REPORT TO THE OREGON PROCESSED VEGETABLE COMMISSION, 1993-1994

TITLE: Nitrogen Management in Vegetable Crops and Their Rotations

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PROJECT STATUS: Continuing

FUNDING: $10,800 in 1993-94 from OPVC. Additional funding from CAAR, OSU, and Unocal. Funds spent for fertilizers; soil and tissue analysis; sample collection; labor for plot establishment, maintenance and harvest; travel, Corvallis to Aurora.

OBJECTIVES:

1. Evaluate N uptake efficiency in broccoli and use passive capillary pan lysimeters to refine measurements of nitrate leaching.
2. Evaluate the N-trapping efficiency of cover crops following 1992 and 1993 broccoli and sweet corn crops.
3. Estimate the contribution of cover crops, following a sweet corn crop, to the nitrogen requirements of a broccoli crop.
4. Evaluate the effect of N placement on cauliflower yield.
5. Evaluate the potential leaching of nitrate from optimally-fertilized cauliflower plantings.
6. Evaluate the possibility of overseeding as a means of establishing a catch crop in cauliflower.
7. Evaluate the effect of several N sources on sweet corn yield.
8. Evaluate N uptake efficiency in sweet corn and measure nitrate leaching.
9. Evaluate the effect of splitting N applications on sweet corn yield.
10. Collect and analyze soil samples before and after commercial crops of sweet corn, broccoli, cauliflower, beans, carrots, and table beets and survey grower cooperators to relate findings to soil type and management practices.

PROGRESS REPORT:

Cover Crop N Uptake

In the long-term crop rotation study, winter cover crops of cereal rye, rye plus Austrian pea, and red clover were either overseeded (July 1, 1992) into a standing crop of sweet corn (rye, clover) or were seeded (Oct. 14, 1992) into plots after the corn residue was plowed under (rye, rye+pea). The sweet corn had been fertilized with either 0, 50, or 200 lb N/acre.

Samples taken on April 14, 1993 indicated that N uptake by the cover crop varied both by cover crop species and rate of N applied to the corn (Fig. 1). Uptake was much lower than than in the previous instance (1991) of cover crops following corn. However, trends were similar between the two years. Cover crop N uptake was almost the same for zero or 50 lb/A of applied N, indicating excellent N recovery by the sweet corn at low rates of N. A rough estimate of the amount of residual fertilizer N left over from the sweet corn crop that was recovered by the rye cover crop can be obtained by examining the rye-only uptake at the three fertilizer rates as shown in Fig. 1. Subtracting the amount of N taken up by the drilled rye grown on non-fertilized subplots from the N taken up at the greatest N rate suggests that only 29 pounds/acre (25 for overseeded rye) was taken up from the high rate of N. This nitrogen would have been available for leaching. Of course, an undetermined amount of nitrogen may have leached before the cover crops were well established.

Note that there was very little advantage to overseeding the rye relative to drilling it in the fall. The overseeded rye did not make substantial growth until the corn stalks were mowed down and the fall rains started. However, overseeding should be a less expensive means of establishing a cover crop. Both clover and rye + pea resulted in greater N uptake than did the rye, presumably due to N fixation. Clover N uptake did not vary with N rate.

The greatest cover crop N accumulation of 105 lb/A occurred on clover plots which had been harvested for a seed crop and allowed to regrow since the summer of 1992 (clover green manure). This data is not included in Fig. 1 since this clover did not follow sweet corn and was not fertilized.

Another measure of the efficiency of vegetable and cover crops at N uptake was obtained in 1992 and 1993. Applying fertilizer enriched with the stable isotope ^{15}N allows direct measurement of the fate of applied N in cropping systems, and allows determination of the partitioning of fertilizer N among soil, plants, and microbes. In 1992, ^{15}N-urea fertilizer was applied at 214 lb N/acre to three replicated sweet corn microplots (7.2 sq. yd. each). Ears, stalks, and roots were analyzed for ^{15}N. Soil was sampled from zero to 48-inch depth and analyzed for total and microbial biomass N. In one half of each microplot, ^{15}N-labelled corn stalks and roots were switched with unlabelled corn stalks and roots from an equal area before seeding cover crops to separately determine the fate of ^{15}N derived from residual soil N and corn residue. In the spring of 1993, rye cover crop shoots and roots, as well as soil, were sampled and analyzed for ^{15}N. Samples of the 1993 broccoli crop and soil samples were collected at harvest. Analysis of this data is still in progress.

