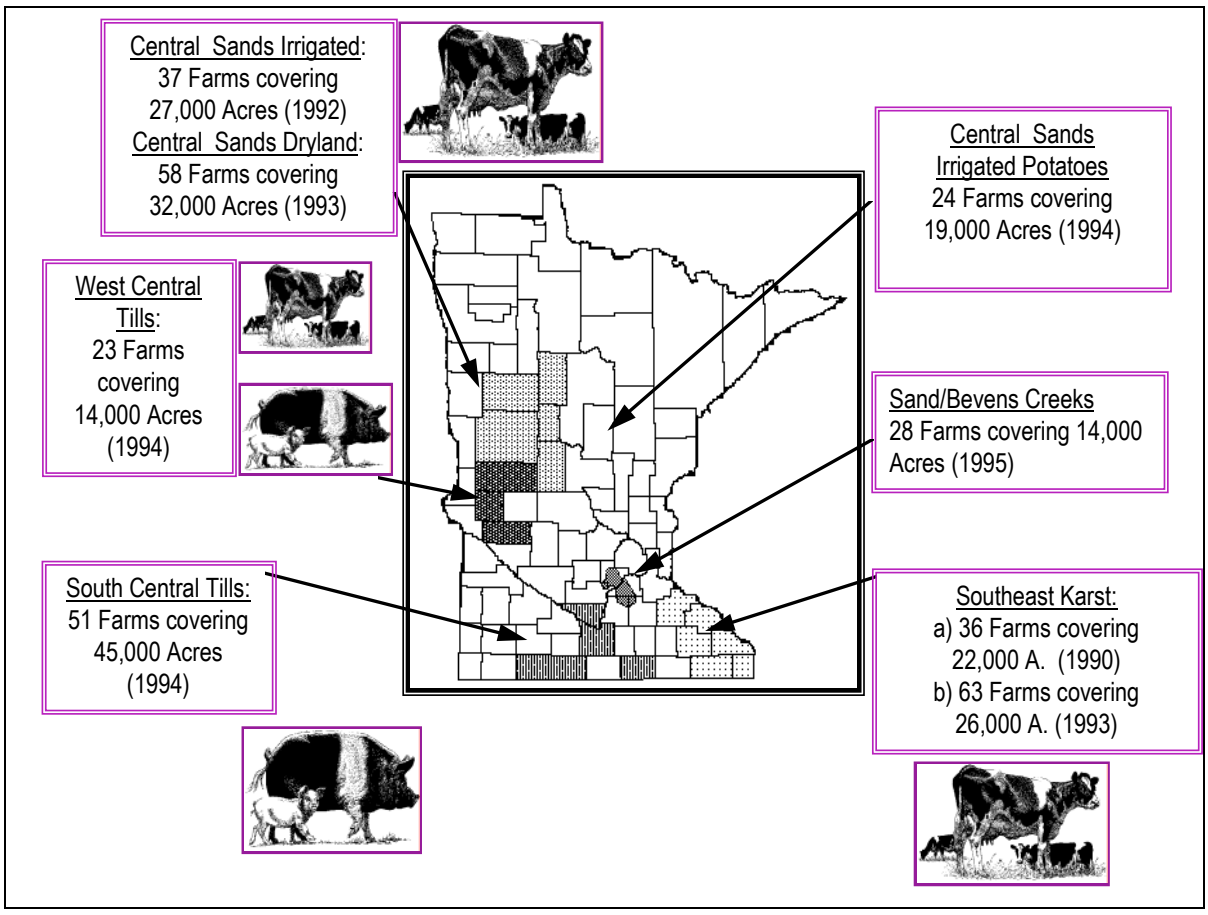
Farm Nutrient Management Assessment Program For Hog Producers in South Central MN and Dairy Farmers in Southeast MN

In the past 5 years, over 300 farms covering over 200,000 acres, participated in the **FA**rm **N**utrient **M**anagement **A**ssessment **P**rogram (**FANMAP**) with staff from the Minnesota Department of Agriculture. Producers volunteered 2-4 hours of their time to share information about their farming operation. Producers were carefully selected to represent a wide diversity of management skills and farm characteristics. The overall purpose of the program was to develop a clear understanding of current farm practices regarding agricultural nutrients and utilize this knowledge to target various forms of assistance.



Pork producers in South Central Minnesota were the focus of the South Central Tills surveys and dairy producers were the focus of the Southeast Karst surveys. The South Central Tills surveys concentrated on the five counties with the highest densities of hogs while the Southeast Karst surveys focused on six counties with a major portion each county located on the Karst soils. The Karst area is defined as soils overlying a bedrock of fractured limestone.

Information collected focused mainly on nitrogen use on corn acres. Information was collected on a field by field basis for nitrogen inputs of fertilizer, manure and legumes. These inputs were then compared to the University of Minnesota (UM) recommendations for corn based on previous crop, soil type, and yield goal.

