FRASER RIVER ACTION PLAN

Trends In Commercial Fertilizer Use In The Lower Fraser Valley 1997

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TRENDS IN COMMERCIAL FERTILIZER USE
in the
LOWER FRASER VALLEY
1997

Prepared for

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1.0 INTRODUCTION

This report summarizes information collected on recent trends in the use of commercial fertilizers in Lower Fraser Valley agriculture. Retail fertilizer sales data obtained from the Canadian Fertilizer Institute (Canadian Fertilizer Institute; 1994-96 and Western Canada Fertilizer Association; 1989-1993) and selected data from the 1991 and 1996 Censuses of Agriculture (Statistics Canada; 1997a, 1997b, 1994, 1992, 1991) were compiled. Data on commercial fertilizer use in the Sumas River and Matsqui Slough Watersheds in 1997, collected by GrassRoots Project Management (GrassRoots; 1998), was also summarized. Representatives of Lower Fraser Valley fertilizer suppliers, the BC Ministry of Agriculture, Fisheries and Food and Agriculture and Agri-Food Canada were interviewed to obtain their observations of and comments on recent trends in local fertilizer usage.

This report updates some of the data contained in and refers to a previous report on the use of commercial fertilizers in the Lower Fraser Valley, "Application of Inorganic Fertilizers in the Lower Fraser Valley - Data Summary Report" (Brisbin and Runka; 1995).

2.0 RETAIL FERTILIZER SALES

Data on retail fertilizer sales in Canada are compiled by the Canadian Fertilizer Institute. Recent sales data for Southern British Columbia are presented in Table 1.

The data presented includes the total retail sales in terms of tonnes of nitrogen (N), phosphate (P_2O_5), potash (K_2O) and sulphur (S), reported on the basis of a "fertilizer year". A fertilizer year ends June 30.

The Southern British Columbia area is all of BC except for the Peace River area. This data is not available for smaller geographic areas.

The total retail sales include all retail sales whether for agricultural or non-agricultural uses. No effort has been made to estimate what proportion of these sales were for agricultural purposes.

The data shows considerable variation in yearly sales from 1990 to present, but no obvious trends up or down.

3.0 CENSUS OF AGRICULTURE DATA

Selected Lower Fraser Valley data from the 1991 and 1996 Censuses of Agriculture, by Regional District, are presented in Table 2.

Regional District boundaries changed between the 1991 and the 1996 Census. The former Central Fraser Valley and Fraser-Cheam Regional Districts are now part of the Fraser Valley Regional District. The Fraser Valley Regional District also includes that portion of the former Dewdney Alouette Regional District east of the Mission - Maple Ridge municipal boundary. The new Greater Vancouver Regional District includes the

former Greater Vancouver Regional District plus that portion of the former Dewdney-Alouette Regional District west of the Mission - Maple Ridge municipal boundary.

Table 2 presents the same data as Lower Fraser Valley totals and shows the reported changes from 1991 to 1996.

The following definitions apply to this data.

Land in crops:
1996:
- sum of all areas reported for field crops, tree fruits and nuts, berries and grapes, vegetables, nursery products and sod.

1991:
- sum of all areas reported for field crops, fruits, vegetables, nursery products and sod.

Land used for pasture is not included in this land use category.

Commercial Fertilizer Use:
1996:
- the area, in 1995, on which commercial fertilizer was used.

1991:
- the area, in 1990, on which commercial fertilizer was used.

Fertilizer and Lime Purchases:
1996:
- fertilizer and lime purchases in 1995 (calendar year) or for the last complete accounting (fiscal) year.

1991:
- fertilizer and lime expenses in 1990 (calendar year).

The total number of farms reporting increased by 12%, from 5773 in 1991 to 6441 in 1996, while the total reported area of farms increased by 5%, from 90,074 ha to 94,130 ha. The amount of land in crops also increased by 5%, from 50,643 ha to 53,269 ha.

