

1982

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### Recommended Citation

Raney, Robert J.; Russ, Oliver G.; and Powell, D. Michael (1982) "Tillage and No-preplant Tillage Compared for Grain Sorghum and Soybean Production in North-central Kansas," *Kansas Agricultural Experiment Station Research Reports*: Vol. 0: Iss. 12. <https://doi.org/10.4148/2378-5977.7368>

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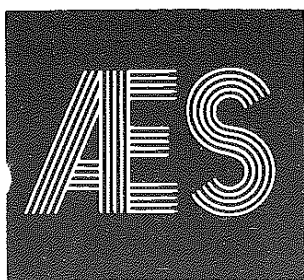
# Tillage and No-preplant Tillage Compared for Grain Sorghum and Soybean Production in North-central Kansas

## **Keywords**

Keeping up with research; 55 (April 1982); Kansas Agricultural Experiment Station contribution; no. 82-281-s; Tillage; No-preplant; Grain sorghum; Soybean; Preplant tillage; Kansas

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Keeping  
Up With  
Research  
**55**

APRIL 1982

## **Tillage and No-preplant Tillage Compared for Grain Sorghum and Soybean Production in North-central Kansas**

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Two main functions of preplant tillage are to control early-season weed growth and to prepare a seedbed. Both functions, however, can be accomplished without tillage operations if herbicides are applied to control early-season weeds and a no-till planter is available to plant directly into crop residue.

We evaluated grain yields and weed control for three preplant-tillage systems: (1) disk as needed to control weeds and prepare a seedbed; (2) apply a herbicide in April to control weeds and grasses until planting time, disk just before planting; and (3) use a herbicide, with no-preplant tillage, to control weeds and grass before planting, then plant with a no-till planter. This study was established on the K.S.U. North-central Experiment Field near Belleville in 1975. (See Table 1.)

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**AGRICULTURAL EXPERIMENT STATION**

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The cropping sequences were: (1) continuous grain sorghum, (2) continuous soybeans, (3) grain sorghum after soybeans, and (4) soybeans after grain sorghum. In all plots, crops were planted with a no-till planter in rows 30 inches wide. Grain sorghum was seeded at 52,000 seeds/acre (seeds 4 inches apart in the row); soybeans at 105,000 seeds/acre (seeds spaced 2 inches apart). Grain sorghum was fertilized by broadcasting nitrogen fertilizer to apply 60 pounds of nitrogen/acre in early spring and by banding at planting with 10-20-0 at 100 pounds/acre. Furadan was banded at planting at 13 pounds/acre to control insects. Also, in grain sorghum plots Ramrod/Atrazine was broadcast at 6 pounds of product/acre at planting to provide weed and grass control.

Soybeans were not fertilized, but the seed was inoculated. When the seeds were planted, Lasso + Sencor was broadcast at 2 qt and at .75 lb of product/acre to control weeds and grass.

Table 1. *Preplant operations on tillage test plots for grain sorghum and soybeans, North-central Experiment Field, Belleville, 1975-81.*

| Preplant treatment    | Operation and timing       |                 |
|-----------------------|----------------------------|-----------------|
|                       | Mid April                  | Before planting |
| Mechanical only       | Disk                       | Disk as needed  |
| Mechanical + chemical | 3 lb Bladex/a <sup>1</sup> | Disk            |
| Chemical only         | 3 lb Bladex/a <sup>1</sup> | None            |

<sup>1</sup>80 W wettable powder

Table 2. *Average grain sorghum yields, broadleaf weed control, and grass control for tillage systems, Belleville, 1975-81.*

| Tillage treatment     | Grain yield (bu/a)* | Weed control  |           |
|-----------------------|---------------------|---------------|-----------|
|                       |                     | Broadleaf (%) | Grass (%) |
| Mechanical only       | 64                  | 72            | 91        |
| Mechanical + chemical | 66                  | 85            | 93        |
| Chemical only         | 65                  | 87            | 75        |
| LSD (.05)             | N.S.                | N.S.          | 13        |

\*Grain yields corrected to 12.5% moisture.

Results for grain sorghum yields and weed control for 1975-81 are given in Table 2; those for soybeans in Table 3.

Table 3. Average soybean yields, broadleaf weed control, and grass control for tillage systems, Belleville, 1975-81.

| Tillage treatment     | Grain yield (bu/a)* | Weed control  |           |
|-----------------------|---------------------|---------------|-----------|
|                       |                     | Broadleaf (%) | Grass (%) |
| Mechanical only       | 24                  | 69            | 85        |
| Mechanical + chemical | 24                  | 78            | 87        |
| Chemical only         | 25                  | 75            | 82        |
| LSD (.05)             | N.S.                | 8             | N.S.      |

\* Grain yields corrected to 12.5% moisture.

Table 4 shows average crop yields and weed- and grass-control percentages for the cropping systems.

Table 4. Average yields, broadleaf weed control, and grass control for cropping systems, Belleville, 1975-81.

| Cropping system          | Grain yield (bu/a)* | Weed control  |           |
|--------------------------|---------------------|---------------|-----------|
|                          |                     | Broadleaf (%) | Grass (%) |
| Continuous grain sorghum | 65                  | 81            | 82        |
| Sorghum after soybeans   | 65                  | 82            | 91        |
| LSD (.05)                | N.S.                | N.S.          | 9         |
| Continuous soybeans      | 22                  | 72            | 88        |
| Soybeans after sorghum   | 26                  | 77            | 80        |
| LSD (.05)                | N.S.                | N.S.          | 6         |

\* Grain yields corrected to 12.5% moisture.