The average farm size was 886 acres with 842 acres of tillible cropland and all farms had some type of hog production. Corn accounted for 53% of the cropland acres and soybeans accounted for another 42%. Ninety-seven percent of commercial nitrogen fertilizer used was applied to the corn acres and the average commercial nitrogen fertilizer rate on corn acres was 141 pounds of nitrogen per acre. Seventy-one percent of the nitrogen fertilizer applied to corn was in the form of anhydrous ammonia. In regard to anhydrous ammonia, 49% was fall applied, 36% was spring applied, and 15% was side-dressed during the growing season.

Timing of nitrogen applications is important from is important from both a economic and environmental standpoint. Generally, the more time between the nitrogen application and crop uptake, the greater the nitrogen loss. Not only is the nitrogen not available for the corn crop, but often the nitrogen will leach into groundwater. To receive the maximum benefit from fall applied nitrogen, soil temperatures should remain below 50^{o} at the 6 inch depth. At Waseca and Lamberton experiment stations, this occurs approximately October 29. In 1993 at the Waseca experiment station, the year of fall application for the farmers in the survey, soil temperatures reached 50^{o} on October 10 but rose above 50^{o} on the 15th and the fell below and remained below 50^{o} on October 27. Over two-thirds of producers applied anhydrous before October 29. Delaying fall applications until October 27 could have made more nitrogen available for the corn crop in 1994. Research at the Waseca experiment farm has shown that corn with spring applications of nitrogen will constantly out-yield fall applications of nitrogen if nitrogen is applied at the same rate. Farmers today should consider the possible yield reduction when deciding on the time of fall application of nitrogen and when considering fall versus spring application of nitrogen.

Livestock on farms consisted mainly of hogs, but some farmers also had dairy and beef . The 51 farmers surveyed sold a total of 30,000 feeders, 150,000 finishers and maintained 8,500 sows on the farm. Hog production contributed 93% of the manure, based on nitrogen. Ninety-two percent of the manure was handled as a liquid and 8% as a solid, also based on nitrogen. Eighty percent of the manure was applied on corn, also based on nitrogen. Figure one details the fate of the manure as it travels to the field.

Total pounds of manure nitrogen produced was 1,800,000 for all farms. However, only 450,000 pounds, or 25% of the nitrogen produced, was available for the 1995 crop. Most of the nitrogen was lost though application methods. In fact, more nitrogen was lost, 675,000, than was made available to the 1994 crops! Much of this loss was because of the lack of incorporation of manure (40% of the manure applied had no incorporation). Same day incorporation of manure would double the amount of nitrogen available compared to no incorporation. Also, approximately one-half of the nitrogen “lost” would be available during the second and third years after the application.

