ON-FARM RESEARCH OF NITROGEN MANAGEMENT FOR SNAP BEAN PRODUCTION

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Snapbeans for processing are grown on approximately 75,000 acres in Wisconsin. Slightly more than one-half of the area is located in central Wisconsin on sandy soils where overhead irrigation is available, while the remainder is on heavier soils in east-central, south-central, north-west and north-east Wisconsin. Snapbeans are produced on specialized farms and in mixed, livestock farming systems, but nearly all are under contract with processing companies which provide inputs for production and management. Because of the different requirements of the processors, perhaps up to 10 major bean cultivars are grown each year across the various locations, requiring different management practices to produce optimum returns to both grower and processor. Recently, there is increasing concern about the impact of agricultural practices on environmental quality. Of particular importance in central Wisconsin where there are porous soils and a high water table, is the movement of chemicals, e.g. fertilizers and pesticides into the ground water.

The recommended amounts of nitrogen to be applied to snapbeans have not changed appreciably for some time, even though there have been on-going changes in the other components of the cropping system. The current recommendations are for the addition of 40 N/A on low-N soils and 20 lbs/A on moderate-fertility soils with perhaps a starter fertilizer on all. New cultivars have replaced others. Tillage practices, within and between row plant spacings, methods of N application, planting and harvesting machinery have all undergone considerable modification. Along with these improvements, problems associated with increased root rot incidence have become greater, particularly where short rotations are practiced. It is within this background of change that it was necessary to re-assess the N needed for snapbean production in Wisconsin.

Options for research. Traditionally, production-oriented research is conducted on an experiment station and the findings are presented at field days and growers meetings or through published bulletins, with the expectation that the best results will be adopted for production. Usually factorial experiments involving the combination of a few typical cultivars, different N levels and possibly one other factor are conducted. Even though large experimentally, these combinations represent only a small proportion of the combinations that occur in reality throughout production fields in Wisconsin. The limited space and opportunities presented by the constraints of traditional experiment station research suggested that perhaps other options should be explored.

"On-farm" research has received emphasis recently in Third world countries where it is evident that traditional approaches were not working well. On-farm research is a combination of primary research and extension, but it is conducted in the farmer's field and he/she is an important partner in designing, conducting and interpreting the research. The farmer provides knowledge, practical experience, the land and many of the experimental inputs and an assessment of the relevance of the results. The research scientist provides new ideas based on scientific inquiry, acquisition of data measurements, good experimental control and assurance that data interpretation is valid. The objective of on-farm research is to obtain information that will optimize productivity and profitability and protect fragile natural resources as efficiently and effectively as possible.

On-farm research in 1986. On-farm research on snapbean production was conducted in eleven fields in Wisconsin in 1986. Seven fields were in the central sands area and four were on clay loam soils in southern Wisconsin. Participating growers were identified with the assistance of processing company field persons. Within each field, which ranged from 18 to 140 acres, 6-8 blocks were identified at representative sites to lay out each replication. Up to 9 treatments were applied. These consisted of adding different amounts of N fertilizer (e.g. 20, 40, 20 + 20 lbs N/A) or rhizobial inoculant, thinning plant stands to alter population density or planting a "control" of a non-nodulating soybean cultivar to determine the amount of N supplied by the soil and from fertilization by the farmer. A "farm-base" treatment was included in each block to compare the experimental treatments to the actual farm practices. Each experimental unit consisted of 3 rows long enough to provide 1/100 hectare. Row lengths differed according to between row spacing. One to two days prior to harvest all experimental plots were harvested to determine plant dry wt. and pod yield. Subsequently tissues were assayed for total N content.

Preliminary results from 1986. Although some data were lost, there was excellent recovery overall. We found that when farmers were applying low to moderate levels of N, additional application of 20 lbs N during the early vegetative stage increased pod yields. Similarly, where there was a response to N application the addition of granular rhizobial inoculant as a sidedress during early vegetative growth produced a yield increase comparable to that from adding 20 lbs N/A. However, different cultivars responded differently. We also found that cultivars responded differently to different population densities, suggesting that yields were maximized at different densities. When seed costs are considered, optimum returns differ for different cultivars under different management practices.

Modifications in 1987 included sampling throughout the season to develop a profile of nitrogen accumulation, inclusion of a constant good fixing, root rot resistant dry bean for field to field, and cultivar to constant comparisons.

Participating growers were very enthusiastic, with increased interaction resulting during similar trials in 1987. We conclude that on-farm trials provide an effective and efficient research approach to generate primary research information which is applicable to commercial production.

Reference

Hildebrand, P. E. and Federico Poy. 1985. "On-Farm Agronomic Trials in Farming Systems Research and Extension." Lynne Reinner Publishers, Inc. Boulder, CO. 161p.