Yukon Agriculture 1984

STATE OF THE INDUSTRY

Agriculture Canada

Research Branch

YUKON AGRICULTURE 1984:

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I INTRODUCTION

1983 and 1984 saw intense interest in Yukon agriculture. For the first time in 10 years, acquiring agricultural land became a realistic possibility. Under the impetus of proposed block land transfers, the Agricultural Development Council of the Yukon Government, with the cooperation of Agriculture Canada, continued their appraisial of agricultural lands in Yukon. Equally as important, strides were made in assessing the commercial potential of Yukon agriculture.

At the beginning of 1985 Yukon agriculture has reached a watershed. Major changes will follow the block land transfers. For the first time in nearly a hundred years substantial quantities of land will be brought into agricultural production in Yukon. The objective of this report is to record the condition of Yukon agriculture at this turning point. As such, the scope of the report goes beyond an annual summary of events. The report looks to the recent past (Section II) to characterize the political background to agricultural development. Section III looks to a potential future of Yukon agriculture and tries to demonstrate that under reasonable (and reasonably conservative) assumptions there is room for important growth in the agricultural industry of Yukon.

Section IV catalogues diverse initiatives to develop an agricultural infrastructure while Section V looks at a particular group of experiments that demonstrate productivity and provide useful information about growth conditions in Yukon. Future reports on agriculture will record the continued progress and direction of Yukon agriculture.

II POLITICAL BACKGROUND

On June 10, 1975 the minister of the Department of Indian affairs and Northern Development (DIAND) decreed a moratorium on the development of agricultural lands in the Yukon and Northwest Territories. The ostensible purpose of the moratorium was to allow time for resource inventories to be undertaken to prevent land use conflicts or inappropriate use of northern lands. Agroclimatic and soil surveys were completed within three years (Eley 1977, Rostad et al 1977). These described the potential for agriculture in the north and deliniated on reconnaisance level maps the extent and class of suitable soils. In the Yukon, Native Land Claims land selections and a lack of an agricultural policy were cited as reasons for the continuation of the moratorium. The intent of the moratorium was clearly as a temporary measure, but 10 years later federal lands are still officially closed to new developments in agriculture.

In the interim several Yukon government reports on agriculture were prepared. These included a survey of costs of agricultural production in the territory (Whiting 1980), an uncompleted attempt at a agricultural policy (Resource Planning Branch 1982) and a review discouraging agricultural development due to concerns for wildlife and wildlife habitat (Lortie 1982).

Control of certain lands by the territorial government dates back to the mid-fifties. The block land transfers around Whitehorse and other communities occurred in 1970. It was not until February 1982 that a territorial Agricultural Development Council (ADC) was appointed through legislation and, in May of the same year, the availability of Commissioner's land for agriculture announced. The council was composed of three Yukoners involved in agriculture and functioned in association with the Department of Municipal and Community Affairs, Yukon Lands Office. Applications for agricultural land development were accepted by the Agricultural Development Council for all parts of Yukon, not just Commissioner's Lands, with the understanding that land transfers would occur wherever potential was recognized.

In 1983, a report (Hoyt 1983) completed under contract for DIAND recommended land transfers to facilitate the development of the agricultural industry in areas presently under federal control. In August 1984 the Agricultural Development Council began reporting to the Minister of Renewable Resources rather than the Minister of Municipal and Community Affairs. At the same time, Department of Renewable Resources formed an Agriculture Section which presently has two full-time employees. In December of 1984 the chairman of the ADC, Mr. Paul Fletcher, resigned placing the future of the Council in doubt. The ADC received 160 applications for agricultural land. The new agricultural Section is presently accepting applications.

Agricultural land agreements are confined to Commissioner's Lands, that 400 square miles (approximate) around communities that is administered by the

Government of Yukon. The lands are released by the Lands Office under a five year agreement for sale program. Eighty percent of the land applied for must be considered arable (i.e., Canada Land Inventory Agriculture Capability Class 3, 4 or 5) and two thirds of this arable portion must be cleared and cultivated within the agreement period. The land holder may specify reserve lands at the time of the original application, and may move onto the reserve lands as soon as the original parcel (maximum 160 acres) is considered improved and title is approved.

Yukon Government pressure, the completion of most land selections by Natives, and the election of a national Conservative government in September 1984, has sped up the land transfer process. Transfer areas are defined in the vicinity of all Yukon population centers and are expected to receive approval in 1985. The exact extent of the transfers will not be known until they occur, but agricultural areas will be substantially increased.

An agriculture policy, so long a DIAND requirement for transfer of agricultural land from federal to territorial control, continues to evolve as the applications are processed and the economic potential of Yukon agriculture becomes evident. Initial processing of the applications involves clarification of boundries and the elimination of multiple applications for the same ground. Resolution of conflicts with existing or proposed land uses progressively defines the position of agriculture in the Yukon land use process.

Yukon farmers will gain input on agricultural policy through the recently

created Agriculture Planning Advisory Committee, to report to the Minister of Renewable Resources. The committee is composed of members representing the Yukon Livestock and Agriculture Association and the Department of Renewable Resources. A representative of Agriculture Canada will also sit on the Committee in an advisory role. At the moment, the actual transfer of the land is all that is necessary to officially launch a new era in Yukon agriculture.

III AGRICULTURAL PRODUCTION ESTIMATES:

The question of how large Yukon agriculture can become is of great importance in a start up situation. At present somewhat more than 4000 acreas are in production for grain, forage and vegetables and the Yukon government estimates the total value of all agricultural produce to be valued at 1.3 million for 1984. Only a small proportion of the Territory's demand for these products is presently produced locally. Future land requirements depend on how much agricultural produce can be sold. The most obvious market for Yukon agricultural products is at home. The long term objective of Yukon agriculture is to replace a proportion of the imports of agricultural products which can be produced locally. These products include hardy field vegetables, some greenhouse vegetables, meat products, some grains, and all livestock forage requirements. Production goals are based on the following assumptions.

i) demand for products is based on continuing population of 25,000.

ii) land required for agricultural production will be available.

iii) economic viability will exist within the industry allowing infrastructure and linkages to come into place.

Future production estimates cover two time horizons. The mid-term perspective

covers the next five years and corresponds to the initial agreement period of agricultural development projects. The long term perspective has a time horizon of 15 to 25 years. Present and projected livestock numbers are listed in Table 1, cultivated acreages for the same time periods are graphically illustrated in Figure 1.