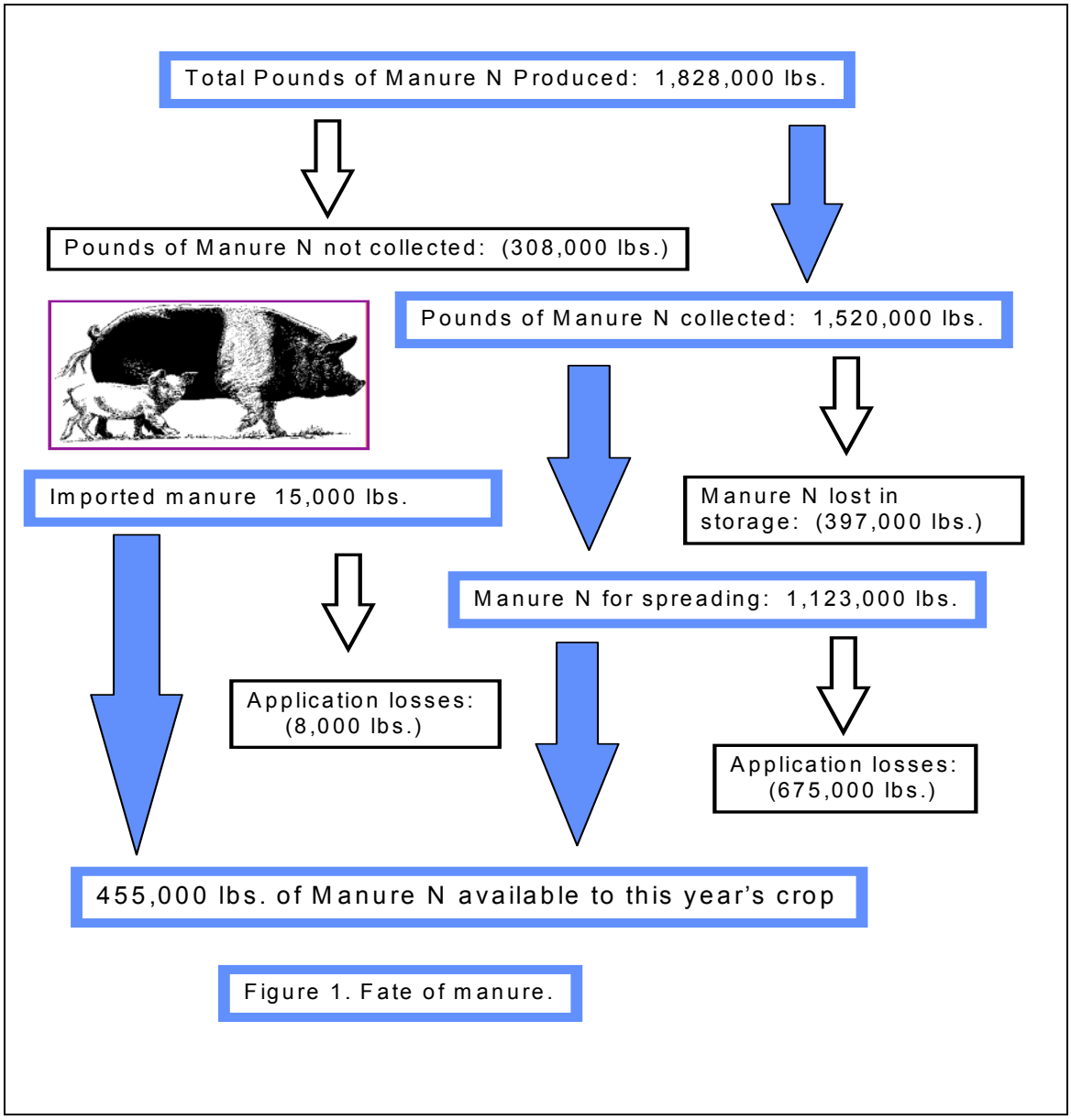


Figure 1. Fate of manure.

One-third of the farmers had tested manure in the past. Manure testing is often the best way to determine the amount of nutrients you have available.

Commercial fertilizer, manure, and legumes contributed a total of 4,375,000 pounds of nitrogen available for the 1994 corn crop. See figure 2.

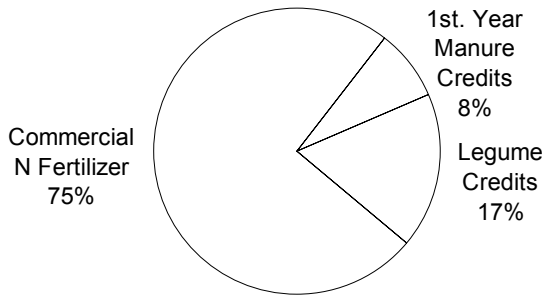


Figure 2. Contributions of Nitrogen to the 1994 corn crop.

Amounts of nitrogen applied were then compared to the UM recommendations. The corn yield goal averaged 154 bushels per acre across all five counties and 97% of the soils tested were in the medium to high range in regard to organic matter. Most of the corn acres were also in a corn soybean rotation, allowing a contribution of approximately a 40 nitrogen credit for those corn acres. Figure 3 compares the amount of nitrogen contributed to the UM recommendations for corn.

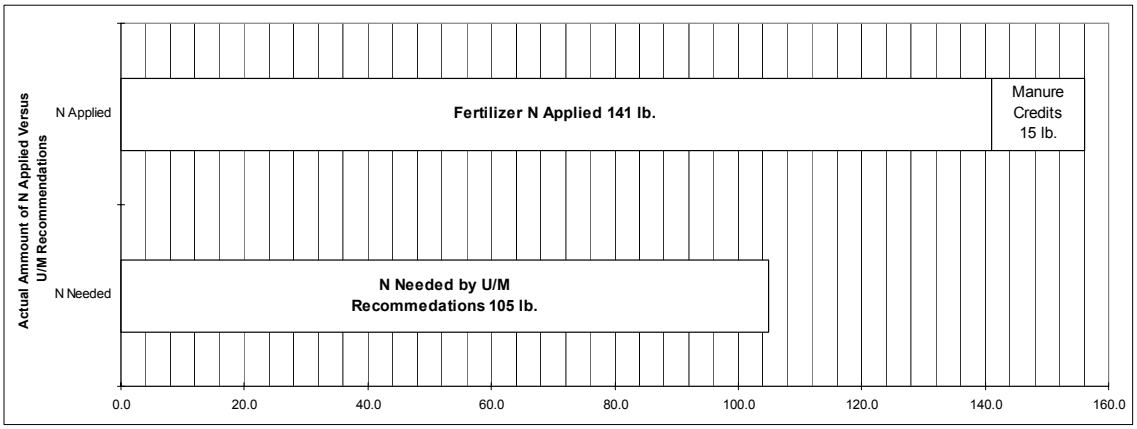


Figure 3. Crop nitrogen requirements in comparison to nitrogen inputs.

Nitrogen fertilizer rates were also broken down by legume and manure contributions into four scenarios. Figure 4 details the differences in those rates.

