Conservation LEARNING CENTRE

Results 1994

Ducks Unlimited Canada

CANADA'S GREEN PLAN

SSCA

SASKATCHEWAN SOIL CONSERVATION ASSOCIATION

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A. Introduction

In the spring of 1993, the Conservation Learning Centre was established south of Prince Albert, Saskatchewan. It is a demonstration farm which focuses on farming practices which conserve soil, water and wildlife in the Parkland region.

The site consists of 3 quarter sections of land, used for a variety of purposes. These purposes include demonstrations, research, and student activities relating to three primary areas of interest which are direct seeding, forages, and shelterbelts.

The Conservation Learning Centre (CLC) is meant to be a learning place, for all ages and all levels of expertise. For example, researchers are invited to establish applied research plots or benchmark testing at the Centre. Producers are given the opportunity to learn about the research and demonstration results through summer tours, winter workshops, and the media. Youth are also invited, with their teachers, to visit the Centre for tours and learning activities which are designed to teach about conservation strategies.

B. Acknowledgements

A partnership of producers, government and non-government organizations, and industry has made this project possible. Throughout this report, sponsorship is acknowledged for support of specific projects. The CLC is grateful for the support of its three founding partners, Canada's Green Plan through Agriculture and Agri-Food Canada, Ducks Unlimited Canada, and the Saskatchewan Soil Conservation Association. Also, thanks to the many hours of work that the steering committee members have invested in the project:

Producers:	Marv Fenrich, Wilkie (chairman) Stewart Adams, Birch Hills Ed Beauchesne, Albertville Wyett Meyers, Meath Park Eric Pankratz, Foam Lake Terry Pearse, Tisdale
Agency Representatives:	Roy Button, Barry Swanson, Sask. Ag. and Food Phil Curry, Lee Moats, Ducks Unlimited Canada Jason Fradette, P.F.R.A. Adrian Johnston, Agriculture and Agri-Food Canada Al Raine, Crop Protection Institute Jeff Schoenau, University of Saskatchewan

1994 Staff:	Manager	Patricia Flaten
	School Program Coordinator	Joan Detillieux
	Summer Assistant	Barb Podhorodeski

C. Annual Crops Projects

1. ALTERNATIVE ANNUAL CROPS GARDEN

Purpose: Producers have shown a tremendous interest in the production of any new crop in Saskatchewan. They are mainly looking for any crop that has the potential to provide higher return per acre than wheat or barley. These crops may have benefit to all producers, but particularly in a direct seeding situation, the importance of good crop rotations calls for the consideration of a wide variety of crops. The purpose of the project is to demonstrate 45 different crops which may be of interest to farmers in the Parkland area, allowing producers to observe crop establishment, growth and maturity characteristics.

Fertilizer: No fertilizer applied

Pesticides: No pesticides used

Discussion: as provided by Roy G. Button, Soils and Crops Agrologist, Sask. Ag. & Food, Tisdale.

To evaluate new crops, two major factors to look at are markets and adaptability. Non-traditional crops such as herbs and spices often.do not have established markets. They may require alot of time, planning and research to locate markets. Market research should be done before production of the crop.

Climate is the major factor that restricts the adaptability of crops in Saskatchewan. Our cool, short season with limited frost free periods restricts the crops that can be grown. In northern Saskatchewan we only have 95 to 110 frost free days. Heat is often a limiting factor as expressed by a corn heat unit rating of approximately 2100 at Prince Albert. Crops that will reach maturity within our climate conditions is a major factor in crop selection.

Different types and varieties of commonly grown specialty crops like peas, lentils and canary seed were included in the plot along with a number of new crops. The crops grown in the plot plus a short description of the crop or variety are listed below.

1. Peas - The dry pea is used for human food and livestock feed. It is a cool season crop best adapted to the black soil zone in Saskatchewan. Approximately 1,100,000 acres were seeded in Saskatchewan in 1994, 50% yellow and 50% green.

a.) Radley Green Pea - medium sized semi-leafless green pea with medium maturity, short vines and medium yield; grades reduced by bleaching.

b.) Emerald Green Pea - large green peas, with smooth angular shaped seed, early maturity and medium vine length.

c.) Majoret Green Pea - large round green cotyledon food pea, semi-leafless, similar to Radley in maturity and height

d.) Marrowfat Green Pea - a very large seeded green pea with irregular seed shape. Contracted for specialty markets.

e.) Maple Pea - a large olive coloured seed with brown mottles, medium to low yield, late maturity and long vines. Contracted for pigeon feed.

f.) Trapper Yellow Pea - small seeded yellow pea with medium yield; maturity and vine length used for birdseed and split peas.

g.) Express Yellow Pea - high yielding, large seeded yellow pea with medium to early maturity and short vines. Suitable for soups and flour.

h.) Bohaytr Yellow Pea - large yellow pea, smooth, uniform seed size. Medium maturity and vine length. Fair ascochyta resistance.

i.) Patriot Yellow Pea - medium seed size yellow pea, early maturity and short vines, semi-leafless, fair ascochyta resistance.

j.) Highlight Yellow Pea - medium sized yellow pea, early maturity and short vines, semi-leafless, resistant to powdery mildew.

2. Lathyrus - Grass pea, large irregular seeded pulse crop. Used for human food or livestock feed. Nutrition concern with toxin that may result in paralysis, but breeding program can reduce levels.

3. Chickpea - Large seeded dry pulse crop used for soups, vegetable combinations or as a component of fresh salads. Deep tap root that allows the plant to withstand drought. Requires 110 days to mature. Disease can be a problem.

a) Desi Chickpea - small seeded, shorter growing than Kabuli. Ascochyta a concern.

4. Lentils - Lentils are used as a protein source in soups, stews and vegetarian dishes. It is a cool season crop best adapted to the Dark Brown and southern part of Black Soil Zones. Approximately 800,000 acres were grown in Saskatchewan in 1994.

a.) Laird Lentil - an extra large seeded Chilean lentil developed at the University of Saskatchewan. The most common variety grown in the Province.

b.) Richlea Lentil - medium size yellow cotyledons chilean lentil with superior yield to Eston and Laird, faster cooking than Laird.

c.) Rose Lentil - medium sized red cotyledons lentil that has potential use in the red split lentil market.

d.) Eston Lentil - small seeded persian type lentil.

e.) French Green Lentil - bluish black marbled seed coat, yellow cotyledons, high yield. Contracted for french market.

f.) Spanish Brown - brownish coat with purple speckles. Ascochyta resistance.

5. Triticale - Cereal produced by crossing wheat and rye. Used for flour, as a feed grain or silage. Late maturity, 106 days.

6. Sunola - Early maturing miniature sunflower used for vegetable oil. Oil content of 43-44%. Oil yield greater than canola under dry conditions. Later maturity than Argentine Canola.

7. Sunwheat - Hybrid sunflower. Early maturing (90-95 days) and shorter than conventional hybrids. Oil content 40%; mainly used for birdseed.

8. Beans - Dry beans are grown for human consumption. The five major types grown in Western Canada are Pintos, pink, Great Northern, or large white, Red Mexican and Navy or

small white. Beans require a warm, long, frost free growing season and good moisture conditions. Breeding programs developing lines with earlier maturity and more upright to harvest with conventional equipment

a.) Othello Pinto Bean - large, brown mottled seed, earlier maturing (106 days) pinto bean with good yield and cooking quality.

b.) Great Northern Bean - large, white, medium-to-late maturing, indeterminate growth. Used for human food consumption. 112-115 days.

c.) V136 Red Mexican - small, dark red seed, maturity of 110 days.

d.) Viva Pink Bean - small pink seed, early maturing variety (108 days) with good yield potential.

e.) Black Bean - small black bean, maturity earlier than Othello. New variety with earlier maturity.

f.) Mung Bean - small variable coloured bean used for sprouting, medium-to-late maturing 100-115 days.

g.) Soya Bean - oilseed and protein meal crop. Maple Presto earliest variety at 110 days maturity. Requires 2300-2500 corn heat units.

h.) Fababean - large, reddish, brown bean grown primarily for livestock feed as silage or dry beans. It is best adapted to the moisture growing areas of the Province. Maturity is 106-112 days but can withstand frosts in late May or early June. New variety Orion with maturity of 102 days.

