing an FFQ specific to the study population is preferable, but often not possible as this is a multi-step process including administering a 24-hour food recall to determine the most commonly consumed foods, then pilot testing and validating the FFQ (Sharma, 2011). Instead, a previously developed FFQ from a study with a similar objective and population can be modified (Cade et al., 2001). This reduces the development process, but requires input from nutrition professionals in the community as well as pilot testing and validation. The latter involves comparing results derived from the FFQ with intakes assessed by two 24-hour dietary recalls among participants.

Of those available, we found the GEM Block FFQ from Nutrition Quest was the most appropriate to modify as their data output could be modified to include amounts of each food line item consumed. However, as a majority of the foods in this FFQ were reported as mixed dishes or combined food items, such as “beef, pork and veal”, we would still have had to develop a method for disaggregating these foods and estimating the grams of each ingredient per serving. We were concerned about the assumptions such a method would entail and the potential for error, as well as the time that would be required to complete this work. Another major limitation was that the GEM Block FFQ from Nutrition Quest was never validated anywhere, let alone in the Yukon, we were not confident that the data we would derive from the FFQ would be robust. Taking all of this into consideration, we decided not to pursue the food frequency questionnaire or the food consumption study.

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