There are problems with using Census of Agriculture data to generate inventory information for a specific geographic area. The two most significant problems are expected to be under reporting by producers and the way in which the collected data is presented by geographic area.

When Census of Agriculture data is tabulated, reporting for a specific geographic area is based on the location of the farm headquarters. If the farm headquarters is located within the specified area all livestock, poultry and cropping information associated with that farm operation is included whether or not they are located in the specified area.

No effort was made in this current study to determine to what extent the increase in the number of farms reporting, the total area of farms and the amount of land in crops was due to more complete reporting, the location of farm headquarters causing data to be reported for a particular area when that activity was occurring in a different geographic

area or to a true increase in the number of farms, total farm area and amount of land in crops. A true increase in the total area of farms would be surprising.

While the total number of farms reporting increased by 12%, the total area reported area of farms and the total reported area of crops increased by only 5% each. Although this suggests a decrease in the average size of farms and a decrease in the average cropped area per farm, this data may indicate a more complete reporting by smaller farms in the 1996 compared to 1991.

The number of farms reporting commercial fertilizer use increased by 6%, similar to the 5% increase in the number of farms reporting land in crops, while the reported area on which commercial fertilizer was used increased by only 1%.

In both the 1991 and 1996 Census the number of farms reporting fertilizer and lime purchases or expenses was significantly greater than the number of farms reporting fertilizer use. The number of farms reporting fertilizer and lime purchases or expenses increased by 15%, compared to a 5% increase in the number of farms reporting commercial fertilizer use.

Fertilizer purchases reported in 1996 were 37% greater than the fertilizer and lime expenses reported in 1991, however fertilizer prices increased substantially during this period. Changes in fertilizer prices are discussed in Section 4.

In an effort to overcome the problems associated with comparing the total reported values, as discussed above, selected ratios of Census data were calculated. These ratios are summarized in Table 4.

The number of farms reporting land in crops to the total number of farms reporting decreased from 62% to 59%, suggesting a lower percentage of farms with cropped land. The area of land in crops to the total area of farms increased from 56% to 57%, suggesting that the ratio of total farm area in crops remained fairly constant.

Ratios which include commercial fertilizer use suggest a downward trend in fertilizer use. The ratio of the number of farms reporting fertilizer use to the total number of farms reporting decreased by 5% and the ratio of the area of land on which commercial fertilizers were applied to the area of land in crops decreased by 4%.

On the other hand ratios involving fertilizer and lime purchases or expenses showed significant increases. The ratio of fertilizer and lime purchases to area of land in crops increased by 30%, from $379/ha to $492/ha. However, fertilizer prices in 1995 were significantly higher than those which were experienced in 1990. Changes in fertilizer prices are discussed in the following Section.

4.0 FERTILIZER PRICES

Fertilizer prices effective during the reporting period of the 1996 Census of Agriculture (January 1995 to May 1996) were significantly higher than those which would have

been effective during the 1991 Census reporting period (January 1990 to December 1990).

Statistics Canada reports, on a monthly basis, industrial product price indexes for a number of goods, including several fertilizer related chemicals.

This note to readers is contained in "Industry price indexes - August 1997" (Statistics Canada; 1997):

> The Industrial Product Price Index (IPPI) reflects the prices that producers in Canada receive as the goods leave the plant gate. It does not reflect what the consumer pays. Unlike the Consumer Price Index, the IPPI excludes indirect taxes and all the costs that occur between the time when a good leaves the plant and the time when the final user takes possession of it, including the transportation, wholesale, and retail costs.

Monthly price indexes from January 1987 to August 1997 were compiled for five fertilizer related products. The annual average of these indexes (1986 = 100) are presented in Table 5. The 1990 and 1995 annual averages and the percentage change in these values were:

product	avg index - 1990	avg index - 1995	change
ammonium nitrate	101.1	142.7	41%
ammonium phosphates	91.3	120.9	32%
urea	87.3	139.5	60%
fertilizer chemicals	91.2	131.8	45%
mixed fertilizers (Western Canada)	98.1	128.4	31%

The increase in average product price indexes from 1990 to 1995 ranged from 31% to 60%. On a per hectare of land in crops basis the fertilizer and lime purchases reported in the 1996 Census were 30% higher than the fertilizer and lime expenses reported in the 1991 Census. Comparing the increase in product price indexes to the increase in unit fertilizer and lime purchases or expenses suggests that the per hectare application of commercial fertilizers decreased between 1990 and 1995.

5.0 DISCUSSION BY CROP GROUP

The most recent and area specific data on commercial fertilizer usage is that collected by GrassRoots Project Management during the summer and fall of 1997. This data was collected as part of a waste management survey of agricultural producers within the Sumas River and Matsqui Slough watersheds (GrassRoots; 1998) done for Environment Canada. Results of a preliminary analysis of the commercial fertilizer usage for forage grass and silage corn is included in the following sections and is summarized in Table 6.

As well these discussions of commercial fertilizer use by major crop group include comments on recent trends obtained from representatives of local fertilizer suppliers and of the BC Ministry of Agriculture, Fisheries and Food and Agriculture and Agri-Food Canada.

In general commercial fertilizer use in agriculture is decreasing. The recent upward trend in fertilizer prices and an increasing awareness by producers of potential environmental problems are significant factors which are encouraging better nutrient management. Improved utilization of manure nutrients and a reduced reliance on commercial fertilizers appears to be, in many cases, significant.

5.1 Forage Grass

Commercial fertilizer use on forage grass crops has been decreasing over the past few years.

GrassRoots Project Management collected data on commercial fertilizer applications to forage grass crops from 100 farms, representing 2809 ha, in the two watersheds. The weighted average annual application rates over the two areas were calculated to be 155 kg/ha of N, 4 kg/ha of P_2O_5 and 3 kg/ha of K_2O. This compares to estimated 1991 average annual applications of commercial fertilizers to forage grass crops in these two watersheds of 186 kg/ha of N, 43 kg/ha of P_2O_5 and 54 kg/ha of K_2O (Brisbin and Runka; 1995). The corresponding reductions are 17% for nitrogen, 91% for phosphorus and 94% for potassium.

Based on the comments received the significant reduction in the use of potassium was anticipated in that producers have become more aware of high levels of potassium in their forage crops and the related herd health problems in dairy operations. There are several producers who have applied no commercial fertilizer potassium for the past few years; of the 100 operations growing forage grass surveyed by GrassRoots only 16 indicated that commercial fertilizers containing potassium had been applied.

A significant reduction in phosphorus applications was also anticipated, however the magnitude of the reduction indicated by the GrassRoots data is perhaps surprising. Only 22 of the 100 operations growing forage grass applied phosphorus in the form of commercial fertilizers.

Applications of commercial fertilizer nitrogen was expected to have decreased since observations indicated that several producers have reduced their application of commercial nitrogen fertilizer over the past 5 or so years. On these operations the reduction may be as high as 30 to 35%, or perhaps 50 kg-N/ha. The GrassRoots data indicates an average reduction of 17%, or 31 kg N/ha, in commercial nitrogen applications to forage grass crops.

The most significant factor in the reduction in commercial nitrogen applications is an increasing reliance on manure to provide nutrients for the first cut of grass. While no previous information on the extent of regular soil fertility testing was collected the GrassRoots data shows that 92% of the farms growing forage grass in the Sumas River and Matsqui Slough Watersheds, representing 91% of the total forage grass area reported in the surveys, now rely on some form of annual soil fertility testing.