Table 1. Present and projected livestock numbers

Livestock	Present (1984)	Mid-term (5 Years)	Long Term (15 - 25 Years)
Horses	2500	2500	2500
Cattle	500	1000	11,000
Hogs	1000	4000	4000
Dairy	40	600	800
Poultry			
Hens	4000	15,000	20,000
Turkeys	500	1000	3000
Fryers	2500	3500	5000

1. Present Agricultural Production (1984)

Supplying hard figures in Yukon Agriculture is not an easy job. There is no census of agrculture for Yukon. These present production figures are therefore estimates based on discussions with those known to be active within the agricultural sector. It does not include vegetable production from backyard gardens and greenhouses for private consumption.

In 1984 there were 25 - 30 full time and approximately 75 part-time farms in

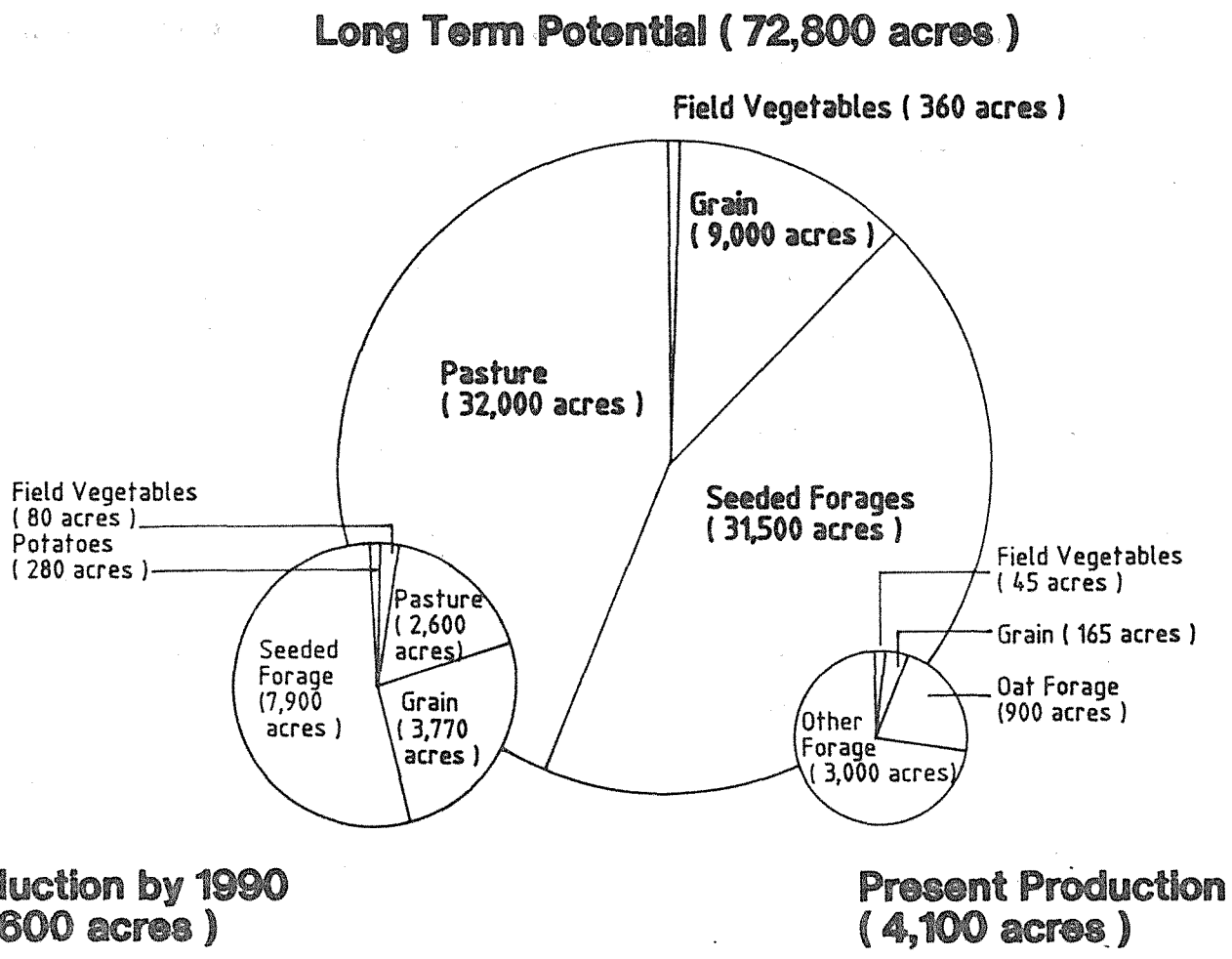

Figure 1: Present and projected acreages of agricultural production in the Yukon Territory

Yukon. Over 90% of present acreage devoted to agriculture is in forage production, the majority in bromegrass and well adapted annual forages (Figure 2).

Field vegetables and grain make up much smaller areas and are both activities that can be expanded significantly in the near future (Figure 3 - 5). Most livestock feed is for the 2500 odd horses presently estimated for the territory. These are primarily from the outfitting industry as well as some hobby horses. Poultry presently exists at commercial levels and can be expanded in the short term to fullfill local demands. Diary and beef cattle numbers are presently very low.

2. Mid-Term Prospective: The Next Five Years

Under the terms of the agricultural agreements approximately 12,000 additional acres will come into production in the next 5 years (up to 1990).

The rate that land will be brought into production will, in fact, vary widely. At the same time, the exact emphasis in production on the part of the producer cannot be predicted. The estimates for land requirements in the first five years assume that farmers will concentrate on fulfilling all forage requirements for the existing livestock market (mostly horses), and that a modest start in the dairy industry occurs.

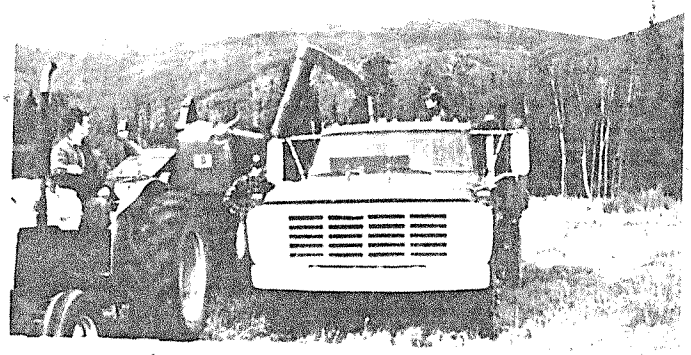

Figure 2 (left). Excellent stand of bromegrass in the Watson Lake area. Bromegrass is the principal perennial forage grown in the Yukon on class 5 land.

Figure 3 (right). Harvesting mature barley in the Klondike Valley. Production of grain is possible in the major river valleys of central and southeastern Yukon on class 3 and 4 land.

