Cloverdale Soil Conservation Group
Project No. S1107, 1991-1994

Final Report: Part 2
Reports, Newsletters and Bulletins

Canada-British Columbia Soil Conservation Program

Canada

BC

Cloverdale Soil Conservation Group
Project No. S1107, 1991-1994

Final Report: Part 2
Reports, Newsletters and Bulletins

Prepared by
Mary-Margaret Gaye, P. Ag.

Our Soil ... Our Future

Canada-British Columbia Soil Conservation Program

Cover photograph shows cover crop planted from Free Seed Program at John Yue Farms.

Photograph by Mary-Margaret Gaye.

Acknowledgements

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Geoff Hughes-Games	B.C. Ministry of Agriculture, Fisheries and Food (Chair)
Phil Bergen	Agriculture and Agri-Food Canada
Lawrence Herd	B.C. Ministry of Agriculture, Fisheries and Food
Dave Melynchuk	B.C. Ministry of Agriculture, Fisheries and Food
Wayne Odermatt	B.C. Ministry of Agriculture, Fisheries and Food
Lorne Owen	B.C. Ministry of Agriculture, Fisheries and Food

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The responsibility for the report as written and all conclusions reached herein, is the author's alone. The report does not necessarily reflect the opinions of the Federal and Provincial Governments which funded the study."

Preface

This report, Part 2 of the Final Report, presents detailed accounts of field demonstrations and trials, and newsletters and bulletins distributed during a three-year project to "encourage the development, evaluation, transfer, and adoption of conservation farming practices that sustain soil and water productivity over the long term". It is one of three documents prepared for the Final Report--Part 1 summarizes the activities conducted during the project and Part 3 provides practical guidelines for organic soil management.

The project was funded by a grant awarded to the Cloverdale Soil Conservation Group by the Canada-British Columbia Soil Conservation Program to address concerns of vegetable producers farming organic soils located on the floodplain of the Nicomekl and Serpentine rivers.

The organic soils in the Cloverdale area support almost one-quarter of British Columbia's 61 million dollar fresh vegetable industry. The productive capability of the soil is matched by favourable climatic conditions for growth, making Surrey one of the most important agricultural areas in the province.

Organic soil, however, is subject to degradation from natural processes which are accelerated by poor soil management. Because of organic top soil losses, many vegetable producers in Cloverdale manage fields with shallow organic layers or exposed mineral subsoils. This creates crop management problems and increases production costs.

The Cloverdale Soil Conservation Group was formed to address two serious issues: 1. how to conserve the remaining highly productive organic soil, and 2. how to manage and increase the productivity of the poorer quality, exposed subsoil. The material in this document was distributed to the agricultural community to provide information relevant to those issues.

Committees and Staff

Cloverdale Soil Conservation Group

Bill Dun, Premier Produce Farms Ltd. (Chair)
Rick Law, Law Pacific Vegetable Farms Ltd.
Paul Garvin, Garvin Farms
Tim Singh, Cloverdale Produce Farms Ltd.
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Cloverdale Lettuce and Vegetable Co-operative: Year 1 and 2
Surrey Farmers' Institute: Year 3

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September 1992 Seed cover crops by 15 September for best results.
October 1992 Paratill now to ease spring soil management.

Part 1. Research and Demonstration Reports

Cloverdale Soil Conservation Group
TRIAL RESULTS

Canada-British Columbia Soil Conservation Program 17720 57th Ave., Surrey, B.C., V3S 4P9 (604) 576-2911

December 1991 Trial Report No. 1-1

1991 SPRING SEEDED COVER CROPS SPECIES EVALUATION

Mary-Margaret Gaye & Jean Hogue

Co-operator **Tim Singh**, Cloverdale Produce Farms Ltd.

Objective To assess spring seeded cover crop species for plant yield.

Species 22 species and mixtures (see Table 1).

Seeding Date 28 May

Fertilizer Preplant application of 15-18-15+1.8 Mg at 672 kg/ha.

Seeding Rates

Clovers (excluding Alsike)	12 kg/ha
Alsike clover	5.6
Alfalfa	22.4
Trapper field peas	60
Mustard/Oilseed radish	12
Westerwolds Italian ryegrass	28
Italian ryegrass	12
Cereals	112

Harvest Dates 24 July, 20 August, 23 October

Experimental Notes

The trial was a randomized complete block design with 3 replications. Plot size was 1.5m x 10m. Cereals and field peas were hand broadcast; the remaining species were machine seeded using a Brillion seeder. Plots were hand weeded as necessary. Plant biomass samples were taken from a 0.75m x 10m strip in the center of each plot, using a flail forage harvester. Subsamples (about 100-300g) were used to determine dry matter content. Data were statistically analyzed using Duncan's multiple range test.

Results

Spring seeded cover crops can be grown before a late season cash crop or through the entire season. Table 1 lists the yields at each cut. A species or mixture with a large yield in the first cut would be suitable for an early season cover crop. After the first cut the cereals showed some regrowth but the mustard and oilseed radish did not. Species or mixtures giving good regrow, thus the largest total yield, are best for a full season cover. Species and mixtures ranking 1 gave the highest first cut yields (Table 2), and total yields (Tables 2).

Many of these species are perennial and will not be winter killed. This trial will continue into the spring to determine winter survival and the effect of the cover crops on soil management.

Acknowledgements

Thanks to Dr. S. Freyman, Agassiz Research Station, Agriculture Canada, for the use of the forage harvester and Brillion seeder.

Table 1. Yield (dry weight) of spring seeded cover crops.

Species	Dry Matter Yield (t/ha)			
	First Cut	Second Cut	Third Cut	Total
Legumes:				
Ladino clover	0 d	1.6 b	1.6 de	3.2 fghi
Red clover	0 d	1.6 b	3.0 a	4.6 def
Alsike clover	0 d	1.9 ab	1.4 ef	3.3 fghi
Trapper field peas	1.1 cd	0.4 cd	0 g	1.6 i
WL 225 alfalfa	0 d	1.5 b	1.1 ef	2.6 fghi
Webfoot alfalfa	0 d	1.5 b	0.9 f	2.4 ghi
Broadleaves:				
Mustard	2.5 abc	0 d	0 g	2.5 ghi
Oilseed radish	1.8 bc	0 d	0 g	1.8 hi
Grasses:				
Westerwolds Italian ryegrass	2.5 abc	1.7 b	3.1 a	7.3 ab
Italian ryegrass	2.2 abc	2.0 ab	2.6 abc	6.9 abc
Cereals:				
Oats	3.1 ab	0.5 cd	0 g	3.6 efgh
Barley	2.9 ab	0.5 cd	0 g	3.5 efghi
Wheat	3.8 a	0.5 cd	0 g	4.3 defg
Mixes:				
Ladino clover/Italian ryegrass	2.7 abc	2.1 ab	2.5 abc	7.2 abc
Ladino clover/Barley	2.8 abc	0.5 cd	2.0 cd	5.3 cde
Red clover/Italian ryegrass	2.9 ab	2.4 a	2.8 ab	8.2 a
Alsike clover/Italian ryegrass	4.0 a	1.9 ab	2.8 ab	8.7 a
Alsike clover/Barley	3.1 ab	0.5 cd	2.2 bcd	5.8 bcd
Trapper field peas/Italian ryegrass	2.7 abc	1.9 ab	2.9 a	7.6 ab
Trapper field peas/Barley	3.0 ab	0.5 cd	0 g	3.5 efghi
Webfoot alfalfa/Italian ryegrass	2.5 abc	2.0 ab	2.8 ab	7.2 abc
Webfoot alfalfa/Barley	3.5 ab	0.8 c	0 g	4.3 defg

Within columns, means followed by the same letter are not significantly different at $P > 0.05$, using Duncan's multiple range test.

Table 2. Rank and dry weight of spring seeded cover crops: first cut.

Rank	Species	Description	Yield (t/ha)
1	Alsike clover/Italian ryegrass	Mix	4.0
1	Wheat	Cereal	3.8
2	Webfoot alfalfa/Barley	Mix	3.5
2	Red clover/Italian ryegrass	Mix	3.3
2	Alsike clover/Barley	Mix	3.1
2	Oats	Cereal	3.1
2	Trapper field peas/Barley	Mix	3.0
2	Barley	Cereal	2.9
3	Ladino clover/Barley	Mix	2.8
3	Ladino clover/Italian ryegrass	Mix	2.7
3	Trapper field peas/Italian ryegrass	Mix	2.7
3	Webfoot alfalfa/Italian ryegrass	Mix	2.5
3	Westerwolds Italian ryegrass	Grass	2.5
3	Mustard	Broadleaf	2.5
3	Italian ryegrass	Grass	2.2
4	Oilseed radish	Broadleaf	1.8
5	Trapper field peas	Legume	1.1
6	Ladino clover	Legume	0
6	Red clover	Legume	0
6	Alsike clover	Legume	0
6	WL 225 alfalfa	Legume	0
6	Webfoot alfalfa	Legume	0

Means with a similar ranking are not statistically different.

Table 3. Rank and yield (dry weight) of spring seeded cover crops: total.

Rank	Species	Description	Yield (t/ha)
1	Alsike clover/Italian ryegrass	Mix	8.7
1	Red clover/Italian ryegrass	Mix	8.2
2	Trapper field peas/Italian ryegrass	Mix	7.6
2	Westerwolds Italian ryegrass	Grass	7.3
3	Webfoot alfalfa/Italian ryegrass	Mix	7.2
3	Ladino clover/Italian ryegrass	Mix	7.2
3	Italian ryegrass	Grass	6.9
4	Alsike clover/Barley	Mix	5.8
5	Ladino clover/Barley	Mix	5.3
6	Red clover	Legume	4.6
7	Wheat	Cereal	4.3
7	Webfoot alfalfa/Barley	Mix	4.3
8	Oats	Cereal	3.6
9	Barley	Cereal	3.5
9	Trapper field peas/Barley	Mix	3.5
10	Alsike clover	Legume	3.3
10	Ladino clover	Legume	3.2
10	WL 225 alfalfa	Legume	2.6
11	Mustard	Broadleaf	2.5
11	Webfoot Alfalfa	Legume	2.4
12	Oilseed radish	Broadleaf	1.8
13	Trapper field peas	Legume	1.6

Means with a similar ranking are not statistically different.

Cloverdale Soil Conservation Group
TRIAL RESULTS

Canada-British Columbia Soil Conservation Program
17720 57th Ave., Surrey, B.C. V3S 4P9
(604) 576-2911

December 1991
Trial Report No. 1-2

1991 FALL SEEDED COVER CROPS SPECIES EVALUATION

Mary-Margaret Gaye & Jean Hogue

Co-operator Bill Dun, Premier Produce Ltd.

Objective To assess fall cover crop species for plant yield.

Species 12 species (see Table 1).

Seeding Date 3 September

Soil Type 7.1% organic matter, pH 4.9, 78 ppm NO_3^-, mineral ridge

Seeding Rates

Cereals	140 kg/ha
Faba beans	"
Austrian winter peas	"
Buckwheat	"
Mustard	22.4 kg/ha
Oilseed radish	"
Annual ryegrass	56 kg/ha

Sampling Date 28, 29 October

Experimental Notes

The trial was a randomized complete block design with 3 replications. Plot size was 2m x 10m. Plant biomass samples were taken from a 1 m^2, randomly chosen subplot, and dry matter content from a 100-300g sample. The experiment was analyzed using Duncan's multiple range test.

Results

Barley and mustard produced the largest yield of cover crops seeded on 3 September (Table 1 and 2). Both these species are winter killed. Fall rye, a crop that will survive most southcoastal winters, produced the second largest yield. Buckwheat produced the largest yield of the legumes and was the only species to be killed with the first frost.

The species will be evaluated in the spring for winter survival and soil management.

Table 1. Yield (dry matter) of fall seeded cover crops.

Species	Dry matter yield (t/ha)
Cereals - Overwinter:	
Fall rye	3.0 b
Winter wheat, 'Monopol'	2.2 bc
Cereals - Winter killed:	
Oats	2.6 bc
Barley	4.2 a
Spring wheat	2.8 bc
Grass - Winter killed:	
Westerwolds Italian ryegrass	2.2 bc
Legumes:	
Faba beans, 'Orion'	0.8 e
Austrian winter peas	1.0 de
Buckwheat	1.8 cde
Broadleaves:	
Mustard	4.8 a
Oilseed radish	1.9 bcd
Mix:	
Oats/Austrian winter peas	2.5 bc

Within columns, means followed by the same letter are not significantly different at $P > 0.05$, using Duncan's multiple range test.

Table 2. Rank and yield (dry matter) of fall seeded cover crops.

Rank	Species	Description	Yield (t/ha)
1	Mustard	Broadleaf	4.8
1	Barley	Cereal	4.2
2	Fall rye	Cereal*	3.0
3	Spring wheat	Cereal	2.8
3	Oats	Cereal	2.6
3	Oats/Austrian winter peas	Mix	2.5
3	Winter wheat, 'Monopol'	Cereal*	2.2
3	Westerwolds Italian ryegrass	Grass	2.2
4	Oilseed radish	Broadleaf	1.9
5	Buckwheat	Legume	1.8
6	Austrian winter peas	Legume	1.0
7	Faba beans, 'Orion'	Legume	0.8

* Overwinter

Means with same rank are not significantly different.

Cloverdale Soil Conservation Group
TRIAL RESULTS

Canada-British Columbia Soil Conservation Program
17720 57th Ave., Surrey, B.C., V3S 4P9
(604) 576-2911

December 1991
Trial Report No. 1-3

1991 FALL SEEDED COVER CROPS SPECIES EVALUATION AND TIME OF SEEDING

Mary-Margaret Gaye & Jean Hogue

Co-operator **Bill Dun**, Premier Produce Ltd.

Objective To assess fall cover crop species, seeded at three different dates, for plant yield and nitrogen.

Species
Winter wheat, 'Monopol'
Spring barley, 'Heartland'
Spring oats, common #1
Faba bean, 'Orion'
Oilseed radish

Seeding Dates 23 August, 13 September, 4 October

Soil Type 45% organic matter, pH 5.0, 238 ppm NO_3^-

Seeding Rates
Cereals and faba bean: 140 kg/ha
Oilseed radish: 22.4 kg/ha

Sampling Dates
Plant yield (biomass): 29 October
Plant and soil nitrogen: 4 October, 25 October, 15 November

Experimental Notes

The trial was a randomized complete block design with 3 replications. Plot size was 2m x 10m. Seeds of each species were hand broadcast and raked, or hand drilled into furrows (beans and peas only). Each plot was divided into 6 subplots for plant and soil sampling. Plant biomass samples were taken from a 1 m^2, randomly chosen subplot. Dry matter content was determined from 100-300g subsamples. For nitrogen sampling, five plant samples and five soil cores (0-23 cm depth) were taken at each sampling date, from a randomly chosen subplot. Norwest Labs Inc. conducted the nitrogen

analysis. ANOVA using individual degrees of freedom (timing) and Duncan's multiple range test were used to analyze plant yield data. Data from plant and soil nitrogen sampling were analyzed using repeated measures analysis of variance.

Results

Plant dry matter yield. Yield from all species increased with earlier seeding dates (Table 1 and Figure 1). All species seeded on 23 August, except faba beans, produced similar yields. Barley showed the best growth of all plants seeded on 13 September. Germination and growth of cover crops seeded on 4 October was poor -- most likely because of low soil moisture in the first few weeks following seeding.

Plant and soil nitrogen. Oats, followed by oilseed radish, had the highest total N (extractable ammonium and nitrate) of crops seeded early (23 August) (Figure 2). However, at the second seeding date barley showed the highest total nitrogen. Nitrogen concentration in al^Xxcrops generally decreased as plant biomass increased (data not shown).

Soil nitrate concentration did not differ between cover crops, but was lowest under crops seeded on the earliest seeding date (Figure 3). Presumably, crop removal of soil nitrates was greatest with this seeding date. The smaller biomass of crops seeded later reflects the higher nitrate concentrations observed in the surface layer of soil.

Conclusions

Plant biomass and nitrogen uptake are important aspects of fall seeded cover crops -- a large plant biomass will provide soil protection and also reduce leaching of excess soil nitrates into the groundwater.

In this study, the greatest biomass was obtained from the cereals and oilseed radish seeded on 23 August. Crops seeded at this time also removed the greatest amount of excess nitrates from the soil -- the greatest amount of total N (kg/ha) was obtained from oats. However, barley produced the greatest biomass and the highest total nitrogen of crops seeded on 13 September. Plants seeded on 4 October produced small yields and low nitrogen levels.

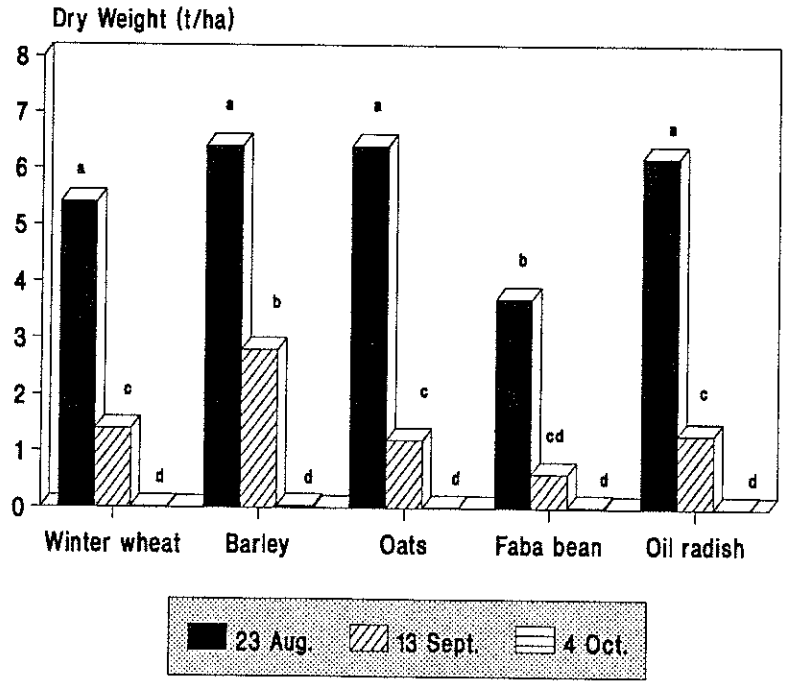
The plots will be assessed in the spring for plant survival and nitrogen levels.

Table 1. Rank and yield (dry matter) of fall cover crops seeded at three different dates.

23 August			13 September			4 October		
Rank	Species	Yield (t/ha)	Rank	Species	Yield (t/ha)	Rank	Species	Yield (t/ha)
1	Barley	6.4	2	Barley	2.8	5	Barley	0.04
1	Oats	6.4	3	Winter wheat	1.4	5	Faba beans	0.03
1	Oil radish	6.2	3	Oil radish	1.3	5	Winter wheat	0.02
1	Winter wheat	5.4	3	Oats	1.2	5	Oil radish	0.01
2	Faba beans	3.7	4	Faba beans	0.6	5	Oats	0.01

Means with a similar ranking are not significantly different.

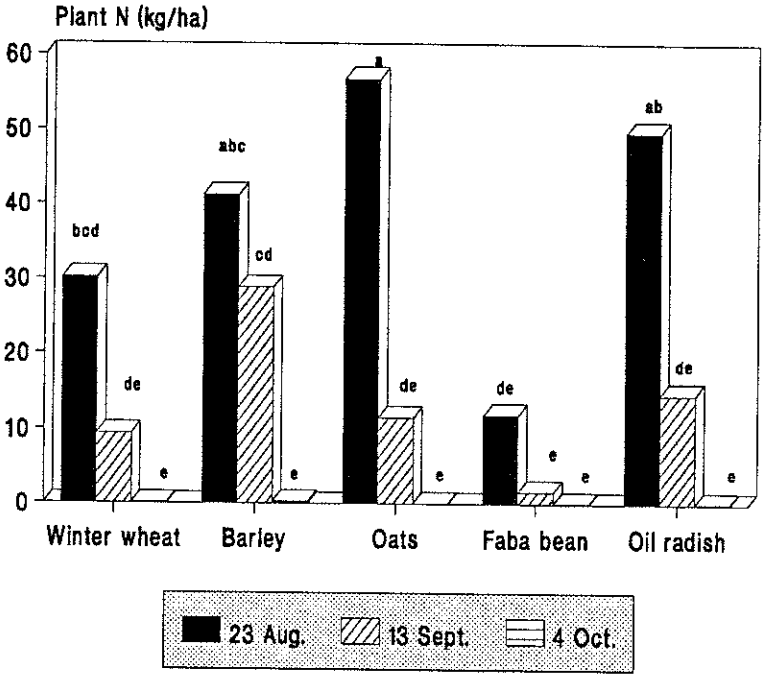
Figure 1. Dry weight of cover crops seeded at three different dates.



Means with similar letters are not significantly different

Harvest date: 29-30 October 1991

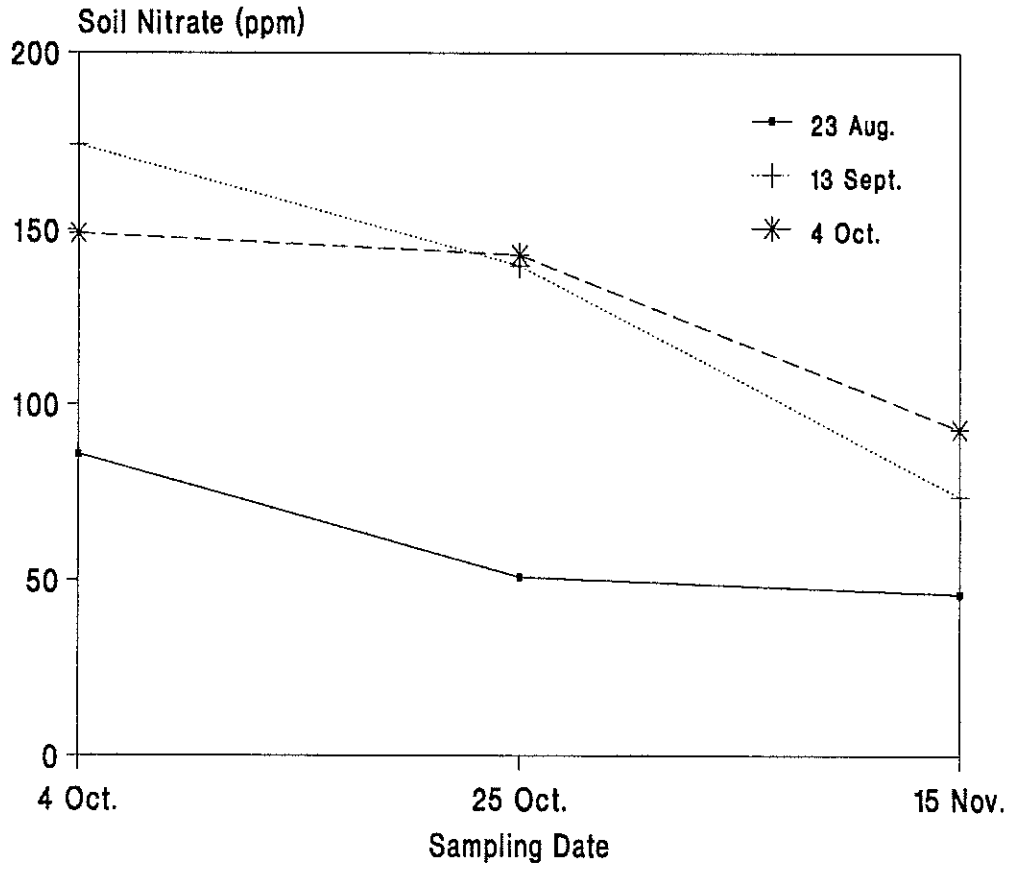
Figure 2. Plant N from cover crops seeded at three different dates.



Means with similar letters are not significantly different

Harvest date: 25,29-30 October 1991

Figure 3. Soil nitrate under cover crops seeded at three different dates.



Cloverdale Soil Conservation Group
TRIAL RESULTS

Canada-British Columbia Soil Conservation Program
17720 57th Ave., Surrey, B.C., V3S 4P9
(604) 576-2911

December 1991
Trial Report No. 1-4

1991 FERTILIZER TRIALS
CARROTS - PHOSPHORUS RATE AND PLACEMENT

Mary-Margaret Gaye and Jean Hogue

Co-operator **Raymond Wong,** Hing Sing Farm

Objective To determine phosphorus rate and placement (broadcast or banded) on carrots grown on: 1) organic soil and 2) mineral ridge.

Cultivar Cello King

Seeding Date 14 May

Soil Details

	Organic	Mineral
O.M.	74.6	48.7
pH	5.49	5.78
NO_3^--N	38	22
P	238	194
K	283	338

Phosphorus Rates
0, 50, 100, 150, or 200 kg/ha

N, K Rates N - 560 kg/ha (split application); K - 222 kg/ha

Harvest Date 10 September

Experimental Notes
Two trials, on a mineral ridge and on a highly organic soil, were conducted in the same field in a randomized complete block design with 4 replications. Plot size was 1.8m x 3m. Phosphorus fertilizer was hand applied (broadcast or banded) to the appropriate plot prior to seeding. The grower seeded and maintained the crop. ANOVA with individual degrees of freedom was used to analyze the data.

Results

Carrots were culled, on the field, for shape and size (small) only; the yields are therefore larger than the pack-out after the Co-op grading.

In both trials, there were no yield responses to increasing rates of phosphorus to the method of application. These results suggest the residual phosphorus levels were sufficient for plant growth.

Table 1. The effect of phosphorus rate and placement on the yield of carrots: Trial 1, mineral ridge; Trial 2, organic soil.

Treatment	Total mkt (t/ha)	Cull (t/ha)	% Mkt.*
Trial 1: Mineral Ridge			
Method:			
Broadcast	77	11	86
Banded	80	13	87
Significance	NS	NS	NS
P Rates (kg/ha):			
0	77	12	87
50	78	12	87
100	78	12	86
150	78	12	86
200	81	13	86
Significance	NS	NS	NS
Trial 2: Organic Soil			
Method:			
Broadcast	68	14	83
Banded	67	13	83
Significance	NS	NS	NS
P Rates (kg/ha):			
0	68	12	85
50	66	14	82
100	66	13	84
150	67	15	82
200	68	13	83
Significance	NS	NS	NS

* Percentage based on field culls, not pack-out from the Co-op.
NS = no significant differences.

Cloverdale Soil Conservation Group
TRIAL RESULTS

Canada-British Columbia Soil Conservation Program
17720 57th Ave., Surrey, B.C., V3S 4P9
(604) 576-2911

December 1991
Trial Report No. 1-5

1991 FERTILIZER TRIALS
ONIONS - NITROGEN RATE AND PLACEMENT

Mary-Margaret Gaye and Jean Hogue

Co-operator
Tim Singh, Cloverdale Produce Farms Ltd.
Paul Garvin, Garvin Farms Ltd.

Objective
To determine the effect of nitrogen rates and placement (broadcast or banded) on onions grown in: 1) organic soil and 2) mineral soil.

Cultivar
Copra

Seeding Date
1) organic: 17 April
2) mineral: 24 April

Soil Details

	Organic	Mineral
O.M.	84.9	34.0
pH	5.35	5.23
NO_3^--N	33	17
P	3	120
K	315	410

Nitrogen Rates
0, 25, 50, 75, or 100 kg/ha

P, K Rates
1) Organic: P - 134 kg/ha, K - 141 kg/ha
2) Mineral: 0-18-24 at 1075 kg/ha

Harvest Date
1) Organic: 20/23 September
2) Mineral: 24/25 September

Experimental Notes
Two trials, on a mineral and on an organic soil, were conducted in a randomized complete block design with 4 replications. Plot size was 1.8m x 3m. Nitrogen fertilizer was hand applied (banded or broadcast) to the appropriate plot prior to seeding.

Each grower seeded and maintained the crop. Prior to grading, onions were field dried for about one week, then dried in a onion shed for two weeks. ANOVA with individual degrees of freedom was used to analyze the data.

Results

Onions grown on the mineral soil tended to be smaller and yield less than those grown on organic soil. These observations cannot be tested statistically as crop management differed between the two trials.

Mineral soil. The total yield of onions declined with increasing rates of nitrogen (see Table 1 and Figure 1), but was not affected by the method of application.

Organic soil. Fertilizer rates or placement did not affect the total yield of onions grown on the organic soil.

Acknowledgements

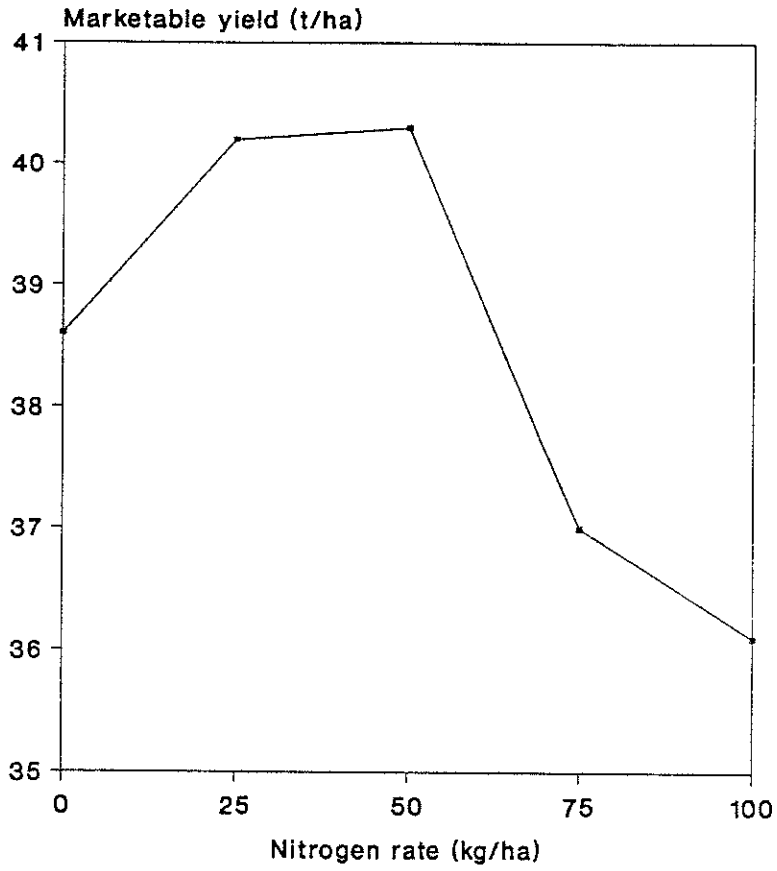
Thanks to Dr. P. Bowen, Agassiz Research Station, Agriculture Canada, for the use of the onion grader.

Table 1. The effect of nitrogen rate and placement on the yield of onions: Trial 1, mineral soil; Trial 2, organic soil.

Treatment	Marketable				Unmkt. (t/ha)
	Total (t/ha)	% Small	% Medium	% Jumbo	
Trial 1: Mineral Soil					
Method:					
Broadcast	38	27	73	0	1
Banded	39	30	70	0	1
Significance	NS	NS	NS	NS	NS
N Rates (kg/ha):					
0	39	29	71	0	1
25	40	25	75	0	1
50	40	28	72	0	1
75	37	29	71	0	1
100	36	32	68	0	2
Significance	*	NS	NS	NS	NS
Trial 2: Organic Soil					
Method:					
Broadcast	50	9	86	5	0.3
Banded	50	9	87	4	0.3
Significance	NS	NS	NS	NS	NS
N Rates (kg/ha):					
0	52	11	84	5	0.4
25	51	9	88	3	0.3
50	49	8	89	3	0.3
75	50	8	85	7	0.2
100	49	9	87	5	0.3
Significance	NS	*	NS	NS	NS

NS = no significant difference.
* = significance at α=0.05

Table 1. The effect of nitrogen rates on the yield of onions: mineral ridge.



Cloverdale Soil Conservation Group
TRIAL RESULTS

Canada-British Columbia Soil Conservation Program
17720 57th Ave., Surrey, B.C., V3S 4P9
(604) 576-2911

December 1991
Trial Report No. 1-6

1991 FERTILIZER TRIALS
LETTUCE - PHOSPHORUS RATE AND PLACEMENT

Mary-Margaret Gaye and Jean Hogue

Co-operator **Tim Singh**, Cloverdale Produce Farms Ltd.

Objective To determine the effect of phosphorus rate and placement (broadcast or banded) on lettuce grown in organic and mineral soil.

Cultivar Salinas

Seeding Date 1 May

Soil Details

	Organic	Mineral ridge
O.M.	58.1	31.1
pH	5.59	5.62
NO_3^--N	25	14
P	118	126
K	233	267

Phosphorus Rates

0, 40, 80, 120, or 160 kg/ha

N, K Rates N: 67 kg/ha, P: 134 kg/ha

Harvest Date 15/16 July

Experimental Notes

Two trials, on and off a mineral ridge, were conducted in the same field in a randomized complete block design with 4 replications. Plot size was 1.8m x 3m. The field chosen for the trial had a relatively low amount of available phosphorus prior to fertilizer application. Fertilizer was hand applied (broadcast or banded) to the appropriate plot. Lettuce was seeded and maintained by the grower. ANOVA with individual degrees of freedom was used to analyze the data.

Results

The yield of lettuce from the trial conducted on the organic soil was less than that from the mineral ridge because of weed competition.

In both trials, there were no yield (per ha) responses to increasing rates of phosphorus or to application method. These results suggest the residual amount of phosphorus in the soil was sufficient for plant growth.

Table 1. The effect of phosphorus rate and placement on the yield of lettuce: Trial 1, mineral ridge; Trial 2, organic soil.

Treatment	Mkt. plant weight (g)	Total wt. (t/ha)	Mkt. wt. (t/ha)	% Mkt.	# of cases per ha
Trial 1: Mineral Ridge					
Method:					
Broadcast	899	70	50	70	2298
Banded	906	70	52	75	2377
Significance	NS	NS	NS	NS	NS
P Rates (kg/ha):					
0	890	70	49	71	2312
40	889	69	51	79	2382
80	899	68	47	68	2195
120	910	73	54	71	2452
160	924	70	52	74	2347
Significance	*	NS	NS	NS	NS
Trial 2: Organic Soil					
Method:					
Broadcast	864	62	38	53	1729
Banded	850	60	32	46	1334
Significance	*	NS	NS	NS	NS
P Rates (kg/ha):					
0	839	59	32	50	1577
40	865	64	36	52	1746
80	868	62	31	47	1120
120	853	61	35	46	1517
160	867	61	40	54	1698
Significance	*	NS	NS	NS	NS

NS = no significant differences.
* = significance at α=0.05

Cloverdale Soil Conservation Group
TRIAL RESULTS

Canada-British Columbia Soil Conservation Program
17720 57th Ave., Surrey, B.C., V3S 4P9
(604) 576-5616

December 1992
Trial Report No. 2-1

1992 FERTILIZER TRIALS
PHOSPHORUS CHALLENGE

Mary-Margaret Gaye, Jean Hogue and Steve Brekker

Co-operators

Dave Brar, Brar Bros. Farm
Rick Law, Pacific Vegetable
Tim Singh, Cloverdale Produce Farms
Gilbert Wong, Howe Wong Farm Farms
Ray Wong, Hing Sing Farm

Fertilizer supplied by: **Stephen Eng**, Agrico Sales Ltd. and **Noel Roddick**, Noel Roddick Ltd.

Objective

Phosphorus levels in many fields in Cloverdale have built up to the extent that added phosphorus may have a negligible effect on crop yield. Adding phosphorus in this situation unnecessarily increases input costs and may increase the environmental risk of excess phosphorus entering the river systems.

The **Phosphorus Challenge** was designed to give farmers an opportunity to test a lower rate of phosphorus application without risking a loss in profitability. (A similar program was developed in Ontario with successful results.) The Conservation Group agreed to pay participating farms for any loss in profit resulting from lower application rates.

Demonstration Notes

Five farms participated in the program but, because of adequate phosphorus farm application rates, only three were chosen to continue in the program (see Table 1). In each of the three cases, residual phosphorus levels from the soil test were rated 'optimum' or higher by the laboratory (Norwest Labs), and the planned farm application rate for phosphorus was greater than that recommended by the B.C.M.A.F.F.

At each site, fertilizer was applied to a large field plot at the same rate as the farm rate with the exception of phosphorus. Participating farmers choose either to apply phosphorus at the

B.C.M.A.F.F. recommended rate according to a soil test, or to apply a lower rate.

Test plots were located within the main cropping area and were managed by the farmer following conventional practices. At harvest, samples from the test site and the main cropping area were taken from adjacent plots located along the length of the test site. Samples were statistically analyzed using a paired-difference *t*-test (Statistical Analysis System, SAS Institute 1985).

Table 1. Farms participating in the P challenge.

Farm	Field	Crop	Farm P rate (kg/ha)	B.C.M.A.F.F. recommended rate (kg/ha)	Participating farm test P rate
1	1	lettuce	67	56	-
2	1	lettuce	128	134	-
3	1	potatoes	90	101	-
	2	carrots	75	0-45	0
4	1	carrots	160	73	0
5	1	potatoes	162	123	81

Summary Results Participating farms applied phosphorus at rates 75 to 160 kg/ha less than those applied to adjacent crops. Reduced phosphorus levels did not significantly affect crop yield at any of the test sites. Hence, there was no loss in profit for the participating farms.

Recommendations

1. Stay with the same soil test laboratory--labs use different soil testing methods. Reporting and interpretation of results can differ between labs.

2. Base phosphorus application rates on current and past soil tests--soil tests taken over a number of years show trends in nutrient levels for a field. Knowledge of previous fertilizer use and the field's cropping history are also important in the interpretation of the soil test.

3. Phosphorus rates recommended by the B.C.M.A.F.F.'s Vegetable Production Guide are based on laboratory test method and crop requirements. Follow these rates particularly if the soil test shows 'optimum' or 'high' residual phosphorus.

SITE 1: CARROTS (CV. CELLO KING)

Soil Details

O.M.	51.5%
pH	5.21
NO_3^--N (kg/ha)	1.1
P_2O_5 (kg/ha)	132 (rated optimum)
K (kg/ha)	108

Phosphorus Rates (P_2O_5 kg/ha)

farm rate	75
trial area	0
[B.C.M.A.F.F.	0-45 (starter effect)]

Seeding Date 6 May

Harvest Date 7 August (93 days to harvest)

Plot Size 13 m x 61 m (3 carrot rows per bed)

Results There were no differences in yield or nutrient content detected between carrots seeded without added phosphorus and those with phosphorus added at a rate of 75 kg/ha (see Table 2.).

Table 2. Yield and tissue analysis results from Site 1.

Carrots		Farm site	Test site	Significance/ Rating*
Six-week yield	Root length (cm)	9.0	9.3	NS
	Plant weight (g)	1.7	1.7	NS
Final harvest yield	Marketable (T/ha)	41.7	43.3	NS
	Culls (T/ha)	9.4	8.4	NS
	% mkt.	82	84	NS
Tissue analysis at final harvest %	NO_3-N (N)	2.84	2.77	NS, normal
	Phosphorus (P)	0.243	0.257	NS, normal
	Potassium (K)	1.90	1.90	NS, below normal
	Calcium (Ca)	1.60	1.87	NS, normal
	Magnesium (Mg)	0.433	0.400	NS, normal

NS = no significant difference

*Rating based on optimum range for each nutrient (Norwest Labs.): N (1.99%-3.99%); P (0.19%-0.49%); K (1.99%-3.99%); Ca (1.29% - 2.99%); and Mg (0.30%-0.55%).

SITE 2: CARROTS (CV. SIX PAC II)

Soil Details

O.M.	47.5%
pH	5.43
NO_3^--N (kg/ha)	19.0
P_2O_5 (kg/ha)	84 (rated optimum)
K (kg/ha)	179

Phosphorus Rates (P_2O_5 kg/ha)

farm rate	160
trial area	0
(B.C.M.A.F.F.	73)

Seeding Date 6 May

Harvest Date 30 September (129 days to harvest)

Plot Size 16 m x 260 m (4 carrot rows per bed)

Results Carrot yields did not differ between sites with added phosphorus and those without, however, added phosphorus resulted in longer roots at the 6-week stage of development (see Table 3.). Potassium and magnesium content of carrot leaves was greater from sites without added phosphorus but only magnesium was less than the recommended optimum.

Table 3. Yield and tissue analysis results from Site 2.

Carrots		Farm site	Trial site	Significance/ Rating[1]
Six-week yield	Root length (cm)	14.0	13.0	*
	Plant weight (g)	2.8	2.9	NS
Final harvest yield	Marketable (T/ha)	78.4	84.9	NS
	Culls (T/ha)	20.0	18.	NS
	% mkt.	80	82	NS
Tissue analysis at final harvest %	NO_3-N (N)	2.53	2.67	NS/normal
	Phosphorus (P)	0.223	0.267	NS/normal
	Potassium (K)	3.57	3.87	*/normal
	Calcium (Ca)	1.37	1.50	NS/normal
	Magnesium (Mg)	0.197	0.237	*/below normal

*, NS = significant at p=0.05 and no statistical difference respectively.
[1]Rating based on optimum range for each nutrient (Norwest Labs.): N (1.99%-3.99%); P (0.19%-0.49%); K (1.99%-3.99%); Ca (1.29% - 2.99%); and Mg (0.30%-0.55%).

SITE 3: POTATOES (CV. RUSSET BURBANK)

Soil Details

O.M.	81.2%
pH	5.25
NO_3^--N (kg/ha)	5.6
P_2O_5 (kg/ha)	49.3 (rated marginal)
K (kg/ha)	133

Phosphorus Rates (P_2O_5 kg/ha)

farm rate	162
trial area	81
(B.C.M.A.F.F.	123)

Seeding Date 22 May

Harvest Date 4 October (135 days to harvest)

Plot Size 3.25 m x 283 m

Results Plant nutrient content at 6 weeks, with the exception of phosphorus content, and potato yield were not affected by reduced phosphorus application (Table 4). Although lower in the trial site, phosphorus analysis showed that nutrient content was sufficient for potato growth in both application sites.

Table 4. Yield and tissue analysis results from Site 3.

Potatoes		Farm site	Trial site	Significance/ Rating[1]
Tissue analysis	NO_3-N (N)	4.40	4.03	NS/above normal
at 6-weeks	Phosphorus (P)	0.670	0.563	*/above normal
%	Potassium (K)	3.83	3.33	NS/below normal
	Calcium (Ca)	0.450	0.423	NS/below normal
	Magnesium (Mg)	0.287	0.307	NS/below normal
Potato yield	No. 1 large	22.4	23.4	NS
(T/ha)	No. 1 small	9.9	7.3	NS
	No. 2	2.3	2.9	NS
	Total marketable	34.6	33.6	NS
	% marketable	81	82	NS

*, NS = significant at p=0.05 and no statistical difference respectively.
[1]Rating based on optimum range for each nutrient (Norwest Labs.): N (3.0%-4.0%); P (0.25%-0.40%); K (6.0%-8.0%); Ca (1.5% - 2.5%); and Mg (0.7%-1.0%).

Cloverdale Soil Conservation Group
TRIAL RESULTS

Canada-British Columbia Soil Conservation Program
17720 57th Ave., Surrey, B.C., V3S 4P9
(604) 576-5616

December 1992
Trial Report No. 2-2

1992 FERTILIZER TRIALS
CARROTS - PHOSPHORUS RATE AND PLACEMENT

Mary-Margaret Gaye and Jean Hogue

Co-operators **Gerry, Jim Sprangers**, Sprangers Farms

Objective To assess the effect of phosphorus rates on the yield of carrots grown on: 1) organic soil and 2) mineral ridge.

Cultivar Caro Choice

Seeding Date 8 May

Soil Details

	Organic	Mineral
O.M.	62.4	4.4
pH	6.14	6.41
NO_3^--N	21 kg/ha	25 kg/ha
P	86 kg/ha	68 kg/ha
K	265 kg/ha	692 kg/ha

Phosphorus Rates

0, 12.5, 25, 50, 100 or 200 kg/ha

Additional Fertilizer

Nitrogen: $CaNO_3$ @ 550 kg/ha. Banded 11 June by farmer.
Potassium: K_2O @ 269 kg/ha (farm rate)
Boron: @ 1.1 kg/ha (farm rate)
Magnesium: @ 1.6 kg/ha (farm rate)

Harvest Date 12 and 14 August

Experimental Notes

Two trials were conducted in the same field on organic soil and on a mineral ridge (exposed by land levelling), in a randomized complete block design with 4 replications. Plot size was 1.8 m (1 bed) x 3 m. Carrots were seeded in four rows per bed. Phosphorus fertilizer was hand broadcasted to the appropriate plots prior to seeding. The grower seeded and maintained the crop. The data were analyzed using ANOVA with individual degrees of freedom.