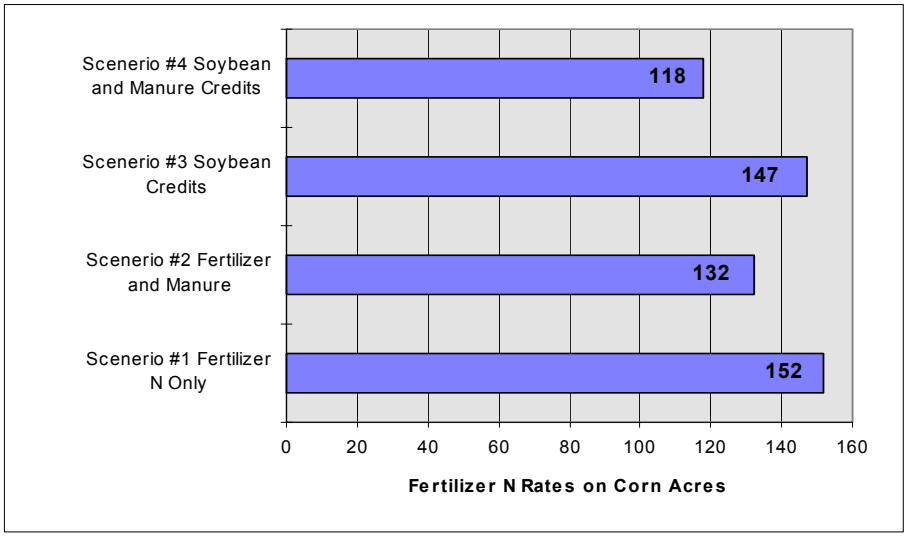


Figure 4. Commercial nitrogen rates on corn separated by legume and manure contributions.

Farmers, on average, were reducing nitrogen fertilizer by 5 pounds an acre when comparing corn following corn to corn following soybeans. Soybeans contribute 40 pounds per acre of nitrogen to the following corn crop.

Next, the different scenarios were compared by the rates of excess above the UM recommendations. Figure 5 details those rates.

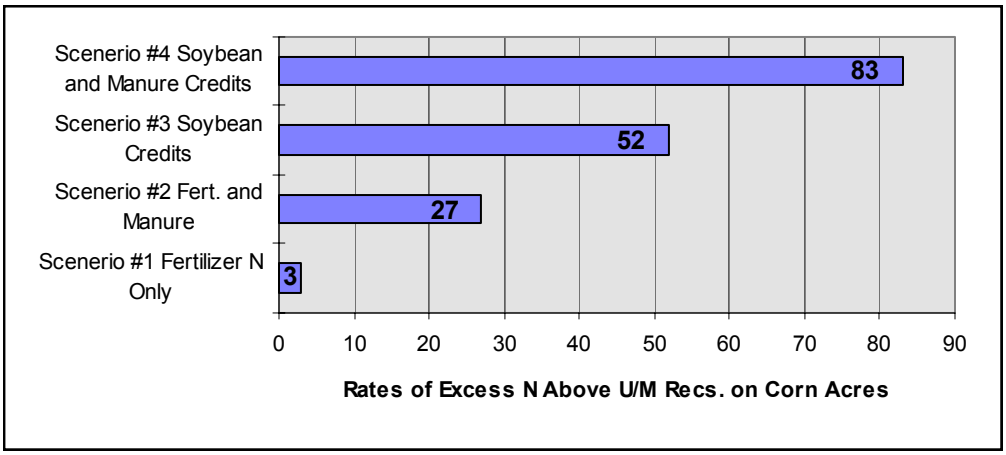


Figure 5. Amounts of nitrogen in excess of UM recommendations.

When farmers were applying fertilizer nitrogen to corn acres with no manure applied or previously in soybeans, they were doing an excellent job. Here reductions of nitrogen would reduce yields and increases of nitrogen would not increase the yields enough to pay for the cost of the nitrogen. Clearly an area where farmers could save money on nitrogen is on those acres with soybean credits. An additional 50 pound per acre reduction could save a farmer $10.00 an acre with the same yield potential. If a fertilizer dealer is applying the nitrogen, it is important to inform the dealer of corn fields previously in soybeans so they can reduce nitrogen rates. Manured corn acres could also be an area where farmers have potential savings on fertilizer. Manured corn acres not previously in soybeans could have reductions of 25 pounds of nitrogen per acre, or a savings of $5.00 per acre, with the same yield potential. And, on manured corn acres previously in soybeans reductions of 80 pounds of nitrogen per acre would be possible, or a savings of $16.00 per acre, with the same yield potential. With nitrogen prices high, farmers should supply information about fields previously in soybeans, or fields applied with manure, to anyone applying nitrogen fertilizer.

Dairy Farmers in Southeast Minnesota

The average farm size was 405 acres with 274 acres of tillible cropland and all farms had some type of dairy operation. Corn accounted for 49% of the cropland acres while alfalfa, soybeans and small grains accounted for 22%, 16%, and 10% respectively. Ninety-two percent of commercial nitrogen fertilizer used was applied to the corn acres and the average commercial nitrogen fertilizer rate on corn acres was 90 pounds of nitrogen per acre. Fall nitrogen fertilization is not recommended for Southeast Minnesota and in this study there was no fall nitrogen fertilization.

