



# Considerations for Double-cropping Corn Following Hay in Pennsylvania

## INTRODUCTION

Double-cropping corn following the first cutting of hay can be an effective cropping strategy to maximize feed production on fields that are being rotated from hay to corn. Many crop producers in Pennsylvania routinely use this strategy with a good success rate, but it requires careful management. Without paying some attention to the details, you may obtain disappointing results. The objectives of this fact sheet are to review the advantages and disadvantages of double-cropping corn following hay and to provide some recommendations for improving the success rate of the practice.

## PROS AND CONS

The main advantage of the double-crop system is that ideally you can harvest 1 to 2 tons of dry matter from the hay crop, and then harvest a corn crop that could average 75 percent or more of a normal crop. The system also has the advantage of spreading out the farm's corn planting and harvest schedule. Double-cropped corn can be used for late-harvested silage or to top off silos filled with full-season crops that were planted earlier. Many growers spread late spring manure applications on the double-cropped hay fields, and the system also can reduce soil erosion. Allowing the hay crop to grow in the spring helps to limit runoff from adjacent tilled fields. Double cropping following hay also can be used as a rescue strategy when producers discover a winterkilled hayfield after the first cutting.

The system also can have disadvantages. On shallower soils, the hay crop can deplete soil moisture enough to limit the early growth of the subsequent corn crop, resulting in disappointing corn yields. Soils also can be hard and difficult to plant in, particularly if the last hay harvest was made while the soil was wet. In sods with significant amounts of grass, insects can be a problem. Also, in areas

with shorter seasons, the effects of the delayed planting are more severe; therefore, corn yields may be reduced to the extent that the practice is unprofitable.

Overall, however, under the right conditions and with good management, the practice can be a profitable one. Key aspects of managing the system include forage crop harvest and control, manure management, hybrid selection, insect management, planter management, and the economics of the practice.

## HARVESTING THE ALFALFA

Early in the spring, identify hay fields that are candidates for rotation. If possible, schedule these fields for harvesting first. Harvesting for haylage instead of hay also is preferable, because the harvest usually can be made earlier and with less drying time in the field. Avoid harvesting under wet soil conditions, since this will compact the soil and lead to problems with the corn crop. Identifying hay fields early in the spring that need to be rotated also will help to minimize the number of unplanned double-crop situations that are necessary. These unplanned double crops usually are not the most profitable crop-rotation alternatives.

## MANURING THE FIELD

Residual nitrogen credits from a legume hay crop often can meet most of the nitrogen requirements of a double-crop corn crop; consequently, from a nutrient standpoint these fields are not high-priority sites for manure applications. The residual nitrogen credit from a 50 percent stand of alfalfa is estimated at 120 lbs N/A; from red clover it is 90 lbs N/A. The N credit from sods with a legume content of less than 25 percent is 40 lbs N/A. Manuring can help to supply any additional nitrogen required to meet the needs of the corn crop in these situations, but it also can contribute to soil compaction and reduce the potential for timely no-till planting of the corn crop.

Many farmers apply manure to double-cropped fields simply because they provide an opportunity for applications during the growing season. Manure can be applied immediately following the alfalfa harvest, and then can be incorporated with tillage as soon as possible. This strategy maximizes the nitrogen contribution of the manure and helps to minimize soil-compaction-related problems associated with the application. Tilling the soil will increase evaporation and reduce its available moisture, which can reduce yields in some cases.

If manure applications are relatively light, and care is taken to spread them evenly and under dry conditions, then fields often can be no-tilled successfully following this practice. Fields also can be manured following the corn planting, if manure can be spread in this fashion. When manuring following planting, avoid wheel traffic on the corn rows.

#### HYBRID SELECTION

Corn hybrid selection should be based on the anticipated use of the crop and the growing degree days available from planting until frost. In some areas of southeastern and southcentral Pennsylvania such as the southern parts of York, Lancaster, and Franklin counties, full-season (115- to 120-day) hybrids can be planted in late May and still mature well for grain. In most areas of the state, however, a shorter-season corn will be necessary when planting is delayed until late May. If a silage harvest is planned, slightly longer-season hybrids can be used, but the hybrid still should reach the half milk line stage of maturity regularly before frost.

The length of the growing season and the available heat units have a large impact on the success of the double-cropping practice. In shorter-season areas, the later maturity of the hay crop can result in the corn planting's being delayed until June 1 in some years. In a typical early-medium season area, this would reduce the available growing degree days for the corn crop from about 2,600 to 2,200, requiring that a 95-day hybrid be used instead of a 108-day hybrid. Under these conditions, it will be more difficult to make double-cropping a profitable practice because of the planting date penalty and the lower yield potential of the short-season hybrid.

Because of these seasonal effects, double-cropping corn following hay is most common in areas where 110-day or later-maturing corn hybrids are adapted.