Results

Six week analysis. Phosphorus rate did not affect root length or total weight of carrots grown on organic or mineral soil.

Final harvest. Carrots were hand harvested and graded for shape and size: the yields are therefore larger than the pack-out after grading at the Co-op.

In both trials, marketable yield was not affected by increasing rates of phosphorus. These results suggest the residual phosphorus levels were sufficient for plant growth. Yield of carrots grown in the mineral soil was low due to poor germination and plant growth (see Table 1).

The percentage of unmarketable carrots produced on mineral soil significantly increased with increasing rates of potassium.

Table 1. The effect of phosphorus rate on the yield of carrots: Trial 1, organic soil; Trial 2, mineral ridge.

Treatment	Total mkt (t/ha)	Cull (t/ha)	% Mkt.*
Trial 1: Organic Soil			
P Rates (kg/ha)			
0	58.9	11.6	16
12.5	56.1	12.4	18
25	58.4	12.8	18
50	57.0	11.3	17
100	56.1	13.5	19
200	56.5	12.8	18
Significance	NS	NS	NS
Trial 2: Mineral Ridge			
P Rates (kg/ha)			
0	4.2	14.2	77
12.5	3.7	8.6	62
25	2.4	8.2	76
50	4.0	14.7	79
100	2.9	13.8	84
200	2.4	9.5	81
Significance	NS	C*	L,C*

* Percentage based on field culls, not pack-out from the co-op.
NS = not significantly different.
L*,C* = linear and cubic trends significant at p=0.05.

Cloverdale Soil Conservation Group
TRIAL RESULTS

Canada-British Columbia Soil Conservation Program 17720 57th Ave., Surrey, B.C., V3S 4P9 (604) 576-2911

December 1992 Trial Report No. 2.3

1992 FERTILIZER TRIALS
CARROTS - NITROGEN APPLICATION RATE AND TIMING

Mary-Margaret Gaye and Jean Hogue

Co-operators **Gerry, Jim Sprangers,** Sprangers Farms
Stephen Eng, Agrico Sales Ltd.

Objective To assess nitrogen rates and application timing [$CaNO_3$ or slow release (41.5% N)], on carrots grown on organic soil.

Cultivar Caro Choice

Seeding Date 8 May

Soil Details

O.M.	95.7
pH	4.95
NO_3^--N	9 kg/ha
P	9 kg/ha
K	109 kg/ha

Nitrogen Rates and Application Dates

Rates: 0, 25, 50, 75, 100 kg/ha (actual N)
Application dates:
$CaNO_3$--banded on 15 June, following commercial practice in adjacent field.
Slow release N--designed to release N over 12-14 weeks. Applied (banded) just prior to seeding.

Additional Fertilizer

0-18-24 plus micronutrients applied by farmer at about 1100 kg/ha

Harvest Date 18/19 August

Experimental Notes

The trial was conducted in a randomized complete block design with 4 replications. Plot size was 1.8 m (1 bed) x 3 m. Carrots were seeded in four rows per bed. Fertilizer was banded between rows--two bands per plot--and incorporated into the soil. The farmer seeded and maintained the crop. Six-week and final yield data were analyzed using ANOVA with individual degrees of freedom.

Results

Six-week analysis. Nitrogen application rate or timing did not affect root length. Slow release fertilizer applied at low rates (0 or 25 kg/ha) resulted in significantly larger total plant weight, however, increases were slight and of minor horticultural importance.

Final harvest. Note: carrots were hand-harvested and graded on the field (shape and size). The yields are therefore larger than the pack-out after the Co-op grading.

Top yield (leaves and stems). Fertilizer rate did not affect the weight of tops produced per hectare. Top weight was larger with the application of slow release fertilizer than with fertilizer applied during cultivation (0.4 t/ha). The percentage of tops was not affected by fertilizer timing or rate.

Root yield. Carrot yield increased with increasing rates of fertilizer, but was not affected by the timing of application. The culls were primarily deformed roots. Treatments did not affect the cull yield or the percentage of marketable roots.

Table 1. The effect of nitrogen application rate and timing on the yield of carrots.

Treatment	'Tops'[1.] (t/ha)	Total mkt. (t/ha)	Cull (t/ha)	% Mkt.[2.]	% Tops
Timing:					
$CaNO_3$	3.8	56.5	26.1	68.3	31.3
Slow release	4.2	56.3	27.1	67.5	33.3
Significance	*	NS	NS	NS	NS
N Rates (kg/ha):					
0	3.7	55.3	27.9	66.4	30.8
25	4.1	53.0	24.7	68.3	34.7
50	3.8	56.4	28.1	66.8	30.9
75	4.0	58.0	27.0	68.2	31.7
100	4.3	59.4	25.5	69.7	33.6
Significance	NS	*L	NS	NS	NS

[1.] Leaves and stems.
[2.] Percentage based on field culls, not pack-out from the Co-op.
NS = no significant differences.
*, L = denotes significance at p=0.05 and linear trend respectively.

Cloverdale Soil Conservation Group
TRIAL RESULTS

Canada-British Columbia Soil Conservation Program
17720 57th Ave., Surrey, B.C., V3S 4P9
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January 1993
Trial Report No. 2-4

1992 SPRING SEEDED COVER CROPS SPECIES EVALUATION - YEAR 2

Mary-Margaret Gaye and Jean Hogue

Co-operator **Rick Law**, Law Pacific Vegetables Ltd.

Objective To assess plant species for suitability for spring seeded cover crops.

Species 24 species and mixtures (see Table 1).

Seeding Date 23 April 1992

Fertilizer Preplant application of 11-10-29.5+2.5 S, 0.33 B, 1.68 Cu and 0.84 Fe @ 250 lb/acre

Soil Details

Organic matter	29.5%
pH	6.17
Nitrogen (NO_3-)	16.8 kg/ha
Phosphate	131 kg/ha
Potassium	371 kg/ha

Seeding Rates

Clovers	13.4 kg/ha
Alfalfa	26
Mustard/oilseed radish	15
Westerwolds Italian ryegrass	34
Cereals	119

Experimental Notes

The trial was a randomized complete block design with 3 replications. Plot size was 1.32m x 10m. Plots were seeded using an 'International' seed drill. Clover and alfalfa plots were mowed on 15 June for weed control. All other plots, including a bare soil control plot, were hand weeded as necessary.

Plant yield. Plant biomass samples were taken from a 0.75m x 10m strip in the center of each plot at each harvest date, using a flail forage harvester. Harvest dates were: first cut--broadleaves on 10 June, cereals and grass on 23/24 June, and clovers and alfalfa on 9 July; Second cut--29/30 July; third cut--1 September. Subsamples (about 100-300g) were oven-dried to determine dry matter content. Data were statistically analyzed using Duncan's multiple range test.

Root yield. Species were assessed for root development on 24/25 June and on 7/8 October. Harvest dates represented root growth after an early-season and a full-season cover crop respectively. At each harvest, two cores (diameter 10.8 cm amx length 17 cm) were sampled from each plot. Samples were washed to remove soil and oven-dried. Data were statistically analyzed using Duncan's multiple range test.

Nematode assessment. Root and soil samples were assessed for nematodes on 28 April, 24 June and 26 October. At each sampling date, 12 soil cores were taken from each plot (monocultures only) and combined for assessment. Roots and soil were separated in each pooled sample for analysis.

Results

Plant yield. Table 1 lists the yield at each cut. Mustard and oilseed radish were flowering at the first cut; the cereals were beginning to head. Species and mixtures ranking 1 gave the largest first cut yields and total yields (Tables 2 and 3 respectively).

Root yield. Dry root yield is presented in Table 4. The largest root yield at the first harvest was obtained from oilseed radish followed by fall rye. Mixture of clovers or Italian ryegrass with cereals were the top five yielding cover crops.

Alfalfa produced the largest yield from the second harvest. This was followed by mixtures of cereals and alsike clover. Fall rye produced relatively large root yields but not shoot yields, at all sampling dates.

Nematode Assessment

Preliminary results from a one-year evaluation showed the presence of nematodes (root-knot nematode) in some of the soil and root samples but there were no statistically significant difference found between treatments

In all cases, nematodes were not present in the soil samples taken prior to crop germination.

Recommendations

Organic soils in Cloverdale benefit from a long-term rotation that includes a soil-building cover crop. 'Glues' released from plant roots and

decomposing plant material are important in promoting good soil structure. The choice of cover crops should be based on management requirements as well as yield. For example, the cereal in a cereal/clover mixture can be combined for seed leaving the clover to provide overwinter soil protection. Also the clover's long tap root creates a drainage channel in the mineral subsoil complimenting the fibrous root system of the cereal in the promotion of good field drainage.

A species or mixtures producing a large yield in the first cut is suitable as an early season cover crop. However, crop rotation with cash crops must also be considered. For example, mustard or oilseed radish should not be followed by a brassica cash crop. Species or mixtures showing regrowth after the first cut are suitable for full season cover cropping.

1993 spring assessment will include weed control and plant survival.

Acknowledgements

Nematode assessment was conducted by Dr. Thierry Vrain and Robyn deYoung, Vancouver Research Station, Agriculture Canada

Table 1. Yield (dry weight) of spring seeded cover crops.

Species	Dry Matter Yield (t/ha)			
	First Cut	Second Cut	Third Cut	Total
Legumes:				
Ladino clover cv. Sacramento	2.9 fg	1.6 efgh	1.6 abc	6.2 cde
Red clover, Pacific double cut	2.5 gh	1.6 efghi	2.0 a	5.9 cde
Alsike clover	3.2 efg	1.3 fghi	1.7 abc	6.2 cde
WL 225 alfalfa	2.6 gh	2.3 abc	1.9 a	6.8 cd
Broadleaves:				
Mustard - B. juncea cv. Cutlass	1.6 hi	0 j	0 g	1.6 g
Oilseed radish	1.2 i	0 j	0 g	1.2 g
Grasses:				
Westerwolds Italian ryegrass	2.0 ghi	2.3 abc	0.9 def	5.3 ef
Cereals:				
Spring barley cv. Virden	5.8 a	1.1 i	0 g	6.9 cd
Spring oats cv. Jasper	6.1 a	1.2 hi	0 g	7.3 bc
Red spring wheat cv. Max	4.1 cde	1.5 efghi	0 g	5.6 de
Fall rye, common #1	2.1 ghi	1.4 efghi	0.7 ef	4.2 f
Mixes:				
Red clover/spring barley	5.5 ab	2.3 abc	1.7 ab	9.5 a
Red clover/spring oats	6.1 a	1.8 def	1.8 a	9.7 a
Red clover/spring wheat	4.6 bcd	2.2 bcd	1.6 abc	8.4 ab
Red clover/fall rye	2.3 ghi	2.5 ab	2.0 a	6.7 cde
Alsike clover/spring barley	5.8 a	1.9 cde	1.3 bcd	9.0 a
Alsike clover/spring oats	5.0 abcd	2.5 ab	1.1 de	8.6 ab
Alsike clover/spring wheat	4.9 abcd	2.6 ab	1.1 de	8.4 ab
Alsike clover/fall rye	2.1 ghi	2.8 a	1.2 cd	6.1 cde
Italian ryegrass/spring barley	5.1 abc	1.3 ghi	0.6 f	6.9 cd
Italian ryegrass/spring oats	5.1 abc	1.7 efg	0.6 f	7.4 bc
Italian ryegrass/spring wheat	3.8 def	1.6 efgh	0.6 f	6.1 cde
Italian ryegrass/fall rye	1.7 hi	1.7 defg	0.7 ef	4.2 f

Within columns, means followed by the same letter are not significantly different at P>0.05 using Duncan's multiple range test.

Table 2. Rank and dry weight of spring seeded cover crops: first cut.

Rank	Species	Description	Yield (t/ha)
1	Spring oats cv. Jasper	Cereal	6.1
1	Red clover/spring oats	Mix	6.1
1	Spring barley cv. Virden	Cereal	5.8
1	Alsike clover/spring barley	Mix	5.8
2	Red clover/spring barley	Mix	5.5
3	Italian ryegrass/spring oats	Mix	5.1
3	Italian ryegrass/spring barley	Mix	5.1
4	Alsike clover/spring oats	Mix	5.0
4	Alsike clover/spring wheat	Mix	4.9
5	Red clover/spring wheat	Mix	4.6
6	Red spring wheat cv. Max	Cereal	4.1
7	Italian ryegrass/spring wheat	Mix	3.8
8	Alsike clover	Legume	3.2
9	Ladino clover cv. Sacramento	Legume	2.9
10	WL 225 alfalfa	Legume	2.6
10	Red clover, Pacific double cut	Legume	2.5
11	Red clover/fall rye	Mix	2.3
11	Fall rye, common #1	Mix	2.1
11	Alsike clover/fall rye	Cereal	2.1
11	Westerwolds Italian ryegrass	Grass	2.0
12	Italian ryegrass/fall rye	Mix	1.7
12	Mustard - B. juncea cv. Cutlass	Broadleaf	1.6
13	Oilseed radish	Broadleaf	1.2

Table 3. Rank and dry weight of spring seeded cover crops: total cut.

Rank	Species	Description	Yield (t/ha)
1	Red clover/spring oats	Mix	9.7
1	Red clover/spring barley	Mix	9.5
1	Alsike clover/spring barley	Mix	9.0
2	Alsike clover/spring oats	Mix	8.6
2	Alsike clover/spring wheat	Mix	8.4
2	Red clover/spring wheat	Mix	8.4
3	Italian ryegrass/spring oats	Mix	7.4
3	Spring oats cv. Jasper	Cereal	7.3
4	Italian ryegrass/spring barley	Mix	6.9
4	Spring barley cv. Virden	Cereal	6.9
4	WL 225 alfalfa	Legume	6.8
5	Red clover/fall rye	Mix	6.7
5	Alsike clover	Legume	6.2
5	Ladino clover cv. Sacramento	Legume	6.3
5	Alsike clover/fall rye	Mix	6.1
5	Italian ryegrass/spring wheat	Mix	6.1
5	Red clover, Pacific double cut	Legume	5.9
6	Red spring wheat cv. Max	Cereal	5.6
7	Westerwolds Italian ryegrass	grass	5.2
8	Fall rye, common #1	Cereal	4.2
8	Italian ryegrass/fall rye	Mix	4.2
9	Mustard - B. juncea cv. Cutlass	Broadleaf	1.6
9	Oilseed radish	Broadleaf	1.2

Means with a similar ranking are not statistically different.

Table 4. Rank and dry root yield at two sampling dates.

Species	Root type	9 July		8 October	
		Rank	Dry yield 10^{-3} g/cm^3	Rank	Dry yield 10^{-3} g/cm^3
Oilseed radish	tap	1	1.83		
Spring barley	fibrous	7	1.06		
Spring oats	fibrous	7	1.05		
Mustard	tap	8	0.86		
Spring wheat	fibrous	8	0.82		
WL 225 alfalfa	tap	7	1.07	1	3.42
Alsike clover/fall rye	mix	3	1.66	2	2.98
Alsike clover/spring barley	mix	9	0.72	2	2.97
Fall rye, common #1	fibrous	2	1.80	3	2.84
Alsike clover/spring oats	mix	6	1.17	4	2.62
Alsike clover/spring wheat	mix	9	0.72	5	2.45
Italian ryegrass/fall rye	fibrous	5	1.33	5	2.20
Red clover/spring wheat	mix	9	0.78	6	2.03
Red clover	tap	11	0.38	6	2.02
Alsike clover	tap	10	0.61	6	1.95
Ladino clover	tap	10	0.62	6	1.80
Red clover/fall rye	mix	4	1.46	6	1.80
Red clover/spring oats	mix	7	0.93	6	1.78
Italian ryegrass/spring wheat	fibrous	9	0.76	7	1.57
Italian ryegrass	fibrous	6	1.23	7	1.51
Italian ryegrass/spring barley	fibrous	8	0.86	8	1.42
Red clover/spring barley	mix	6	1.18	8	1.41
Italian ryegrass/spring oats	fibrous	7	1.10	9	1.12

Cloverdale Soil Conservation Group
TRIAL RESULTS

Canada-British Columbia Soil Conservation Program
17720 57th Ave., Surrey, B.C., V3S 4P9
(604) 576-5616

21 January 1993
Trial Report No. 2-5

1992 COVER CROP TRIALS
SORGHUM-SUDANGRASS ASSESSMENT

Mary-Margaret Gaye and Jean Hogue

Co-operators

Richard Law, Law Pacific Vegetables Ltd.

Seed suppliers:
Kan-Tex Seed Co., Tulia, Texas
East Chilliwack Co-op., Abbotsford, B.C.

Objective

To evaluate warm-season crops--sorghum-sudangrass and pearl millet--for spring seeded cover cropping.

Seeding Date

21 May

Soil Details

O.M.	29.5%
pH	6.17
NO_3^--N	7 kg/ha
P	131 kg/ha
K	371 kg/ha

Fertilizer

Preplant application of 11-10-29.5+2.5 S, 0.33 B, 1.68 Cu and 0.84 Fe @ 250 lb/acre

Treatments

Sorghum-sudangrass (3 cultivars):
'Sugar Beef' (white seeded) (Kan-Tex Seed Co.)
'Cattle Grazer' (red seeded) (Kan-Tex Seed Co.)
'Pioneer 877F (white seeded) (East Chilliwack Co-op.)
Pearl millet (Kan-Tex Seed Co.)

Seeding Rate

Sorghum-sudangrass	36 kg/ha
Pearl millet	18 kg/ha

Harvest Date

28 August

Experimental Notes

The trial was conducted on a mineral ridge within a field of organic soil. The experimental design was a randomized complete block with 4 replications. Plot size was 4 m x 15 m. Treatments were seeded using a seed drill with a between-row spacing of 18 cm.

The pearl millet was cut the third week of May because of poor weed competition--the data from this cutting were not recorded.

At final harvest, plants were cut at the soil surface from sub-plots 5 m x 0.75 m. Plants from all treatments were flowering. The collected data were analyzed using a protected Duncan's multiple range test.

Results

Yield measured on a fresh weight basis did not differ between the tested cultivars of sorghum-sudangrass (see Table 1.). Sugar beef produced the lowest dry matter of the three cultivars, however, it reached the greatest plant height.

Plant growth of the pearl millet was initially slow resulting in weed competition. The relatively small shoot yield was most likely due to the mid-season mowing.

Table 1. Yield of four warm-season cover crops.

Treatment	Fresh weight t/ha	Dry matter t/ha	Plant height m
Sorghum-sudangrass			
'Cattle grazer'	57 a	15.7 a	3.0 b
'Pioneer 877F'	59 a	15.3 a	2.7 c
'Sugar beef'	47 a	13.3 a	3.2 a
Pearl millet	34 a	6.0 b	1.5 d

Within columns, means followed by the same letter are not significantly different at $p>0.05$ using Duncan's multiple range test.

Cloverdale Soil Conservation Group
TRIAL RESULTS

Canada-British Columbia Soil Conservation Program
17720 57th Ave., Surrey, B.C., V3S 4P9
(604) 576-5616

January 1993
Trial Report No. 2-6

1992 FALL SEEDED COVER CROPS SPECIES EVALUATION - YEAR 2

Mary-Margaret Gaye & Jean Hogue

Co-operator **Rick Law**, Law Pacific Vegetables Ltd.

Objective To assess plant species for suitability to fall cover cropping.

Species 12 species (see Table 1).

Seeding Date 3 September

Soil Details

Organic matter	55%
pH	5.63
Nitrogen (NO_3^-)	37 kg/ha
Phosphate	70 kg/ha
Potassium	119 kg/ha

Seeding Rates

Cereals	140 kg/ha	
Faba beans	"	
Austrian winter peas	"	(mix: 68 kg/ha)
Red clover	12 "	
Mustard	13 "	
Oilseed radish	16 "	
Annual ryegrass	32 "	

Sampling Dates Shoot yield: 2, 3 November
Plant height and weed control rating: 18 November

Experimental Notes

The trial was a randomized complete block design with three replications. Plot size was 2m x 10m. All plots were seeded with an 'International' seed drill. Plant biomass samples were taken from a 1 m^2, randomly chosen subplot. A 100-300g subsample was oven-dried to determine dry matter content. Plant heights were determined by extending the leaves of grasses, and measuring to the growing tip of broadleaved plants. Weed competition was determined using the weed control rating system

of the Expert Committee on Weeds (ECW). Data were statistically analyzed using Duncan's multiple range test.

Results

Barley produced the largest yield and plant height of all tested species (Tables 1 and 2, Fig. 1). The second largest yield was obtained from oats. The remaining cereals and their mixtures produced larger yields than the broadleaved species and Italian ryegrass.

Chickweed was a common weed in the experimental site. The yield of cover crop species that were slow to germinate or grow was likely reduced due to weed competition. Acceptable control according to ECW standards was obtained only with barley and oats (Fig. 2). Although these species produced the tallest plants, plant height was not necessarily associated with good weed control. For example, mustard plants were the shortest of all species but relatively good weed control was obtained because of the large growth habit of the leaves that prevented light from reaching the soil surface.

The species will be evaluated for winter survival and herbicide effects, prior to spring cultivation.

Table 1. Yield (dry matter) of fall seeded cover crops.

Species	Fresh weight (t/ha)	Dry matter yield (t/ha)
Cereals - Overwinter:		
Fall rye, common #1	18.0 ef	2.0 bcd
Winter wheat, 'Fundulea'	23.9 de	2.4 bc
Cereals - Winter killed:		
Oats, 'Jasper'	34.6 b	2.5 b
Barley, 'Virden'	45.5 a	3.5 a
Spring wheat, 'Max'	26.0 cd	2.2 bc
Grass:		
Westerwolds Italian ryegrass	15.2 f	1.3 e
Legumes:		
Faba beans, 'Friedrichs'	18.1 ef	1.5 de
Austrian winter peas	12.2 f	1.5 de
Pacific double cut red clover	0.0 g	0 f
Broadleaves:		
Mustard, 'Cutlass'	26.6 cd	1.9 bcde
Oilseed radish	25.2 cd	1.8 cde
Mix:		
Oats, 'Jasper'/Austrian winter peas	31.7 bc	2.4 bc

Within columns, means followed by the same letter are not significantly different at P > 0.05, using Duncan's multiple range test.

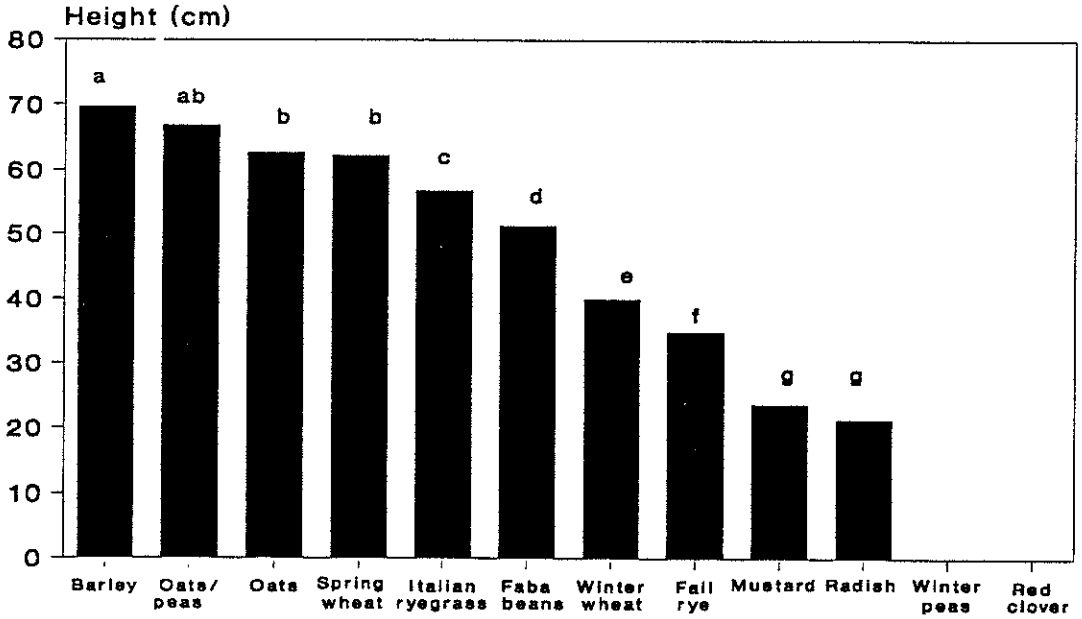
Table 2. Rank and yield (dry matter) of fall seeded cover crops.

Rank	Species	Description	Dry matter Yield (t/ha)
1	Spring barley, 'Virden'	Cereal	3.5
2	Spring oats, 'Jasper'	Cereal	2.5
3	Winter wheat, 'Fundulea'	Cereal*	2.4
3	Spring oats, 'Jasper'/Austrian winter peas	Mix	2.4
3	Spring wheat, 'Max'	Cereal	2.2
4	Fall rye, Common #1	Cereal*	2.0
5	Mustard, 'Cutlass'	Broadleaf	1.9
6	Oilseed radish	Broadleaf	1.8
7	Faba beans, 'Friedrichs'	Legume	1.5
7	Austrian winter peas	Legume	1.5
8	Westerwolds Italian ryegrass	Grass	1.3
9	Pacific double cut red clover	Legume	0

* Overwinter

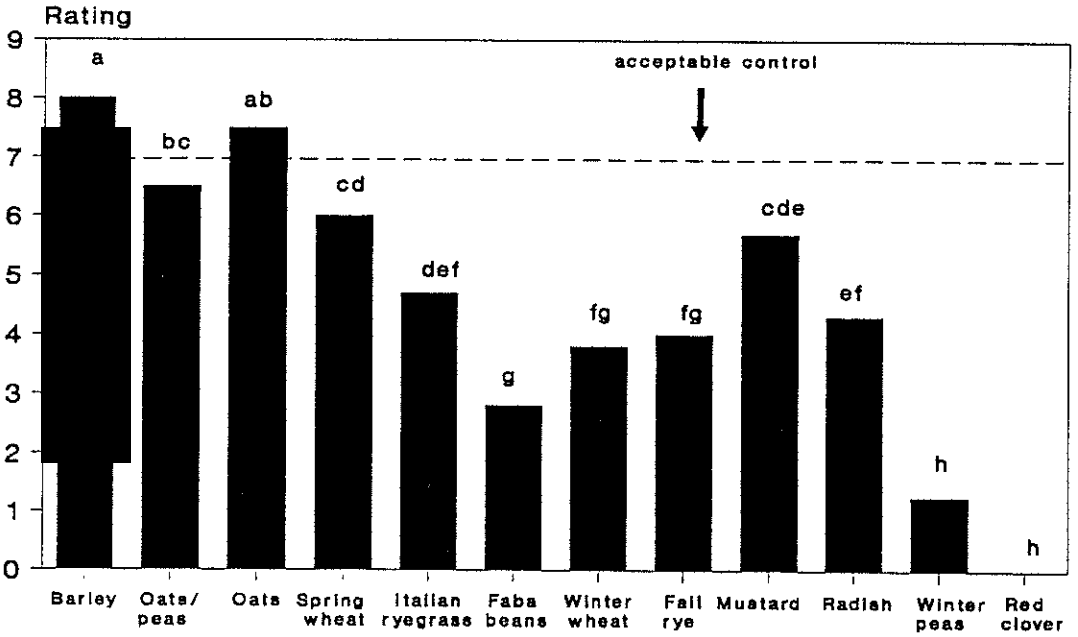
Means with same rank are not significantly different.

Fig. 1. Plant height.



Means followed by the same letter are not significantly different at P>0.05, using Duncan's multiple range test.

Fig. 2. ECW weed control rating*.



Means followed by the same letter are not significantly different at P>0.05, using Duncan's multiple range test.

*ECW = Expert Committee on Weeds; 0 = no control, 9 = full control

Cloverdale Soil Conservation Group
TRIAL RESULTS

Canada-British Columbia Soil Conservation Program
17720 57th Ave., Surrey, B.C., V3S 4P9
(604) 576-5616

January 1993
Trial Report No. 2-7

1992 FALL SEEDED COVER CROPS SPECIES EVALUATION AND TIME OF SEEDING YEAR 2

Mary-Margaret Gaye & Jean Hogue

Co-operator **Rick Law, Law Pacific Vegetable Ltd.**

Objective To assess fall cover crop species, seeded at three different dates, for plant yield and nitrogen uptake.

Species
Winter wheat cv. Monopol
Spring barley cv. Virden
Spring oats cv. Jasper
Faba bean cv. Friedrichs
Westerwold's Italian ryegrass

Seeding Dates 24 August, 14 September, 5 October

Soil Type

Organic matter	33.5%
pH	5.87
Nitrogen (NO_3^-)	25.8 kg/ha
Phosphate	135 "
Potassium	171 "

Seeding Rates

Winter wheat	140 kg/ha
Spring barley	134 "
Spring oats	136 "
Faba bean	137 "
Italian ryegrass	32 "

Sampling Dates

Shoot yield: 23, 24 November
Total plant and soil nitrogen, plant and root biomass:
6 October, 27 October, 16/17 November
Plant height and weed rating: 18 November

Experimental Notes

The trial was a randomized complete block design with 3 replications. Plot size was 2 m x 10 m. Seeds of each species were drilled using an 'International' seed drill. Data were collected from randomly selected subplots within each plot. Five soil cores (0-23 cm depth) were taken at each sampling date from a 30 cm^2 subplot and combined for nitrogen analysis. All plants were removed from the same subplot to assess nitrogen content, and root and shoot yield. Shoot yield was also determined from 1 m^2 subplots harvested at the end of the growing season. Dry matter content was determined by oven drying 100-300 g subsamples. Plant height was determined by measuring plant leaves from the soil surface to the extended tips, and the rating system of the Expert Committee on Weeds (ECW) (scale from 0-9) was used to assess weed competition. Norwest Labs Inc. conducted the nitrogen analysis. Data collected over three sampling dates were analyzed using repeated measures analysis of variance. ANOVA using individual degrees of freedom and Duncan's multiple range test were used to analyze shoot yield data.

Results

Shoot yield from 23 November harvest. Cover crop yield increased with earlier seeding dates (Fig.1). Over all seeding dates, the largest yields were obtained from barley, followed by oats (Fig. 2). Barley showed a trend towards a greater yield than all other crops seeded on 14 September, but this trend was not statistically significant.

Plant height and weed suppression. Plant height is an indication of the degree of weed suppression and soil protection given by a particular cover crop. Plant height may also influence spring soil management particularly where a tall plant produces a large amount of residue in the spring.

With the exception of winter wheat, the earliest seeded cover crops (late-August) obtained the greatest height. Barley, the tallest crop, reached a height of 1 m while the remaining early-seeded crops ranged from 0.6 to 0.8 m. The heights of crops seeded mid-September ranged from 0.3 to 0.6 m--barley and winter wheat were the tallest and shortest crops respectively. Barley and oats seeded in early October reached a height of 0.2 m but all other crops were about 0.1 m. A height of 0.1 m would provide little winter soil protection.

Only barley and oats seeded in late-August gave acceptable weed control according to the ECW rating criteria (rating 7+). Most crops seeded mid-September were rated about 5 (maximum rating is 9).

Plant yield and nitrogen assessment from 3 sampling dates.
Plant yield. The shoot yield of early-seeded barley, averaged over three sampling dates, was larger than all other crops seeded at the

same time (Table 1). The yield from the remaining crops seeded at this time did not differ. Crops seeded mid-September followed the same trend. Winter wheat and Italian ryegrass showed the smallest yield of the late-seeded crops.

Root:shoot ratio tended to decline with increasing shoot biomass (correlation 48%)--the lowest root:shoot ratio (1:13) was observed with barley, the largest yielding plant (Table 1).

Nitrogen uptake. Nitrogen uptake increased with early seeding dates, and generally declined after the second sampling (Fig. 3). This latter effect is probably because plant nitrogen is diluted by the larger biomass of more developed plants. Over all seeding dates, barley showed the largest nitrogen uptake and faba beans (a legume), the least. All other crops were statistically equivalent (Fig. 4). The inverse of this trend was reflected in the soil nitrate content under the respective crops. The decline of soil nitrates after the second sampling is most likely the result of leaching.

Conclusions

Cover crops planted early enough during a cropping season can take up nitrogen left in the soil after the removal of the cash crop, and protect the soil from erosion and structural degradation over the winter months. Upon decomposition cover crops add organic matter to the soil and release the 'captured' nitrogen. Excess plant residue, however, may cause spring soil preparation problems.

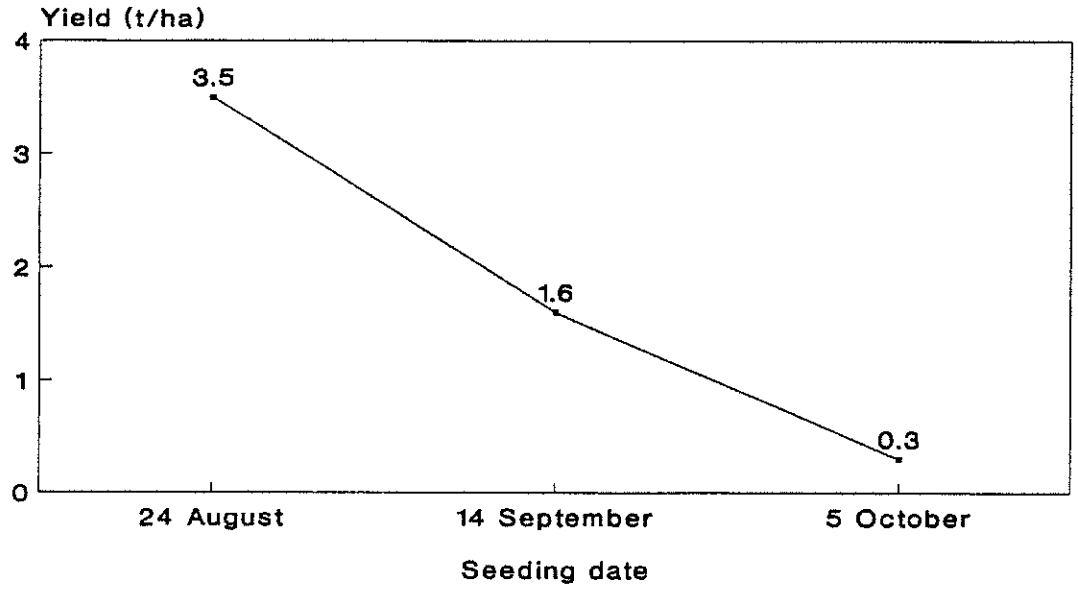
In this study, barley produced the largest biomass at all seeding dates, and also took up the greatest amount of nitrogen. Oats followed barley in producing large yields but the nitrogen uptake did not differ from winter wheat or Italian ryegrass. Although faba beans showed good growth throughout the fall, the nitrogen uptake was the lowest of all crops.

Table 1. Yield (dry matter) and nitrogen uptake of fall cover crops seeded at three dates*.

Seeding date	Cover crop	Shoot yield g/m^2	Root yield g/m^2	Root:shoot ratio	Tissue NO_3- kg/ha
24 August	Barley	489 a	37 de	1:13.8 g	12.1 a
	Oats	320 b	51 bc	1:6.4 ef	5.6 cd
	Faba beans	373 b	86 a	1:4.1 e	1.5 e
	Winter wheat	341 b	47 cd	1:7.5 fg	9.0 abc
	Italian ryegrass	340 b	60 b	1:6.0 ef	9.6 ab
14 September	Barley	175 c	19 fg	1:8.6 fg	11.4 a
	Oats	125 d	19 fg	1:5.8 d	6.5 bcd
	Faba beans	71 de	16 gh	1:2.2 c	0.6 e
	Winter wheat	116 d	19 fg	1:6.2 f	3.2 de
	Italian ryegrass	89 d	14 ghi	1:6.0 ef	6.2 bcd
5 October	Barley	21 ef	7 hi	1:2.7 d	1.1 e
	Oats	18 ef	9 ghi	1:1.7 b	0.8 e
	Faba beans	19 ef	16 gh	1:0.9 a	0.1 e
	Winter wheat	12 f	5 hi	1:2.2 c	0.4 e
	Italian ryegrass	6 f	3 i	1:2.1 c	0.2 e

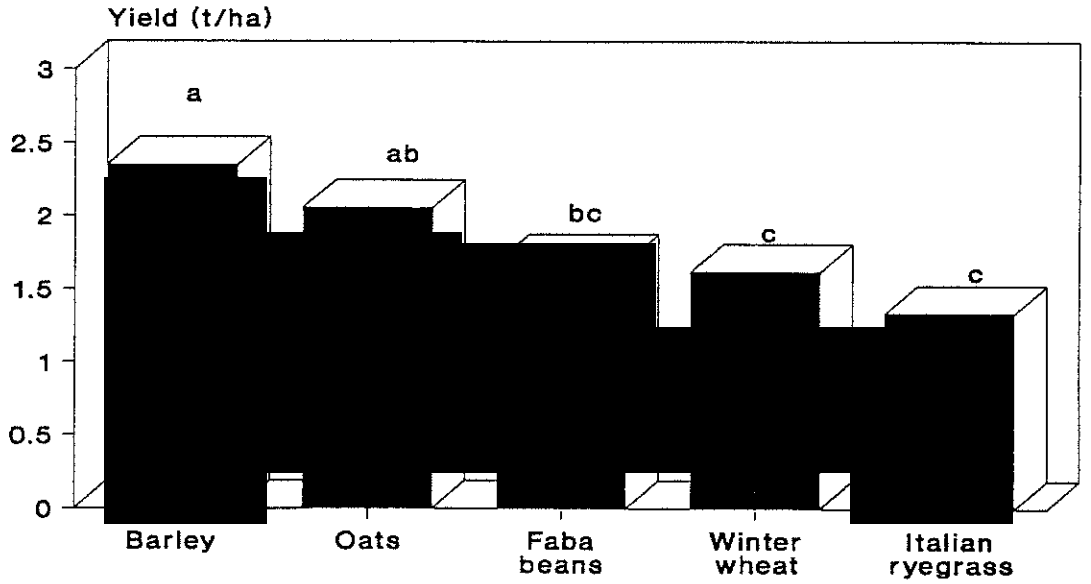
Within a column, means followed by a similar letter are not significantly different.
*Yields are the means of three sampling dates: 6 October, 27 October and 16 November.

Fig. 1. Yield (dry matter) of cover crops* seeded at 3 different dates.



Sampling date: 23/24 November
* numbers are averages of 5 cover crops.

Fig. 2. Yield (dry matter) of 5 fall cover crops*.



Means followed by the same letter are not significantly different at P>0.05, using Duncan's multiple range test.
* Sampling date: 23/24 November

Fig. 3. Plant and soil nitrate levels as affected by cover crops seeded at 3 different dates. Data points are the means of 5 cover crops.

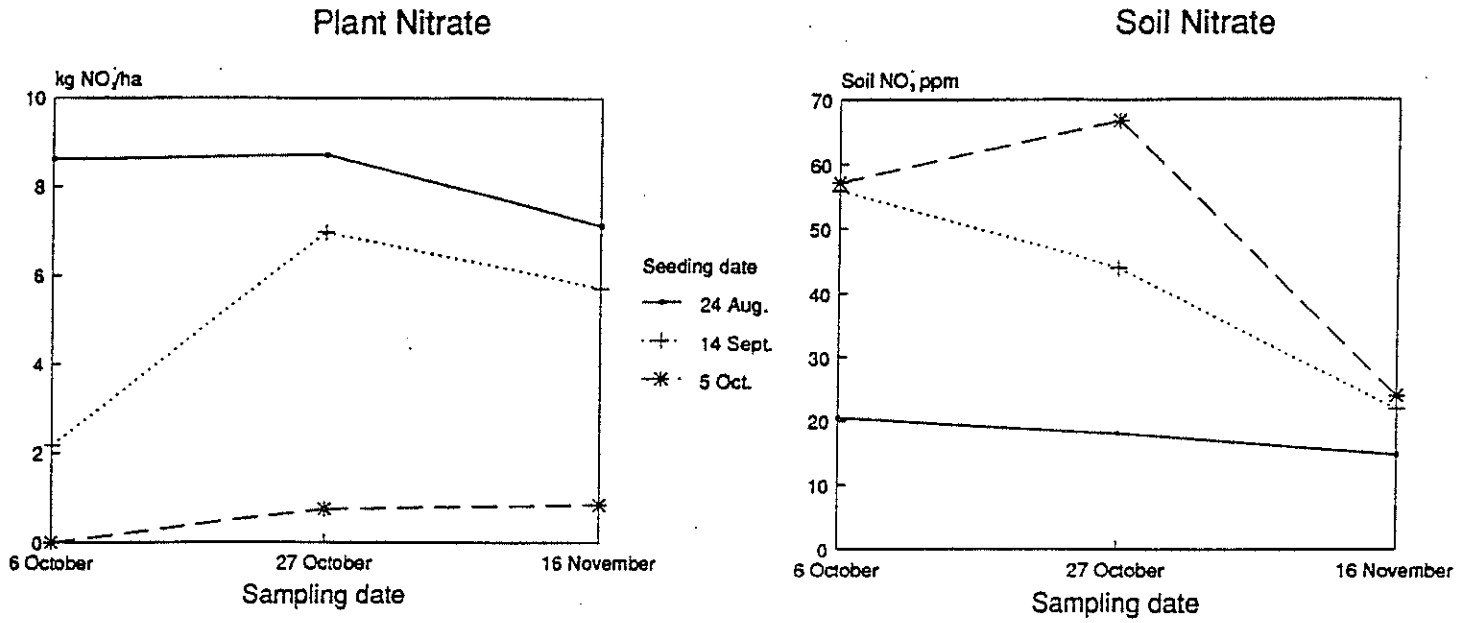
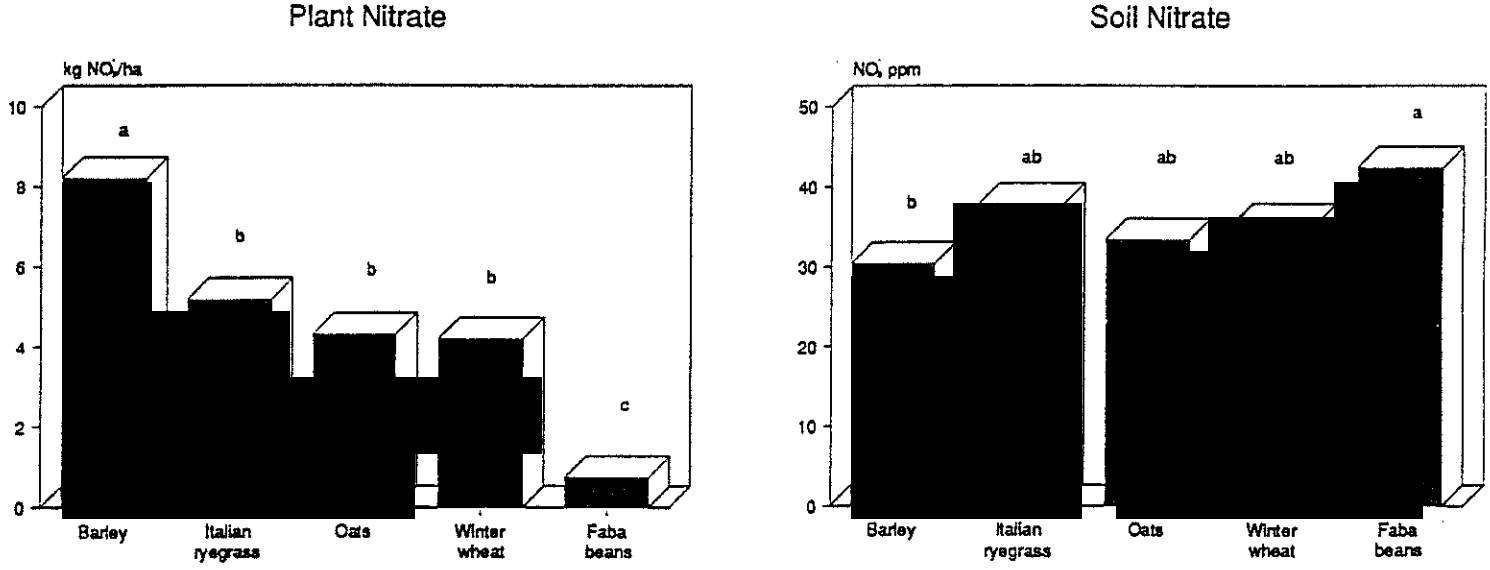


Fig. 4. Plant and soil nitrate levels as influenced by cover crops. Levels for each crop are the means of 3 seeding dates.



