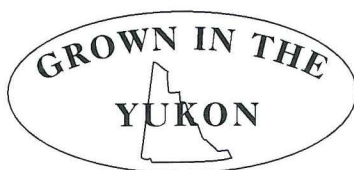
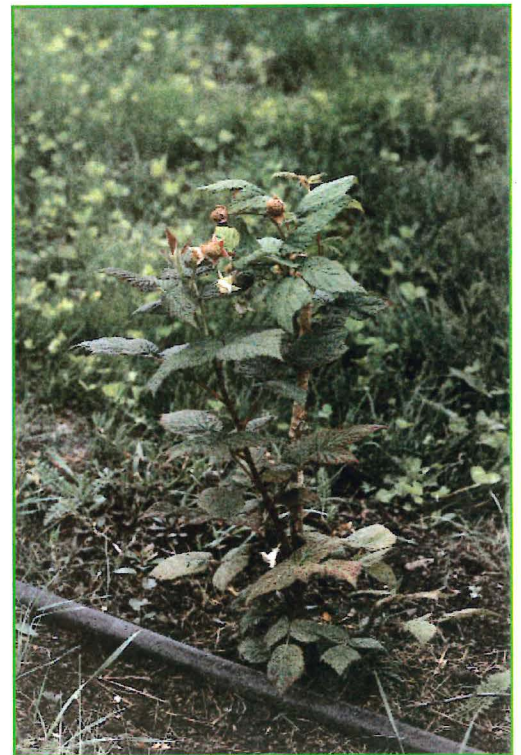


# YUKON AGRICULTURAL RESEARCH AND DEMONSTRATION REPORT

1998 Field Season



**Yukon**  
Renewable Resources  
Agriculture Branch

PR-99-03

# **Yukon Agriculture Research and Demonstration Report**

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Final Report  
1998 Field Season

## **Summary**

### **Forestry Farm Demonstration Plot**

The 1998 growing season was the fourth in a four year soil improvement trial undertaken at the Takhini Forestry Farm. The purpose of this trial is to determine the costs and benefits of conserving and building soils through a rotating series of plowdown crops. The yield and cost of production were recorded, as well as observations on soil tilth and crop response to the soil conservation procedures.

During the 1998 growing season, the Takhini test plot experienced the highest number of growing degree days and the longest killing frost free period during the four year trial. The agroclimatic rating was Class 4. The plots received minimal precipitation and irrigation was critical for crop establishment and growth.

The level of organic matter in the soil did not change very much over the four years, however, visually the soil tilth and structure did improve to the point where compaction was unlikely. There was also a notable increase in fertility which can be attributed to the return of nutrients to the soil by green manuring with plowdown crops.

Oats proved to be a better plowdown crop than rye because of weed control. The fall rye was sown in early August and each year a large crop of weeds germinated with the rye. Herbicide was required the following spring to stop the weeds from going to seed before the rye was ready to be plowed under. The oat crop reached full biomass before the weeds went to seed, so the weeds became a bonus to the plowdown rather than an expense.

The potato crop was only successful two out of four years, therefore, including more frost tolerant vegetables (cabbage and rutabaga) in the trial in 1996 provided economic diversification resulting in positive returns.

### **McCabe Creek Grain Trials**

The purpose of the grain trials is to provide more information on growth and yield differences between irrigated and non-irrigated grain crops in central Yukon. The two acre trial site is divided into six 1/3 acre plots of wheat, barley and oats on one side under irrigation, and replicate plots without irrigation on the other side.

The agroclimatic rating for the 1998 growing season at McCabe Creek was Class 2. This is two classes above the 30 year average for Carmacks.

Similar to previous years, the irrigated yield was higher than the non-irrigated yield in 1998. Over the four year trial, irrigated grains yielded an average of two and a half to three times more bushels per acre than the non-irrigated grains.

### **Propyzamide Trial to Control Foxtail Barley in Forage Crops**

The purpose of this trial is to test the effectiveness of Kerb 50-W, a herbicide containing propyzamide which controls foxtail barley in pastures and forage crops. Foxtail barley is a short-lived perennial bunchgrass. When in flower, it produces long barbed awns which are unpalatable to livestock. This reduces pasture and forage quality, yield and crop value.

In September 1996, the cooperators applied Kerb 50-W to a one hectare plot. During the summer of 1997, very little foxtail barley was noted in the sprayed area, therefore, in September of the same year, the herbicide was applied to 80 acres of infested hay. Again the Kerb 50-W was generally effective in the control of foxtail barley. The cooperators were also hoping for control of quackgrass, but this did not occur at the rate of application that was used.

### **Raspberry Variety Trial**

The summer of 1998 was the first growing season in a multi-year raspberry variety trial at a farm located on the north side of the Takhini River. The purpose of the trial is to investigate the performance of several varieties of raspberries using various soil amendment techniques. Monitoring of soil reaction to the various amendments will also be recorded with the economic input. This will measure the commercial viability of the amendments.

Soils at the trial site are mainly silt/loam, pH is above neutral and salinity levels range from slightly to moderately saline. In an attempt to lower the alkalinity level of the soil, the trial plot was divided in half and sulfur was applied to the top section.

Six varieties of raspberries were planted in 100 ft rows. Varieties included Kiska, Boyne, Souris, Red River, Double Delight and Honey Queen. Three rows of each variety were planted. Before planting, a commercial farm fertilizer was applied to the first row, an organic fertilizer was applied to the second row, and the same organic fertilizer and shredded peat moss was added to the third row of each variety. A drip irrigation system was used to water the raspberries.

At the end of July, a first year assessment of the plants was undertaken to determine transplant success and the state of the plants as they entered their first winter. Overall, the Boyne and Honey Queen varieties had the greatest

number of healthy plants. The Red River variety had the largest number of dead or unhealthy plants. Since the effects of soil amendments are long term, observations on their effect will not be possible until next year.



