



Literature Review for the Tr'ondëk Hwëch'in Teaching & Working Farm



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Tr'ondëk Hwëch'in Teaching and Working Farm, Dawson City, Yukon; Farm Hand Crew at work, September 2015. Photo Credit: Adam Farr, 2015 Farm Hand Crew Lead.

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1.0 INTRODUCTION TO THE DAWSON CITY REGION

1.1 PAST AND PRESENT DAY POPULATIONS

For thousands of years the Dawson area of Yukon Territory was home only to the Tr'ondëk Hwëch'in First Nation and their predecessors. The population of this area was small at around 500 settlers in 1896 (Wikipedia, 2015). It was not until January of 1897 when Joseph Ladue, a New York businessman and prospector, founded the town site electing to name the settlement after Canadian geologist George M. Dawson, whom had explored and mapped the region in 1887 (Wikipedia, 2015).



Figure 1. Aerial view of Dawson, 1989. Source: www.arcticwebsite.com/Yukonimages1898p3.html

In June 1897, the new town of Dawson had a population of some 4,000. By June the following year the population had grown to over 25,000 (City of Dawson, 2015). Dawson was known as the “Paris of the North” in 1898, being the biggest city west of Winnipeg and north of San Francisco, having developed to support around 40,000 people (*ibid.*). At the end of 1898 the population was reduced to a mere 8,000 (Wikipedia, 2015).

Dawson City was named the capital of the Yukon Territory from the territories founding in 1898. Shortly thereafter, the discovery of gold in Nome, Alaska had substantially reduced the population. It wasn't until 1904 that it was incorporated as a town with a population of 1,319 (The Canadian Encyclopedia, 2011). The city of Dawson remained the capital of the Yukon Territory until 1952. The opening of the Alaska Highway to the public in 1948 changed travel and shipping methods leading to a change of population dispersion in the territory. After World War II the Alaska Highway expanded and bypassed Dawson by 480 km, which further reduced Dawson's population and northern reliance on the community. In 1953, the “Town of the City of Dawson” lost its capital-city title to Whitehorse (*ibid.*).

Throughout the 1960s and 1970s, the population hovered around 600 to 900 full-time residents. Plans were made in the 1960s to preserve the town's rich history. Buildings were recovered and the historic Klondike Gold Rush town began to attract international crowds of tourists. The last census completed in 2012 reported Dawson's population to be an estimated 2,000 residents (Yukon

Bureau of Statistics, 2012). Every year the population grows significantly in the summer months, due to the presence of tourists and seasonal workers. The current population identifies as 30% Aboriginal, 12.5% French-Canadians and 36% Europeans with about half of the population being born outside of the territory (Yukon Government, 2011).

1.2 GROWING CONDITIONS OF THE DAWSON REGION

The Klondike region of the Yukon presents rich soils, especially on the river islands and floodplains bordering both the Klondike and Yukon Rivers. In addition, this area of the territory was never glaciated and has had centuries for the soil to develop. Dawson City is located on the floodplain where the Klondike and Yukon Rivers meet. This convergence of valleys offers a certain protection from the elements and, because of the nutrient-rich sediment deposition, allows an ideal microclimate for agriculture.

The winter season in Dawson City is quite bitter with temperatures falling to extremes near minus 50 degrees Celsius: so cold that in recent years Rock Creek, just southeast of the airport, froze throughout its entire depth. Another possible reason for this could be lower water levels in the creek. With the challenges winter presents, the summer season extends a welcoming relief to the dark winter days.

Dawson's growing degree days¹, considering a base temperature of 5 degrees Celsius, can begin as early as the second week of April and extend as late as the September equinox (Farmwest, 2015). Dawson's location, at a latitude of 64 degrees north, offers producers days of near 24 hours of daylight. On average, the area boasts to have the mildest growing conditions in the Yukon.

