RESEARCH REPORT

Sugarbeet Conference, Fort Collins, Colorado

February 5, 6, 1974

Prepared by: J. N. Carter

A. Location of Project: Western Region
Idaho-Montana-Utah Area
Snake River Conservation Research Center
Kimberly, Idaho

B. Work Reporting Unit Title: Maintenance of soil fertility by use of fertilizer and adaptable soil management practices.

C. Work Reporting Unit: 5704-12320-001

D. SMY's for Past Year at Location: 1.5 SMY

E. Names of Scientists in Project at Location: J. N. Carter, D. T. Westermann, and M. E. Jensen

F. Mission of Research:

To develop soil and tissue test procedures that can be used to predict the N fertilizer needs for optimum root and sucrose production by sugarbeets; to relate the N needs with the irrigation water used; and to develop a N simulation model for sugarbeets.

G. Objectives of Research:

To determine a predictive relationship for supplying adequate, but not excessive, N fertilizer for sugarbeets; to correlate the available soil N (mineralizable, ammonium, and nitrate) with N uptake, root yield, percentage sucrose, and sucrose yield for sugarbeets in southern Idaho; to relate the constant in the equation $N = N_o e^{-Ct}$, used for predicting changes in NO_3-N in sugarbeet petioles, to the various soils and climatic conditions in southern Idaho; and to test a N simulation model for sugarbeets, developed from data at one location in south central Idaho, with similar data obtained from wide geographical and climatological conditions.

H. Research Accomplishments:

Results show that a soil test to measure both the mineralizable and NO_3-N level of a soil serves as a valuable guide in recommending N fertilizer for sugarbeets. The amount of N supplied from mineralizable

sources in a uniformly cropped and fertilized field is expected to remain reasonably constant if adequate but not excessive N fertilizer is supplied each year to the crop grown. Therefore, repeating the test for mineralizable N each year may not be necessary. Determining the amount of NO_3-N in the root zone, which is now feasible with rapid and accurate methods of soil analysis, combined with predetermined mineralizable N, would increase the accuracy of N fertilizer recommendations. Results further indicate that petiole analysis, using the time-dependent theoretical approach developed, can be a valuable guide in recommending N fertilizer for sugarbeets. A soil test for available N, performed early in the season, would be preferred to a tissue test so that fertilizer could be applied before planting or side-dressed early in the growing season. However, determining the optimum N fertility level by soil test does not reflect irrigation practices in which leaching may be involved. Tissue testing can be used to supplement a soil test in predicting the adequacy of N. Results also indicate that a N simulation model can be developed for accurately predicting N and irrigation water needs.

I. Impact of Research Accomplishments on Science and General Public:

The use of these tests will enable more accurate N fertilizer recommendations for obtaining maximum sucrose production. Greater profits will be achieved by reducing fertilizer costs, increased sucrose percentage in the beets, reduced impurities in the beets, and increasing the percentage of refinable sucrose. In addition, less N will be available for leaching below the root zone where properly applied reducing the possibility of contamination of groundwater with NO_3-N.

J. Obstacles to Achieving Objectives:

Considerable progress has been made in the development of both soil and tissue tests to predict optimum N fertilizer rates for maximum sucrose production. The main obstacle in the development of an accurate N simulation model is having sufficient complete data collected over many years of research.

K. Future Plans and Needs:

Emphasis will be placed on using data currently available in further evaluating and improving methods of predicting N needs of sugarbeets. Research in the immediate future will be confined to those areas of N research where there is need for strengthening present methods.