

## CROP RESIDUE VS. NITROGEN NEEDS

### and GROWER CULTURAL PRACTICES

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In the 1990's the yield in tons per acre has decreased for Monitor Sugar Company growers. Yield was about 2.8 tons per acre less since 1990 compared to the previous ten years. An average of 16.1 tons per acre did not produce grower margins large enough to maintain acres in sugar beet production.

Many practices were examined to find the cause, including seed varieties and grower practices. Seed varieties had changed, giving more increase in sugar content than tons per acre. The growers often look back to older varieties as being better. US-H23 was the last public variety and was sold in the 1980's. Compared to US-H23, the varieties in 1996 had an increase in recoverable sugar per ton of over 10 percent, but the expected tonnage did not increase. The tons per acre of approved varieties had decreased for a period, with the low in the early 1990's when there was a 3.5 percent decrease in tonnage compared to US-H23. For 1996, the variety approval program was changed to emphasize tonnage more and to hold the sugar content requirement constant.

Grower practices that had changed were; the use of considerably less phosphorus and boron (Graphs 1 & 2), some decrease in manganese, about steady use of potassium and an increase in the use of nitrogen. None of these have been confirmed to have caused fewer tons per acre. The use of less phosphorus and boron were both recommended by research conducted in conjunction with Michigan State University. The use of more nitrogen does not seem to have helped, but it also does not seem to have hurt the sugar content or purity (Table 3). The new varieties and some increase in stand may be the reason. The opinion is that the new varieties allow the use of more nitrogen and still give a good sugar content and purity.

Nitrogen rate is a factor in the yield of sugar beets and also the sugar content. There had been dozens of nitrogen tests done in Michigan prior to establishment of our current research program in 1988. The recommended rate was 90 pounds of applied nitrogen. From 1988-1994, eleven tests were conducted that seemed to confirm previous tests (Graph 4), but when comparing results based on the amount of residue in the previous crop, differences were observed. More nitrogen seemed to be needed following the high residue crops of corn and wheat.

One reason older nitrogen test results indicated the use of 90 pounds of nitrogen was that more tests were planted following dry beans. An average of 71 percent of the

beets were planted following dry beans before 1989 and only about 46 percent since then.

#### AND GROWER CULTURAL PRACTICES

The results of strip trials from one year are contained in graph 5. They indicate the least amount of nitrogen is needed after soybeans and the most after the high residue crop of corn. Rates of nitrogen that would be recommended today are: after corn or wheat, 140 pounds; after dry beans, 110 pounds; and after soybeans, 90 pounds. More nitrogen tests should be done following different amounts of residue and the legume crop of soybeans to confirm these rates.

The increased nitrogen use by growers has not solved the problem of lower yield, and variety changes do not explain all of the loss. There is not one answer to lower yields.

Some factors to explain the decrease in yield are:

1. Crop rotations have become shorter. From 1982-85, the growers used a four year rotation more than 80 percent of the time. This is down to 61.7 percent for the period of 1988-96. In 1996, many farmers planted less sugar beets to lengthen their rotations.
2. Date of planting is important (Table 6). From 1981-90, most acres were planted in April, 84.5 percent, and only 20.8 percent in April from 1991-96. As the table shows, the yield also decreased.
3. Adverse weather experienced in Michigan is another large factor (Graph 7).
  - 1988 -- extremely dry and hot.
  - 1989 -- excessive rain in late May and early June caused root damage.
  - 1991 -- only 7 percent planted in April and 26 percent replants because of seedling disease.
  - 1992 -- entire crop planted between May 4-14 and inadequate moisture for good germination. There was less than one inch of rain for the month of May.
  - 1993 -- wet April, entire crop planted between May 7-19.
  - 1994 -- many replants because of crusting. This also caused poor stands.
  - 1995 -- about 75 percent planted in May.
  - 1996 -- 96 percent planted in May and record rainfall in April, May, and June caused 4,831 acres to never be planted and another 9,693 to be destroyed. There was also root pruning of surviving beets.