#### INSECT MANAGEMENT

Double-cropping corn into sods can present an increased opportunity for insect problems. Insect pressure generally will increase with the amount of grass in the sod crop and the age of the stand. Consequently, in short alfalfa-based rotations, the only insecticide typically necessary is a seedbox treatment. In older sods that contain more grass, some additional insect control may be needed.

Corn that is double-cropped following an alfalfa stand may be slightly more at risk for damage from the black cutworm, since the adult moths like to lay their eggs in

green fields in the spring. Since cutworms usually are only a sporadic problem, routine treatment of these fields with a broadcast foliar insecticide might not be economical. The best strategy is to scout fields and treat only if there is a problem. There generally is no need to use a granular insecticide on fields following alfalfa or predominately alfalfa/grass mixtures.

The risk of injury from black cutworm, true armyworm, sod webworm, white grub, stalk borer, seed corn maggot, and wireworm increases when corn is planted into any of the following: old alfalfa sods that are mostly weeds and grass, mixed grass/legume fields, or grass fields. Under these conditions, a seedbox insecticide treatment containing lindane and diazinon can provide some control of seedcorn maggot and wireworms. An Iowa State study showed that for wireworms, seed treatments provide the same amount of control as do soil insecticides. A foliar insecticide treatment broadcast with the herbicide can help to reduce the potential for damage from the armyworm, common stalk borer, and cutworm. A program combining the seed treatment with a foliar insecticide usually provides sufficient insect control on these double-cropped fields. The field also can be scouted weekly through the five leaf stage; the foliar insecticide then would be applied only if it is necessary.

Consider using a granular insecticide where heavy pressure is anticipated from white grubs (primarily in old bluegrass sods), or where scouting has identified them as a potential problem. If you decide to use a granular product, select one that also will provide some protection against above-ground feeding insects such as black cutworm.

Double-cropped corn also can be more susceptible to damage from the European corn borer in some years. Bt corn hybrids might be ideal for planting in this situation, especially if the corn will be used for grain.

#### PLANTING CONSIDERATIONS

Planting double-cropped corn into a sod usually can be accomplished with few problems, provided the planter is adjusted properly and working well. The most frequent problems encountered in this system include achieving good seed-to-soil contact and adequate penetration into hard soils under no-till conditions. Monitoring seed depth and seed furrow closure is essential. If conditions are dry, a slightly deeper seed depth of 2 to 2-1/2 inches may improve seed germination. Row cleaners also can be useful in improving seed-to-soil contact where there is heavy, grassy crop residue.

Avoid planting double-cropped fields when the soil is too wet, because furrow closure can be a problem. It sometimes is tempting to plant these sod fields when the soil is still wet, because these fields can tolerate traffic while tilled fields can not. Although furrow closure often occurs at planting, subsequent drying and shrinking, especially on clay and clay loam soils, can cause the furrow to open, exposing the seed. To reduce the likelihood that this will happen, use an 8- or 13-wave fluted coulter.

## WEED CONTROL

Fewer annual weed species typically appear in double-cropped corn following hay, once the hay crop and associated perennials have been controlled. This means that the cost of residual herbicide programs or follow-up post-control treatments might be reduced in this system.

Killing the forage crop and achieving good weed control, however, requires some careful consideration. An uncontrolled established forage crop left to compete with young developing corn can be disastrous. Recovery and regrowth of legumes and forage grasses in corn is difficult and expensive to manage.

**Postharvest control.** Moldboard plowing will effectively kill most forage crops; however, the time, expense, and soil conservation considerations may make this option impractical. Lesser amounts of tillage alone do not effectively control well-established forage crops. For no-till corn, alfalfa and clover can be controlled well with Banvel or Banvel plus 2,4-DLVE. 2,4-DLVE alone does not consistently kill either alfalfa or some clover species. If forage grasses or weedy grasses (e.g. quackgrass) are present, include Roundup in the mix.

Adequate regrowth of both legumes and grasses following the hay harvest is critical for successful control. Six or more inches of regrowth will ensure adequate control. Hay stubble with little leaf or stem tissue to absorb the herbicide will not be controlled effectively; therefore, allow 7 to 10 days after harvest before applying the herbicide. Planting into an uncontrolled hay field with plans to spray before the corn emerges carries greater risk. To be successful, this

approach requires careful planning and ideal weather conditions for timely control. If the corn emerges before adequate weed regrowth occurs, for example, Roundup cannot be applied and control of the sod becomes difficult.

Forage and weedy grasses differ in their susceptibility to Roundup. Timothy and quackgrass are relatively susceptible, whereas orchardgrass, smooth brome, and tall fescue are somewhat more tolerant to Roundup. Reed canarygrass is one of the most Roundup-tolerant forage grass species. The rate of Roundup necessary for effective grass control depends on the amount of grass growth at application time as well as current environmental conditions. Less regrowth (i.e. 3 to 4 inches) and cool weather will require a higher rate of Roundup (e.g. 3 quarts). Apply Roundup using less carrier (i.e. 5 to 10 gallons of water per acre) to increase the effectiveness.