The 1996 Census reports 25,135 ha of "all other tame hay", which excludes areas planted to alfalfa or alfalfa mixes, in the Lower Fraser Valley. This is 49% of the total

land in crops. A 50 kg-N/ha reduction on this area would represent a total reduction in nitrogen applications of 1257 tonnes-N/year. Total commercial nitrogen applications to grass land, excluding pasture, were estimated to be 3192 tonnes-N/year in 1991 (Brisbin and Runka; 1995). Total commercial nitrogen applications in the Lower Fraser Valley agriculture were estimated to be 5866 tonnes in 1991. A 1257 tonne reduction would therefore represent a reduction in total commercial nitrogen applications of about 21%. If the GrassRoots data is representative for the entire Lower Fraser Valley, a 31 kg N/ha reduction applied to 25,135 ha would mean 717 fewer tonnes of nitrogen are now being applied to forage grass crops compared to 1991.

However, for many of the producers who have reduced commercial nitrogen fertilizer applications further reductions are not anticipated. Nitrogen is considered a primary factor in achieving good yields and good quality forage. Relatively high land values motivate producers to maximize, or come close to maximizing, yields. As well some producers have reduced nitrogen applications to the point of having a reduced protein content, and this is not considered acceptable. If a 50 kg N/ha reduction in commercial nitrogen applications is the maximum which producers will accept and if a reduction of 31 kg N/ha has already been achieved, a further reduction of perhaps only 480 tonnes per year can be anticipated for forage grass crops in the Lower Fraser Valley.

5.2 Corn for Silage

Commercial fertilizer use on corn land has been decreasing as well. The upward trend in fertilizer prices is encouraging better nutrient management and it appears that producers generally perceive that the environmental risks associated with nutrient applications to corn land are higher than those associated with applications to grass land.

There is a trend towards more reliance on manure nutrients for pre-planting application, with some producers applying only manure before planting, and the pre-sidedress soil nitrate test (PSNT) for corn silage is rapidly gaining acceptance.

The data on commercial fertilizer applications to silage corn in the Sumas River and Matsqui Slough watershed areas collected by GrassRoots Project Management support the contention that there has been a significant reduction reliance on commercial fertilizers. Data from 99 producers growing corn for silage, representing 1837 ha of silage corn land, were collected. The weighted average application of commercial fertilizers to silage corn land was calculated to be 62 kg/ha of N, 67 kg/ha of P_2O_5 and 16 kg/ha of K_2O. This compares to application rates of 140 kg/ha of N, 90 kg/ha of P_2O_5 and 95 kg/ha of K_2O estimated for 1991 (Brisbin and Runka; 1995). Comparing the two sets of data indicates reductions of 78 kg/ha of N (56%), 23 kg/ha of P_2O_5 (26%) and 79 kg/ha of K_2O (83%).

A total of 6201 ha of corn for silage area in the Lower Fraser Valley, 12% of the area of land in crops, was reported in the 1996 Census. If nitrogen applications were reduced by 78 kg-N/ha on this area the total reduction in nitrogen applications would be 484 tonnes-N/year. An estimated total nitrogen application to silage corn land of 830 tonnes-N was estimated for 1991 (Brisbin and Runka: 1995). The total application of commercial nitrogen in Lower Fraser Valley agriculture was estimated to be 5866

tonnes-N in 1991. A 484 tonne reduction may therefore represent a reduction of about 8% in total commercial nitrogen applications.

The PSNT methodology is used to evaluate soil nitrate levels prior to a side-dress application of fertilizers (generally early to mid-June) and base nitrogen applications on the results.

Surveys of corn fields by Agriculture and Agri-Food Canada (Zebarth, pers. com.) indicate that perhaps 56% of silage corn fields require no side-dressing of nitrogen. Comments received from representatives of fertilizer suppliers suggest that the proportion of corn fields requiring no side-dressing of nitrogen is greater than 56%. The GrassRoots data indicated that 62 of the 99 farms (63%) growing corn for silage, representing 53% of the surveyed corn for silage acreage, did not sidedress any fertilizers.

A potential reduction, with the adoption of the PSNT methodology, of nitrogen applications is estimated using the following assumptions.