2.0 HISTORY OF FOOD PRODUCTION

2.1 IN THE YUKON TERRITORY

Early attempts at growing food in the Yukon were made in the 1840s. Robert Campbell, a Scottish explorer and Hudson's Bay Company (HBC) fur trader, was the first individual to attempt domestic food production in the Yukon. Prior to his arrival, he gained knowledge and experience growing miscellaneous grain and vegetable crops at the HBC's experimental farm in Red River, Manitoba. Beyond minimal supplies for construction and certain essentials sent north by HBC headquarters, traders and trappers were provided with seed and expected to provide for themselves (Robinson, 2010). Food production in the north had been initiated at three different locations, Frances Lake (1842-1849), Pelly Banks (1845-1849) and Fort Selkirk (1848-1852). These postings were not chosen

¹ Growing degree days take into account heat accumulation and are calculated based on a temperature, minimal temperature requirements of the crop of consideration, and available hours of sunlight (Farmwest, 2015).

for the quality of land for production but rather the proximity to Native camps for the intent of trading (*ibid.*).

The Alaska Commercial Company established posts in the 1880s at Fort Reliance, Forty Mile and Fort Selkirk. In the fall of 1888 Arthur Harper, a noted Irish prospector, and Joe Ladue, founder of Dawson, attempted growing potatoes, turnips, radishes and cabbage at Fort Selkirk (*ibid.*). Although long days in the north offered considerable light, the limitations of the short growing season and unpredictable frosts proved challenging. In 1890 Harper decided to purchase heavy cotton material for covering crops in order to protect them from frost damage (*ibid.*). By 1895 potatoes were being sold for \$1 per pound at Forty Mile in 1895 (*ibid.*). With the successes gained at Forty Mile, Harper applied for a 160 acre homestead in the Fort Selkirk region (*ibid.*). He learned from experience that land in closer proximity to rivers allowed for improved frost protection during the growing season (*ibid.*). Still, lands selected for growing purposes were done so based on proximity to the populations of trading posts and mines.

2.1.1 Dawson Area

It was not until 1896 with the discovery of gold in the Klondike Drainage that transient populations were drawn more northerly. Relying on imported goods, international settlers became susceptible to disease from lack of nutrients. Until farms could be established, newcomers were challenged to provide themselves with nutritious diets (*ibid.*). The transport of goods was primarily by river with sternwheeler boats and limited to the narrow season in which the river was not frozen.



Figure 2. Dawson area farmer's market in the early 1900s.

Source: www.electriccanadian.com/history/yukon/territory/chapter7.htm

Growing successes in the Dawson region were reported “in the foothills” region of the Klondike River. Californian J.A. Acklan had chosen and cultivated a ten-acre, southern-aspect slope along the Klondike River for vegetable production in the 1898 growing season. When his order of seeds and implements arrived, it included a large consignment of greenhouse glass (The Daily Klondike Nugget, October 5, 1898). This was the first use of a structure to lengthen growing season conditions in the area. Acklan produced a successful harvest of lettuce, radishes, onions, turnips,

rutabagas, beets, green peas, carrots, parsnips, potatoes and small plots of barley and oats (The Daily Klondike Nugget, September 7, 1898).

Henry Daum and his brother, German immigrants, set up an eleven-acre parcel of land on Klondike Island in the late 1890s. The brothers chose to add horse manure from the streets of Dawson to the already fertile soil of their chosen land. The farm produced 29 pound heads of cabbage and a variety of other greens and vegetables (Robinson, 2010). Seed was started early in flats, next put into bench bins and pots and set outside into cold frames in the spring, and finally into the fields when there was 20 hours of sunlight (*ibid.*). In 1901, the brothers had one acre in production and were able to harvest 750 head of cauliflower, 4,000 cabbages, 500 bunches of celery, 1 ½ tons of potatoes, 2 tons of turnips, 500 pounds of rutabagas and 1,500 dozen cucumbers. This same season they lost seventy-five of their tomato plants before the fruit ripened due to frost (The Daily Klondike Nugget, September 7, 1901). Unfortunately, with all successes reported they were forced to close the farm around 1913 due to mining of their attained land (Robinson, 2010).