Livestock on farms consisted mainly of dairy, but some farmers also had hogs and beef . The 63 farmers surveyed had an average dairy herd of 68 cows. Dairy livestock contributed 95% of the manure, based on nitrogen. Forty-five percent of the manure was handled as a liquid and 55% as a solid, also based on nitrogen. Eighty percent of the manure was applied on corn, also based on nitrogen. Figure 6 details the fate of the manure as it travels to the field.

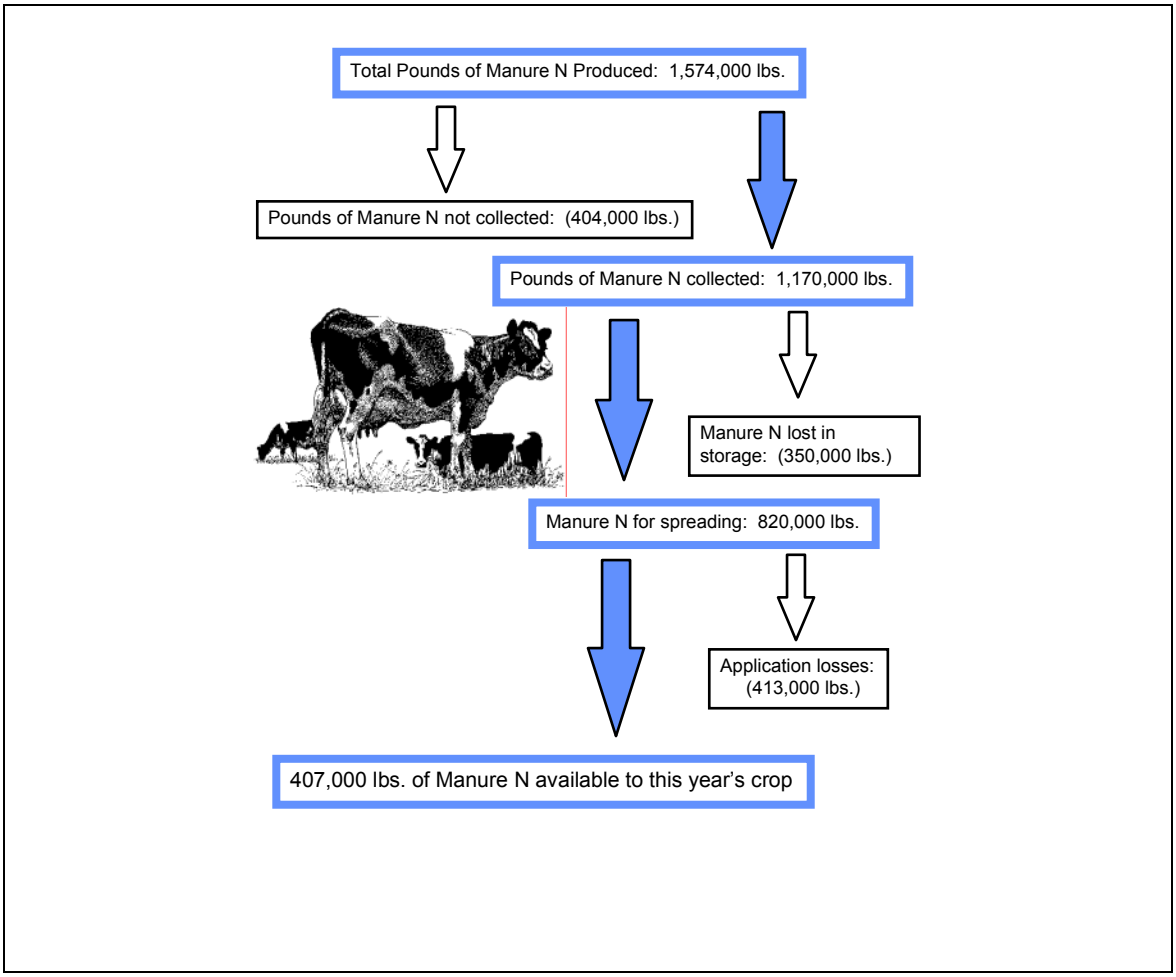


Figure 6. Fate of manure for the Southeast farmers.

Total pounds of manure nitrogen produced was 1,500,000 for all farms. However, only 400,000 pounds, or 25% of the nitrogen produced, was available for the 1995 crop. Most of the nitrogen was lost though application methods. In fact, more nitrogen was lost, 413,000, than was made available to the 1994 crops! Much of this loss was because of the lack of incorporation of manure (40% of the manure applied had no incorporation). Same day incorporation of manure would double the amount of nitrogen available compared to no incorporation. Also, approximately one-half of the nitrogen "lost" would be available during the second and third years after the application.