- in the absence of the PSNT, side-dressed nitrogen would be applied at a rate of 110 kg-N/ha
- using the PSNT the proportion of corn land requiring no side dressed nitrogen is 65% and an average application on the remaining 35% is 80 kg-N/ha

Therefore, with a 100% adoption of the PSNT methodology the average side-dressed application of nitrogen would decrease by 82 kg-N/ha, from 110 to 28 kg-N/ha.

Using the GrassRoots data a weighted average sidedress nitrogen application is calculated to be 24 kg N/ha with 45% of the farms representing 55% of the corn for silage acreage indicating that the PSNT is used. Industry and agency representative estimates of the rate of adoption of the PSNT methodology for the entire Lower Fraser Valley ranged from 20% to 70%. The rate of adoption is expected to increase. This suggests widespread adoption of the PSNT procedure may result in a reduction in nitrogen applications greater than the 82 kg/ha estimated above.

Using the GrassRoots data, pre-plant commercial fertilizer applications were estimated to be 38 kg/ha of N, 67 kg/ha of P_2O_5 and 15 kg/ha of K_2O. Although no estimates of the potential reduction in these average application rates were made, there may be some scope to reduce these rates, particularly the pre-plant applications of phosphorus.

5.3 Vegetables

Application of commercial phosphorus and potassium to vegetable land has been decreasing. The primary factor in the reduction is economic; increasing fertilizer costs. Soil testing and use of the results of these tests to determine phosphorus and potassium applications is increasing in the vegetable industry.

The application of commercial nitrogen to vegetable land is more difficult to assess since varieties are changing and different varieties have different needs. Relatively more vegetables are being grown on sandy soils where nitrogen applications will be

higher than on organic (muck) soils and with the wetter weather experienced during the past two growing seasons additional nitrogen is applied when fields are replanted.

5.4 Raspberries

Fall testing of soil nitrate levels is recommended to assess nitrogen management in raspberry fields (Zebarth et al; 1997).

Bernie Zebarth (pers. com.) has estimated that with adoption of the fall soil nitrate testing methodology the weighted average nitrogen application rate to raspberry land could be reduced by 114 kg N/ha, from 215 kg N/ha to 101 kg N/ha. However, a significant proportion of the estimated potential reduction in total nitrogen application is from reduced applications of poultry manure; the potential reduction in commercial fertilizer nitrogen is estimated to be only 11 kg N/ha, from 60 kg N/ha to 49 kg N/ha.

The total Lower Fraser Valley raspberry area in 1996 was reported to be 2225 ha. Therefore the potential reduction in total nitrogen applications to raspberry land would be
254 tonnes per year. Of this only 24 tonnes N per year would be from reduced applications of commercial fertilizers.

Total commercial nitrogen fertilizer applications to raspberry land was estimated to be 171 tonnes/year in 1991 (Brisbin and Runka; 1995). An application rate of 49 kg/ha over 2225 ha would represent a total annual application of 109 tonnes/year, a 62 tonne decrease from 1991. Such a decrease would represent about 2% of the total estimated 1991 commercial fertilizer nitrogen application of 5866 tonnes. Unfortunately the rate of adoption of the fall soil nitrate testing methodology is estimated to be less than 5% and therefore the majority of the potential reduction is yet to be achieved.

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Table 1

RETAIL FERTILIZER SALES (tonnes) **Southern BC (excludes Peace River area)**

from Retail Sales Statistics - Canadian Fertilizer Institute
include both agricultural and non-agricultural sales P2O5 x 0.437 = P; K2O x 0.83 = K

tonnes / year

	1983	**1984**	**1985**	**1986**	**1987**	**1988**	**1989**	**1990**	**1991**	**1992**	**1993**	**1994**	**1995**	**1996**	**1997**
N	11852	12361	15734	15520	14707	14315	16816	15841	15670	15611	19996	18248	14356	14453	17271
P2O5	6982	7020	8879	8648	8187	8217	8942	9347	8840	8161	10347	12389	8100	7081	9277
K2O	6268	4824	7277	6097	7024	6604	6044	5881	6969	5168	7894	7515	5976	5012	6602
S	1692	2296			3278	3080	2964	2276	2322	2741	3528	3803	3028	2609	3147

