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Ecofarming
Fallow Aids in Winter Wheat-Fallow Rotation

This NebGuide discusses the use of ecofarming to control weeds and manage crop residues.

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Ecofarming is defined as a system of controlling weeds and managing crop residues throughout a crop rotation with minimum use of tillage so as to reduce soil erosion and production costs while increasing weed control, water infiltration, moisture conservation and crop yields. Energy requirements are much lower with ecofallow than with normal fallow systems. The ecofallow period in the 3-year rotation is the period between wheat or other small grain harvest and the planting of corn or sorghum. The fallow period in the 2-year rotation occurs between wheat harvest and the planting of winter wheat 14 months later.

Ecofallow means controlling weeds during the fallow period by using herbicides and/or tillage with minimum disturbance of crop residues and soils. We have been working on the ecofallow concept for 20 years, and it is presently being used in the winter wheat-fallow rotation and the winter wheat-corn or sorghum-fallow rotations. The winter wheat-fallow rotation is commonly used in western Nebraska. The 3-year rotation consists of winter wheat-ecofallow-sorghum or corn-fallow. The fallow period after corn or sorghum is followed by winter wheat. This rotation is generally used in the areas that receive 16 to 20 inches of precipitation. In eastern Nebraska, this could be an oats-ecofallow-corn, sorghum or soybean rotation.

In the 3-year rotation, corn or sorghum yield increases of 20 to 25 bu/A are common. However, in the 2-year rotation, wheat yields are not always increased.

The savings from reduced tillage almost equal the additional cost of herbicide treatment. The profit comes from increased yields and reduced erosion.

How to Develop a System for Winter Wheat-fallow Rotation

An effective weed control program begins with the winter wheat crop. A good stand of vigorously growing winter wheat prevents weeds from becoming a problem following harvest. Weeds are larger and harder to kill in poor stands of winter wheat. Wheat planted in 7-inch rows has fewer weeds than 14-inch row plantings. However, wider row spacings are preferred in areas where there is more stubble and less rainfall. Barnyardgrass, foxtail species and field sandbur are especially troublesome in these wider spaced plantings in the higher rainfall areas. Farmers should make every effort to obtain uniform and vigorous stands of wheat. Poor stands and the lack of vigor are usually due to poor moisture management during the fallow period before winter wheat planting. Stand and vigor of winter wheat can be improved by:

- Killing weeds before they remove soil water during summer fallow period. Common purslane is especially troublesome.
- Using a rodweeder to kill weeds and firm up a seedbed on the last two tillages prior to planting.
- Using a hoe drill instead of a disk drill if surface soil (2 to 4 inches) is dry so that seed can be planted into firm, moist soil.
- Checking depth of seeding to be sure seed is planted 1 inch into moist soil, especially in the tractor tracks.
- Planting weed free and clean seed; trashy seed reduces or stops the planting rate.
- Planting an adapted variety at the proper time.
- Using tillage methods during the summer fallow period that leave plant residue on the soil surface to control erosion.
- Fertilizing according to soil tests. Proper fertilizer placement is essential.
- Checking the wheat early in the spring for broadleaf weed control. Broadleaf weed problems encountered after wheat harvest can be partly or completely eliminated by the timely spraying of the proper herbicide treatment in the spring.
- Eliminating volunteer wheat in adjacent fields at least 10 days prior to seeding winter wheat to avoid wheat streak mosaic.

Timely harvest with a properly adjusted combine operated at speeds that will put the grain into the bin instead of out the back will reduce volunteer wheat problems. Spreading the straw uniformly will save time and frustration when planting the next crop. Use a good straw spreader on the combine or remove excess straw as soon as possible. Unload while moving and if you have to stop, pull out and let the combine clear before stopping. Piles of straw are difficult to plant through. If residues are extremely heavy, removing the loose straw behind the combine may be desirable.

Weed Control

There are four distinct periods in which weeds must be controlled.

1. ***Weed control in winter wheat.*** A timely application of 2,4-D, 2,4-D + Banvel, or 2,4-D + Brominal can control many of the winter annual weeds and early germinating annual broadleaf weeds. These are the weeds that hinder crop development and harvest the most. If not controlled after harvest, they will quickly reduce soil water content.