Means followed by the same letter are not significantly different at P>0.05, using Duncan's multiple range test.

Cloverdale Soil Conservation Group
TRIAL RESULTS

Canada-British Columbia Soil Conservation Program
17720 57th Ave., Surrey, B.C., V3S 4P9
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January 1993
Trial Report No. 2-8

EFFECT OF GLYPHOSATE ON ESTABLISHED COVER CROPS

Mary-Margaret Gaye, Jean Hogue, Roy Cranston* and David Ralph*

*B.C. Ministry of Agriculture, Fisheries and Food

Co-operator **Tim Singh**, Cloverdale Produce Farms Ltd.

Objective To assess two rates of glyphosate (Roundup, Wrangler, Laredo) on established cover crops.

Species

Clovers:	Ladino
	Red
	Alsike
Alfalfa:	WL 225
	Webfoot

Westerwolds Italian ryegrass

Seeding Date 10 March 1991

Glyphosate Application Date
5 May 1992

Treatments
1. Control (no herbicide)
2. 2.25 L/ha
3. 3.5 L/ha

Treatment were based on recommended rates on the pesticide label: 2.25 L/ha for plants under 15 cm and 3.5 L/ha for those over 15 cm.

Experimental Notes

The trial was established one year prior to herbicide application and assessed for cover crop yield throughout the growing season (see Report 1-1). The effect of different rates of glyphosate was determined on cover crops surviving the winter. The trial was a split-plot design with three replications. Plot size was 1.32 m x 10 m. Each plot was split into three subplots for treatment application. Plots were assessed after 55 days using the Expert Committee on

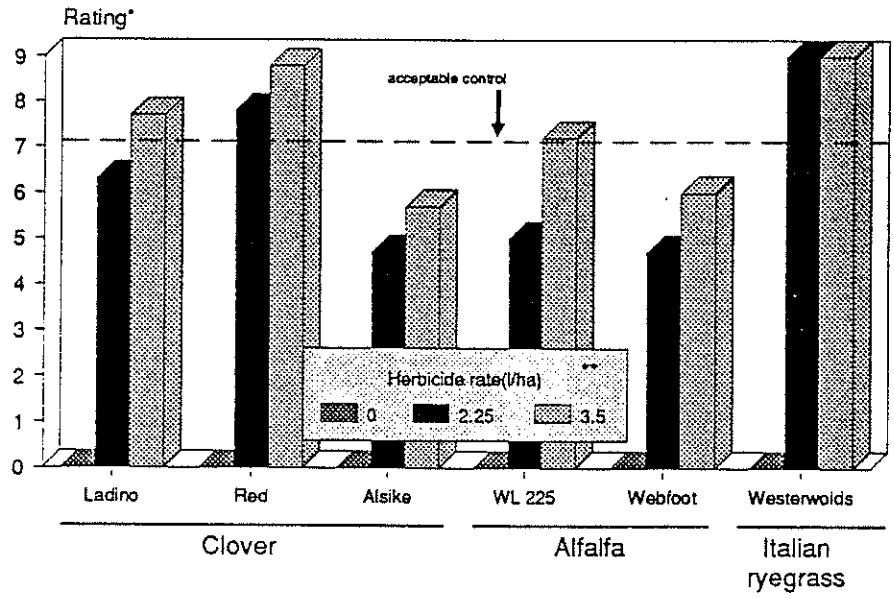
Weeds rating scale (0-9). Data were analyzed using ANOVA with individual degrees of freedom.

Results

Westerwolds Italian ryegrass was completely killed at both herbicide rates even through the crop was over 60 cm in height when treated (Fig. 1). Red clover was acceptably controlled at both rates, however, Ladino clover was controlled only at the highest rate. Alsike clover was not acceptably controlled. All the clovers were under 15 cm in height at application.

Marginally acceptable control of WL225 alfalfa was observed at the highest glyphosate rate. Webfoot alfalfa was not acceptably controlled at either rate.

Fig. 1. The effect of two rates of glyphosate applied on established cover crops.



* 0 = no control, 9 = full control
** Roundup, Laredo, or Wrangler

Cloverdale Soil Conservation Group
TRIAL RESULTS

Canada-British Columbia Soil Conservation Program
17720 57th Ave., Surrey, B.C., V3S 4P9
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January 1993
Trial Report No. 2-9

GRASSES FOR DITCH BANK STABILIZATION
YEAR 2 ASSESSMENT

Mary-Margaret Gaye and Jean Hogue

Co-operator **Jack Chan**, Jack's Garden

Objective To assess grasses for ditch bank stabilization.

Seeding Date 19 May 1991

Treatments

1. Control--no seeding
2. Companion mixture (10% Silvana hard fescue, 10% creeping red fescue, 80% Elka perennial ryegrass)*
3. Cloverdale mixture (5% redtop bentgrass, 15% Silvana hard fescue, 80% Saturn perennial ryegrass)
4. Silvana hard fescue
5. Enjoy chewings fescue
6. Saturn perennial ryegrass

Each of the above treatments were divided into a fertilized (50 kg N/ha, 50 kg P/ha, 100 kg K/ha) and unfertilized subplot. Fertilizer was applied 28 June 1991.

*Richardson Seeds

Sampling dates

	1991	1992
Shoot and root yield:	27-28 Nov.	21 Oct.
Weed populations:	31 Oct.	25 May
Plant heights:		23 Oct.

Trial Establishment

1991. The trial was established on a ditch bank with a previous history of erosion and slumping problems. The land owner applied Roundup to the weeds on the ditch bank prior to seeding. Grasses were broadcast and hand-raked onto the plots. A herbicide (MCPA @500 g/L) was applied to the plots on 10 July to control broadleaf

weeds. All plots, excluding the control, were mowed on 10 July and 4 September.

Experimental Notes

The trial was a split-plot design with three replications. Root yield was determined by separating the roots from a soil core 17 cm in depth and 10.8 cm in diameter. Plant shoots above each soil core were removed to determine shoot yield. Two cores were removed from each of the 12 treatments at each sampling date. Roots were washed to remove soil, and plants and roots oven-dried.

Plant height was determined by measuring from the soil surface to the extended shoot tip. Weed populations were counted within a square metre subplot selected from each treatment. The rating scale from the Expert Committee on Weeds was used to assess the entire plot.

Results

Grasses were well established on the plots by the end of the 1991 growing season. The untreated control was primarily broadleaf, annual leaves.

A relatively short grass cover minimizes ditch maintenance. Plant height was lowest in the Cloverdale mixture and the Saturn perennial ryegrass (Table 1). The fescues were the tallest grasses. These results were also reflected in the shoot yield.

Weed populations in 1992 were largest in the Silvana hard fescue, after the control. There was no significant difference between the number of weeds present in the remaining grasses. Overall weed ratings showed acceptable weed control in the two mixtures and the Saturn perennial ryegrass (7 or above) (Fig. 1).

Shoot yield did not differ significantly between grasses in 1991. Root yield per unit of soil (root density) was largest in Enjoy chewing fescue. Silvana hard fescue developed more slowly than the other grasses. In 1992 root density was greatest with Silvana hard fescue and lowest in Saturn perennial ryegrass. Both these species are present in the Cloverdale mixture. Root density did not differ between the two mixtures. A good root system increases the stability of the ditch banks.

A high root to shoot ratio should result in increased bank stabilization while minimizing ditch bank maintenance (i.e. mowing). Root:shoot ratios were lower the establishment year and not significantly different. By 1992 the fescues had the highest root:shoot ratio (about 1:1.1). The Cloverdale mixture had the highest root:shoot ratio of the mixtures (about 1:1.5).

Companion mixture showed signs of rust in the spring of 1992. This disease was not present on either the Cloverdale mixture or the Saturn perennial ryegrass.

Recommendations

The fescues have a high root:shoot ratio which is advantageous for ditch bank stabilization. However, grass mixtures are preferable for ditch bank applications in order to overcome weed problems often associated with slow establishment. We found Saturn perennial ryegrass preferable to Elka perennial ryegrass (in the Companion mixture) because of early season susceptibility to rust observed in the latter mixture. However, the ryegrass in both mixtures appeared to out-compete the fescues and bentgrass that were added to the mixtures. A lower percentage of ryegrass may improve the establishment of the fescues, thus increasing the overall root:shoot ratio of the mixture.

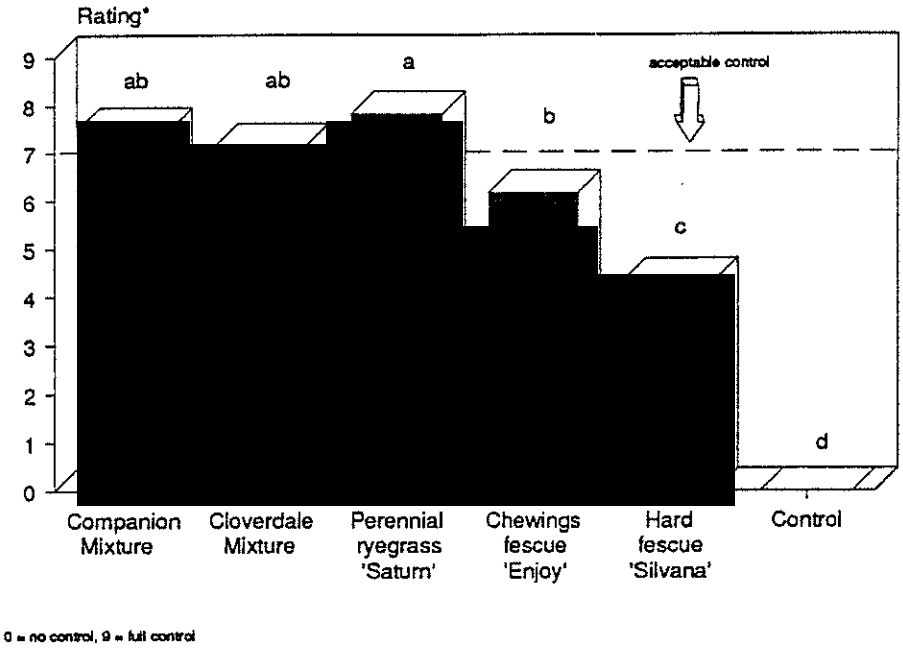
Note: Richardson Seeds Ltd. has since reduced the percentage of ryegrass in their Companion mixture. We are testing this mixture at another location, but with Saturn perennial ryegrass rather than Elka perennial ryegrass.

Table 1. Yield of grasses for ditch bank stabilization.

Species	Plant height cm		Shoot yield kg/plot		Root density $x10^{-3}$ g/cm^3		Root:shoot ratio	
	1991	1992	1991	1992	1991	1992	1991	1992*
Companion mixture	--	27.9 bc	40.6 a	51.9 b	4.3 ab	8.6 bc	0.25 a	0.44 b
Cloverdale Mixture	--	24.9 c	33.8 a	31.5 bc	3.8 ab	7.5 bc	0.19 a	0.67 ab
'Saturn' perennial ryegrass	--	25.1 c	29.0 a	28.5 c	3.5 ab	4.2 c	0.24 a	0.41 b
'Enjoy' chewings fescue	--	31.6 a	35.2 a	52.5 b	9.2 a	16.2 ab	0.51 a	0.86 a
'Silvana' hard fescue	--	29.5 ab	20.5 a	74.5 a	2.5 ab	25.9 a	0.21 a	0.95 a
Control	--	--	--	--	0.8 c	11.6 bc	--	--

*Analysis performed on log transformed data.
Within columns, means followed by the same letter are not significantly different according to Duncan's multiple range test, p=0.05

Fig. 2. Weed control* in grasses seeded in monoculture and mixtures.



* According to the rating scale of the Expert Committee on Weeds.
Columns with the same letter above are not significantly different at p=0.05 according to Duncan's multiple range test.

Cloverdale Soil Conservation Group
TRIAL RESULTS

Canada-British Columbia Soil Conservation Program
17720 57th Ave., Surrey, B.C., V3S 4P9
(604) 576-5652

June 1993
Trial Report No. 3-1

EFFECT OF GLYPHOSATE ON ESTABLISHED COVER CROPS 1992 AND 1993 RESULTS

Mary-Margaret Gaye, Jean Hogue, Roy Cranston[1.] and David Ralph[1.]
[1.] B.C. Ministry of Agriculture, Fisheries and Food

Co-operators **Year 1: Tim Singh**, Cloverdale Produce Farms Ltd.
Year 2: Richard and Dennis Law, Law Pacific Vegetables Ltd.

Objective To assess two rates of glyphosate (Roundup, Wrangler, Laredo) on established cover crops.

Treatments **Rate of glyphosate**
1. control (no herbicide)
2. 2.25 L/ha
3. 3.5 L/ha

Treatments were based on pesticide label recommendations: 2.25 L/ha for plants under 15 cm and 3.5 L/ha for those over 15 cm.

Species	Year 1	Year 2
Clovers:	Ladino white (<15 cm[2.])	Ladino white (4 cm)
	Red (<15 cm)	Red (8 cm)
	Alsike (<15 cm)	Alsike (8 cm)
Alfalfa:	WL 225 (<15 cm)	WL 225 (14 cm)
	Webfoot (<15 cm)	
Other:	Westerwolds	
	Italian ryegrass (60 cm)	Fall rye (29 cm)

[2.] Plant height at herbicide application

Experimental Details

	Year 1	Year 2
Seeding date	28 May 1991	22 April 1992
Glyphosate application date	10 March 1992	15 March 1993
Glyphosate assessment date	5 May 1992	11 May 1993

Experimental Notes

Each trial was established one year prior to herbicide application and assessed for cover crop yield throughout the growing season (see Reports 1-1 and 2-4). The effect of glyphosate was determined on cover crops surviving the winter. The trial was a split-plot design with three replications. Plot size was 1.32 m x 10 m. Each plot was split into three subplots for herbicide application. Plots were assessed 56 days (1992) and 57 days (1993) after herbicide application using the Expert Committee on Weeds rating scale (0-9, 7 represents acceptable control). Data from each year were combined as a split-split-plot and analyzed using ANOVA with individual degrees of freedom Duncan's multiple range test.

Results

Westerwolds Italian ryegrass survived the winter in Year 1 and was completely killed at both herbicide rates even though the crop was over 60 cm in height when treated. However, it did not survive the winter in Year 2 and was therefore not included in the final data analysis. Fall rye was grown only in Year 2 and was completely killed at both herbicide rates (rated 9).

The data presented are the means of the two trials as there was no significant difference determined between years for the effect of glyphosate.

In both years red clover was acceptably controlled at both rates of glyphosate whereas Ladino clover was controlled only at the highest application rate (Figure 1). Alsike clover and WL 225 alfalfa were not acceptably controlled.

Marginally acceptable control of WL 225 alfalfa was observed at the highest glyphosate rate in Year 1 but not in Year 2. The plants in Year 2 were well-established with deep roots at the time of herbicide application and most likely better able to withstand the effects of the herbicide.

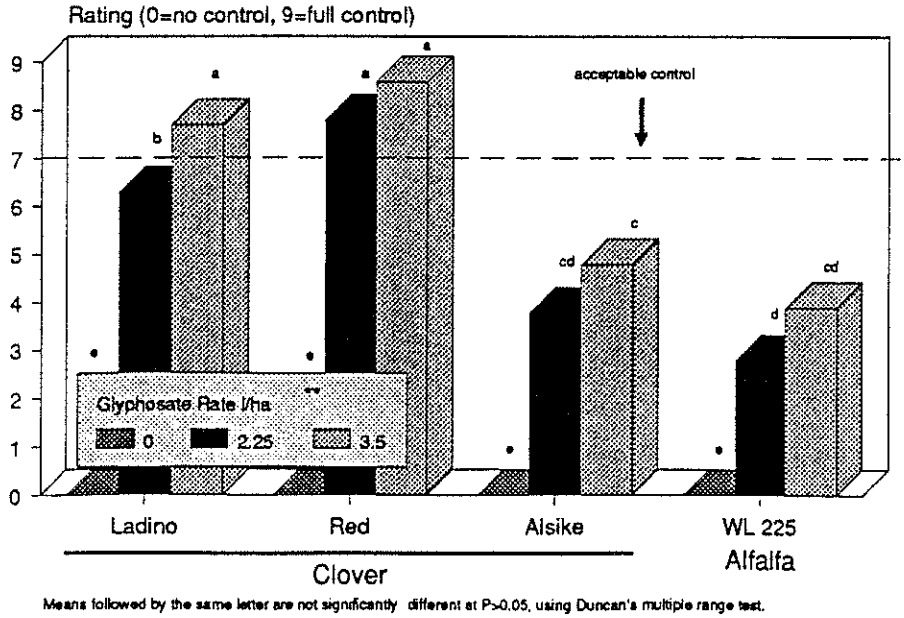


Fig. 1. The effect of two rates of glyphosate applied on established cover crops in Years 1 and 2.

Cloverdale Soil Conservation Group
TRIAL RESULTS

Canada-British Columbia Soil Conservation Program
17720 57th Ave., Surrey, B.C., V3S 4P9
(604) 576-5616

November 1993
Trial Report No. 3-2

1993 FERTILIZER TRIALS
POULTRY MANURE DEMONSTRATION

Cloverdale Soil Conservation Group: Mary-Margaret Gaye and Jean Hogue
Sustainable Poultry Farming Group: Kevin Chipperfield and Walter Riemann

Co-operators **Ray Wong, Wayne Wong,** Hing Sing Farm

Objective

Many Cloverdale farmers use manure to help build-up the soil. The manure also has a nutrient value that is often overlooked. This should be considered to avoid the application of excess nutrients when applying manure alone or in combination with chemical fertilizers. Adding excess nutrients unnecessarily increases input costs and may increase environmental risks resulting from nutrients entering the river systems.

This demonstration was designed to compare nutrient availability and carrot yield, produced with and without added manure.

Demonstration Notes

Treatments were applied to strip test sites (6 beds wide by 370 ft. long) located within a commercial carrot field. Treatments were as follows:

1. manure + chemical fertilizer applied at the farm rate,
2. chemical fertilizer applied at the farm rate, and
3. manure with no chemical fertilizer.

Poultry manure was spread using a chain spreader at rates ranging from 8 to 20 t/acre (rates were assessed at 5 locations in each treatment). The lowest rate (8 t/acre) was used to determine fertilizer requirements.

Chemical fertilizer (5-12-16+0.3 B+0.5 Cu) was applied at about 700 lb/acre. Calcium nitrate (15.5-0-0) was banded at an average of 220 lb/acre on all treatments, after the first crop cultivation.

Carrots were seeded on 16 June. Treatments were assessed for yield at the six-week growth stage and at maturity (4 October). At each harvest, sample carrots were taken from ten plots (2 m long) located at equal spacing along the length of each treatment. Data collected from adjacent plots, in all two-treatment combinations, were statistically analyzed using a paired-difference *t*-test (Statistical Analysis System, SAS Institute 1985).

Because of field variability (test plots crossed a mineral ridge) the organic soil depth was determined at each test site. The relation between yield and soil depth was assessed using Pearson's correlation coefficient computed by Statistical Analysis System.

Soil analyses were conducted before and after the trail to determine residual nutrients available to the crop and the nitrogen remaining after crop production. Norwest Labs performed the chemical analyses of soil and manure samples.

Table 1. Nutrient application in three test sites.

Available nutrient	Soil test (lb/acre)	Treatment (lb/acre)			Crop requirements B.C.M.A.F.F. (lb/acre)
		Manure (after losses)	Chemical fertilizer	Manure + chemical fert.	
Nitrogen (NO_3-N)	0	143 + 34* 177	35 +34* 69	178 + 34* 212	78-157
Phosphorus (P_2O_5)	97	205	84	289	0-40
Potassium (K_2O)	239	196	112	308	0-40

* side-dressed 15.5-0-0

Yield Results

The following are results from one year of study. At least one more year of study is necessary to confirm these results. In addition, some of the variability we observed in the data could be due to the uneven manure application.

Six-week analysis. After six weeks of growth, treatments did not differ when assessed for total plant yield or root length.

Final yield analysis.

Yield. Marketable yield did not significantly differ between treatments compared in Table 2. Chemical fertilizers, however, showed a trend towards higher yields when compared with manure applied alone or in combination with chemical fertilizer. This latter trend was significant for total carrot yield.

Treatments with manure showed a trend towards higher yields of carrots culled for forking, however, total cull yield did not differ between treatments.

Additional analysis.

Soil depth. The depth of the organic topsoil ranged from 8" to over 24". The depth, however, did not statistically influence carrot yield (Pearson's correlation coefficient range: 0.11-0.26).

Nutrients remaining after harvest. The levels of residual ammonia in the soil did not significantly differ between treatments compared in Table 3. Both treatments with manure contained significantly more residual nitrates than the chemical fertilizer treatment. Residual nitrogen (ammonia and nitrate) was not significantly correlated with crop yield.

Table 2. Carrot yield as influenced by manure and chemical fertilizer treatments.

Comparison	Marketable yield (t/acre)	Culls--forked (t/acre)	Total culls (t/acre)	Total yield (t/acre)
Manure + chemical fertilizer	16.3	2.8	10.4	26.7
Chemical fertilizer	18.0	1.8	10.2	28.3
Significance	NS	***	NS	*
Manure	16.5	2.1	9.6	26.1
Chemical fertilizer	18.0	1.8	10.2	28.3
Significance	NS	NS	NS	**
Manure + chemical fertilizer	16.3	2.8	10.4	26.7
Manure	16.5	2.1	9.6	26.1
Significance	NS	NS	NS	NS

Table 3. Residual nutrients (after crop harvest) as influenced by treatments.

Comparison	NH_4-N (ppm)	$N0_3$-N (ppm)	Phosphorus	Potassium
Manure + chemical fertilizer	14.8	226	173	486
Chemical fertilizer	10.8	116	164	294
Significance	NS	**	N/A	N/A
Manure	20.0	238	248	504
Chemical fertilizer	10.8	116	164	294
Significance	NS	*	N/A	N/A
Manure + chemical fertilizer	14.8	226	173	486
Manure	20.0	238	248	504
Significance	NS	NS	N/A	N/A

*, **,***, NS = significant at p=0.05, p=0.01, p=0.001, and no statistical difference respectively.

Comparative Costs

Manure input costs were less than those of pre-plant fertilizers (Table 5). Reducing the manure application rate by 50% could result in substantially larger savings, while maintaining the nutrients recommended for carrot production.

Table 5. Comparative costs of poultry manure and chemical fertilizers.

Inputs	Unit	$/unit	A Chemical fertilizer pre-plant + side-dressed Per acre	B Pre-plant manure (high) + side-dress fertilizer Per acre	C Pre-plant manure (low) + side-dress fertilizer Per acre
Poultry manure					
• pre-plant rate (1)	tonnes/ac		0	7.29	3.65
	cu. yards/ac			20.83	10.41
• delivered cost (2)	$/tonne	3.88		28.25	14.12
• on-farm storage cost (3)	$/tonne	1.32		9.82	4.81
• application cost (4)	$/tonne	8.07		58.83	29.42
• application cost (5)	$/hour	10.00		10.00	10.00
Total cost manure	$/acre		0	106.70	58.35
Inorganic fertilizer					
• Pre-plant					
rate (5-12-16)(6)	lb/acre		700	0	0
price (7)	$/lb	0.21	146.36	0	0
application cost (8)	$/acre		7.00	0	0
Total pre-plant	$/acre		153.36	0	0
• Side-dress		0.14			
rate (15.5-0-0)	lb/acre		220	220	220
price (9)	$/lb		30.12	30.12	30.12
application cost (8)	$/acre		7.00	7.00	7.00
Total side-dress	$/acre		37.12	37.12	37.12
Total cost inorganic fertilizer	$/acre		190.48	37.12	37.12
Total cost fertility program			**$190.48**	**$143.82**	**$95.47**

Sources:

1. Applied in trial (8.1 tons=7.29 tonnes) as high rate and half (4 tons) for low. Average weight per cubic yard is 350 kg.
2. Local suppliers quote for fall delivered broiler litter ($1.25/yd^3, 3.1 yd^3/tonne)
3. Cost of 5 mil plastic sheet, renewed every third year.
4. Stennes, 1993, $8.07/tonne. Cost to farmer using own equipment.
5. Estimate 1 hour/acre. Wage: Agr. Empl. Services, Abbotsford, 1994.
6. Cloverdale Soil Conservation Group.
7. Agrico Sales. Estimated cost of a custom blend fertilizer in 1993.
8. Estimated equipment costs at $7/acre for each pre-plant and side-dress application based on custom application charges.
9. Green Valley Fertilizers, 1993, price based on $10.95/36.36 kg bag.

Prepared by Walter Riemann. For detailed information refer to Sustainable Poultry Farming Group Fact Sheet: Economics of Poultry Manure on Vegetable Crops.

Conclusions

The marketable yield obtained from poultry manure and chemical fertilizer treatments was not significantly different.

This demonstration showed that poultry manure has a high nutrient replacement value. Poultry manure applied at 8 t/acres supplied more nutrients--nitrogen, phosphorus and potassium--than B.C.M.A.F.F. recommendations for carrot production. The application rate could probably be reduced by 50% while still meeting the B.C.M.A.F.F. recommendations. Also, the level of excess nutrients increased when chemical fertilizer was applied in addition to manure. Nutrient availability was most closely matched to crop requirements using chemical fertilizers. Excess application of nutrients--either from manure or chemical fertilizer--does not increase marketable yield but may increase culls.

Using poultry manure as source of nutrients was about $50/acre less than using only chemical fertilizers. Using 50% less manure would result in still lower input costs.

Recommendations

1. Calibrate manure spreaders to ensure uniform application rates.
2. Determine nutrient content of manure.
3. Match manure application to crop requirements. Adjust chemical fertilizer applications accordingly.
4. Ensure manure is spread in a uniform pattern.

Cloverdale Soil Conservation Group
TRIAL RESULTS

Canada-British Columbia Soil Conservation Program
17720 57th Ave., Surrey, B.C., V3S 4P9
(604) 576-5616

November 1993
Trial Report No. 3-3

1993 FERTILIZER TRIALS
CARROTS - PHOSPHORUS RATE AND PLACEMENT
YEAR THREE

Mary-Margaret Gaye and Jean Hogue

Co-operators **Tim Singh,** Cloverdale Produce Farms
The fertilizer was supplied by **Topnotch Nutri.**

Objective To assess the effect of phosphorus rates on the yield of carrots grown on: 1) organic soil and 2) mineral ridge.

Cultivar Eagle

Seeding Date 1 June

Soil Details

	Organic	Mineral
O.M.	71.4	36.9
pH	5.92	5.92
NO_3^--N	6 kg/ha	7 kg/ha
P	48 kg/ha	80 kg/ha
K	131 kg/ha	131 kg/ha

Phosphorus Rates

0, 12.5, 25, 50, 100 or 200 kg/ha

Additional Fertilizer

Nitrogen: NH_4NO_3 @ 224 kg/ha. Banded 6 July by farmer.
Potassium: K_2O @ 128 kg/ha (farm rate)
Sulphur: @ 27 kg/ha (farm rate)
Magnesium: @ 13.4 kg/ha (farm rate)

Harvest Date 28 and 29 September

Experimental Notes

Two trials were conducted in the same field on organic soil and on a mineral ridge, in a randomized complete block design with 3 replications. Plot size was 1.8 m (1 bed) x 3 m. Carrots were seeded in four rows per bed. Phosphorus fertilizer was hand broadcasted to the appropriate plots prior to seeding. The grower seeded and maintained the crop. The data were analyzed using ANOVA with individual degrees of freedom.

Results

Six week analysis. Phosphorus rate did not affect the root length or total weight of carrots grown on mineral soil. The total plant weight of carrots grown on organic soil was largest at a phosphorus application of 100 kg/ha.

Final harvest. Carrots were hand harvested and graded for shape and size on the field--yields are therefore larger than the pack-out after grading at the Co-op.

In both trials, marketable yield was not affected by the rate of phosphorus application (see Table 1). The residual phosphorus levels were likely sufficient for plant growth. Cullage was influenced by phosphorus application rates on organic soil, however, this did not affect the total marketable yield of carrots.

Table 1. The effect of phosphorus rate on the yield of carrots: Trial 1, organic soil; Trial 2, mineral ridge.

Treatment	Total mkt (t/ha)	Cull (t/ha)	% Mkt.
Trial 1: Organic Soil			
P Rates (kg/ha)			
0	86	15	85
12.5	88	13	87
25	90	14	87
50	87	17	84
100	87	15	85
200	90	12	89
Significance	NS	C*	C*
Trial 2: Mineral Ridge			
P Rates (kg/ha)			
0	74	13	86
12.5	76	12	86
25	76	11	87
50	81	12	88
100	78	11	86
200	78	12	86
Significance	NS	NS	NS

NS = not significantly different.
C* = cubic trend significant at p=0.05.

Cloverdale Soil Conservation Group
TRIAL RESULTS

Canada-British Columbia Soil Conservation Program 17720 57th Ave., Surrey, B.C., V3S 4P9 (604) 576-5616

November 1993 Trial Report No. 3-4

1993 FERTILIZER TRIALS
CARROTS - NITROGEN APPLICATION RATE AND TIMING
YEAR TWO

Mary-Margaret Gaye and Jean Hogue

Co-operators **Tim Singh**, Cloverdale Produce Farms
Slow-release nitrogen fertilizer (PCU) supplied by **Stephen Eng**, Agrico Sales Ltd.

Objective To assess nitrogen application rates and timing [$CaNO_3$ or slow release N (41.5%)], on carrots grown on organic soil.

Cultivar Eagle

Seeding Date 24 May

Soil Details

O.M.	61.9
pH	5.32
NO_3^--N	10 kg/ha
P	64 kg/ha
K	130 kg/ha

Nitrogen Rates and Application Dates
Rates: 0, 25, 50, 75, 100 kg/ha (actual N)
Application dates:
1. *$CaNO_3$* banded at seeding (24 May)
2. *$CaNO_3$* banded at first cultivation
3. *Polymer-coated urea*--designed to release nitrogen over 12-14 weeks. Banded at seeding.

Additional Fertilizer
0-24-19-2 Mg-4 S applied by farmer at about 670 kg/ha
K_2O @ 112 kg/ha banded on 6 July

Harvest Date 30/31 August

Experimental Notes
The trial was conducted in a randomized complete block design with 3 replications. Plot size was 1.8 m (1 bed) x 3 m. Carrots were seeded in four rows per bed. Fertilizer was banded between rows--two bands per plot--and incorporated into the soil. The farmer seeded and maintained the

crop. Six-week and final yield data were analyzed using ANOVA with individual degrees of freedom.

Results

Six-week analysis. Nitrogen application rate or timing did not affect root length or total plant weight.

Final harvest. Note: carrots were hand-harvested and graded on the field (shape and size). The yields are therefore larger than the pack-out after the Co-op grading.

Marketable carrot yields were not affected nitrogen application rate or timing. Cullage was mainly due to deformed roots and was largest when nitrogen was applied at 50 kg/ha. Treatments did not affect the percentage of marketable roots.

Table 1. The effect of nitrogen application rate and timing on the yield of carrots.

Treatment	Total mkt. (t/ha)	Cull (t/ha)	% Mkt.
Timing:			
$CaNO_3$ at seeding	62	18	78
$CaNO_3$ at cultivation	61	17	78
Slow release N	62	18	78
Significance	NS	NS	NS
N Rates (kg/ha):			
0	60	17	78
25	63	18	78
50	63	19	77
75	61	18	77
100	63	16	80
Significance	NS	*Q	NS

NS = no significant differences.
*, Q = denotes significance at p=0.05 and quadratic trend respectively.

Cloverdale Soil Conservation Group
TRIAL RESULTS

Canada-British Columbia Soil Conservation Program
17720 57th Ave., Surrey, B.C. V3S 4P9
(604) 576-5616

November 1993
Trial Report No. 3-5

1993 SPRING SEEDED COVER CROPS SPECIES EVALUATION - YEAR 3

Mary-Margaret Gaye and Jean Hogue

Co-operator **Rick Law,** Law Pacific Vegetables Ltd.

Objective To assess plant species for suitability for spring seeded cover crops.

Species 23 species and mixtures (see Table 1).

Seeding Date 20 May 1993

Fertilizer Preplant application of

Seeding Rates

Clovers	13	kg/ha
Alfalfa	26	
Mustard/oilseed radish	15	
Westerwolds Italian ryegrass	34	
Cereals	119	

Experimental Notes

The trial was a randomized complete block design with 3 replications. Plot size was 1.32 m x 10 m. Plots were seeded using an 'International' seed drill.

Data from legume monocultures was not collected because of poor spring growth and intense weed competition.

Plant biomass samples were taken from a 0.7 m x 10 m strip in the center of each plot at each harvest date, using a flail forage harvester. Harvest dates were: first cut--broadleaves on 6 July, cereals and grass on 12/13 July; Second cut--10 August; third cut--8 September. Subsamples (about 100-300g) were oven-dried to determine dry matter content.

Cover crops were rated for weed competition using the Expert Committee on Weed standard rating system prior to the first cut on 6 July. All data were statistically analyzed using Duncan's multiple range test.

Results

Plant yield. Table 1 lists the yield at each cut. Mustard and oilseed radish were flowering at the first cut; the cereals were beginning to head. Species and mixtures ranking 1 gave the largest first cut yields and total yields (Tables 2 and 3 respectively).

Spring barley, spring oats, and Italian ryegrass mixed with spring barley produced the largest yield in the first cut. The Italian ryegrass/spring barley mixture also remained the top yielding cover crop at the end of the season, after three cuts.

Weed rating. Acceptable weed control (rated 7 or above using the ECW system) was observed in monocultures or mxxtures of oats and barley. All other cover crops were rated below the acceptable level.

Table 1. Yield (dry weight) of spring seeded cover crops.

Species	Dry Matter Yield (t/ha)			
	First Cut	Second Cut	Third Cut	Total
Broadleaves:				
Mustard - B. juncea cv. Cutlass	3.6 bcd	0 f	0 e	3.6 ef
Oilseed radish	2.9 de	0 f	0 e	2.9 f
Grasses:				
Westerwolds Italian ryegrass	1.9 ef	1.9 a	1.6 a	5.4 bc
Cereals:				
Spring barley cv. Virden	5.7 a	0 f	0 e	5.7 bc
Spring oats cv. Jasper	5.6 a	0 f	0 e	4.8 def
Red spring wheat cv. Max	3.6 cd	0 f	0 e	3.6 f
Fall rye, common #1	1.9 ef	0.8 de	0.8 d	3.4 f
Mixes:				
Red clover/spring barley	4.8 ab	0 f	0 e	4.8 cd
Red clover/spring oats	4.8 abc	0 f	0 e	4.8 def
Red clover/spring wheat	3.6 cd	0 f	0 e	3.6 f
Red clover/fall rye	1.3 f	0.9 cd	0.9 cd	3.1 f
Alsike clover/spring barley	5.0 a	0 f	0 e	5.0 bcd
Alsike clover/spring oats	4.8 abc	0 f	0 e	4.8 cde
Alsike clover/spring wheat	3.6 cd	0 f	0 e	3.6 f
Alsike clover/fall rye	1.7 f	1.3 bc	1.1 abcd	4.1 def
Italian ryegrass/spring barley	5.1 a	1.1 cd	1.3 abc	7.5 a
Italian ryegrass/spring oats	4.7 abc	0.5 e	0.9 bcd	6.2 b
Italian ryegrass/spring wheat	3.3 d	1.2 bc	1.2 abcd	5.7 bc
Italian ryegrass/fall rye	2.0 ef	1.5 b	1.4 ab	4.9 cd

Within columns, means followed by the same letter are not significantly different at P>0.05 using Duncan's multiple range test.

Table 2. Rank and dry weight of spring seeded cover crops: first cut.

Rank	Species	Description	Yield (t/ha)
1	Spring barley cv. Virden	Cereal	5.7
1	Spring oats cv. Jasper	Cereal	5.6
1	Italian ryegrass/spring barley	Mix	5.1
1	Alsike clover/spring barley	Mix	5.0
2	Red clover/spring barley	Mix	4.8
3	Alsike clover/spring oats	Mix	4.8
3	Red clover/spring oats	Mix	4.8
3	Italian ryegrass/spring oats	Mix	4.7
4	Mustard - B. juncea cv. Cutlass	Broadleaf	3.6
5	Red spring wheat cv. Max	Cereal	3.6
5	Alsike clover/spring wheat	Mix	3.6
5	Red clover/spring wheat	Mix	3.6
6	Italian ryegrass/spring wheat	Mix	3.3
7	Oilseed radish	Broadleaf	2.9
8	Italian ryegrass/fall rye	Mix	2.0
8	Westerwolds Italian ryegrass	Grass	1.9
8	Fall rye, common #1	Mix	1.9
9	Alsike clover/fall rye	Cereal	1.7
9	Red clover/fall rye	Mix	1.3

Table 3. Rank and dry weight of spring seeded cover crops: total yield.

Rank	Species	Description	Yield (t/ha)
1	Italian ryegrass/spring barley	Mix	7.5
2	Italian ryegrass/spring oats	Mix	6.2
3	Spring barley cv. Virden	Cereal	5.7
3	Italian ryegrass/spring wheat	Mix	5.7
3	Spring oats cv. Jasper	Cereal	5.6
3	Westerwolds Italian ryegrass	Grass	5.4
4	Alsike clover/spring barley	Mix	5.0
5	Italian ryegrass/fall rye	Mix	4.9
5	Red clover/spring barley	Mix	4.8
6	Alsike clover/spring oats	Mix	4.8
6	Red clover/spring oats	Mix	4.8
7	Alsike clover/fall rye	Mix	4.1
8	Mustard - B. juncea cv. Cutlass	Broadleaf	3.6
9	Red spring wheat cv. Max	Cereal	3.6
9	Alsike clover/spring wheat	Mix	3.6
9	Red clover/spring wheat	Mix	3.6
9	Fall rye, common #1	Cereal	3.4
9	Red clover/fall rye	Mix	3.1
9	Oilseed radish	Broadleaf	2.9

Means with a similar ranking are not statistically different.

Recommendations

Fields used for intensive vegetable production--particularly those with exposed mineral ridges--benefit from a long-term rotation with a soil-building cover crop. The cover crop can be planted for a portion of the growing season or, ideally, for an entire growing season. Cover crop yield as well as root structure should be considered. For example, the fibrous roots of cereal in a cereal/clover mixture help to build up the soil while the tap root of the clover creates a drainage channel in the mineral subsoil. Clover, however, without good control may become a weed problem in subsequent years. Cover crops producing a large yield in the first cut are suitable for use as early season cover crops.

Cloverdale Soil Conservation Group
TRIAL RESULTS

Canada-British Columbia Soil Conservation Program
17720 57th Ave., Surrey, B.C., V3S 4P9
(604) 576-5616

November 1993
Trial Report No. 3-6

1993 FERTILIZER TRIALS
PHOSPHORUS CHALLENGE--YEAR 2

Mary-Margaret Gaye and Jean Hogue

Co-operators

Amrik Sihota, Canadian Farms
Richard Law, Pacific Law Vegetable Farms
Ray Wong, Hing Sing Farm

Fertilizer supplied by: **Stephen Eng**, Agrico Sales Ltd. and **Noel Roddick**, Noel Roddick Ltd.

Objective

Phosphorus levels in many fields in Cloverdale have built up to the extent that crop yields may not be affected by additional phosphorus. Adding phosphorus in this situation unnecessarily increases input costs and may increase the environmental risk of excess phosphorus entering the river systems.

The **Phosphorus Challenge** was designed to give farmers an opportunity to test a lower rate of phosphorus application without risking a loss in profitability. (A similar program was developed in Ontario.) The Conservation Group agreed to pay participating farms for any loss in profit resulting from lower application rates.

Demonstration Notes

Three farms participated in the program. Fields chosen for testing had an 'optimum' or higher residual phosphorus rating from the soil test (conducted by Norwest Labs). The planned farm application rate for phosphorus was also greater than that recommended by the B.C.M.A.F.F.

At each site, fertilizer was applied to a large field plot at the same rate as the farm rate with the exception of phosphorus. Participating farmers choose to apply phosphorus at one-half the B.C.M.A.F.F. recommended rate.

Test plots were located within the main cropping area and were managed by the farmer following conventional practices. At harvest, samples from the test site and the main cropping area were taken from adjacent plots located along the length of the test site. Samples were statistically analyzed using a paired-difference *t*-test (Statistical Analysis System, SAS Institute 1985).

Table 1. Details of phosphorus application rates on participating farms. Tests were conducted on carrot crops.

Farm	Residual phosphorus (kg/ha)	B.C.M.A.F.F. recommended rate (kg/ha)	Farm P rate (kg/ha)	'P Challenge' test rate (kg/ha)
1	179	0-45	81	43
2	105	0-45	67	34
3	149	0-45	123	62

Table 2. Experimental details.

Farm	Cultivar	Seeding date	Harvest date	Test plot size
1	Carochoice	17 May	7 Sept.	5.4 m x 85 m
2	Carochoice	4 June	23 Sept.	13 m x 58 m
3	Pioneer	26 May	22 Sept.	11 m x 61 m

Summary Results Participating farms applied phosphorus at rates 33 to 61 kg/ha less than those applied to adjacent crops. In all test sites crop yield and quality (size) was not affected by phosphorus rates.

Table 3. Yield results.

Farm		Six-week yield		Yield--final harvest (t/ha)		
		Root length (mm)	Total g/carrot	Mkt. yield	Cull	% Mkt.
1	Farm rate	135	7.3	71	22	76
	P Challenge	126	6.8	80	18	82
	Significance	NS	NS	NS	*	*
2	Farm rate	105	1.7	33	17	66
	P Challenge	111	1.8	38	17	68
	Significance	NS	NS	NS	NS	NS
3	Farm rate	158	5.7	65	12	84
	P Challenge	168	5.5	67	14	82
	Significance	NS	NS	NS	NS	NS

*, NS = denotes significance at P=0.05 and not significantly respectively.

Recommendations

1. Stay with the same soil test laboratory--labs use different soil testing methods. Reporting and interpretation of results can differ between labs.

2. Base phosphorus application rates on current and past soil tests--soil tests taken over a number of years show trends in nutrient levels for a field. Knowledge of previous fertilizer use and the field's cropping history are also important in the interpretation of the soil test.

3. Phosphorus rates recommended by the B.C.M.A.F.F.'s Vegetable Production Guide are based on laboratory test method and crop requirements. Follow these rates particularly if the soil test shows 'optimum' or 'high' residual phosphorus.

Cloverdale Soil Conservation Group
TRIAL RESULTS

Canada-British Columbia Soil Conservation Program 17720 57th Ave., Surrey, B.C., V3S 4P9 (604) 576-5616

November 1993 Trial Report No. 3-7

1993 FERTILIZER TRIALS
SLOW-RELEASE NITROGEN DEMONSTRATION

Mary-Margaret Gaye and Jean Hogue

Co-operators **Jim Sprangers**, Sprangers Farms Ltd.
Ray Wong, Hing Sing Farm
The fertilizer was supplied by **Agrico Sales Ltd.** and **Coast Agri.**

Objective To assess the effect of nitrogen formulations--polymer-coated urea, sulphur-coated urea and calcium nitrate--on crop yield.

Demonstration Notes

Side-by-side demonstration plots were established at two farms by the landowners. The Conservation Group was requested to collect and assess yield data. Farm 1, testing potatoes, compared polymer-coated urea ('Polyon PCU 43N', 14 week release) with sulphur-coated urea. Farm 2 compared polymer-coated urea ('Duration', type 60, 12-14 week release) with the farm practice of using sulphur-coated urea and side-dressing with $CaN0_3$ at the first cultivation. Carrots were selected as the test crop.

Test plots were located within the main cropping area and were managed by the farmers following conventional practices. At harvest, samples from the test site and the main cropping area were taken from adjacent plots located along the length of the test site. Potatoes were graded as No. 1 small (2-3" diameter) and large (3"+ diameter); No. 2 (1 ¾-3" diameter); and cull (small, damaged or misshapen). Carrots were culled for size and shape. Data were statistically analyzed using a paired-difference *t*-test (Statistical Analysis System, SAS Institute 1985).

Table 1. Experimental details.