Sweet corn in the microplots recovered about 51% of the applied N and about half of this was removed with the ears at harvest. This closely agrees with results obtained in a separate sweet corn N use trial in 1992. Of the N left in the soil as residual or returned with the corn residue (150 lb/acre), about 10% was recovered by the rye winter cover crop, 50% remained in the soil, and 41% was lost from the system, presumably by leaching. Rye N recovery in the microplots was lower than for the plots as a whole (see above). The low recovery may be related to the late planting date (13 October) and poor rye stand in the microplots.

Upon completion of the remaining lab work, the fate of the ^{15}N applied to the 1992 corn crop, incorporated into the 1992-93 cover crop, and then made available for uptake by the 1993 broccoli crop, will be determined. This will provide definitive information on uptake and recycling of N by rye cover crops.

<u>Cover Crops on Broccoli Yield</u>

Broccoli yield varied significantly with cover crop and N rate (Table 1). Yield of broccoli on plots which had been in rye was slightly depressed compared to plots which had been winter-fallowed. This is consistent with results obtained in 1991. Among possible explanations are allelopathy from the rye residue, immobilization of mineral N by the decomposing rye straw, or an adverse effect of cereal rye on soil tilth. When a legume was present in the cover crop, broccoli yields tended to be greater than for the winter fallow, but the differences were not significant. Greatest yield and mean head weight were from plots which had been in overseeded clover.

In contrast to sweet corn and broccoli in 1990 through 1992, the yield of broccoli, averaged over preceding cover crops, did not increase from the intermediate to the highest N rate. This was the case for nearly every combination of cover crop treatment and N rate (Table 2). A buildup of soil organic N due to cover cropping, thus eliminating the need for high rates of N, might explain the lack of response to a rate of N previously found to be optimal for broccoli at this site. However, since the plots which had been winter-fallowed for four years responded similarly, this does not appear to be a valid explanation. The greatest yield recorded in this trial was for the combination of an overseeded clover cover crop and the intermediate rate of N.

The contribution of a cover crop legume to broccoli yield can best be appreciated by comparing broccoli yield at zero applied N (Table 2). While the yield from the rye cover crop plots was the same or sligtly depressed compared to fallow, the rye plus pea, overseeded clover, and spring-plowed clover green manure crop all significantly increased yield.

Nitrogen Rate, Placement, and Timing on Cauliflower Yield

On 27 July, 'Snowball Y Improved' seedlings were transplanted bare-root in rows 2.5 feet apart with 18 inches between plants in the row. Plot size was three rows, 20 feet long. All three rows were harvested. The initial application of 40 pounds N/acre, as urea, was either broadcast or banded three inches to the side and two inches deep immediately after transplanting and irrigated in. The remaining nitrogen was broadcast or banded on the appropriate plots on 2 September or on 2 and 21 September, depending on the treatment (Table 3). Sidedress N source was either urea or calcium nitrate. Two sets of plots (Treatments 9 and 10) were overseeded with 'Wheeler' cereal rye on 7 September to determine the feasibility of overseeding into cauliflower as a means of establishing a winter N catch crop. Plots were harvested on 8 and 19, October, and 2 November. Following the last harvest, soil in treatments 1, 2, 3, 4, 5, and 11 was sampled to 48-inch depth in 12-inch increments. The plots are being maintained through the winter in order to resample for soil N content and cover crop N uptake.

For the plots receiving only broadcast applications of urea, yield and mean head weight increased with increasing N rate to a maximum at 240 lb N/A (Table 4). The same trend was not true for the percentage of Grade No. 1 heads (defect-free), as only an increase from no applied nitrogen to the lowest rate of 60 lb/A caused an increase in quality. In 1992, quality continued to increase with increasing increments of applied N. Previous work at the OSU vegetable farm suggested that the optimum rate of nitrogen application to cauliflower is in the range of 150 to 200 lb/acre, somewhat lower than the results obtained in these trials.

Banded versus broadcast application of N at planting had no significant effect on yield or quality (Table 5). In 1992, there was more of a trend toward greater yield and head size with a banded application but it was also not a statistically significant effect. Apparently, even with rows 30 inches apart, enough feeder roots establish in the soil between the rows that concentrating the fertilizer near the plant row is not a great advantage. This is in agreement with results obtained with broccoli grown on 16 or 20-inch row spacing.