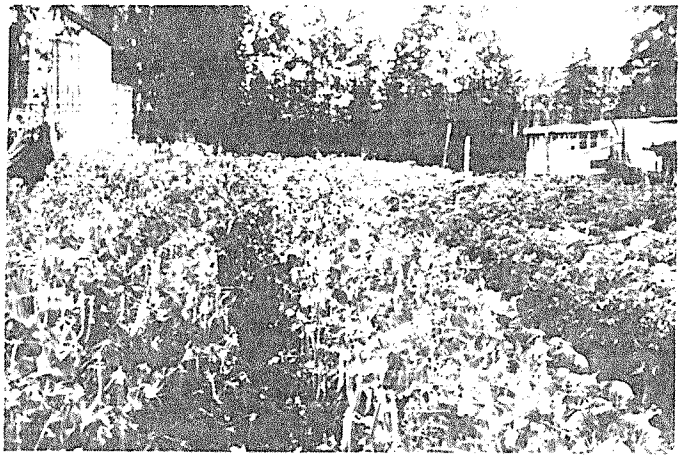

Figure 4 (left). Lush vegetable garden in the Sunnydale area near Dawson City. Farms in this area once provided produce to feed tens of thousands in the Klondike during the gold rush at the turn of the century.

Figure 5 (right). Garden vegetables, peas and potatoes, photographed at Minto Bridge north of Mayo. As in the Klondike, this area of the Yukon holds potential to produce all the adapted vegetables needed to supply the present market in the Yukon.

Other potentially profitable products in a start-up situation are poultry (especially laying hens) and hogs. Cattle are not included in these initial estimates of required land. The profitability of beef depends on a decrease in the price of hay and grain. Cattle, therefore, represent a future direction (greater than 5 years) for expansion after initial local feed demands are met and the price of feed begins to decline.

This projected expansion aims to replace 10 - 15% of imported products in these areas within the given 5 year time frame. Under these assumptions additional acres needed in the next 5 years are about 9,000. If proposed agreements are fulfilled to the letter, land in production at the end of the first 5 years would exceed projected requirements. This condition provides stimulus to continued expansion of the industry, but also emphasizes that economic production must be the main goal for Yukon.

3. The Long Term Perspective: 15 - 25 years

It is the long term goal of Yukon agriculture to:

i) replace approximately 85% of the currently imported agricultural products which could be grown locally (hardy vegetables; poultry, dairy, and red meat products; livestock grain)

ii) replace 90% of currently imported forage products

iii) supply a further 25% of produce suitable for tourist needs (fresh summer vegetables, eggs and some dairy products)

iv) supply 40% of greenhouse grown vegetables and make such available through the year.

A time horizon of 15 - 25 years is assumed to meet this long term goal. To do so, acreages for field vegetables grains and forages are estimated at greater than 70,000 acres, a 15 - 20 times increase from present levels (Figure 1). The figures for acres of land and numbers of livestock required are calculated based on the domestic market and exclude possible markets in Alaska, the Canadian North Slope, and the Mackenzie Delta area.

Table 2 lists the weight of greenhouse vegetables required to supply 40% of the demand for these items by a population of 25,000. These vegetables could be grown by a number of operators. Lettuce and tomatoes comprize the largest proportion of greenhouse vegetables.

Table 2. Year round greenhouse production for 40% import replacement

Crop	Production (Pounds)
Celery	90,000
Cucumbers	40,000
Lettuce	180,000
Peppers	33,000
Tomatoes	138,000
Radishes	10,900
TOTAL	491,900

The goal of greater than 70,000 acres under production is realistic, but it is

unrealistic to except Yukon agriculture to move from its present small base to the targeted import replacement levels in the near future. Success or failure of the industry will depend on appropriate and adequate government support, development of agricultural services and facilities within the Territory, and economic viability to allow self-sustaining growth.

4. New Applications and Production Potential

Applications still pending, the majority of which are on federal land, represent approximately 50,000 acres of new agricultural land. The majority of the proposed new acreage centers around Whitehorse (66% is within 100 miles of Whitehorse). This pattern reflects the city's large population compared to other Yukon communities. The proposed new agricultural land around Whitehorse is limited to agricultural capability class 5 land. (Class 5 land is regarded as suitable for "perennial forage crops or other specially adapted crops" (B.C. Ministry of Environment 1983), but is not suitable for cereals. The best agricultural land in Yukon is rated class 3 or 4. Such land requires "moderately intensive management practices" or suffers from a "moderately restricted range of crops" (B.C. Ministry of Environment 1983). Class 3 and 4 land is capable of growing grain crops if managed properly. In other words, the bulk of new land proposed for agriculture (83% of this land is Class 5) will be fairly inflexible in terms of productive uses. The major limitation that affects capability class in Yukon is climate. Cool temperatures, short frost-free growing periods and, especially around Whitehorse, low precipitation

are the major climatic constraints. Of these constraints, only moisture deficiencies are easily mitigated.

Of the areas surveyed by Rostad et al (1977), the ratio between Class 5 land and class 3,4 land is approximately 8 to 1 (Table 3). In other words, 8 acres of class 5 land were inventoried to each one of either Class 3 or 4. The applications, however, show a 20 to 1 ratio. Class 3 and 4 land is not being applied for proportionally to its availablity in inventoried areas. The productivity of land increases as the agricultural capability rating improves. Therefore, the ratio of Class 5 to higher class lands provides a very broad measure of the efficiency of the agricultural land selections. Obviously, other factors than agricultural capability affect land applications. Obvious constraints on choosing a higher capability land are knowledge, existing access to land (road building can be prohibitively expensive), and proximity to the major population and service center of Whitehorse.

In areas where class 3 and 4 lands are available (Table 4) the applications show some appreciation of the economic wisdom of choosing the highest capability land available. In the Dawson-Mayo and Carmacks-Pelly regions the bulk of applications fall on Class 3 and 4 lands.

Overall, the predominence of class 5 land selection affects the projected future acreage requirements to a limited degree. Vegetable yields on class 5 land are adequate to meet Yukon agriculture's projected share of the market. Further, it was anticipated that Yukon's agricultural strength will be in the

Table 3. Areal extent and location of agricultural capability classes in the Yukon*

Region	Class 3 and 4	Class 5	TOTAL
Dawson-Stewart Crossing-Mayo	60,200	412,300	472,500
Pelly Crossing- Carmacks	68,500	355,000	423,500
Watson Lake	25,800	516,900	542,700
Faro-Ross River	1,600	78,800	80,400
Whitehorse	----	180,900	180,900
Takhini-Dezadeash	----	311,800	311,800
Total	156,000	1,855,630	2,011,700

*Figures are taken from Rostad et al (1977) and are rounded to nearest 100 acres. This inventory concentrated on major river valleys and areas near existing communities. The totals, therefore, should not be regarded as absolute totals for Yukon as a whole.