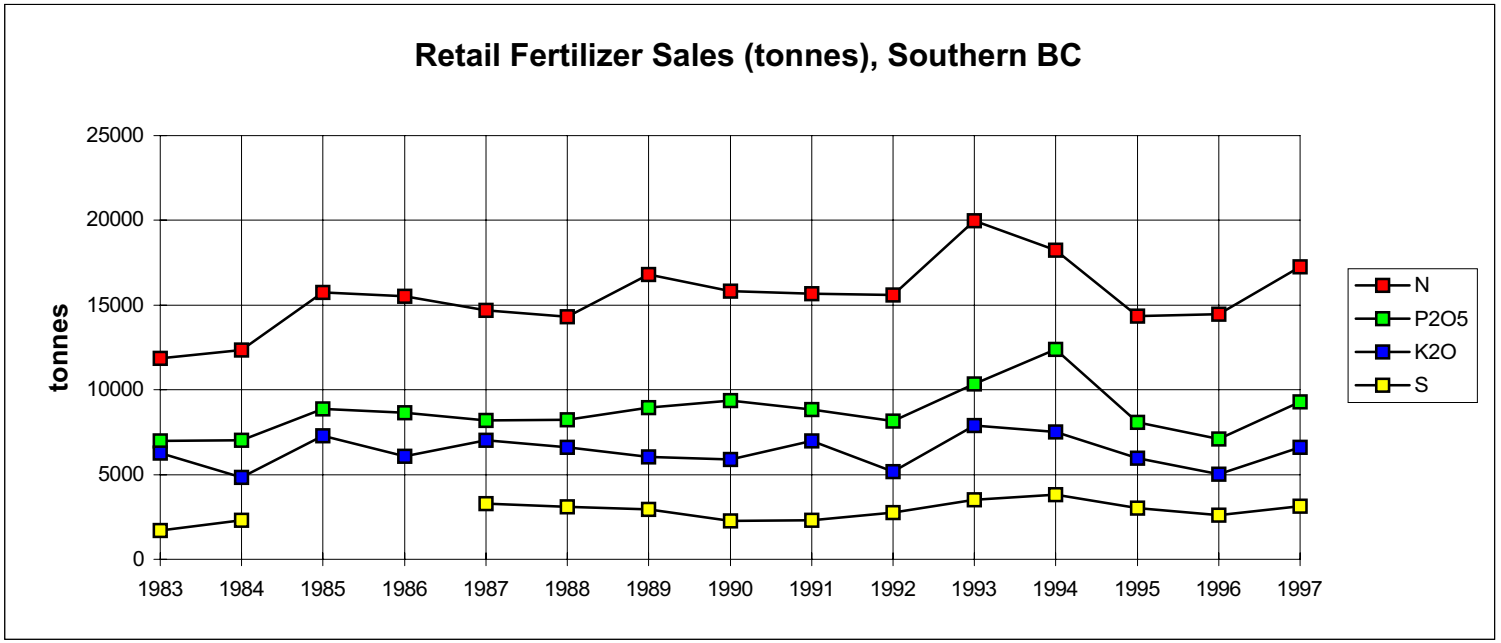

Table 2

CENSUS OF AGRICULTURE DATA

1991 Census of Agriculture

Regional District	Total number of farms reporting	Total Area of Farms (ha)	Farms Reporting Land in Crops	Land in Crops (ha)	Farms Reporting Commercial Fertilizer Use	Commercial Fertilizer Use (ha)	Farms Reporting Fertilizer and Lime Expenses	Fertilizer and Lime Expenses ($1000)
Central Fraser Valley	1406	20669	975	14037	639	10977	727	4202
Fraser-Cheam	978	18979	699	11405	503	10336	562	2857
Dewdney-Alouette	742	14184	439	6541	311	5538	361	2075
Greater Vancouver	2647	36242	1440	18660	909	14230	1180	10048
Lower Fraser Valley	**5773**	**90074**	**3553**	**50643**	**2362**	**41081**	**2830**	**19182**