Grain sorghum and soybean annual yields for each cropping system and preplant tillage system are listed in Tables 5 and 6, respectively. The wide variation in yields probably can be attributed to the rainfall patterns and total annual rainfall.

Table 5. Annual grain sorghum yields for each cropping system and preplant tillage system, Belleville, 1975-81.

| Year                | Sorghum after soybeans |               |       | Continuous sorghum |               |       | Average |
|---------------------|------------------------|---------------|-------|--------------------|---------------|-------|---------|
|                     | mech.                  | mech. + chem. | chem. | mech.              | mech. + chem. | chem. |         |
| ..... (bu/a)* ..... |                        |               |       |                    |               |       |         |
| 1975                | 14                     | 19            | 11    | 31                 | 34            | 24    | 22      |
| 1976                | 50                     | 50            | 42    | 47                 | 49            | 58    | 49      |
| 1977                | 80                     | 91            | 81    | 84                 | 89            | 75    | 83      |
| 1978                | 58                     | 72            | 67    | 64                 | 64            | 71    | 66      |
| 1979                | 95                     | 90            | 102   | 84                 | 89            | 84    | 91      |
| 1980**              | 15                     | 9             | 15    | 7                  | 6             | 7     | 10      |
| 1981                | 139                    | 128           | 140   | 128                | 132           | 138   | 134     |
| Avg.                | 64                     | 66            | 65    | 64                 | 66            | 65    | 65      |

\* Grain yield corrected to 12.5% moisture.

\*\* Heavy chinch bug infestation caused crop failure.

Table 6. Annual soybean yields for each cropping system and preplant tillage system, Belleville, 1975-81.

| Year                | Soybeans after sorghum |               |       | Continuous soybeans |               |       | Average |
|---------------------|------------------------|---------------|-------|---------------------|---------------|-------|---------|
|                     | mech.                  | mech. + chem. | chem. | mech.               | mech. + chem. | chem. |         |
| ..... (bu/a)* ..... |                        |               |       |                     |               |       |         |
| 1975                | 29                     | 26            | 24    | 12                  | 21            | 32    | 24      |
| 1976                | 8                      | 5             | 7     | 24                  | 8             | 12    | 11      |
| 1977                | 37                     | 41            | 40    | 22                  | 26            | 31    | 33      |
| 1978                | 15                     | 15            | 13    | 15                  | 16            | 18    | 15      |
| 1979                | 29                     | 32            | 30    | 27                  | 29            | 27    | 29      |
| 1980                | 18                     | 21            | 20    | 17                  | 15            | 16    | 18      |
| 1981                | 47                     | 45            | 45    | 30                  | 33            | 38    | 40      |
| Avg.                | 26                     | 26            | 26    | 21                  | 21            | 25    | 24      |

\* Grain yields corrected to 12.5% moisture.

Table 7 shows the annual rainfall during the growing season, divided into two parts: rainfall from April through June, when the moisture is primarily stored in the soil profile; and rainfall from July through September, when it replenishes soil moisture used by the crop.

Table 7. Rainfall for the growing season (including spring and summer), Belleville, 1975-81.

| Year | Spring*  | Summer** | Growing season (total) |
|------|----------|----------|------------------------|
|      | (inches) |          |                        |
| 1975 | 13.24    | 5.57     | 18.81                  |
| 1976 | 9.87     | 5.90     | 15.77                  |
| 1977 | 13.38    | 15.80    | 29.18                  |
| 1978 | 11.89    | 17.54    | 29.43                  |
| 1979 | 10.69    | 10.53    | 21.22                  |
| 1980 | 8.81     | 6.40     | 15.21                  |
| 1981 | 9.56     | 14.69    | 24.25                  |
| Avg. | 11.06    | 10.92    | 21.98                  |

\* April, May, and June

\*\* July, August, and September

Below-average grain sorghum yields in 1975 and 1976 can be traced to below-average summer rainfall for those years. One cannot make such comparisons for 1980, when chinch bugs caused a crop failure. Near-average to above-average summer rainfall produced above-average grain yields in 1977, '78, '79, and '81.

Soybean yields were below average in 1976, '78, and '80. Rainfall was below average in 1976 and 1980 for both spring and summer. In 1978 rainfall was near average in the spring and 6.62 inches above average in the summer; however, that summer nearly 4 inches of rainfall came in one 24-hour period.

## CONCLUSIONS:

**Grain sorghum.** Grain yields showed no significant differences that can be attributed to cropping or preplant-tillage systems. Yields did appear to be more affected by summer than by spring rains. Broadleaf weed control was not affected by cropping systems or by preplant-tillage systems (Tables 2 and 4). The "chemical only" preplant tillage system and the continuous grain sorghum cropping system provided inferior grass control.

**Soybeans.** Soybean yields were not affected by cropping or preplant-tillage systems, although continuous soybeans averaged 4 bu/acre less than did

soybeans following grain sorghum (Table 4). Broadleaf weed control among the preplant tillage systems showed mechanical only to be inferior to the mechanical + chemical tillage system (Table 3). Grass control was superior for the continuous soybean cropping system.

NOTE: This study was designed to compare the effects of tillage and cropping systems on grain yields and on broadleaf and grassy weed control. No attempt was made to measure soil-erosion losses attributed to the three cropping systems.

One would think that early-spring rainfall would be better conserved by the no-preplant tillage system, but that was not reflected in our 7-year yield averages.

The economical benefit from fewer trips over the field versus the additional cost for an extra herbicide application for the no-preplant tillage system was not evaluated for this report.

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