9. Lupin - A high protein grain legume used for animal feed. Production in Saskatchewan limited because it requires low calcium soils and maturity, 110 days. Withstands spring frost and is tolerant to drought.

10. Quinoa- A grain crop that when the seed coat with high saponin levels is removed, produces a high protein and good nutritional quality grain sold in the health food market. Small (1/16") variable coloured seed, maturity 100+ days. Flea beetles and fall sprouting are concerns.

11. Borage - An erect annual grown as a source of oil for the pharmaceutical and health markets. Adapted to the cooler moist areas of the Province. Seed the size of popcorn. Maturity about 90 days. Ripens uneven and shattering causes harvesting losses.

12. Fenugreeek - Ground seed used in curry, also pickling spice and confectionary products. Oil extracted for artificial maple flavour. Legume with maturity of 100-120 days. Can stand early spring frost.

13. Coriander - Powder made from ground seed is used for flavorings of all kinds of food products. A main ingredient of curry powder and used in flavoring gin. Heat loving crop with maturity of 100 days. Germinates very slowly (up to 21 days).

14. Poppy - Seed is used for medicine, bird feed and baking; oil extracted for margarine and cooking oils. Adapted to central and southern agriculture areas of Saskatchewan. Prefers cool temperatures as seedling tolerates frost at seedling stage. Opium poppy requires license issued under Narcotic Control Act.

15. Buckwheat - Flour from grain used for pancake and breads, also for specialty prepared foods such as poultry stuffings, cereals, etc. Early maturing (80-90 days) annual seeded crop, susceptible to frost in the spring.

16. Summer Savory - Annual foliage or oil, used as spice for vegetable and meat products Leaves and flowers used whole, fresh and dried

17. Fennel - Annual, late maturity concerns for seed production, seeds used for spice for meat, vegetables, soup and pickling. Fennel oil used in perfumes, soup, liqueurs and licorice candy
18. Dill - Dill seed and dill oil is used as spice for pickles, salad, soups, stews, etc. Oil extracted by steam distillation. Annual seed in early spring or self-seed in autumn. Harvest whole plant in 85-95 days after seeding for oil extraction.
19. Yellow Flax - United States variety, yellow seeded flax contracted for specialty baking market. Maturity for seed 110-115 days, seed in fall or early spring.
20. Canary Seed - Annual grass grown in Saskatchewan as food for caged and wild birds. Production and management similar to wheat but less drought tolerant, maturity 100 days.
21. Proso Millet - Is a component of grain mixes for pet birds and livestock feed. Warm season annual grass maturing in 70-80 days. Grown for emergency hay production.
22. Oilseed Radish - Oilseed crop for specialty markets and sprouting. Similar to canola, high erucic acid, maturity 80-85 days, yield 75% of canola.
23. Cramby- High erucic acid mustard plant, containing 30-35% oil. Industrial oil seed crop used to produce plastics, coatings and lubricants. Meal potential for livestock feeding.
24. Low lino canola (Stellar) - Low linoleic acid canola with superior quality for deep frying.
25. Anise - The seeds are used whole, ground or extracted for oil. Used in baking, cheese, sausage, salad dressing, pickles, liquors, licorice flavourings, etc. Small seeded annual requiring a long growing seasons; 120 days.

Sponsorship: Prince Albert Agriculture, Development and Diversification Board

2. EFFECT OF SEEDPLACED NITROGEN FERTILIZER WITH CANOLA

Background:

Within low disturbance cropping systems producers are striving to use crop inputs as efficiently as possible. This has generated an interest in applying nitrogen fertilizer at the time of seeding. An application of this nature reduces the number of operations required (tillage, fertilizer banding) and leaves more undisturbed residue thereby protecting the soil from erosion.

The amount of fertilizer that can safely be applied with the seed is influenced by a wide array of interrelated factors. Some of these include soil texture, pH, soil moisture, salinity, organic matter, fertilizer rates, fertilizer type and fertilizer distribution. Effect of seedplaced fertilizer is influenced by crop type with cereals generally considered more tolerant than small seeded crops, such as canola. Landscape features such as topography can also influence the effect of fertilizer placement.

Purpose: To demonstrate how seedplaced fertilizer rates, fertilizer source and landscape topography influence the emergence and yield of canola.

Treatments: 0, 20, 40, and 60 kg. N/acre as urea as well as ammonium nitrate, seed placed with a narrow opener Randomized strip plot design. Triple superphosphate seedplaced at 30 kg P_2O_5/ha

Crop: Legacy Canola seeded on May 27

Seeding Implement: Research scale high clearance hoedrill

Previous Crop: CPS Biggar Wheat, straw and chaff chopped and spread.

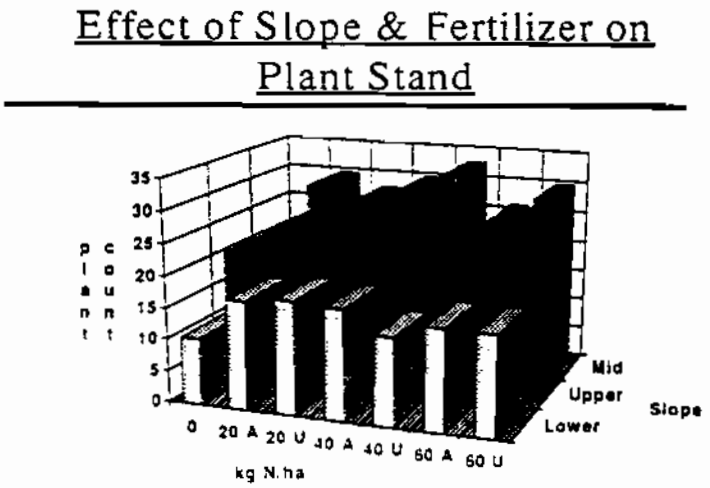
Pesticides: Roundup applied at 1 L/acre May 9
Lontrel and Poast used as post emergent herbicides

Rainfall Notes: 4 inches of rain fell during the 2 weeks previous to seeding, 1 inch of rain fell during the 2 days following seeding.

Results and Discussion: as provided by Garry Hnatowich, Agricultural Research and Development, Sask. Wheat Pool, Saskatoon.

Soil moisture conditions at seeding were excellent and a seeding depth of 1.25 - 1.8 cm was attempted. The hoedrill used to establish the crop has excellent depth control however the hoe openers and packing system does create a relatively deep furrow. In this trial excessive and violent rainfall occurred approximately four hours after the seeding operation and continued for 48 hours. This rainfall resulted in the furrow sides collapsing and soil washing into the furrow trench such that the seeding depth was increased considerably. This was particularly true at lower slope levels that apparently accumulated additional soil from upslope positions. Plants randomly selected after emergence indicated that increased seeding depth at lower positions severely reduced plant stands. This is illustrated in plant counts shown in Figure 1.

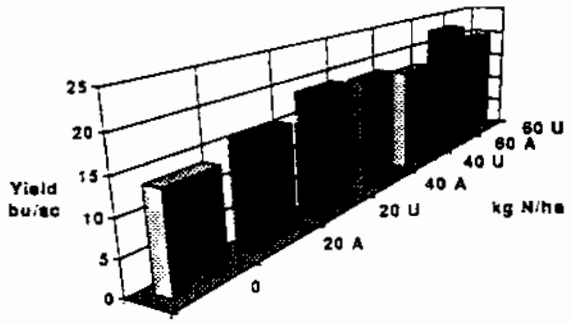
FIGURE 1



No apparent difference in plant stand occurred between the midslope and shoulder landscape position. Plant counts were reduced by approximately 40% in the footslope area. The graph also clearly illustrates that neither fertilizer source nor amount applied significantly influenced plant establishment. It was quickly apparent that early growing season precipitation and frequency had negated fertilizer and landscape responses Consequently at harvest, landscape features were not separately obtained. Yields of the fertilizer treatments are shown in Figure 2.

FIGURE 2

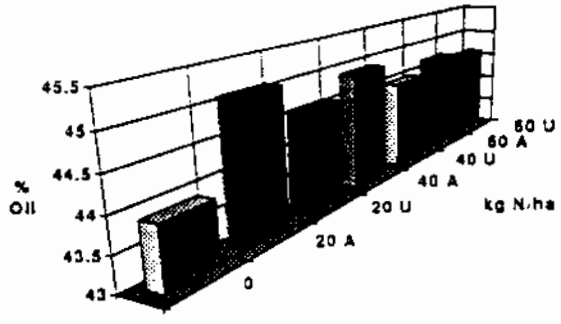
Effect of Seedplaced Fertilizer on Yield



Within fertilizer rates there were no significant differences in yield obtained from the two forms of nitrogen fertilizer. Fertilizer application increased yield and yield continued to increase as fertilizer rates increased. Considering canola's general sensitivity to seedplaced fertilizer, yields might have been expected to be adversely affected. These results further demonstrate the influence of favourable soil moisture and seasonal precipitation. Fertilizer application did elevate seed oil content as shown in Figure 3. The form of nitrogen fertilizer applied did not influence seed oil content.

FIGURE 3

Effect of Seedplaced Fertilizer on % Oil Content



Sponsorship: This is a project of the Sask. Wheat Pool. under the supervision of Mr. Garry Hnatowich.

3. BARLEY AND SEED PLACED UREA

Purpose: To demonstrate the results of seed placing all of a barley crop's N requirements.

Treatments: 0, 15, 30, 45, 60, 75, and 90 # actual N/acre in the form of urea, seed placed with a knife opener at 9 inch spacing, representing an 11% seedbed utilization. No phosphorus was applied, no spokewheel injection of N was used.

Crop: Harrington Barley seeded at 1.5 bpa., May 12

Previous Crop: Parkland Canola, straw and chaff chopped and spread.

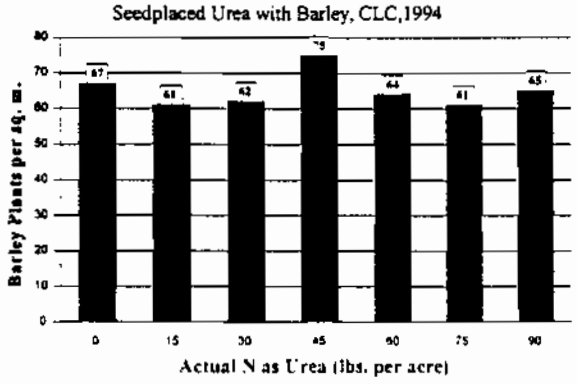
Pesticides: Roundup applied at .5 L/acre May 9
Avadex surface applied October 21, 1993
Refine Extra @ recommended rate applied June 9

Results and Discussion:

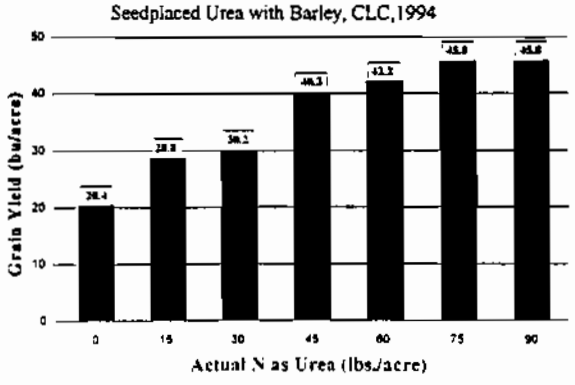
As is stated in the previous discussion of a similar project with canola, one would fully expect some crop emergence and yield damage due to the high rates of urea fertilizer seed placed in this demonstration. A similar project at the CLC in 1993, using canola, showed decreased plant stand, decreased yields and greater numbers of wild oats at the higher rates of seedplaced urea. Also, on the upper slopes, yield damage was magnified.

In the 1994 barley demonstration, in wet spring conditions, the same damage was not seen. The following figures describe the emergence and yields obtained from these field strips. The strips were non-replicated, each of an area 33' wide by 436' long.

Plant Counts



Grain Yield



As seen in these figures, neither emergence nor yield were severely affected by the seedplaced fertilizer this year. The major reason is not due to the practice being predictably safe, but due to good seedbed moisture at time of seeding and 4 inches of rainfall immediately following the seeding. A useful guide to use when considering seedplacement of nitrogen and phosphorus is contained in a provincial bulletin, entitled ' Farm Facts: Revised Guidelines for Safe Rates of Fertilizer Applied with the Seed', available at Rural Service Centres.

Sponsorship: Avadex applied by Esso Farm-Tek
Avadex and Roundup supplied by Monsanto
Seeding implement supplied by Flexi-coil
Refine Extra supplied by DuPont

4. CROP ROTATION BY NITROGEN PLACEMENT

Purpose: To evaluate a number of fertilizer N placement options in a direct seeding system, including a crop rotation of CPS wheat, barley, canola and flax.

Background: Currently, inability to apply high rates of fertilizer N at seeding, in a one-pass system, is cited as a factor preventing adoption of direct seeding.

Treatments: This was the first year of a 4 year project. N fertilizer will be applied at soil test recommended rates using 4 different application methods:

* side band at seeding (one pass system)
* pre-seeding band of N, followed by direct seeding (two pass system)
* post-seeding spoke injection (two pass system)
* seed and fertilizer applied with sweep opener at seeding (one pass system). This treatment will be replaced with a conventional tillage treatment in 1995.

Results: as provided by Dr. Adrian Johnston, Agriculture and Agri-Food Canada, Melfort Research Station.

The data presented in the table below is separated into shoulder and toe slope landscape positions. In general, crops were taller and produced more grain and dry matter in the toe slope position. There was also more weeds in the wheat, barley and flax crops in the toe slope positions while the reverse was true for canola. Plot grain yields will be determined when the site is harvested in the spring of 1995.

	Shoulder				Toe			
	Spring Band	Side Band	Sweep	Spoke	Spring Band	Side Band	Sweep	Spoke
Plant count (plants/m^2)								
Wheat	317	287	398	378				
Barley	225	212	201	260				
Canola	79	151	127	197				
Flax	350	330	455	427				
Height (cm)								
Wheat	82.0	81.6	79.2	80.2	84.2	86.2	88.0	90.2
Barley	66.4	66.8	66.8	68.2	74.2	80.6	73.4	75.6
Canola	78.2	83.4	91.4	78.8	92.0	92.8	91.4	86.8
Flax	64.2	66.0	64.4	61.4	60.2	60.0	55.2	58.6
Grain yield (kg ha^{-1})								
Wheat	2480	2479	3595	2442	2695	2984	2318	3582
Barley	2248	2580	2095	2406	2469	2607	2338	2052
Canola	1356	886	656	969	1452	1122	1032	1293
Flax	1324	889	752	1513	-	1157	813	1534
Dry matter yield (kg ha^{-1})								
Wheat	6522	6986	9388	6306	7351	8268	6032	9479
Barley	7662	7550	6839	6765	7633	8690	7684	6890
Canola	4733	5741	2944	5571	6004	4005	5136	6282
Flax	4046	3156	4442	4420	-	3920	2983	4477
Total Weeds (weeds/0.25 m^2)								
Wheat	2.2	2.2	1.2	6.0	5.8	20.4	6.6	14.8
Barley	10.6	9.6	8.8	6.4	10.2	17.8	16.0	10.6
Canola	22.8	12.4	10.8	16.0	13.8	8.0	13.2	7.4
Flax	12.6	14.8	13.2	16.0	25.0	17.6	22.8	11.4

Previous Crop: CPS Biggar Wheat

Sponsorship: This is a project of the Melfort Research Station, under the supervision of Dr. Adrian Johnston.

5. VARIABLE RATE N FERTILIZATION TRIAL

Purpose: To assess variable versus uniform N fertilization of cereal and oilseed crops under conservation tillage.