Figure 3. Vegetable stand in Dawson, 1906. Source: tc.gov.yk.ca/archives/hiddenhistoryasian/en/early/07.html

It is on record that by mid-July 1898 C.M. Bartholam, another successful producer in the Klondike Valley, was able to sell six-week old produce for a high price to local residents. A bunch of onions was fifty cents, eight to ten radishes cost one dollar and lettuce was twenty-five cents a bunch (The Daily Klondike Nugget, July 16, 1898).

In the fall of 1898 applications for acreages had increased and surveying had begun to expand agricultural opportunities. “By 1899, there were twelve market gardens selling their vegetables in Dawson City” (Robinson, 2010). One of these land applicants was John Fox. He developed a farm of two acres alongside the Daum brothers on Klondike Island. In 1901 he grew 5,000 head of cabbage, 1,000 celery plants and half an acre of potatoes. He also harvested a ton of carrots along with radishes, green onions, lettuce and other small, marketable greens and vegetables, storing four tons for winter use (The Daily Klondike Nugget, September 7, 1901).

In 1901 there were notable farms around Dawson in four areas: a string of farms on Klondike Island—just described above—some land across the Yukon River just upstream from the Klondike River at Sunnydale Slough, some land at West Dawson across the Yukon River, and downstream a short distance from the Dawson town site (*ibid.*). Farms along the Klondike River were located close to Dawson City and connected by an early wagon road system. A portion of the connecting road was constructed under a government contract (*ibid.*).

In 1901, another producer by the name John Charlais cultivated ten acres of land around Sunnydale Slough in the Yukon River, upriver from the mouth of the Klondike River. He boasted cauliflower heads with half of the lot about eight inches in diameter. Many of the cabbages and turnips weighed five to six pounds each with some cabbage weighing up to twenty pounds a head, the largest a record thirty pounds (*ibid.*). In its peak production levels, the Sunnydale Slough area of Dawson was the site of ten homesteads (Robinson, 2010).



Figure 4. Urban garden in Dawson, 1905. Source:

collectionscanada.gc.ca/pam_archives/index.php?fuseaction=genitem.displayEcopies&lang=eng&rec_nbr=00003407187&title=Vegetable+garden%2C+Dawson%2C+Y.T.%2C+August+19th%2C+1905.+&ecopy=a020544

The third of the four major production areas in the Dawson area is the West Dawson agricultural community. These farms were connected to Dawson City by a cable ferry that operated across the Yukon River. Brockfelt Farm was about ten acres and produced from twelve to fifteen tons of vegetables for winter use in 1901. Just down river from Brockfelt Farm was the Brown and Matheson-owned eighty acre parcel of land with ten acres in production. In 1900, five acres were seeded in timothy for hay and oats yielding about 15 tons. In 1901, 3 acres of cabbages were planted yielding about 20,000 heads, half an acre of turnips and one acre in potatoes yielding 200 bushels. 15,000 celery plants were also harvested for winter storage. The Semi-Weekly Nugget reported in the same season that B&M's hothouse tomatoes produced high yields (The Daily Klondike Nugget, September 7, 1901).

Most farms in the Dawson area were small with around four to five acres in cultivation. An example of production in one growing season is that a 30 square foot plot on one farm could produce ten crops of radishes. Another farm sold \$6000 worth of vegetables during the summer and stored twenty tons for the winter market (*ibid.*). The largest farm in the Dawson area, the Pee Pate Farm, was on two islands located “near the upper ferry.” Twenty of the acres were in oats production with a few acres dedicated to turnips (*ibid.*). The farm noted to be “the best” in the Klondike Valley, for undeclared reasons, was on Mosher’s Island below the Ogilvie Bridge over the Klondike River (Robinson, 2010).