In addition, tank mixing residual herbicides such as atrazine with the Roundup can reduce its overall effectiveness. This is especially true at rates of 1.5 quarts per acre or less with forage species like orchardgrass. To counteract this effect, increase the rate of Roundup in the mix to compensate for any loss in activity, or apply an atrazine-based product several days after the Roundup to improve forage species control.

For example, in no-till double-crop corn planted after a legume-timothy or quackgrass mixture, apply 1 to 2 quarts of Roundup plus 1 pint of 2,4-DLVE or Banvel per acre. A combination of 1 pint 2,4-DLVE plus 1/2 to 1 pint Banvel per acre will broaden the control program. For orchardgrass, tall fescue, or smooth brome, increase the rate of Roundup up to 3 quarts per acre. Reduce the rate

**Figure 1. A worksheet to estimate the economics of double-cropping corn following hay.**

Hay/Corn Double-crop		Your Estimate	Full-Season Corn	Your Estimate
<i>Receipts</i>				
1.5 T DM/A haylage	\$150		160 bu/A corn \$480	
130 bu/A corn	\$390			
Corn silage				
Total	\$540		\$480	
<i>Costs</i>				
Haylage harvest	\$23			
Extra herbicide	\$10			
Insecticide	\$7			
Corn production	\$270		\$270	
Total	\$310			
Net returns to mgmt.	\$230		\$210	

slightly if there is more grass regrowth (greater than 6 inches) or increase it if a residual product is tank-mixed.

**Preharvest control.** Another option is to apply Roundup before the alfalfa harvest. The timing of this application is aimed at the control of certain perennials such as quackgrass and forage grasses before the field is rotated away from alfalfa. Apply Roundup at 1 quart per acre (maximum rate allowed) and use low-rate technology (10 gallons of carrier or less per acre) for maximum activity. *Tank mixes are not allowed with this treatment.* Treated alfalfa may be harvested 36 hours to 7 days after application. Harvesting the hay about 5 days after treatment will minimize forage deterioration and should allow for adequate grass control. Application in the fall is most effective for controlling forage grasses and may be adequate for alfalfa, depending on the year. A spring application just prior to hay harvest should help control quackgrass, as well as the forage grass species. Alfalfa regrowth will continue to require preplant tillage or a “timely” systemic herbicide application. In this system, a follow-up treatment of Banvel or Banvel plus 2,4-D in the preemergence herbicide program or an early post timing should effectively control legume regrowth.

#### OTHER CONSIDERATIONS

Other management considerations that increase the effectiveness of the double-cropping practice include labor availability, timeliness, and the length of the hay rotation. The double-cropping system is not likely to be feasible on farms where labor is limited during late May and early June. On these farms it is challenging enough to manage hay harvesting without trying to plant and spray double-cropped corn on a timely basis. Timeliness is critical in the double-crop hay/corn system, because if corn planting or herbicide applications cannot be accomplished within a fairly narrow window, the corn yields and profitability will suffer. Consequently, only those operations that can expect to achieve this rapid crop turnaround should consider the practice. Farmers also should consider the length of the hay rotation. Insect- and weed-control problems and costs generally will be lower in shorter rotations, because the hay will tend to be less grassy and will harbor fewer insects.

#### ECONOMIC CONSIDERATIONS

The economics of double-cropping corn after hay will vary with each situation and will depend upon yields, labor and machinery availability, commodity prices, and input costs. In some cases, as in the example provided in Figure 1, the practice will be a profitable one, whereas in other situations it will not. The worksheet provides examples of costs and returns that could be used to estimate the profitability of a double-crop system compared to a full-season corn crop where the sod was killed in the previous fall. In the example, corn is valued at \$3.00/bu and haylage at \$100/ton DM, and corn production costs are estimated at \$270/acre. Haylage harvesting

costs were set at \$10.40/acre to mow and condition the crop, and \$8.30/ton to chop and blow it into a silo. We also assumed slightly higher costs for herbicides and insecticides in the double-cropped corn. The “Your Estimate” columns can be used to estimate the profitability of double-cropping in other situations.

Factors other than profitability also could impact the decision to double-crop. Some of these include erosion control, manure disposal, labor supply, and the opportunity to maximize homegrown feed production.

#### SUMMARY

Double-cropping corn following the first cutting of a hay crop can be a profitable practice. Double-cropping likely will be most profitable when the following conditions are met:

- The farm is located in a longer-season area of Pennsylvania.
- Planting and herbicide applications are timely.
- The soils are relatively deep and productive.
- The farm is managed to maximize forage yields per acre.
- The crop is planted on winterkilled hayfields that are not discovered until after the first harvest.
- Adequate labor and machinery are available.

It is important to remember that a mistake made with any aspect of the management of double-cropped fields such as weed control, hay harvest timing, or planter management, can lead to disappointing results. In particular, avoid harvesting hay fields when soils are wet, adjust the planter for sod conditions, control insects, and kill the forage crop, respraying if necessary. Double-cropping is not a practice that is very forgiving to poor management, so careful planning and timely operations are essential.

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