Banded versus broadcast application of the sidedressed N also did not result in significant differences. This is in contrast to 1992, when greater yield and mean head size occurred with a broadcast application. However, the single greatest yield in this trial was with the combination of broadcast fertilizer at planting, broadcast sidedress fertilizer, and a rate of 240 lb N/A.

Overseeding cereal rye about four weeks before first harvest did not reduce cauliflower yield (Table 6). This is consistent with results obtained in 1992, even though the rye development was greater than in 1993 than in 1992. Use of calcium nitrate, rather than urea, as source of the sidedressed N had no effect on yield for the sum of the three harvests (Table 7). Splitting the sidedressed N application such that half the sidedressed N was not applied until eight weeks after transplanting had no effect on yield or quality (Table 8).

Results of the post-harvest soil sampling for nitrate and ammonium content of cauliflower plots are not yet available. However, results obtained in 1992 (and which were not available in time for the 1992 report) show that cauliflower effectively depleted the root zone of nitrate at all rates of applied N except 240 lb/A (Table 9). Even at the high rate of N, residual soil nitrate was comparable to that before any fertilizer was applied. Except for a slight increase in the top 12 inches at the highest rate of applied N, soil ammonium concentrations were also similar to the initial levels. Apparently, cauliflower is similar to broccoli in N uptake efficiency, even though it was planted at a lower plant population and wider between-row spacing.

Both soil nitrate and ammonium concentrations declined during the winter of 1992-93 (Table 10). This decline was particularly noticeable for the root zone. Regardless of treatment, both nitrate and ammonium concentrations were less than they had been in the spring of 1992, before any fertilizer was applied. In May, 1993, soil ammonium concentration did not vary much with depth and rate of previously applied nitrogen fertilizer had no effect on ammonium concentration at any depth tested. Soil nitrate concentration tended to increase slightly with depth and tended to be higher where more fertilizer had been applied. This effect was significant only between 24 and 48-inch depth, however. The cereal rye catch crop effectively depleted soil nitrate at these depths. This is consistent with the effects seen in 1991 and 1992 for cereal rye following broccoli.

The soil and rye will be sampled in the spring of 1994 as a function of rate of applied N to determine the amount of N leached versus that trapped in the rye shoots.

<u>Nitrogen Rate, Source, Placement, and Timing on Sweet Corn Yield</u>

'Jubilee' sweet corn was seeded on 13 May. Sixty lb/A of triple superphosphate was banded two inches to the side and two inches beneath the seed row on all plots. Forty lb N/A as urea, ammonium nitrate, calcium-ammonium nitrate (CAN-17), or urea-ammonium nitrate (UAN-32) was also shanked in at 2 inches beneath and 2 inches to the side of the seed row on all but the zero nitrogen treatment (Table 11). Plot size was 15 feet wide (six rows) by 30 feet long. Spacing between rows was 30 inches. The remaining N was shanked in (banded) or broadcast to the appropriate plots at planting or on 21 June (split application). The plots were harvested on 24 August.

After harvest, the stover was mowed and left in place on the plots. The plots were sampled for residual soil nitrate and ammonium concentration on 22 October, before the onset of fall rains, and their identity was maintained over the winter so that samples could be taken in the spring of 1994.

When all the sidedressed N was banded as urea, yield increased with increasing rate of N to a maximum at 180 lb N/A (Table 12). However, the yields at 120 and 240 lb N/A were not significantly different than at 180. Mean ear weight tended to be greatest at 180 lb/A. Tipfill was most complete at 180 or 240 lb N/A, while ear length did not vary significantly among the three largest rates of N.

Most of the other combinations of N source and application method were at 120 lb total N/A. Comparisons of N utilization are based on banded urea at planting and broadcast urea sidedress, with a split application, as the standard. Mean yield of corn fertilized at 120 lb N/acre did not vary significantly with N source, but the plants fertilized with CAN-17 tended to have the greatest yield and number of harvestable ears (Table 13). This is consistent with results obtained in 1992. The greatest mean ear weight tended to be with urea as N source. Past research at NWREC with urea, ammonium nitrate, and other solid N fertilizers has indicated no consistent effects on corn yields.

When comparing the effect of the timing of the sidedressed N application, and averaged over urea and ammonium nitrate as N source, a split or delayed application of the sidedressed N appeared slightly superior to applying all fertilizer at planting for yield, number of ears harvested, ear weight, and tipfill, but the differences were not significant (Table 14). An effect of split application might have been expected in 1993 because of the greater than normal precipitation (6.1 inches) and, thus, leaching potential, during the interval between planting and the delayed sidedress application.