**Raspberry Variety Trial**

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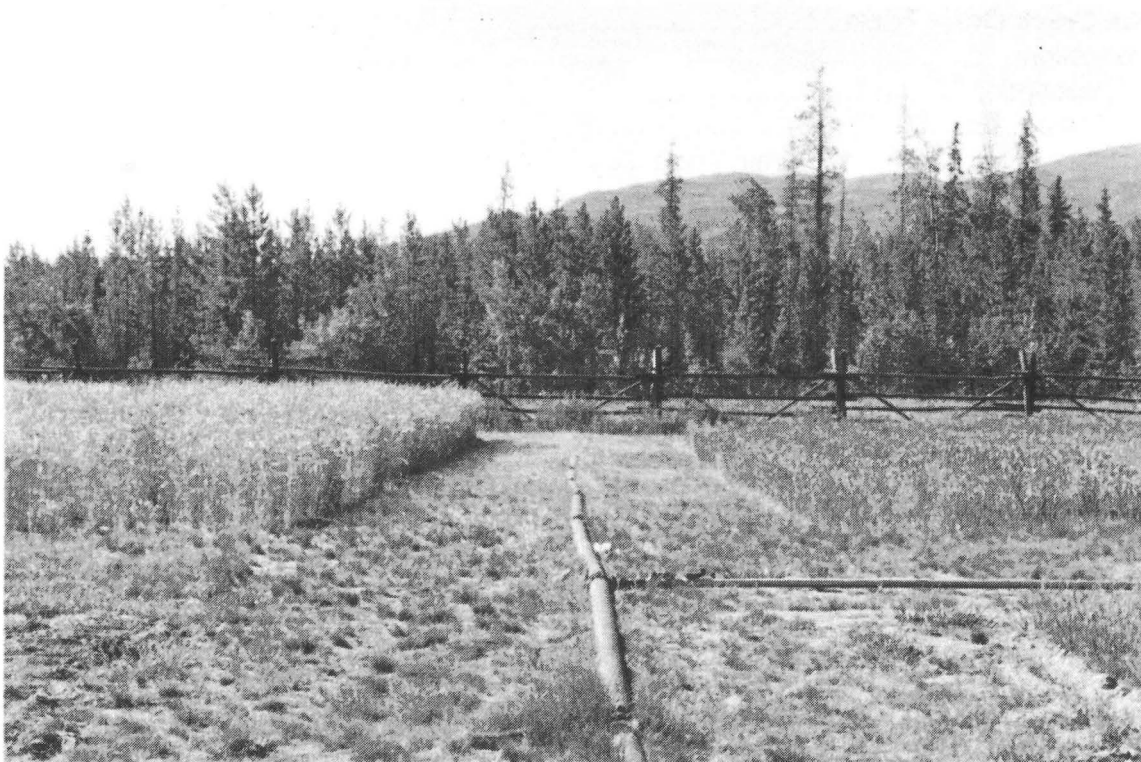
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**Takhini Demonstration Plots**

# **Part 1: Forestry Farm Demonstration Plot**

## **Introduction**

This is the fourth and final report in a series of four annual progress reports describing the agriculture research trials conducted in the Yukon by the Agriculture Branch. This section of the report describes the 1998 field season results and the overall findings of the soil conservation trials undertaken at the Takhini Forestry Farm demonstration site.

The demonstration plots are located on a level, sheltered 0.98 hectare field which is divided into four plots. All crops are grown under irrigated conditions. The soil, landscape and climatic properties of the demonstration site are typical of those encountered at many farms in the southwest region of the Yukon.

The goal of the conservation trials is to determine the costs and benefits of conserving and building soils using various crops as plowdowns. Local growers will be able to use this information to increase soil organic matter which will improve soil tilth and water-holding capability.

## **Soil Improvement Trial Objectives**

This four year soil conservation trial has the following objectives:

1. To monitor changes in nitrogen, pH and organic matter levels resulting from annual plowdowns. This will be done using soil test results and visual assessment of soil structure.
2. To monitor the cost of inputs so the economics of building soil resources in the Whitehorse area can be determined.
3. To gain a better understanding of the benefits gained from crop plowdown under Yukon soil and climate conditions.
4. To monitor the performance and yield of a cash crop following a plowdown rotation.

## **Site Description**

### **Agrometeorology**

Climate is the major limiting factor to agriculture in the Yukon because of the short frost free period and lack of heat units during the growing season. Agroclimatic capability ratings are a measure of the degree of limitation imposed by the climate on agricultural production. These ratings are derived from 30 year normal data collected by Atmospheric

Environment Services of Environment Canada, and they represent a measure of the amount of heat available to crops during the growing season. The agroclimatic rating is modified to account for local climate patterns, such as frost occurrences, which affect the length of the growing season. Agroclimatic classes range from Class 1 (no restrictions) to Class 7 (unable to be used for any agricultural purpose; Table 1).

**Table 1**  
**Definitions and Operational Constraints of Land Capability Classes for Cultivated Agriculture in Yukon Territory (Tarnocai et al. 1988, Table 6)**

<b>Class 1</b>	These lands have no significant limitations to use for the production of the full range of common Canadian agricultural crops (none in Yukon). (1400-1600 GDD)
<b>Class 2</b>	These lands have slight limitations that restrict the range of some crops but still allow the production of grain and warm season vegetables (none in Yukon, based on a 30 year average). (1200-1400 GDD)
<b>Class 3</b>	These lands have moderate limitations that restrict the range of crops to small grain cereals and vegetables (in a few localized areas in Yukon). (1050-1200 GDD)
<b>Class 4</b>	These lands have severe limitations that restrict the range of crops to forage production, marginal grain production and cold-hardy vegetables (valleys of central Yukon). (900-1050 GDD)
<b>Class 5</b>	These lands have very severe limitations that restrict the range of crops to forages, improved pastures and cold-hardy vegetables (the most common class of agricultural land in Yukon). (700-900 GDD)
<b>Class 6</b>	These lands have such severe limitations for cultivated agriculture that cropping is not feasible. These lands may be suitable for native grazing. (<700 GDD)
<b>Class 7</b>	These lands have no capability for cultivated agriculture or range for domestic animals.

During the 1998 growing season, the weather station at the Takhini test plot recorded the highest number of growing degrees days (GDD) during the four year trial (Tables 2 & 3). The number of GDD are calculated beginning the fifth consecutive day with mean temperatures above 5°C, and terminated the day after the first killing frost occurring after mid-July. This year, the first killing frost occurred August 12<sup>th</sup> (Table 2). The agroclimatic rating for 1998 was Class 4 (900-1100 GDD), which is suitable for the maturation of oats, barley and rye.

**Table 2**  
**Agroclimatic Data for the 1998 Growing Season at Takhini Test Plots**

Climate Factor	May	June	July	August	Total	Adjusted for Day Length*
Max Temp (°C)	30.6	30.9	34.1	27.7	-	-
Min Temp (°C)	-7.5	-1.5	-0.7	-5.6	-	-
Daily Mean (°C)	10.0	14.8	14.9	11.6	-	-
30 Year Normal	6.7	12.0	14.1	12.5	-	-
Total Precipitation (mm)	5.8	13.9	23.1	14.7	57.4	-
30 Year Normal	12.9	30.7	33.6	37.9	115.1	-
Growing Degree Days (>5°C)	133.7	294.3	305.7	90.1	823.8	972.1
Frost Free Period (0°C)		13 <sup>th</sup>	17 <sup>th</sup>		35 days	
Killing Frost Free Period (-2.2°C)	24 <sup>th</sup>			12 <sup>th</sup>	81 days	

\* The temperature factor is adjusted upward by 18% to account for the boost plants receive from the long hours of daylight north of 60° latitude.

\*\* Whitehorse Airport records a 30 year mean frost free period of 87 days. This is longer than the 1998 frost free period and most others recorded at the Forestry Farm. The airport site regularly receives winds which tend to keep the temperature above freezing, while the forest sheltered nature of the Takhini Valley site reduces air movement, and therefore frosts are more common.

**Table 3**  
**Summary Weather Data from the Takhini Test Plots (1995-1998)**

	1995	1996	1997	1998
Growing Degree Days (>5°C)	728.0	504.0	763.2	823.8
Effective Growing Degree Days (>5°C)	859.0	594.7	900.6	972.1
Frost Free Period (0°C)	44 days	25 days	45 days	35 days
Killing Frost Free Period (-2.2°C)	67 days	50 days	74 days	81 days
Precipitation (mm)	106.6	161.9	124.8	57.4

Although the frost free period was only 35 days, the killing frost free period was 81 days, the longest one during the four years (Tables 2 & 3).