Fifteen percent of the farmers had tested manure in the past. Manure testing is often the best way to determine the amount of nutrients you have available.

Commercial fertilizer, manure, and legumes contributed a total of 4,375,000 pounds of nitrogen available for the 1994 corn crop. See figure 7.

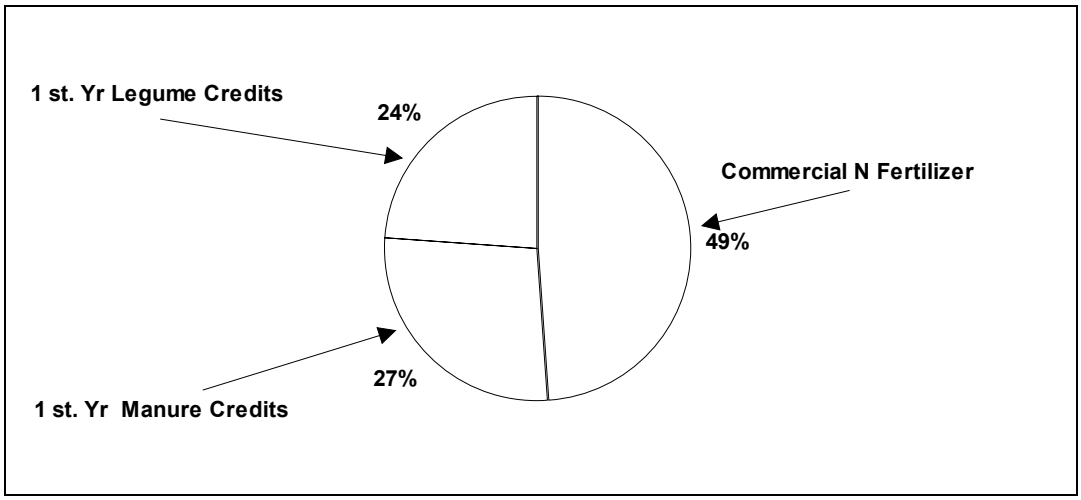


Figure 7. Contributions different sources of nitrogen.

Amounts of nitrogen applied were then compared to the UM recommendations. The corn yield goal averaged 147 bushels per acre across all six counties and soils were assumed to be in the medium to high range in regard to organic matter. Many of the corn acres were also in a corn soybean or a corn alfalfa rotation, allowing contributions of nitrogen credits for those corn acres. Figure 8 compares the amount of nitrogen contributed to the UM recommendations for corn.

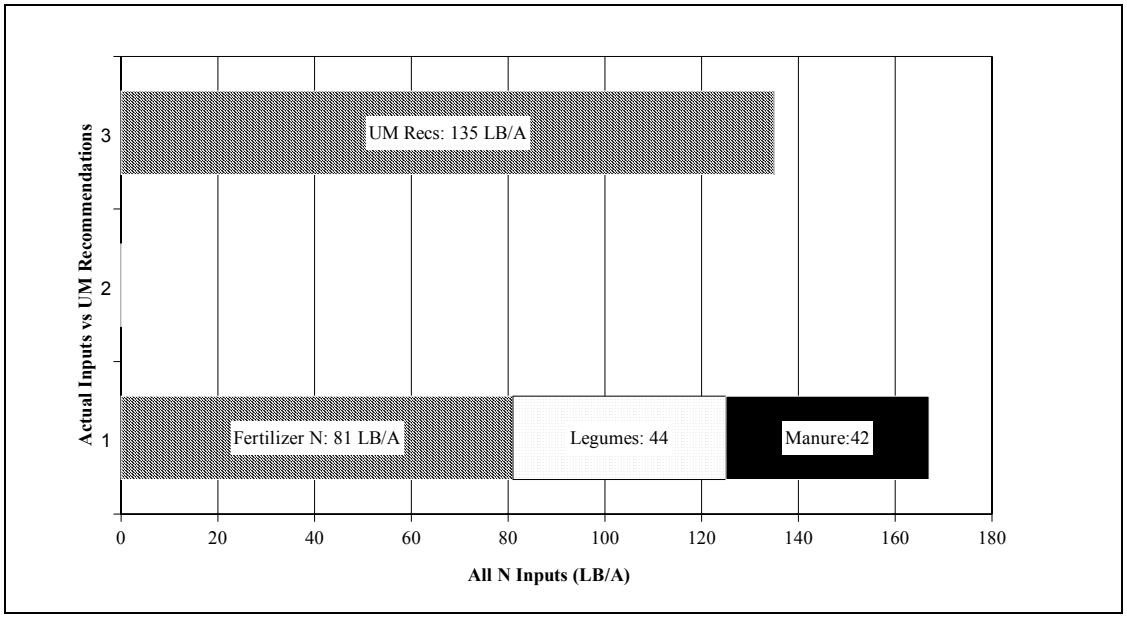


Figure 8. Crop nitrogen requirements in comparison to nitrogen inputs.

