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G05-1570 How to Spray a Field to Prevent Overlap and Reduce Drift Injury

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How to Spray a Field to Prevent Overlap and Reduce Drift Injury

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Proper spraying techniques for various situations are outlined and illustrated. A table shows how changing the sprayer speed can affect pressure on sprayers with rate controllers.

The method used to spray a field can affect pest control and potential crop injury to the targeted crop and adjacent crops. Start spraying a field on the side where the drift potential is greatest when wind speeds are low or blowing away from the susceptible area. Sometimes an applicator may need to return to a site later to spray when weather conditions are more favorable and would not cause spray drift. These factors should be considered and can make a difference on how you start and stop spraying a field (see *Figure 1*).

Fields With Rows

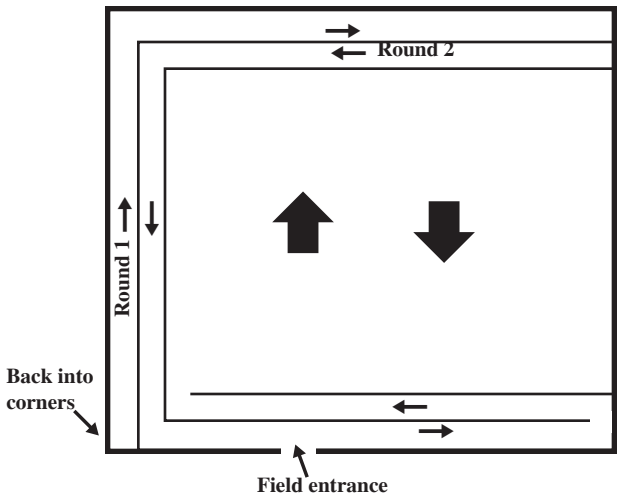
In fields with rows, usually it is best to follow the rows and set the sprayer and planter to the same row spacing. For example, with 30-inch rows and 6-, 12-, 18- and 24-row planters, sprayers with boom lengths of 30, 45, 60, 75, 90, 105, and 120 feet work best. With 30-inch rows and 8-, 16- and 24-row planters, sprayers with boom lengths of 40, 60, 80, 100 and 120 feet work best. Do watch for narrow and wide guess rows. In some situations with row widths less than 22 inches and wide sprayer tires, growers will spray perpendicular to rows so the tires cause less crop damage. In most situations two passes are needed on each end of the field to provide space for the sprayer to slow down, turn around and get back up to speed.

Fields Without Rows or When Not Following the Rows

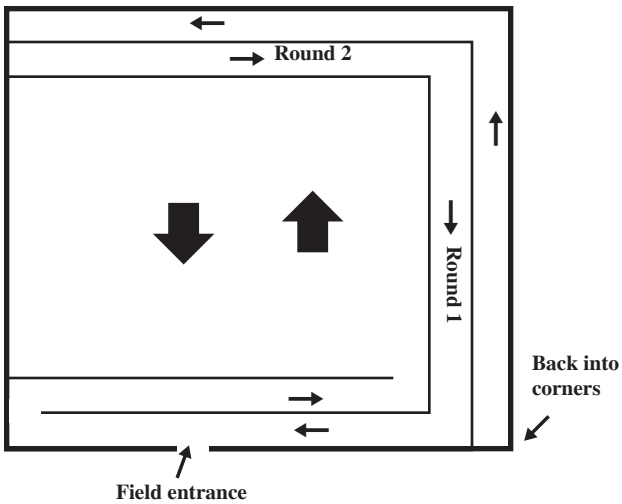
When not using rows, start by spraying the ends and one side of the field with two initial rounds on three sides of the field. This will provide turning room for the tractor and sprayer. Spraying the ends first allows one to go around trees, power poles, guy wires and other obstructions, but requires backing into the corners for complete coverage (see *Figure 1)*.

If wind is blowing in the direction of susceptible crops, avoid spraying these areas until conditions permit.

Use previous wheel tracks as an approximate marker, depending on the length of the sprayer and whether the booms are positioned on the rear of the sprayer. In most situations shut off booms as front wheels cross the previous wheel tracks.



Turn left if cab is on the left or in center.



Turn right if cab is on the right.

Figure 1. How to start spraying a field — spraying three sides.

Another method is to spray all four sides (see *Figure 2*). The disadvantage of this is that a partial boom width often occurs in the last pass and many times the foam mark or other mark has disappeared before the applicator returns to that side of the field. Also, even with GPS applicators can forget that they already made two passes on the other side of the field.

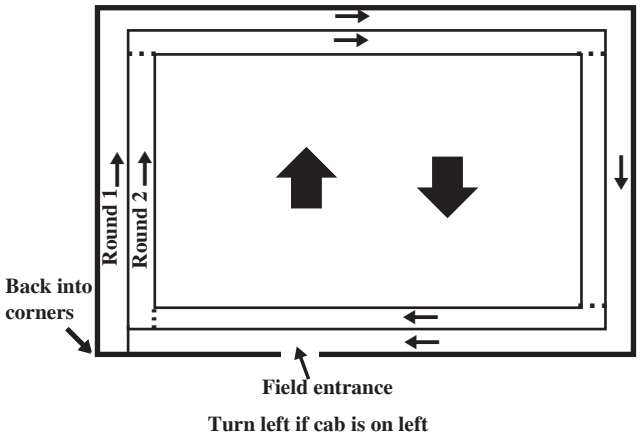


Figure 2. How to start spraying a field when spraying four sides.