Treatments: This was the first year of a 3 year project. Treatments, which were established in long strips (plots) across the landscape (4 m by 170 m, replicated 3 times) are:

(1) **uniform rate-** 1 fertility zone based on plot average spring **soil nitrate-N** levels (fertilizer rate of 70 lb N/ac, based on F.A.R.M. Phase II recommendations)

(2) **variable rate-** 3 fertility zones based on **soil nitrate-N** spatial distribution (0-7, 7-14 and 14-21+ lb N/ac with corresponding fertilizer rates of 85, 75 and 65 lb N/ac, respectively)

(3) **variable rate-** 3 fertility zones based on **organic matter** spatial distribution (0-1.5, 1.5-3.0 and 3.0+ % organic carbon) and nitrate-N levels within each zone (low, medium and high yield goal recommendations, respectively)

(4) **variable rate-** 3 fertility zones based on **landform element complexes** (L.E.C.- shoulder, footslope and level depressional) and soil nitrate-N levels within each complex (low, medium and high yield goal recommendations, respectively)

Crop: Flax ('Norlin') was direct seeded into cereal stubble on May 10 at a seeding rate of 50 lb/ac, using an air drill.

Fertilizer: Fertilizer N applied according to treatments. All treatments received 20 lb/ac P_2O_5 placed with the seed, whereas urea was sidebanded.

Weed Control: Weeds were controlled by preseeding Round-up plus in-crop herbicides (Poast plus Buctril 'M').

Results: As provided by Dr. Hugh Beckie, Agriculture and Agri-Food Canada, Melfort Research Station.

The growing season was characterized by above-average precipitation (approx. 160% of normal). Fertilizer use efficiency (kg seed per kg applied N) was used to compare treatments. Each treatment consisted of 12% wetlands (non-cropped). As well, each treatment consisted of approximately 22% shoulder, 58% footslope and 20% level depressional areas. Flaxseed yield was measured in each cell

Table 1. 1994 preliminary results

Treatment	Average	Shoulder	Footslope	Level depressional
1 Yield in kg/ha (bu/ac)	1847 (29)	1635	1985	1650
Fertilizer rate (kg N/ha)	78	78	78	78
F.U.E. (kg seed/kg N)	23 7	21 0	25.4	21.2
2 Yield	1901 (30)	1794	1995	1796
Fertilizer rate (calculated)	84	88	85	80
F.U.E.	22.8	20.5	23.6	22.8
3 Yield	1814 (28)	1780	1903	1536
Fertilizer rate (calculated)	75	59	78	91
F.U.E.	25.2	30.4	25.4	17.0
4 Yield	1876 (30)	1720	1968	1751
Fertilizer rate	75	50	79	93
F.U.E.	26.2	34.4	25.0	18.8

These preliminary results indicate that treatments 3 and 4 had the highest average F.U.E., due to a significant increase in F.U.E. of the shoulders compared with the conventional treatment (1). However, the F.U.E. of the level depressional areas tended to be lower than the conventional treatment. Fertilizer recommendations for the level areas of treatments 3 and 4 that are based on a medium to low yield goal may enhance their average F.U.E. in 1995. For treatments 1 and 2, the largest N response occurred on the footslope positions. Yields on the level areas were likely reduced by weeds (e.g. Canada thistle) and by enhanced disease or N losses (e.g. denitrification). Results of treatment 3 were generally similar to treatment 4, reflecting the high spatial correlation between Landform Element Complex (L.E.C.) and organic matter level. The fertility zones of treatment 2 generally corresponded with L.E.C. (i.e. shoulders tended to have the lowest spring nitrate-N levels, level depressional areas the highest). The F.U.E. for this treatment was lower than the conventional treatment. This would indicate that the current thinking of applying more fertilizer on shoulders and less on level depressional areas (uniform yield goal) compared with conventional application may only be partly correct.

These results would suggest that the best strategy may be to divide fields into L.E.C.'s, soil sample each L.E.C. separately, *but* use non-uniform crop yield goals (potentials), with a higher yield goal for the footslope positions, a similar or lower yield goal for level depressional areas and lower yield goal for shoulders. Based on current flax prices, treatment 4 had a gross return of over $19/ac higher than the conventional treatment. Increasing the F.U.E. of the level areas by altering yield goals may result in even higher returns. This study will continue for the next 2 years.

Sponsorship: This is a project of the Melfort Research Station, under the supervision of Dr Hugh Beckie.

6. NON-INCORPORATED AVADEX TRIAL

Purpose: To see how Avadex granules will work to control wild oats in a direct seeded barley crop, with no incorporation other than the seeding operation.

Treatments: 1) Late fall application, Oct. 21, 1993
2) Early spring application, April 22, 1994
3) No Avadex

Crop: Harrington Barley seeded at 1.5 bpa., May 12

Seeding Implement: Flexicoil 5000, sidebanding openers

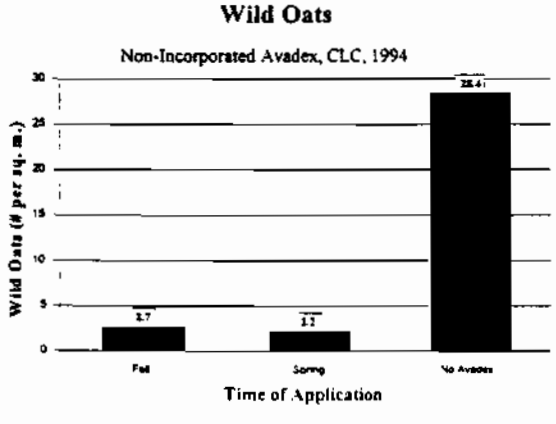
Previous Crop: Parkland Canola, straw and chaff chopped and spread

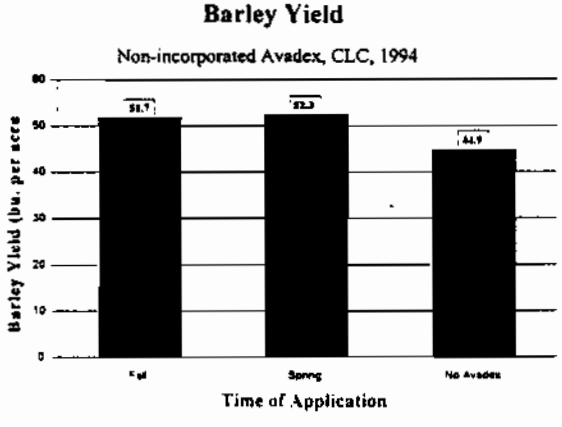
Fertilizer: Sidebanded 97# (26-31-0)
Spokewheel inject 50# actual N/acre, liquid

Pesticides: Avadex surface-applied as described
Roundup applied at .5 L/acre May 9
Seed treated with Vitavax Single solution, liquid
Refine Extra @ recommended rate applied June 9

Results and Discussion:

In this project, rather than comparing the levels of incorporation of Avadex, the comparison was one of timing. The product was applied in the late Fall and early Spring, and compared to no Avadex. One may have expected the late Fall application to be superior to the Spring





application, however, in this year's conditions at the CLC, no such results were found. However, noticeable control was gained through both treatments. The following graphs show the wild oat plant counts and barley yields. The results are expressed as averages within replicated, 28m by 60m plots.
The wild oat numbers indicate that there was no significant difference in control whether the Avadex was applied in the Spring or Fall. Translated into percent control, the Avadex achieved 90% control over the check plot. This is not going to be acceptable control for all producers, as even the relatively small numbers of uncontrolled wild oats were visually obvious.

Barley yield was decreased by 15% where Avadex was not used. Again, no significant yield difference was seen between the Fall and Spring applications.

As of yet, no official recommendations exist for applying Avadex as a non-incorporated product in a minimum disturbance direct seeding system.

Sponsorship: Avadex applied by Esso Farm-Tek
Avadex and Roundup supplied by Monsanto
Seeder supplied by Flexi-coil
Refine Extra supplied by DuPont
Vitavax supplied by Gustafson
Liquid N supplied by Simplot
Spoke wheel equipment supplied by Pattison Bros.
Granular fertilizer supplied by Cominco

7. NON-INCORPORATED SPRING-APPLIED EDGE TRIAL

Purpose: To evaluate the performance of Edge as a non-incorporated product within a direct-seeded pea crop.