This year, the trial plots received minimal precipitation, only 57.4 mm, well below the 30 year normal of 115.1 mm (Table 2). Irrigation was critical during this growing season for crop establishment and growth.

## Soils

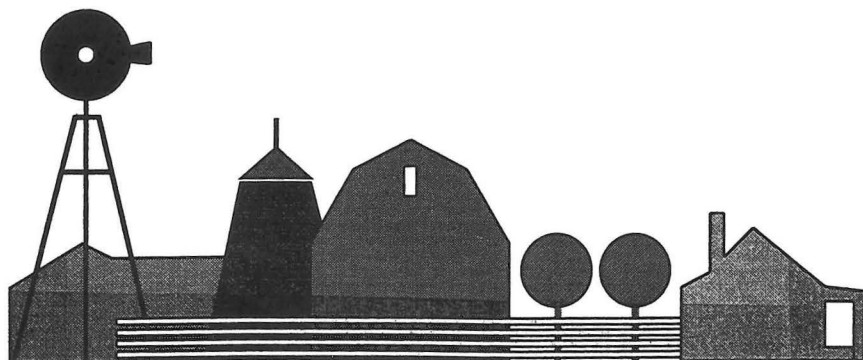
The fine textured soils at the demonstration plot vary from silt loam to sandy loam, and their potential for agricultural production is rated as fair to good. These soils belong to the Lewes soil association and are categorized as loam, with an average particle size breakdown of 42% sand, 47% silt and 11% clay throughout the four fields.

From 1995 to 1998, soil tests indicated that the soil pH in all four plots varied from a high of 7.1 (1996) in Plot 1 to a low of 6.2 (1997) in Plot 4. Over the course of the four year trial, the average soil pH did not change as a result of the plowdowns.

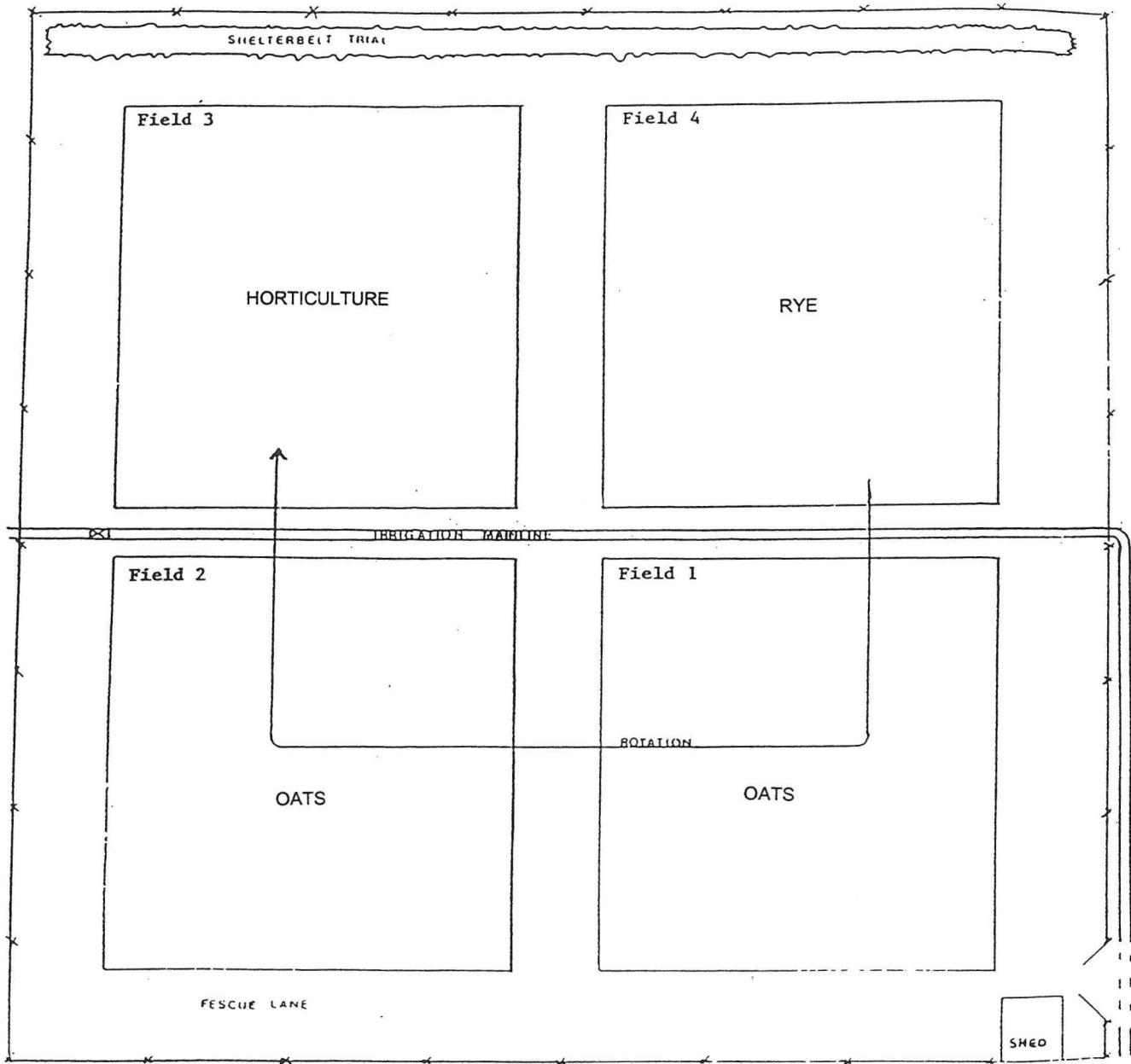
The level of organic matter reported in the soil test results did not change much (+0.3%) during the length of the trial. This result is somewhat surprising because soil tilth and structure did improve, at least visually, to the point where compaction is unlikely. Another noted result of the rotation and plowdown was that soil tests taken in the fall of 1997 showed optimum fertility levels for an oat crop in Plot 2, and lower than average fertilizer requirements in the other plots. The increase in soil fertility can be attributed to the return of nutrients to the soil by green manuring with plowdown crops.

## Site Preparation and Plot Design

The agriculture test plots are located at the Federal Forestry Reserve situated south of the junction of the Klondike Highway and the Takhini Hotsprings Road. The 0.98 hectare trial site is divided into four 40 m x 35 m test plots. The crops grown in each plot are annuals, and each year they are rotated clockwise (Figure 1). All demonstration trials are conducted under irrigated conditions.



**Figure 1**  
**Forestry Farm Plot Layout 1998**



The seedbed was prepared using a six foot rototiller and chain harrows. Grains were drilled into the seedbed using a small plot precision seeder, and fertilizers were broadcast according to soil test recommendations. Horticultural transplanting was done by hand and seeded trials were planted using a precision row seeder.

Weed control in the horticultural trial consisted of rototilling between rows and hand roguing. Hand roguing was also used to remove weeds in the crop rows. One application of MCPA was used on the rye plot for broadleaf weed control on May 27<sup>th</sup>. This controlled the scorpion weed, but not the hawksbeard flowers.

