

## HIGH YIELD WHEAT MANAGEMENT STUDIES

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Interest in high yield wheat management (i.e. intensive wheat management) has increased in Kentucky during the last few years. This interest has been created because of the improved yield potential of newer soft red winter wheat varieties, high yields obtained in intensive wheat management research in other states, and the high yields being obtained in Europe with their intensive management inputs.

In several of the European countries, average winter wheat yields of 70 bu/acre or higher are common in intensively managed fields, yields in excess of 100 bu/acre are being consistently produced. In contrast, average state yields in Kentucky over the past 10 years have been about 40 bu/acre with no great improvement. Reasons for this, in large part, have been because of minimized inputs into wheat production. Although this keeps costs low, it doesn't always result in the highest yields. With good management techniques, newer varieties and improved weed and disease control products, average state yields of 50-60 bu/acre are realistic. In fact, for wheat to be profitable in a single-cropping situation, a yield of about 55 bu/acre must be obtained. However, the question remains to what extent and how consistently wheat yields can be improved by increasing inputs and are these inputs economical?

### Methods

In an effort to answer these questions, a wheat management level study was started at Princeton in 1984. From an initial comparison at two management levels, the treatments have expanded to four management levels to better understand the economics of the treatments. The wheat was grown on a soil suited for high production and several high yielding varieties have been used in the study. The treatments consisted of the following:

- 1) Minimum Management - 1984-1987. Minimum inputs. Planting rate of 30-35 seeds/ft.<sup>2</sup>, 90# N/ac (1 application), and no fungicides, insecticides, or weed control.
- 2) Economical Management - 1985-1987. This treatment was an effort to make judicious use of any inputs. The inputs were

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the same as treatment 1 except fungicides, insecticides and weed control would be used only if needed as determined by scouting. Fungicides were the only additional inputs used for each of the years.

- 3) High Management - 1984-1987. This treatment was designed to use most of the inputs that might improve the chances for a high yield. Planting rate of 30-35 seeds/ft.<sup>2</sup>, 120# N/ac in 3 applications, insecticide at planting, weed control (1986-87), and scheduled fungicide use (2-3 applications).
- 4) Ultra High Management - 1986-87. In addition to the inputs used in treatment 3, this treatment used a growth regulator and the N rate was 180#/ac in 4 applications.

### Results

- 1) High yield levels of wheat can be obtained in Kentucky (Table 1).
- 2) Yield levels appear to be affected as much by weather and environmental conditions as they do by management. A good indication of this is the annual variation in yield levels, particularly at the minimum input level.
- 3) Wheat yields can be substantially improved by management techniques and inputs (Table 1) but it is not always economically feasible (Table 2).
- 4) When averaged over the four years of the study, the economic returns for the "High" management level were essentially the same as the "Minimum" management level. Although higher yields were achieved at the "High" management level, the additional returns were negated by the costs of the additional inputs for this treatment over the four-year period. In two of the years (1985 and 1987), the additional inputs were profitable; however, in the other two years (1984 and 1986) they were not.

Table 1. Effect of Management Level on Wheat Production

| <u>Treatment</u> | <u>Yields (bu/a)</u> |             |             |             |                |
|------------------|----------------------|-------------|-------------|-------------|----------------|
|                  | <u>1984</u>          | <u>1985</u> | <u>1986</u> | <u>1987</u> | <u>Average</u> |
| 1. Minimum       | 87                   | 32          | 63          | 89          | 68             |
| 2. Economic      | --                   | 51          | 62          | 89          | --             |
| 3. High          | 99                   | 65          | 78          | 109         | 88             |
| 4. Ultra High    | --                   | --          | 81          | 111         | --             |

Table 2. Effect of Management Level on Economic Returns Above the Minimum Management Level

| Treatment     | Economic Returns (\$/ac.)* |       |       |       |         |
|---------------|----------------------------|-------|-------|-------|---------|
|               | 1984                       | 1985  | 1986  | 1987  | Average |
| 1. Minimum    | 0                          | 0     | 0     | 0     | 0       |
| 2. Economic   |                            | +\$36 | -\$22 | -\$8  |         |
| 3. High       | -\$16                      | +\$37 | -\$21 | +\$5  | -\$1    |
| 4. Ultra High |                            |       | -\$36 | -\$16 |         |

\*Returns above costs for additional inputs only.

Wheat prices/bu: 1984 = \$3.30; 1985 = \$2.90; 1986-87 = \$2.50.

Table 3. Effect of Wheat Price on Economic Returns Above the Minimum Management Level

| Treatment                   | Economic Returns (\$/Ac) |        |        |        |         |
|-----------------------------|--------------------------|--------|--------|--------|---------|
|                             | 1984                     | 1985   | 1986   | 1987   | Average |
| ----- \$2.50/Bu Price ----- |                          |        |        |        |         |
| Minimum                     | 0                        | 0      | 0      | 0      | 0       |
| High                        | -25.60                   | +23.50 | -21.00 | + 5.00 | - 4.50  |
| ----- \$3.00/Bu Price ----- |                          |        |        |        |         |
| Minimum                     | 0                        | 0      | 0      | 0      | 0       |
| High                        | -19.60                   | +40.00 | -13.50 | +15.00 | + 5.50  |
| ----- \$3.50/Bu Price ----- |                          |        |        |        |         |
| Minimum                     | 0                        | 0      | 0      | 0      | 0       |
| High                        | -13.60                   | +56.50 | - 6.00 | +25.00 | +15.50  |

Table 3 shows the effect of wheat prices on returns when the cost of inputs remain constant. This demonstrates that the yield increase for the high management treatment becomes profitable as wheat prices increase and the economic risk for the higher inputs is reduced. The profitability of the additional inputs with the higher management should be evaluated annually since it is contingent on wheat prices, input costs and yield increases as a result of the higher inputs.

### Summary

Wheat yields in Kentucky can be increased by management but the inputs required for the higher management are not always profitable. Profitability is determined by the yield increase, price of wheat, and cost of the added inputs. Applying all the possible inputs routinely into a wheat management program is not a sound economical approach. Each producer should adapt management guidelines to his own situation (since no two seasons or fields are exactly the same) to utilize specific inputs under specific climatic conditions, using those that are profitable and adjusting those that are unprofitable. The challenge is not necessarily to get the highest yields possible, but to increase yields and to do it economically through good management.

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CREDITS

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