Table 4. Approximate acreages of agricultural land applications by region and class.

Region	Land Applications # Of Applicants	Total* Acres	Class 3,4 Land (As % of Total)	Land to Be Into Production In next Five Years Class 3 and 4	Class 5
Dawson-Stewart Mayo	31	6300	51.2	921	560
Pelly Crossing Carmacks	11	5810	52.7	549	268
Watson Lake	4	3100	12.6	84	184
Faro-Ross River	2	350	45.7	84	84
Whitehorse	61	51,350	---	---	4058
Takhini-Dezadeash	40	17,750	---	---	3379
TOTALS	149**	48,610	14	2393	8533

*Includes lands held in reserve for future expansion beyond the initial five year development period

**Total number of applications is between 160 and 170. Some applications are duplicated while others lie outside the regions indicated and are not included in the table.

area of seeded forages and native hays. Even the long term agricultural projection calls for only 9000 acres of required grain production (which needs, by definition, class 3 or 4 land). If all of the class 3 and 4 land currently applied for were brought into production (approximately 6810 acres), it represents greater than 60% of the projected class 3,4 acreage requirement. It is arguble, however, that as agricultural activity increases and competition increases, those with higher capability land, other things remaining constant, will have a definite economic advantage.

IV AGRICULTURAL INITIATIVES IN 1984

1. Land Dispositions

Through the activities of the Agricultural Development Council and the Yukon Department of Community and Municipal Affairs the first lands agreement for agriculture were processed in April of 1983. Thirty-seven dispositions of land totalling just over 4500 acres occurred in 1984. These are in addition to the 26 dispositions of land totalling 2800 acres recorded for 1983. These agreements are confined to Commissioner's Lands.

The original process of application review by the Agricultural Development Council has been replaced by a more formal review by the Land Use Advisory Committee of the Yukon government. It is anticipated that this Committee will undertake application reviews on all future federally transferred lands as well.

2. Yukon Department of Renewable Resources, Agricultural Section

a) Extension Activities

Dick Filteau, the Agricultural Development Advisor (ADA), pursued a wide range

of extentions activities in 1984. The ADA acts as an intermediary and general clearing house for agricultural information pertaining to the north. He receives information on local conditions and passes back information and advice based on 40 years of experience in agriculture and on diverse information sources assembled in 1983-84. Extension activities emphasize the commercial potential in the Yukon agricultural situation

The extension activities include participation in a number of seminars and meetings. Agricultural and garden oriented seminars were held in Whitehorse and Dawson City. Mr. Filteau also attended the Northern Resources Conference in Whitehorse in November and an agricultural symposium in Anchorage in December of 1984.

The ADA disseminates a huge volume of information on soils and soil fertility, chemicals, green housing, building and storage plans, livestock care and homemakeing. During 1984, 120 home and farm visits were made. Over four hundred office visitors and around 1000 telephone calls were received by the Agriculture Section.

As part of efforts to understand Yukon growing conditions, fruit trees and flowering shrubs were brought to Yukon. These included: apple trees, apple crab, crab apple, currants, plums, chokecherry, gooseberry, honeysuckle, roses, lialacs and willows. The ADA also played the key role in the forage and grain trials. The trials are described in Section V of this report.

b) Seminars and Symposia

The Spring Agricultural Seminar was held in Whitehorse and featured George Jones of the Farm Credit Corporation and Dr. Lloyd Spangelo of Beaverlodge Experimental Farm as guest speakers. Dick Filteau, the Agricultural Development Advisor to the Yukon government, and Scott Smith, a pedologist with Agriculture Canada, also presented material at the seminar.

Mr. Jones outlined Farm Credit Corporation (FCC) services to the 80 people attending the seminar. Subsequent to Mr. Jones' visit Brad Choquette was appointed to Yukon as a credit agent for the Corporation. In 1984 the FCC approved agricultural loans in Yukon for the first time.

Dr. Spangelo spoke on the subject of the potential and limitations of northern agriculture. Scott Smith spoke on the nature of Yukon soils for agriculture and Dick Filteau presented an outline of the proposed field crop trials.

The Fall Agricultural Seminar in Dawson City was attended by 55 people and featured a report on Northern Crops delivered by Joe Tsukamoto. Dr. Tsukamoto, who directed the Experimental Farm at Mile 1019, outlined the crops which, in his opinion, are likely to be good producers in Yukon. Besides Dr. Tsukamoto, other speakers were Dick Filteau, who reported intial results from the crop trials, and Scott Smith, who presented a climatologic summary of Yukon's 1984 growing season and related it to crop and soil performance.

The agricultural Symposium 1984, held in Anchorage in December, was the other

major event relating to northern agriculture. Dick Filteau, Al Alcock (president of the Yukon Livestock and Agricultural Association), and Peter Horsnell of Dawson City represented Yukon agriculture at the meeting. The Symposium explored all aspects of the problem of making Alaskan agriculture commercially competitive. Items of interest to Yukon agriculture included a paper on land disposal in Alaska for agricultural purposes, and another on equitable criteria governing loans for agriculture. The confidence and depth of committment of Alaskans is illustrated by their emphasis on both internal and international marketing of their agriculture products. Alaskan agriculture's development has not been without major problems. Hopefully, Yukon agriculture can avoid some of the mistakes made there.

3. Yukon Livestock and Agriculture Association.

The substantial growth of the Yukon Livestock and Agriculture Association (YLAA) reflects the general upsurge of interest in agriculture in recent years. The YLAA increased membership from 48 in 1983 to 140 as of March 1985. The Association formed three chapters to accommodate this growth. Chapters were newly established in 1984 in Klondike, Stewart Valley, and Whitheorse. The YLAA constitution was also revised to reflect the needs of an expanded membership.

YLAA is involved in many aspects of the agricultural scene in Yukon. At the policy level it is part of an Agricultural Advisory Committee of Y.T.G. formulated to review, propose, and recommend on all agricultural matters. YLAA

is also a member of the Wildlife Advisory Board of Renewable Resources.

The approval of the application to the New Crop Development Fund of the Regional Development Branch of Agriculture Canada is a major achievement of the Association. The program means a more comprehensive approach to developing and testing crops in Yukon. The proposed tests will look at the commercial potential of both traditional and new field crops. The proposal calls for three years of tests overseen by a Yukon Implementation Committee. The program will be directed by a general manager hired full-time for the job.

The development program has two advantages for Yukon agriculture. First, new crops that appear suitable in terms of growth characteristics and potential profitability will be actively sought. Second, the capability of running field trials allows a better evaluation of crop response under real growth conditions.