Farm	Crop	Seeding date	Harvest date	Test plot size	Nitrogen Applied (kg/ha)
1	'Norkotah' potatoes	12 May	31 Aug.	13.2 m x 110 m	67 (PCU, SCU)
2	'Eagle' carrots	20 April	21 July	26 m x field length	148 (PCU) 117 (SCU + $CaN0_3$)

Summary Results

Farm 1--potatoes. Tissue analysis of 6-week old plants showed that the PCU treatment had 50% less nitrate concentrations than the SCU treatment.

At final harvest, total marketable yield was 20% larger from the PCU treatment compared with the SCU treatment. This was mainly due to an increase in the yield of potatoes graded No. 1, small. Seventy-five percent of potatoes grown with SCU nitrogen were graded marketable compared with 84% from PCU nitrogen. Potatoes were field graded and marketable yields are larger than after Co-op grading.

Table 2. Potato yield results.

Farm 1, potatoes	Six-week tissue analysis--NO_3-N (ppm)	Yield--final harvest (t/ha)				
		Can. #1, large	Can. #1, small	Can. #2	Total Mkt.	Cull
SCU	0.04	11.0	22.7	8.1	41.9	8.2
PCU	0.02	9.0	34.2	7.1	50.3	5.5
Significance	*	NS	***	NS	**	NS

*, **, ***, NS = denotes significance at p=0.05, p=0.01, p=0.001 and not significant respectively.

Farm 2--carrots. The PCU trial site received more nitrogen than the SCU site (see Table 1), however, there were no yield differences observed between the two treatments, after six weeks of growth.

At harvest, marketable yield was not significantly different between the two treatments, however, the yield of culls was largest from the PCU site. Soil nitrogen analysis after harvest showed 7 and 11 kg/ha residual NO_3-N in the PCU and SCU sites, respectively.

Table 3. Carrot yield results.

Farm 2, carrots	Six-week yield		Yield--final harvest (t/ha)		
	Root length (mm)	Total g/carrot	Mkt. yield	Cull	% Mkt.
SCU	175	3.7	59	10	85
PCU	165	3.6	56	16	78
Significance	NS	NS	NS	*	*

*, NS = denotes significance at P=0.05 and not significant respectively.

Farm revenue results The use of PCU resulted in a $121/ha increase in revenue from potato production, considering the increased yield and cost of the fertilizer (see Table 4).

Table 4. Effects of SCU and PCU on farm revenue in potato production.

Potato crop	SCU	PCU	Difference
Total yield Marketable yield [1.]	50.1 t/ha 35.1 t/ha	55.8 t/ha 39.1 t/ha	5.7 t/ha 4.0 t/ha
Revenue [2.]	$1170/ha	$1303/ha	$133/ha
Fertilizer cost [3.]	$58/ha	$70/ha	$12/ha
Net change in revenue	$1112/ha	$1233/ha	**$121/ha**

[1.] Based on 30% culls--field average (excluding PCU trial site) from B.C. Coast Vegetable Co-op.
[2.] Based on the Co-op's average field grade-out (excluding PCU trial site) and on October 1993 net prices to farm.
[3.] Based on SCU (@$364/ton) and PCU (@$438/ton) applied at farm rate.

Conclusions and Recommendations

Marketable potato yield was 20% larger from the polymer-coated urea treatment compared with the sulphur-coated urea treatment. The larger yield increased net revenue by $121/ha.

There were no significant differences in marketable carrot yield between the two nitrogen treatments, however, the polymer-coated urea treatment resulted in a larger yield of culls. Farmers able to reduce field trips using PCU by not applying side-dressed nitrogen may realize savings in input costs, however, this was not tested in the present trial.

The results presented are based on data collected in one year. Similar tests should be conducted for at least one more year to confirm the results.

Cloverdale Soil Conservation Group
TRIAL RESULTS

Canada-British Columbia Soil Conservation Program
17720 57th Ave., Surrey, B.C., V3S 4P9
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December 1993
Trial Report No. 3-8

FALL SEEDED COVER CROPS SPECIES EVALUATION - 1992/93 RESULTS

Mary-Margaret Gaye & Jean Hogue

Co-operator Rick Law, Law Pacific Vegetables Ltd.

Objective To assess plant species for suitability to fall cover cropping.

Species 11 species (see Table 1).

Seeding Date 3 September 1992, 2 September 1993

Seeding Rates

Cereals	140 kg/ha	
Faba beans	"	
Austrian winter peas	"	(mix: 68 kg/ha)
Mustard	13 "	
Oilseed radish	16 "	
Westerwold's ryegrass	32 "	

Sampling Dates Shoot yield: 2/3 November 1992, 23/24 November 1993
Plant height and weed control rating:
18 November 1992, 24 November 1993

Experimental Notes

The trials were a randomized complete block design with three replications. Plot size was 2m x 10m. All plots were seeded with an 'International' seed drill. Plant biomass samples were taken from a 1 m^2, randomly chosen subplot. A 200-400g subsample was oven-dried to determine dry matter content. Plant heights were determined by extending the leaves of grasses and cereals, and measuring to the growing tip of broadleaved plants. Weed competition was assessed using the weed control rating system of the Expert Committee on Weeds (ECW).

Data from 1992 and 1993 were statistically analyzed separately and in combination. Means were separated using Duncan's multiple range test.

Results

With the exception of the ECW rating, there were no statistical differences between years and the means of 1992 and 1993 are presented.

In 1992 chickweed was a common weed in the experimental site. Acceptable control according to ECW standards was obtained only with barley and oats (Fig. 1). Although these species produced the tallest plants, plant height (Fig. 2) was not necessarily associated with good weed control. For example, mustard was the shortest crop but relatively good weed control was obtained because of the large growth habit of the leaves that prevented light from reaching the soil surface (not shown).

In 1993 weed growth was limited and weed control was acceptable in all cover crops with the exception of mustard and Austrian winter peas.

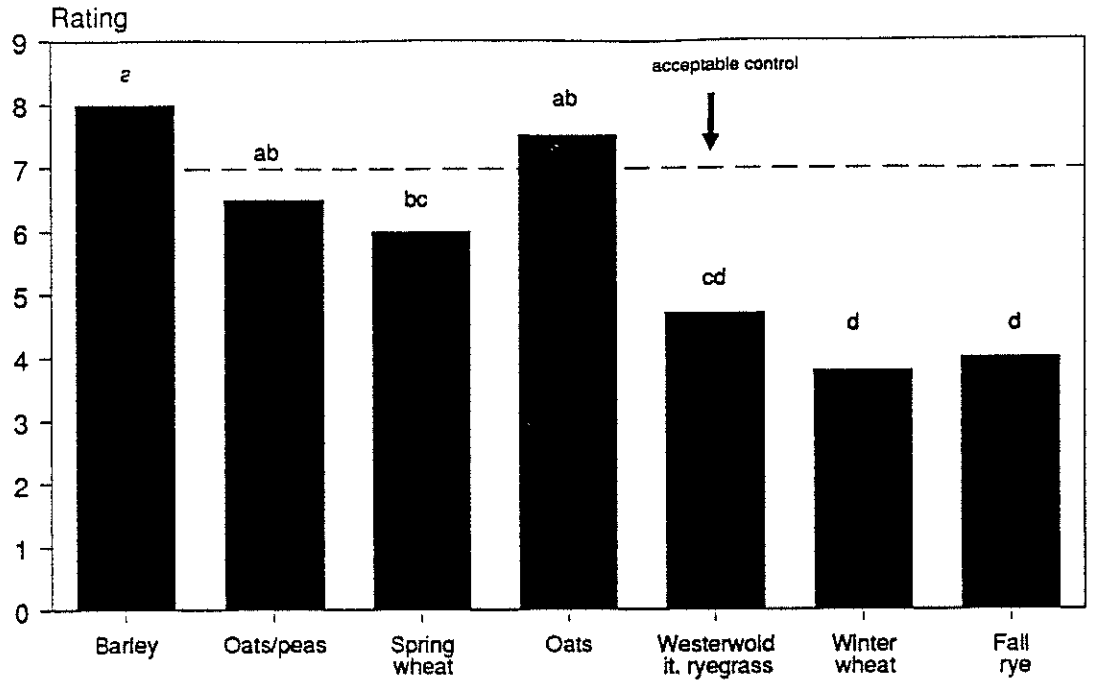
Barley produced the largest yield and plant height of all tested species (Table 1 and Fig. 3). The second largest yield was obtained from oats. The remaining cereals and their mixtures produced larger yields than the broadleaved species and Westerwolds Italian ryegrass.

Table 1. Yield (dry matter) of fall seeded cover crops: 1992 and 1993.

Cover crop	Dry matter yield (t/ha)
Cereals - winter killed:	
Barley, 'Virden'	4.3 a
Oats, 'Jasper'	3.8 b
Spring wheat, 'Max'	2.4 c
Cereals - overwinter:	
Winter wheat, 'Fundulea'	2.3 cd
Fall rye, common #1	1.9 de
Grass - overwinter:	
Westerwolds Italian ryegrass	1.6 ef
Legumes - winter killed:	
Faba beans, 'Friedrichs'	1.8 de
Austrian winter peas	1.3 f
Broadleaves - winter killed:	
Mustard, 'Cutlass'	1.7 ef
Oilseed radish	1.5 ef
Mix:	
Oats, 'Jasper'/Austrian winter peas	3.6 b

Within columns, means followed by the same letter are not significantly different at $P > 0.05$, using Duncan's multiple range test.

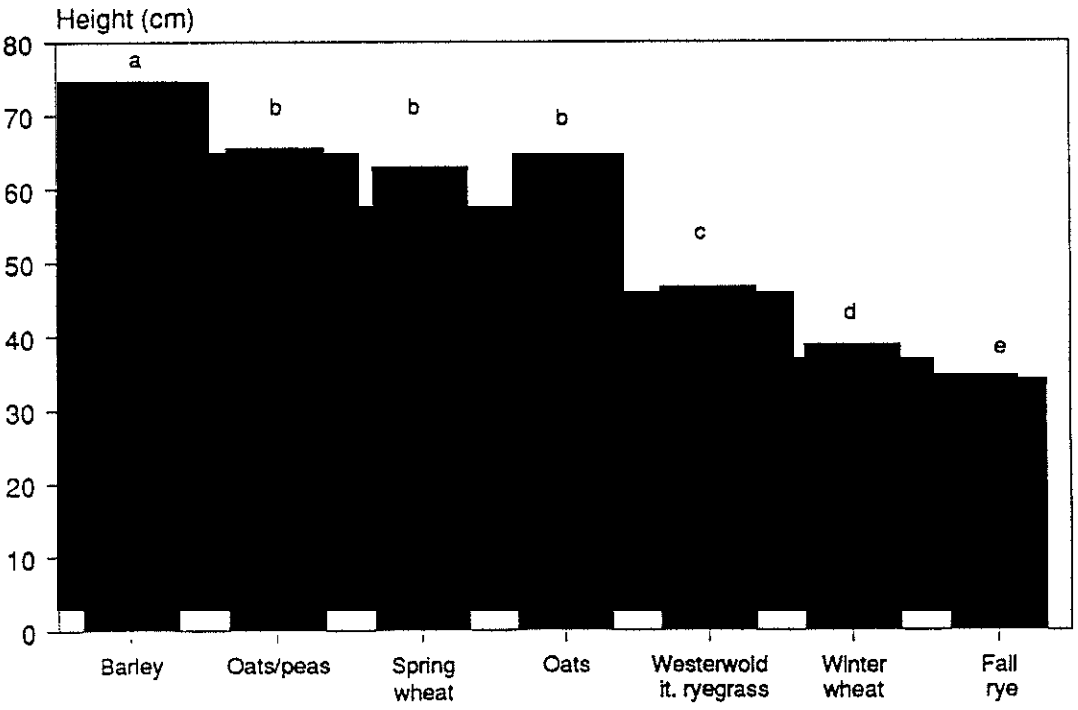
Fig. 1. ECW* weed control rating: 1992.



Means followed by the same letter are not significantly different at P>0.05, using Duncan's multiple range test.

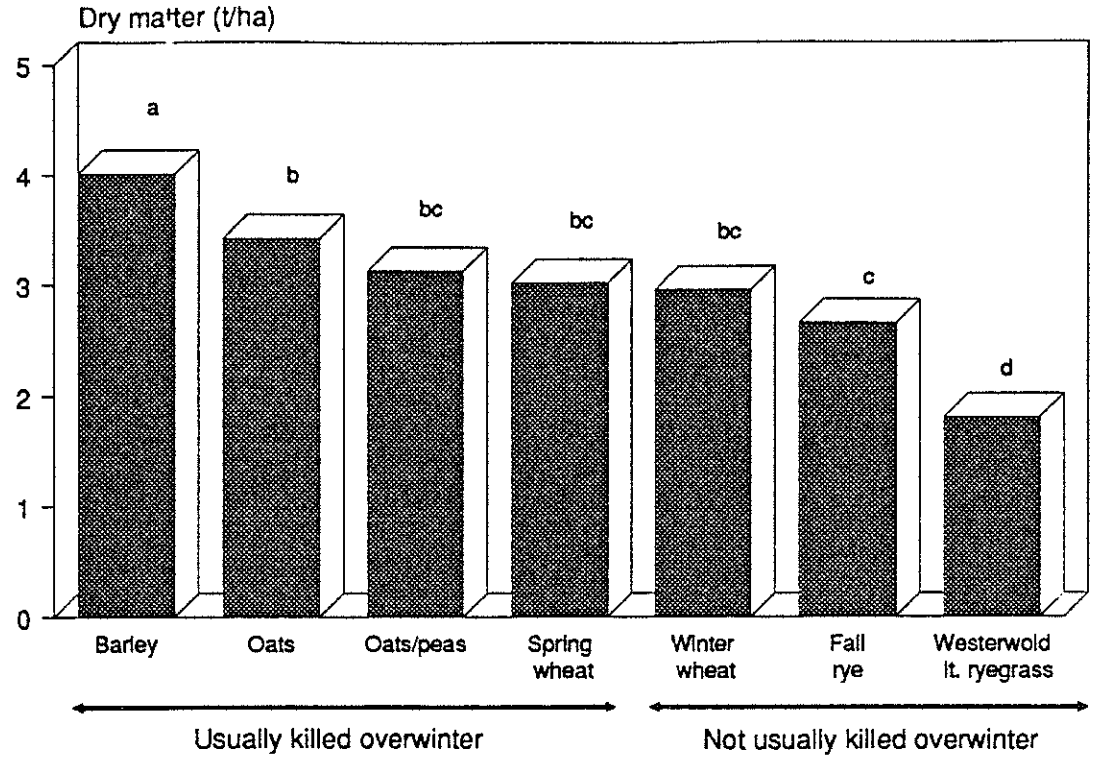
*ECW = Expert Committee on Weeds; 0 = no control, 9 = full control

Fig. 2. Plant Heights: 1992 and 1993.



Means followed by the same letter are not significantly different at P>0.05, using Duncan's multiple range test.

Fig. 3. Dry matter yield: 1992 and 1993.



Columns under the same line are not significantly different at P=0.05 using Duncan's multiple range test.

Cloverdale Soil Conservation Group
TRIAL RESULTS

Canada-British Columbia Soil Conservation Program
17720 57th Ave., Surrey, B.C., V3S 4P9
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January 1994
Trial Report No. 3-9

1993 FALL SEEDED COVER CROPS SPECIES EVALUATION AND TIME OF SEEDING YEAR 3

Mary-Margaret Gaye & Jean Hogue

Co-operator **Rick Law, Law Pacific Vegetable Ltd.**

Objective To assess fall cover crop species, seeded at three different dates, for plant yield and nitrogen uptake.

Species
Winter wheat cv. Monopol
Spring barley cv. Virden
Spring oats cv. Jasper
Faba bean cv. Friedrichs
Westerwold's Italian ryegrass

Seeding Dates 25 August, 15 September, 6 October

Soil Type

Organic matter	46.8%
pH	5.47
Nitrogen (NO_3^-)	140 kg/ha
Phosphate	138 "
Potassium	127 "

Seeding Rates

Winter wheat	140 kg/ha
Spring barley	134 "
Spring oats	136 "
Faba bean	137 "
Italian ryegrass	32 "

Sampling Dates

Total plant and soil nitrogen, plant and root biomass:
6 October, 28 October, 18/19 November
Plant height and weed rating: 24 November

Experimental Notes

The trial was a split-plot design with 3 replications. Plot size was 2 m x 10 m. Seeds of each species were drilled using an 'International' seed drill. Data were collected from randomly selected 30 cm^2 subplots within each plot. Five soil cores (0-23 cm depth) were taken at each sampling date from each subplot and combined for nitrogen analysis. All plants were removed from the same subplot to assess nitrogen content, and root and shoot yield. Dry matter content was determined by oven drying the subsamples at 60C. Plant height was determined by measuring plant leaves from the soil surface to the extended tips, and the rating system of the Expert Committee on Weeds (ECW) (scale from 0-9) was used to assess weed competition. Norwest Labs Inc. conducted the nitrogen analysis. Data collected over three sampling dates were analyzed using repeated measures analysis of variance. ANOVA using individual degrees of freedom and Duncan's multiple range test were used to analyze data when the repeated measures tests were not significant.

Results

Plant height and weed suppression. With the exception of winter wheat, the earliest seeded cover crops (25 August) obtained the greatest heights--these ranged from 57 to 99 cm (Table 1). Barley was the tallest crop at each seeding date, however, oats were not significantly different when seeded on 15 September. Faba beans, winter wheat and Westerwold's Italian ryegrass seeded on 6 October grew less than 10 cm in height. These cover crops would probably not provide adequate winter soil protection when seeded late.

Weed control did not differ between treatments. A mean rating of 8.7 indicated acceptable control according to the ECW rating criteria (a rating of 7 or above is acceptable).

Plant yield and nitrogen assessment from 3 sampling dates.
Plant yield. The largest shoot yields, at each seeding date, were obtained from barley, oats and winter wheat (Table 1). Barley showed a trend towards producing the largest yields at the second and third seeding dates, however, this was not significant. Faba beans and Westerwold's Italian ryegrass produced the smallest yields. The yields from these two cover crops did not differ significantly except for the last seeding date. At this date, the smallest yield was obtained from Westerwold's Italian ryegrass.

Repeated measures analysis showed a significant correlation between sampling dates therefore analysis statistics are not shown in Table 1. Cover crop root yield differed between seeding dates (significant interaction).

Total plant yield, shown in Fig. 1, reflected the same trends as shoot yield, however there were significant differences between barley, oats and winter wheat at the first seeding date. Plant yield at the third

seeding date was not significantly different with the exception of Westerwold's Italian ryegrass.

Nitrogen uptake. Total plant nitrogen decreased linearly with seeding date. Barley and oats showed the largest nitrogen content, at the first two seeding dates (Fig. 2). Faba beans, a leguminous crop, had the smallest nitrogen content of all cover crops. There were no significant differences in total plant nitrogen between species seeded on the last seeding date.

Fig. 3 shows plant and soil nitrate-N as influenced by sampling date and cover crop, at each seeding date. Over all sampling dates, plant nitrate-N content per unit land area decreased with seeding date and was largest with barley (Figs. 3a, b, and c). Faba beans showed the smallest nitrate-N content. Nitrate-N content tended to decline after 28 October in crops seeded on 25 August or 15 September. This reflects the increasing plant biomass and the subsequent decline in the concentration of nitrogen (ppm).

Soil nitrate-N under crops seeded at the first two seeding dates generally declined as plant biomass increased. The change in the slope of the graph after 28 October is probably due to the reduction in plant growth as temperatures became cooler (Fig. 3d and e). Growth of crops seeded on 6 October was poor and hence the decline of soil nitrate-N after the second sampling is most likely the result of leaching (Fig. 3f).

Conclusions

The results of this trial showed that cover crops planted in early October did not produce enough biomass to provide adequate soil cover or to take up nitrogen left in the soil after removal of the cash crop.

The largest biomass and total nitrogen content was obtained from crops seeded in late August. Cover crops add organic matter to the soil and release the 'captured' nitrogen as decomposition occurs. Excess plant residue, however, may interfere with spring soil preparation.

Barley, oats and winter wheat produced the largest yields at the first and second seeding dates, however, nitrogen content was lower in winter wheat compared with oats and barley. Faba beans showed the lowest nitrogen content of all cover crops.

Table 1. Plant height and yield (dry matter) of cover crops seeded at three dates*.

Seeding date	Cover crop	Plant height (cm)	Shoot yield (g/m^2)	Root yield (g/m^2)
25 August	Barley	99 a	586 a	40
	Oats	81 b	612 a	78
	Winter wheat	45 f	548 a	61
	Faba beans	70 c	349 b	68
	Italian ryegrass	57 d	322 b	58
15 September	Barley	53 e	204 c	22
	Oats	50 e	180 c	31
	Winter wheat	24 g	179 c	24
	Faba beans	24 g	85 d	34
	Italian ryegrass	19 h	81 d	17
6 October	Barley	17 h	21 de	6
	Oats	11 i	14 de	10
	Winter wheat	9 ij	11 de	5
	Faba beans	4 k	14 de	13
	Italian ryegrass	7 j	3 e	3

Within columns, means followed by a similar letter are not significantly different.
*Yields are the means of three sampling dates: 6 October, 27 October and 16 November. Statistics for root yield are not shown as repeated measures analysis was significant.

Fig. 1. Total plant dry matter yield of five cover crop species as affected by seeding date. Data points are the means of three sampling dates.

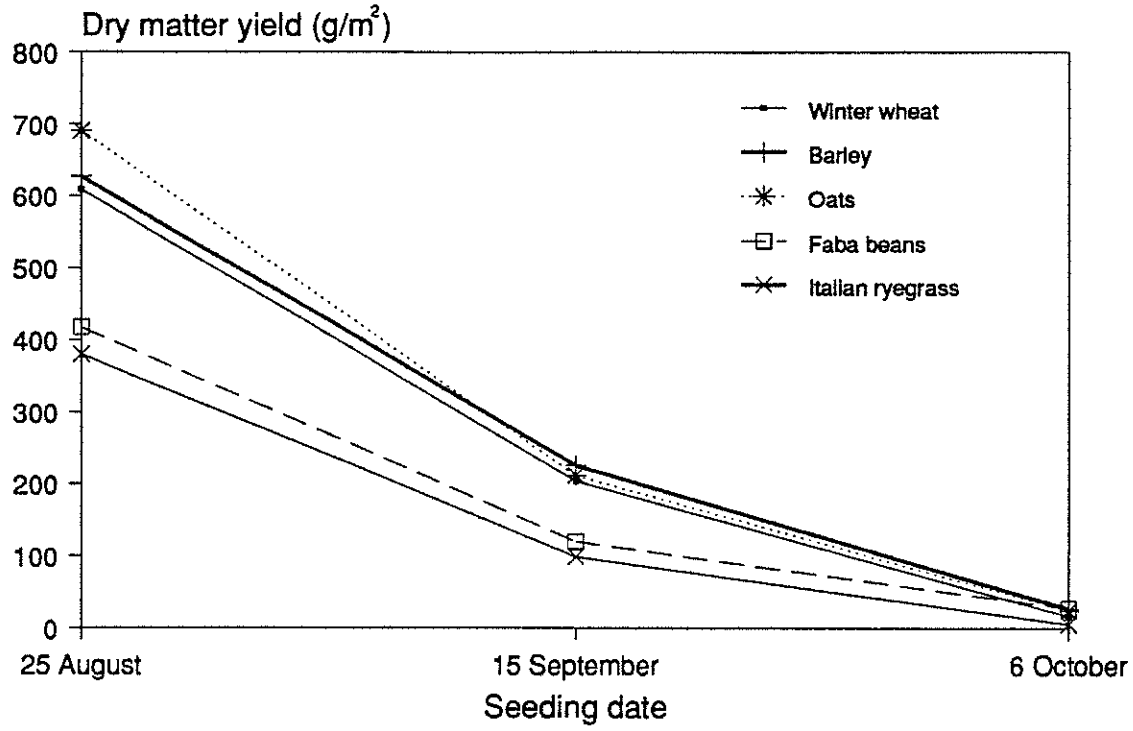


Fig. 2. Total plant nitrogen content of five cover crop species as affected by seeding date. Data points are the means of three sampling dates.

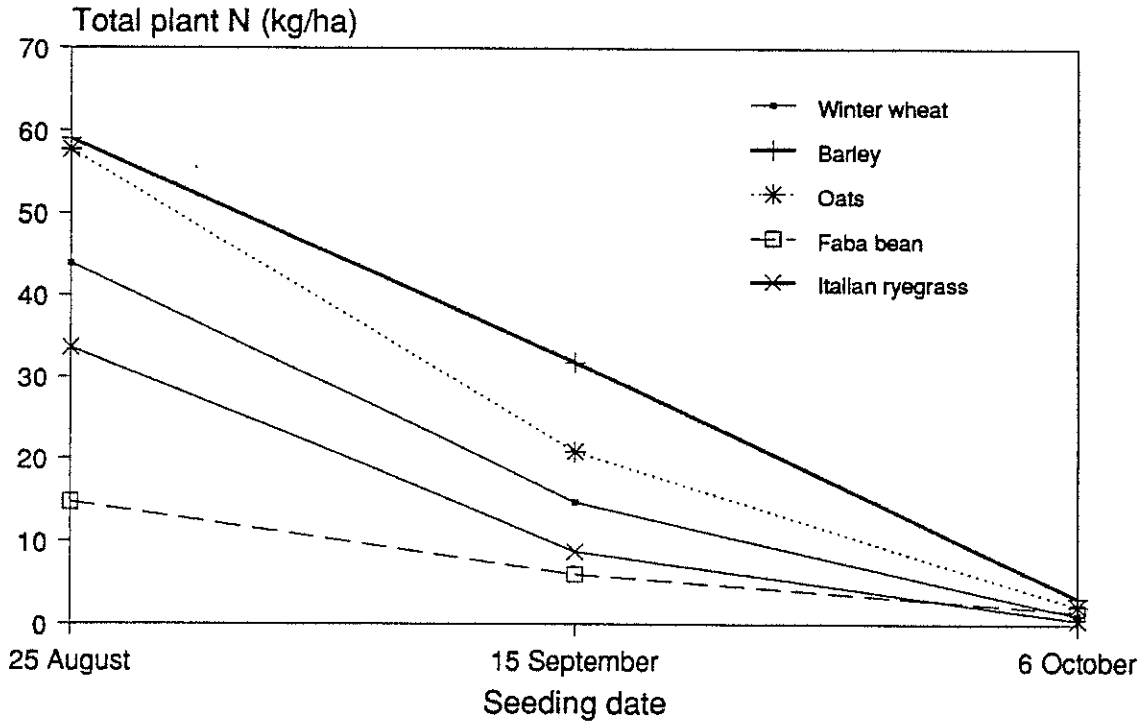
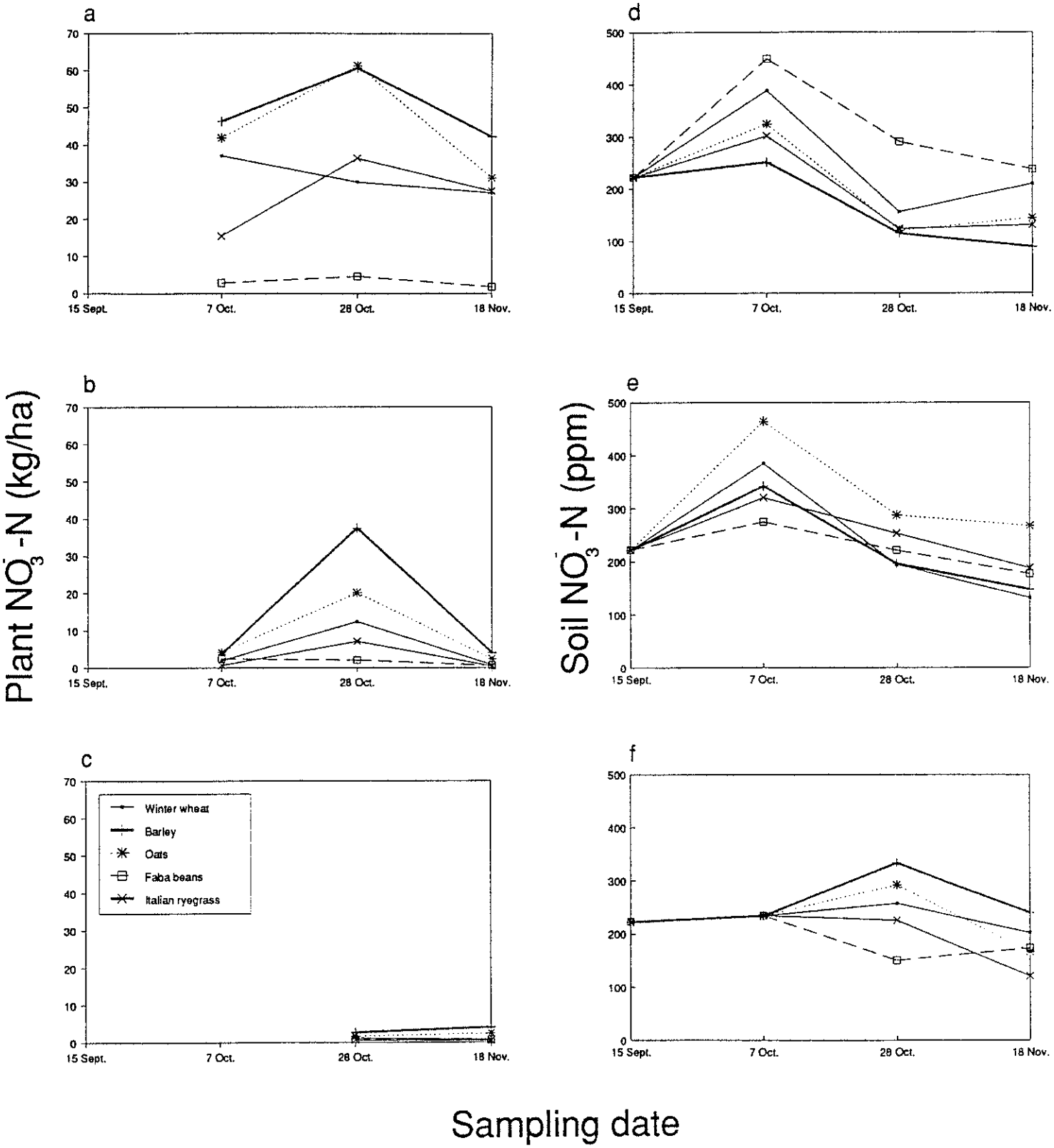


Fig. 3. Plant and soil NO_3-N as influenced by sampling date and cover crop, at three seeding dates. 25 August seeding date is shown in Figs. a and d; 15 September seeding date in Figs. b and e; and 6 October seeding date in Figs. c and f.



Part 2. Newsletters

Cloverdale Soil Conservation Group

SOILNEWS

Canada-British Columbia Soil Conservation Program Vol.1 No.1 May 1991

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Our Soil...Our Future

BC Canada

"DIRT ELIMINATORS" KEEP THE SOIL ON YOUR FARM AND HELP REDUCE BLACK ROOT ROT AND DISPOSAL PROBLEMS

Here's an opportunity to conserve soil and to improve marketability. "Dirt eliminators" are a standard addition to the carrot and onion harvesters of muck growers in the Holland Marsh area of Ontario. The "dirt eliminators" or "star tables" are adjustable rows of rubber 'stars' mounted on stainless steel axles. The crop passes over these units while being conveyed to large bins or trucks. (Similar to the star tables on the potato harvesters at Pacific Vegetable Farm and Sprangers Farm.) Holland Marsh growers claim these work extremely well, eliminating much of the soil from the crop. More soil is removed at the farm, and the Co-op benefits by less soil to dispose of and less potential for black root rot infections.

The Cloverdale Soil Conservation Group has ordered a "dirt eliminator" from Weening Brothers, an equipment manufacturer in Ontario's Holland Marsh. The unit will cost about $2,800 -- more than other models because of an hydraulic motor that makes field adjustments easier. It will be installed on one of Tim Singh's carrot harvesters to see how it works in our soils. Tim has offered to loan his harvester to anyone interested in trying the unit in different soil conditions. Arrange this with Tim, or speak to the project manager. The unit will be shown at a demonstration day later this season.

WHAT IS THE CLOVERDALE SOIL CONSERVATION GROUP?

The Cloverdale Soil Conservation Group is made up of vegetable producers from the Cloverdale area; B.C. Ministry of Agriculture, Fisheries and Foods advisors; and an Agriculture Canada representative. This past fall the group was awarded $400,000 under a federal-provincial program called "Our Soil...Our Future". These funds will support a 3-year program to address issues concerning soil and water management of organic soils in the Cloverdale area.

The Group is working primarily with vegetable producers, but all producers farming organic soils in the area will be included in the Group's mailing list, as they may find some of the information useful. The Group will be conducting research trials on growers' fields and holding demonstration days. The growers will be kept informed with timely issues of this bulletin and notices of special events. Contact the project manager, Mary-Margaret Gaye, or any Group member, with suggestions, comments or questions.

CELERY GROWERS: AVOID BOLTING LOSSES

We are stretching things to include this as a soil conservation item but....

Michigan celery growers are very concerned about the potential of crop losses from bolting. They produce what is called 'paper celery' -- an early celery that was historically covered by paper for cold temperature protection but is now covered by small row tunnels or the newer floating mulches. They grow all their own transplants, some using a '0-DIF' system of equal day and night temperatures that seems to reduce bolting losses. One of the top celery growers plants Ventura in the early season and only plants Florida 683 as a last crop. (In his *Fusarium* infested fields he plants tolerant varieties. Like us, they are still searching for a tolerant variety with good market qualities. This grower seemed pleased with the varieties Matador and Picador.)

It is important to note that the growers regularly monitor the early celery for potential bolting. They do this by walking through the fields and randomly cutting plants in half to check for developing seedstalks. The growers will harvest the crop early if seedstalks are developing. This way they avoid the losses that occur once the flowerstalk is visible.

This spring has been very cool and producers may see some bolting in their early celery crops. Monitoring fields is very easy for growers to do themselves, but Barb Peterson of Coast Agri has shown an interest in including this type of monitoring in their program.. Give Barb a call if you think you could use this service (530-7212).

LAND LEVELLING OR CONTOURING -- WHICH IS BEST?

Increasing numbers of fields are being levelled in our area. Most of the fields are levelled by scraping the entire field surface and moving soil from high areas to fill in the low spots. In some areas over 2 feet of soil may have to be removed to level the field, exposing the less productive subsoil. The preferred method, one that will preserve the organic soil, is to scrape aside the layer of organic soil, level out the mineral subsoil, and replace the organic soil over top. This is more expensive and it is not always practical if the organic layer is too shallow.

Land levelling is not necessarily beneficial to fields in the Cloverdale area. Mineral subsoils are exposed when the organic layer is shallow. The structure of the mineral soils is often very poor and crop productivity will drop until the soil is rebuilt -- a process that can take many years. Also, soil with a poor structure will not conduct water as easily as a well structured soil, resulting in drainage problems.

Local land levellers have started to contour some fields. Soil from the high spots is used to fill in the low areas, without levelling the entire field. In fields where this technique is appropriate, selective contouring will minimize exposure of the mineral soil and result in less structural damage -- particularly in areas that are reasonably level to start with. Crop productivity will drop in areas where the soil has been disturbed but, with selective contouring, these areas will be fewer than when the entire field is levelled. This type of contouring should be cheaper too!

Remember, **land levelling does not replace a good drainage system.** Levelling may eliminate the water that collects in low spots, but it will not improve the drainage of a poorly structured soil.

Soil pathogens, such as onion root rot, Fusarium of celery, and black root rot of carrots, can be transferred between fields by farm implements.

Kelly Bros. has expressed concern about the potential of disease transfer on their machinery. They are considering purchasing equipment necessary to allow them to wash and disinfect the machinery before it leaves a farm. In the meantime, the equipment can be washed and disinfected using pressure hoses on the farm -- a job that can be done by the grower to save costs. (It can take about 2 hours to properly wash down the equipment.) Talk to Todd or Brent Kelly about this. It could save crop losses later on.

COMPACTION PROBLEMS? TRY A PARATILL

Many of the fields show signs of soil compaction -- poor plant growth and poor drainage after rainfall or irrigation. Subsoiling can reduce compaction problems and thereby improve drainage. (It does not substitute for a good drainage system!) Late summer or fall subsoiling is most beneficial as the subsoil has dried out and good cracking of the clay results. Growers who cannot subsoil at the end of the season may do this before spring seeding and will still see benefits.

The Conservation Group has ordered a Paratill from the Tye Company in Texas. This subsoiler has a unique winged design that minimizes soil disturbance. It should work well on fields where the mineral subsoil should not be brought up. The design of this implement differs from the earlier Paraplow in that the shanks are attached to a straight tool bar. Cloverdale Produce, Sprangers Farms and Maddocks Farm have the Paraplow with an angled tool bar, but these are no longer available.

The Group's Paratill will be used in demonstrations and will also be on loan for growers to try it out on their own fields. It should arrive in about 4 weeks so contact the Group if you are interested in using it.

Wayne Odermatt says that the Paratill has been used successfully in Eastern Washington on sandy loams for deep tillage under potato rows. This serves to shatter the subsoil with minimal seed piece disturbance, but should be carried out within 2 weeks of planting. Effectiveness locally would likely depend on subsoil moisture at the time of the operation.

COMING EVENTS: EASTERN VEGETABLE PRODUCTION REPORT

Earlier this spring, Geoff Hughes-Games and Mary-Margaret Gaye visited the muck vegetable production areas of Ontario and Michigan.

Find out what equipment growers are using in these areas, and how they are coping with problems they are facing.

Come to the EASTERN VEGETABLE PRODUCTION REPORT night -- **22 May, 8:00 P.M., at the Cloverdale Lettuce and Vegetable Co-operative.**

Mark it on your calendar and we will see you there.

Unless otherwise noted, the bulletin is written by Mary-Margaret Gaye. Production is by Jean Hogue.
We welcome submissions, suggestions and comments.

Cloverdale Soil Conservation Group

SOILNEWS

Canada-British Columbia Soil Conservation Program Vol.1 No.2 Aug. 1991

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Our Soil...Our Future

BC Canada

• FREE SEED • FOR FALL COVER CROPS

The Cloverdale Soil Conservation Group needs your help. We would like information on the management of fall-seeded spring barley and oats, in Cloverdale fields. In return, we will give you enough seed to plant up to 10 acres of your land in these fall cover crops.

What do you have to do?

1. Phone the project manager, Mary-Margaret Gaye (576-2911), to let us know that you want to participate (leave a message).
2. Plant the seed (broadcast or drill) after your last crop this season (best to plant before September 15).
3. Let us know your comments -- we will talk to you after seeding and in the spring to find out how you managed the cover crop and to hear your observations on the cover crop's effect on spring land preparation and on the following crop.

What will you receive for participating?

1. Free seed (up to 1000 lbs in total) of your choice -- spring barley or oats.
2. Any advice you may need on planting the cover crop.
3. A 'Cloverdale Soil Conservation Group -- Participating Farm' sign for your farm (optional).
4. All the benefits of a cover crop on 10 acres of your land -- improved soil structure and drainage, additional organic matter, and reduced erosion.

Phone now for your seed for this season's overwinter cover cropping.

Sorry, but this offer is only good for vegetable producers farming organic soil in the Cloverdale area.

THE CLOVERDALE SOIL CONSERVATION GROUP

The Cloverdale Soil Conservation Group is a non-profit organization of Cloverdale vegetable producers who are concerned about soil conservation.

This past fall the Group was awarded $400,000 under a federal-provincial program called " Our Soil...Our Future". These funds will support a 3-year program to address issues concerning soil and water management of organic soils in the Cloverdale area, and to promote soil conservation practices. The Group works with B.C. Ministry of Agriculture, Fisheries and Foods advisors, and an Agriculture Canada representative.

Demonstration and research projects undertaken by the Group are conducted in cooperation with local growers -- using their fields, equipment and, labour. This support is critical for the success of the program.

Local growers are kept informed with timely bulletins, and notices of special events. Contact the project manager Mary-Margaret Gaye or any Group member with suggestions, comments or questions.

COVER CROPS MEAN GOOD SOIL MANAGEMENT

Cover crops are a valuable part of soil management programs for Cloverdale producers. Soil erosion caused by winter winds or the overland flow of water during the winter storms are common problems in the area. Cover crops protect the soil surface and reduce this erosion.

Cover crops also play an important role in improving soil structure. The roots create drainage channels and release a 'glue' that holds soil particles together. This action stabilizes soil aggregates and improves tilth. The structure of mineral soil found on exposed ridges can be very poor, as has been shown in studies conducted by U.B.C. researchers. Fields with exposed mineral soils will particularly benefit from cover cropping.

Another benefit of overwintering cover crops is nutrient management. Cover crops can use nutrients for plant growth and will utilize nutrients left in the soil after the cash crop is taken off, or from late-summer applications of manure. This prevents nutrient loss through leaching. As the cover crop decomposes, a portion of these nutrients are released and become available for the succeeding crop.

Hints for growers planting a cover crop for the first time

Some Cloverdale producers have successfully grown spring barley and oats as overwintering cover crops for many years. These crops do well in the area and are very easy to manage as they are usually winter killed. The crop residue still protects the soil from the impact of raindrops and reduces the incidence of surface sealing (hence poor drainage). Growers planting a cover crop for the first time should start with a few acres seeded to either barley or oats. This fall, the Group will be assessing different cover crops for suitability in this area. Growers will have an opportunity to look at alternative cover crops before trying them on their own fields.

Establishing a cover crop is no different from growing many other crops. It is easily accomplished using regular tillage and planting equipment. A light discing before planting is usually all that is needed when the cover crop is planted following another crop. (Remember, the Cloverdale soils will benefit by minimizing tillage.) No additional fertilizer is required for late summer plantings.

Seeds can be broadcast (use a fertilizer spreader) and lightly disced or harrowed, or drilled. The seeding rate for cereals (like barley) is generally 100+ lb/acre. The seeding rate for early plantings can be reduced, as each plant is able to produce more leaf and root mass. Late plantings will require a higher seeding rate to establish good ground cover, particularly where

the erosion potential is high. Planting is usually done immediately after the last harvest to allow the crop enough time to become established before winter. This should be no later than mid-September.

WHAT ARE THE WHITE STAKES AND GREEN SIGNS ABOUT?

The Cloverdale farming community is now dotted with white stakes and green signs -- from the Cloverdale Soil Conservation Group's summer projects. And the stakes and signs will increase in number over the next 2½ years!

The stakes are located at our trials, but many are now hidden by the crops. The large green signs, posted at the trial sites that are visible from the road, indicate what the trial is about. Every grower who is participating with the Group -- by hosting a trial or another project -- has a smaller green sign at the farm's entrance.

The summer has been very busy. The following is an almost-complete-list of this season's trials and projects, and the participating farms:

Fertilizer rate and placement (banded or broadcast):

- lettuce (phosphorus), off and on a mineral ridge, Cloverdale Produce Ltd.
- carrots (phosphorus), off and on a mineral ridge, Hing Sing Farm

COMING LEGISLATION AFFECTS GROWERS FIELD-STORING MANURE

The Agricultural Waste Control Regulation for the Waste Management Act is drafted and is expected to be signed by cabinet by this fall. The Code of Agricultural Practice for Waste Management which is attached to the regulation and will become law, exempts a farmer from requiring a permit to handle agricultural waste, as long as the Code of Agricultural Practice is met. The Code will have an impact on all farming operations that produce or utilize manure.

Of special interest to many Cloverdale growers will be the part of the Code concerning the field storage of manure. The act states that manure stored longer than 2 weeks must be located at least 30 metres (100') from any water course (eg. ditch). Manure can be stored in a storage facility that is located a minimum of 15 metres (50') from any water course. Structures, bermed areas, or tanks are defined as storage facilities in the regulation. No matter how far the manure is stored from a water course, it must be protected from the rain so the nutrients do not leach out. This can be achieved by a roof or a tarp placed over the manure. Producers not meeting this Code and shown to be polluting, will be subject to a permit and may be liable for prosecution once the Regulation is signed.

Best Waste Management Plans

Rick Van Kleeck, B.C.M.A.F.F. Waste Management Engineer, under the Best Agricultural Waste Management Program, will come out to your farm (or his designate) to help you decide on the best site, structure size, etc. for your manure storage. Pick up a 'Work Request' form for a Best Agricultural Waste Management Plan, at the Cloverdale office.