Treatments: 1) Edge applied May 6, no incorporation other than the seeding operation.
2) Edge applied May 6, immediately followed by a rotary harrow incorporation
3) no Edge applied.

Crop: Express Peas seeded on May 13th.

Previous Crop: CPS Biggar Wheat

Fertilizer: 97# (26-31-0) sidebanded with a Flexicoil air drill, peas inoculated with Enfix.

Pesticides: Roundup applied at 1 litre per acre on May 9th.
Edge applied as described.

Results and Discussion:

No data has been recorded for this trial, however some general observations have been made Since the peas were seeded on wheat stubble, with some potential for wild oats, these were the most obvious weeds to take notice of. For these two weeds, no differences were seen between rotary harrow incorporation and no incorporation. Significant control was achieved through the use of Edge, with and without incorporation, however in some areas the wild oats escaped.

The product was applied only one week before seeding, a shorter interval than what would normally be desired. The rotary harrow treatment was done on the same day as application. The fluffing action of the wheat straw, created by the harrows, was a detriment to the seeding program as the straw did not flow through the seeding implement as well as where the rotary harrow was not used. Fall use of a rotary harrow would provide for a much better direct-seeding situation in the spring as the straw would settle during the winter period.

Peas are generally considered a very non-competitive crop. Due to the plugging of some seed openers during seeding, some 2-3' strips were left bare in the plot area. Later in the season, it was obvious that both wheat and wild oats took advantage of these areas, whether Edge was applied or not. This unintentional demonstration further supports the importance of crop competition in weed control programs. Weed control should be approached by using as many factors as possible. Competition from a vigorous crop will enhance weed control, just as will a combination of herbicides, sanitation, prevention, and physical methods.

Because of the generally positive results of this project, Edge has been applied to a 35 acre field to be seeded to peas in 1995. Weeds numbers and species will be monitored.

Sponsorship: Edge application and monitoring by DowElanco.
Roundup supplied by Monsanto.
Seeding implement supplied by Flexicoil.
Fertilizer supplied by Cominco.
Inoculant supplied by Esso Petroleum.

D. Field-scale Results

1. FIELD-SCALE: EXPRESS PEAS

Purpose: To produce a pea crop within a direct-seeding system, using products which are readily available. Plant into **CPS Biggar wheat stubble**, straw and chaff chopped and spread

Treatments: The entire field (80 acres) was treated similarly, with one exception, the south portion was rolled with no water in the roller drums, the north east portion was rolled with the drums half full, the north west portion was rolled with the drums a quarter full. During the harvesting operation, general observations will be made as to the benefit (ease of harvest) of one treatment over the other.

Crop: Express peas seeded at 2.75 bu./ac., May 13

Fertilizer: Side banded 97# (26-31-0), Flexicoil sidebanding opener
Seed treated with Enfix inoculant

Pesticides: Roundup applied at 1 L/acre May 9
Sencor applied at recommended rate, June 10
Poast applied at recommended rate, June 24, 3 days after rolling the peas.
Reglone applied August 20

Results: Pea yield netted 17 bpa.. Emergence was considered good, except where some plugging of seed boots was experienced. The July 28th hailstorm damaged some of the pods and flowers. Perhaps more damage was through prematurely flattening the crop, creating a more favourable situation for disease to flourish during cool, wet conditions of 1994.

No obvious differences were experienced by the harvest crew, between land rolling techniques.

Spread of pea vine residues through the harvesting operation was not considered adequate for 1995 seeding. Therefore, 2 harrowing systems were experimented with after harvesting the peas. The first, an oscillating 'crazy' harrow system proved to bunch the straw, likely creating a worse situation for seeding through. The second system seemed to work very well, using heavy duty, long-tined harrows at relatively high speed.

Sponsorship: Express peas supported by Newfield Seeds
Roundup supplied by Monsanto
Seeder supplied by Flexi-coil
Poast supplied by BASF
Fertilizer supplied by Cominco
Inoculant supplied by Esso Petroleum
Pea roller supplied by Flaman Sales, P.A.
Reglone supported by Zeneca Agro
Trucking and marketing of the crop sponsored by Finora Canada Ltd.

2. FIELD-SCALE: EXPRESS PEAS

Purpose: To produce a pea crop within a direct-seeding system, using products which are readily available. Plant into standing **canola stubble**, straw and chaff chopped and spread.

Treatments: The entire field (18 acres) was treated similarly, with one exception, the west portion was rolled with no water in the roller drums, the east portion was not rolled.

Crop: Express peas seeded at 2.75 bu./ac., May 13

Fertilizer: Sidebanded 97# (26-31-0), Flexicoil sidebanding opener.
Check strip with 50# actual N spoke wheel applied.
Seed treated with Enfix inoculant (check strip with no inoculant).

Pesticides: Roundup applied at 1 L/acre May 9
Sencor applied at recommended rate, June 10
Poast applied at recommended rate, June 24, 3 days after rolling the peas.
Demonstration strip of Reglone applied on July 12
Field scale application of Reglone on August 20

Results: Pea yield netted 17 bpa.. The July 28th hailstorm damaged some of the pods and flowers. Perhaps more damage was through prematurely flattening the crop, creating a more favourable situation for disease to flourish during cool, wet conditions of 1994.

At harvest, benefits were seen in having rolled the peas, even though these peas were seeded into stone-free canola stubble and wet conditions tended to level the furrows.

Spread of pea vine residues through the harvest operation was not considered adequate for 1995 seeding. Heavy duty, long-tined harrows, used at relatively high speed, provided excellent spreading of the residues.

Sponsorship: Express peas supported by Newfield Seeds
Roundup supplied by Monsanto
Seeder supplied by Flexi-coil
Poast supplied by BASF
Fertilizer supplied by Cominco
Inoculant supplied by Esso Petroleum
Pea roller supplied by Flaman Sales, P.A.
Reglone supported by Zeneca Agro
Trucking and marketing of the crop sponsored by Finora Canada Ltd.

3. FIELD-SCALE HARRINGTON BARLEY

Purpose: To produce a barley crop using direct seeding techniques. Plant into canola stubble, residues chopped and spread evenly. Use post-emergent herbicides

Treatments: The entire field was treated similarly (80 acres).

Crop: Harrington Barley seeded with a Flexicoil air drill, sidebanding openers, at 1.5 bpa., May 12

Fertilizer: Sidebanded 97# (26-31-0), Flexicoil sidebanding opener
Spokewheel injected 50# actual N/acre, liquid on June 9

Pesticides: Roundup applied at .5 L/acre May 9
Prevail applied at recommended rate on June 10
Seed treated with Vitavax Single solution, liquid

Results: Crop yielded 44 bpa.. Emergence of the crop was excellent. Leaf diseases and hail damage both affected the yield of the Harrington barley. Hail in July knocked seeds out of the heads and encouraged lodging of the crop. Estimated hail damage to the heads was at least 20%.

Sponsorship: Granular fertilizer supplied by Cominco
Prevail supplied by DowElanco
Roundup supplied by Monsanto
Seeder supplied by Flexi-coil
Vitavax supplied by Gustafson
Liquid N supplied by Simplot
Spoke wheel equipment supplied by Pattison Bros.

4. FIELD-SCALE HARRINGTON BARLEY

Purpose: To produce a barley crop using a direct seeding techniques (20 acres). Plant into standing canola stubble, residues spread evenly. Use **surface application of Avadex** as method of wild oat control.

Crop: Harrington Barley seeded with a Flexicoil air drill, sidebanding openers, at 1.5 bpa., May 12

Fertilizer: Sidebanded 97# (26-31-0), Flexicoil sidebanding opener
Spokewheel injected 50# actual N/acre, liquid

Pesticides: Roundup applied at .5 L/acre May 9
Granular Avadex applied on Oct. 21, 1993
Seed treated with Vitavax Single solution, liquid
Refine Extra @ recommended rate applied June 9

Results: Yielded 44 bpa.. Both hail damage and leaf diseases affected yields. Avadex treatment worked well in most of the area, except in the areas of heaviest populations, where they broke through. Further discussions of Avadex as a surface applied herbicide is found in section A.6.