Nitrogen fertilizer rates were also broken down by legume and manure contributions into six scenarios. Figure 9 details the differences in those rates.

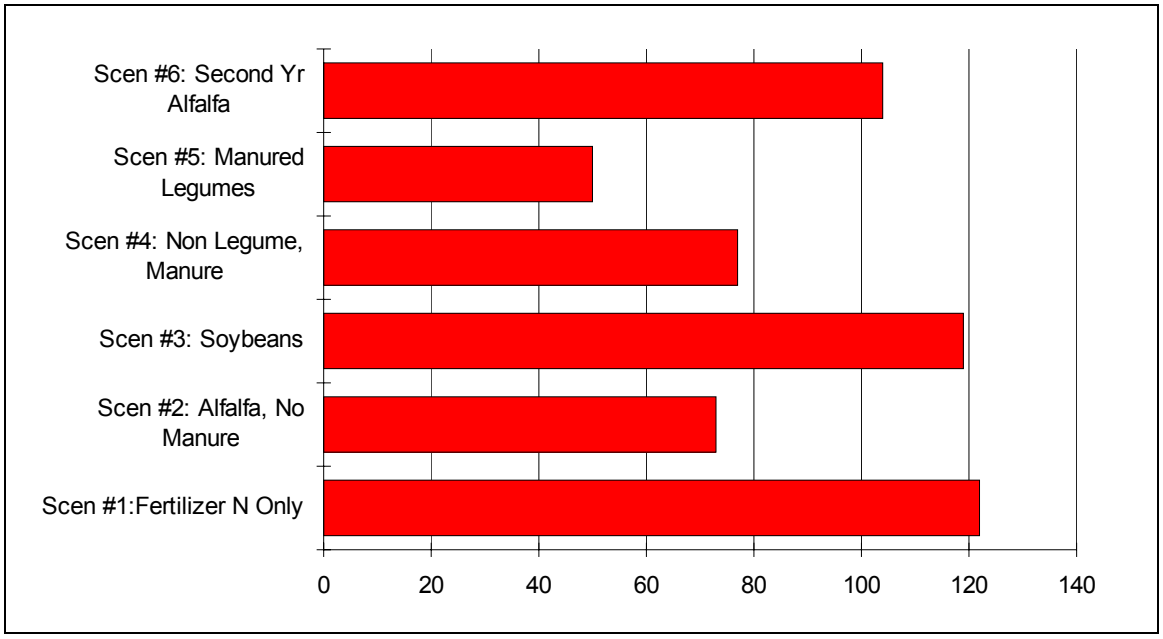


Figure 9. Commercial nitrogen rates on corn separated by legume and manure contributions.

Farmers, on average, were reducing nitrogen fertilizer by 5 pounds an acre when comparing corn following corn to corn following soybeans. Soybeans contribute 40 pounds per acre of nitrogen to the following corn crop.

Next, the different scenarios were compared by the rates of excess above the UM recommendations. Figure 10 details those rates.