## Soil Improvement Trials

### Trial Description, Results and Plot Design

#### Field 1 - Greenfeed Oats

The oat plot was seeded on May 21<sup>st</sup>, and the crop had germinated by mid June (Table 4). This field was irrigated once soon after it was seeded, and then not again until July 2.

**Table 4**  
**Field 1: Soil Improvement Trial - Greenfeed Oat Trial No. 1**

Plot Design .....	35 x 40 meters
Seedbed Preparation .....	Fall Plowdown, Spring Harrowing
Fertilizer Application.....	None
Seeding Rate .....	100 lb/acre
Seeding Method.....	Precision Plot Seeder
Seeding Date .....	May 21, 1998
Seed Variety .....	Certified AC Mustang
Plowdown Date.....	N/A
Soil Test Date .....	October 1, 1998
pH.....	6.8
Organic Matter .....	1.7%

This oat crop was grown for 113 days from time of seeding to time of sampling which occurred on September 10<sup>th</sup> when the oats were considered to be in the milk to soft dough stage of grain maturity. Sampling of oats occurred 43 days later than it did the previous year. This year's crop was short, and we were hoping for more growth since the *Mustang* oat variety yielded 17% more greenfeed than *Cascade* oats in trials conducted in Alberta (Agri-Fax 1998).

On September 10<sup>th</sup>, the oat crop was randomly sampled for biomass using a 0.5 m<sup>2</sup> sampling frame. Two 0.5 m<sup>2</sup> samples were taken from the plot. When the samples were dried and weighed, they produced 7,147 lb/ac of green manure (Table 5). As fed (containing 5.6% moisture) crude protein tested at 6.7%. When fully dried, the crude protein tested at 7.1% (Table 5).

**Table 5**  
**Field 1: 1998 Oat Harvest Results (bottom right plot)**  
**Cost and Return Summary (per acre)**

<b>Cost:</b>	<b>Oats</b>
Seed Cost	\$38.70
Fertilizer	None
Irrigation	\$45.00
Fuel and Equipment Cost	\$45.00
Total Cost	\$128.70
<b>Return:</b>	
Total Harvest @ 5.6% Moisture	7,147 lb/ac
Calculated Harvesting Loss	10%
Marketable Harvest	6,432 lb/ac
Selling Price	\$5.00 per 50 lb bale
<b>Gross Return:</b>	\$643.23/ac
<b>Net Return:</b>	\$514.53/ac

In 1997, oats were grown in this field as a soil improvement plowdown. This year's soil test results showed a pH of 6.8 and an organic matter content of 1.7%.

Field 2 - Greenfeed Oats

This oat plot was seeded on May 21, irrigated on June 10, and the crop had germinated by mid June (Table 6).

**Table 6**  
**Field 2: Soil Improvement Trial - Greenfeed Oat Trial No. 2**

Plot Design .....	35 x 40 meters
Seedbed Preparation .....	Fall Plowdown, Spring Harrowing
Fertilizer Application .....	56-0-20 lb/acre, N-P-K
Seeding Rate .....	100 lb/acre
Seed Variety .....	Certified <i>AC Mustang</i>
Seeding Date .....	May 21, 1998
Seeding Method .....	Precision Plot Seeder
Plowdown Date .....	N/A
Soil Test Date .....	October 1, 1998
pH .....	6.9
Organic Matter .....	1.9%

This oat crop was grown for 113 days from time of seeding to time of sampling which occurred on September 10<sup>th</sup> when the oats were considered to be in the milk to soft dough stage of grain maturity. Again, sampling of oats occurred later than the previous year because the oats were small and expected to grow more.

On September 10<sup>th</sup>, the oat crop was randomly sampled for biomass using a 0.5 m<sup>2</sup> sampling frame. A total sample of 1.0 m<sup>2</sup> was taken from the plot. When the samples were dried and weighed, they produced 6,629 lb/ac of green manure. As fed (containing 5.6% moisture) crude protein tested at 7.6%. When fully dried, the crude protein tested at 8.1% (Table 7).

**Table 7**  
**Field 2: 1998 Oat Harvest Results (bottom left plot)**  
**Cost and Return Summary (per acre)**

<b>Cost:</b>	<b>Oats</b>
Seed Cost	\$38.70
Fertilizer	\$40.00
Irrigation	\$45.00
Fuel and Equipment Cost	\$45.00
Total Cost	\$168.70
<b>Return:</b>	
Total Harvest @ 5.6% Moisture	6,629 lb/ac
Calculated Harvesting Loss	10%
Marketable Harvest	5,966 lb/ac
Selling Price	\$5.00 per 50 lb bale
<b>Gross Return:</b>	\$596.61/ac
<b>Net Return:</b>	\$427.91/ac

In 1997, the horticulture crops were grown in this field as a cash crop following the soil amendment plowdown rotation. Soil test results for 1998 showed a pH of 6.9 and an organic matter content of 1.9%.

#### Summary of Greenfeed Oat Trial

Since 1996, greenfeed oats have been included in two of the four plots in the soil improvement trials. Under irrigation, crops ranged from 5,000 to 7,000 pounds of green manure per acre (average of 6,487 lb/ac) based on a 90-100 lb/ac seeding rate (Table 8). Input costs ranged from \$128.00/ac to \$227.00/ac depending on fertilizer requirements and if the field was fertilized to soil test recommendations for a soil improvement crop. The benefits of plowing the crop into the soil included improved soil tilth and texture, and a nutrient kick worth up to \$100/ac in improved soil fertility.

**Table 8**  
**Average Oat Harvest Results (1996-1998)**  
**Cost and Return Summary (per acre)**

<b>Cost:</b>	<b>Oats</b>
Seed Cost	\$38.85
Fertilizer	\$72.83
Irrigation	\$45.00
Fuel and Equipment Cost	\$45.00
<b>Total Cost</b>	<b>\$201.68</b>
<b>Return:</b>	
Total Average Harvest	6,487 lb/ac
Calculated Harvesting Loss	10%
Marketable Harvest	5,838 lb/ac
Selling Price	\$5.00 per 50 lb bale
<b>Gross Return:</b>	<b>\$583.81/ac</b>
<b>Net Return:</b>	<b>\$382.12/ac</b>

Field 3 - Horticulture Crops

The rutabagas and potatoes were seeded, and the cabbages were transplanted on May 26<sup>th</sup> and 27<sup>th</sup> (Table 9). The horticulture crops were harvested on September 8<sup>th</sup> and 9<sup>th</sup>. In 1997, oats were grown in this plot. This year's soil test showed a pH of 6.8 and an organic matter content of 1.6% (Table 9).