1996 Census of Agriculture

Regional District	Total number of farms reporting	Total Area of Farms (ha)	Farms Reporting Land in Crops	Land in Crops (ha)	Farms Reporting Commercial Fertilizer Use	Commercial Fertilizer Use (ha)	Farms Reporting Fertilizer and Lime Purchases	Fertilizer and Lime Purchases ($1000)
Fraser Valley	2977	54454	1937	29784	1358	24254	1597	10381
Greater Vancouver	3464	39676	1882	23485	1148	17221	1657	15845
Lower Fraser Valley	**6441**	**94130**	**3819**	**53269**	**2506**	**41475**	**3254**	**26226**

Table 3

CENSUS OF AGRICULTURE DATA - CHANGES

Lower Fraser Valley

	Total number of farms reporting	Total Area of Farms (ha)	Farms Reporting Land in Crops	Land in Crops (ha)	Farms Reporting Commercial Fertilizer Use	Commercial Fertilizer Use (ha)	Farms Reporting Fertilizer and Lime Purchases	Fertilizer and Lime Purchases ($1000)
1991 Census	5773	90074	3553	50643	2362	41081	2830	19182
1996 Census	6441	94130	3819	53269	2506	41475	3254	26226
Change	**668**	**4056**	**266**	**2626**	**144**	**394**	**424**	**7044**
% Change	**12%**	**5%**	**7%**	**5%**	**6%**	**1%**	**15%**	**37%**

Table 4

CENSUS OF AGRICULTURE DATA - SELECTED RATIOS

	Land in Crops to Total	Commercial Fertilizer Use to Total	Commercial Fertilizer Use to Land in Crops	Fertilizer and Lime Purchases to Total	Fertilizer and Lime Purchases to Land in Crops	Fertilizer and Lime Purchases to Fertilizer Use
Farms Reporting	**(no. farms/ no. farms)**	**(no. farms/ no. farms)**	**(no. farms/ no. farms)**	**(no. farms/ no. farms)**	**(no. farms/ no. farms)**	**(no. farms/ no. farms)**
1991 Census	0.62	0.41	0.66	0.49	0.80	1.20
1996 Census	0.59	0.39	0.66	0.51	0.85	1.30
% change	**-4%**	**-5%**	**-1%**	**3%**	**7%**	**8%**
Areas and Amounts	**(ha/ha)**	**(ha/ha)**	**(ha/ha)**	**($/ha)**	**($/ha)**	**($/ha)**
1991 Census	0.56	0.46	0.81	213	379	467
1996 Census	0.57	0.44	0.78	279	492	632
% change	**1%**	**-3%**	**-4%**	**31%**	**30%**	**35%**

Table 5

Industrial Product Price Indexes

product	1989	1990	1991	1992	1993	1994	1995	1996	90 - 95 change
ammonium nitrate	103.0	101.1	101.5	105.2	110.2	121.3	142.7	147.6	41%
ammonium phosphates	98.5	91.3	87.8	85.5	84.6	100.6	120.9	128.0	32%
urea	95.1	87.3	88.2	86.9	93.2	105.9	139.5	148.3	60%
fertilizer chemicals	97.4	91.2	90.4	89.6	93.3	106.1	131.8	139.5	45%
mixed fertilziers, Western Canada	103.6	98.1	99.0	99.0	100.6	108.2	128.4	134.0	31%