When comparing a broadcast versus a banded application of sidedressed urea or ammonium nitrate fertilizer (Table 15), there were no significant effects on yield or quality. However, the number of ears/A was greater with broadcast application of the sidedressed nitrogen.

In comparing CAN-17 with urea as N source, at 180 pounds N/acre, CAN-17 again tended to produce greater yield, but the difference was not significant (Table 16).

Post-Harvest Mineral Nitrogen Status in Grower Fields

Soil samples were taken to a depth of 5 feet both before and after crops of beans, beets, broccoli, carrot, cauliflower, and sweet corn, for determination of mineral nitrogen (ammonium-N and nitrate-N) content. Thirty fields were sampled, representing 14 growers, 4 counties, and 7 soil types. The growers were interviewed to determine field history and cropping and fertilization intentions. They were asked to keep records of fertilizer applications and irrigations and were interviewed after harvest to determine crop yield and any other factors which might have affected yield or quality.

Grower cooperation was generally excellent. Samples were taken from 6 bean, 2 beet, 7 broccoli, 2 carrot, 5 cauliflower, and 8 corn fields. Our plan had called for one less bean field and one more broccoli field, but weather-related changes in planting schedules and choice of fields caused the one discrepancy.

The average pre-plant nitrate and ammonium concentrations are seen in Fig. 2. In order to preserve anonymity, only averages are presented in this report. However, it is safe to say that there were few surprises in the pre-plant data. The relatively heavy rainfall during the late winter and spring resulted in very low levels of nitrate present in most fields. Most cases of higher levels of nitrate or ammonium could be explained by a past history of manure application or by the presence of a legume cover crop.

Not surprisingly, there were much greater differences among fields at harvest. Not all the data is in yet, but average nitrate and ammonium levels at harvest vary both with crop and with grower cultural practices (data not shown). For example, in top foot of the soil, nitrate concentrations were greater for sweet corn than for the other crops (Fig. 2). This is in agreement with our results indicating that sweet corn is relatively inefficent in taking up N. Nitrate levels were generally elevated, not only in the surface foot of soil, but also at greater depths. This contrasts with our experience at NWREC and may indicate movement of nitrate as a result of the unusually wet late spring and early summer, or may indicate that improvements could be made in irrigation practices. Post-harvest ammonium concentrations varied much less between pre-season and post-harvest sampling than did nitrate (Fig. 3).

The grower cooperators will be mailed a copy of the data from their fields along with the average for all fields.

Table 1. Main effects of preceding cover crop, and rate of applied nitrogen on yield and quality of broccoli, NWREC, 1993

Treatment	Yield (T/A)	Mean head wt. (g)
Cover crop		
Fallow	3.3	202
Rye	2.8	180
Rye + pea	3.6	208
Overseeded rye	3.1	203
Overseeded clover	3.7	241
Fall-plowed clover	3.1	197
Spring-plowed clover	3.6	221
LSD (0.05)	0.6	35
N rate (lb/A)		
0	2.4	149
50	3.9	233
200	3.7	238
LSD (0.05)	0.4	27

Table 2. Interaction of preceding cover crop and rate of applied nitrogen on yield and quality of broccoli, NWREC, 1993

Cover crop	N rate (lb/A)	Yield (T/A)	Mean head wt. (g)
Fallow	0	1.9	124
	125	4.1	246
	250	3.9	236
Rye	0	1.6	111
	125	3.4	208
	250	3.3	221
Rye + pea	0	3.5	184
	125	3.7	210
	250	3.7	229
Overseeded rye	0	2.0	138
	125	3.5	221
	250	3.7	249
Overseeded clover	0	2.9	190
	125	4.5	277
	250	3.7	256
Fall-plowed clover	0	2.4	157
	250	3.8	237
Spring-plowed clover	0	3.2	188
	250	3.9	254
	LSD (0.05)	1.1	61