A.L.D.A. Loans

A storage facility for manure with a concrete floor can cost between $8.00 and $11.00 per ft^2. A.L.D.A. loans are available for producers to build permanent structures for manure storage. Growers can borrow $5,000 to $75,000 at one-half of the prime interest rate, amortized over 20 years. The B.C.M.A.F.F. office in Cloverdale has more information and application forms -- contact Dianne Gertzen (576-2911). If you intend to apply for an A.L.D.A loan, start working on your application as soon as possible. It can take a few weeks to collect the required information and the application forms are processed on a first-come, first-served basis. Also, it can take up to 8 weeks to get a building permit from the Municipality of Surrey, so plan ahead.

- carrots (nitrogen), Sprangers Farms
- onions (nitrogen), Garvin Farms
- onions (nitrogen), Cloverdale Produce Ltd.

Cover crop assessment:
- spring-seeded trial, Cloverdale Produce Ltd.
- spring-seeded demonstration, Pacific Vegetable Farms
- fall-seeded trials (varieties and time-of-seeding), Premier Produce

Permanent cover crops for blueberry plantings:

This trial is conducted with Stan Freyman, Weed Scientist, Agassiz Research Station.
- legume and grass species assessment, Pacific Vegetable Farms

Ditchbank erosion control:
- grass species assessment, Jack's Garden (176th St. and 40th Ave)
- grass species assessment, Sprangers Farms

Land leveling and drainage assessment project:

This project is conducted with the co-operation of Todd Kelly (Kelly Farms Land Leveling) and Brian French (RBS, Land Resource Consultants)
- assessment of a 10 acre field for potential levelling and drainage, Maddocks Farms

The first-year's results from some of the trials will be available at the fall and winter producer meetings. Also, at these meetings, growers will have an opportunity to sign up to host a trial next season. Some of the above trials will be in the same location for 3 years, but most trials will change location with each season. Growers that host a trial benefit by getting trial results that are specific to their soil and management systems.

EARLY SEASON RAINS CAN CAUSE SOIL COMPACTION PROBLEMS

Many of the fields in the Cloverdale area show signs of compaction, such as poor drainage after irrigation or a heavy rain storm, and poor plant growth. Long periods of rain in this past season forced growers to harvest their crops while their fields were still wet. Harvesting on wet fields can lead to soil compaction, particularly on the mineral ridges that are now exposed in many of the fields.

Mineral soils need special care -- they are much more susceptible to compaction problems than black, organic soils. Subsoiling, as part of your soil management plan, can help to reduce compaction and improve drainage. The best time to subsoil your fields is in late August or early September when the clay subsoil contains the least amount of water. Subsoiling at this time of the year will shatter the clay, creating good drainage channels. Planting can then be done earlier in the spring on fields that drain quickly and that are less susceptible to soil compaction.

BOOK NOW FOR END-OF-SEASON SUBSOILING

Our Paratill is ready for late-season use. Growers that used the Paratill in the spring found they had no trouble pulling it with their tractors. (One grower had some problems pulling in heavy clay). The implement works well. It is designed to subsoil to a depth of 14" to 16" and does so without bringing up the mineral subsoil.

A few growers have mentioned that they may not be able to pull the 4 legs with their tractors. Although the manual suggests that the Paratill requires 30 hp per leg, Rick Law easily pulled the 4 legs using his 80 hp tractor, driving at 6 mph. Jerry Sprangers has pulled his 4-legged Paraplow (earlier design with an angled tool bar) with a 75 hp tractor, without difficulty. If you are still concerned about your tractor power, we can remove 2 legs so that you can try out the Paratill.

Phone Mary-Margaret Gaye or Jean Hogue (576-2911) to arrange a time to borrow the subsoiler.

Cloverdale Soil Conservation Group

SOILNEWS

Canada-British Columbia Soil Conservation Program Vol.1 No.3 Dec. 1991

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Our Soil...Our Future

BC Canada

FREE SEED PROGRAM GREENS CLOVERDALE

This fall the Cloverdale Soil Conservation Group offered all Cloverdale vegetable producers enough barley or oat seed to cover 10 acres of land for fall cover cropping. In return, the Group asked the producers for observations on the cover crop and spring soil management. It was a great opportunity for those wanting to try cover crops for the first time, or those wanting to expand their existing acreage of cover crops.

The response was overwhelming! All the major producers, and many smaller producers, with land free by about mid-October, took up the offer. To seed the crop, farmers hauled old seed drills from the back of barns, used fertilizer or lime spreaders, and hand-broadcasted. They seeded 10 acres of barley or oats, or seeded 5 acres each of barley and oats side-by-side. In total 22 farms planted at least 10 acres of cover crops this fall -- a first for Cloverdale. Each participating farm received a personalized 'Participating Farm' sign for the farm entrance.

The Group would like to monitor the cover crops for insects. The cover cropped fields, with plants at different stages of growth, provide an excellent opportunity to assess crane fly populations. The best time to do this is in February or early-March. Farmers participating in the free seed program will hear more about this in February.

WHAT'S INSIDE...

SPRING SEEDED COVER CROPS BUILD GOOD SOIL

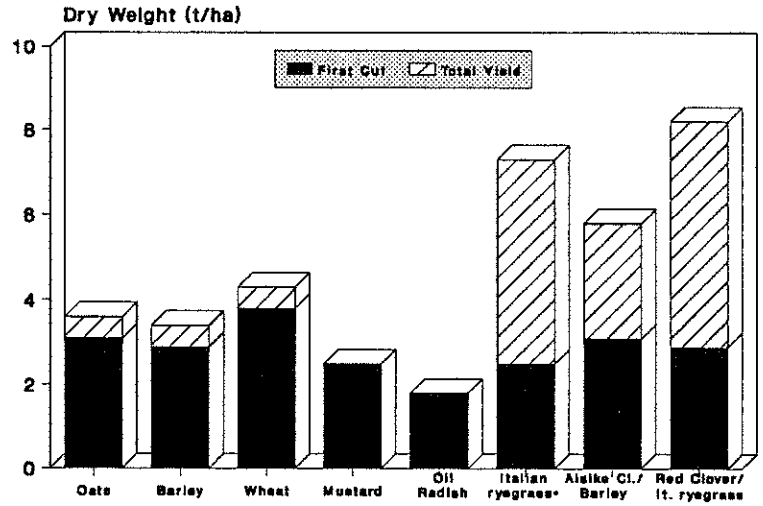
The soil structure in many Cloverdale fields needs to be improved, particularly where mineral ridges are appearing. Farmers considering cutting back on their production next year, leaving soil bare, should consider a cover crop. Fields scheduled for late season cash crops may also benefit from early seeded cover crops. Organic matter from the cover crops will break down, improving the soil structure, and their roots will release the 'glue' that helps to improve soil structure. A good structure is necessary if soil is to conduct water well.

The spring seeded cover crop trial conducted at Cloverdale Produce Farms assessed different plant species for their suitability for full and partial season cover. The crops were all seeded on May 28, and were first cut on July 24. Cover crops grown over the entire season were cut an additional two times.

The cereal crops (spring wheat, oats and barley) grew quickly, and regrowth after the first cut was negligible. The largest yield was from spring wheat. Cereals have a fibrous root structure that is excellent for improving the soil. The mustard and oilseed radish (brassicas) did not yield as well, but these plants have a large tap root that can improve soil drainage. Farmers considering a cover crop as the first planting of the season should choose one that is fast growing and high yielding. All the cereals and the brassicas in the trial could probably have been cut earlier with little reduction in yield.

Italian ryegrasses mixed with a legume (alsike or red clover, field peas) yielded as well as cereals at the first cut. The mixtures continued to produce good yields throughout the season. The graph shows results from the largest yielding crops. In total, 22 species and mixtures were evaluated. Phone the project manager (576-2911) to obtain a full report (Report No. 1-1) with results for all of the cover crops tested. This coming spring the plots will be sprayed with herbicides. The trial site will be monitored during the production of a cash crop to determine the impact of cover crops on subsequent field management.

Dry Weight of Spring Seeded Cover Crops



Seeded: 28 May 1991
First cut: 24 July 1991

* cv. Westerwolds

NEW GROUP EQUIPMENT

Many summer cover crops should be cut periodically throughout the season; a task that can be labour intensive without the proper equipment. The Cloverdale Soil Conservation Group will be purchasing a mower to ease crop management. The mower is for use at farms with demonstration plots, and will also be on loan to vegetable producers who may need it for cutting cover crops.

The mowers use should be easy to co-ordinate because--unlike the Paratill--it can be used throughout the season.

A NEW SKYLINE FOR 40TH AVENUE

Producers driving along 40th Avenue should have noticed a new building on the Sprangers Farm. This is Cloverdale's first manure storage shed to be built in response to the upcoming changes to the Waste Management Act.

The building is large (60 x 140 ft.) and will hold about 3500 yd^3 of manure. It is also sturdy enough to stand up against strong winter winds. The site for the building was the most central location on the farm for manure storage and, because it had been used for the past 35 years for this purpose, it was well-packed by trucks and farm vehicles. Still, the concrete base for the building was poured on 16 inches of gravel. The site was also large enough that the regulation setback of 50 ft. from a ditch was easily met. The building has a 17 ft. clearance so Gerry devised a unique system (ask him about it!) to prevent damage to the roof when trucks are unloading.

A manure storage shed has been in Gerry's plans since he started building up the farm, 40 years ago. The upcoming Code provided the incentive to achieve this goal; the A.L.D.A. program from the B.C.M.A.F.F. provided the funding. (Interest rates at half of prime over 15 years -- application forms are available from the Cloverdale B.C.M.A.F.F. office.) Gerry also had good support from the District of Surrey who processed his request for a building permit as quickly as possible, enabling him to have the building constructed prior to the fall rains.

Sprangers' manure storage building meets the changes in the Waste Management Act. However, producers who do not want to build a shed are using alternatives. Field-stored manure must be covered -- but this can be with tarps. If the pile is located 50-100 ft. from a ditch (it cannot be closer than 50 ft.) and 100 ft. from a domestic well, the base of the pile must also be bermed. Keep your eyes on Cloverdale's changing skyline!

UPDATE ON THE NEW WASTE MANAGEMENT CODE

The signing of the Agricultural Waste Control Regulation, with the attached Code of Agricultural Practice for the Waste Management Act was delayed because of the recent change in government. It is, however, expected to be signed by Cabinet soon and once signed will immediately affect growers storing manure in their fields.

Review of the Code.

The Code states that manure stored longer than 2 weeks in a field must be located at least 30 metres (100 ft.) from any water course (eg. ditch) or domestic well. Manure stored in a field overwinter must be covered to prevent nutrient leaching. Manure can be stored in a storage facility that is located a minimum of 15 metres (50 ft.) from any water course and 30 metres (100 ft.) from a domestic well. Structures, bermed areas, or tanks are defined as storage facilities in the Code. No matter how far the manure is stored from a water course, it must be protected from the rain so the nutrients do not leach out. A roof or tarp will provide this protection. Rick Van Kleeck (B.C.M.A.F.F., 852-5363) is available for advise on storage facilities.

How the rules will be enforced.

Producers not meeting the Code and shown to be polluting, will be subject to a permit and may be liable for prosecution once the Regulation is signed. Currently, the Ministry of the Environment issues an abatement order to individuals shown to be polluting. The individual must develop a plan for resolving the problem. The issuance of an abatement order and approval of a plan can take 6-8 weeks. The individual is then required to implement the plan. It is likely that enforcement of the new Code will be similar to current practices. Areas such as the floodplain of the Nicomekl and Serpentine Rivers (i.e. the Cloverdale area) are environmentally sensitive and producers improperly storing manure may be given a relatively short time to correct the situation. When the Code is passed the B.C.M.A.F.F. will meet with commodity groups to explain the Code requirements.

HOW MUCH FERTILIZER IS TOO MUCH?

Cloverdale's muck soils, like those in eastern Canada and the United States, are showing increasing levels of phosphorus and potassium. This situation arises when more fertilizer is applied to the soil than can be used by the crop. It is not known if high levels of phosphorus and potassium affect the quality and shelf-life of the crop, but excess application can be an expensive and unnecessary cost for the farmer.

The Cloverdale Soil Conservation Group conducted a number of trials this past season, looking at phosphorus and nitrogen rates and placement (banded or broadcast). Because of the increasing number of fields with exposed mineral ridges, the trials were conducted on both muck and mineral soils. Usually these trials were conducted in the same field by planting on and off a mineral ridge. In all cases, the fields chosen had relatively low levels of phosphorus or nitrogen prior to the trial.

Lettuce and carrots did not show a yield response to phosphorus rates or application method. Phosphorus was applied to the lettuce at rates of 40, 80, 120 and 160 kg/ha, and to the carrots at 50, 100, 150 and 200 kg/ha. The yield at these rates did not differ from plots that did not receive phosphorus. These results suggest the residual amount of phosphorus in the soil was sufficient for plant growth.

The results from the nitrogen trials were more surprising. The yield of onions planted on a muck soil did not increase with increasing rates of nitrogen -- nitrogen rates of 0, 25, 50, 75 and 100 kg/ha were applied. On a mineral soil, however, the yield of onions was best at rates of 25 and 50 kg/ha. Nitrogen applied at 75 and 100 kg/ha resulted in the lowest yields.

Cloverdale Produce Farms Ltd., Hing Sing Farms, Sprangers Farms and Garvin Farms hosted the fertilizer trials. Detailed reports on the trials can be obtained by phoning the project manager.

These results are from trials conducted over one year. The work is still in a preliminary stage. However, growers applying high rates of phosphorus, particularly to fields with high residual levels, could probably safely reduce their application rates because of the good fertility of most Cloverdale soils.

LAW PACIFIC VEGETABLE OPENS UP THE FARM

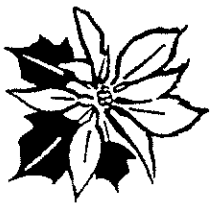
Early in the fall Rick Law, Law Pacific Vegetable Farm, hosted a Cloverdale Soil Conservation Group field day to over 50 producers, and research, extension and agribusiness personnel. Throughout the past season, Rick seeded different cover crops in large plots to assess their suitability for vegetable producers. Taking the group to the demonstration sites on tractor-pulled wagons, he explained the advantages and disadvantages of each crop. He seeded many popular cereals (oats, barley, winter wheat) and clovers, as well as less frequently used cover crops (buckwheat, Austrian winter peas, fava beans and pearl millet). Particularly impressive was the sorghum-sudangrass (red and white seeded). This crop was over 8 ft. tall and had a very fibrous root system. Sorghum-sudangrass should be seeded in June when the soil is warmer, and it will provide lots of organic matter and roots for soil building. Rick will comment on spring soil management next season.

A joint blueberry project between Law Pacific Vegetable Farm, the Cloverdale Soil Conservation Group, and Agriculture Canada (Agassiz Research Station) was shown to attenders by Dr. Stan Freyman. In the spring Stan seeded permanent cover crops (clovers, birdsfoot trefoil and sheep fescue) between blueberry rows and he will start to assess these next year.

Many attenders saw the impressive Erikson pumping station for the first time. Dave Melynchuk (B.C.M.A.F.F.) gave the group a brief history of the station (A.R.D.S.A. funded) and provided details on the capacity. Ron Bishop started the pump so the group could see it in operation.

WATER IN THE DITCHES DROPS

Free water on the fields during the winter months is not good for the soil (particularly the mineral soils) and reduces some of the positive effects of cover crops. The Cloverdale Soil Conservation Group has received good support from the District of Surrey's Engineering Department concerning the water levels in the ditches. At the Group's request the District agreed to keep the pumps affecting the Burrows and Logging ditches set at the spring and fall levels throughout the winter. The request was made because of concerns about flooding in the Group's overwinter trials and concerns about soil conservation. The water in the ditches dropped 1-2 ft. once the pumps were reset. This is a great benefit to farmers with fields affected by these pumps, and will improve plant survival in the trials. Contact the project manager with any comments or suggestions about the new settings.



PESTICIDE APPLICATOR'S CERTIFICATE NOW REQUIRED

An applicator's certificate from the Pesticide Control Branch will be necessary by **January 1, 1992**, for **purchasing or using** a restricted pesticide. Pesticides on the restricted list include:

Birlane	Dinoseb	Monitor
Counter	Dyfonate	Parathion
Dasanit	Furadan	Thimet
Dinitro	Goal	Guthion
	Di-Syston	BromoGas

Several key vegetable crop pesticides are on this list.

Growers have two options to prepare for the exam:

1. Home study -- a kit is available from the Ministry of Environment Pesticide Control Branch (584-8822). The kit is $15 and includes a video and study material.
2. Enrol in a course:
   - Fraser Valley College (584-8822) is offering a 3-session course on February 1, 8 and 15 from 9:00-4:00. Registration fee is $175 and includes the cost of the exam and study material.
   - John Maxwell (531-0885) will conduct a 2-day course at the Cloverdale Lettuce and Vegetable Co-operative but requests a minimum of 15 participants. Registration fee is $105 including the study material and the exam. Phone him to get your name on a list.

The exam costs $25 and is different from previous years. The Pesticide Control Branch recommends that farmers writing the exam on their own should purchase the home study kit so that they are familiar with the new format.

Wayne Odermatt, B.C.M.A.F.F.

STAR TABLES IN CLOVERDALE

Last spring the Cloverdale Soil Conservation Group installed a star table on Tim Singh's carrot harvester. The table was purchased from Weening Bros., Ontario (416-775-3839). (Weening Bros. will sell individual stars as well as tables.) The star table works well in wet muck and removes a lot of soil from the carrots. Tim has noted, however, that he frequently has to clean the stars when they are operating on wet mineral soil.

Cloverdale producers now have a local manufacturer of the tables -- North American Visser Equipment Co. (533-4050). The company has produced (and sold) its first star table for a local carrot harvester. The stars are smaller and softer than the ones on Tim's harvester, and will get a test this coming season.

DRAINPIPES OR LAND LEVELLING: WHICH IS BEST?

A common sight in Cloverdale after heavy rains are poorly drained fields with water collecting in low spots. The associated problems are well known -- delayed entry into fields, soil worked when it is too wet, harvesting delays, and crop losses. Another common sight are fields with shallow organic layers and exposed mineral ridges causing problems in crop management.

The Cloverdale Soil Conservation Group has tackled the challenge that farmers face when confronted with a field like the ones described above.

The Group located a field that needed better drainage -- a field belonging to Maddocks Farms on 176th St., south of the viaduct. The 10 acre field had three low spots that were slow to drain in the spring or after a heavy rainfall. The existing drainage system consisted of two or three wooden drains that did not work well, but the landowners had installed an excellent pumping system.

Project options.

The landowners and the Group had three options to evaluate:

1. installation of a drainage system specifically designed for the field,
2. laser land levelling, or
3. drainage system and land levelling.

Field assessment methods.

The field was assessed for land levelling and areas that would be cut or filled were marked -- 48 sites in total. The depth of the top organic layer and the field elevation was measured at every cut or fill site. The ability of the clay subsoil to conduct water was assessed at three sites.

Results of the field assessment.

1. The organic layer was shallow (about 6 in.) at most cut and fill sites.
2. Field elevation varied about 2 ft. over the entire field although visually it appeared greater.
3. The clay subsoil had many old roots channnels that provided good drainage.

Outcome.

1. It was decided not to level the field as the organic layer was very shallow and levelling would expose large areas of subsoil. This would destroy existing drainage through old root channels and could lower crop yield in the following years.
2. 'Big O' perforated drainpipe was ploughed into the field in late October. The clay subsoil is driest in late summer or early fall and the chance of 'smearing' is reduced (smeared clay will reduce water movement to the drain pipes). The water level in the drainage ditch was lowered in the days preceeding installation. The drainpipes were located at 30 ft. spacing, 3.6 ft. depth, and on a 0.1% slope.
3. Low spots may be filled in spring, if water still collects.
4. Field drainage ditches will be pumped throughout the winter months.
5. The field will be fall Paratilled and cover cropped for the duration of the project.

Watch this field through the winter. The drains are working well and the water level in the ditch is set below the outlets of the drainpipes. Keith and Reg will report later on spring soil management and how early they are able to work the soil without damaging its structure.

The drainage assessment and design was conducted by RBF Land Resource Consultants Ltd., and the drainage installation by Valley Farm Drainage Ltd. The project is conducted on a cost-sharing arrangement with the landowners.

REGISTER NOW FOR FEDERAL PAYMENTS

All growers should register under the federal government NISA Program (Net Income Stabilization Account) prior to December 31, 1991. It is likely that any payments made by the federal government to farmers under the 'Third Line of Defense' or FSAM II Program will be made through the NISA computer data base. If your farm is not registered you **will not** get any money. Application forms are available at the B.C. Vegetable Marketing Commission.

George Rush,
Cloverdale Lettuce and Vegetable Co-operative

We wish you a very merry Christmas and a good, prosperous New Year.

Mary-Margaret Gaye and Jean Hogue

Unless otherwise noted, the bulletin is written by Mary-Margaret Gaye. Production is by Jean Hogue. We welcome submissions and suggestions.

Cloverdale Soil Conservation Group

SOILNEWS

Canada-British Columbia Soil Conservation Program Vol.2 No.1 Mar. 1992

Cover Crops Live Through the Winter

The winter was very mild and most cover crops seeded with the Free Seed Program were not winter-killed -- particularly where the crop was seeded late. Some management points:

- Cover crops growing in water-saturated fields will probably die once the weather warms up and the plants start to grow. Except where cover crops were planted early, the yellowing of the cover crop is probably due to excess water in the field.
- Ploughing will kill the cover crop, providing the soil is turned right over and the plant buried.
- Cover crops can be sprayed with Round-up to ensure a complete kill. Roy Cranston (B.C.M.A.F.F.) advises Round-up be applied at 2.25 l/ha if plants are less than 15 cm, and 3.5 l/ha for plants over 15 cm.

The Free Seed Program will be offered again this year -- so plan ahead for seed orders.

许多燕麦和大麦，如果开春还生长，你就用 Round-up 药水去洗死这些麦，用 2.25 L/ha 洗。若这些麦高过 15 厘米，就用 3.5 L/ha 药水。

注：L（公升）ha（公顷）

WHAT'S INSIDE...

17720 - 57TH AVENUE
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V3S 4P9

TELEPHONE: (604) 576-2911
FAX: (604) 576-8717

Our Soil...Our Future

BC Canada

Seed Ditchbanks Now for Winter Care

Planting a grass cover will stabilize the ditchbank and reduce winter erosion. The root systems of most annual weeds growing on the banks, will not prevent the soil from slumping into the ditch. As well, annual weeds may harbour disease and insect pests, and produce weed seeds that are blown into the fields.

Grasses tested for erosion control at Jack Chan's (40th Ave. at 176th St.) have now gone through one winter. Areas of the bank covered in annual weeds have many sites of soil erosion into the ditch. The weakest spots are where the drainpipe laterals emerge into the ditch. The one erosion site in the test plots is in a location that has collapsed in past years.

Jack is very pleased with the results and has asked us to help him grass the remaining ditchbank. He will provide the labour and will pay for the seed, and we will supervise the work and order the seed. The bank will be seeded with the two mixes that performed well in the trial, 'Companion Mix' and our own 'Cloverdale Mix'.

Surrey保持垅土组有专人识得怎样整平垅土，不让粘垅走上垅面。整平垅土之前，你先打电话保持组，他们会有一个好计划给你。使用"Paratill"机器整松垅底会较排水。年尾时用最好。垅底干，泥土容易散。在沟渠边种上青草，这些草根会挡住垅土，杂草不会挡住垅，又有虫，对蔬菜生长不好。保持组在Jack chan沟渠边种上青草，挡住垅，很好。你要种这些草，请打电话：(576-2911)

Need help seeding?

NEW OFFER!

Now is the time to seed your ditchbanks so the grass is established before the summer. This spring, the Group will help grass Cloverdale ditches that collasped through winter erosion, and ditches that have been recently cleaned. A grass cover should establish quickly on ditches with few weeds on the banks. You provide the labour and the $$$, and we will get the seed and organize the work. Call us for ditch erosion control.

Aerial Photographs Used to Record Changes in Surrey's Farmland

在二月十号，Surrey保持垅土组，用飞机影有农田的相片，见农田排水差和遮住作物的生长情况。明年我们将会影更多的相片，看相片怎样改，什么时候排水，松土，种小麦或收成。你要买此相片，价钱：每一张四元。

注：遮住——这里指田上种的小麦。

Aerial photographs were taken of Surrey's farmland on February 10, shortly after a heavy rainfall. Photographs were taken within the area bounded north-south by #10 Highway and 32nd Ave., and east-west by 186th St. and the ocean. The cost of the flight was shared by the Cloverdale Soil Conservation Group and the District of Surrey, and the flight was organized by RBF Land Resource Consultants Ltd.

Surrey will use the photographs to locate areas requiring further drainage. The Conservation Group will use the photographs to document management changes in the area. Water present on poorly drained fields is easily identified in the photographs. Cover crops and, in some fields, mineral ridges are also evident. Similar photographs, but of a smaller area, were taken in 1988 by RBF Land Resource Consultants Ltd. The Conservation Group hopes to repeat the flight next winter to monitor and compare the impact of field management on drainage.

Reprints of the photographs can be ordered at a cost of about $4.00 each (scale is 1:10,000) -- individual farms are usually located within one photograph. Phone the project manager to place your order.

An open letter to the Surrey farming community concerning the new Surrey Farmers' Institute.

The Surrey Farmers' Institute is now being organized. A number of Cloverdale producers have applied for incorporation under the Farmers and Womens Institutes Act.

Why we need a Farmers' Institute

Everyone in farming knows how hard it has become to preserve our operations and our livelihoods.

Over the past months the Surrey vegetable farmers have worked as a group to direct government attention to our economic concerns. The letters that we all signed and our meetings with provincial officials helped us to gain a good share of the federal emergency funding and, we hope, will help to bring us a marketing program. We have seen how effective we can be acting together rather than as individuals.

Our farming community is under intense pressures resulting from the economic problems facing our industry, and from the encroaching urban development on our farmland. The Institute will give us a united voice and improve our ability to deal with the many concerns affecting the viability of our farming industry.

On March 9 the Surrey Farmers' Institute will represent our at interests at Surrey Municipal Council -- a delegation will make a presentation concerning regional drainage improvements and ditch maintenance. We hope to establish regular meetings with Council members to keep them informed about agricultural concerns.

Early in 1993 we will organize a pesticide course or study session for Institute members. The cost will be included in the Institute membership fee and members will pay only for the manual and the exam. If the membership agrees, a course could be held annually.

Becoming a member

Most of our members will be Surrey farmers but the Institute is open to interested individuals that are associated with the farming business. An individual, family or corporation (farm) can join with one membership and be entitled to one vote.

The fee for one's first year of membership is $100. Fees for the second and following years of membership will likely be lower. Memberships will be recorded for the fiscal year, January 1 to December 31, so join early.

The success of the Institute will depend on the membership and involvement of the whole community. Phone me (576-1449) for information and registration forms.

Surrey耕田协会.是现在组织的.这个协会是帮助农夫解决困难的.加果有了这个协会招牌.你写信比政府就显得很重要.政府知道农夫耕田困难.这封信就可以帮助你去政府处取超过资金.

我们是去Surrey政府问排水和沟渠管理好的.明年我们有药水教你用.

若你加入这个协会.第一年要用一個元.第二年会便宜些.会籍是从一月一号至到十二月三十一号.这重要的是去入会籍.和发展得成功.你要入这协会.请打电话Tim Singh.(576—1449).

Tim Singh, President
Surrey Farmers' Institute
March 5, 1992

The Conservation Group Goes to Council

A delegation from the Cloverdale Soil Conservation Group and the Surrey Farmers' Institute, appeared before the Surrey Municipal Council on March 9 with a presentation concerning drainage in the lowland areas of Cloverdale.

The Cloverdale Soil Conservation Group and the Surrey Farmers' Institute are concerned about the continued productivity of the valuable organic (muck) soils of the Nicomekl-Serpentine floodplain and with the increasing drainage problems resulting from the urbanization of the upland areas. The A.R.D.S.A. program that funded many of the much-needed pumping stations in the area has now ended and there is, as yet, no replacement.

The soil profile in the area is changing and good drainage systems -- both on-farm and municipal -- are critical to its continued productivity. Cooperation between producers and the municipality is essential to make drainage work. The two groups reinforced these concerns with members of the Council and hoped to establish a communication link between the Surrey Farmers' Institute and Municipal Council.

Surrey泥土保持组和耕田协会是向Surrey政府问及排水和农场管理好的。我们想经常见政府人员，让政府知道农夫耕田的困难。

Soil Conservation with an ALDA Loan

The Agricultural Land Development Assistance Program (ALDA) provides long-term, low-interest loans for capital expenditures that conserve soil. Loans are from $5,000 to $75,000, with repayment over 15 years at a fixed interest rate of one-half the bank prime.

What type of items qualify? (from ALDA Info Sheet No. 2.01)

- seeder for cover crop planting
- drainage systems for soil erosion control
- minimum/zero-till equipment
- wind breaks of hardy living vegetation
- grassed waterway construction
- channel stabilization

Other items may also qualify.

What do you have to do?

- have a 'Best Soil Management Plan' prepared
- qualify under provisions of the Agricultural Credit Act

What other projects qualify under ALDA?

- drainage
- manure storage

农夫能够去政府借款(即ALDA)来修整好泥土。此利息是银行利息的一半。这些款你可十五年后还。

Contact the B.C.M.A.F.F. (576-2911 or 852-5363) or Mary-Margaret Gaye for more information.

Law Pacific Vegetable Farm Cuts Back on Tillage

This spring Pacific Vegetable Farm will be testing the Agassiz Research Station's new MaxEmerge 2 planter -- a zero-till seed drill made by John Deere. Corn will be drilled, without tilling, into a heavy trash of barley. Yields will be compared with a tilled corn field.

Excess tillage pulverizes the soil and destroys its structure. Tillage is required for the seedbed preparation of most crops grown in Cloverdale, but can the number of passes with the rotovator be reduced? Something to think about while you are preparing your fields this season.

Rick Law是用原来下过小麦的田上再种上玉米。政府比有一部种玉米机器他们，如果用打泥机过多，对泥土会有影响的。因为泥土细粒就难以去排水，这个开春，请你不要用打泥机这么多。

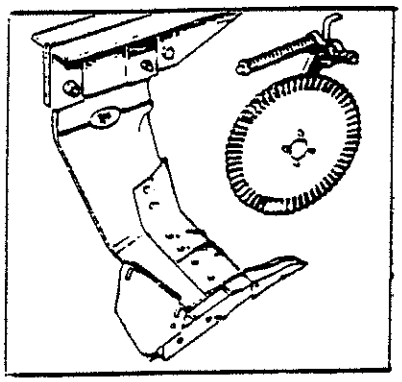
REPEAT OFFER!

The Paratill for Spring Soil Management

如果你用"Paratill"机器松动泥底，这样会放便排水。用这个机器，年尾用最好，因为泥底干，泥土易散。你想借用此机器请打电话：(576-2911)。

Subsoiling can improve field drainage. The 'Paratill' subsoiler is designed to minimize soil disturbance and reduce the amount of mineral subsoil brought to the surface. This is advantageous for many Cloverdale fields.

Subsoiling is most effective in the fall when the subsoil is driest. At this time the mineral subsoil will 'shatter', creating many drainage channels. If the subsoil is too wet, the action of the subsoiler will 'smear' the clay and close natural drainage channels. Late spring subsoiling can be beneficial if the subsoil is not saturated with water. The Paratill is available for spring use - phone Mary-Margaret or Jean to make arrangements.



Drainage is Key to Wet Soils Problem, U.B.C. Soil Scientist Says

It's hard to believe that soil structure can make the difference in surface runoff that the 25 attenders to the annual meeting of the Cloverdale Lettuce and Vegetable Co-operative were shown by visiting U.B.C. soil scientist, Dr. Jan de Vries. Jan attended the 27 February meeting at the request of the Cloverdale Soil Conservation Group.

Water, simulating a heavy rainfall, was poured on to a poorly structured soil and the water quickly ran off the sloped surface, carrying many soil particles with it. Without a slope, the water remained on the soil surface. Attenders could see through a plexiglass container how little water infiltrated the soil. Jan compared this with water movement in a well structured soil. In this case, attenders could see the water moving quickly through the soil and out the bottom of the container, carrying few soil particles. Jan stressed the need for good on-farm and regional drainage systems to remove the water from the fields, once it moved down through the soil.

Asked how a farmer could improve the soil structure, Jan pointed out the importance of roots and organic matter in gluing together the soil particles -- and of giving the soil a 'rest' to allow the glue to work. He noted the difficulty of achieving this in an intensive vegetable cropping system. Fall cover cropping would be helpful, he said. In response to questions concerning the mineral ridges and the shallow muck soils, Jan said manure applied to the ridges was beneficial and would help to increase the organic matter content and improve soil structure. He felt that land-levelling, and deep cultivation on shallow muck soils should be avoided as each would bring up the mineral subsoil.

Jan brought two books with aerial photos, and descriptions of soil material and characteristics, for all areas of the Fraser Valley. He did not have time to present these, but the Conservation Group has a set that farmers can use.

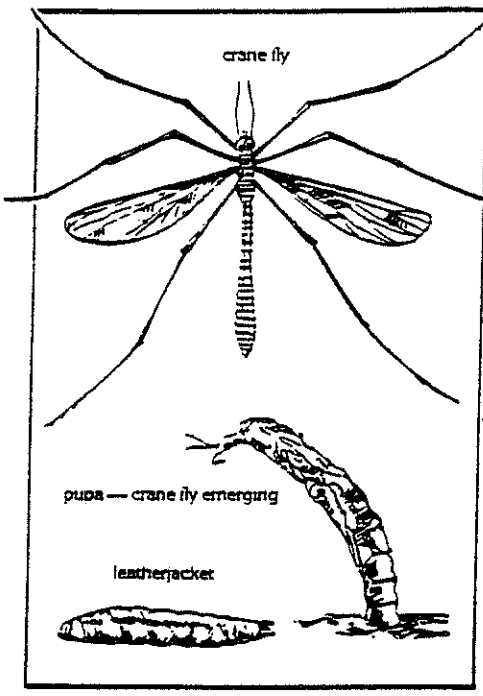
Dr. Jan de Vries 说：泥土的结构是很重要的。如果泥土的结构不良好，农田就难以排水。最重要的是树梁和政府须要排水管理好。

若种多些小麦和下些鸡屎会帮助泥土肥沃。耙田时请不要耙这么深，即不要让泥底上的 clay (粘土) 走上泥面。

Crane Flies Say No to Most Cover Crops

Crane flies deposit their eggs from mid-August to mid-October in fields covered with vegetation. By mid-February the developing larvae have started to feed on the roots of available plants. If not controlled, the larvae will later feed on the roots and leaves of many cash crops.

In late February the Group monitored fields planted to cover crops with the Free Seed Program, to determine crane fly larvae (leatherjackets) populations and to warn farmers of potential problems. Twenty random soil samples (sample size was 10.5 cm in diameter and 10 cm in depth) were taken from each 10 acre field. The soil samples were taken to the Ministry office and submersed in a saturated salt solution. Larvae in the soil floated to the surface within a few minutes. Leatherjackets were obtained from two of the 18 fields assessed, and the landowners were notified. Larvae populations in these two fields were 6 and 13 leatherjackets per m^2. Both fields were located close to pasture lands -- a favoured location for crane flies to deposit eggs.



In addition, cabbage root maggots were observed in samples from two fields, and wireworms from one.

Henry Gerber, B.C.M.A.F.F., has advised that fields with any leatherjackets present be sprayed with Parathion 7-10 days before ploughing, if susceptible crops such as lettuce, celery or corn are to be planted (see also the B.C.M.A.F.F. Vegetable Production Guide). It is important the insecticide contact the soil so it should be applied before the cover crop dies (i.e. before spraying with Round-up).

这"Crane flys"会损失许多蔬菜收获.它们生下的虫在草边。我们查过农田,那个按照我们的计划来种上青草的.十九块田有二块田有"Crane flys"幼虫。这农夫用"Parathion"药水喷杀幼虫。他们将种生菜和玉米。

Thanks for the interviews

Cloverdale vegetable producers were interviewed by the Conservation Group during January and February, to determine management practices and to gain an understanding of public awareness about conservation issues. We thank all the producers for the time they spent during the interviews, and Howe Wong for his translation. The information collected from the 37 interviews is being tabulated by Brad Stennes, Dobbin Farms Ltd.

多谢你比时间在我们农场访问.这报告是现在开始筹办的。

NEW OFFER!

Reduce Phosphorus Fertilizer at Our Expense

Over application of phosphorus (P) will cost you extra money and gradually build up in the soil. Yet, in our test plots, phosphorus did not increase the yield of lettuce or carrots. The Group wants to test these results on large field strips -- and we will take the risk!

How will the program work?

Participating farmers will plant a strip of land with low phosphorus application rates. The yield from this strip will be compared to an adjacent strip with phosphorus applied at the farm rate. **The Conservation Group will pay for any loss in profit in the low P strip.** Farmers can test low phosphorous rates at the Conservation Group's expense!!

Phone soon for more information. Offer is limited to a few farms.

加过多亚磷肥入泥土就浪费钱，许多田肥泥太高。其实是加肥过多。若你下多肥，也不会使生菜和红萝卜生长得好的。试不要用这么多肥。你可试种上两行菜，一行下多肥，另一行下少肥，如果下少肥的菜收成不比下多肥的菜高，我们比回失去的钱给你，你要讲多些情况给我们知，提供是给少数农场的。

What to Grow When Your Soil Needs a Rest

Soil that is intensively tilled during the cropping season -- such as can occur with vegetable production -- will benefit from a 'rest' period. Excess tillage breaks down the soil structure, leading to poor soil drainage and the accumulation of water on the soil surface.

The roots of cereals, grasses or legumes produce a glue that binds the soil particles together, improving the soil structure. Taking a field out of production for a full or partial season will give the glue time to work.

Farmers intensively cropping vegetables may have difficulty incorporating a rest period into their management systems, but ideally this should be part of a long-term crop rotation. Soil management that works to improve soil structure will pay the farmer back by improving soil drainage and thus crop productivity, and by extending the life of the field drainage system.

The Conservation Group conducted research trials last year to find crops that would produce the best yield for in-season cover cropping. Spring wheat, and a mixture of Alsike clover and Italian ryegrass were the highest yielding of crops cut on 24 July. Second best were barley and oats -- alone or in mixture with a legume such as clover or alfalfa. Italian ryegrass, in mixture or alone, was best for a full-season cover. Details of the trial are available at the office.

如果农田每个季节都耕作，这对泥土是有影响的。因此要比一个季节停止耕作，种上小麦、大麦、青草和三叶草这样泥土肥沃，再种上蔬菜就会有好的收成，排水也好。

Surrey泥土保持组试种过小麦和Italian ryegrasses，这两种草保持泥土最好。

Land-Levelling or Drainage: You Decide

NEW OFFER!

Mineral subsoils are often exposed when Cloverdale fields with shallow organic (black) layers, are levelled. Crop productivity in the mineral areas is generally poor for the first few years after levelling. Also, the mineral subsoils must be managed very carefully as they tend to form large hard clods if worked too wet.

Now -- Cloverdale vegetable producers do not have to be caught by surprise after the field has been levelled.

Call us first. The Group will measure the depth of the top organic (black) soil throughout a field you are considering levelling. The amount of organic soil can be compared to the proposed 'cut and fill' levelling plan, to predict the areas of organic soil that will be buried and of mineral subsoil that will be exposed.

Then you decide, after you know how much mineral subsoil will be exposed. A good drainage system may be the best answer for improved field drainage. It will take the water away from the field without bring up the subsoil.

The first assessment. Last fall the Group assessed a 10 acre field of Maddocks Farms (on 176th St., south of the viaduct). Levelling would have exposed large areas of mineral subsoil and destroyed the natural drainage channels made by old roots. Keith and Reg decided to installed a well-designed drainage system and not to land-level.

Once installed, the Maddocks subsoiled (with a 'Paratill') the field across the drainpipes, and cleaned the drainage ditch so outlets were about 1 foot above the bottom of the ditch. The ditch was pumped all winter to keep the drains flowing.

The field has obvious low spots but, with one exception, the new drainage system kept the field free of surface water all winter.

The Group's New Purchase -- a Rotary Mower

A John Deere rotary mower was purchased to cut spring and summer cover crops on demonstration plots. It will also be used co-operatively by Cloverdale vegetable producers.

Specifications:

260

Number of disks	6
Width of cut	7 ft. 10 in. (2.39 m)
PTO hp required	45 hp (59.2 kW)
PTO speed	540 rpm
Disk speed	3030 rpm
Transport width plus tractor	10 in. (25.4 cm)
Cutting speed (12.9 k/hr)	Up to 8 mph
Lift system	Hydraulic
Weight	948 lb. (430 kg)
Hardware	Metric

Surrey保持垸土组，买了一个割草机去害小麦苗农夫要借用，请打电话办公室。(576—2911)

整平垸土时，粘土会上来垸面的。粘土会影响蔬菜生长。因此你整平垸土至前，先打电话保持组，保持组有专人识得怎样整平垸土的。他们会比一个好计划你，使蔬菜不受粘土影响。电话：(576—2911)

Corriflex used for drainage project

In the last edition of the newsletter, we identified the wrong drainpipe used in the drainage project at Maddocks Farms. Valley Farm Drainage Ltd. installed Corriflex. Our apologies to Flex-Lox Pipe Ltd.

Unless otherwise noted, the bulletin is written by Mary-Margaret Gaye. Production is by Jean Hogue. Translation by Susanne Law and Donna Mah.

We welcome submissions, suggestions and comments.

Cloverdale Soil Conservation Group

SOILNEWS

Canada-British Columbia Soil Conservation Program Vol.2 No.2 July 1992

17720 - 57TH AVENUE
SURREY,
BRITISH COLUMBIA
V3S 4P9

TELEPHONE: (604) 576-5616
FAX: (604) 576-5652

Our Soil...Our Future

BC Canada

Free Seed Program Offered Again -- Order Now

Last years' free seed program for fall cover cropping was a great success. Twenty-one farms participated planting a total of 194 acres in barley or oats. Some farmers bought additional seed and planted more acreage.

The Conservation Group is now offering the program for the second (and last!) year. Each vegetable farm producing on Cloverdale's muck soils can apply for barley or oat seed to plant up to 10 acres in a fall cover crop. This is a good opportunity to experiment with cover cropping and to see how it can benefit the soil. In return, the Conservation Group will gather information from the participating farm on spring and fall cover crop management.

Order now by phoning 576-5616. There may be fall shortages and the Conservation Group wants to place the order as soon as possible to make sure there is sufficient seed. (Last year there was some difficulty finding seed for the late orders.)

Bonus for Surrey Farmers' Institute Members

The Surrey Farmers' Institute has informed us that members can buy cover crop seed at low, bulk purchase rates. Phone Rick Law 574-3632 for more information.

我們又將提供免費種子服務了。在 Cloverdale 黑土(漠土)上耕種的菜農，可得到大麥或燕麥種子作秋季覆蓋作物可超過 10 英亩。農民們可試種覆蓋作物看看它如何有利土壤。作為回報，我們將詢問你春季和秋季覆蓋作物管理情況。請立即電話聯係：576－5616。

WHAT'S INSIDE

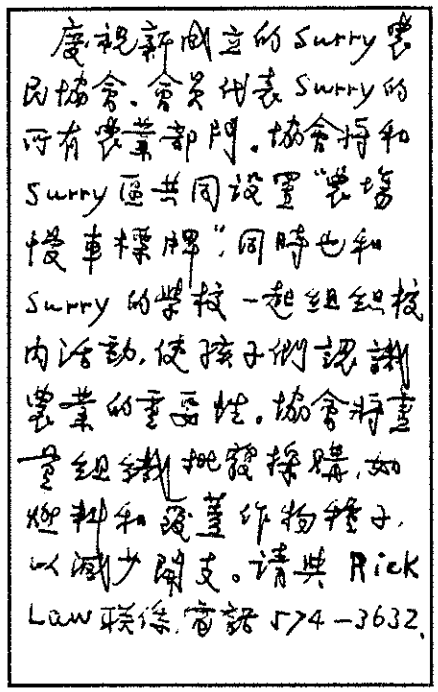
Congratulations to the Surrey Farmers' Institute

Congratulations to the newly formed Surrey Farmers' Institute. The Institute seems off to a good start--membership is climbing and now represents most of Surrey's diverse commodity groups.