Another important aspect of YLAA is its information and education function. The association is a major sponsor of 4H activities in Yukon. Al Alcock, the association president, attended the Alaskan Agricultural Symposium in 1984 to keep abreast of the Alaskan agricultural scene. The spring and fall seminars, held in Whitehrose and Dawson City respectively, helped to keep members informed on important agricultural developments.

The Farmer's Market, which was held in Whitehorse in August 1984, served the dual role of showing to the public the range of produce available in Yukon and,

equally as important, demonstrated to producers the importance of marketing in increasing the acceptability of Yukon produce. In particular, produce supplies have to be attractive, dependable, and adequate to demand in order to encourage their consistent use.

It is expected that the YLAA will continue to play a key role in representing the concerns and ideas of the agricultural sector to both government and to the general public. A co-ordinated and broad membership ensures continued momentum in the development of this small but expanding local industry.

4. 4-H Yukon

The 4-H program is dedicated to helping young people develop useful leisure and work skills. Project clubs within 4-H Yukon teach horticulture (gardens and houseplant), cooking, wood working and horsemanship. The Horse Club is the largest of the four with 18 members in 1985. Riding lessons, clinics, theory, field trips, summer camp, horse shows, trail rides and a riding program for the disabled all occur under the auspices of the horse club.

Officers of 4-H Yukon have attended several conferences, seminars and workshops to broaden their organizational skills and to garner new ideas for future club directions. The 4-H organizaiton has sponsored trips by members to the Haines Fair in Alaska, to the Pacific National Exhibition in Vancouver and has arranged for a member to spend a week with a 4-H family in Fort St. John.

4-H Yukon enjoys support from Yukon Government Recreation and the Yukon Livestock and Agriculture Association. It will expand its operations in 1985 to include a poultry project and, perhaps, a computor project. From a small beginning 4-H Yukon has steadily increased the scale of its operations. Its growing stronger each year and promises more useful and varied projects in the future.

5. Agriculture Canada - Yukon Soil Survey Unit

The Yukon Soil Survey Unit is a field office of the Land Resource Research Institute of the Research Branch of Agriculture Canada. It was involved in several projects in 1984 related to Yukon Agriculture both directly and indirectly. Besides the agriculture related work, the unit systematically increased its experience with a wide range of Yukon soil conditions.

The Whitehorse area detailed soil survey occupied four weeks of 1984 field season. Over 26,000 acres of land in the Takhini Valley about 30 miles west of Whitehorse were surveyed at a scale of 1:20,000. The map provides a sound base for evaluating agricultural potential and will be used for agricultural land planning (Figure 6). This work was requested by the Yukon Department of Municipal and Community Affairs, and is part of an on-going project to map the soils of Whitehorse North and South planning areas.

A three day reconnaissance survey in the Richardson Mountains was undertaken to

gain appreciation of the range of Yukon soils. This work has generated some interesting questions about the development of soil in high latitude mountainous areas.

The proposed Coal River Springs Park development east of Watson Lake was initially identified by the Yukon government in 1983. In 1984 the Soil Survey Unit at the request of the Yukon Department of Renewable Resources sampled soil parent materials to evaluate engineering characteristics and road building potential on various access routes into the Springs.

Agriculture Canada processed approximately 250 soil fertility samples in 1984. The samples came from both existing and proposed agricultural developments. The Soil Survey Unit also cooperated with the Agriculture Section of Renewable Resources in staging forage and grain trials. The primary work of the unit was to monitor soil nutrients and moisture as crop growth progressed.

The Unit set up soil temperature sensors at 7 locations around the Yukon in 1984 as part of ongoing research into soil climate. The equipment records changes in the soil temperature at different depths over a representative range of Yukon soils and vegetation covers. Two sites are at Eagle Plains, one is in Dawson City, three sites are located near Whitehorse and one is in Watson Lake. Information about temperature is collected in the top 3 feet of the soil. Soil temperature data are used by Agriculture Canada to classify soil types. As well the sites provide data on both the movement and temperature of frost in the soils. Temperature readings over-time across Yukon will help illuminate

Figure 6. Collecting soil cores during soil survey in Takhini Valley. Cores are used to determine soil moisture holding capacities used in assessing agricultural capability and irrigation suitablities.

Figure 7. Digging soil pits in the McArthur Range to examine soil development and glacial history in the central Yukon.

the relationship between soil temperature and seed germination.

One week in July was spent in the Mayo area looking at soil development on different ages of glacial material (Figure 7). This work supplemented research begun in 1983 with the Geologic Survey of Canada. The final outcome of the work will be a map of the complex glacial deposits in central Yukon plus an interpretation of climate changes over the last 2 million years.

6. Farm Credit Corporation (FCC) Activities

The FCC opened its doors to Yukon business for the first time in 1984. Agricultural development is almost invariably an expensive proposition and access to farm credit is a very important step in developing an agricultural support system in Yukon.

At present, farm credit for Yukon is handled by the Edmonton office of the FCC. Brad Choquette was appointed credit agent for Yukon early in 1984. Approximately $250,000 in loans were granted to Yukon farmers in 1984.

V THE CROP TRIALS

1. The 1984 Growing Season

The 1984 growing season was cooler and wetter than "normal" at all localities. Of the 4 major climate stations illustrated (Table 5), Mayo Landing and Watson Lake approximate the 30 year averages most closely. Dawson City and Whitehorse show a more pronounced deviation from normal.

Dawson City, although cooler than usual, did not experience the killing frost in June and July that Whitehorse did. Dawson City also benefited from favorable distribution of the increased rainfall in that excess rain fell in

Table 5. Summary of 1984 growing season in Yukon (May through August)*

Station	Mean Temp.	Temp. Differential From Normal 0°C	Prec. Differ. From Normal (%)	Total Degree Days Above 5° C
Dawson City	11.5	-2.0	+15	784
Mayo Landing	12.5	+1.0	+ 5	917
Watson Lake	11.7	-0.9	+ 6	826
Whitehorse	10.5	-2.9	+13	679

*Data prepared from Environment Canada (1984).

July when crops were in full growth. In Whitehorse the extra rain fell in May and August while June and July were cool and dry. Overall, Whitehorse experienced the least desirable growing season although none of the climate data indicated extraordinary variations from normal.

2. The Forage Trials Results

a) Trial Design

Forage trials were undertaken in Dawson City, Watson Lake, Mayo and Whitehorse. The trials were designed to answer questions relating to:

- the response of forage crops to different rate of fertilizer application.
- typical forage yield
- the food quality of the forage.