Table 3. List of treatments, 1993 cauliflower N utilization trial, NWREC

No.	Total N applied	Placement at planting	Placement and timing of sidedress
		lb/A	
1	0	0	None
2	60	40 broadcast	20 broadcast, 5 weeks
3	120	40 broadcast	80 broadcast, 5 weeks
4	180	40 broadcast	140 broadcast, 5 weeks
5	240	40 broadcast	200 broadcast, 5 weeks
6	120	40 banded	80 broadcast, 5 weeks
7	120	40 broadcast	80 banded, 5 weeks
8	120	40 banded	80 banded, 5 weeks
9	120	40 broadcast	80 broadcast, 5 weeks; interseed, 6 weeks
10	240	40 broadcast	200 broadcast, 5 weeks; interseed, 6 weeks
11	120	40 broadcast	80 broadcast as calcium nitrate, 5 weeks
12	240	40 broadcast	200 broadcast as calcium nitrate, 5 weeks
13	120	40 broadcast	40 broadcast, 5 weeks; 40 broadcast, 8 weeks
14	240	40 broadcast	100 broadcast, 5 weeks; 100 broadcast, 9 weeks

Table 4. Effect of rate of broadcast urea nitrogen on yield, head size, and quality of cauliflower, NWREC, 1993

N rate (lb/acre)	Mean head wt. (g)	Grade No. 1 heads (%)	Total yield (tons/acre)
0	565	39.5	7.1
60	664	62.5	8.5
120	809	62.7	10.6
180	978	58.6	11.9
240	1002	53.9	12.4
LSD (0.05)	170	16.6	2.6

Table 5. Effect of broadcast versus banded application of initial and sidedressed nitrogen on yield, head size, and quality of cauliflower, 1993

Placement at planting	Placement at sidedress	Mean head wt. (g)	Grade No. 1 heads (%)	Total yield (tons/acre)
Broadcast	Broadcast	809	62.7	10.6
	Banded	924	60.2	11.3
Banded	Broadcast	923	51.5	10.9
	Banded	889	63.0	11.0
Broadcast at planting mean		867	61.4	11.0
Banded at planting mean		906	57.8	11.0
Significance, planting		NS	NS	NS
Broadcast at sidedress mean		866	57.1	10.8
Banded at sidedress mean		906	61.6	11.2
Significance, sidedress		NS	NS	NS

Table 6. Effect of overseeding cereal rye on cauliflower yield, head size, and quality at two rates of nitrogen, NWREC, 1993

Treatment	N rate (lb/acre)		Mean head wt. (g)	Grade No. 1 heads (%)	Total yield (tons/acre)
Overseeded	120		859	66.3	10.7
	240		988	54.5	11.2
		Mean	924	60.4	11.0
Not overseeded	120		809	62.7	10.6
	240		1002	53.9	12.4
		Mean	906	58.3	11.5
	Significance		NS	NS	NS

Table 7. Effect of sidedressed nitrogen source on cauliflower yield, head size, and quality at two rates of nitrogen, NWREC, 1993

N source	N rate (lb/acre)		Mean head wt. (g)	Grade No. 1 heads (%)	Total yield (tons/acre)
Urea	120		809	62.7	10.6
	240		1002	53.9	12.4
		Mean	906	58.3	11.5
Calcium nitrate	120		857	67.7	10.2
	240		972	60.2	12.2
		Mean	915	63.9	11.2
	Significance		NS	NS	NS

Table 8. Effect of splitting the application of sidedressed nitrogen on cauliflower, head size, and quality at two rates of nitrogen, NWREC, 1993

Timing of Application	N rate (lb/acre)		Mean head wt. (g)	Grade No. 1 heads (%)	Total yield (tons/acre)
All at 5 weeks	120		809	62.7	10.6
	240		1002	53.9	12.4
		Mean	906	58.3	11.5
Half at 5 weeks,	120		966	61.5	11.8
remainder at 8 weeks	240		928	67.5	11.8
		Mean	947	63.5	11.8
	Significance		NS	NS	NS

Table 9. Effect of rate of broadcast nitrogen on soil nitrate and ammonium concentrations (ppm) following final cauliflower harvest, 11 November, 1992

		N rate, lb/A				
		0	80	160	240	LSD (0.05)
Sample depth (inches)	Pre-plant	Post-harvest				
Nitrate						
0-12	5.6	1.1	1.7	1.1	6.4	2.6
12-24	3.8	1.6	0.4	0.6	1.1	NS
24-36	3.1	2.1	1.3	1.5	2.6	NS
36-48	3.8	3.0	3.5	3.1	2.7	NS
Ammonium						
0-12	4.8	4.2	5.0	5.7	8.8	3.0
12-24	2.8	4.2	4.1	3.0	3.9	NS
24-36	5.1	3.9	4.2	3.2	3.7	NS
36-48	4.4	4.0	3.5	2.7	3.9	NS