**Table 9**  
**Field 3: Soil Improvement Trial - Horticulture Crops**

Plot Design	35 x 40 meters
Seedbed Preparation	Fall Plowdown, Spring Rototilling
Fertilizer Application	16-1-12 lb/acre, N-P-K
Seed Varieties:	
Potatoes	Russet Burbank
Cabbage	Survivor, 5 week transplants
	Multikeeper, 5 week transplants
Rutabaga	Thompson
Seeding Date	May 26-27, 1998
Planting Methods	Hand, Precision Row Seeder
Harvest Date:	
Potatoes	September 8, 1998
Cabbage	September 8, 1998
Rutabaga	September 9, 1998
Soil Test Date	October 1, 1998
pH	6.8
Organic Matter	1.6%

The same two late varieties of storage cabbage grown in 1997 were grown again in 1998. Approximately 20% of the cabbage failed to reach maturity this year as opposed to 30% in 1997. However, the heads were much smaller in 1998 and the marketable harvest and gross return were considerably less than in 1997 (Tables 10 & 11). The 1997 marketable harvest was 23,052 lb/ac compared to only 9,200 lb/ac in 1998.

**Table 10**  
**1998 Horticulture Harvest Results**  
**Cost and Return Summary (per acre)**

<b>Cost:</b>	<b>Potatoes</b>	<b>Cabbage</b>	<b>Rutabaga</b>
Certified Seed	\$1,380.00	\$1,650.00	\$350.00
Fertilizer	\$159.00	\$159.00	\$159.00
Irrigation	\$105.00	\$105.00	\$105.00
Fuel and Equipment	\$45.00	\$45.00	\$45.00
Thinning	-	-	\$200.00
<b>Total Cost</b>	<b>\$1,689.00</b>	<b>\$1,959.00</b>	<b>\$859.00</b>
<b>Return:</b>			
Total Harvest	11,748 lb/ac	11,499 lb/ac	10,111 lb/ac
Cull and Undersize	40%	20%	10%
Marketable Harvest	7,049 lb/ac	9,200 lb/ac	9,100 lb/ac
Selling Price	\$0.40/lb	\$0.25/lb	\$0.15/lb
<b>Gross Return:</b>			
	\$2,819.60/ac	\$2,300.00/ac	\$1,365.00/ac
<b>Net Return:</b>			
	\$1,130.60/ac	\$341.00/ac	\$506.00/ac



**Takhini Demonstration Plots**

**Table 11  
Horticulture Summary Data (1995-1998)**

	<b>Potatoes</b>	<b>Cabbage</b>	<b>Rutabaga</b>
<b>1995</b>			
Total Harvest			
Cull & Undersize			
Marketable Harvest			
Net Return	\$-309.00/ac	Not planted	Not planted
<b>1996</b>			
Total Harvest	10,758 lb/ac	16,962 lb/ac	9,926 lb/ac
Cull & Undersize	75%	10%	20%
Marketable Harvest	2,690 lb/ac	15,266 lb/ac	7,941 lb/ac
Net Return	\$-561.00/ac	\$1,857.50/ac	\$332.12/ac
<b>1997</b>			
Total Harvest	17,160 lb/ac	32,931 lb/ac	30,888 lb/ac
Cull & Undersize	25%	30%	10%
Marketable Harvest	12,870 lb/ac	23,052 lb/ac	27,799 lb/ac
Net Return	\$3,459.00/ac	\$3,804.00/ac	\$3,316.00/ac
<b>1998</b>			
Total Harvest	11,748 lb/ac	11,499 lb/ac	10,111 lb/ac
Cull and Undersize	40%	20%	10%
Marketable Harvest	7,049 lb/ac	9,200 lb/ac	9,100 lb/ac
Net Return	\$1,130.60/ac	\$341.00/ac	\$506.00/ac

The 1998 potato crop produced a marketable harvest of 7,049 lb/ac compared to 12,870 lb/ac in 1997 (Table 11). This season's potatoes were less in number and quite a bit smaller than those harvested in 1997. The 1998 net return was \$1,130.60/ac compared to \$3,459/ac in 1997 (Table 11).

The gross weight of this year's rutabaga crop was approximately three times less than the 1997 crop (Table 11). The seed used during the 1998 growing season was three years old which could have caused the lower germination rate. The crop produced a marketable harvest of 9,100 lb/ac, and the net return was \$506.00/ac (Table 11).

#### Summary of Horticulture Crop Trial

The original design of the horticulture trial was only for potatoes as a cash crop following a rotation of plowdown crops. Due to mid-summer killing frosts in 1995, the horticulture trial was expanded to include cabbage and rutabagas which are more frost tolerant than potatoes. In 1996, this proved to be a wise decision because mid-summer frosts killed the potato crop again, but both cabbage and rutabaga returned a profit.

In 1997, the weather cooperated and all three horticulture varieties yielded very well providing a net return of over \$3,000.00/acre for each variety. A longer frost free period, consistent irrigation, and good timing of both thinning and weed control provided a stress free environment for crop growth.

The 1998 growing season was both the hottest and driest of the four year trial. Irrigation was less consistent resulting in lower yields in both the potato and cabbage crops. The rutabaga seed was three years old and had poor germination in the 1998 trial. Overall, what could have been an excellent year had marginal results due to a few poor management decisions.

Field 4 - Fall Rye

The fall rye crop was seeded on August 8, 1997 and irrigated on August 20<sup>th</sup> of the same year (Table 12). Approximately six inches of growth was recorded prior to freeze-up.

**Table 12**  
**Field 4: Soil Improvement Trial - Fall Rye**

Plot Design .....	35 x 40 meters
Seedbed Preparation .....	Fall Plowdown, Spring Harrowing
Fertilizer Application .....	80-0-0 lb/acre, N
Seeding Rate .....	90 lb/acre
Seed Variety .....	Canada #1, common
Seeding Date .....	August 8, 1997
Seeding Method.....	Precision Plot Seeder
Plowdown Date.....	July 23, 1998
Soil Test Date.....	October 1, 1998
pH.....	6.4
Organic Matter.....	1.4%

Even though there was very little snow cover during the winter of 1997/98, temperatures were moderate and very little winter kill occurred. Along with the overwintered rye crop, scorpion weed and narrow leafed hawkweed rosettes also overwintered in abundance. MCPA herbicide was applied to the plot at the highest rate recommended on May 27<sup>th</sup>. Control of scorpion weed was successful, but the hawksbeard was not controlled. The rye plot was not fertilized in 1998, and the crop was irrigated once in early June.

Two 0.5 m<sup>2</sup> samples of rye were taken on July 23<sup>rd</sup>, and the rye was plowed under the same day. When the samples were dried and weighed, they produced 5,337 lb/ac of green manure (Table 13). As fed (containing 5.8% moisture) crude protein tested at 8.8%. When fully dried, the crude protein tested at 9.3%.

**Table 13**  
**Rye Harvest Results (1996 & 1998)**  
**Cost and Return Summary (per acre)**

<b>Cost:</b>	<b>Rye (1996)</b>	<b>Rye (1998)</b>
Seed Cost	\$30.00	\$30.00
Fertilizer & Herbicide	\$59.50 & \$19.50	\$72.00 & \$20.74
Irrigation	\$45.00	\$45.00
Fuel and Equipment Cost	\$45.00	\$45.00
Total Cost	\$199.00	\$212.74
<b>Return:</b>		
Total Harvest	4,600 lb/ac	9,883 lb/ac
Calculated Harvesting Loss	10%	10%
Marketable Harvest (straw only 60%)	2,484 lb/ac	5,337 lb/ac
Selling Price	\$5.00 per 50 lb bale	\$5.00 per 50 lb bale
<b>Gross Return:</b>	\$414.00/ac	\$533.67/ac
<b>Net Return:</b>	\$215.00/ac	\$320.93/ac

Summary of Fall Rye Trial

When comparing fall rye with oats as soil improvement plowdown crops, the main difference for our trial was weed control. The fall rye was sown in early august, and each year a hefty crop of biennial weeds germinated with the rye crop. Once these weeds were established, the added input of herbicide was required to stop them from reaching maturity and going to seed before the rye was optimum for plowdown. The oat crop seemed to reach full biomass potential before the biennial weeds went to seed, so the weeds became an added bonus to the plowdown rather than an expense. Yields and costs in the production of rye versus oats were otherwise comparable.

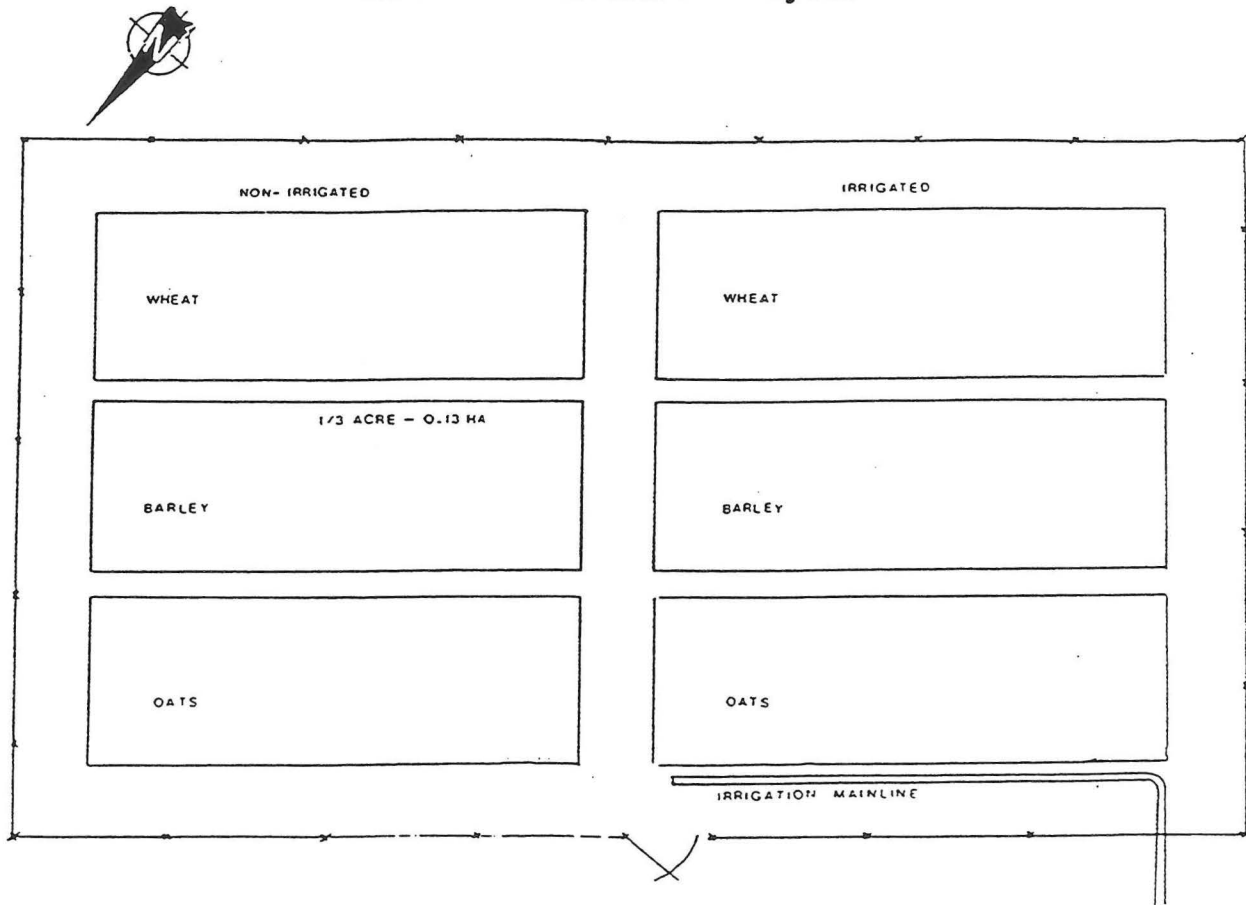
## **Part 2: Cooperative Research and Demonstration Trials**

### **McCabe Creek Grain Trials**

#### **Introduction**

The 1998 growing season was the fourth year in a multi-year grain trial at the McCabe Creek Farm located 65 km north of Carmacks. The two acre site is divided into 1/3 acre plots of wheat, barley and oats on one side under irrigation, and replicate plots without irrigation on the other side (Figure 2).

**Figure 2**  
**McCabe Creek Farm Plot Layout 1998**



The purpose of this trial was to compare the growth and yield of grains produced under irrigated and non-irrigated conditions. Irrigation water for this trial comes from McCabe Creek located within 120 m of the test plots.

### **Site Description**

McCabe Creek Farm occupies the nearly level fluvial deposits of the Yukon River. Fields slope gently towards the Yukon River which is located on the farm's southern boundary, and McCabe Creek flows along the farm's western boundary. The soils belong to the Midway Lodge association and are classified as Orthic Brunisol. Surface soil textures range from sandy loam to silt loam, and sub-soil texture varies from sand to gravelly-sandy loam. Soil pH averages 7.0 throughout the site. The ash layer at the crop demonstration site generally varies from 5 to 10 cm, but may reach 20 cm in depressions.

The climate described in the 1995 and 1996 demonstration reports was based on weather data from Carmacks. To overcome the variability of climate over small areas, the

Agriculture Branch established a weather station at McCabe Creek Farm in May 1997. However, 30 year normals and precipitation data still come from Carmacks. The on-site weather station was installed in the southeast corner of the test plots. Electronic sensors measured soil temperature at a depth of 15 cm, and ground surface and air temperatures at 5 cm and 1.5 m above the ground respectively. The data was used to calculate daily average air, ground surface and soil temperatures, and to calculate effective growing degree days (EGDD) for the site (Table 14).

**Table 14**  
**Agroclimatic Data for the 1997 Growing Season at McCabe Creek Farm**

Climate Factor	May	June	July	August	Total	Adjusted for Day Length*
Max Temp (°C)	32.1	32.4	34.3	28.4	-	
Min Temp (°C)	-3.7	1.7	4.0	-4.6	-	
Daily Mean (°C)	12.9	15.9	17.5	13.0	-	
30 Year Normal (Carmacks)	7.2	12.9	14.8	12.5	-	
Total Precipitation (mm; Carmacks)	12.5	32.4	25.4	25.8	96.1	
30 Year Normal (Carmacks)	20.1	34.5	55.1	39.4	149.1	
Growing Degree Days (>5°C)	191.5	326.1	387.4	230.4	1135.4	1362.5
30 Year Normal (Carmacks)	68.0	237.0	301.0	229.0	835.0	1002.0
Frost Free Period	16 <sup>th</sup>			18 <sup>th</sup>	95 days	
Killing Frost Free Period	14 <sup>th</sup>			26 <sup>th</sup>	105 days	

\* The temperature factor is adjusted upward by 20% to account for the boost plants receive from the long hours of daylight north of 61° latitude.

After adjusting growing degree days to effective growing degree days, the agroclimatic rating for the 1998 growing season was Class 2 (1362.5 EGDD), which is suitable for the production of grain and warm season vegetables. This is two classes above the 30 year average for Carmacks, which averages 1002.0 EGDD.

### Grain Trials

The purpose of this trial is to compare the growth and yield of wheat, barley and oats under irrigated and non-irrigated conditions in central Yukon. Both irrigated and non-irrigated yields for the past four growing seasons are shown in Tables 15 and 16. Similar to previous years, the irrigated yield was higher than the non-irrigated yield of grain in

1998. Over the four year trial, irrigated grains yielded an average of two and a half to three times more bushels per acre in all types, compared with non-irrigated grains.

**Table 15**  
**Yield Data - Irrigated Grain Trial**

Grain	Seeding Rate (lb/acre)	Yield 1998 (bu/acre)	Yield 1997 (bu/acre)	Yield 1996 (bu/acre)	Yield 1995 (bu/acre)	Central Yukon Trials 1987-1991
Barley <i>Johnson</i>	90	32 (AC Albright)	72	26	63	9 to 57
Oats <i>Cascade</i>	90	82 (AC Mustang)	145	47	137	24 to 178
Wheat <i>Roblin</i>	90	17	65	16	45	9 to 46

**Table 16**  
**Yield Data - Non-Irrigated Grain Trial**

Grain	Seeding Rate (lb/acre)	Yield 1998 (bu/acre)	Yield 1997 (bu/acre)	Yield 1996 (bu/acre)	Yield 1995 (bu/acre)	Central Yukon Trials 1987-1991
Barley <i>Johnson</i>	90	22 (AC Albright)	47	11	-	9 to 57
Oats <i>Cascade</i>	90	27 (AC Mustang)	116	16	-	24 to 178
Wheat <i>Roblin</i>	90	15	32	2	-	9 to 46

" - " crop not harvested due to low sample yields

The 1998 growing season was characterized by low soil moisture in the spring and a poorly functioning irrigation system throughout the summer. Crop yields in the irrigated trial followed the water line. The oats received the most water and yielded three times as much as the non-irrigated oats; barley, which was in the middle, yielded one and a half times more than the non-irrigated barley; and the wheat at the end of the line showed yields similar to the non-irrigated trial because the irrigation water rarely got that far.

### Summary of McCabe Creek Grain Trials

Overall, the demonstration served its purpose, and the cooperator invested in a wheel line irrigation system after the second year of the trial. According to our trial, even when the non-irrigated grains produced a crop, yields were lower than irrigated grains, and grades were lower due to inadequate moisture during the growing season. Irrigation is the only way to ensure consistent quality and quantity of grain production in central Yukon.

## Herbicide Trial to Control Foxtail Barley in Forage Crops

Foxtail barley (*Hortem jubatum*) continues to be one of the most economically destructive weeds forage producers in the Yukon have to deal with. When in flower, foxtail barley produces long barbed awns unpalatable to livestock. This reduces pasture and forage quality, yield, and crop value.

Controlling grass weed species in a stand of forage grasses is not easy. Manual roguing is only effective on small patches, burning may destroy viable seed but not the established plant, and chemical controls must be highly selective. The only herbicide recommended in the Saskatchewan Agriculture Crop Protection Guide for the control of foxtail barley in established bromegrass or grass/legume pastures is Kerb 50-W.

Kerb 50-W, with the active ingredient propyzamide, is applied in the fall with ground spraying equipment. Rainfall or irrigation following the application of Kerb 50-W is required to wash the herbicide into the root zone as root absorption is the primary mode of uptake. Leaf absorption of the herbicide is minimal. Dry soil conditions at the time of weed emergence may result in reduced control. Approximately three inches of precipitation is required for adequate activation, and best results occur when soil temperatures are low, but above freezing.

The test area is in an established 12 year old field of bromegrass located west of Whitehorse along the Takhini River. Soils are moderately alkaline fine-textured silts and clays with local concentrations of salts occurring throughout the field. Foxtail barley, native alkali grass and glaucous bluegrass appear in patches throughout the field and in the undergrowth below the bromegrass.

In late September 1996, 1.8 kg of Kerb 50-W mixed with 250 liters of water was applied to a one hectare plot with ground spraying equipment. Observations of the field were made throughout the summer of 1997. Very little foxtail barley was noted in the area that was sprayed, and both the bromegrass and the alkali grass appeared to be unaffected by the herbicide. Outside the plot, foxtail barley continued to flourish.

The cooperators in this trial were pleased with the demonstration results, and in mid September 1997 applied the herbicide to 80 acres of foxtail infested bromegrass. The rate of application per acre was 1 kg of herbicide mixed in 400 litres of water.

Results were noted in the summer of 1998. Again, the Kerb 50-W was generally effective in the control of foxtail barley. The cooperators had also hoped to control quackgrass, but this did not occur at the rate of application. The cost of applying Kerb 50-W varies between \$28.00 to \$105.60 per acre depending on the rate of application (1998 suggested retail price; Saskatchewan Agriculture and Food 1999).

# Raspberry Variety Trial

## Introduction

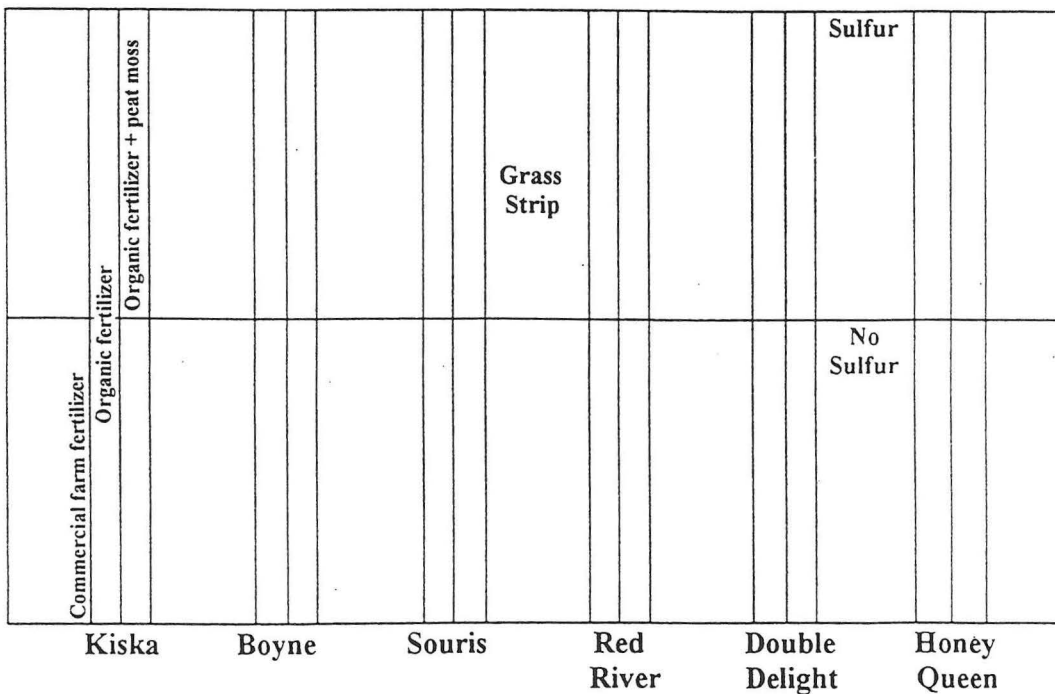
The summer of 1998 marked the first growing season in a multi-year raspberry variety trial undertaken at a farm located on a lower bench on the north side of the Takhini River. The purpose of the trial is to investigate the performance of several varieties of raspberries using different soil amendment techniques. Monitoring of soil reaction to the various amendments will be recorded together with the economic input, which will measure the commercial viability of the amendments. In the long term, practical data on the commercial production of raspberries in southern Yukon's main agricultural belt will benefit the industry.