In May 1902, local produce was averaging about twelve cents per pound. Restaurants were finding it more affordable to use stored, tin goods rather than purchasing locally produced vegetables (*ibid.*). A decade after the gold rush boom, farmers were getting around five to ten cents per pound for potatoes at harvest. Stored potatoes sold at a higher price of eight to ten cents per pound in the winter (*ibid.*). At this time, the market for local produce had diminished and no longer seemed reasonable because of decreased freight charges for southern produce. But, the 1907 growing season was such a success that five homesteads were approved by the government and another dozen were applied for (*ibid.*).

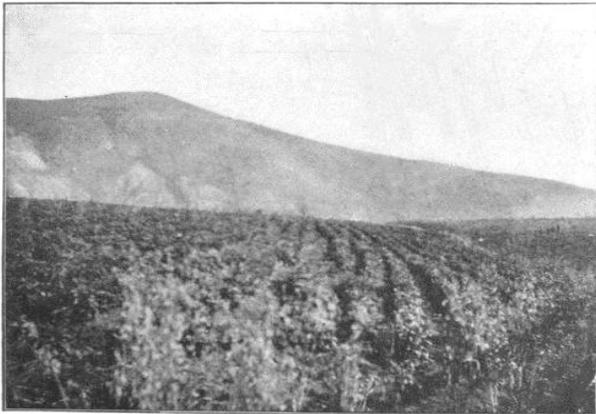


Figure 5. Potato patch, Dawson, 1903. Source: www.gutenberg.org/files/42611/42611-h/42611-h.htm

Around this same time, Lewis Cruikshank attained 160 acres of Harper and Ladue’s old location on Ogilvie Island. His primary crops in production were hay and oats. He also had an excellent rhubarb patch which he made into rhubarb and cranberry wine (*ibid.*). By 1926 he had been steading on the island for twenty years. The longer Cruikshank stayed, however, the more money he continued to lose. Following a full scale fire in 1923, his land was flooded in 1925, washing away buildings, fences, stocked firewood along with chickens and horses. Even after such devastating losses, he continued to grow wheat, alfalfa, brome grass and potatoes until the 1940s (*ibid.*).

In a 1908 copy of *Alaska-Yukon Magazine* a writer reported that root cellars used on island farms did not freeze. One farm was vented to retain the temperature at the required low of 3°C. All root

and tuber vegetables, as well as onions, were stored in the root cellar for off-season market sales. Racks of solid cabbage heads would sell for one dollar each or about eight to twelve cents a pound. Turnips, carrots and parsnips sold for eight cents per pound in the winter while onions cost twelve cents (Alaska-Yukon Magazine, September 1908).

2.3 SUCCESSES AND CHALLENGES GROWING IN FRONTIER TIMES

The most prominent threat to pioneer growers' production was the early and unpredictable frosts, which killed crops early in the season. In the late 1800s it was found that by covering the rows with a cloth the more sensitive crops could be saved. Now, it is known that a very low rate of application of water, through irrigation, can prevent freezing damage through the release of heat during cooling and freezing for temperatures as low as -6 degrees Celsius (Bootsma, 1985).

Even though the cold, lengthy winters of the north can present challenges to growers, many have found ways to extend the growing season vis-à-vis growing innovations. For example, in the early 1900s a Norwegian gardener in Nome, Alaska, extended his growing season by removing snow from his plot in the spring around April 15. The soil in his plot would be thawed to a depth of 4 to 6 inches before the surrounding snow had disappeared. This gave him an extra three weeks of high returns before southern produce would arrive and force him to lower his prices (Dawson Daily News, May 12, 1906). Benefits of a shorter growing season and cool growing season include that 1) there is a limited season for pest infestation and infection of disease, and 2) certain crops thrive in cool weather conditions, including root vegetables such as carrots and beets, and plants in the *Brassicaceae* family including cabbage, cauliflower and broccoli, to name a few.