Table 10. Effect of rate of broadcast nitrogen and rye catch crop on soil nitrate and ammonium concentrations (ppm), May, 1993

	N rate, lb/A					
Sample depth (inches)	0	80	160	160+catch	240	LSD (0.05)
Nitrate						
0-12	0.2	0.3	0.1	0.3	0.3	NS
12-24	0.3	0.6	0.6	0.4	1.2	NS
24-36	0.5	1.4	2.3	0.7	2.3	1.1
36-48	0.5	1.8	2.3	0.8	3.0	1.2
Ammonium						
0-12	1.6	2.1	2.1	2.4	1.9	NS
12-24	1.8	2.2	1.8	1.9	2.8	NS
24-36	2.2	1.5	1.7	1.7	1.5	NS
36-48	1.9	1.9	1.7	1.8	2.5	NS

Table 11. List of N application treatments, sweet corn nitrogen utilization trial, NWREC, 1993

No.	N rate (lb/A)	N source	Banded at seeding (lb/A)	Broadcast at seeding (lb/A)	Sidedress[z] rate, method (lb/A)
1	0	None	0	0	0
2	60	Urea	40	0	20 broadcast
3	120	Urea	40	0	80 broadcast
4	180	Urea	40	0	140 broadcast
5	240	Urea	40	0	200 broadcast
6	120	NH_4NO_3	40	0	80 broadcast
7	120	CAN-17	40	0	80 banded
8	120	UAN-32	40	0	80 banded
9	120	Urea	40	80	0
10	120	Urea	40	0	80 banded
11	120	NH_4NO_3	40	80	0
12	120	NH_4NO_3	40	0	80 banded
13	180	CAN-17	40	0	140 banded

[z]Nitrogen sidedressed on 21 June.

[y]Overseeded on 23 June.

Table 12. Effect of rate of urea-nitrogen[z] on the yield of sweet corn, NWREC, 1993

N rate (lb/A)	Yield (T/A)	No. ears per acre	Ear wt. (g)	Ear length (inches)	Tipfill[y]
0	2.7	10680	241	8.2	2.9
60	5.8	20060	268	8.7	2.9
120	7.5	25400	268	8.9	3.1
180	7.7	25960	272	8.8	3.3
240	7.5	25510	268	9.0	3.4
LSD (0.05)	1.5	6330	NSD	0.3	0.4

[z]Forty pounds N/acre banded at planting, remainder broadcast five weeks later.
[y]Five point scale with 5=perfect fill.

Table 13. Effect of four nitrogen sources, at 120 pounds N/acre[z], on the yield of sweet corn, NWREC, 1993

N source	Yield (T/A)	No. ears per acre	Ear wt. (g)	Ear length (inches)	Tipfill
Urea	7.1	22670	286	8.9	3.3
NH_4NO_3	7.0	23980	271	8.9	3.5
CAN-17	7.3	24960	267	8.9	3.3
UAN-32	6.7	22560	269	8.7	3.2
LSD (0.05)	NS	NS	NS	NS	NS

[z]Forty pounds N/acre banded at planting, 80 pounds N/acre banded five weeks later.

Table 14. Effect of timing of sidedress nitrogen application[z] on the yield of sweet corn, NWREC, 1993

N source	Timing	Yield (T/A)	No. ears per acre	Ear wt. (g)	Ear length (inches)	Tipfill
Urea	planting	7.0	24310	265	8.9	3.0
Urea	5 weeks	7.5	25400	268	8.9	3.1
NH_4NO_3	planting	7.3	24850	269	8.8	3.1
NH_4NO_3	5 weeks	7.7	26270	271	8.8	3.3
LSD (0.05)		NS	NS	NS	NS	NS

[z]Total nitrogen applied = 120 pounds/acre. Sidedress application = 80 pounds/acre.

Table 15. Effect of banded versus broadcast sidedress nitrogen[z] application on sweet corn yield, NWREC, 1993

N source	Sidedress method	Yield (T/A)	No. ears per acre	Ear wt. (g)	Ear length (inches)	Tipfill
Urea	Band	7.1	22670	286	8.9	3.3
Urea	Broadcast	7.5	25400	268	8.9	3.1
NH_4NO_3	Band	7.0	23980	271	8.9	3.5
NH_4NO_3	Broadcast	7.7	26270	271	8.8	3.3
LSD (0.05)		NS	2950	NS	NS	NS

[z]Rate of applied nitrogen = 120 pounds/acre. Sidedressed five weeks after planting.