## Site Description

An automated weather station was installed on the east side of the trial plot, but not enough data was collected during the 1998 growing season to determine growing degree day values.

Soils at the trial site are predominantly silt/loam, pH is above neutral, and salinity levels range from slightly saline (EC 1.5 ds/m) to moderately saline (EC 4-8 ds/m). The site chosen for the trial is approximately one acre in size and is located in the least saline area of the farm. Due to the high alkalinity of the soil at the chosen site, the trial plot was divided in half, and sulfur was applied to the top half at a rate of 795 lb/acre in an attempt to lower the alkalinity level (Figure 3). The bottom half of the plot was left untreated.

**Figure 3**  
**Raspberry Trial Plot Layout**



## Raspberry Trials

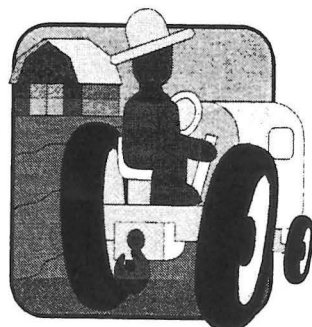
From May 29-31<sup>st</sup>, six different varieties of raspberries were planted in 100 ft rows. Varieties included Kiska, Boyne, Souris, Red River, Double Delight and Honey Queen (Figure 3; Appendix A). Plant spacing is three feet between plants and three feet between rows, with 10 ft grassed mowing strips between the varieties. Three rows of each raspberry variety were planted for a total of 18 rows. Before planting, a commercial farm fertilizer was applied according to soil test recommendations to the first row of each variety. An organic fertilizer was applied to the second row, and the same organic fertilizer and shredded peat moss was added to the third row of each variety (Table 17).

**Table 17**  
**Raspberry Variety Trial - Row Treatments**

ROW	TREATMENTS
1	5 lb 34-17-0 1 lb 0-0-60
2	5 lb 12-0-0 Blood Meal 5 lb 2-14-0 Bone Meal 1 lb 0-0-50-18 Potassium Sulfate
3	5 lb 12-0-0 Blood Meal 5 lb 2-14-0 Bone Meal 1 lb 0-0-50-18 Potassium Sulfate 3.8 cu ft. Shredded Peat Moss

A drip irrigation system is being used to water the raspberries at the site. A two inch gasoline powered water pump is located on the river side at the nearest point to the test plot. This pump brings water to the test plot through approximately 220 m of two inch poly pipe. Two overhead sprinklers were used to germinate the grass mowing strips.

At the end of July, a first year assessment of the plants was undertaken to determine transplant success and the state of the plants as they entered their first winter (Table 18). Overall, the Boyne and Honey Queen varieties had the greatest number of healthy plants, some were even producing first year fruit. The Red River variety did not take very well and had the greatest number of dead or unhealthy plants. Since the effects of soil amendments are long term, observations on their effect will not be possible until next year.



**Table 18  
Raspberry Variety Trial - First Year Assessment**

PLANT VARIETY	NUMBER OF PLANTS*		
	Vigorous Growth	Poor Growth	Dead (plant did not survive transplant)
<b>Kiska</b>			
Row 1	18	9	7
Row 2	19	8	7
Row 3	22	2	10
<b>Boyne</b>			
Row 1	28	4	2
Row 2	29	4	1
Row 3	29	4	1
<b>Souris</b>			
Row 1	24	4	6
Row 2	17	11	6
Row 3	15	12	7
<b>Red River</b>			
Row 1	6	22	6
Row 2	5	6	23
Row 3	6	10	18
<b>Double Delight</b>			
Row 1	14	7	13
Row 2	15	11	8
Row 3	14	6	14
<b>Honey Queen</b>			
Row 1	23	8	3
Row 2	22	12	0
Row 3	24	5	5

\* each row has 34 plants

## References

Alberta Agriculture. 1998. Agri-Fax. January 1998.

Saskatchewan Agriculture and Food. 1999. Guide to Crop Protection.

Tarnocai, C., Smith, C.A.S., and Beckman, D. 1988. Agriculture potential and climate change in Yukon. *In* Proceedings of the Third Meeting of Northern Climate, September 7-8, 1988, Whitehorse, Yukon. Atmospheric Environment Service, Environment Canada, Downsview, Ontario, pp. 181-196.

## Appendix A

### Raspberry Variety Descriptions

**Kiska** - Developed by Dr. Arvo Kallio at the Agricultural and Forestry Experiment Station, Fairbanks Alaska. Kiska raspberries have thin, willowy canes. Under optimum fertility and moisture, canes may easily reach 6-8 feet in height. These canes tend to bend outward and downward making harvesting difficult.

**Boyne** (Chief x Indian Summer) – Developed at the Agriculture Canada Research Station at Morden, Manitoba and introduced in 1960. It is the hardiest and most consistently productive cultivar for the Prairies and the main cultivar for commercial production in all colder regions of Canada and the United States. Canes are medium in height, thick, erect and stocky, with many lateral branches. Fruit is medium sized, dark red, firm, juicy, aromatic and tart. It has very good dessert quality, good frozen quality and is excellent for processing and canning.

**Red River** {[Fall Red x native primocane fruiting type (Cheyenne x Wyoming)] x (Fall Red x Boyne)} – Selected in 1978 at the Agriculture Canada Research Station, Morden Manitoba, Red River fruits earlier than other selections tested. It has medium red berries which are sweet, tart and good. Canes are relatively short and stout with sparse short spines, and grow to a height of 3.5 feet.

**Double Delight** {[Fall Red x native primocane fruiting type (Cheyenne x Wyoming)] x (Fall Red x Boyne)} – Developed by Agriculture Canada Research Station, Morden Manitoba. Double Delight canes are stout with sparse, short spines and grow to a height of 5 feet. The medium red berries are sweet, tart and excellent.

**Souris** – Developed by Agriculture Canada Research Station, Morden Manitoba. An improved selection of Boyne because it is better tasting, a heavier producer of fruit and it has 15% better spider mite resistance.

**Honey Queen** – Introduced by Robert Erskine from Alberta's Rocky Mountain House in the mid-sixties. It is the hardiest of the yellow raspberries. It has good-sized, aromatic berries that have a mild but entirely different flavour than the red berries. The berries are considered soft, and poorly suited to freezing and processing, but are excellent fresh.