#### CONCLUSION:

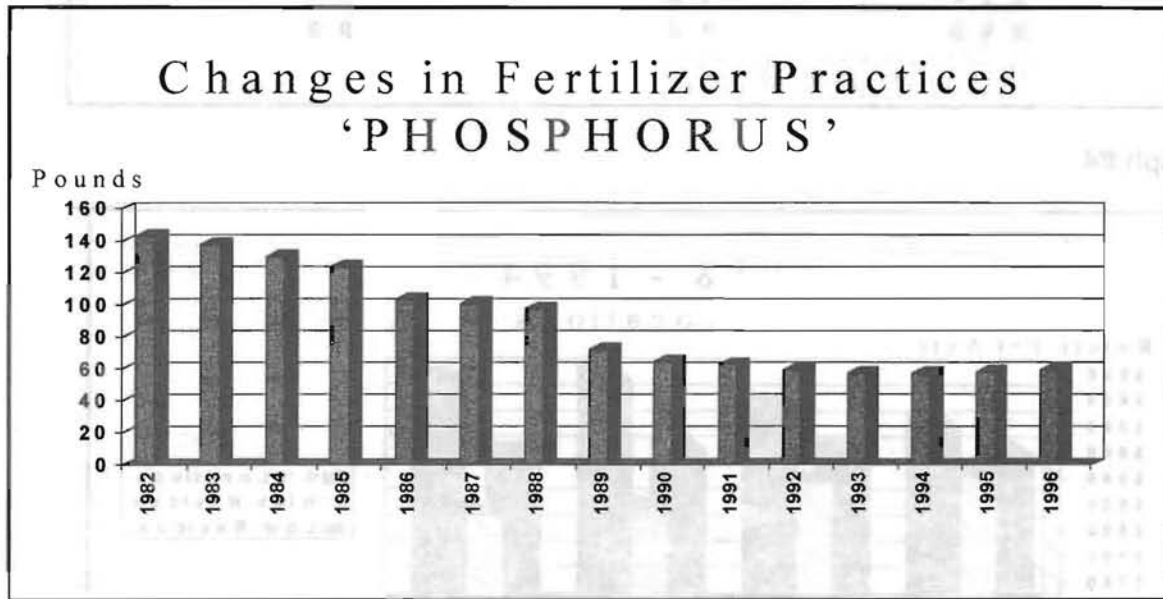
The growers are using more applied nitrogen fertilizer. The sugar content and purity do not seem to have been affected because of a small increase in stands and new varieties. The new varieties appear to use more nitrogen without a reduction in sugar content and purity.

More applied nitrogen is needed in all crops except soybeans compared to the previous 90 pounds per acre recommendation. More tests are needed but preliminary

results lean toward the use of: 140 pounds of nitrogen after corn or wheat; 110 pounds of nitrogen after dry beans and 90 pounds of nitrogen after soybeans.

The issue of lower tons per acre is harder to answer. Adverse weather conditions and late planting are the two main reasons, and shorter crop rotations and different varieties had some affect.

Graph #1:



Graph #2:

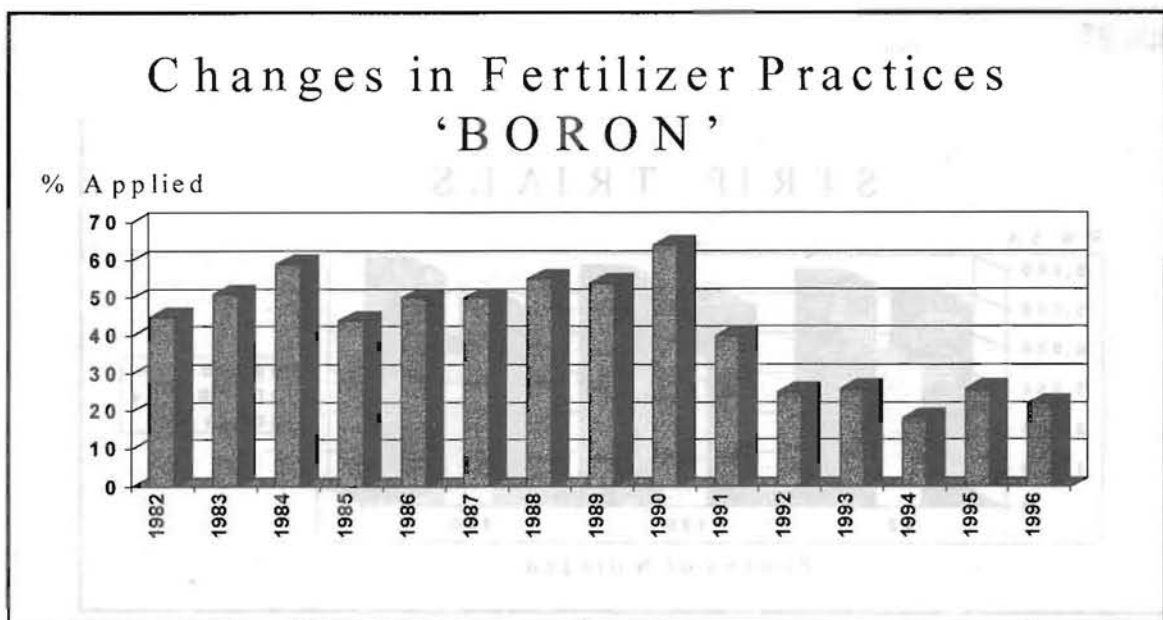
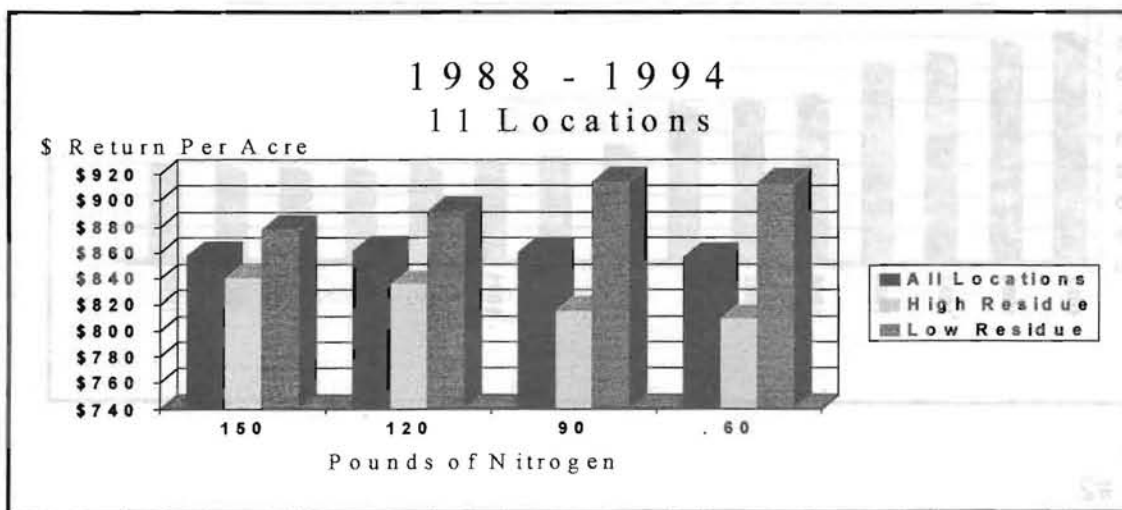