Existing farm operations volunteered small parcels of land for the forage trials. Each experimental block consisted of three 15 by 30 foot plots. One plot received no fertilizer, one received the equivalent of 60 pounds of nitrogen and 30 pounds of phosphorus per acre, and the third received twice as much again of the nutrients. Exact rates and types of application were adjusted in some areas to deal with site specific nutrient problems.

Each trial consisted of 4 blocks of plots separated by 5 or more feet. The fertilizer was applied by hand spreader. Two, 1 sq. yard subplots, chosen at

random within each plot, were harvested and yield and yield caluclated on a pounds per acre basis(Figure 8 - 10).

The forage trial results are summarized in Table 6. In every case, except the lone alfalfa stand, application of nitrogen and phosphous produced positive economic benefits (i.e. net returns). With one exception from the Whitehorse area, the higher application of fertilzer produced a diminished response for each dollar spent on fertilizer. The exception was a moist, irrigated soil. This may indicate that lack of moisture limits plants from making the most efficient use of the extra nutrient.

b) Forage Quality

In general, forage quality in Yukon compares well with average values for Alberta and can be considered suitable for livestock feed in most cases. The ideal feed is high in protein and low in fibre. Fibre is the coarsest and least digestable part of the plant. The higher the fibre percentage the lower the Total Digestable Nutrient (TDN) values. TDN is an important consideration if livestock must face a long winter season. Protein values for ruminants are less important because protein can be fed cheaply as a supplement. Non-ruminants, such as horses, will thrive on the highest protein feed available. Table 7 summarizes tests of forage quality.

The protein and fibre content of the forage samples from the Whitehorse area are lower than from other areas. In all areas increased fertilizer applications resulted in higher forage protein contents as well as higher

Table 6. Summary of forage trial results

Region	Forage Type	Fertilizer Application * N	P_2O_5	K_2O	Cost Of ** Fertilizer ($ Per Acre)	Yield Lbs/Acre	Returns (lbs) For $1 Fert. Input	Net Added Returns At 8¢ lb ($) ⊠
Watson Lake		0	0	0	0	2350	---	---
	Brome	60	30	30	65	4950	40	140
		120	60	60	131	7000	31	239
Whitehorse 1		0	0	0	0	1150	---	---
	Brome	60	30	0	58	3900	51	168
		120	60	0	116	7150	59	372
Whitehorse 2		0	0	0	0	1300	---	---
	Brome/	60	30	0	54	2350	19	25
	Alfalfa	120	60	0	109	3000	11	23
Whitehorse 3		0	0	0	0	3250	---	---
	Oats	60	30	0	54	5900	49	160
		120	60	0	109	7850	35	259
Whitehorse 4		0	0	0	0	1185	---	---
	Alfalfa	11	51	0	34	2118	27	40
		11	51	60	56	2040	-3	12
Mayo Landing			0		0	957	0	---
	Brome	60	30	0	54	2873	35	98
Dawson City			0		0	983	0	---
	Brome	30	15	15	29	1891	31	44
		30	15	65	40	1960	6	38

* N = nitrogen, P_2O_5 = phosphate K_2O = potash

** Cost figures assume 64¢ per pound for N, 54¢ lb for P_{205} and 36¢ lb for k_{20}

⊠ .08¢ lb equals $4.00 for a 50 pound bale.

Table 7. Quality of Yukon grown forage and comparison with some Alberta averages.

Location	Forage	Protein(%)	Average Fibre (%)	Estimated TDN
Alberta Average*	Brome	Average 8.8	33.5	----
Watson Lake, 3 samples,site	Brome	Average 11.6 Range 9.2-12.1	35.0	49
Dawson-Mayo 5 samples, 2 Sites	Brome	Average 11.5 Range 6.1-13.9	31.8	53
Whitehorse 9 samples, 3 sites	Brome	Average 7.3 Range 4.9-8.7	27.5	58
Alberta Average*	Alfalfa	Average 16.10	31.4	----
Whitehorse 3 Samples, 1 site	Alfalfa	Average 9.5 Range 8.7-10.5	31.2	----
Whitehorse	Oats	Average 5.8	----	----
3 samples.1 site		Range 4.6-6.7	----	----

*Figures for Alberta average value for brome and alfalfa were supplied by Alberta Agriculture, Agricultural Soil and Feed Testing Laboratory in Edmonton.

forage yields. Nutrient requirements, especially mineral and vitamin requirements, vary according to the type and purpose of the livestock (eg. dairy versus beef cattle; horses versus sheep). The nutrient value of hay will decline with storage. By spring hay that was nutritionally adequate after harvest may be low in minerals and, particularly, vitamin A.

All these complications aside, the nutrient levels of Yukon brome also compare favorably to those quoted for Manitoba (Univ. of Man. 1977, p. 234). If we assume that the Vitamin A levels of Yukon forage, (for which we have no figures), are also comparable to those quoted, then Yukon brome will be adequate feed for most liverstock. This is particularly true as regards TDN. A good practice, however, is to supplement minerals by way of a salt lick. This is especially important in the spring when forage has been stored a long time.

c) Forage Trial Soil Conditions

In all locations bromegrass response to nitrogen and phosphate fertilizer additions were tested. In most cases similar rates of fertilizer were used. Although soil texture (i.e. percentage of sand silt and clay size particles) and soil chemistry varied from site to site similar yields of hay were usually obtained. Most soils are classified as Eutric Brunisols, those on the more moist sites as Humic Gleysols (CSSC 1978).

The soils of S.W. Yukon are alkaline (pH greater than 7.0) and are sometimes saline. The Takhini Valley soils are, for the most part, composed primarily of silts and clays and are stone free. These soils under established brome stands tend to be low in nitrogen (N) and phosphate (P), but are naturally well supplied with potassium (K).

Dawson soils are near neutral (pH approximately 6.5 - 7.0) and are not saline. The Dawson site used for brome trails was rather sandy and stones were common.

After harvesting, soil nutrient values were found to be low (similar to Takhini Valley soils), and there is also a regional deficiency of potassium in these soils as a result of local geology.

The Mayo area trial took place on an acidic, sandy upland soil. Soil values were low for all essential nutrients. As with all other locations, excellent response to fertilizer was observed in the Mayo trial. Finally, at the Watson Lake site moderately acid soils of peaty and sandy character grew excellent bromegrass. Here again, all major elements were in naturally short supply.

In cases where moderate or large amounts of fertilizer N were added to the soil, post growing season fertility analysis indicates that little to none of this remains available to the plant beyond one growing season. Nitrogen is very mobile in the soil and is used by both plants and micro organisms. Phosphate, on the other hand, tends to be held more tightly by the soil and a portion of fertilizer applied P remains available in years following. Such was evident in plots that received P fertilizer. Potassium levels in the fertility analysis tended to reflect natural background levels regardless of the fertilizer additions.

