A Typical Alternate Crop-Fallow Farming System in Western North Dakota.

FALLOW MANAGEMENT CAN CONTRIBUTE TO FUEL CONSERVATION

Thomas J. Conlon, Armand Bauer and Timothy C. Faller

More than 16.5 million acres of set-aside land was released for planting nationwide when the USDA lifted restrictions on acreage controls last year. As a result, prospective plantings in North Dakota are up about 8 per cent for 1974, for eight major crops surveyed by the North Dakota Crop and Livestock Reporting Service.

Quoting Nicholas Smith, director of the newly-formed USDA group dealing with fuel shortages faced by agriculture, Agricultural Situation (1) states that while agriculture has been designated a priority fuel customer and can expect to receive some additional fuel allocation this year, part of the total needed for the extra 1974 acreage will have to come from conservation. Farmers will simply have to save on fuel use elsewhere.

Conlon is superintendent, Dickinson Branch Experiment Station; Dr. Bauer is professor, Department of Soils; and Faller is superintendent, Hettinger Branch Experiment Station.

Fuel saving possible through proper management of tillage operations on North Dakota's four million acres of summerfallow can contribute significantly to necessary fuel conservation. The number of tillage operations necessary on summerfallow can be reduced without appreciable reduction in crop yield the following year. But timeliness of the first and all subsequent tillage operations during the fallow year is of primary importance if the highest possible grain yields are to be obtained the following year.

Results of trials at the Dickinson Experiment Station indicate that the first tillage operation on

land to be fallowed should be started by the middle of May in this area, with June first as the deadline date for completion (2). Results of similar trials at two other western North Dakota stations support the observations made at Dickinson. At the North Central Agricultural Experiment Station at Minot (5), delaying the first cultivation of fallow from June 1 to July 1 produced consistently lower yields. Wheat on fallow that received the initial tillage on July 1 produced only about 91 per cent as much grain as when the initial tillage was on June 1. At both the Dickinson and Minot trials, the tillage implement used on both dates was the moldboard plow. At the Northern Great Plains Field Station, Mandan, North Dakota (7), wheat yields were reduced an average of about six bushels an acre when the first tillage of the fallow year was delayed until July 1 as compared to June 1.

Spring work in the southwestern corner of North Dakota usually is begun somewhat earlier than in the rest of the state. For this reason, the recommended time to begin first tillage operations on land to be fallowed in the area represented by the Dickinson station is May 15, with the first tillage to be completed by June 1 rather than the later date indicated at the other two stations.

Experiments at seven locations on minimum tillage requirements for summerfallow in western Canada by Molberg et. al. (6) indicated that three or four tillage operations were usually enough for satisfactory weed control on summerfallow and generally provided highest grain yields. In these trials, different amounts of tillage had little effect on soil-moisture conservation. Dew (3) found that four tillage operations, one-way disc for the first and the field cultivator for the other three, usually controlled weeds in the sub-humid region of central Alberta. More tillages than necessary to control weeds had no effect on wheat yield or soil moisture conserved. In trials at Melita, Manitoba, Dryden et. al. (4) reported that satisfactory weed control and maximum yields were obtained by discontinuing tillage on September 15, and that summerfallow tillage could be discontinued on August 30 with no significant reduction in crop yields.

Trials were begun at Dickinson in 1968 and at Hettinger in 1969, which compared summerfallow where the cultivations were done at 4-week, 5-week, 6-week and 7-week intervals, starting with the first tillage operation as close to May 15 as possible. When the initial tillage began on or about May 15, the average number of cultivations required at 4-week intervals was six, the 5-week interval required five and the 6 and 7-week intervals required four tillage operations during the season.

Yield results from these trials at the two southwestern North Dakota stations are summarized in Tables 1 and 2.

Table 1. Wheat Yields - Summerfallow Management Study - Dickinson 1968-1972

Cultivation Interval	Yield in Bushels Per Acre 1968	1969	1970	1971	1972	5-Year Average
4 weeks	38.8	43.0	19.5	46.8	28.1	35.2
5 weeks	37.4	43.3	19.1	46.0	27.2	34.6
6 weeks	38.6	40.3	18.4	44.2	28.3	34.0
7 weeks	39.5	38.0	16.8	44.2	27.2	33.1
L.s.d. @ 5%	4.8	7.1	7.0	3.7	4.6	

Table 2. Wheat Yields - Summerfallow Management Study - Hettinger 1970-1973

	Yield in Bushels Per Acre 1970	1971	1972	1973	4-Year Average
4 weeks	28.7	39.3	22.8	29.3	30.0
5 weeks	29.3	41.5	24.3	26.5	30.4
6 weeks	29.2	39.3	20.8	25.8	28.8
7 weeks	29.6	37.8	21.5	24.0	28.3
L.s.d. @ 5%	2.7	3.5	2.7	3.1	

Table 3. Available Soil Water After Fallow, at Seeding - Dickinson

Cultivation Interval	Available Soil Water to 4 Feet					
	1968	1969	1970	1971	1972	Average
	Inches					
4 weeks	4.1	2.3	4.9	6.1	4.1	4.3
5 weeks	4.7	3.3	5.1	6.3	4.6	4.8
6 weeks	4.5	2.6	5.2	6.3	5.1	4.7
7 weeks	4.1	2.7	5.9	6.3	5.1	4.8

There were no statistically significant differences in yield at the 5 per cent confidence level for any year in the five-year period the trial was conducted at Dickinson.

In the trial at Hettinger during a four-year period, 1970-1973, a clearly significant yield difference occurred only in 1973, when production from the 4-week cultivation interval showed a 4.5 to 5.0 bushel advantage over treatments where the cultivation interval was 6 and 7 weeks.

Amounts of available soil water and available soil nitrogen (N) in the fallow at Dickinson at approximately seeding time are shown in the data presented in Tables 3 and 4, respectively. There was no statistically significant difference in stored water or available nitrogen for any year among the cultivation intervals. (The analyses included depths beyond those indicated).

The number of tillage operations necessary for good weed control is also adequate for maximum moisture conservation and optimum grain yield. While there are times when cultivation of fallow to reduce effects of wind erosion is helpful, tillage that does not result in weed control adds to the cost of maintenance and has little effect on moisture conservation and nitrate accumulation.

For every gallon of fuel saved per acre on the total summerfallow acreage in North Dakota, a contribution of 4 million gallons of fuel will be made for use on the extra acreage being formed. Adopting good fallow management practices this year is one trade-off that can be made with no significant sacrifice in crop yield.

References

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Table 4. Available Soil Nitrogen After Fallow, at Seeding - Dickinson

Cultivation Interval	Available Nitrogen to 2 Feet Pounds Nitrogen (N)					
	1968	1969	1970	1971[1]	1972[2]	Average
4 weeks	108	95	80	98	71	90
5 weeks	131	119	68	88	65	94
6 weeks	120	105	59	92	47	85
7 weeks	137	125	68	92	57	96

[1] *Samples from late September, 1970.*

[2] *Nitrate-nitrogen only. Other dates include nitrate plus ammonium nitrogen.*