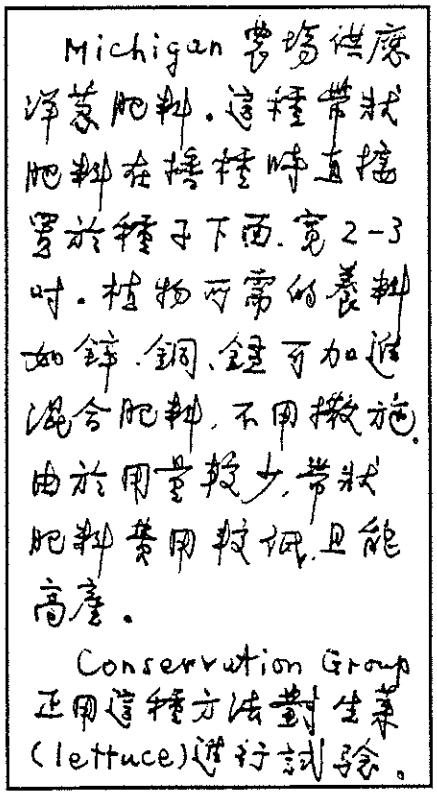
'Slow moving vehicle' signs are appearing at various locations around Surrey thanks to the work of Institute member Mike Bose. The Institute requested signs specifying 'Slow moving farm vehicles' but those may be a little slower in coming because they are not standard stock. An education committee was recently established to work with Surrey schools because, according to Institute member Mike Pohlmann, "it is necessary to increase the awareness of farmers". Institute President Tim Singh is hopeful this will lead to the purchase of locally produced agricultural products thus helping to ensure the economic viability of farming. The Institute is also looking at reducing farmers' input costs through bulk purchases. An area of special interest to the Cloverdale Soil Conservation Group is the bulk purchase of seed for fall cover cropping.

For more information on the Institute phone President Tim Singh (576-1449) or write to:

Surrey Farmers' Institute
5790 - 175th Street
Box 34034
Surrey, B.C.
V4P 8C4



Onion Growers Stay Competitive in Michigan



Onion growers in Michigan have changed their fertilizer program in response to studies conducted by the Michigan State University. Most producers now band the starter fertilizer 2-3 inches directly under the seed--a change from a totally broadcast starter fertilizer program. Michigan extension worker, Tom Dudek, claims this method "stimulates early growth and insures top yields".

Dudek says that growers will broadcast the potash if the need is great (over 200 lb K_2O/acre), otherwise it is banded with the nitrogen and phosphorus. When required, micronutrients are put in the banded starter (i.e. zinc, copper, manganese). Manganese is also foliar applied. Both granular and liquid fertilizers are banded.

Michigan State University soil scientist, Darryl Warncke, is also studying fertilizer banding for carrots and lettuce.

This year, the Cloverdale Soil Conservation Group will again study the placement and rate of phosphorus for lettuce. Last year lettuce yields were not improved with added phosphorus using either the banded or the broadcast method. The trial this year will be conducted in a field with very low phosphorus levels (the soil test says 5 lb/acre!) and the lettuce should show a yield response.

Plan Ahead for Fall Cover Cropping -- Research Results

A good cover crop provides winter soil protection, takes up unused nutrients from the soil, and improves the soil structure. To do this, the crop must grow quickly after fall seeding. However, the cover crop must be easily handled in the spring if it is to become part of a farm soil management program.

Last season the Conservation Group conducted two trials at Premier Produce Farm to assess fall seeded cover crops--one compared the yield of 13 different crops, and the other assessed yield and nitrogen uptake of five crops seeded at different dates. Roy Cranston and David Ralph (B.C.M.A.F.F.) worked with the Conservation Group to assess spring cover crop control with a herbicide (see article below). The results may help farmers to choose the fall cover crop that best suits their needs. Full reports are available by phoning 576-5616 (Report No. 1-2 and 1-3).

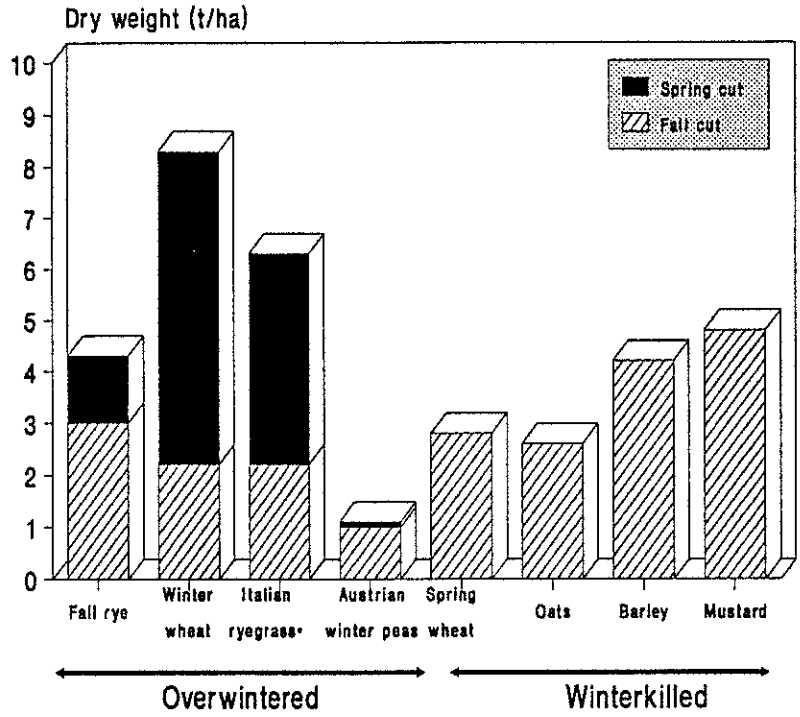


Figure 1. Yield of fall seeded cover crops.

Comparison of different cover crops. The cover crops were seeded on 3 September 1991 and the yield assessed at the end of October 1991 and the end of March 1992.

Figure 1 shows that the largest yield (dry matter) at the fall assessment was obtained from barley and mustard, followed by fall rye. The remaining cereals and grasses all ranked third. Austrian winter peas produced the lowest yield.

The crops were assessed after growth had resumed in the spring. The largest yield was obtained from winter wheat, followed by Westerwolds Italian ryegrass. All other cover crops, including the barley and oats, died overwinter.

See **Results**, page 4.

覆盖作物在冬季保护土壤，免聚结土壤，利于排水，同时，覆盖作物利用上季作物收获后留下的肥料，避免流失河中。

我们试验过多种覆盖作物，以便找出最好的秋播品种。大麦由于产量最高（参看图1），能形成好的秋季保护层。在我们的试验中，大麦在冬季死亡，春季的田间管理容易。因此，秋季尽可能早地种植覆盖作物，以增加秋季生长量，是很重要的。

Results - from page 3

Comparison of cover crops seeded at different dates. Barley, oats, oil seed radish, winter wheat and faba beans were seeded on 23 August, 13 September and 4 October (1991). The yield, assessed on 29 October, was the same from all cereals seeded on the first seeding date. However, barley produced the best yield of all cover crops seeded later. The cooler temperatures of September delayed germination and slowed down the growth of the winter wheat and oat cereal crops (see Fig. 2).

The trial also showed that only the cover crops seeded early (23 August) took up significant amounts of nitrogen from the soil.

The trials will be repeated this fall at a different location.

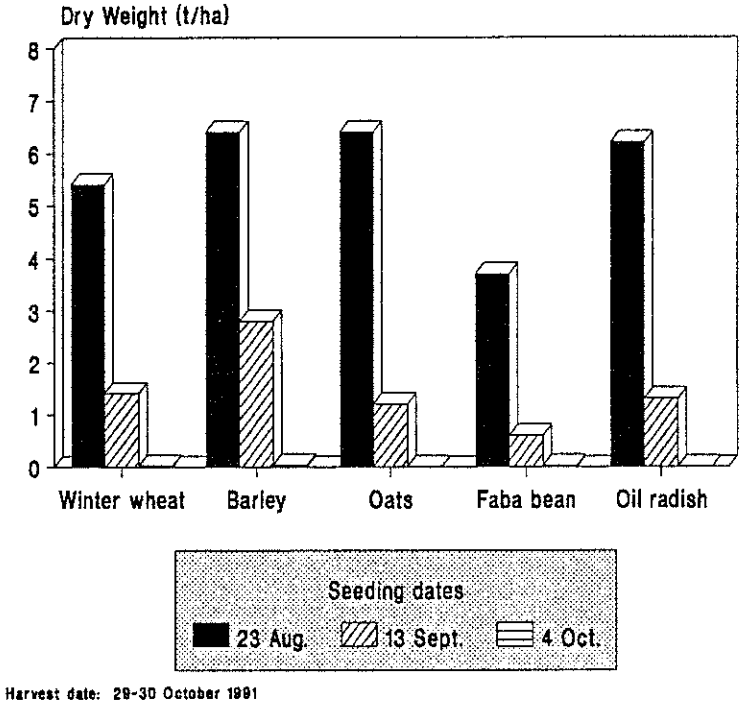


Figure 2. Yield of cover crops seeded at three different dates.

Cloverdale Farmers Give Fields a Rest

有些農民决定不種作物而讓土壤休閑，這樣能改良土壤，提高產量。有些農民將種植綠蓋作物，有大麥、燕麥、三葉草和蘇丹草。

A number of Cloverdale farmers decided to "give a field a rest" and planted a few acres to an in-season cover crop. The fields, in some cases, needed soil building and a rest from the intensive tillage that comes with vegetable production. Long-term soil management plans should include a good cover crop in the crop rotation.

These are a few fields to watch: Ray Wong planted a 4-acre potato field on 184th Street to sorghum-sudangrass and oats (separate areas). The sorghum-sudangrass produces a large amount of plant biomass (it grows like corn but is planted at a higher density), has a large root system, and is said to reduce the incidence of Verticillium wilt in following potato crops. Cereals are traditional soil builders. Tim Singh planted a 11-acre field on 164th Street to barley underseeded with Ladino clover. Clovers have a long tap root and are also 'nitrogen fixers'. Similar to last year, Rick and Dennis Law have planted large plots of different cover crops. The list to date includes oats; Austrian winter peas; mixed peas and oats; oats mixed with WL 225 and Webfoot alfalfas, and with Pacific red and Ladino clovers; Westerwolds Italian ryegrass mixed with Pacific red clover, and three types of sorgum-sudangrass. Keith and Reg Maddocks seeded a field on 176th Street to an early season cover crop of wheat. The crop averaged about one foot in height when they applied a herbicide and planted the field to the cash crop.

Cloverdale Producers 'Farm Messy'

Farmers in Tennessee who have changed to no-till crop production wear hats with the slogan 'I farm messy'. Some of the Cloverdale fields planted to a fall cover crop supplied by the Conservation Group show what the Tennessee farmers are referring to. The fields look messy with cereal crop residue ('trash') on the soil surface. Messy fields mean reduced tillage and they are the new look for farmers practicing good soil conservation techniques. (Excess tillage can destroy the soil structure and lead to poor field drainage.) Many Cloverdale farmers are managing cover crop trash for the first time.

Farmers have reported on some trash interference at planting but the Conservation Group is awaiting word on the growth and yield of crops planted into trash. One farmer did not have any trouble planting potato seed in a field with plenty of trash and he does not anticipate any yield reduction. The roots of the cover crop clogged machinery during transplanting for a few farmers--particularly in fields that were planted early and soil conditions were such that the cover crop was disced just before transplanting.

Direct seeding into a field with cover crop trash may require special crop management. Lettuce was easily seeded using a 'Stan Hay' into a field with heavy trash but the farmer irrigated more than usual to ensure the seedlings did not dry out. This could happen if the seed germinates next to a buried piece of trash.

Reports from Holland indicate that fields with spring ploughed cover crops are usually irrigated more than those without. Some farmers in Holland turn their cover crop under in the fall to ease spring field preparation and reduce irrigation requirements. The added organic matter and root mass (the roots are a great help in binding soil particles together) benefit the soil but there is no winter soil protection against erosion and the impact of rain drops (these can actually break apart the soil particles). Even dead plant residue--cover crop or cash crop--will give the soil some winter protection. Fall ploughing or herbicide-killing the cover crop may be a useful compromise for Cloverdale farmers wanting an early entry into a field that is slow to become 'workable'.

Cloverdale的一些土地，即使在耕翻後仍有許多枯死的覆蓋作物（殘枝落葉）在表土，這樣很好，因爲它表示土地沒有過度耕翻。過度耕翻使土壤細碎，不易透水。多數農民認爲殘枝落葉對種植無妨碍，但也有農民認爲，這種情況下，要增加灌水次數才能使種子發芽。

"Seed cover crops before harvesting", says Delta Farmer

一位Delta的農民把覆蓋作物撒播在兩三天後即將收穫的馬鈴薯地里，收穫時，種子已被土覆蓋。

For the last 2 years, Delta vegetable producer, Hugh Reynolds, has seeded his fall cereal cover crop before harvesting the potato crop. Reynolds says, "We are very busy during the potato harvest and by seeding into the standing crop we are sure to get the cover crop planted." The farmer saves time by broadcasting barley, wheat or rye seed (whichever is available and cheapest) at 100-125 lb./acre, two to three days before he plans to harvest--broadcasting is completed very quickly using a fertilizer spreader. The seed often germinates on the soil surface but it is covered with soil during the potato harvest.

If Reynolds has time, he will subsoil the field after harvesting. He says this works best on short vines like Norchips--longer vines like Russet Burbanks may drag with the subsoiler.

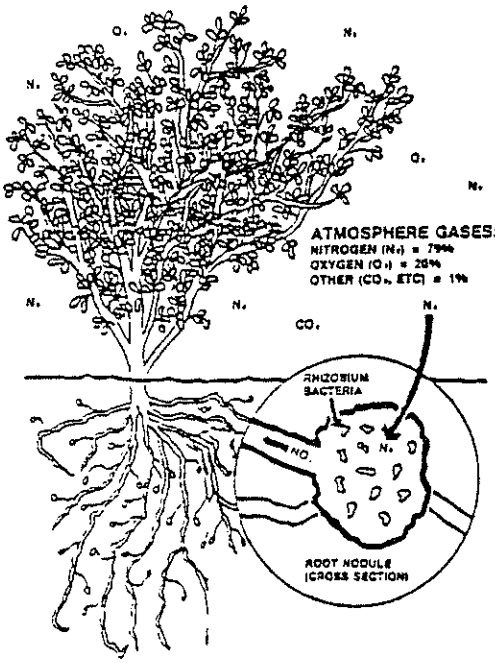
Legumes: Producers of Nitrogen

The Conservation Group assessed different legumes (alfalfa, clover, peas, fava beans) because of their ability to build and protect the soil. Their roots strengthen the soil by binding soil particles together into aggregates. The long, tap roots also open channels in the clay subsoil for drainage and aeration. Legumes also have the unique capability of producing--or 'fixing'--nitrogen from the atmosphere.

How do legumes 'fix nitrogen'? Legumes have a special relationship with *Rhizobium* bacteria. The *Rhizobium* enter the root hairs of the legume plant and live in gall-like nodules on the roots. As the plant grows, the bacteria convert nitrogen from the atmosphere, that is not available to the plant (N_2), into nitrogen compounds that can be used by the plant (NH_3). This nitrogen is stored in the nodules on the root and becomes available when the plant dies or is ploughed under and decomposes--a benefit to succeeding crops. Some transfer of nitrogen can occur from the roots of legume plants to a companion crop. For example, wheat planted with an understory of clover.

Where are the Rhizobium? *Rhizobium* bacteria are present in the soil **but** each legume or group of legumes requires a unique species of *Rhizobium*. For example, *Rhizobium* that live on clover many not live on peas. The presence of nodules does not guarantee nitrogen fixation has taken place. The *Rhizobium* must have a high nitrogen-fixing capacity for effective nodulation. Nodules with pink-to-red centres contain rhizobia that are fixing nitrogen. This is easily checked by splitting open a nodule.

Inoculation for good returns. Legume seed should be inoculated with the correct *Rhizobium* species to ensure effective nitrogen fixation and to improve plant yields. This is particularly true the first time a field is planted to a new legume species.



The inoculant is commonly sold in a powdered peat-base form (black colour). It should be applied to the seed with a sticker solution to ensure the rhizobia are close to the newly emerging roots. Stickers are easily applied at the farm using a 10% solution of honey, sugar or corn syrup in water. A powdered milk solution is also a very effective sticking agent (see Table 1).

See **Legumes**, page 7.

豆類是一種如同三葉草、蔬豆和蠶豆那樣的植物，它們的根能改良土壤。根在土中形成孔道，使水從地里排出。豆類從空氣中攝取氮，(N, 13 - 16 - 10 = N-P-K) 并將它轉變成植物能利用的形式。它們是怎樣轉變的呢？豆類根部的莖上生長着特殊的細菌（似小球）。這些細菌供氮給植物。植物死亡後，氮便進入土壤，被其他植物利用。使用種豆類能減少氮肥施用量。

農民種豆類時，應選擇與之共生的細菌類型，作種子處理。這樣，豆類會長得更好。細菌可在種子商店買到。

Legumes - from page 6.

The following is from the Saskatchewan Government publication, *Soil Improvement with Legumes*: To inoculate legume seeds they should be placed in a large container and sufficient sticker applied to slightly wet all seeds. Then half of the required amount of inoculant powder should be sprinkled on the seeds while mixing until the seeds are uniformly black. To eliminate the need for spreading and drying the inoculated seed and to avoid clogging the seeder, the other half of the required amount of inoculant powder is then added to the partially inoculated seed and mixed thoroughly in the container. The fully inoculated seed can then be planted with normal seeding equipment. This type of seed inoculant may be done one to two days before the actual seeding date but only if the inoculated seeds can be stored in a cool place.

Table 1. Effect of sticking agents on nodule production and whole plant yield in soybeans.

Type of legume	Nodules/plant	Plant yield (mg)
uninoculated control	0	350
water	39	779
sugar solution	83	751
honey solution	94	864
Nitracoat (commercial)	109	911
powdered milk solution	96	1081
Sig. difference (0.05)	29	200

Source: Saskatchewan Agriculture, Legume Inoculation

Hydroseeding Beats Hand Raking for Erosion Control

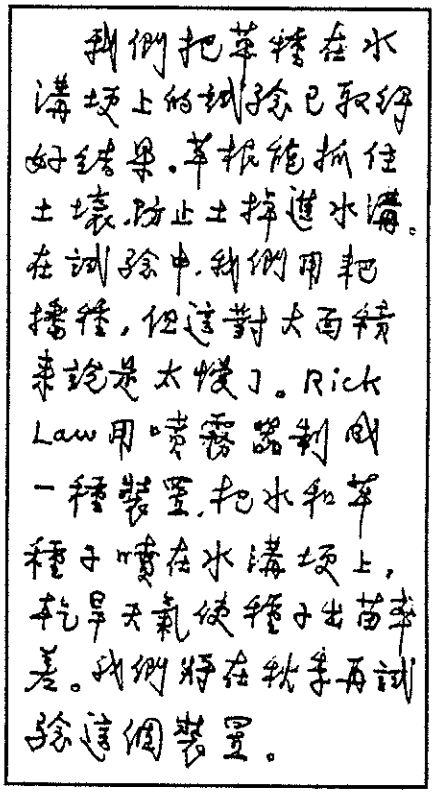
The Conservation Group had good results from the ditch bank erosion control trials seeded last spring--and favourable comments from the growers who hosted the trials. To expand this area of our program we needed a method of seeding suited to large areas. (We hand seed and rake the trial sites.)

Hydroseeding is used commercially to seed large areas. Grass seed is sprayed on the bank with a fibrous mulch to protect the seed, and a 'glue' or tacifier is added to ensure the seed remains on the bank. Commercial hydroseeding can be expensive and the equipment is often too large for farm use.

Pacific Vegetable Farm (Rick and Dennis Law) are working with the Conservation Group to develop a hydroseeder from farm equipment for use on farm ditch banks. Rick has modified a 250 gallon spray tank with mechanical agitation. The seeding solution is pumped out using a 3.5 hp self-priming trash pump with a 2" outlet and a 2" discharge through a 2" hose. Nozzle size is dependant on the seed size but it must be large enough to prevent clogging. The formula used for seeding is based on the agitation capability of the spray tank. A couple of trial sites were established at Pacific Vegetable Farm but the dry spring had a serious effect on seed germination.

Thanks to C.P.I. equipment for the use of the trash pump, and Can-For Fibre and Products for donating the Eco-Fibre.

Jean Hogue



Glyphosate (Roundup, Wrangler, Laredo) For Cover Crop Killdown

A trial was established on March 10, 1992 at Cloverdale Produce Farms, to chemically kill overwintering spring seeded cover crops has shown a marked difference in susceptibility to glyphosate herbicide (Roundup, Wrangler and Laredo).

Product labels recommend an application rate of 2.25 l/ha (0.9 l/acre) if target plants are less than 15 cm in height. If over 15 cm, the label recommends using 3.5 l/ha (1.4 l/acre).

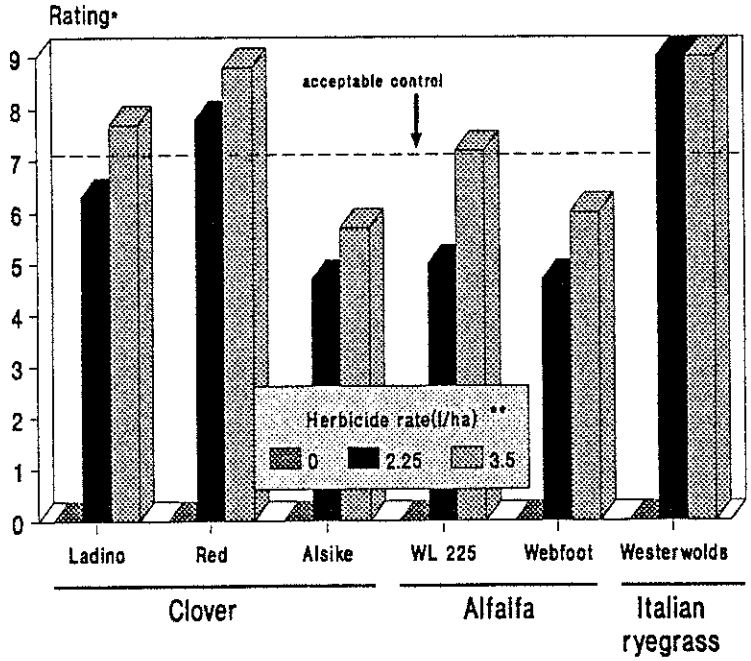
In tests using these rates, Alsike clover exhibited the greatest tolerance to the herbicide and was not controlled at even the highest rate when checked 32 days after spraying. Control of red clover was acceptable at both rates used. Ladino clover was best controlled at only the 3.5 l/ha rate. All covers were under 15 cm high when sprayed.

Alfalfa cultivars, also under 15 cm at application, proved very difficult to control. The highest rate provided only marginally acceptable control of cultivar WL 225. Webfoot alfalfa was not controlled with either rate tested.

Westerwolds Italian ryegrass was completely killed with the lowest herbicide rate even though the crop was over 60 cm in height when treated.

Roy Cranston

我們在不同的覆蓋作物上測試除草劑 Round-up，每公頃 2.25 和 3.5 升兩種濃度，低濃度能將意大利黑麥草和紅三葉草殺死，高濃度才能殺死 Ladino 三葉草，而 Alsike 三葉草不被 Round-up 殺死。



* 0 = no control, 9 = full control
** Roundup, Laredo, or Wrangler

Figure 3. Effect of glyphosate on cover crops.

A New Face for the Conservation Group

Steve Breker joined the Conservation Group's 'team' of employees in May. Steve is a student at Simon Fraser University and will be with us until September. He is co-ordinating the phosphorus program as well as helping on our other projects. Steve can be reached at his office--576-5628.

Steve Breker是 Conservation Group的新夏季工作人员。

Spring Ideal for 'Paratill' Users

The Conservation Group's Paratill has been in almost constant use this spring. The dry weather conditions have been good for spring Paratill use as the clay subsoil should be relatively dry. This is necessary to get the 'shattering' effect that improves field drainage. To date this spring the Paratill has been used 16 times to subsoil a total of about 250 acres.

乾旱春季有利 Paratill 機的使用。深翻能破碎底層的乾粘土，改善排水。今年春季許多農民使用了 Paratill 機。

Program to Green Cloverdale Keeps Fields Green to Early Spring

Woops! We promised the oats and barley cover crops would die over the winter, making spring field management easy. Not so. Cover crops in fields remaining free of flood water survived the unusually mild winter and farmers faced a new spring management problem--preparing fields with a live, standing cover crop, for planting.

This is how you managed.

Most farmers did not have any trouble preparing the fields for planting. Problematic fields were those planted early and not ploughed because of excess soil moisture, and those with heavy cover crop growth resulting from late field preparation.

About half the fields were sprayed with either Round-up or Gramoxone before the soil was worked, and about two-thirds of the fields were ploughed before discing. Without ploughing, two or three discings were usually needed to work in the cover crop. A few farmers noted field preparation was easiest when they could leave about a week between successive discings thus giving the cover crop a chance to dry out. Only two farmers mentioned a minor regrowth of oats in the following cash crop--neither farm had sprayed with a herbicide but in each case, the oats were easily weeded out. All farms (with the exception of one that will not be in production next year) plan on planting cover crops again this fall.

'Covercrops for California Agriculture'--a University of California publication--warns against ploughing under a heavy cover crop as it can form a layer that is slow to decay. The authors suggest using a 'covercrop disk' to chop the organic matter and incorporate it with the soil for faster decaying. Geoff Hughes-Games (B.C.M.A.F.F.) says the cover crop disc is a heavy tandem disc with serrated front and smooth rear discs, and is commonly used in California.

暖冬没有杀死我们种植的覆盖作物。多数农民在准备春播时，并未遇到麻烦。最大的麻烦是早播的土地乾得太慢。约有半数农民喷涂草剂杀死覆盖作物，大多数农民在耙地前犁地。加州农民使用双耙重圆盘耙。有耙有铡盘。没耙平滑。

Program to Lower Phosphorus Rates Underway

A new program was initiated this spring by the Conservation Group. We are working with several farmers to lower the levels of residual phosphorus (P)(eg. 13-16-10=13%N-16%P-10%K) in the soil. Farmers can reduce the amount of money spent on fertilizer and minimize the environmental impact of excess phosphorus by applying phosphorus at the B.C.M.A.F.F. recommended application rate.

The program was started in response to the increasing levels of phosphorus in the soil. Darryl Warncke, a soil scientist at Michigan State University, has also observed the build up of phosphorus in Michigan's muck soils. P levels in those soils have increased by 100 pounds per acre in the last twenty five years. As a result of this trend, M.S.U. is now studying the effect of reduced P rates on crop yield. The Ontario Ministry of Agriculture and Food, and the Conservation Group are conducting similar studies.

In our program, soil samples were taken from the participating farmers' field. A large plot within each field was fertilized at the B.C.M.A.F.F. recommended P rate indicated by the soil test. Some farmers elected to apply very little to no P at all because of high levels of residual phosphorus. The difference in yield between the Conservation Group rate and the farm rate will be compared at an early growth stage and at harvest time.

We were pleased to find that some farmers had already lowered their P application rates and were well within the B.C.M.A.F.F. recommendations. There was no need to run the trial on those fields!

Steve Breker

本區一些土地富含磷(13－16－10＝N－P－K)，经少施到不施磷肥，既省资金，又利环境。我们正對含磷高的土地进行低含磷率試驗。

Unless otherwise noted, the bulletin is written by Mary-Margaret Gaye. Production is by Jean Hogue and translation by Wei Yang Yang (Agassiz, B.C.).

We welcome submissions and comments.

Working Together

DISTRICT OF SURREY
Engineering Department

14245 - 56th Avenue, Surrey
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Telephone
(604) 591-4340

R.W. KYLE, B.Sc., P.Eng., Municipal Engineer

Fax
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June 23, 1992

File: 5334-200

REPLY TO: Traffic & Transportation Division
ATTENTION: Robert Costanzo

Mr. Michael Bose
Surrey Farmer's Institute
5590 - 175 Street
Box 34034
Surrey, B.C.
V3S 8C4

Dear Mr. Bose:

Re: **Safety of Farm Vehicles on Surrey Streets**

Further to your letter of May 20, 1992, regarding the above, we provide you with the following information.

We agree that signs should be provided to warn motorists of the presence of farm vehicles on the requested roadways in Surrey. We will sign these roads with our own "Respect Slow Moving Farm Vehicles" sign. This sign will be diamond shaped and conforms closely to the Manual of Uniform Traffic Control Devices (M.U.T.C.D.) signing standard for warning signs. Please refer to attached sheet for sign layout and dimensions.

We shall proceed to install these signs on Surrey roadways at the requested locations. Signs will be installed on Provincial highways (Highway 15 and Highway 10) upon approval of our request to the Ministry of Transportation & Highways.

Thank you for bringing your traffic concerns to our attention.

Yours truly,

Mike Mah, P.Eng.
Traffic Operations Engineer

RAC/dr
eg2doc3065

Attach.

SIGN DIMENSION: 90cm x 90cm (36" x 36")

BLACK CHARACTERS ON YELLOW BACKGROUND

Late submission by the Surrey Farmers' Institute

Cloverdale Soil Conservation Group

SOILNEWS

Canada-British Columbia Soil Conservation Program Vol.2 No.3 Dec. 1992

17720 - 57TH AVENUE
SURREY,
BRITISH COLUMBIA
V3S 4P9

TELEPHONE: (604) 576-5616
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Our Soil...Our Future

BC Canada

Surrey vegetable farmers are top conservationists

Last year many farmers planted a test acreage in a cover crop through the Conservation Group's Free Seed Program. A drive through Cloverdale's farming area this year shows how quickly the sound conservation practice was adapted. Almost every vegetable farm seeded a cover crop. Our program supplied about 40 farms with enough seed for 125 ha--this is an increase from 23 farms last year. Many farms seeded additional acreage through the Surrey Farmers' Institute--some farmers seeded over 60% of their total farm acreage.

The cover crops, including the late seeded crops, grew well during the extended fall. Some of the barley and oats seeded in early September are now showing signs of yellowing--a cold winter should kill even the later seeded cover crops.

A number of farmers tested new management techniques. To save time, Ray Wong broadcast seeded barley (using a fertilizer spreader) into his potato crop immediately before harvesting. He lightly disced the seeded field using a 16" disc, three or four days after harvesting. Next year Ray will cross-disc the field rather than discing with the harvesting tracks, to improve the cover crop stand.

Tim Singh and Gilbert Wong mowed cover cropped fields (using the Group's mower) in the fall when the grain was about 30 cm in height. This practice may improve the spring management of fields with extra cover crop growth. Amrik Sihota used the mower last spring to cut the cover crop before ploughing.

Fields planted to fall cover crops were also subsoiled using the Paratill. Farmers found the practice works well as long as the grain is not bent over and is no more than about 30 cm in height.

WHAT'S INSIDE...

'Phosphorus Challenge' cuts fertilizer use

This spring the Conservation Group offered vegetable farmers a unique opportunity to reduce phosphorus fertilizer without risking profit losses. The Conservation Group agreed to pay farmers for any losses occurring from reduced phosphorus application.

The program was designed because phosphorus in many Cloverdale fields is built up to such a level that additional phosphorus may not affect crop yields. Adding phosphorus in this situation unnecessarily increases input costs and may increase the environmental risk of excess phosphorus entering the river systems.

Participation in the first year of the program was limited to five farms. Soil from six fields was tested and in three fields, farmers were applying appropriate rates of phosphorus. Three farms remained in the Phosphorus Challenge.

Participating farms applied fertilizer to a large test area at the same rate as the farm rate with the exception of phosphorus. Farmers choose either to apply phosphorus at the B.C.M.A.F.F. rate according to a soil test, or to apply a lower rate. At all sites--two carrot fields and one potato field--yield did not differ between the test site and the adjacent crop fertilized at the farm rate. Added phosphorus did not affect crop yield measured at an early developmental stage or at final harvest. (Telephone 576-5616 for a full report--No. 2-1.) Similar results were observed in the Group's research trials assessing phosphorus rates on carrot yield (Report No. 2-2).

Soil tests, particularly if followed over the years, are a good indicator of the amount of phosphorus available in the soil. The B.C.M.A.F.F. recommended rates of phosphorus application are based on a soil test and the crop needs. Use the recommended rates, and your knowledge of previous fertilizer use and the field's cropping history, to determine the appropriate rate of phosphorus application.

New ditch bank coverings tested at Cloverdale Produce Farm

The Conservation Group continues to expand its work with ditch bank erosion control. Tim Singh's newly dug ditch located north of the barn at 4623-168th St. is now a test site for ditch bank maintenance strategies.

The ditch is typical for the area. It was dug in early fall using the Surrey Dyking District's V-shaped bucket which creates a ditch with very steep sides (1:1.5 slope). Drainpipes were ploughed into the adjacent field every 40 feet. The areas of disturbed soil above the drainpipes are usually the most susceptible to collapse into the ditch. Without proper care, ditch banks are quickly covered in annual weeds and the sides continually slump, widening the ditch. Weed seeds from the ditch area also spread into adjacent fields creating extra weeding problems.

This ditch was a great opportunity for the Cloverdale Soil Conservation Group to test some of the erosion control blankets available for use in areas that are slow to establish grass covers. The first step was to hydroseed the entire ditch bank with a new mixture of grass seed (a modified 'Companion' mixture from Richardson Seeds). The seed was pre-germinated to speed-up grass establishment (probably an unnecessary step with the extended fall). The erosion control blankets were put in place a few days after seeding. Two types are tested: a long-lasting coconut fibre matting and a coconut fibre/straw matting. These were applied by either lining the entire ditch or simply covering the areas of soil disturbance above the drainpipes. The latter method, if effective, will reduce the application cost.

The grass germinated and grew well over the fall. However, the soil on the north side of the ditch quickly dried because of sun exposure. The grass stand is poorer in this location.

The demonstration site is easily visible from the road and is well worth watching over the next few years. Proper early ditch care may ease later maintenance requirements, such as ditch cleaning.

A new purchase option for the Conservation Group

The Conservation Group is considering purchasing a hydroseeder for vegetable farmers in the Cloverdale area to seed farm ditch banks. The hydroseeder has the capacity to accept a 50 lb. bag of wood fibre mulch in 10 seconds and the mulch does not need to broken up prior to loading. The unit is small--about the same size as the one made by Rick Law--but it is light enough (650 lb.) to be carried in a pick-up truck. The added speed of mixing and operating the unit will make ditch bank seeding much faster than with our existing unit.

Members of the Conservation Group will be making a trip to Anacortes in the new year to see the hydroseeder in operation. If the unit is purchased, the newly cleaned ditches in the area could be seeded in early spring before the fields are workable.

Farm tours show conservation work

Cold temperature and rain did not prevent over 40 people from attending the Cloverdale Soil Conservation Group's field day on 6 November.

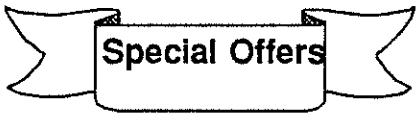
The Conservation Group believe planting cover crops is a useful soil management technique to help alleviate some of the soil problems faced by growers in the area and this was the emphasis on the first stop. Two trials were presented. The first trial demonstrated the effect of different fall seeding dates on plant growth. The second trial was evaluating 12 different species for their performance as fall seeded cover crops.

In the past, the management of ditch banks has not been a priority for many growers. But a wide range of problems can arise from improperly managed ditch banks. The Conservation Group has extended its original plan to include ditch bank management. The second stop was at a farm where the group is evaluating different grass species for use on ditch banks.

The seeding method has been a problem in reseeding ditch banks with favourable grasses. The Conservation Group in conjunction with Rick Law (Law Pacific Vegetables) designed a small hydroseeder to solve the problem. The hydroseeder was demonstrated at the third stop--a farm with a newly dug and seeded ditch.

Attendees finished the farm tours with a warm lunch and an opportunity to discuss poultry manure management with Kevin Chipperfield, Sustainable Poultry Farming Group co-ordinator.

by Jean Hogue



Land Management Assistance Program. A government assistance program for projects or equipment aimed at soil conservation (brochure sent out in last mailing). Applications are processed on a first-come, first-serve basis while the money lasts. The applications to date include manure spreaders and a soil reclamation project. Other possibilities are a Paratill or a front-end hitch (to reduce the number of field passes thus soil compaction). Phone Dave Melnychuk (576-5600) for more information.

Canada-China Young Farmers Training Program. A program to bring Chinese farmers to Canada (or Canadian farmers to China) for periods up to one year to train on intensive agricultural enterprises. Host farm supplies room and board, and pays $700/month to the organization. Information available at the Conservation Group office.

'The Economics of Conservation-Based Management for Organic Soils in South Coastal British Columbia'--a report written by Brad Stennes and funded by the Canadian-British Columbia Soil Conservation Program. Assesses the costs of establishing a conservation-based management system for Cloverdale area vegetable farms. Copies available from the Cloverdale Soil Conservation Group office.

Up-Coming Events

Surrey Farmers' Institute. Directors' meeting (all members and prospective members welcome). 6 January 1993 at the B.C.M.A.F.F. office in Cloverdale (7:30 pm). Guest speaker: Financial consultant, David Twitchett. 'Basic financial planning for farmers--now is the time to review your financial plans'.

Cover Crop Workshop. 20 January 1993. Second annual workshop in Langley presenting the latest information on cover cropping in the Fraser Valley. Special lunchtime presentation by Mark Sweeney and Tim Singh--a slide show of harvesting equipment in Europe and California. Free (includes lunch). Phone Mary-Margaret Gaye (576-5616) for more details (agenda available) or to register.

Surrey Farmers' Institute. Annual General Meeting. 27 January 1993 (7:30) at the Cloverdale Lettuce and Vegetable Co-operative (5590-152nd Street, Surrey).

Farm Direct Marketing Conference. 27 January-2 February. Portland, Oregon. Topics include: niche markets, customer relations, marketing and promotions, etc. A brochure is available from the Conservation Group office or by phoning Brent Warner (B.C.M.A.F.F.) 656-0941.

Lower Mainland Horticultural Improvement Association--Growers' Short Courses. 3-5 February 1993. Featuring Cloverdale Soil Conservation Group talk on cover cropping and ditch bank hydroseeding, and a display booth.

Surrey Farmers' Institute off to a good start

The Surrey Farmers' Institute has had a great impact in the last 10 months since incorporation. This is a partial list of accomplishments: 1) organization of a farmers' rally in Victoria resulting in a 9.5 million dollar, 5-year provincial 'Buy B.C.' program, 2) provincial and federal lobbying resulting in a speedy federal decision on anti-dumping complaints filed by vegetable producers, 3) convincing Surrey District of the need for 'Respect slow moving farm vehicle' signs--these are now installed on district and provincial roads, 4) setting up an educational program with Surrey schools that includes farm tours and lending curriculum material ('Farm Kit'), 5) convincing Surrey District to establish a general clause in district contracts concerning the conduct of contractors' workers (to address past problems with theft and trespassing), 6) arranging for the purchase of bulk cover crop seed, 7) organizing a display booth promoting agriculture in Surrey products at the Cloverdale fall fair, 8) holding a summer and winter social event for members, and 9) appointment of SFI member to the G.V.R.D.'s recently formed Agricultural Advisory Committee.

Currently, members are addressing waterfowl issues including hunting regulations, and the establishment of waterfowl habitats and land acquisition in Surrey as proposed by wildlife agencies. We will also organize a pesticide applicators course for early in 1993, if there is sufficient demand.

Now is the time to renew past memberships or to sign up new members. Our membership now represents all agricultural sectors in Surrey. Our group is effective because we have a unified voice representing Surrey farmers--additional members will increase our strength. Annual membership fees are $100 for the first year of membership, and $80 for the second and following years of membership. Phone the secretary-treasurer, Mary-Margaret Gaye, at 931-3301 (home) for an application form.

by Richard Law, Vice-President

Wildlife agency release plans for Surrey

The Canadian Wildlife Service has released the 'Pacific Coast Joint Venture Area Plan for Boundary Bay'--a proposed plan for wildlife management that includes farmland areas in parts of Surrey. Land acquisitions, the establishment of wildlife habitats, and farmer cooperative projects are included in the plan. Copies of the plan were distributed to members of the Surrey Farmers' Institute for comment--additional copies can be obtained through the Institute or from the Canadian Wildlife Service.

We apologize for not translating this edition of Soilnews into Chinese. Our next edition will include the Chinese summary.

Unless otherwise noted, the bulletin is written by Mary-Margaret Gaye. Production is by Jean Hogue.

We wish you a very happy Christmas and a prosperous New Year.
Mary-Margaret and Jean

Cloverdale Soil Conservation Group

SOILNEWS

Canada-British Columbia Soil Conservation Program Vol.3 No.1 Mar. 1993

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Our Soil...Our Future

BC Canada

Spring handling of cover crops

The action of discs and moldboard plows on the soil differ and inappropriate use of either implement may damage the soil. The moldboard plow can smear soil at the bottom of the tillage layer because of the downward force on the plowshare. Disks cut and rip the soil, and exert less downward pressure.

The question of whether to use a plow or disc to incorporate cover crop residue is an important issue to consider. Before deciding consider:

Is the cover crop alive? If so, a mower or herbicide will help control the cover crop. A mower can be used if the crop growth is heavy, time is not critical and a well-tilled seedbed is required for the cash crop. Herbicides can be used if the cover crop is known to be difficult to kill with tillage and the field must be prepared quickly for planting.

Will the cash crop be transplanted or precision seeded? 'Messy' seedbeds with lots of cover crop trash may not interfere with planting when using large seeded crops such as corn, peas or potatoes. In this case a single mowing and discing may be sufficient.

For transplanting, multiple discing may be enough to incorporate the trash when a 'trash coulter' is installed in front of the transplant foot.

For precision seeders, multiple discing may be essential to reduce surface trash to a minimum. If time is critical a plow can be used to incorporate the cover crop.

What is the soil moisture level? Wet soils are more easily damaged by a single pass of a plow than by a single pass of a disk. Plowing cover crops into wet soil will leave cover crop residue in a mat under the surface that may not decompose and could lead to crop management problems later in the season.

See **Spring management**, page 2.

WHAT'S INSIDE...

Fall cover crop seed program a great success

The response to the 1992 free seed program was outstanding. Thirty-nine growers participated compared with 21 in the previous year. We recently completed a survey of 38 participating growers about their cover crop management--all but two growers planted their allotted cover crop seed. 278 acres were seeded from the free seed program and, with the extra seed purchased by 17 growers, the total number of acres seeded in Cloverdale was in excess of 970 acres!

Broadcasting the seed followed by a light discing was the most popular method of seeding (21 farmers) but 15 farmers used a grain drill. The grain drill results in a more uniform seeding but the overall growth of the cover crop does not appear to differ between the broadcast and drilled seed.

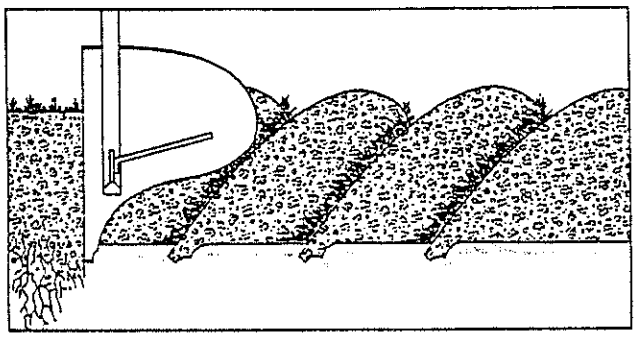
The growth of the cover crop is affected by the seeding date. The 23 growers that seeded in August and September had the best results. Their cover crops reached an average of 30 cm giving a very good ground cover, and with the cold weather this past winter, all their cover crops died. Farmers also noted that the early seeded cover crop reduced the amount of weeds growing in the field if the seeding was uniform. The remaining growers received varied results. Some growers who seeded in October received excellent results, but the majority of the cover crops seeded in October did not grow sufficiently to establish a good cover and the crops tended to survive the winter. All but five growers reported their cover crops dead, from either the prolonged cold weather or from flooding. Regrowth was noticed on some of the later seedings but the recent cold spell is expected to kill the crops.