Table #3:

A P P L I E D N I T R O G E N V S . % S U G A R		
	<u>P o u n d s</u>	<u>% S u g a r</u>
1 9 8 2 - 9 2	1 0 0 . 4	1 6 . 8 2
1 9 9 3	1 0 6 . 9	1 8 . 0 3
1 9 9 4	1 1 0 . 8	1 8 . 6 1
1 9 9 5	1 2 2 . 8	1 7 . 5 4
1 9 9 6	1 2 5 . 3	1 7 . 9 9

Graph #4:



Graph #5:

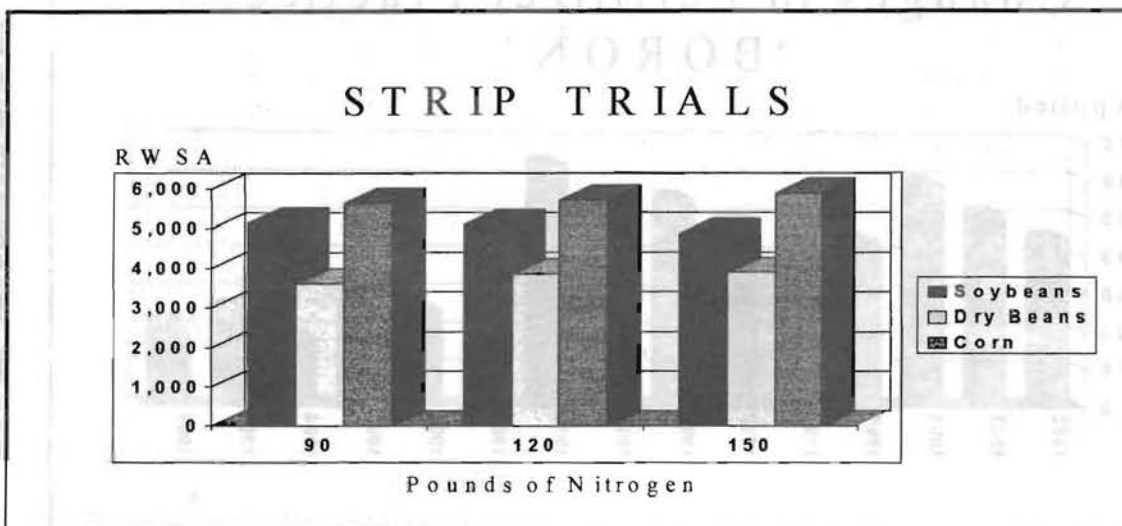


Table #6:

EFFECT OF PLANTING DATE		
	<b>% Planted <u>in April</u></b>	<b>Tons/ <u>Acre</u></b>
<b>1981--90</b>	<b>84.5</b>	<b>18.98</b>
<b>1991--96</b>	<b>20.8</b>	<b>16.11</b>

Graph #7:

