MIDSOUTH

Soft Red Winter Wheat – High Yields Achieved with Intensive Management

By C.S. Snyder

It wasn't too many years ago that SRWW growers were pleased with yields ranging from 40 to 50 bu/A. Today, they are disappointed if several of their fields do not yield more than 80 to 90 bu/A, or if the farm average yield dips below 60 to 70 bu/A.

Over the past decade or so, U.S. average wheat yields have continued their upward trend because of improved varieties and improved management (**Figure 1**). Future SRWW yield improvements will depend heavily on attention to management details. High yield successes have been achieved in numerous SRWW-producing states. In 1998, growers in Arkansas documented yields of 119.4 bu/A, and growers in Kentucky documented yields of 115 bu/A.

Soft red winter wheat (SRWW) yields have been increasing rapidly. Farmers now expect yields in their best fields to be as much as twice as high as those just a few years ago. In 1998, a farmer field in Arkansas produced 119.4 bu/A in that state's research verification program. Kentucky research yields consistently exceeded 100 bu/A during the 1990s, in both tilled and no-till trials. The key to continued yield increases will be attention to management details.

In Fields of Kentucky

Dr. Morris Bitzer at the University of Kentucky has worked for several years with the agricultural industry and SRWW growers in high yield contests. The top 10 yields each year in Kentucky ranged from 94 to 115 bu/A during 1993 to 1998. As a consequence of this joint effort to improve wheat management and the consistent demonstration of high yields, state average wheat yields have also increased since the early 1990s. Dr. Bitzer notes five key management considerations for high yields: 1) selection of an adapted variety with proven performance in university tests; 2) seeding rates of 30 to 35 seeds/square foot, 3) timely seeding (October 10 to 20 in Kentucky); 4) timely nitrogen (N) applications, using split applications in the spring if the yield potential is above 65 bu/A; and 5) use of pesticides as needed. The majority of the highest yields in the Kentucky contests received N-P_2O_5-K_2O fertilizers near planting in the fall. Application rates varied among years and farms, which makes it difficult to make any specific conclusions. Fall N rates ranged from 4 to 45 lb/A, P_2O_5 rates from 5 to 115 lb/A, and K_2O rates from 5 to 200 lb/A.

Arkansas Research Verification Program

Many agronomists suggest the most important management decision a grower can make to obtain high yields is the selection of an adapted variety. When the wheat drill leaves the field, as much as 60 percent of the yield may have already been determined. In the southern SRWW states, adequate soil surface drainage could be the next most important factor. Drain furrows should be established at correct intervals, with connections to outlet ditches, according to Dr. William Johnson, University of Arkansas Cooperative Extension Service. He advocates that farmers spend about half the time it takes to plant in running the drain furrows.

These principles and other research-proven practices were implemented on 11 fields in the 1997-98 University of Arkansas

Wheat Research Verification Program. Program yields ranged from 55.3 to 95.3 bu/A and averaged 73.2 bu/A at 13.5 percent moisture. Test weights averaged 59 lb/bu. The 95.3 bu/A yield was on a 53-acre field on Roxanna and Dardanelle silt loam soils (deep, well drained, with average to high native fertility) in the Arkansas River Valley in Logan county. Soil pH in the field was 6.9, and Mehlich 3 extractable phosphorus (P) and potassium (K) were 52 and 187 lb/A, respectively, in the upper 6 inches. Cation exchange capacity (by cation summation) was 9 meq/100 grams. The field was prepared by disking twice, followed by a field cultivator. The previous crop was corn. Urea was fall-applied at 30 lb N/A, the standard fall N rate when wheat follows corn in Arkansas, along with 30 lb/A P_2O_5 and 30 lb K_2O/A. The variety was NK Coker 9543 drilled on October 13, 1997 at 120 lb/A. A blend of urea and ammonium sulfate was applied to provide 113 lb N/A and 24 lb/A sulfur (S). Initial stand was 31.3 plants/square foot. Final tiller count was 5.4 tillers/plant, and the head count was 83.6 heads/square foot. The field was combined on June 5, 1998 with a test weight of 59.7 lb/bu. The excellent yield resulted in an estimated applied N use efficiency of 1.2 lb of N/bu. The field had scattered ryegrass that was below the University of Arkansas treatment threshold. No other pests were detected at treatment levels.

Based on an estimated wheat price of $2.80/bu, total income for the Arkansas field was $266.84/A. Total direct expenses were $93.28/A, and total fixed expenses were $22.75/A, which brought the total specified expenses to $116.03/A. The break-even price above total specified expenses was $1.22/bu. Net returns above total expenses were $150.81/A and changed to $84.10/A when a 25 percent crop share rental was considered. **This high-yielding field proved to be the most profitable of the 11 fields enrolled in the 1997-98 University of Arkansas Wheat Research Verification Program**. The fertilizer expense on this high-yielding field accounted for 36 percent of the total specified expenses. Just as in this Arkansas example, many wheat growers are spending more on inputs but reaping the reward in higher yields and lowered per unit costs, which translates into lower break-even prices.