Seven growers tried some form of fall management on their cover crops: 4 ploughed under the cover crop, 1 mowed, 1 subsoiled through the cover crop using the Paratill, and 1 both mowed and subsoiled the crop. Fall ploughing results in the loss of the soil protection benefit achieved by overwintering cover crops. The affects of fall mowing and/or paratilling through the cover crops will be assessed this spring before planting.

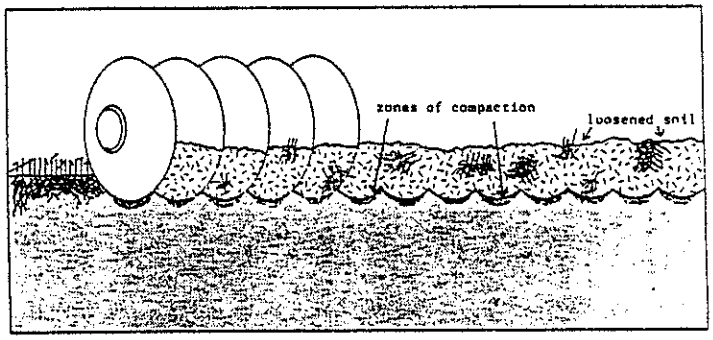
Some follow up questions on spring management will be asked later in spring.

Jean Hogue, Project Technician

Spring management - from page 1.



Effect of plowing on soil.



Effect of discing on soil.

Discing a cover crop leaves the residue in small pieces thus aiding in opening and drying the soil as well as improving residue decomposition. Discing the cover crop will require more than one pass to incorporate the residue but the second and third pass will be carried out in drier soil. The first pass will cut the cover crop residue and damage to the soil will be minimal if the individual disks are set to take only a thin cut.

What can be done to improve cover crop incorporation when plowing? Try the following if a plow must be used to incorporate the cover crop residue:

1. Try to kill the cover crop using a herbicide if the crop survived the winter.
2. Mow or disc the crop residue if there is a large amount of trash.
3. Plow when the soil is starting to dry out.
4. Use a subsoiling shank to reduce soil smearing (see insert).

Geoff Hughes-Games
Regional Soil Specialist, B.C.M.A.F.F.

The chisel plow or moldboard plow for soil conservation?

The following is taken from two Ontario Ministry of Agriculture and Food publications: The Chisel Plow (No. 87-047) and The Moldboard Plow (No. 87-072). Phone 576-5616 for photocopies.

The chisel plow is the most commonly used conservation tillage implement in Ontario. It has a number of advantages over the moldboard plow including savings in fuel consumption and time requirements for primary tillage. Most importantly for soil conservation, the chisel plow leaves more crop residue on the soil surface than does the moldboard plow.

The chisel plow lifts, turns and shatters the soil. It therefore works best when the soil is reasonable dry. If the soil is too wet, the desired shattering action is not achieved and the soil between the shanks may not even be disturbed. Tillage to a depth of 10-15 cm is commonly practised.

Chisel plows may be equipped with individually- or gang-mounted coulters to cut through the trash and reduce plugging problems. The coulters should be set just deep enough to slice through trash.

Sweep teeth are preferred for spring tillage (see diagram). They leave the soil less ridged than twisted shovels and, when used properly, leave more crop residue on the soil surface. If used too often they will pulverize the soil and a zone of compaction may develop

The moldboard plow was historically the most widely used primary tillage impliment in Ontario because of its reliability in crop production. Used traditionally for 'clean' plowing, the moldboard plow is not considered an implement that conserves the soil.

The moldboard plow lifts, fractures and turns a furrow slice. The degree to which the furrow slice is turned varies with the curvature of the moldboard and the speed at which it is operated. See **Plow**, page 4.

New equipment seen on Cloverdale fields

Farmers in Cloverdale are taking soil conservation seriously. Equipment and practices that have been used for many years are now questioned as concerns about the long-term productivity of the soil arise.

Many practices--such as the use of a rotovator and extensive tillage--are damaging to the soil and can result in the slow loss of soil productivity. Cloverdale farmers are concerned about this and new equipment will be seen on the fields this spring.

Rick and Dennis Law (Law Pacific Vegetables) and Tim Singh (Cloverdale Produce Farms) each purchased a front-mounted, 3-point hitch for their tractors. The use of the hitches reduces the number of field passes as two operations can take place at the same time. This means less soil compaction as well as lower labour costs. Rick and Dennis will attach a bed-shaper to the front hitch and a seeder at the back; Tim will start with a soil loosener on the front, followed by a rotovator. According to Gerry Sprangers, the hitches are commonly used in Europe and are becoming increasingly popular in the United States. Two companies that manufacture the hitches in North America are Laforge and Buckeye. Estimates range from about $3,000 to $9,000.

There are currently three rotary power harrows (Maschio, Terranova) in use on the vegetable fields. Rotary power harrows are replacing rotovators as the power harrows are less damaging to the soil and result in superior cultivation. Rotovators tend to pulverize the soil particles thus breaking down good soil structure. Sprangers Farms has used a power harrow for many years and Law Pacific Vegetable Farms, for one season. Both farms report successful seedbed preparation. Rick adds that the power harrow is easier to use than a rotovator as it does not push the machine ahead on the clay ridges or go down as deep, as well as it appears not to leave a hard pan.

A number of farmers took advantage of the Land Management Assistance Program to purchase manure spreaders. Manure usage enables farmers to cut back on chemical fertilizers and helps to build up the soil--important for fields with shallow organic layers or exposed mineral subsoils.

Some farmers are thinking about spade machines for field cultivation. According to Geoff Hughes-Games (B.C.M.A.F.F.) spade machines minimize damage to the soil structure and work very successfully on mineral soils but they have not been tested on the organic soils in Cloverdale. The Conservation Group is trying to arrange a demonstration of the implement this spring.

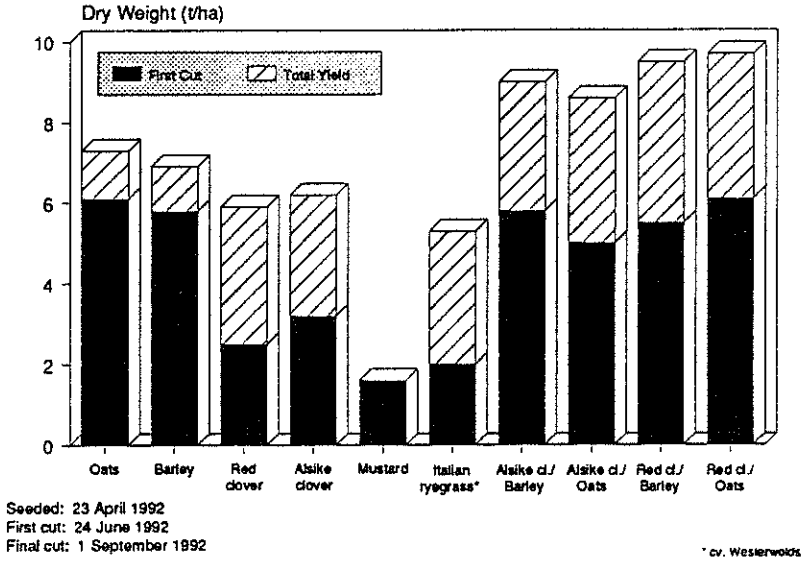
Rest a field to build-up the soil--research results

The Conservation Group is testing many cover crop species for in-season cover cropping. A long-term rotation of cash crops with a cover crop such as grain will help to build up the soil. This practice is common with vegetable producers in England.

The choice of cover crop depends upon many factors including the desired harvest date, organic matter yield, subsequent cash crop and overwinter field plans.

In our trials, the oil seed radish and mustard were harvested at flowering. These plants are from the brassica family and they should not be followed by crops such as cabbage or cauliflower. The grains were beginning to head when harvested. The clovers and alfalfa were harvested on three different dates and, as they will live through the winter, will be harvested again this spring.

Yields from some of the tested species are given in the figure above and in greater detail in Report 2-4 (phone for full report). The greatest yielding cover crops after the first harvest (24 June 1992) were barley and oats alone, or mixed with alsike or red clover. After the final harvest (1 September 1992) mixtures of barley or oats with either alsike or red clover produced the greatest yields. Oilseed radish and mustard produced the smallest yields of all cover crops.



Trash on your field? Trash coulters help, says John Inman.

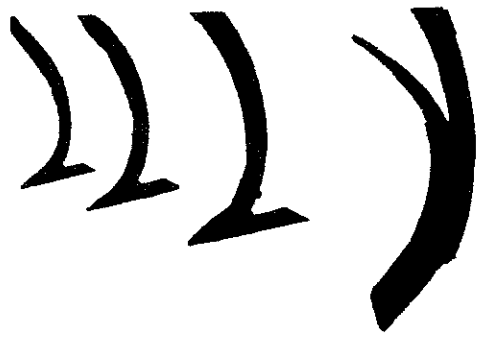
John Inman, University of California farm advisor present at the L.M.H.I.A. Grower's Short Course, says California farmers put coulters in front of transplanting shoes to eliminate residue build up during transplanting.

Single, rolling coulters (can be fluted) are placed at the depth of the shoe or about 1/2" below. They cut through the trash and make transplanting a relatively easy operation. If the coulters are set too deep, they will not cut the trash but instead will tend to push the residue in front of the machine. Cloverdale farmers transplanting into fields with cover crop trash may want to test this practice.

Plow - from page 3.

Clean plowing essentially eliminates surface residue by completely inverting the furrow. In Ontario, the plow is operated at shallow depths to avoid turning up the subsoil--about 15 cm.

The moldboard plow becomes part of a conservation tillage system when narrow bottoms are used, the plow is operated at shallow depths, and secondary tillage is kept to a minimum. Modifications to the moldboard to leave more crop residue on the soil surface have been tested. These include removing trash covers (coverboard) and removing part of the moldboard. Residue handling attachments on secondary tillage equipment may be necessary to accommodate the extra residue.



The chisel plow is commonly outfitted with either a sweep tooth (left) or a twisted shovel (right)

Farm 'messy' to build up the soil

Cover cropping promotes good soil structure but many benefits of cover cropping can be lost by excessive tillage. Excessive tillage will deplete the organic matter content of the soil, and result in poor soil structure and reduced water holding capacity.

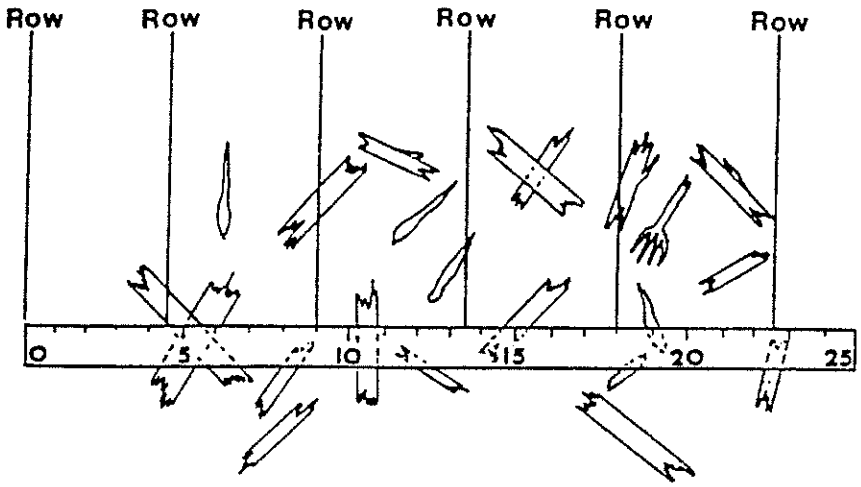
Last year farmers seeding with Stan Hay precision seeders or seeding potatoes found they could seed successfully into 'messy' fields--those with cover crop trash on the soil surface. Good crop stands were obtained although one farmer applied extra irrigation to a lettuce crop during the germination and early establishment stages.

Almost all Cloverdale vegetable farmers now cover crop for winter soil protection. But year 'round soil care is necessary to maintain its productivity. This spring, keep tillage to a minimum, particularly secondary tillage. Messy fields maximize economic and conservation benefits. The following table shows the amount of crop residue remaining after field operations.

Field operation	Residue remaining after each operation*
Harrow	0.90
Harrow packer	0.80
Coil packer	0.95
Field cultivator	0.80
Field cultivator with harrows	0.60
Wide blade cultivator	0.90
Rod weeder	0.90
One way disc	0.50
Tandem or offset disc	0.50
Chisel plow, straight shovel	0.75
Chisel plow, twisted shovel	0.60
Moldboard plow	0.10
Fertilizer injection	0.80
Airseeder-knife opener	0.85
Disc drill, double disc	0.85

*Table adapted from B.C.M.A.F.F. factsheet 'Estimating crop residue cover for soil erosion control, 1991'. By R. Kline.

"A conservation tillage system is one which leaves at least 30% of the soil surface covered with crop residues after planting." *Ontario Ministry of Agriculture and Food.*



The meterstick method of measuring crop residue

Here's how to measure crop residue using a metre stick:
"The metre long stick marked into 25 equal segments may be used to measure crop residues. The stick is placed at right angles to crop rows, beginning at one row. Percent crop residue cover is measured by counting the number of marks that lie directly over a piece of residue, and multiplying by four....A minimum of 10 measurements should be made randomly through a field to obtain a field average."

From B.C.M.A.F.F. factsheet 'Estimating crop residue cover for soil erosion control, 1991'. By R. Kline.

Surrey helps in soil conservation

Except for a few peak storm periods, water in many of the ditches in the vegetable farming area was reasonably low throughout the winter.

The District of Surrey kept the Burrows, Logging and Erickson pumps set at the spring level for the second winter. This was done at the request of the Conservation Group and the Surrey Farmers' Institute.

The mineral soil occurring throughout the farming area is structurally damaged by recurring flood waters. Practices that result in the rapid movement of water through the soil and away from the fields are necessary for effective soil conservation.

Farms in the lowland areas--particularly those pumping fields throughout the winter (a practice the Conservation Group strongly recommends)--require municipal co-operation in order to effectively remove field water. Keeping the water in the ditches low is a good start.

Weed alert for farmers growing cover crop seed

Good soil management of land used for intensive vegetable production includes a rotation into a cover crop such as grain. This gives the soil a rest and promotes its long-term productivity. Farmers taking a field out of production for a full or partial season can combine the grain for fall cover crop seed.

These fields must be properly managed to avoid the production of weed seeds. Weed seeds not only increase the cost of combining and seed cleaning, but also add to the bank of weed seeds in the grain field. Weed seeds will also be transferred to other fields if the grain is not properly cleaned.

The following examples show how many weed seeds per plant can be produced by some weeds common to Cloverdale fields:

Weed	Average No./plant	Dormancy
Chickweed		10
Lettuce, Prickly	27 900	
Mustard, Common	2 700	
Grass, Barnyard	7 160	
Lamb's-quarters	72 450	21-40
Pigweed, Redroot	117 400	21-40
Purslane	52 309	21-40
Shepherd's-Purse	33 509	35

Farmers can obtain a copy of the B.C.M.A.F.F.'s 1993 Field Crop Production Guide, or call Roy Cranston, B.C.M.A.F.F. Weed Specialist (576-5600), for advice on weed control.

Shanks reduce plow damage in wet soils

Using a plow in wet soil can cause 'smearing'. Smearing the soil seals off natural drainage channels, thus slowing the movement of water through the soil. Smearing may affect subsequent seedbed preparation and crop growth. A simple alteration of the plow can reduce this impact.

Insert a small subsoiling shank behind the centre of each plow share to break the plowpan. The shanks need only to extend 15-20 centimetres below the bottom of the plow share to be effective.

Note: Valley Equipment (George White) has one shank in stock that fits a Kverneland 3-bottom plow. The shank is 20-25 cm in length and is designed to be effective for all three bottoms.

Up-Coming Event

Pesticide disposal.

Now is the time to clean out the farm and remove old, unusable or banned pesticides. B.C. Environment (Toxic Reductions Branch) and Laidlaw Environmental Services are planning a pesticide disposal day on Saturday, 27 March in Surrey. The Conservation Group is collecting information from Cloverdale vegetable farmers and Surrey Farmers' Institute members, on chemicals for disposal. This information will help the co-ordinators plan and finalize the project. Phone Mary-Margaret or Jean with your farm plans for disposal.

Message from the President--Surrey Farmers' Institute

The Institute has come a long way in the one year since incorporation. Our work in 1992 brought recognition and financial returns to the farming community and 1993 appears full. Our new directors, elected at the annual general meeting, are Tim Singh (president), Reg Maddocks (vice-president), Gerry Sprangers, Rick Law, Mike Bose and Arnold Weiners.

Already in 1993 the Institute has addressed many issues of local concern including the use of agricultural land within the Agricultural Land Reserve.

We are well-represented on the newly formed G.V.R.D. agricultural advisory committee by three of our members: Daryl Arnold, Herb Vander Ende and Mary-Margaret Gaye. The first meeting was held on 5 February to discuss the priority actions of the committee. Some of the concerns raised were the separation of an 'agricultural zone' and a 'green zone' in policy development, the development of models for increased communication at all levels of government and with the public, and the need to address immediate issues such as the future of the Roberts Bank back-up land and the loss of government programs like A.R.D.S.A.

We once again approached Surrey council requesting the establishment of an agricultural advisory committee. The request was brought to council on 9 February and was turned down in a vote of 5 to 4.

About 12 members of the Institute, headed by Reg Maddocks, organized a study group to prepare for the Pesticide Applicators Certificate exam. Staff of the Cloverdale Soil Conservation Group agreed to help tutor the group. The study session and examination took place over one day at the B.C.M.A.F.F. office in Cloverdale.

Monthly meetings are held on the first Wednesday of each month. Meetings often include a presentation or talk by a guest speaker: topics range from wildfowl concerns to financial management and soil analysis. Current and prospective members are welcome at the meetings. For information on the Institute, telephone me at 576-1449.

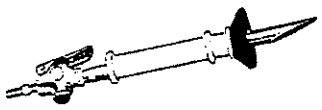
Tim Singh, President

Up-Coming Events

Container collection program 1993.

A pesticide container collection program is being planned for the Fraser Valley this year. Only metal and plastic containers that are triple rinsed and dry will be accepted. If you want to participate, remember to triple rinse your containers when they are emptied and leave the caps off so they can dry. Dates and locations will be announced later.

Madeline Waring, B.C.M.A.F.F. Pesticide Specialist



Tip: use pressure rinser to speed up rinsing

Farming for profit and stewardship--workshops.

1. *Maintaining soil quality*: Friday 5 March, Corvallis, Oregon. Topics include: soil health, nutrient recycling, soil bugs, cover crops in horticultural systems and farm tours (cover cropping).

2. *Nitrogen management and water quality*: Thursday 18 March, Mt. Vernon, Washington. Topics include: groundwater contamination, cropping strategies to control nitrate leaching.

Phone Mary-Margaret for agendas and registration forms.

Special Offers

'P challenge' for Cloverdale vegetable farmers. The Cloverdale Soil Conservation Group is, for the second year, challenging farmers to cut back on phosphorus application.

Tests last year showed that phosphorus can be applied on many fields at rates lower than farm rates without yield losses. By matching crop needs, farmers save money and improve water quality, particularly in areas where excess phosphorus can leach into river systems.

This is how the program works. Soil from fields of participating farms is tested to determine the recommended phosphorus application rate for the planned crop. On fields where the planned application rate is greater than the B.C.M.A.F.F. recommended rate, a large test plot is fertilized at the B.C.M.A.F.F. recommended rate (or lower!). Crops are monitored throughout the season. The Conservation Group will pay the farmer for any profit lost because of reduced yields. (Last year, there were no yield losses!) This is a great opportunity to test lower phosphorus rates without risking a loss in profit.

Register early as participants will be limited again this year. Phone Mary-Margaret or Jean for more information.

Conservation Group mower--free to Cloverdale vegetable farmers. Last spring, many farmers eased field preparation by mowing the cover crop before discing or ploughing. For best results, the crop should be standing. Trash incorporation is improved if cover crops are left to dry for a few days before discing or ploughing. The Conservation Group mower can be used to mow cover crops--at no cost! Phone Jean to reserve the mower. Please--no ditch bank cutting!

Conservation Group hydroseeder. Now is the time to take care of your ditch banks and stop erosion. The Conservation Group is negotiating the purchase of an easy-to-use (and transport) hydroseeder for use this spring. This will make seeding ditch banks very easy and fast. Grass mixtures have been tested in the area and have stopped erosion on very unstable banks--drive by Jack Chan's on 40th Ave. at 176th Street. Some farms have already booked for this spring--so phone early for details and to reserve use of the hydroseeder.

Conservation Group Paratill--free to Cloverdale vegetable farmers. The Paratill is a uniquely-designed subsoiler that does not bring up the subsoil. This is particularly important on Cloverdale fields with shallow organic layers. The Paratill shatters the clay subsoil thus creating cracks for field drainage. To operate effectively and to prevent smearing, the subsoil should be relatively dry. Although fall is the best time to use the implement, many Cloverdale farmers borrow it in the spring. Phone Jean to reserve the Paratill.

Land Management Assistance Program. A federal government grant program that provides up to 50% funding for projects or implements that result in soil conservation. Some Cloverdale farmers have applied to this program for the purchase of manure spreaders. Phone Mary-Margaret or Dave Melynchuk, B.C.M.A.F.F., (576-5600) for details.

Conservation Group reports available.

No. 2-1. Phosphorus challenge
No. 2-2. Carrots-phosphorus rate and placement
No. 2-3. Carrots-nitrogen application rate and timing
No. 2-4. Spring seeded cover crops species evaluation
No. 2-5. Sorghum-sudangrass assessment
No. 2-6. Fall seeded cover crops species evaluation
No. 2-7. Fall seeded cover crops species evaluation and time of seeding
No. 2-8. Effect of glyphosate on established cover crops
No. 2-9. Grasses for ditch bank stablization

Unless otherwise noted, the bulletin is written by Mary-Margaret Gaye. Production is by Jean Hogue. Translation by Wei Yang Yang.

A newsletter summary in Chinese is available.

Cloverdale Soil Conservation Group
SOILNEWS
Canada-British Columbia Soil Conservation Program Vol.3 No.1 Mar. 1993

業務通訊摘要

覆蓋作物的春季處理　如果長得繁茂，便在耙或耕之前用割草機割掉覆蓋作物。若土地必須迅速備用，作物不用翻犁，便使用除草劑。土地準備工作取決於下茬作物種類，例如，大種子作物（薯仔）能在有大量覆蓋作物殘茬的情況下播種，而不需多整地，在移植機前面安裝犁刀，有助於土地準備工作。犁刀切割殘茬，使之云塘塞在移植機腳下，對於精細播種機則需多耙，盡可能減少土表的殘茬。如果時間緊，只犁。在潮濕土地上，犁比耙更破壞土壤。犁把覆蓋作物像草蓆一樣鋪在表土下面，而耙則把覆蓋作物切成小地，較快地分解。
在每個犁鏵後面裝一個小的表土開溝器以便鬆土。這樣可減少犁潮濕土地造成的土壤破壞。

秋季覆蓋作物種子項目取得巨大成功
39位種植者參加了1992年的免費種子項目，而前一年為21位。此項目播種278英畝，有17位農民額外購買了種子，因此，在Cloverdale的種植面積超過970英畝。
大多數（21位）農民撒播種子，但有八位農民用了谷物條播機，在8月和9月播種的，土壤覆蓋最佳而雜草最少。這些作物冬綫死亡。大多數在10月播種的，沒有形成良好覆蓋，作物在冬季仍成活。雖有少數用Paratill深耕，但秋季管理畢竟很少了。

保持土壤是用凿形犁还是犁壁犁？ 凿形犁比犁壁犁较少破坏土壤而保留更多的作物残茬在土表，土壤乾燥時，兩種犁都好。凿形犁上可安裝犁刀，切割覆盖作物残茬，減少堵塞問題。犁刀的深度應剛好夠切過残茬。為保持土壤，犁壁犁最好是窄底，深度淺（小於 15 cm），和最小的二道犁。

Cloverdale 田野上出現新的機械

下面幾種機械是新來的：

1. 前裝掛三點牽引裝置 兩步操作同時完成，減少了田間往返的次數，節省勞力和減輕土壤鎮壓。Rick 和 Dennis Law 準備在前牽引裝置（front hitch）上掛一個苗床成形機，並在拖拉機後面掛一個播種機；Tim Singh 準備在前面裝一個耙土器再跟一個 rotovator。

2 旋轉耙（Maschio, Terranova） Dennis 和 Rick Law, Gerry 和 Jim Sprangers 已經用旋轉耙代替他們的 rotovator。這種耙對土壤破壞小，從而提高耕作質量。Rotovators 粉碎土壤分子，使破壞了好的土壤結構。

3. 厩肥撒布機 在土地管理援助項目支持下，已購買了許多台，利用厩肥能使農民少用化學肥料，並有助於培養土壤。

研究成果 — 休閒培養土壤

及時種植覆盖作物給土壤以休閒，有助於保持生產能力，可計劃整個季節或部分季節種植覆盖作物。在我們的試驗中，三葉草或苜蓿與大麥或燕麥混作的產量最好。

看上去"亂轉轉"的果塙反而培養土壤

覆盖作物能培養土壤，但耕犁太多又使一些好處喪失。覆盖作物殘茬在土表意味着良好的土壤保持，去年農民們很容易在土表有覆盖作物殘茬的苗床上播種生菜。要維持作物生產力，過年土壤保護是必要的，今春建議少耕，需要時才耕。

Surrey 協助土壤保持　Surrey區政府維持把泵安裝在 Burrows, Logging 和 Erickson 渠，並保持泰季水平，為第二個冬季服務，這就是說，溝渠裏的水較低，水可更快地從田地排走，水泵裝在土表會造成磚質土。

種植覆蓋作物要防除雜草　集約蔬菜生產土地的良好土壤管理，包括覆蓋作物如谷物的輪作，這樣使土壤能休閒并增進其長期生產力。種植谷物，特別是收種子的谷物的土地，要防除雜草，這樣，清潔種子的費用較少，隨着秋季覆蓋作物播下雜草的機會也大大減少。

Surrey 農民協會

協會的新領導是 Tim Singh (會長), Reg Maddocks (副會長), Gerry Sprangers, Rick Law, Mike Bose 和 Arnold Weiners.

今年的大事是：Surrey 的農地利用，參加新成立的 G.V.R.D. 農業諮詢委員會，農業諮詢委員會對 Surrey 議會的要求，以及考參加農藥使用人員証書考試的會員舉辦農藥學習班。

要了解情況的，請給我電話：576-1449.　　會長 Tim Singh

即將來臨的事情

農藥處置　B.C. 環境部（減害局）和 Laidlaw 環境服務公司計劃 3月27日星期6 在 Surrey 舉辦一個農藥處置日，如果你有農藥要扔掉，請與 Jean 聯系。

農藥容器處置　BCMAFF 和 BCMELP 計劃在辦一個農藥容器處置項目，容器處置前必須淋洗三次並乾燥，請注意此事的公告。

Cloverdale某农的"矿挑战" 有些土地含矿很高，农民可在混合肥料中加超少的矿，却仍能获得好产量，施矿多於需要量，得多花钱，並造成矿溶到河裏。当地，土壤保持组测试土壤，並建議計劃作物的施矿量，在用矿超過我們建議用量的土地上，我們將在小面積上施用低矿量。為鼓勵農民施用較少矿肥，如果試驗地減產，我們將賠償損失。去年未發生減產情況，我們也沒賠錢。詳情可電話 Mary-Margaret 或 Jean (576-5600)。

土壤保持組割草機 — 免費借給 Cloverdale 某農 保持組有一架割草機，在春季耙地耕地之前，農民可借用，以刈割覆蓋作物。打電話給 Jean 借用割草機。

土壤保持組水播機 根據 Jack Chan 在 40th Ave. at 176 th Street 的試驗區，在極不穩固的溝坡上，草能防止土壤流失，農民可借用保持組的水播機播種溝坡，請打電話給 Mary-Margaret 詢問詳情。

保持組的 Paratill 免費供給 Cloverdale 某農
Paratill 是一種深耕犁，但不會把粘重底土翻到土表。深耕在粘土中形成裂縫，使田間排水較快。秋季是深耕的好季節，但許多農民在春季才借 Paratill。 打電話給 Jean 預訂 Paratill。

土地管理援助項目 一項聯邦政府批准的項目，補助哪些肯在保持土壤的工程或工具所需的資金達50%，有的 Cloverdale 農民已經申請此項項目，以購買施肥撒布機。詳情詢問 Mary-Margaret。

Cloverdale Soil Conservation Group

SOILNEWS

Canada-British Columbia Soil Conservation Program — Vol.3 No.2 July 1993

Beyond 1994...it's up to you!

This is the final year for the Cloverdale Soil Conservation Group's 3-year project. The $400,000 project was 100% funded by the Canada-British Columbia Soil Conservation Program. Funding will end on 31 March 1994.

The project aimed to determine management strategies for vegetable producers to reduce the loss of the black, organic soil and to improve the productivity of the exposed mineral ridges. The conservation group promotes the use of appropriate strategies through field days, demonstrations, newsletters and on-farm visits. Most of the work conducted by the conservation group has focused on cover cropping, drainage, fertilizer use, ditch bank stabilization and implements for improved soil management.

The Cloverdale Soil Conservation Group now has an opportunity to conduct another project under the federal Green Plan. The federal government will contribute 80% of the monies required (to a maximum of $40,000/year) to support a project for 4 years. This means $10,000 each year must be contributed by producers, or another source, to support a $50,000/year project.

We need your help. A proposal should be submitted soon to secure funding from the Green Plan. We want to know if the farming community wishes to support another project and, if so, the concerns that should be addressed and possible funding sources. Please fill in the enclosed questionnaire or the survey on the last page (Surrey farmers can use the enclosed stamped envelope), and return as soon as possible. Your response will determine the future direction of the Cloverdale Soil Conservation Group.

1994年之後…由你們決定！ 現在是 Cloverdale 土壤保持組三年項目的最後一年了。這個40萬元的項目將在1994年3月31日結束，從聯邦政府可獲得資金實施另一項目，政府將提供項目開支的80%，也就是說，一個每年5萬元的項目有1萬元要由農民或其他來源資助。我們想知道，農民是否支持另一項目，請填寫調查表並儘早回覆，它將決定今後方向。

17720 - 57TH AVENUE
SURREY,
BRITISH COLUMBIA
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FAX: (604) 576-5652

Our Soil...Our Future

BC Canada

WHAT'S INSIDE...

Two years of trial results on cover crop killdown

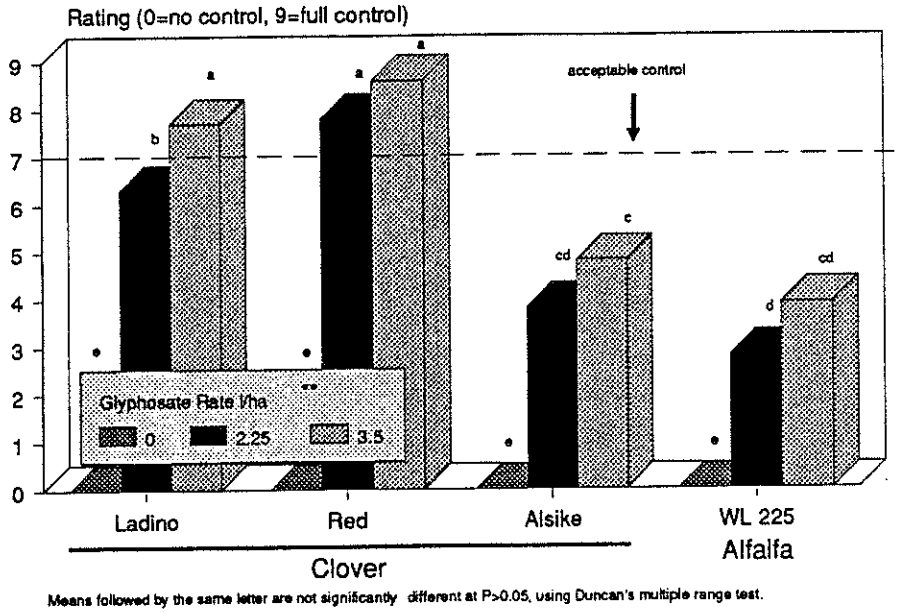
This spring the conservation group collected a second year of results from trials established to assess glyphosate herbicide (Roundup, Wrangler, Laredo) in a chemical kill of overwintering spring seeded cover crops. The trials were conducted with Roy Cranston (Weed Specialist, B.C.M.A.F.F.) and David Ralph (Weed Technician, B.C.M.A.F.F.)., and took place at Law Pacific Vegetable (1993) and Cloverdale Produce Ltd. (1992).

Two rates of glyphosate recommended on the product label were tested: 2.25 and 3.5 l/ha. Results from both years were similar so they were combined for this report. (A full report--No.3.1--is available upon request.)

Cover crops showed a marked difference in susceptibility to the herbicide. Westerwolds Italian ryegrass survived the winter in Year 1 and was completely killed at both herbicide rates even though the crop was over 60 cm in height when treated. However, it did not survive the winter in Year 2. Fall rye was grown only in Year 2 and was completely killed at both herbicide rates.

In both years red clover was acceptably controlled at both rates of glyphosate whereas Ladino white clover was controlled only at the highest application rate (see figure). Alsike clover and WL 225 alfalfa were not acceptably controlled.

殺倒覆蓋作物的兩年試驗結果　使用除草劑(Roundup, Wrangler和Laredo)殺死生長一年的覆蓋作物.采用兩種劑量:每公頃2.25升和3.5升.秋黑麥只種了一年,兩種劑量都能完全殺死.紅三葉草被兩種劑量控制,殺死Ladino白三葉草須用高劑量.兩種劑量都不能殺死Alsike三葉草和WL 225首蓿.



Means followed by the same letter are not significantly different at P>0.05, using Duncan's multiple range test.

Strip testing reduces farm risk

带状试验减少风险

带状试验是在作物区内做新措施的小面积试验.土壤保持组常做农民作减少施磷.最放肥种.底肥施用等试验.及新措施的产量对比.

Many Cloverdale farmers are using strip tests this season to assess new crop and soil management practices. Test strips reduce the risk often associated with undertaking new production practices.

In test strips organized by the conservation group, farmers are assessing reduced phosphorus application rates, slow-release fertilizers (poly- and sulphur-coated urea) and manure applications.

Each farm is using a test area about 6 to 10 beds wide by the length of the field. The strips are large enough to give the farmers a good indication of crop response. The test area is located within the cropping area using the current practice, enabling side-by-side comparisons of crop growth and yield. The conservation group will be collecting data from the test sites for later reports, along with observations and measurements of productivity from individual farmers.

Resources for on-farm experimentation.

A number of publications are available for farmers wanting to advance farm-testing beyond the simple test strips described above--for example replicated test strips. The publications also include details on how to collect, record and analyze data. (The data can even be analyzed using computer software programs developed for on-farm testing!) Phone Mary-Margaret Gaye (576-5616) for a publication list.

Ditch bank erosion mats prevent slumping at Cloverdale Produce Farm

Last fall the conservation group tested various erosion control mats at Cloverdale Produce Farms. The ditch (1:1.5 slope) was dug and hydroseeded with a grass mixture just before the mats were applied. By early November, the grass had grown through the mats to about 2 inches in height.

However, the action of freezing and thawing over the winter caused a dramatic change in the ditch banks. By spring, any area of the ditch bank not covered by an erosion control mat had slumped into the ditch. Grass roots on the uncovered portions were not well enough established to hold the steeply sloped sides in place.

In an attempt to prevent further slumping--and to also continue testing--the conservation group added three more erosion control materials to the demonstration. (We thank Bill Peters, B.C.M.A.F.F., for the suggestions.) The following table details the materials and costs. The cost of staples used to hold the material in place and the cost of labour for installation are not included. A report on the comparative effectiveness of the materials will be prepared next spring.

防蝕蓆防止 Cloverdale Produce Farm 的溝壕侵蝕　去年秋季保持理在 Cloverdale Produce Farm 的一個陡溝壕上測驗了各種防蝕蓆。鋪蓆前挖掘溝壕並水播混合草。到今春，未蓋蓆的溝壕已下滑，草根不材抓牢溝壕。現我們已增加更多的防蝕蓆作測驗。下表列出了各種材料和價格，隨後將介紹各種材料的性能。

Material	Roll size	Roll cost	Cost/ft^2	Appl'n date
100% coconut mat	80" x 83'	$103	18.5¢	Sept. '92
Coconut and straw mat (1:1)	80" x 83'	$ 83	15¢	Sept. '92
100% straw mat	80" x 83'	$ 44	8¢	May '93
Geojute	48" x 225'	$108-150	12-17¢	May '93
Burlap (7 oz)	60" x 417'	$115-136	5.5-6.5¢	May '93

Cover crop seed program extended for new participants

The conservation group's successful fall cover crop seed program will be extended for participants joining the program in 1992 or 1993. Under this program, participants receive enough barley or oat seed to plant 10 acres of cover crop. Many farmers joining the program in 1991 now routinely seed fall cover crops on as much land as possible. Last fall over 970 acres of prime vegetable land were seeded by 95% of Cloverdale's farmers--up from the few acres seeded by one or two Cloverdale farmers prior to the program!

This fall, only farmers that have participated in the program for one year, or new participants, will receive the seed. This will give most farmers an opportunity to participate in the program for two years. Conservation group staff will contact participants concerning their 1993 order, or phone 576-5613 with your order.

覆蓋作物項目
為新參加者開門

接受過一年免費種子或首次參加的農民可參加1993年免費種子項目。農民可得到10英畝的大麥或燕麥種子。現許多農民應可種多種覆蓋作物。去年 Cloverdale 地區已超過970英畝，請電洽576-5613報名。

Summer staff joins conservation group

Steve McMillan has rejoined the conservation group to help with summer field trials and demonstrations. Steve worked for most of last fall harvesting and seeding fall trials, and at the fall field day. Matthew Halverson--also a familiar face with the conservation group--will take Steve's place through the month of August.

夏季工作人员参加保持组
Steve McMillan (至7月)和
Matthew Halverson (8月)
已经成为保持组员。

Don't get caught in the 'wrong place at the wrong time' with field-stored manure

Farmers stock-piling manure for field winter storage should keep in mind the regulations in the Waste Management Act. Manure can be stored between two weeks and 9 months on a field as long as it is located at least 30 m from a watercourse (ditches and rivers) or a domestic water supply, and stored in a way to prevent nutrient leaching (i.e. bermed and covered). For further information call Soils and Engineering, B.C.M.A.F.F., at 852-5363. For a copy of the Code of Agricultural Practice for Waste Management, phone 576-5616.

别在"错误的地点和错误的时间"在田间堆放厩肥

冬季在田间堆放厩肥的农民们，要记住废物管理法的规定，在距离灌渠，河流或家用水源至少30米的厩肥，可存放2星期至9个月，必须做到防止养分流失（也就是加棚板和覆盖）。详情可询问B.C.M.A.F.F.电话 852-5363。

Earthworms--a sign of health at the drainage demonstration site

Remember the conservation group's drainage/levelling demonstration on Maddocks' Farm on 176th Street just south of the viaduct? In 1991 the conservation group assessed the depth of the top organic layer in the 10-acre field and predicted the areas in which the mineral subsoil would be brought to the surface through land levelling. The landowners and the conservation group decided to install drain pipes in the field to improve drainage, rather than level the field and expose large areas of mineral subsoil.

The landowners maintained the site by pumping the water year 'round from the ditch into which the drain pipes flow (ensuring the continuous movement of water through the laterals), cleaning the ditch, subsoiling the field with a Paratill in the fall (when possible), and planting a cover crop. Winter wheat was planted last fall and removed for green chop in the late spring.

The conservation group assessed the field for leatherjackets this spring and found no leatherjackets but lots of earthworms! Earthworms are not often seen in Cloverdale's black organic soils or in the exposed mineral subsoils, but they are probably the most important animal living in the soil. Earthworms may move as much as 15 tons of dry earth per acre through their bodies annually--an action that can improve the soil quality.

Benefits of earthworms. Earthworms are known to increase soil fertility and productivity. Their 'casts' (excretion products) are high in many macro- and micronutrients and can also improve the ability of the soil to retain nutrients. Earthworms travelling through the soil leave behind holes that are important for aeration and drainage, similar to old root channels.

See **Worms**, page 5.

蚯蚓 — 排水示范点的良好标志　保持组设在 176 St. 桥南的排水/水平示范点，地主维持得很好。他们常年抽水进排水管，保持灌渠清洁，秋季用 Paratill 松表土並播冬盖作物。今春我们发现很多蚯蚓在混合黏表土的黑色有机土裏，蚯蚓在田地裡並不普遍，但牠们是土壤的重要生物。幫助改良土壤和造排水孔，蚯蚓生活在不粘和不過湿的土壤。良好的土壤管理（如作冬盖作物，加厩肥和排水）会增加蚯蚓，牠们一来，土壤便改良。

Manure lets farmers cut costs on chemical fertilizers

Many Cloverdale vegetable farmers use manure as an amendment to promote good soil structure, but few consider its nutrient value. The conservation group, along with Kevin Chipperfield (Sustainable Poultry Farming Group), is assessing the potential nutrient value of poultry manure in carrot production.

Carrots grown on test strips spread with turkey manure will be compared to carrots produced using chemical fertilizers with no added manure. The table below summarizes the treatments and nutrient availability.

Poultry manure is generally higher in nutrient content--particularly available nitrogen--than other animal manures. After our application the manure appeared to be lightly spread, but the lowest application rate still exceeded crop requirements. (Measured application rates ranged from 8-20 ton/acre.) Excess nutrients can burn germinating seeds, cause pollution problems and unnecessarily increase farm input costs. Farmers can easily measure their application rate to ensure excess manure is not applied. Phone 576-5616 for guidelines; "Calibrating Manure Spreaders".

Later reports will include crop yields and a cost-benefit analysis. Stay tuned!

厩肥減少農民化肥開支

許多農民使用厩肥改良土壤,但他們未考慮其營養價值。我們試驗了用火鷄糞種植紅蘿蔔,下表列出了各處理及其營養供應量。下步將比較產量。火鷄糞含養份較多,噴灑面大,在本試驗中,最低用量的養份也多於作物需要(取樣 8－20 噸/英畝),過多養份會灼傷正在發芽的種子,造成污染和增加成本。測量你的用量,勿用過量。

Worms - from page 4.

Preferred habitat. Earthworm activity is highest in well-aerated and moist (not poorly drained) habitats that have a good supply of organic matter for food. Only a few types of earthworms will tolerate low soil pH.

Fields with shallow organic soil mixed with large amounts of mineral subsoil will benefit from earthworm activity. Disturbed mineral subsoil in the Cloverdale area, however, is often poorly drained and not well-aerated. Good soil management practices--such as cover cropping, manure additions and adequate drainage--will result in conditions that promote earthworm activity. Once the earthworms settle in, they will speed-up the soil building process. Earthworms really are a sign of soil 'health'!

Available nutrients	Chemical fertilizer @ farm rate (lb/acre)	Turkey manure @ 8 t/acre (lb/acre)	Turkey manure & chemical fert. (lb/acre)
Total nitrogen			
• applied	• 91	• 144	• 235
• soil supply	• 9	• 9	• 9
• crop needs	• 50	• 50	• 50
• excess	• 50	• 103	• 194
Phosphorus P_2O_5			
• applied	• 84	• 204	• 288
• soil supply	• 97	• 97	• 97
• crop needs	• 0-40	• 0-40	• 0-40
• excess	• 141-181	• 261-301	• 345-385
Potassium K_2O			
• applied	• 112	• 200	• 312
• soil supply	• 239	• 239	• 239
• crop needs	• 0-40	• 0-40	• 0-40
• excess	• 311-351	• 399-439	• 511-551

Spring management of fall cover crops

A follow-up survey of the 36 participants of the 1992 cover crop seed program that actually seeded is now complete. The wet spring caused delays in field entry and enabled the cover crops to continue growing--cover crops were alive (regrowth or overwintered) on 20 farms at the time of first cultivation. Only 3 growers felt that the cover crops delayed their planting schedule. For one grower the delay was caused by the extra work required to kill the cover crop (i.e. spraying) while the other two growers felt the cover cropped land was slow to dry and could not be worked as early as the bare land.

Twelve growers applied a herbicide to their cover crops. Control was achieved using either paraquat or glyphosate at the recommended rate.

The amount of remaining residue did not affect planting for the majority of growers (33 growers) whether they ploughed (20) or just disced (13). The remaining growers had minor problems such as clogging.