Other innovations used to extend the growing season include growing under glass, which was considered in the nineteenth century and found to be very beneficial. In The Dawson Daily News, 1902, the following statement is followed by information about greenhouse use in West Dawson, "rich farming land is located in the lowland at West Dawson between the village and shipyards to the north, lies a big stretch of fine rich farming land" (Dawson Daily News, June 2, 1902). Two growers, Mr. Lobell and Mr. Drockmiller, were extensively producing vegetable seedlings from hothouses for spring. Mr. Lobell is said to have produced two cycles of radishes and lettuce starting in February. The first mid-1800 structures were small and primarily used for starting seedlings (Robinson, 2010). In the early 1900s, Mr. Lobell's greenhouse was reported to have been 150 feet long with a deep excavation banked high on one side. There was also an underground warm storage area located in the greenhouse. Vegetables were grown in the hothouses of Dawson until December (Dawson Daily News, June 2, 1902).

William K. DuBell had the largest garden in West Dawson (Morning Sun, July 15, 1902). Mr. DuBell produced nearly every vegetable locally produced. He grew sweet corn, peppers, cucumbers,

tomatoes, lettuce and squash in his greenhouse. The article also mentioned that Mr. DuBell was in the process of preparing an underground greenhouse for growing mushrooms, with no further details provided (*ibid.*)



Figure 6. Flooding in Dawson, 1925. Source: digitalcollections.lib.washington.edu/cdm/singleitem/collection/laroche/id/87

The harsh winter season was regular and expected, but the devastation of natural events such as unexpected fire and unavoidable flooding were difficult to recover from. These events not only reduced crop potential for the next season but destroyed infrastructure and reduced the financial capacity of some producers to farm into future years. Although these natural events were not ideal for the land tender, both fire and flooding offer beneficial nutrients to the land following the event. Being located at the convergence of two rivers, Dawson has seen its share of floods. May 14, 1925 may have been the last flood of the century to occur. The south end of the city was under four to five feet of water, stretching back as far as 8th Avenue. Farmers who grew on the islands were devastated. Water levels started to recede on May 15th around noon (Dawson Daily News, May 14, 1925).

1979 was another bad flood year where on May 3 hotels had flood damage in rooms as far back as 5th Avenue and Princess Street. One of the more recent floods was at noon on May 12, 1982 on Rock Creek. Ray Magnuson, chief highway superintendent for the territory said, “A wall of ice that could be about 10 to 15 feet high,” blocked the Klondike River (The Whitehorse Star, May 12, 1982). About one-quarter mile of the highway was covered by ice chunks. The water had receded in less than 24 hours. Records at the Dawson City Museum Archives report that Rock Creek flooded in 1982, 1986, 1994 and 1997.

As the 20th century marched forward (1920s), the horticulture and agriculture industries reduced production levels, and more fodder crops for livestock were grown rather than vegetable crops for the community. There is little to no information regarding production throughout the 1930s to the 1970s. The Harrowsmith magazine reports at the turn of the century that there were over 100

farms, which fell in numbers to 41 in 1931, and to 17 in 1976 (Harrowsmith #23, Volume IV, October 1979).

During the 1970s period there were other challenges that came to the surface. One of the problems producers had with increasing their business was finding help on the farm or finding the money to pay for machinery (*ibid.*). Grocery costs were high with a head of lettuce on average being thirty percent higher in Yukon grocery stores than those in the south (*ibid.*).