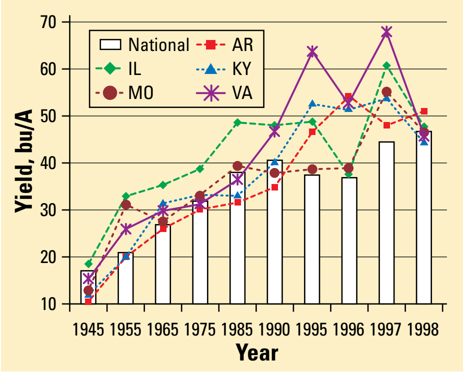

Figure 1. Selected state SRWW and national wheat yield trends. (Source: USDA-NASS.)

Several of the most successful wheat growers who participated in the research verification program cited attention to P needs as fundamental to high yield success, especially on the fields with low P which are rotated with rice. On these soils, many growers are applying P in the fall and diammonium phosphate with the first spring N.

Kentucky Research

The goal of a University of Kentucky wheat fertilization research program (at Princeton) comparing conventionally tilled and no-tillage systems is not to produce maximum yields. Instead, according to Dr. Lloyd Murdock, Extension Professor, the focus is to remove as many yield limiting barriers as possible to allow the yield potential of each variety to express itself within each system. During years with favorable weather, SRWW yields over 100 bu/A have been common in both conventionally tilled and no-tillage systems (**Table 1).**

Almost all of the wheat trials at Princeton follow corn...typical for most of the farmers in western Kentucky. In spite of good efforts, the researchers have not always been successful in removing all yield barriers. Weather frequently was unfavorable and some weeds, insects and diseases escaped control. Of course, the same is often true in many farm fields. Still, consistently high yields have been obtained in research with both conventional tillage and no-till systems. These research results illustrate the yield potential possible on many farms with skilled management.

The following methods and practices are used in the University of Kentucky tillage system and fertilization program. Although they would not always be economical for producers, according to Dr. Murdock, the principles can lead to consistent high yield production.

1. Select well-drained soils, soil test, and apply aglime and fertilizer according to research-based recommendations. Apply 20 lb/A of fall N if the previous corn crop was N-deficient.
2. Flail-mow corn stalks on no-tillage plantings; till the field to reduce surface residue cover to less than 30 percent for tilled plantings.
3. Choose a high yielding variety with a good disease resistance/tolerance package, based on university trials. Calibrate the seed drill to accurately plant 35 disease treated seeds/square foot for tilled plantings and 40 seeds/square foot for no-till plantings. Plant at 1 to 1½ inches deep during the optimum planting period (between October 10 and 20 in western Kentucky).

TABLE 1. Effects of tillage system on SRWW yields at the Princeton, Kentucky Research and Extension Center.

Year	Yield, bu/A	
	Tilled wheat	No-till wheat
1993-94	108	114
1994-95	106	107
1995-96	93	82
1996-97	91	88
1997-98	85	78
1998-99	89	87
Average	95	93

4. Apply a contact herbicide near planting for no-till plantings.
5. Make stand counts soon after emergence to determine stand adequacy. Scout weekly for pest problems. Apply herbicide in November if weed population warrants action. Scout and spray insecticide 30 to 60 days after planting to control aphids which vector Barley Yellow Dwarf Virus (if thresholds are exceeded).
6. Apply the first part of the split N rate at green-up (Feekes growth stage 3) in February. This is usually one-third of the total spring N rate. If tiller numbers are below 70/square foot, increase this first split N rate by 10 to 20 lb/A. Apply the remainder of the spring N split in March (Feekes growth stage 5 or 6) for a total spring N rate of 100 lb/A for tilled wheat and 120 lb/A for no-till wheat.
7. Apply any needed insecticide in February or March if aphid numbers exceed threshold.
8. Apply herbicide to control wild garlic and any spring weeds at Feekes growth stage 5 or 6.
9. Continue scouting for diseases and apply fungicides if necessary. Apply systemic fungicide at head emergence to protect against septoria, rust, and glume blotch.
10. Harvest as soon as practical to guard against test weight reduction that results from weathering.

Many farmers question why research plots sometimes yield more than farmer fields. Field variability can often explain yield differences. Farmers and crop advisers also need to remember that some researchers trim their plot alleys and plot ends in advance of harvest. The longer the period between plot trimming and harvest, the greater the potential for what is termed the "border effect", a yield enhancer.

Current SRWW varieties are responsive to good management, as illustrated in this Kentucky research. Excellent yields can be achieved in both tilled and no-till systems with proven crop production and protection practices. BC

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