2. ***Weed control after wheat harvest.*** Weeds growing in the wheat stubble must be controlled as soon as harvest is completed with either sweep tillage or herbicides. It is important that weeds are controlled from wheat harvest until winter because those allowed to grow for 30 days after harvest can remove as much as 3 inches of soil water. Weeds will use all of the water that is available in

the soil between wheat harvest and fall, whether it is an inch or several inches. This may mean a 20 to 30 bu/A reduction in corn or sorghum yields. Yield reduction in winter wheat has not been this dramatic.

Several weed species are capable of extracting soil moisture to a lower level than crops. Moisture lost to weeds cannot be replaced. Apply herbicides as soon as the straw from the combine has settled to the ground and the weeds are visible. Control weeds that are present at wheat harvest before they become too vigorous to kill or before they produce seed. Grass weeds are the most difficult to control. The best treatments have been combinations of paraquat and AAtrex (atrazine). See *EC 130, A Guide for Herbicide Use in Nebraska*, for the latest recommendations. Paraquat is non-selective and drifts to adjacent crops will cause damage. If this herbicide combination fails, a sweep plow must then be used to prevent weed seed production and soil water loss.

Failure to control weeds during this period has occurred for several reasons, including:

- Straw shields the weeds;
- weeds are under drought stress when sprayed;
- weeds are permitted to become too vigorous before spraying;
- not using X-77 surfactant with paraquat;
- use of improper sprayer nozzles and pressure;
- insufficient or too much agitation;
- nozzles spaced too far apart;
- tolerant species;
- traveling too fast when spraying;
- dust on weeds interferes with herbicide performance.

Flood tip nozzles on flotation sprayers should be spaced 30 to 40 inches and have at least 100 percent overlap. Poor success with paraquat has been observed when using less than 30 psi at the nozzle because there are not enough droplets to give good coverage. The amount of the carrier should be 20 to 60 gallons per acre, depending upon weed growth and the amount of stubble and dust. High speed distorts spray patterns and increases problems with dust. For best results, speed should not be over 12 mph with flotation sprayers.

Uniform spray patterns are important to prevent skips and overlaps of the herbicide. Marking systems are essential in stubble application.

Atrazine requires at least 1 inch of rain to move it into the root zone. Volunteer wheat may be a problem if it is sprayed after sweep plowing and insufficient rain occurs to activate the atrazine. Care should be taken to reduce unnecessary wheel tracks.

Barnyardgrass, field sandburs and foxtail species that are well tillered and vigorously growing are difficult to kill with paraquat + AAtrex, especially if there is not enough rainfall to move the atrazine into the root zone. These fields should be watched closely and undercut with a sweep plow if grass begins to regrow.

Perennial weeds are more difficult to control with reduced tillage. Banvel and 2,4-D will aid in the control of broadleaf perennial weeds. Timely application of Roundup is effective on most perennial weeds when properly applied.

Some farmers use cropping options and apply AAtrex at 0.5 to 1 qt/A following winter wheat

harvest. If sufficient snow is trapped and spring rain is received prior to corn or sorghum planting, they will plant these crops. Additional weed control is needed for corn and sorghum. If there is less than 3 feet of moist soil, they will fallow and plant winter wheat in the fall. However, atrazine may carryover on calcareous or low organic matter content soils and cause injury to small grains.

3. **Weed control, September through November.** AAtrex applied after wheat harvest will control volunteer wheat and downy brome which germinate in September and October. If no herbicide is applied after harvest and weeds are controlled with a sweep plow, volunteer wheat and winter annuals could be a problem. Paraquat + atrazine can be effectively used up to 12 months prior to planting winter wheat. Bladex or Bladex + atrazine can also be used during this period. If not killed, these weeds can use as much as 3 inches of soil water during the winter.

4. **Weed control in spring.** If preemergence herbicides are applied with good results during the previous summer or fall period, there should be few problems. Three potential problems do exist, however: (1) weeds growing in sprayer skips, (2) volunteer wheat, and (3) grass weeds beginning to emerge in treated areas in early to mid-June. Grass weeds that have emerged in June must be killed by tillage while still in the seedling stage. Weeds such as downy brome in sprayer skips and volunteer wheat should be killed by May 1. Control of most broadleaf weeds has not been a problem where AAtrex was used the previous summer or fall. An exception is Russian thistle. The wind may blow Russian thistle across the fields during the winter, scattering the seeds. Timely sweep tillage is important so that weed escapes can be killed before more severe tillage is needed. AAtrex at 1 to 2 pt/A may only provide partial control of volunteer wheat. Shallow tillage should kill the volunteer wheat and not seriously disturb the atrazine.