Most growers (25) have not noticed effects on the soil probably because of the short term in which they have practiced cover cropping. Eleven growers have noticed improved soil tilth, improved drainage, or wetter fields. All participants are planning on seeding cover crops this fall. In fact over 1000 acres are planned--up from the 900 acres seeded in 1992!

The Cloverdale Soil Conservation Group did not test the fields for leatherjackets because few were found in the previous spring tests. This spring only one grower complained to the conservation group of leatherjackets.

The Cloverdale Soil Conservation Group thanks the participating growers for their support of the seed program and the surveys.

秋播覆盖作物的春季管理

我们调查了36位参加去年覆盖作物种子项目的农民。潮湿天气推迟了进入田间，许多覆盖作物春季处理变得困难。少数农民用Roundup或Paraquat杀死覆盖作物，有3位农民反映覆盖作物推迟了播种下茬作物。有些农民已经注意到土壤和排水的改善，只有一位农民提到大蚊幼虫问题。全部农民都计划今秋播种覆盖作物。

Jean Hogue,
Project Technician

Surrey Farmers' Institute administers conservation project

Beginning 1 April 1993, the Surrey Farmers' Institute assumed responsibility for the financial administration of the Cloverdale Soil Conservation Group's conservation grant. This means the institute pays the project's expenses and applies to the provincial government, through Geoff Hughes-Games, for reimbursement. Because of limited capital, the institute relies on a Bank of Montreal line-of-credit.

The Cloverdale Lettuce and Vegetable Co-operative administered the federal-provincial grant for the first two years and continues to support the project by handling the employment of some project staff.

Surrey农民协会管理保持项目 1993年4月1日开始。Surrey农协接受并执行管理的拨款项目。支付项目开支并向政府申请偿还。Cloverdale生菜和蔬菜合作社也为该项目工作人员就业。

The Surrey Farmers' Institute wishes to thank the following companies for their donations that helped make a successful spring school tour program:

Lilydale Hatchery
Dairyland Foods
Lucerne Foods
Ritchie-Smith Feeds

Update on the Surrey Farmers' Institute

Many events and issues kept institute members busy this past spring. The education committee--members Michael Pohlmann, Mike Bose and Rick Law--organized a number of successful school tours at the following farms: Nicomekle Farms, Winners Holstein Farm and Law Pacific Vegetables. The committee also attended a workshop organized by the Agriculture in the Classroom foundation and learned that the institute is well-ahead of other farm groups in its education program.

This spring, the institute organized an ad-hoc committee comprised of representatives of the B.C. Mushroom Marketing Board, Fraser Valley Egg Producers' Association, Surrey Blueberry Farmers' Association, Surrey Farmers' Institute, United Flower Growers' Co-operative Association and Western Greenhouse Growers' Co-operative Association, to review Surrey's proposed zoning by-laws. The group's main concern was proposed zoning on land within the Agricultural Land Reserve that restricted land usage. This concern, along with others, was quickly addressed by the planning department and new recommendations will be forthcoming to council.

The institute's co-publication with the B.C.M.A.F.F. and the B.C.M.E.L.P., 'Pesticide Safety and Pest Management for Commercial Vegetable Growers--Chinese edition', was released early this year. The manual enabled many vegetable farmers to obtain a pesticide applicator's certificate. Copies are available from the institute.

The Second Annual Bar-b-que will be held at Mike and Novy Bose's farm on 8 August. Last year, most institute members attended the event and participated in an enthusiastic game of hockey or volleyball before dinner.

Membership continues to climb and new members are welcome to attend institute meetings on the first Wednesday in each month, held at the B.C.M.A.F.F. office on 17720-57th Ave., Surrey, at 7:30 pm. Guest speakers are usually invited for discussion on topics such as financial managment, the Agricultural Land Commission, soil analysis and wildlife issues.

Surrey 農民協會活動

Michael Pohlmann 組織了好幾次成功的學校農場參觀。

今春，我們與其他 Surrey 的農場組織一起，檢查了擬議中的 Surrey 分區立案。這個立案將限制農業活動。計劃部門根據我們的意見修改了分區立案。議會將作出最後決定。

協會的《農藥安全與病虫害防治》中文版本於年初完成，因此，許多農民得到了農藥使用人員証書。B.C.M.A.F.F. 計劃出一本 Punjabi 文的同樣的書。

會員正在增加。歡迎新會員參加每月第一個星期三舉行的協會會議：下午7點，在 Surrey 17720 - 57th Ave. 的 B.C.M.A.F.F. 辦公室。

Tim Singh, President
576-1449

Unless otherwise noted, the bulletin is written by Mary-Margaret Gaye. Production is by Jean Hogue and translation by Wei Yang Yang (Agassiz, B.C.).

Beyond 1994 ... it's up to you!

Please fill in and return the following questionnaire.

Your input is critical to future projects conducted through the Cloverdale Soil Conservation Group (CSCG). Please return as soon as possible--Cloverdale vegetable farmers can use the enclosed stamped envelope.

Rank from 1 to 5 (very important to not important) by circling your choice.

1. a) Has the Cloverdale Soil Conservation Group made you more aware of soil conservation and environmental issues? Yes ___ No ___

   b) If yes, how (rank those that apply)

	Very				Not
i) newsletters	1	2	3	4	5
ii) bulletins	1	2	3	4	5
iii) field days	1	2	3	4	5
iv) on-farm demonstrations	1	2	3	4	5
v) on-farm visits	1	2	3	4	5

2. a) Have you changed any management practices because of the CSCG? Yes ___ No ___

   b) If yes, what practices are new?

   _____

3. Do you see a need to continue the CSCG? Yes ___ No ___

4. What concerns should a new project address?

	Very				Not
i) cover cropping	1	2	3	4	5
ii) drainage	1	2	3	4	5
iii) ditch bank stabilization	1	2	3	4	5
iv) fertilizer use	1	2	3	4	5
v) manure management	1	2	3	4	5

   vi) others _____

5. How should the CSCG raise the funding to partly support another project?

   _____

6. Would you contribute $100-$200 per year (depending on farm size) to support another project? Yes ___ No ___

Please include any further comments and mail to (or telephone 576-5616):

Cloverdale Soil Conservation Group
c/o Mary-Margaret Gaye
17720-57th Avenue, Surrey, B.C. V3S 4P9

Cloverdale Soil Conservation Group

SOILNEWS

Canada-British Columbia Soil Conservation Program — Vol.4 No.1 January 1994

17720 - 57TH AVENUE
SURREY,
BRITISH COLUMBIA
V3S 4P9

FAX: **(604) 576-5652**

Our Soil...Our Future

BC Canada

Take early precautions against wireworms

According to Rick Gilmour, B.C. Coast Vegetable Co-operative, wireworms were the #1 problem with potatoes at the co-op this past season. Vegetable farmers in Cloverdale questioned if these occurrences were because of cover crops. We know of no research or reports linking cover crops to an increase in wireworm populations or activity, but the following information should help to increase the effectiveness of your control measures. This information is taken from the 1993 PNW Insect Control Handbook, passed on to us by Barb Peterson, Pro*Tech.

The larvae or immature stage of the insect does the damage--not the adult (called a 'click' beetle). The larvae is small (25 mm when fully mature) and attacks many crops. Wireworms feed on planted seeds, roots of young seedlings, and root crops. Infestations in row crops results in bare spots in the fields along with dead or wilted plants.

"Wireworms require 2 to 6 years to mature, overwintering at a depth of 30 to 60 cm in the soil, only to return near the surface in spring to resume feeding. Mature larvae pupate in the soil and develop into adults, which remain in the soil until the following spring when they emerge, mate, and lay eggs. Because the female beetles fly very little, infestations do not spread rapidly from field to field.

See **Wireworms**, page 5

去年，許多農民的芋仔受金針虫之害（一产農民的生菜苗也受害）。如果在秋季種植了覆蓋作物，使用 Diazinon 或 Lyndane 處理種子，可殺死侵食作物根部的金針虫。確定田洞有金針虫時，必須又早用推荐的農药噴治。Barb. Peterson, Protech 和 B.C. 農林漁業部有關知金針虫的資料。

WHAT'S INSIDE...

How much poultry manure is too much?

The Conservation Group surveyed farmers in 1991 and found that poultry manure was spread on 75% of the acreage. Poultry manure was generally used as a soil amendment and not as a source of nutrients for crop production. Application rates were variable but often higher than B.C.M.A.F.F. recommendations.

This season we teamed up with the Sustainable Poultry Farming Group to compare poultry manure and chemical fertilizer in carrot production. We established a side-by-side demonstration with three treatments using chemical and poultry manure alone, and combined. The manure and chemical fertilizers were spread at commercial rates using commercial spreaders.

We found that poultry manure, applied at 8 t/acre, supplied more nutrients--nitrogen, phosphorus and potassium--than recommended by the B.C.M.A.F.F. The level of excess nutrients increased when chemical fertilizer in addition to manure, was applied. Nutrient availability was most closely matched to crop requirements using chemical fertilizer.

See **Manure**, page 5.

Inputs		Manure (8 t/acre) + side-dress fertilizer ($/acre)	Manure (4 t/acre) + side-dress fertilizer ($/acre)	Pre-plant + side-dressed fertilizer ($/acre)
Poultry manure	$/unit			
• rate				0
• delivered cost $/tonne	3.88	28.25	14.13	
• tarp cost $/tonne	1.98	14.42	7.21	
• application cost $/tonne	8.07	58.83	29.42	
Total manure cost		101.51	50.76	0
Chemical fertilizer				
• pre-plant				
rate (5-12-16)(5) 700 lb/acre		0	0	
cost $/lb	$0.21	0	0	146.36
• side-dress				
rate (15.5-0-0) 220 lb/acre				
cost $/lb	$0.14	30.12	30.12	30.12
• application cost $/acre		10.00	10.00	10.00
Total fertilizer cost		40.12	40.12	196.48
Total costs		**$141.63**	**$90.88**	**$196.48**

The chart was assembled by Walter Riemann, Sustainable Poultry Farming Group.

禽粪含有丰富的养料。通常施肥施用过多时，作物不能利用全部养料。每英亩施用4－6吨禽粪，便能予种保证大多数作物需要的全部养料。

我们曾用红萝卜作试验，禽粪施用8吨／英亩，其氮、磷、钾供应量均超过B.C.省农林、渔业部推荐的指标。再用化学肥料，便增加了养份浪费。而各试验区的红萝卜产量均相等。

施用禽粪时请记住：(1)校准喷布机，以便计算禽粪用量；(2)均匀喷布田间；(3)进行化验，测知施肥的养份含量；(4)只施用作物需要的化学肥料。

Barley tops cover crops for the second year

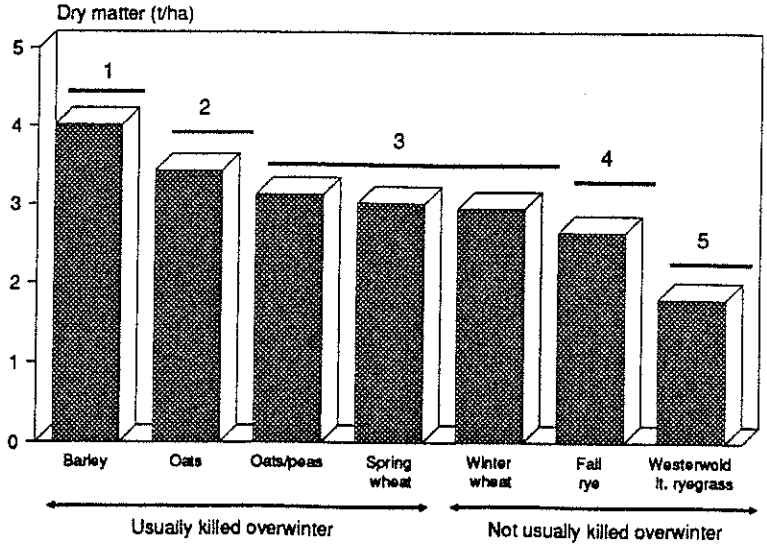
Every year, early in September, the Conservation Group seeds different cover crops to compare their fall growth. This past season the replicated trial took place at Law Pacific Vegetable Farms. Crops were seeded on 3 September 1992/93, and harvested on 3 November 1992 and 23 November 1993.

The best fall cover crop for most intensive vegetable farmers in Cloverdale seems to be one that will grow quickly after the fall cash crops are harvested, particularly when crops are harvested late in the season. Spring field preparation is easiest when cover crops are killed over the winter but a few vegetable farmers plant cover crops that renew growth in the spring thus providing an early crop of 'green chop'. Adequate fall growth means good winter protection for the soil, less weed growth and more organic matter added to the soil with the spring discing.

The results from the 1992 and 1993 fall cover crop tests were very similar. In both years, barley produced the largest yield and oats were second. Winter wheat produced the largest yield of crops surviving the winter. Good suppression of weeds was obtained in all cover crops shown in the table below. Plant height corresponded to yield production--crops with the greatest fall growth were also the tallest.

每年9月，我們播種不同的覆蓋作物，以選擇最佳的種類。三年來的結果表明，大麥在秋季生長最好，其次是燕麥。這兩種作物皆可在冬季收割。秋季生長良好的覆蓋作物能給土壤提供必要的越冬綠蔽。

Dry Weight of Fall Seeded Cover Crops



Columns under the same line are not significantly different at P=0.05 using Duncan's multiple range test.

Cloverdale Soil Conservation Group's project ends in 1994

The Conservation Group will not be applying for funding under the Greenplan to continue its conservation work. The Canada-B.C. Soil Conservation Program grant awarded in 1990 enables the project to continue until 31 March 1994.

This winter the staff of the Conservation Group will be busy continuing to address the concerns of individual farmers and preparing final reports. The reports will summarize and compile results from the three years of research trials and demonstrations. Please phone Mary-Margaret at 576-5616 to be put on the mailing list for the final documents.

由於未列入綠色計劃的資金項目，土壤保持組將不再繼續工作。現今的項目將於1994年3月31日結束。今冬，保持組將繼續幫助農民並準備最後的報告。

Pesticide course offered in punjabi

A pesticide safety course will be held in January 1994 for berry and vegetable farmers. The course will be held in punjabi. It will provide training to enable participants to write a translated version of the provincial pesticide applicator's examination. The B.C.M.A.F.F.'s new punjabi pesticide safety and crop production manual will be ready in time for the course.

Telephone Stephen Torrence, B.C. Horticultural Council, at 535-1476 for information.

一項Punjabi語的農藥安全培訓班將於1994年1月舉辦以準備農藥使用人員考試，電話535-1476找Stephen Torrence詢問

Blueberries under cover

Late spring 1991, the Conservation Group and Stan Freyman, Agassiz Research Station, established a trial to assess different cover crops planted between the rows of blueberries at Pacific Vegetable Farm. Rick and Dennis Law wanted a cover crop that would build up the soil and allow them to stop rotovating the aisles, thus saving labour costs and wear on their equipment. The cover crop would have to suppress weeds without growing into the rows of berries or requiring a lot of maintenance. Most importantly, the cover crop could not cause a loss in blueberry yield.

After two seasons of growth the Laws knew the cover crop they wanted throughout the planting, and after three seasons, the Conservation Group and Stan agreed. Sheep fescue was the winner of all crops tested--surviving saturated and acidic soils, cold winters, and the 'wear and tear' of foot traffic.

Sheep fescue was compared with birdsfoot trefoil, Ladino white clover and alsike clover--all but the fescue were legumes. In the first year of growth, the Laws mowed the cover crops two or three times to kill the annual weeds. The legumes established faster than the sheep fescue, however, the legumes crept quickly into the blueberry rows. During the second season, the sheep fescue was well-established and its slower growth pattern meant less mowing. The third season established the winner. The legumes never recovered from the cool winter temperatures in 1992/93. By late spring only the odd patch of clover or birdsfoot trefoil remained, and these plots were quickly taken over by annual and perennial weeds.

The sheep fescue plots are a now a solid, dark, bluish-green mat. Blueberry yield data collected over two seasons showed the cover crops did not cause a reduction in yield. Rick and Dennis plan to rotovate the remaining plots in the spring and re-seed with sheep fescue.

1991年保持组共 Agassiz 研究站在 Rick & Dennis Law 的蓝莓地上开始一项在蓝莓行间播种不同覆盖作物的比较试验。良好的覆盖作物可抑制杂草，不必在行间旋耕，经三季种植，羊茅表现最好。雏生长缓慢，但可形成厚实、蓝绿色的草席，防止杂草。

Farmers cut back on phosphorus fertilizer

This past season farmers again took up the 'Phosphorus Challenge' and used side-by-side test plots to look at the effects of cutting back on phosphorus applications. This is a program the Conservation Group 'borrowed' from Ontario in which farmers have the chance to try lower phosphorus application rates without risking a profit loss--for two years, the Conservation Group has offered to pay for any losses in profit caused by lower phosphorus application rates in these trials.

Phosphorus levels in many fields in Cloverdale have built up to the extent that crop yields may not be improved by added phosphorus. Adding phosphorus in this situation unnecessarily increases input costs and may increase the environmental risk of excess phosphorus entering the river systems.

Canadian Farms, Pacific Law Vegetable Farms and Hing Sing Farm each selected carrot fields with an 'optimum' or higher rating of residual phosphorus from the soil test. The farmers applied phosphorus to the test plots at about one-half the application rate of the surrounding commercial fields. This meant that rates of 81, 67 and 123 kg P_2O_5/ha were reduced to 43, 34 and 62 kg P_2O_5/ha respectively. In all cases, including 1992, the marketable yield of carrots was not reduced by lower phosphorus application rates. This year, like last, the Conservation Group did not have to pay for any profit losses!

The Conservation Group also tested phosphorus application rates in replicated carrot trials in trials conducted with Mahesh Upadhyaya (U.B.C.) and Peter Toivonen (Agassiz Research Station). Application rates ranged from 0 kg/ha to 200 kg/ha. Results from these trials are similar to the above trials--there were no differences in marketable yield between treatments. Mahesh and Peter found that phosphorus rates did not affect shelf-life.

上季，农民试在红萝卜上少用磷肥。大区试验中，他们使用的磷，只有其他土地使用的半量，而两区的红萝卜产量却相等，施肥前，土壤经过测定磷含量就已达到作物需要量，农民们本可以加较少磷肥，而红萝卜仍生长良好。增施不必要的磷肥，既费钱又损害环境。

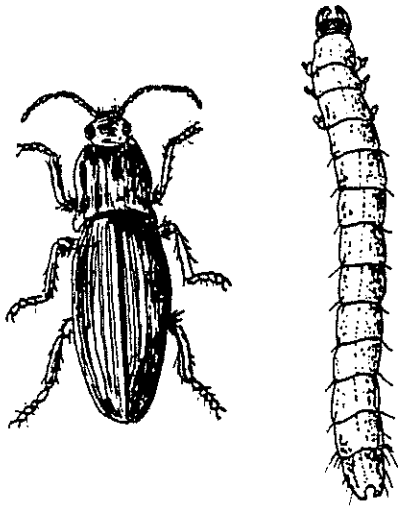
Manure - from page 2.

Applying excess nutrients--either from manure or chemical fertilizer--did not increase marketable yields but may have increased culls. Marketable yield, however, did not differ between treatments. (Telephone 576-5616 for the complete report--No. 3-2.)

The Sustainable Poultry Farming Group recommends spreading poultry manure at applications rates lower than those used in this trial. Determine the nutrient content of the manure first and then adjust chemical fertilizers to match crop requirements. In addition, calibrate manure spreaders to ensure correct application rate and uniform spreading pattern.

The table on this page shows that using poultry manure as a nutrient source, as well as a soil amendment, saves money. Reducing the poultry manure application rate to 50% of the rate used in our demonstration, further reduces input costs while maintaining the level of nutrients recommended by the B.C.M.A.F.F. for carrot production.

Wireworms - from page 1.



Soil temperatures are important in wireworm development and control. Larvae start to move upward in the spring when soil temperatures at the 15 cm depth reach 10°C. Later in the season, when temperatures reach 27°C and above, the larvae tend to move deeper than 15 centimeters where most will remain until the following spring."

B.C.M.A.F.F. insect specialist, Henry Gerber, says cover crop roots can be a food source for wireworms already in the field. However, as cover crops are usually planted after the July-August laying period of the adults, the cover crops should not increase the population of wireworms in the field.

Cover crop seed should be treated with an insecticide--diazinon or lyndane (lyndane is most effective)--prior to planting to reduce the population of wireworms. This treatment is particularly important in fields with a history of wireworms. Registered insecticides should also be applied to cash crops grown in fields with past wireworm problems.

Farmers should test for the presence of wireworms before using control measures, if they do not know the field history. Information on testing methods is available at the B.C.M.A.F.F. office, or can be obtained from Barb Peterson, Pro*Tech (328-3029).

Requests for the Paratill build

The Conservation Group's Paratill was in steady demand this past fall. More farmers are trying the Paratill for the first time as its reputation for improving field drainage spreads. Parts, such as the points, insteps and lower shin, were replaced because of wear.

Remember, the Paratill should be used when the subsoil is driest (in the fall) and on fields with compacted 'plough pans', for the best effect. Some farmers still see field improvements using it before spring planting.

The Surrey Farmers' Institute will submit an offer to the provincial government to purchase the Paratill after the conservation project ends. If the offer is accepted, the Institute plans to continue loaning the implement to farmers but will charge a nominal fee to cover maintenance and repairs. Institute members will probably be charged less. (A good reason to join the Institute!)

許多農民使用保持翅的 Paratill 以改善田間排水。Surrey 農民協會將向買這台 Paratill，以低價租給農民使用。非協會會員的租金可能會高些。這是參加協會的好處。

Farmers test PCU* nitrogen fertilizer

*polymer-coated urea

Two farmers conducting their own on-farm research called in the Conservation Group to help collect the 'finicky' data that many farmers cannot take the time to gather during a busy cropping season. The farmers--Jim Sprangers and Ray Wong--tested a relatively new slow-release, polymer-coated urea (PCU). This fertilizer is more costly than the nitrogen sources commonly used in vegetable production but if the claims of higher yields or fewer field trips are accurate, it may be worth the extra money.

The trials were set-up in a side-by-side design using large plots within the commercial vegetable fields. PCU nitrogen was compared to sulphur-coated urea nitrogen (SCU) in potato and carrot crops (the carrot SCU treatment was also side-dressed with $CaNO_3$). Results collected by the Conservation Group were mixed.

A word of warning! The demonstrations were only conducted for one year and should be repeated to confirm the results. Farmers should test new products for at least two years to improve the reliability of the results.

PCU applied to potatoes resulted in a 20% increase in marketable yield. Grade-out data on the test field from B.C. Coast Vegetable Co-operative was used to calculate the difference in net revenue resulting from SCU fertilizer. This difference--$121/ha--is shown in the table below.

The carrot trial did not show the same results. There were no differences in marketable yield between the two fertilizer treatments but the cull yield was larger in PCU treatments. Farmers may, however, see a difference in net revenue if the carrots are not side-dressed, thus reducing the number of field trips. Telephone 576-5616 for a complete report (No.3-7).

兩位農民在大區上比較了新的 PCU 氮肥。PCU 是一種緩慢釋放的氮素。我們也作了測驗，將 PCU 與硫酸鈣或硫膜尿素比較。在一組測驗中 PCU 與硫酸鈣包膜的紅蘿卜產量相等，在芋仔測驗中，PCU 區的產量較硫膜尿素區為高。我們只測驗了一年，農民應測驗新作物至少兩年，以取得可靠結論。

Effects of SCU and PCU on farm revenue in potato production.

Potato crop	SCU	PCU	Difference
Total yield Marketable yield	50.1 t/ha 35.1 t/ha	55.8 t/ha 39.1 t/ha	5.7 t/ha 4.0 t/ha
Revenue	$1170/ha	$1303/ha	$133/ha
Fertilizer cost	$58/ha	$70/ha	$12/ha
Net change in revenue	$1112/ha	$1233/ha	**$121/ha**

Reports now available.

Please telephone 576-5616 to receive one of the following reports:

No. 3-1. Effect of glyphosate on established cover crops, 1992 and 1993 results.
No. 3-2. Poultry manure demonstration results.
No. 3-3. Carrot phosphorus rate and placement, year 3.
No. 3-4. Carrot nitrogen application rate and timing, year 2.
No. 3-5. Spring-seeded cover crops species evaluation, year 3.
No. 3-6. Phosphorus challenge, year 2.
No. 3-7. Slow-release nitrogen demonstration.
No. 3-8. Fall-seeded cover crops, year 2 and 3.

Students survey vegetable fields for unused nitrogen

Crop	Farm	Ammonium-N (ppm)	Nitrate-N (ppm)	Nitrate-N* (kg/ha)
Romaine lettuce	Farm 1	11.2	401	146-182
	Farm 2	3.6	228	70-87
	Farm 3	0	288	166-208
	Farm 4	0	158	70-87
	Farm 5	5.6	229	117-146
Potatoes	Farm 6	1.1	34	13-16
	Farm 3	2.9	79	37-47
	Farm 7	14.1	51	21-26
	Farm 8	4.1	46	24-30
	Farm 9	0	68	50-63
Carrots	Farm 9	2.5	109	39-49
	Farm 7	2.9	31	11-13
	Farm 3	0	48	26-33

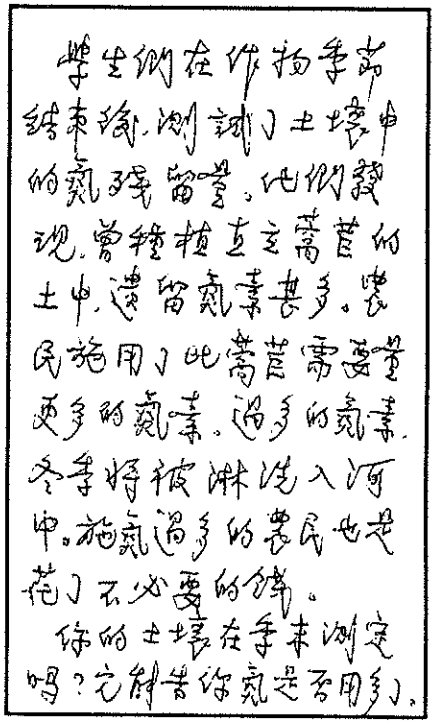
* *Calculated from organic matter content of soil. See box.*

Students from the University College of the Fraser Valley, Andrea Sorensen, Tony Rudd and Sarah Davidson, surveyed a number of Cloverdale fields in the late fall to find out how much nitrogen was left in the soil after the commercial crops were harvested. Because of heavy rainfall in this area, almost all the available nitrogen is leached from the soil over the winter and nitrogen must be added in the spring to meet crop requirements. In the lowlands, excess nitrogen is most likely leached into the river systems rather than the groundwater. Aquatic life can be seriously affected by ammonia losses into the river.

The number of fields surveyed was limited as final harvesting was completed in many fields. The level of unused nitrogen did not appear excessively high in the fields with the exception of fields cropped to romaine lettuce. These fields showed high residual levels of nitrate-N--the form of nitrogen readily leached with rainfall (see the table above).

Testing nitrogen levels after harvesting can be done at very little cost. This 'report card' on fertilizer application rates may give you the information necessary to reduce rates and thus save money that would otherwise be spent on unused and lost nitrogen.

For soils with an organic matter content of 70%, parts per million (ppm) is roughly converted to kg/ha by dividing by 2 (based on a weighed sample analyzed by Norwest Labs). This means that 300 ppm residual nitrogen is about the same as 150 kg-N/ha. As the organic matter content in the soil drops to 30%, the parts per million becomes equivalent to kg/ha. The B.C.M.A.F.F. recommends applying 150 kg-N/ha for romaine lettuce production on organic soil. In the fields surveyed, farmers would be able to grow another crop of romaine and use very little additional nitrogen--in some cases by adding no nitrogen!



學生們在作物季節結束後，測試了土壤中的氮殘留量。他們發現，當種植直立萵苣的土中，遺留氮素甚多。農民施用了此萵苣需要更多的氮素。過多的氮素，冬季將被淋洗入河中。施氮過多的農民也是花了不必要的錢。

你的土壤在季末測定嗎？它能告訴你氮是否用多。

We wish you a prosperous and happy new year.

祝大家新年昌盛，快樂！

Unless otherwise noted, the bulletin is written by Mary-Margaret Gaye. Production is by Jean Hogue and translation by Wei Yang Yang (Agassiz, B.C.).

from the Surrey Farmers' Institute...

Now is the time to join the Surrey Farmers' Institute--the organization representing Surrey farmers. Here is a list of our 1993 accomplishments:

- This year we received good recognition from local and provincial governments. Issues affecting farmers were often brought to the institute for comment. Members now sit on a number of committees that enable us to effect changes vital to Surrey's agricultural community and to raise the profile of agriculture. These committees are:
  i) Greater Vancouver Regional District, Agricultural Advisory Committee
  ii) City of Surrey, Serpentine-Nicomekle Flood Control Strategic Study, Technical Liaison Committee
  iii) City of Surrey, Economic Development Strategy, Planning and Development, Advisory Committee
  iv) City of Surrey, Business Development Working Advisory Committee
  v) Surrey Chamber of Commerce, member
- We continued to lobby in the interest of Surrey farmers.
  i) We formed an ad hoc committee of major farm organizations in Surrey (B.C. Mushroom Marketing Board, Fraser Valley Egg Producers' Assoc., Surrey Blueberry Farmers' Assoc., United Flower Growers' Co-operative Assoc., and Western Greenhouse Growers' Co-operative Assoc.) to successfully prevent the re-zoning of agricultural land in Surrey. Surrey's plans would have excluded greenhouses from many areas. Because of our efforts, land within the Agricultural Land Reserve is now zoned A-1 with no restrictions on farm activities. We also addressed other by-laws affecting farming, such as parking regulations, noise, glare, etc. Our work has led to an agreement by Surrey's planning department to assess the zoning by-laws affecting agriculture, for their new community plan. We are now consulting with the planning department concerning our request for an agricultural study that will provide the basis for an agricultural plan.

  ii) We wrote letters to numerous politicians concerning the Thompson Commission's review of the Employment Standards Act. In addition, we wrote to appropriate politicians and agencies concerning land use issues such as drainage, use of municipal land in the A.L.R., and applications for golf courses.
- Our educational program is very active. Members conducted many farm tours for Surrey elementary schools in 1993 and requests for 1994 farm tours are mounting. Representatives of the B.C.M.A.F.F., Agriculture in the Classroom and the G.V.R.D. have requested information on our program and advertised it in various publications. This program increases public awareness of agriculture.
- We assumed administrative responsibility of the Cloverdale Soil Conservation Group--a government funded conservation program.
- We organized a produce booth and display at the Campbell Valley Country Celebration Fair--a fair sponsored by the G.V.R.D. Our display won special recognition from the G.V.R.D. We also had a booth at the Cloverdale Fall Fair where our members sold corn and pumpkins.
- Our traffic committee continued to address members concerns and to 'get the answers' from appropriate authorities upon request from the membership.
- We held a well-attended second Annual Fall Picnic and Christmas dinner.
- We produced a pesticide safety and pest control manual in Chinese with the Province of B.C. This manual formed the basis of a B.C.M.A.F.F. training program in Cantonese.
- We had the following guest speakers at our monthly meetings: D. Twitchett (financial planning), J. Previer and M. Tate (Boundary Bay Conservation Committee), B. Hermann (Pacific Soils Analysis), B. Mitchell (Bank of Montreal), K. Miller and M. Hornell (Agricultural Land Commission), D. Sands (Green Zone Administrator B.C.M.A.F.F.), and P. Bains (B.C. Horticultural Council).

Membership fees for the first year are $100, and $80 for subsequent years. Applications can be obtained by phoning Mary-Margaret Gaye (576-5616, work; 931-3301, home) or any institute member.

Part 3. Bulletins

Cloverdale Soil Conservation Group
SOILBULLETIN

Canada-British Columbia Soil Conservation Program — August 1992

Field-Stored Manure Now Affected by Provincial Regulations

The new Agricultural Waste Control Regulation, with the attached Code of Agricultural Practice for the Waste Management Act, became law on 9 April 1992. Agricultural wastes--including manure--must be handled in a manner that prevents pollution.

The new laws affect any farmer field-storing manure over the fall and winter for spring use.

Briefly, the regulations affecting field-stored manure are as follows:

- Manure stored longer than 2 weeks in a field must be located at least 30 m from any water course (eg. ditch) or domestic well.
- Manure storage facilities (structures, bermed areas, or tanks) can be located a minimum of 15 m from any water course and 30 m from a domestic well.
- Manure stored longer than 2 weeks must be covered to prevent nutrients leaching--no matter how far it is stored from a water course.

Copies of the Code of Agricultural Practice are available from the B.C.M.A.F.F., or phone Mary-Margaret Gaye at 576-5616.

What can a farmer do to meet the regulations?
An inexpensive solution to prevent nutrients leaching from stored manure is to cover the pile with a plastic tarp. The cover can be held in place with tires.

田間堆放廄肥已受政府法規制約

新的農業廢物管理法規及廢物管理的農業實施附加條例，已於1992年4月9日成為法律。農業廢物（包括廄肥）的處理，必須以避免污染為前提。

新法律制約任何農民在田間堆放的、越過秋冬供春季使用的廄肥。要點簡述如下：

- 放置時間長於2週的田間廄肥必須至少距水道（如水溝）或家庭水井30米。
- 廄肥存放設備（建築物、圍板區或廄肥池）可位於距水道至少15米，距家庭水井30米處。
- 放置時間長於2週的田間廄肥，無論其距水道遠近，均應覆蓋以防止養份淋溶。

農業實施條例的複印件可向B.C.M.A.F.F.索取，或電話Mary-Margaret（576-5611）。

農民如何遵守法規？
防止養份淋溶的經濟辦法，是用塑

A permanent storage facility can be built with the help of a low-interest A.L.D.A. loan (phone the B.C.M.A.F.F. for information).

What procedures will be followed if manure is not stored properly?

Farmers shown to be polluting are liable for prosecution. Most likely an order will be issued for the producer to stop the pollution. The producer must develop, and implement, a plan to resolve the problem.

All this means more work and expense. Are the benefits of manure worth it?

Yes. Manure adds nutrients to the soil that can be used by growing plants. Farmers can reduce the amount of chemical fertilizer applied for the cash crop. (See the B.C.M.A.F.F.'s 'Vegetable Production Guide' for the nutrient content of various manures.)

Manure also adds organic matter that helps to build up the soil--particularly important for the mineral soils appearing in Cloverdale fields. Good soil structure will improve the downward movement of water through the soil (increased infiltration), and result in water draining more quickly from the soil after a heavy rain.

What about late summer or early fall applications of manure?

Manure is best applied in the spring. It can be applied after the last cash crop is removed but, without careful handling, valuable nutrients will be lost. Some nitrogen is highly volatile and can escape into the atmosphere. Nitrogen not lost to the atmosphere, and other nutrients, can be flushed into river systems during the rainy winter months. This nutrient loss means higher rates of chemical fertilizers must be applied for the cash crop in the following season. It can also result in high nutrient levels in the river systems, that can be harmful to fish.

料防水布覆盖肥堆，覆盖物可用轮胎加以固定，

修建永久性的存放設備，可申請A.L.D.A.援助的低息贷款。（電話B.C.M.A.F.F.索取資料）

廄肥存放不當，有何法律後果？

造成污染的農民將受到起訴，很可能發布命令給生產者停止污染，生產者必須制定並執行計劃，以解決污染，

所有這些意味着更多的工作與花費，廄肥還值得施用嗎？值得，廄肥給土壤添加可利用的養份，農民可減少用於經濟作物的化學肥料用量。（參看B.C.M.A.F.F的《蔬菜生產指南》了解各種廄肥的養份含量。）

廄肥也增加有機質，改良土壤結構——對於Cloverdale的礦質土尤為重要。良好的土壤結構能促進水份向下移動（增加滲透），從而使大雨後的排水更加迅速，

晚夏或早秋的廄肥如何施用？

廄肥最好是在春季使用，最後一茬經濟作物收後便施下廄肥，由於未經妥善處理，養份會損失，有的氮素極易揮發，逸入大氣，冬季的多雨季節，其它養份被冲進河流，這樣，下茬經濟作物得施用更多化學肥料，同時也導致河流中養份

Nutrient losses can be minimized in the following ways:

1. **Manure should be incorporated into the soil as soon as possible after application to avoid nutrient losses.** Nitrogen losses from manure application without incorporation are over 20% of the total nitrogen in the manure after 4 days, and about 40% after 7 days. Immediate cultivation after application will reduce nitrogen losses after 4 days to about 5%.

2. **An actively growing cover crop will take up nutrients that may otherwise be lost over the winter months.** The cover crop should be planted before 15 September to maximize nutrient uptake. Nutrients taken up by the cover crop are later released into the soil as the plant decomposes. The nutrients are thus recycled for later use by cash crops.

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的高浓度，对鱼类受害。

採用以下方法，養份損失可減少到最低限度。

1. 厩肥施用後應盡早與土壤掺合以避免養份損失。4天後，未经掺合使用的厩肥，養份損失達总量的20%以上，7天後約達40%。施用後立即翻耕，4天後的養份損失約可降低5%。
2. 生長茁壯的覆蓋作物能吸收養份，否則，這些養份可能在冬季損失。覆蓋作物應於9月15日以前種植，以使吸收更多的養份。當植株分解時，被覆蓋作物吸收的養份又釋放進入土壤。養份如此循環，當下茬经濟作物可利用。

Cloverdale Soil Conservation Group
SOILBULLETIN

Canada-British Columbia Soil Conservation Program — September 1992

Seed Cover Crops by 15 September for Best Results

The response of Cloverdale's vegetable farmers to the Cover Crop Seed Program has been overwhelming! To date, 35 farms--almost all the growers farming the black, organic soils--are planting a cover crop this fall. Ten farmers ordered about 23 tons of extra seed through the Surrey Farmers' Institute, to increase their acreage of cover crops.

Need more seed? *Phone Tim Singh at 576-1449. He produced a bumper crop of barley on a field he let rest for a year--the seed is cleaned and can be purchased at bulk rates by anyone still wanting additional seed.*

We apologize for the late delivery of the second order. Our supplier, Morango Hay Sales (534-2689), was waiting for the barley crop in Alberta to mature but it was destroyed with the recent cold weather. The barley seed supplied was grown in Delta, B.C. and cost $7.75/50 lb. (cleaned). The oat seed was brought in from Alberta and cost $7.95/50 lb. (cleaned). Members of the Surrey Farmers' Institute paid less for bulk seed.

9月15日以前播種覆蓋作物效果最好

Cloverdale的菜農響應種植覆蓋作物，勢不可擋！迄今為止，35個農場（幾乎座落在黑有機土帶的全部農民）將在秋季種植覆蓋作物，10位農民通過Surrey農民協會，額外定購了23噸左右種子，以增加他們的覆蓋作物面積。

需要更多種子嗎？電話576-1449給Tim，他在休閒1一年的地上種植大麥，獲得大丰收，現種子已揚淨，有意增購者，能以優惠價購買。

第二次訂購的種子推遲交貨，我們表示道歉。供貨店Morango Hay Sales（534-2689）當時正在Alberta等候大麥種子成熟，但它毀於最近的冷害。已供應的大麥種子是Delta, B.C.生產的，售價7.75元/50磅（揚淨），燕麥種子購自Alberta，售價7.95元/50磅（揚淨），Surrey農民協會會員，購時能享受優惠價。

These farms are participating in the Seed Program:

下列農場參加了"種子計劃":

- Bill Cho Farm (10 acres)
- Brar Bros. Farm (10)
- Canadian Farm (10)
- Chau Sun Yuen Farm (2)
- Chow Farm (5)
- Chu Lin Farm (10)
- Churk's Farm (2)
- Cloverdale Produce (10)
- Dun Kin Farm (10)
- Ferco Vegetables (10)
- Greenfield Farm (1)
- Heppell Bros. (10)
- Hing Sing Farms (10)
- Hop Hing Farm (10)
- Howe Wong Farm (10)
- Jack's Garden (10)
- James' Garden (10)
- John Yue Farm (10)
- Kang Farm (10)
- Kim's Farm (10)
- Kwong Lee Farm (10)
- Lam Su Farm (5)
- Maddocks Farm (10)
- Mary's Garden (10)
- Medowmist Farms (10)
- Pacific Vegetable Produce (10)
- Paul Garvin Farms (10)
- Premier Produce (10)
- S. & A. Chow Farm (1)
- Shu Yao Farm (1)
- Singh, George (4)
- Sprangers, Bill (10)
- Sprangers Farm (10)
- Wing Hing Yuen (2.5)
- Yue Wo Farm (10)

Seeding Time is Now! Here are a few seeding hints:

- Cover crops are best seeded before 15 September for a good winter cover and to take up nutrients left over from the previous cash crop. Cover crops seeded in October produce very little organic matter. They also may survive a winter that would kill a more established plant. Spring management is easiest when the plants are killed by frost.

- Plant your fields as the cash crop is removed rather than waiting until you can plant all your seed at once. One farm in the area--Sprangers Farms--has already seeded 107 acres in cover crops and will plant more as the season progresses. Cover crops are planted within days after the land is clear. Gerry and Jim noted tremendous potato yields following last season's cover crop and are anxious to see the same results next year.

- Seed at about 100 lb/acre--two of the bags supplied by the Seed Program.

- Drilling produces the most uniform stand but good winter covers can also be produced by broadcasting with a fertilizer spreader (follow this with a light discing or harrowing). Last year some farmers successfully hand-broadcasted small areas.

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現在播種時節已到！

這里提供我點參考意見：

- 覆蓋作物在9月15日前播種最好，能形成良好的冬季覆蓋，并吸收前作留下的養料。10月播種的，只生產極少的有機質，還可能存活一冬，而冬季常殺死生長高大的植株。植株被霜凍殺死，春季管理較為省事。
- 等着在經濟作物收後，便立即下種，不要等到第一次全部完的時才下種。本地的Sprangers農場已種下107英畝覆蓋作物，天氣好時還要再種。土地清理後，幾天內便種覆蓋作物。Gerry和Jim注意到，在上季覆蓋作物後的土地上種薯仔，產量極高，他們渴望明年種有同樣結果。
- 播種量約為每英畝100磅——兩袋"種子計劃"供應的種子。
- 條播能形成整齊一致的群體，但用施肥機撒播（播後用輕圓盤耙或耙）也能形成良好的冬季覆蓋。去年有些農民成功地用手撒播小塊土地。

Cloverdale Soil Conservation Group
SOILBULLETIN

Canada-British Columbia Soil Conservation Program — October 1992

Paratill Now to Ease Spring Soil Management

Now is the time to prepare your fields for winter. Don't stop with cover cropping! Good management now means workable soil early in the spring.

The subsoiler purchased by the Conservation Group--a Paratill--is good for Cloverdale's muck soils. It does not bring up clay subsoil in fields with shallow muck layers.

Fall is the best time to subsoil. The subsoil is driest and 'shatters', leaving cracks for field drainage. This helps to eliminate the standing water present on many fields during the winter. Flood water damages the soil and increases field drainage problems. The photo shows Tim Singh's field on 168th Ave. last winter.

Many farmers using the Paratill last fall noted remarkable differences in field preparation. Fields with past drainage problems were workable early in the spring.

Field planted to a cover crop? Gilbert Wong and Tim Singh have subsoiled fields planted to cover crops. Crop damage is minimal with small plants--less than 30 cm in height.

Phone 576-5616 to borrow the Paratill (leave a message).

借用 Paratill 機，打電話到 576-5616（留話）

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Project Manager

Translation: Wei Yang Yang,
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Paratill 機現在就為春季土壤管理出力

現在是為你的田地過冬作準備的時候了。別停止覆蓋作物！此時的良好管理意味着春季提早耕作的土壤。

Conservation Group 購買的 Paratill 深耕機，對 Cloverdale 的沼澤土很有好處。它不會把粘重的底土翻到淺層頂層。

秋季是深翻的最佳時節。這時的底土最乾燥"易碎"，給田間排水形成裂縫。深翻有助於消除冬季田間積水，積水損害土壤并增加排水困難。照片是去冬 Tim Singh 的 168 Ave. 田地。

許多去秋用過 Paratill 的農民注意到田間準備工作的明顯差別。以前排水有問題的田地，早春便种耕作了。

Gilbert Wong 和 Tim Singh 已在種了覆蓋作物的地上深翻。作物損害最小的是矮植株——高度低於 30 cm 的植株。