Table 16. Effect of CAN-17 versus urea[z] as N source on the yield of sweet corn, NWREC, 1993

N source	Yield (T/A)	No. ears per acre	Ear wt. (g)	Ear length (inches)	Tipfill
CAN-17	8.3	28890	260	9.0	3.3
Urea	7.7	25980	272	8.8	3.3
LSD (0.05)	NS	NS	NS	NS	NS

[z]Nitrogen applied at 180 pounds/acre.

Fig. 1. Cover Crop N Uptake by N Rate
NWREC, 1992-93

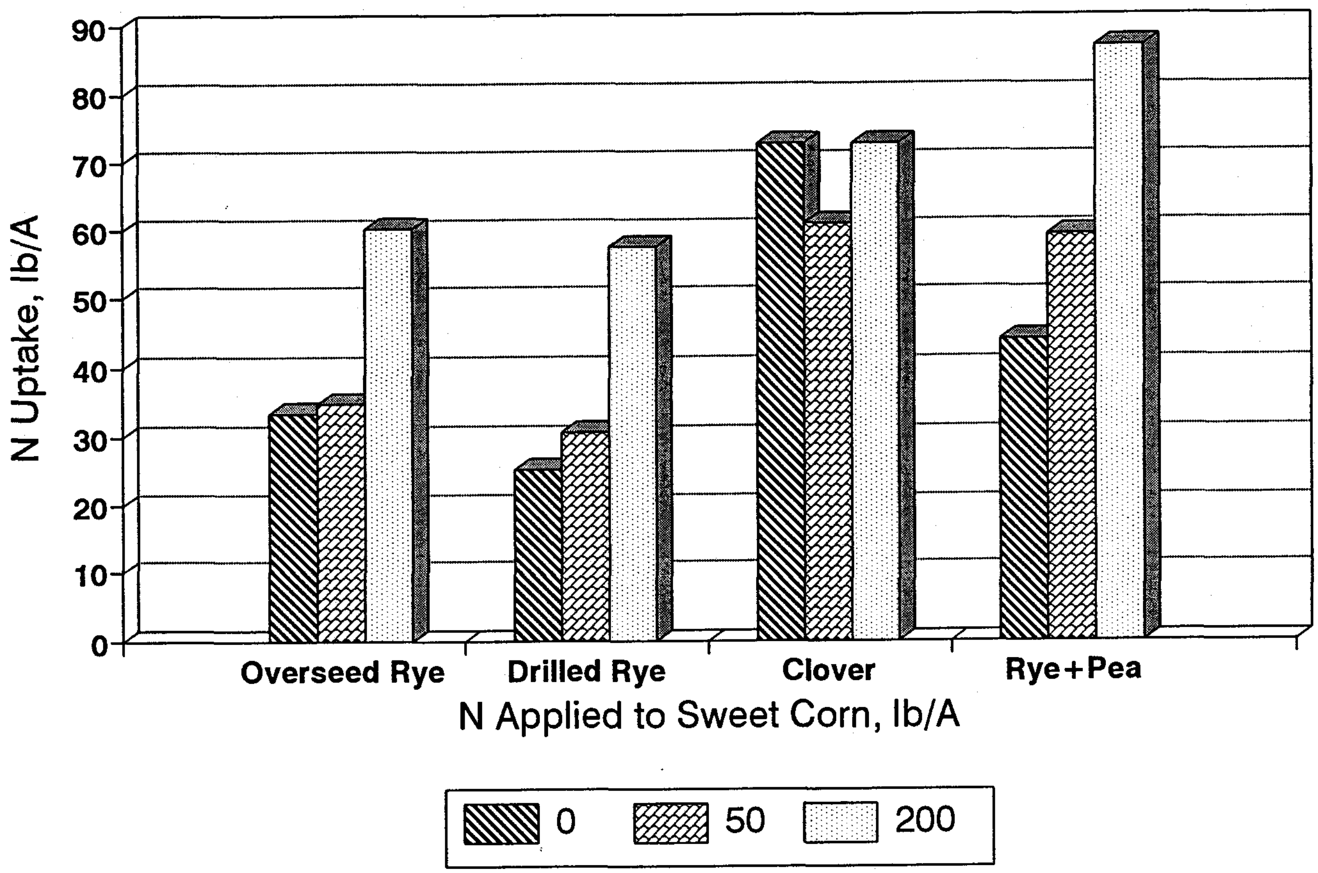

Fig. 2. Crop on Post-Harvest Nitrate
1993 Grower Survey

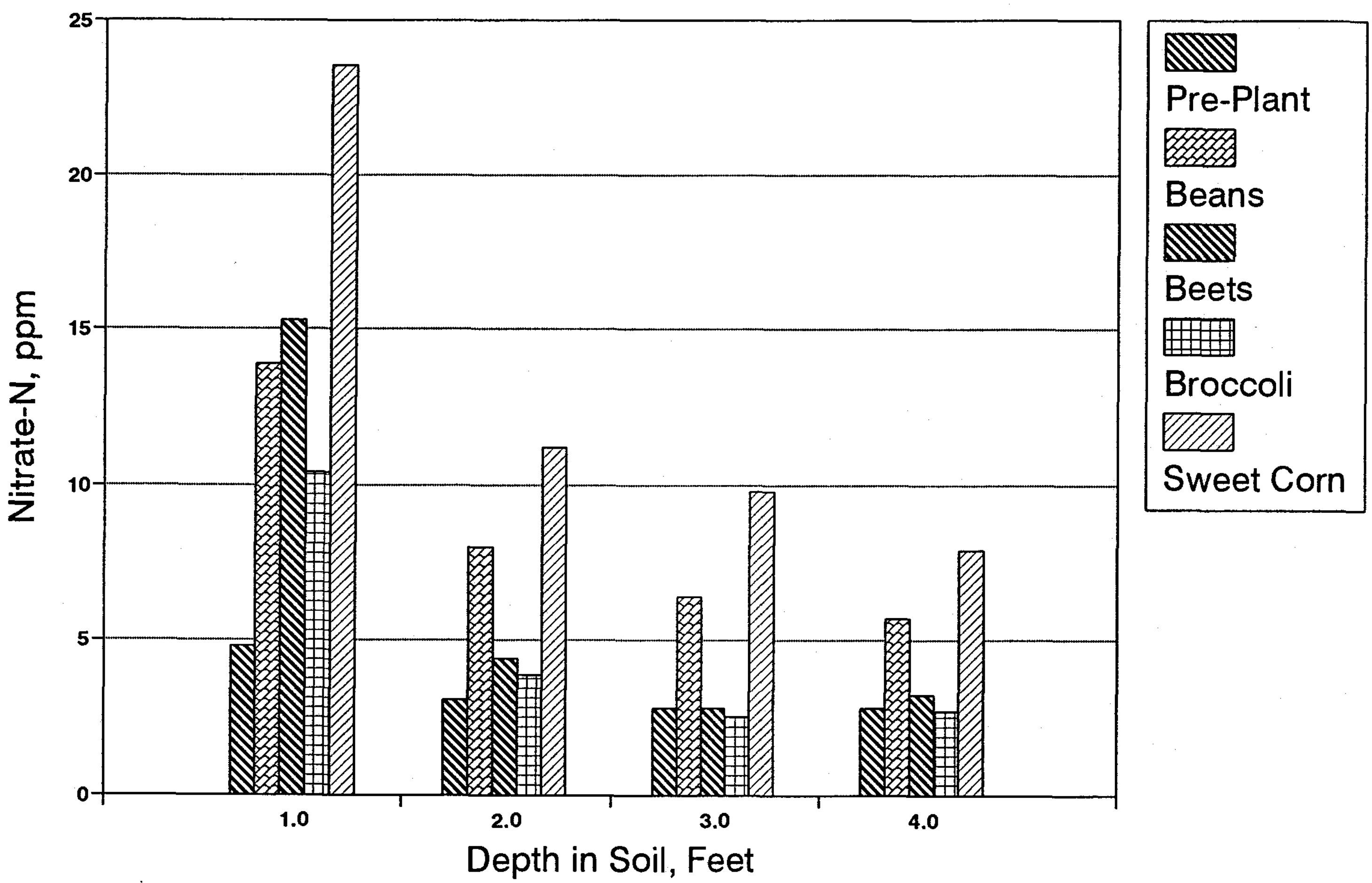

Fig. 3. Crop on Post-Harvest Ammonium
1993 Grower Survey