Sponsorship: Granular fertilizer supplied by Cominco
Avadex and Roundup supplied by Monsanto
Seeder supplied by Flexi-coil
Refine Extra supplied by DuPont
Vitavax supplied by Gustafson
Liquid N supplied by Simplot
Avadex applied by Esso Farm-Tek
Spoke wheel equipment supplied by Pattison Bros.

5. FIELD-SCALE CDC RICHARD HULLESS BARLEY

Purpose: To produce a barley crop using a direct seeding techniques (45 acres). Planted into standing canola stubble, residues chopped and spread evenly.

Treatments: The entire field was treated similarly, with the exception of an unintended seeding error which resulted in some acres being re-seeded 2 weeks later than the initial seeding.

Crop: CDC Richard Hulless Barley seeded with a Flexicoil air drill, knife openers at 1.5 bpa., May 11

Fertilizer: Seedplaced 97# (26-31-0), Flexicoil knife opener
Spokewheel injected 50# actual N/acre, liquid, June 9

Pesticides: Roundup applied at 1 L/acre May 9
Buctril M and Avenge applied at recommended rate on June 10
Seed treated with Vitavax Single solution, liquid

Results: Yielded 45 bpa. at a bushel wt. of 56 pounds. Leaf diseases were not a concern for this hulless barley variety at the CLC this year. Also, hail damage was negligible as compared to the Harrington barley which was further advanced at the time of the hailstorm.

Lodging, however, was a significant problem. After harvest, a Schulte double-flailed mower was used to trim the lodged areas. Heavy duty, long-tined harrows were used to further spread the residues. A hoe-type of opener will be used to seed this field in 1995

Sponsorship: Seed supplied by Proven Seeds
Liquid N supplied by Simplot
Granular fertilizer supplied by Cominco
Buctril M supplied by Rhone Poulenc
Avenge supplied by Cyanamid
Roundup supplied by Monsanto
Seeder supplied by Flexi-coil
Vitavax supplied by Gustafson
Spoke wheel equipment supplied by Pattison Bros.

6. FIELD-SCALE: PARKLAND CANOLA

Purpose: To produce a canola crop following a previous canola crop to see what disease problems may develop under 1994 growing conditions.

Treatments: The entire field was treated similarly (32 acres).

Crop: Parkland (Polish) Canola seeded at 7#/acre, June 20, into Parkland canola stubble. Norlin Flax had originally been seeded, but failed, likely due to seeding depth and heavy rains causing furrows to collapse and crusting of soil surface.

Fertilizer: Sidebanded 114 #(46-0-0), seedplaced 50# (12-51-0), using a ConservaPac seed drill. Previous N application for flax amounted to 15# actual N.

Pesticides: Roundup applied at 1 L/acre May 9
Roundup applied at .5 L/acre June 10
Seed was pre-treated with Vitavax
No in-crop weed control.

Results: Yielded 7 bpa.. No disease survey was possible on this field, due to a hailstorm which severely damaged plants by breaking stems and interfering with both flowering and podding (estimated yield loss at least 65%). Initial impressions at rosette stage were that there was surprizingly little blackleg in this crop.

Sponsorship: Roundup supplied by Monsanto
ConservaPac and tractor supplied by the Melfort Research Station
Fertilizer supplied by Cominco

7. FIELD-SCALE CDC MAKWA WHEAT

Purpose: To produce a wheat crop using direct seeding techniques (38 acres).

Treatments: The entire field was treated similarly.

Crop: CDC Makwa Wheat seeded with a Flexicoil air drill, knife openers at 1.5 bpa., May 11, into standing canola stubble.

Fertilizer: Seedplaced 97# (26-31-0), Flexicoil knife opener
Spokewheel injected 50# actual N/acre, liquid, June 9

Pesticides: Roundup applied at 1 L/acre May 9
Buctril M applied at recommended rate on June 10
Seed treated with Vitavax Single solution, liquid

Results: Yielded 34 bpa.. Negligible damage from hail, some damage from Orange Wheat Blossom Midge. Stand was much taller than preferred for a direct seeding system in the parkland region and will be avoided in the future. Lodging was significant in the lower areas and these were mowed with a Schulte double-flailed mower after harvest.

Sponsorship: Liquid N supplied by Simplot
Granular fertilizer supplied by Cominco
Buctril M supplied by Rhone Poulenc
Roundup supplied by Monsanto
Seeder supplied by Flexi-coil
Vitavax supplied by Gustafson
Spoke wheel equipment supplied by Pattison Bros.

E. Forage Projects

1. FORAGE GRASS VARIETY GARDEN

Purpose: To demonstrate 35 different grass varieties and species which would be of interest to farmers in the Parkland area.

Varieties seeded June 1,1994:

* Reed Canarygrasses: Rival, Palaton, Venture, Vantage

* Russian Wildryes: Cabree, Mayak, Swift, Tetracan, Eejay, Pearl, Prairieland

* Wheatgrasses: Elbee Northern, Walsh Western, Sodar Streambank, Orbit Tall, Greenleaf Pubescent, Clarke Intermediate, Chief Intermediate, Summit Crested, Nordan Crested, Parkway Crested, Fairway Crested, Kirk Crested

* Bromegrasses: Rebound Smooth, Baylor Smooth, Regar Meadow, Magna Smooth, Paddock Meadow, Carlton Smooth, Fleet Meadow, Signal Smooth

* Lodorm Green Needlegrass

* Short Lived Grasses: Arthur Dahurian Wildrye, James Dahurian Wildrye, Adanac Slender Wheatgrass, Revenue Slender Wheatgrass

Fertilizer: 50 # actual N /acre as liquid, spoke wheel injected, June 9

Results: Every variety established quickly and completely this year, due to cool and moist weather conditions throughout the initial stages of growth. The plot was mowed several times to control weeds which may have escaped control by herbicides. In the future, the plot will be available for visual demonstration of stand, competition, and eventual disappearance of particular species. In 1995, alfalfa varieties will be added to the demonstration.

Sponsorship: Seed and seeding provided by the Sask. Forage Council

NITRO ALFALFA

Purpose: To evaluate the success and use of a non-dormant alfalfa, var. Nitro, in a Saskatchewan parkland location. This includes establishment, growth habits, plant populations, dry matter yield, and winter survival under a one and two cut haying regime.

Background:

Alfalfa is a widely used perennial legume in cropping rotations in the parkland areas of Saskatchewan. Most varieties used in Saskatchewan cease growth in the late fall, remain dormant throughout the winter period and resume growth the following spring. The initiation, duration and cessation of the dormant period, combined with accumulation of sufficient root reserves, are factors that contribute to the winter-hardiness and long-term survival of a particular variety.

Many of these alfalfas, however, can be extremely difficult to kill when the intent is to switch to another crop. Combinations of herbicides, tillage and partial fallow periods are required to control plant regrowth. Many of the newer alfalfa cultivars, particularly those from the U. S., are semi-dormant for fall growth, a characteristic that has often been associated with reduced winter survival when utilized as forage (Smithe et al, 1993). For this reason, semi-dormant cultivars may have a place as a short-term alternative crop within the rotation. They establish quickly and grow rapidly throughout the growing season. Because they have a short dormancy period, it is felt that they will not survive Saskatchewan winters. However, recent varietal tests at Melfort, indicated that some non-dormant varieties will survive the first winter under normal management. This includes one forage cut in the year of establishment, two forage cuts or seed production in the second year (Heather Loeppky, Melfort Research Station - personal communication). If these varieties are not long-lived or winter kill in the second or third year they may be easier to eradicate in the short-term, using less tillage or herbicide.

The cultivar, 'Nitro' has an erect growth habit, recovers well after cutting and has a short period of dormancy. Fall dormancy group ranking for Nitro is 8 on a scale of 1 - 9. Beaver and Algonquin have fall dormancy ratings of 2.

