

**INFLUENCE OF FALL WEED SUPPRESSION
IN NEW WHEAT STUBBLE IN A FALLOW-WHEAT ROTATION
WITH MINIMUM TILLAGE**

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MINIMUM TILLAGE FALLOW

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Field testing of summer fallow for wheat production has been conducted both on the farm and at various Federal-State experiment stations for over sixty years in the Great Plains of the United States. In the Northern Plains this involves simple rotations of spring wheat-fallow or winter wheat-spring wheat-fallow. In the Central and Southern Plains these rotations include wheat-fallow or winter wheat-sorghum-fallow. At the present time (1976) about 35 million acres of dryland are being fallowed in the United States after reaching a peak of 41 million acres in 1973.

Because of both large and small differences of soil types- climate, topography, crop systems, crop prices, machinery choices and management opinions; it has been said that there are almost as many systems of fallow as there are operators. In nearly all cases the primary objective of field testing of fallow includes the hope of increasing crop yields and reducing cost and/or improving the convenience of fallow management. These two objectives are not necessarily compatible unless the growth inputs of (a) soil water (b) soil fertility, usually nitrogen and (c) optimum genetic stock of wheat are maximized and erosion hazards minimized.

Until recently, the number of tillage operations per fallow seasons varied widely (4 to 10) and could be categorized into maximum and conventional tillage systems. With a new arsenal of chemicals rapidly coming on the market, the substitution of herbicides for tillage for weed control now makes it possible to consider minimum tillage and no-tillage fallow. Differences regarding these four systems of fallow are given below:

Definitions of Fallow Tillage Systems

1. Maximum Tillage (6 to 10 operations)
 - a. In the old days this referred to dust mulching shortly after each significant rain. Up to 6 to 10 operations/season.
 - b. Today we imply maximum tillage to mean fall weed control with sweeps in new stubble, usually twice, in addition to normal spring and summer weed control and stubble reduction operations the next season.
2. Conventional Tillage (4 to 6 operations)

Spring-summer tillage weed control and stubble reduction operations including use of inversion tools (plows), disk-type implements, sweeps, chisels, rod weeders, etc.

3. Minimum Tillage (2 to 4 operations)

Substitution of contact and/or pre-emergence weed control herbicides for one or more tillage operations during fallow season. Most effective when applied in the fall on new wheat stubble with pre-emergence effect lasting well into the month of June the next season. Emphasis is to retain higher quantities of stubble for snow catchment and mulching for erosion control in addition to reducing tillage necessary to control weeds.

4. No Tillage (0 to 1 operation)

Complete substitution of all tillage (perhaps one for seed bed preparation) with combinations of pre-emergence and contact herbicides throughout the fallow season. This implies use of deep furrow openers for seeding directly into standing or near standing wheat stubble. Present day costs of contact herbicides is prohibitive for this system, but it can and does work experimentally.

With the present trends of shorter straw wheat varieties, higher fuel and mechanical equipment costs, improved herbicide versatility and application techniques, and resulting higher wheat yields; all these factors suggest that minimum tillage fallow may be widely adapted by 1980-1982.

Experimental data are shown on page 3 for maximum, conventional, and minimum fallow tillage as conducted at Akron, Colorado. Similar results have recently been obtained at the North Platte, Nebr. and Colby, Kans. Agricultural Stations.

Table 1 - Influence of Fall Weed Suppression in New Wheat Stubble in a Fallow-Wheat Rotation. Seven-Year Avg. (1969-1972; 1974-1976). Akron, Colo.

FALLOW SEASON INPUTS					
Fallow Weed Control ^a	Fallow Weed Growth Lb/A	Tillage Operations No.	Soil Water at Planting Inches	Fallow Eff. ^b %	Soil Nitrates at Planting Lb/A
Spring Disk, Check (Conventional Tillage)	1020	4.7	6.56	24	82
Fall Sweep, Single	580	5.6	7.24	28	95
Fall Sweep, Double (Maximum Tillage)	320	6.3	7.61	31	103
Fall Sweep (1) + Atrazine	270	4.3	7.70	31	108
Contact Herb. + Atrazine (Minimum Tillage)	290	3.0	7.38	32	110

CROP SEASON OUTPUTS						
Fallow Weed Control ^a	Total Water Use - Wheat ^c Inches	Yield Grain ^e B/A	Winter Straw ^e L/A	Wheat TDM ^e Lb/A	Water Use Eff. ^d Lb/A/In.	Protein Grain %
Spring Disk, Check (Conventional Tillage)	15.16	36.5	3440	5630	365	10.6
Fall Sweep, Single	16.10	40.0	3820	6220	390	11.1
Fall Sweep, Double (Maximum Tillage)	16.46	43.0	4160	6740	405	11.3
Fall Sweep (1) + Atrazine	16.57	43.8	4160	6790	405	11.5
Contact Herb. + Atrazine (Minimum Tillage)	16.95	44.3	4380	7040	415	11.5

a = Applied within seven days after wheat harvest. Contact herbicides include Amitrol-T, Paraquat, and Roundup; b = Fallow efficiency is the net gain of soil water during 13½ months fallow x 100 - fallow season precipitation; c = Soil water use by wheat + crop season precipitation from planting date to harvest; d = Total dry matter (TDM) produced (Lb/A) - total water use (Inches).

Note: Avg. annual precipitation during years of experimentation was 14.20 inches.

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