Another problem related to the lack-of-information on growing suitability for land buyers/those leasing land. Before 1975, individuals could ask for leases to large pieces of land without knowing the suitability of the land for growing. They would clear it, as part of the lease terms, and if it was not good quality land for farming they would just let it go back to nature (*ibid.*). The two percent of arable land was not mapped out as it is today, so the government could not direct people to suitable land. Adding further complexity to this issue was the fact that self-governing negotiations with Yukon First Nations began in 1973, which led public land offices to discourage the granting of leases to buy, which resulted in a freeze on the granting of Crown land altogether. According to a member of the Council of Yukon First Nations, at that time, the federal and territorial governments “would not recognize any land titles given since 1973 as binding” until negotiations concluded (*ibid.*). In turn, some farmers resorted to filing for placer mining claims to acquire leases at the time. It was during this lease halt that the federal Department of Indian Affairs and Northern Development ordered a soil inventory and climatic study to be done. The soils inventory was done by the Saskatchewan Institute of Pedology and published in 1977. It states that “there is a potential for livestock production or market gardening with a steady market for baled hay for winter feed for horses belonging to big game outfitters.” The report also notes “many other types of agricultural operations are possible, including milk production and poultry, egg and honey production” (*ibid.*).

2.4 A COLLECTIVE LIST FROM HISTORICAL DOCUMENTS OF FOOD CROPS GROWN IN DAWSON CITY

- Cabbage (white and blue Dutch)
- Lettuce (Roman)
- Spinach
- Sorrel
- Kale (Scotch)
- Endive
- Parsley
- Chervil
- Chive
- Thyme
- Rosemary
- Chicory (for root)
- Leek
- Broccoli
- Cauliflower
- Celery (yak)
- Cucumber
- Turnip
- Parsnip
- Rutabaga
- Radish
- Carrot
- Beet
- Bean (string)
- Sugar Pea
- Sweet Corn
- Squash (Summer)
- Onion
- Green Onion
- Tomato
- Potato
- Oyster Plant (Salsify)
- Strawberry
- Rhubarb
- Wheat
- Alfalfa
- Clover
- Brome
- Timothy
- Oat

3.0 CURRENT FOOD PRODUCTION PRACTICES

3.1 LEARNING FROM THE PAST: GROWING LOCATIONS

The Canadian Department of Agriculture reported in 1959 that the majority of the Yukon's arable land is located in river valleys (McCracken and Revel 1982). Many current producers have taken to growing in the fertile soils on river islands and floodplain flats in the valleys of the Dawson area. These flat areas of the valley bottom also allow for even and full sun exposure in order to fully take advantage of the impressively high number of degree growing days the Klondike region boasts. Although these flat, low-land areas are rich in nutrients, the northern and central sections of the town site present poor drainage conditions (*ibid.*).

3.2 FOOD CROPS GROWN TODAY

For the most part, today's grower continues to produce the same cold-hardy crops their pioneer counterparts successfully grew (see list of historically-grown vegetables in Section 2.4). Advances have been made in producing crop varieties that perform better in colder climates. For instance, certain seed companies in Alaska offer varieties that have been developed to perform best in heightened daylight and cool night conditions. In the early 1980s one Dawson-area grower had acknowledged that for most crops, greater success was found using hybrid seed over non-hybrid seed (McCracken and Revel 1982).

One grower in the Klondike Valley has been testing trials of different woody stock including different species of apples, pears, and cherries for nearly two decades. Success has been found with certain cultivars of fruit using grafting techniques in conjunction with site specific conditions and protection.

Currently, greenhouses continue to be used for starting seedlings early for transplanting into the field in early spring. Beyond this early start for plants, greenhouses are also utilized to grow some ever-bearing crops like tomatoes and cucumbers for their whole cycle to maximize output or to increase the odds of production of more sensitive crops such as peppers.

3.3 NATIVE PLANTS OF ETHNOBOTANICAL INTEREST TO THE TR'ONDĚK HWĚCH'IN

Ethnobotany is a term used to describe the traditional harvest practices of generations of First Nations people. The Teaching and Working Farm executive is planning a native plant garden, which would be accessible to Elders and younger generations alike, and serve as a beneficial interactive learning feature.

The following is a list of plants harvested throughout the growing season by the Tr'ondëk Hwëch'in community. Some plants in this list may be utilized in the native plant garden. This information was provided by Jackie Olson, Executive Director for the Tr'ondëk Hwëch'in First Nation.