The fact that similar yields and responses to fertilizer were observed in both irrigated and unirrigated trials on such a variety of soils leads to the conclusion that in the north bromegrass is a well adapted crop capable of doing well on all agricultural soils in Yukon.

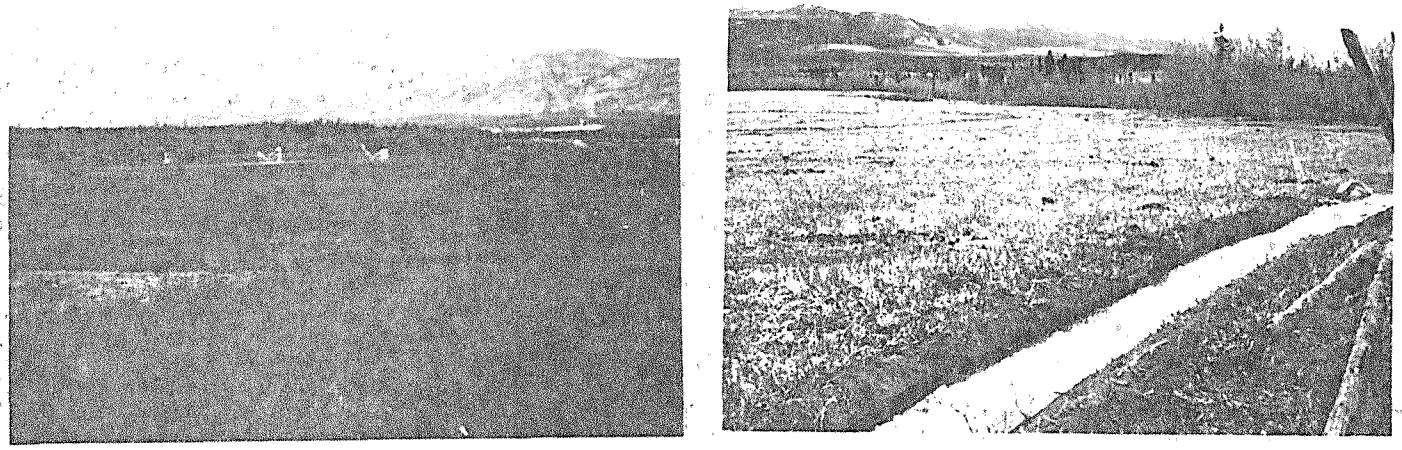

Figure 8 and 9. Irrigated forage crops in the Takhini Valley. Forage crop trials were conducted on bromegrass fertilized and irrigated by sprinkler (left) or flood (right) methods. Stakes visible outline treatment plots.

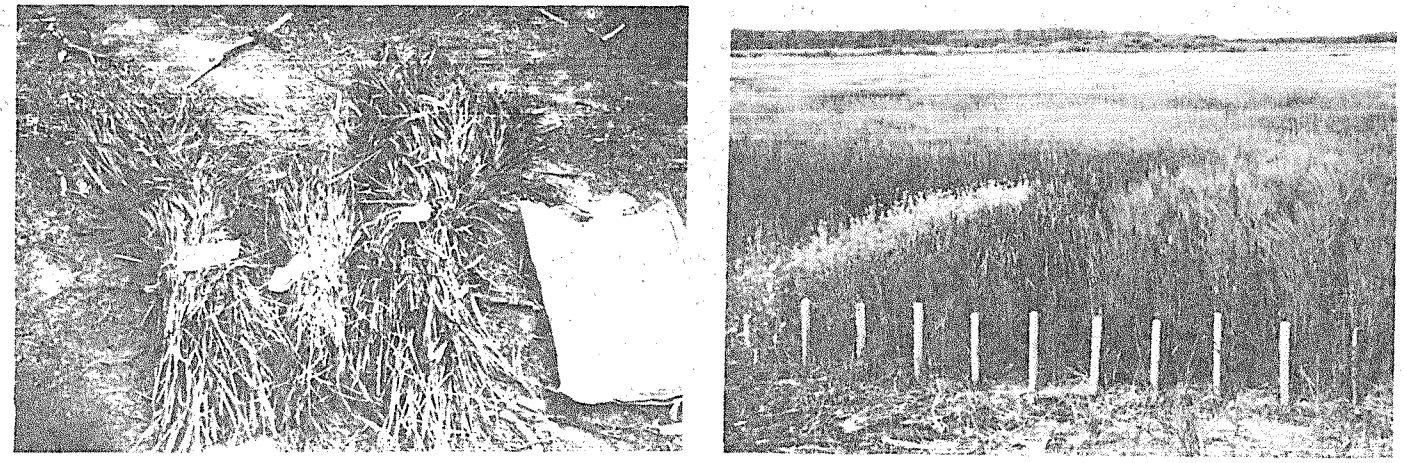

Figure 10. Bundles of bromegrass clipped from fertilized and unfertilized plots show yield effects of added nitrogen and phosphate.

Figure 11. Grain vairety trials, Takhini Valley. Most varieties of wheat, oats, barley and canola did not mature in the trial located on class 5 land.

3. The Grain Trials and Demonstrations

One grain trial and several demonstrations were held in 1984. The difference between the two lies in the elaboratness of the research design. A grain variety trial has several replications to allow for more comprehensive results. Trial results can validly be manipulated statistically while demonstration plots are merely described. Results from both the trial and the demonstrations are outlined in this section.

a) Replicated Variety and Yield Trial: Klondike Valley

The Dawson City area was the site of the only full-fledged grain variety trial in 1984. The trial was planted on May 13 and harvested on September 06. Six varieties of wheat, five of oats, and five of barley were planted in 16.5 foot rows spread approximately 8 inches apart. There was approximately 11 square feet per row. Four rows made up one plot and each plot was replicated four times.

No fertilizer was added for the trial. Soil tests in the spring of 1984 indicated adequate nitrogen levels due to the plow down of pasture. Low levels of phosphorus and potassium were indicated on the test but neither of these nutrients were added.

MCPA Amine formulation 2-4d was administered at an 8oz per acre rate on June 06. It stopped weed growth for 1 week following spraying. During the second week weeds grew vigorously before succumbing in the third week after spraying.

This is an unusual response and there is no explanation for it at present. All varieties of wheat and barley were headed prior to July 1. Otal and Olli barley were ready to swath by mid-August. Otal was superior in both yield and quality. The average yield for Otal over the four plots was 108 bushels per acre. Yields of grain are summarized in Table 10.

Garnet wheat was earliest to ripen while Nepawa and Columbus were the latest. The most vigorous stand of wheat was Park. This trait was visible in the demonstrations as well as the trial; Park wheat also had the highest yield at 55 bushels to the acre.