Planting method: Nitro alfalfa, dormally inoculated, was broadcast on June 21, 1994 into a three acre block of cereal stubble previously sprayed with Roundup. This site was harrow packed and rolled with a pea roller for additional packing.

Results: As provided by Philip Curry, Ducks Unlimited Canada, Melfort.

Plant populations were monitored with .25 sq. meter quadrats along three transects representing various slope positions in the field (lower, mid and upper slope positions) Biomass samples were harvested on Sept. 23, 1994 using .25 sq. meter quadrats and dry matter weights recorded. Samples from each transect were analyzed for quality, including protein, fibre and energy

Table 1. Alfalfa Density and Dry Matter Yield.

Slope Position	Plants/sq. m.	D.M. g/sq.m.	D.M. kg/ha	D.M. t/ac
low	a * 72.8	a 312 0	a 3120	1.243
mid	b 50.8	a 355.2	a 3552	1.446
upper	a 74.0	a 410.0	a 4100	1.633
mean/average	65.9	359.1	3591	1.441
C. V.	24.0	30.8	30.8	
LSD (5%)	15.1	104.0	1039.6	

* Means with the same letter are not significantly different.

Table 2. Alfalfa Feed Quality.

Slope Position	Moisture %	Crude Protein %	Estimated Energy % TDN	Calcium %	Phos-phorus %	Nitrate %	A.D. Fibre %
Lower Slope	11.47 100% DM	20.97 23.69	56 - 58 63 - 66	1.14 1.29	0.27 0.30	Nil	28.78 32.51
Mid Slope	11.55 100% DM	21.04 23.79	58 - 60 66 - 68	1.63 1.84	0.22 0.24	Nil	26.74 30.23
Upper Slope	11.32 100% DM	17.94 20.23	53 - 55 60 - 62	1.54 1.73	0.21 0.23	Nil	31.03 34.99

The alfalfa cultivar 'Nitro', established quickly during the 1994 establishment year, with growth in biomass exceeding many standard cold-tolerant alfalfa varieties seeded earlier in the season. Growth was higher in upper slope positions than in lower slope positions but hay quality was the reverse. Crude protein and energy levels were greater in lower and mid slope positions than in the upper slope position, while percent fibre levels were the reverse. Plants were taller and stemmier in the upper slope positions, shorter but more lush and vegetative in the lower areas. Plant survival of individual plants in each of the sample sites will be determined in the spring of 1995 and the stand managed for forage production.

Sponsorship: Ducks Unlimited Canada
Saskatchewan Agriculture and Food

3. EFFECTS OF ALFALFA WITHIN THE CROP ROTATION

Purpose: To evaluate the influence of alfalfa stand length on subsequent crop production in a conservation tillage production system.

Treatments: This is the first year of a 9 year project. Alfalfa will be seeded in 1994, 1995, 1996, and 1997. In 1998, all alfalfa will be terminated by different methods and seeded into with annual crops.

Measurements: Soil, crop and weed characteristics will be monitored.

Sponsorship: This is a project of the Melfort Research Station, under the supervision of Ms. Heather Loeppky and Dr. Adrian Johnston.

4. FORAGE SEEDING METHODS STUDY

Background:

Perennial forages play an important role in soil conservation. However, conventional methods of establishing forages include intensive tillage. Tillage is used to control weeds, either mechanically or by incorporating a herbicide, and to prepare the seedbed. Researchers have had variable success in establishing forages without tillage. Sometimes failure has been related to poor weed control. In June 1994, a study was initiated at the CLC farm at Prince Albert to determine the impact of direct seeding on alfalfa and meadow bromegrass. Establishment, weed populations, and forage and seed production were/will be monitored taking slope position into account.

Purpose: To determine the influence of eliminating tillage in seedbed preparation on establishment, weed populations, forage and seed production and economics of alfalfa and meadow bromegrass production.

Treatments: This is the first year of a 4 year project. Alfalfa and meadow bromegrass were seeded on June 21. Half was seeded into pre-tilled conditions, while the other half was seeded into standing wheat stubble, pre-treated with Roundup.

Results: as provided by Ms. Heather Loeppky, Agriculture and Agri-Food Canada, Melfort Research Station.

In 1994, meadow bromegrass establishment was as good in untilled as in tilled plots, however, volunteer wheat was a problem. Alfalfa establishment (# of plants) was particularly successful under the no-till system, with fewer of the predominant weeds Biomass samples were taken but have not yet been analyzed. We are still in the process of analyzing the weed counts to see if

there are any significant differences related to landscape position.

Plants per .25 square meter.

Treatment	Brome	W. mustard	V. Wheat	Stinkweed	Shepherd's purse	Cleavers
No Till	13	12	17	3	1	1
Tillage	14	15	3	5	3	2

Treatment	Alfalfa	W. mustard	V. Wheat	Cleavers	Stinkweed	Horsetail
No Till	13	9	4	1	0.3	0.4
Tillage	7	19	1	2	1	0.3

Sponsorship: This is a project of the Melfort Research Station, under the supervision of Ms. Heather Loeppky.

5. DENSE NESTING COVER

Purpose: To demonstrate the successful establishment of a forage stand intended for use as dense nesting cover (45 acres).

Species seeded on June 1, 1993:

* 37% Intermediate Wheatgrass
* 37% Tall Wheatgrass
* 10.5% Slender Wheatgrass
* 10.5% Meadow Bromegrass
* 5% Alfalfa

Results: The forage mix established extremely well in 1993. Volunteer wheat germinated late in the 1993 season, resulting in a thin stand of wheat by fall, but frost prevented seed set. By the summer of 1994, the stand was very healthy, the only weed problem being Canada Thistle. The stand was baled for feed after July 15th, to avoid disturbing duck nesting season.

Sponsorship: This is a project of Ducks Unlimited Canada.

6. POTENTIAL FORAGES FOR USE AS DENSE NESTING COVER

Purpose: To evaluate the persistence of several forages within dense nesting cover.

Treatments: Species overseeded through traditional dense nesting cover mixture on June 1, 1993:

* S-7133K Smooth Bromegrass
* Greenleaf Pubescent Wheatgrass
* S-9051 Intermediate Wheatgrass
* James Dahurian Wild Ryegrass
* Lodorm Green Needlegrass
* Common Sheeps Fescue
* S-1755 Hard Fescue
* Oxley Cicer Milkvetch
* Yellowhead Alfalfa
* Anik Alfalfa

Results: All of these forages germinated and established, approaching 100% success. During the next few years, the stands will be monitored for usefulness as dense nesting cover.

Sponsorship: This is a project of the Melfort Research Station and Ducks Unlimited Canada, under the supervision of Dr. Scott Wright.

F. Tree Projects

1. SHELTERBELT SPECIES GARDEN

Purpose: To demonstrate 25 of the shelterbelt species which are recommended for yard, field, wildlife shelterbelts, and forest belts in the parkland region.

Results: Thirteen species were planted in 1994, with the remaining 12 species to be planted in the spring of 1995. Maintenance of the species garden will be enhanced by installing plastic mulch in 1995.

Sponsorship: This is a project of the PFRA.

2. GREEN ASH FIELD SHELTERBELT

Purpose: To demonstrate the establishment of a deciduous tree shelterbelt, designed for wind erosion purposes, using typical spacing and maintenance practices.

Results: Green ash were planted in 1994 along the northern boundary of the southeast quarter (one-half mile). Survival of the trees has been excellent, approaching 95%. Weed control was achieved through three directed applications of Roundup and was considered adequate.

Sponsorship: This is a project of the PFRA.

3. WHITE SPRUCE FIELD SHELTERBELT

Purpose: To demonstrate the establishment of an evergreen shelterbelt.

Site: A road allowance has been allowed to grow a stand of aspen on the north side of the field property. These existing trees provide significant protection to the fields adjacent to it. They also provide an ideal area for white spruce to grow well in. The spruce will add aesthetic value to the area as well as diversifying the habitat and providing some harvestable value when mature.

Results: A half mile of white spruce was planted in the spring of 1994 along the northern boundary of the northwest quarter. Survival was very good. Weed control was achieved through three applications of Roundup with one application as an overall spray in late Fall. Control of weeds was poor to fair with wild buckwheat being the most troublesome. Canada Thistle control was excellent.