April

Birch bark (*Betula papyrifera*)
Bear root (*Hedysarum alpinum*)

May

Dandelion shoots/flowers
(*Taraxacum officinale*)
Driftwood (no species specific)
Spruce tips
(*Picea glauca* and *Picea maritima*)

June

Rhubarb (*Polygonum alaskanum*)
Spruce roots
(*Picea glauca* and *Picea mariana*)
Wild onion (*Allium schoenoprasum*)

July

Rhubarb (*Polygonum alaskanum*)
Rose petals (*Rosa acicularis*)
Fireweed flowers
(*Chamerion angustifolium*)
Spruce pitch
(*Picea glauca* and *Picea mariana*)

July (continued)

Labrador tea
(*Rhododendron groenlandicum*)
Juniper berries
(*Juniperus horizontalis* and
Juniperus communis)
Sage (*Artemisia frigida*)
High bush cranberries
(*Viburnum edule*)
Wild Strawberries
(*Fragaria virginiana*)
Wild Raspberries (*Rubus idaeus*)
Wild Blueberries
(*Vaccinium uliginosum* and
Vaccinium ovalifolium)
Dwarf Raspberry (*Rubus acaulis*)

August

Firewood (no species specific)
Cranberries (*Vaccinium vitis-idaea*)
High bush cranberries
(*Viburnum edule*)
Rosehips (*Rosa acicularis*)

3.4 APPROACHES TO ORGANIC GROWING

There are several ways to approach organic farming, the mode of growing of interest to the Tr'ondëk Hwëch'in First Nation Teaching and Working Farm near Dawson City. Described in this section are three ways to add nutrients to the soil without the use of chemical fertilizers: green manure, composting and companion planting. Please refer to the bibliography in section 6 for a list of reference materials related to organic growing.

3.4.1 Green Manure Application

Green manuring is a nutrient addition regime that utilizes the undecomposed green plant tissue of a plant to improve soil structure, texture and nutrients, primarily nitrogen (Warman, 1980). The organic matter decomposes building an accumulation of humus improving the soil's overall structure. The decomposition process also allows certain macro and micro nutrients to be readily available for the plant to uptake, reducing the dependence on chemical fertilizers. There is no perfect recipe for this management strategy.

The following points are an introduction to some considerations when choosing a cover crop for green manuring (Dalhousie University, 2011):

- *To cover the soil & capture nutrients:* rye, oats, barley, buckwheat, spring wheat
- *For nitrogen fixing:* peas, vetch, lentils, faba beans, clover, alfalfa
- *For disease control:* brown mustard greens, oilseed radish, buckwheat
- *To break up clay:* alfalfa & oil seed radish

3.4.2 Composting

Like green manuring, composting is another management strategy to naturally add nutrients to your soil. Not only does it make nutrients readily available for the plant, but it also increases the soil's water-holding capacity, improving tilth and aeration (Penn State College, 2015). It is the act of recycling nutrients from decomposing organic matter. Waste material including fruits, vegetables, leaves grass clippings and egg shells can be added to a compost pile; most all organics can be added less bones and meat residues. Animal tissue can be added to a compost mix, but must reach a heightened temperature in order to kill bacteria that could be harmful to the development of the plant and potentially affect human health. Aeration is one of the most important parts of the decomposition process. A compost pile must be turned on a regular basis to aide in the breakdown of organics. Rich humus is the result of a fully developed media for growing.

3.4.3 Companion Planting

Companion planting offers physical support to a plant through neighbouring plants, both above and below the surface. This practice also allows for efficient utilization of nutrients in the soil, reducing the chances of over-utilization of available nutrients. Plants each release certain chemicals that may go against their production by attracting certain insects. When specific species are planted together, the risk of an insect infestation is reduced, which lessens the dependence on insecticides. This is a practice that requires the development of a planting map,

which can assist with development of a crop rotation plan for the next planned cycle or season. Whether companion planting or not, it is important to rotate plantings so that the area does not become a nutrient sink or at risk for heightened disease potential.

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