   If atrazine was not applied the previous fall, spray Bladex 80W at 2.5 to 3.5 lb/A depending on soil type, in March or early April if possible. Volunteer wheat, winter annuals, kochia, and Russian thistle use too much soil water and become too vigorous to wait until May 1 to apply herbicides. Paraquat + X-77 should be added to the Bladex 80W to kill existing weeds. Be aware that if the stubble was tilled the previous fall, unsatisfactory control may occur if sprayed after April 10. This may vary from year to year depending upon weather. Be sure pressure at the sprayer nozzle is 30 to 40 psi. Roundup at 1 to 2 pts/A in 10 to 20 gal/A of water can be used to kill volunteer wheat, downy brome and other annuals if applied in April and no residual herbicide is wanted. Broadleaf weeds may often be the only early weed problem; 2,4-D + Banvel at 1 qt + 0.5 pt/A is an effective April treatment.

Residue Management

Your goal should be to obtain a suitable seedbed that can be planted into satisfactorily with existing hoe drills. We do not advocate controlling weeds throughout the 14-month fallow period with herbicides alone (chemical fallow) because it is too costly, and drills are not available to seed into the undisturbed soil or in heavy residues. Plan on sweep tillage to start in June or early July; with one or more tillages, a good seedbed will be available.

Crop residues are important to the system because:

1. Standing stubble traps snow. This may mean an additional 1 to 3 inches of water available for crop production compared to fields where the residue has been destroyed.
2. Wheat stubble reduces soil temperature and evaporation, thus increasing moisture available for crop growth.
3. Residues reduce wind and water erosion. At least 750 lb/A of wheat residue on the soil surface is

needed to control wind erosion on medium textured soils, and 1,250 lb/A on sandy soils. Additional residues will improve water erosion control. Conventional hoe drills will seed through 2,500 lb/A of wheat residues. The amount of straw left at planting should match the clearance capacity of the drill. Straw can be redistributed by using a mulch treader or by pulling a rotary hoe backwards with the teeth interlocking.

Following is an example of how various tillage operations reduce residues:

	Reduction in each tillage operation
V sweeps 3 to 6 ft in width	10%
Chisel plows	25%
Disks, one-way, tandem offset	40 to 50%
Mulch treaders	25%
Rodweeders with. semichisels	15%
Rodweeder	10%

Fertilizer

Proper fertilizer application is essential for top yields. Fertilizing should be done according to soil tests. Starter fertilizer should be considered since soils under residue are cooler than bare soils. Successful applications have been done using anhydrous ammonia, solutions and dry fertilizers. Anhydrous ammonia can be applied in the fall after wheat harvest or during the summer prior to wheat planting. Avoid fertilizing when the soil is too wet. Wheel tracks can be a problem, particularly when driving on wet soil. Using liquid nitrogen in the summer after wheat harvest is not advised because much of it will be lost if it is not incorporated into the soil after application. Liquid nitrogen should be applied in the spring when temperatures are cooler and the chances of rainfall are greater than the late summer.

How to Get Started

Adequate weed control without atrazine carryover is absolutely necessary. There are many approaches that can be used. Concentrate on one or more of the four major weed problems periods as one herbicide control during the fallow period. Remember that volunteer wheat is a serious weed when considering weed species and populations. Select herbicides according to performance on soil type, organic matter, and carryover potential on eroded areas. Proper calibration and herbicide application cannot be stressed enough. Poor application slows progress and may result in extra tillage, which wastes fuel, or in herbicide carryover, which eliminates the wheat.

We would like to assist farmers in developing a successful program. If you are interested, please contact your county Extension agent. Select a system, make plans, and follow through. Whenever you change systems of farming, *LEARN BEFORE YOU EXPAND.* Continue to use good judgement in your decision making and if you have questions, contact your county agent for help immediately.

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