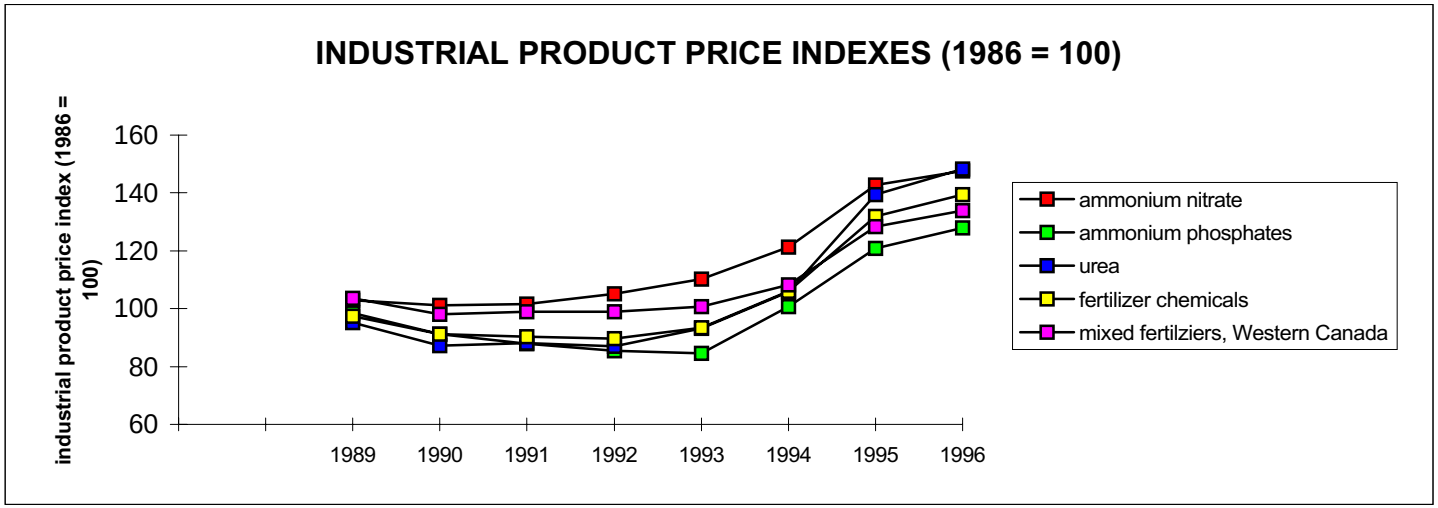

Table 6

COMMERCIAL FERTILIZER USE IN THE SUMAS RIVER AND MATSQUI SLOUGH WATERSHEDS - 1997
data collected by GrassRoots Project Management

Forage Grass

Watershed	farms (no.)	area (ha)	weighted average application N (kg/ha)	P2O5 (kg/ha)	K2O (kg/ha)	use regular soil tests farms (no.)	area (ha)	apply no P2O5 farms (no.)	apply no K2O farms (no.)
Sumas River	74	2082	141	5	4	67	1840	56	62
Matsqui Slough	26	727	197	2	2	25	721	22	22
average	100	2809	155	4	3	92	2561	78	84
percentage of total						92%	91%	78%	84%

Corn for Silage

Watershed	farms (no.)	area (ha)	weighted avg total appln N (kg/ha)	P2O5 (kg/ha)	K2O (kg/ha)	use regular soil tests farms (no.)	area (ha)
Sumas River	75	1443	58	69	15	66	1307
Matsqui Slough	24	394	75	60	18	23	388
average	99	1837	62	67	16	89	1696
percentage of total						90%	92%

Watershed	weighted avg sidedress appln N (kg/ha)	P2O5 (kg/ha)	K2O (kg/ha)	use PSNT farms (no.)	area (ha)	no sidedress appln farms (no.)	area (ha)
Sumas River	24	0.2	0.9	36	904	47	733
Matsqui Slough	23	0.0	0.4	9	111	15	244
average	24	0.2	0.8	45	1015	62	977
percentage of total				45%	55%	63%	53%