Of the oat varieties, Cascade and Grizzly performed best. Grizzly matured somewhat later than Cascade. Foothills was last to mature of the 5 varieties planted. Foothills was further notable for its height compared to other oats varieties and, consequently, tended to lodge more easily. Both Cascade and Grizzly yielded approximately 140 bushels per acre.

An unusual observation was that the oat plants remained green after the head ripened. This did not happen with the barley or the wheat. No satisfactory explanation for this phenominon is available.

A canola trial of Tobin and Candle varieties took place at the same time as the grain trials. Due to profuse growth it was not possible to get accurate yield measurements per plot. The canola was ready to swath by August 15.

Table 8. Forage and grain yields of the three best producing varieties of wheat, barley and oats, Klondike Valley, 1984.

Variety	Forage Yield (Lbs/Acre)*	Grain Yield (Bu/Acre)**
Parkwheat	9750	55
Garnet Wheat	3400	25
Ketepwa Wheat	2800	15
Otal Barley	16,450	110
Johnston Barley	17,800	105
Gateway Barley	8,950	70
Cascade Oats	11,800	145
Grizzly Oats	13,650	135
Foothills Oats	11,000	100

* Rounded to nearest 50 pounds
** Rounded to nearest 5 bushels

b) Demonstration Trials Results

Grain demonstration trials were held in the Takhini Valley, Mayo and Dawson City areas. The Takhini Valley site is classified as capability class 5 (Figure 11). The Mayo site is classified as agricultural capability class 3 and the Dawson City site at Sunnydale is capability class 4. Two features were looked for in assessing the value of demonstrated varieties of oats, barley and wheat. First, vigorous growth is desirable to create the largest weight of forage possible and second, the degree of maturity attained by each variety was recorded.

In the Takhini Valley Cascade oats performed best as a green feed crop and was closest to maturity at harvest. This result conforms with the trial results from central Yukon. Other oat varieties lagged noticably in terms of maturity.

The size and hardness of the kernals varied among the 5 strains of barley demonstrated. Otal barley was the only cereal to attain full maturity. Otal had good kernals and exhibited uniform growth. Otal was the best grain variety demonstrated in the Southwestern Yukon. As with the grain trials held in the better growing climate of Central Yukon, Johnston barley was the best green feed variety. The cooperator at this Takhini Valley site had planted Bonanza barley for green feed. This variety provided excellent green feed yield, but did not mature.

The wheat varieties demonstrated were far from mature. A hard frost in July severely limited wheat growth.

Two grain demonstrations were held in Central Yukon. One was held at Dawson City, the other at Mayo Landing. Although both areas enjoy growing conditions similar to the replicated trial site in the Klondike Valley, results were quite different. Both sites, for example, suffered considerable damage from animals. Productivity estimates, therefore, were not made. The Mayo demonstration was so badly damaged that few conclusive observations could be made. Oat and wheat plants were almost totally destroyed. Surviving plants indicated that Otal and Olli barley matured. Diamond, Johnson and Gateway barley suffered frost damage in late dough stage and did not mature.

The Dawson City site of Sunnydale, although also damaged, fared better than that at Mayo. All barley varieties matured. Cascade and Athabasca oats matured while other varieties did not. Undamaged wheat plants indicated that only Park and Garnet wheat matured.

Barley plants matured normally at central Yukon demonstration sites. Oat plants, as was indicated in the grain trial summary, maintained green stems even as the head filled out. Wheat plants progressed rapidly toward maturity up to the late dough stage and then maturation stalled. These latter occurences will be investigated in 1985 trials.

4. The Potato Trial

During the summer of 1984 one potato trial was undertaken at Haines Junction. Potatoes were planted in 100 foot rows spaced 54 inches apart. The plants were spaced 24 inches apart with approximately 9 square feet allotted to each plant. The equivalent of 4800 plants per acre were planted. The variety used was Norland.

Three different fertilizer applications were used while 2 rows were left unfertilized to provide baseline data. Different applications of nitrogen and potassium, side banded to the rows, tried to isolate rate of response to these nutrients. 10 hills were sampled at random from each row. Results are summarized in Table 9.

A frost occurred on August 12 that killed most of the tops. There was some indication of virus infection, but this problem will be eliminated by using either foundation or elite seed in subsequent trials. The field was nonirrigated and conditions were dry during May and June. A depressional area in the centre of the

trial area enjoyed more vigorous growth. This indicates that increased water supply would likely increase yield at this site.

An excellent response of potato yield to complete fertilization was obvious and illustrated the importance of fertility in producing economic yields of potatos on a commercial scale.

Table 9. Potato trial results (on a per acre basis).

Variety	Fertilizer Application	Fertilizer Cost ($)	Marketable* Yield (Lbs)	Yield* Culls	Increase In Yield per $1 Of Fertilizer Input	Added Net Returns (30¢/Lb MKT Price)
Norland	0	0	5450	1450	----	----
	93-77-0	101	8100	1350	26	697
	33-77-90	95	8850	1350	36	921
	93-77-90	133	10,150	1570	36**	1282

* Figures rounded to nearest 50 lbs.
** In this case the increase in fertilizer cost balanced the increase in yield.

VI SUMMARY

There is irony in the rationale behind promoting agriculture in the north. Remoteness, one of the major obstacles to the establishment of the industry in Yukon, is the very factor that allows it to suceed at all. Economic viability, required in order for the industry to expand, is only possible because of the very high transportation costs associated with importing food into the north. Locally grown produce is valuable, much more so than the same items produced in southern Canada. Hence, while the costs of production are higher on Yukon's marginal farmland, the substantial prices received for local agricultural products, particularly vegetables and livestock feed, mean that the industry can thrive in ventures where similar large scale pursuits in the mainstream of Canada's competitive marketplace lose money. Prices received in Yukon for a 50 lb bale of hay ($4-5) or potatoes (50¢/lb) are unheard of in the south.

A difficulty in establishing the industry in the past has been a lack of government support and committment in two areas: the availablity of suitable land and the provision of programs, services, and policy dealing with agriculture. Positive steps are now being taken by the public sector to facilitate development. The impetus now lies with individuals to make a go of it in spite of the climatic and physical difficulties to be endured.

It is important to note that Yukon agriculture, even in the long term, is small scale. The economics of scale, so vital to viability of southern agriculture ventures, do not apply in this instance. The strategy of Yukon agricultural development is to supply the small local market, to enhance existing lines of products available in food stores, to diversify an economy based on few industries (mining and tourism), and to tap the market created each summer by the hundreds of thousands of tourists passing through the territory by making available to them specialty items grown in the land of the midnight sun.

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