Sponsorship: This is a project of the PFRA.

4. FOREST BELT

Purpose: To demonstrate the establishment of a forest belt.

Site: In the distant past, a field shelterbelt has been planted between quarter sections of the farm. Parts of the shelterbelt are starting to die out and some of the surrounding land has been allowed to grow grass.

Results: A forest belt has been designed to incorporate existing bush and wetland which will provide a wildlife corridor through the centre of the CLC It consists of 3-5 rows of trees and bush. Species were not selected specifically for potential wind erosion control, but for future harvest value, high wildlife habitat potential, and to fit well with the landscape provided. Species include poplar, white spruce, Siberian larch, willow, and fruit-bearing shrubs.

Survival varied depending on site preparation, location and tree species. Planting method deviated from recommended practices. Trees were planted into bromegrass in which strips had been rototilled just prior to planting. This provided less than desirable seedbed quality Maintenance was provided through the use of a directed application of Roundup three times during the year.

Sponsorship: This is a project of the PFRA.

5. WOODLOT

Purpose: To demonstrate a small woodlot that is planted for potential future cash value, wildlife habitat, aesthetic value, and yard shelter.

Results: A three acre woodlot was developed just west of the farmyard during the spring of 1994. Species of trees and shrubs were chosen to provide a large diversity in species and opportunities. Fruit-bearing shrubs (buffaloberry, choke cherry, rose, sea buckthorn, red elder, dogwood) were planted on the south and west perimeters. Rows of hybrid poplar, white spruce, Siberian larch, jack pine, Scots pine and green ash were hand planted directly into standing wheat stubble. Weed control was achieved through spot spraying with Roundup. Birch will be added in 1995.

Sponsorship: This is a joint project of the PFRA and the Canadian Forest Service

6. TREE ESTABLISHMENT AND VEGETATION CONTROL TRIAL

Purpose: To evaluate several methods of controlling weeds within newly planted trees.

Method: A randomized block design was used, including 5 treatments and 5 replications. White spruce, generally difficult to establish in exposed locations, were hand planted within the boundary of the newly planted woodlot on June 20,1994. In the spring of 1995, Siberian larch will be added to the trial. The 5 weed control methods being compared are:

* herbicides only, spot spraying with Roundup
* rototilling
* perforated plastic mulch
* jackpine wood shavings mulch, 4 inches deep
* no weed control

Results: Survival and growth will be measured in each of the following years, beginning in the spring of 1995.

Sponsorship: This is a joint project of the PFRA and the Canadian Forest Service

G. Monitoring of Environmental Effects

1. GREENHOUSE GAS STUDY

Purpose: To measure nitrous oxide gas emissions from the soil.

Background: The loss of nitrogen from the soil to the atmosphere in the form of nitrous oxide is important both agronomically and environmentally. Nitrous oxide represents the unrecoverable loss of nitrogen from the soil-plant system. It has also been implicated as one of the gases involved in global warming and the destruction of the atmospheric ozone layer. Although nitrous oxide emission has been well characterized in the laboratory, considerable uncertainty exists regarding its significance in many ecosystems and regarding the factors regulating it in actual field conditions.

Measurements taken: This is the second year of a three year study of emissions from natural and agricultural soils. The effect of soil texture, topography, land use and precipitation are all included as factors in the study.

Results and Discussion: as provided by Marife Corre, graduate student, Soil Science Department, University of Saskatchewan.

As the data from 1994 has not yet been analyzed at time of writing this report, only the 1993 results will be discussed here.

a) Spatial Patterns: Rates of nitrous oxide emission were associated with the landform complexes associated with the topography at the CLC. Significantly higher rates occurred at footslopes than at shoulder slopes. The observed landscape-scale pattern supports earlier findings which demonstrated that within a particular ecosystem or vegetation biome, topography is the basic control of spatial variability in the landscape. Topography has a strong influence on the more basic hydrological and pedological processes which regulate the soil factors directly controlling the process at the cellular level. The lower N_2O emission activity associated with shoulder slopes reflects the effects of hillslope flow processes and better internal drainage condition of the soils in the upper than in the lower landscape positions.

b) Seasonal Patterns: Regardless of seasonal pattern of N_2O, the spatial pattern associated with landscape remained consistent. Low activity was detected under the dry conditions of late spring and generally increased towards mid-summer, which corresponds with the most frequent and highest rainfall events. These results were similar to an earlier study which revealed that precipitation triggered an increase in N_2O production as a result of an increase in anaerobiosis in the soil. The activity decreased towards the end of the growing season and virtually ceased by the onset of frost. This could be attributed to the low soil moisture and temperature which might have hindered microbial activity.

A large pulse of N_2O emission activity was observed during the early spring, which was much higher than the maximum flux observed in summer. The average soil temperature when the spring pulse occurred was still around 0°C. which might be comparable with that in fall. The large pulse of activity was probably due to the high soil moisture content and increased availability of carbon and nitrogen. Freeze-thaw events were common in March and April, which may have increased the available C and N from lysis of microbial cells.

Sponsorship: This is a project of the University of Saskatchewan, Soil Science Department, as a post-graduate study by Ms. Marife Corre, under the supervision of Dr. Chris van Kessel and Dr. Dan Pennock.

2. RESIDUE DECOMPOSITION ON NORTH AND SOUTH FACING SLOPES

Purpose: To measure decomposition of wheat, barley, flax, canola, and alfalfa crop residue on north and south facing slopes.

Variables:

1. Soil temperature at 5 locations on each slope aspect
2. Crop decomposition, residue bags with 25 g residue are placed at the soil surface in fall and harvested in May and monthly till November, then again in May. Weight loss is related to decomposition.

Progress: Residue bags were placed in crop at the site in May 1994. Residue bags and soil temperature data were collected at monthly intervals. A new set of residue bags were placed in the field in October 1994 and data will continue to be collected.

Sponsorship: This is a project of the Melfort Research Station, under the supervision of Dr. Al Moulin.

3. WEED POPULATIONS WITHIN THE LANDSCAPE

Purpose: To identify and enumerate the weed populations which occur within the landscape, in a direct seeding system.

Progress: Initial experimentation with method of studying weeds within the landscape in 1994. Variables include landscape element and soil temperatures. Project to get fully underway in 1995.

Sponsorship: This is a project of the Saskatoon Research Station, under the supervision of Dr. Gordon Thomas.

4. WATER QUALITY MONITORING PROJECT

Purpose: To assess the impact of runoff from agricultural lands on the quality of small surface water bodies. The study has started in the Fall of 1994 and will continue until 1997.

Context: The effects of different land management systems on soil-water-landscape relationships will be studied at two detailed sites and three satellite sites in the province. The detailed sites are at Biggar and the CLC. The less detailed sites are at Lucky Lake, Craik, and Tisdale.

Progress: At the CLC, two potholes and the small watersheds draining into them have been selected for the study. Both of these sites are under a direct seeding management system. Another watershed on neighboring land, under a more conventional tillage system has also been chosen for comparison purposes in this study.

Most of the characterization of the sites is completed, including topographic and soil surveys. Equipment has been installed to monitor soil moisture throughout the study period. During the winter of 1994-95, a snow depth survey will be done. Composite daily water samples will be taken from each water body at critical times during the year.

Sponsorship: This is a project funded by the federal government through the Green Plan and is a collaborative effort of Agriculture and Agri-Food Canada, the National Hydrology Institute and the University of Saskatchewan (Saskatchewan Centre for Soil Research).

H. Rainfall Records

The following summarizes monthly rainfall records for 1994 at the CLC. Thanks to the Soil Science Department of the University of Saskatchewan for providing this data.

Month	Rainfall (mm)	Rainfall (inches)	
April	10.60	0.42	
May	96.25	3.79	
June	83.01	3.27	
July	90.06	3.55	Hail on July 28th
August	67.10	2.64	
September	13.25	0.52	
October	23.84	0.93	First snowfall, Nov. 1
Total Rainfall	**384.11 mm**	**15.12 inches**	