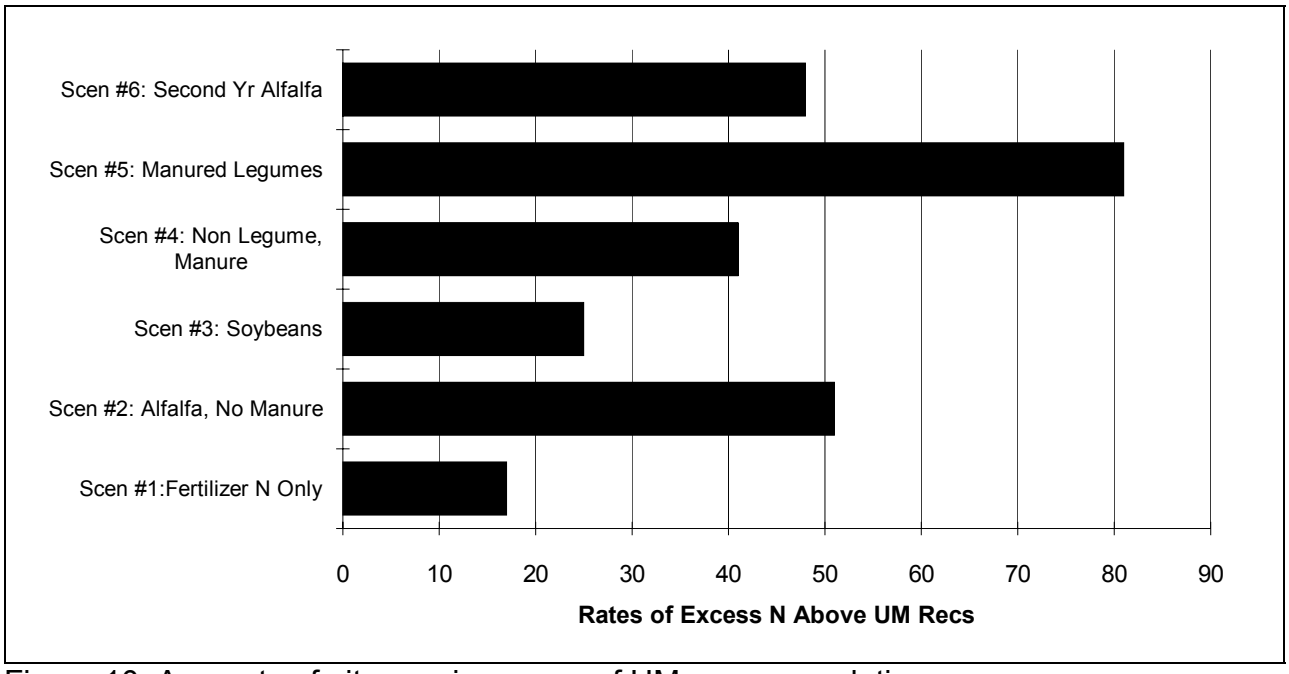


Figure 10. Amounts of nitrogen in excess of UM recommendations.

When farmers were applying fertilizer nitrogen to corn acres with no manure applied or previously in soybeans, they were over-applying by about 15 pounds

per acre. When manure or legume credits are added to the corn acres, over-applications increase to 25 to 80 pounds per acre. Savings of $5.00 to $16.00 an acre would be possible and the yield potential would not change. In addition, a good stand of alfalfa (3 - 4 plants per square foot) would supply the needs of a corn crop with a yield potential of up to 170 bushels per acre. A small amount of nitrogen in the starter would be sufficient for these acres. If possible a farmer could get more value from manure if it is applied to a corn field that was not just in a good crop of alfalfa. If a fertilizer dealer is applying the nitrogen, it is important to inform the dealer of corn fields previously in legumes or applied with manure so they can reduce nitrogen rates. With nitrogen prices high, farmers should supply information about fields previously in soybeans or fields applied with manure to anyone applying nitrogen fertilizer.

Summary

Recent updates in the UM recommendations have reduced the amount of nitrogen required on corn following corn, corn following soybeans, and corn following alfalfa (figure 11). Several reasons have contributed to these reductions. Better seed varieties, increased soil fertility, different tillage practices, and intensive test plot work are some of those reasons. These reductions in resent years have come with no overall yield losses at the reduced rates; Which means savings for the farmer.

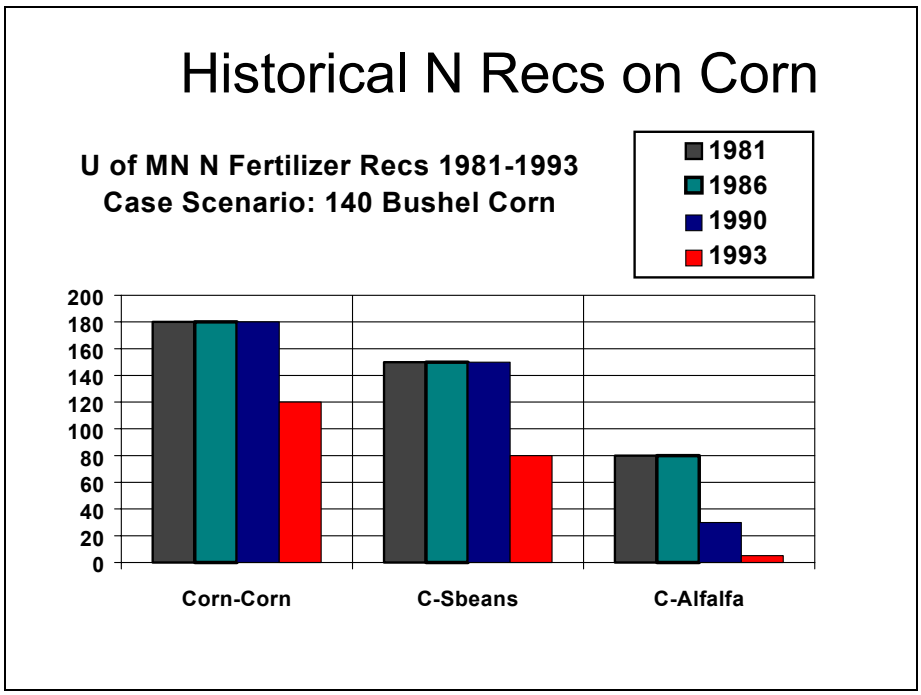


Figure 11. Changes in nitrogen recommendations for corn from 1981 to 1993.

Farmers today have an opportunity to save fertilizer costs by replacing nitrogen with manure or legume credits. When discussing nitrogen applications, farmers should make manure and legume crediting known to whoever is applying the nitrogen. Over-applying nitrogen is only a donation to whoever is selling the nitrogen and is a detriment to the environment where the farmer lives.