Spraying Field Borders

Field borders are visible to the public and an important part of the field. The presence of poor crops, damage from weeds, herbicides, insects and pesticides or nutrient deficiencies along field borders presents a bad appearance. Many factors can increase the potential for problems in field borders, including:

- trashy conditions next to a fence line with minimum tillage;
- weed and insect pressure from fence rows;
- higher potential for overlaps and skips;
- soil compaction from turning and frequent traffic;
- high soil pH from overapplication of lime or dust from a nearby crushed limestone road (high pH increases crop injury from triazine and sulfonylurea herbicides); and
- inconsistent sprayer application. (The outer most sprayer nozzles along the field edge will not apply a full pesticide rate (*Figure 3*) since most nozzles are designed for some pattern overlap. To avoid this, add a nozzle at the end of the boom (*Figure 4*) that can be turned on to give a full rate on field borders.

Use an off-center nozzle at the end of the boom to provide 100 percent overlap. For example, spraying systems OC-, Air Induction Underleaf Banding Spray tip (AIUB) or Underleaf Banding Spray tip (UB) could be used at the end of the boom to provide 100 percent overlap. Most sprayer tip companies have nozzle tips like these. Ideally these nozzles are one-half the size of other nozzles. Select the nozzle tip based on boom height and spray volume.

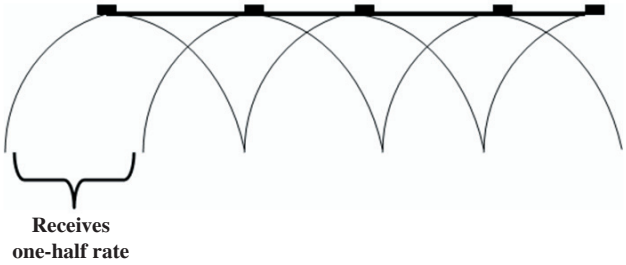


Figure 3. Shows one-half rate of pesticide from end nozzle.

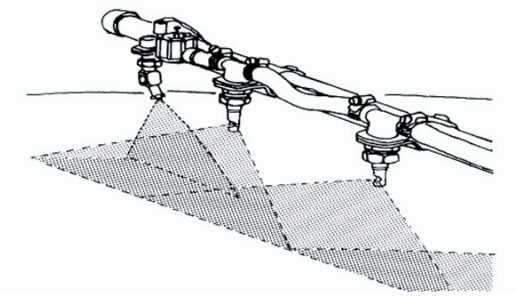


Figure 4. An additional nozzle on the end ensures that a full rate of pesticide is applied. This configuration should only be used on ends and field borders and must be turned off when swathing (spraying field).

Spraying While Turning

Spraying while making sharp turns (*Figure 5*) can result in three to four times the desired pesticide rate along the inner boom and as high as 40 to 50 times in the pivot position. The rate of pesticide near the outer end of the turn can be 1/2 to 1/10 the desired rate. To eliminate this as much as possible, spray in a straight line and eliminate turning while spraying.

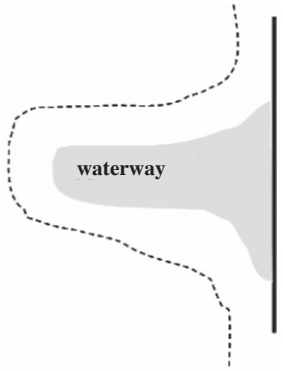


Figure 5. Problems can develop from spraying while making sharp turns. It would be better to turn off the sprayer and back into a corner.

Handling Irregular Shaped Fields

Achieving pesticide coverage of point rows is difficult. Following are some guidelines for improving results.

Do you prefer to overlap applications on irregular areas or leave these areas untreated? Often these areas are difficult to cultivate and many would rather risk crop injury from overlapping pesticides than inadequate weed control. In the case of point rows or uneven row lengths (*Figure 6*),

Figure 6. Spraying uneven row lengths.

applicators do not always select the longest distance of travel. Consider the degree of angle into the point and minimize double spraying. Placing switches on each boom section or even on every two or three nozzles allows controlled treatment of narrow swathes on terraces, point rows and other irregular areas.

Should fence rows, waterways, terrace back slopes, and other areas be treated? Treating terraced fields can be very difficult. Farmable terraces often are sprayed as normal fields with the applicator traveling over the terraces. Other types of terraces, parallel and non-parallel, require one bor-der along each terrace. The points between the terraces are filled in as necessary. Operating foam markers on both ends of the boom can prevent excessive double spraying.

In irregularly shaped fields avoid using pesticides that could cause carryover concerns or water quality problems if applications were overlapped.

Check Areas or "Strips"

Untreated areas (checks) are invaluable for later evaluation of a chemical or fertilizer application. Often, a planned check area provides the only means of evaluating results in terms of pest control, crop injury or fertilizer effectiveness. Checks are especially essential when using new products or the value of the treatment is uncertain.

The check area:

- should be used with the grower's consent;
- is often placed in an area not readily visible to the passerby;
- need not be large — a few feet the length of the boom or spreader is usually sufficient; and
- should be identified on the field record sheet.

Proper Swath Overlap

Nozzle pattern overlap at the end of the boom should be the same as for the rest of the nozzles along the boom (*Figure 7*). For example, if the overlap is 100 percent along the boom, the overlap at the edge of the swath should be 100 percent. The increased overlap of spray pattern and wider nozzle spacing increases the distance with a double rate or no rate of pesticide.

The location of a foam marker can affect the positioning of the end of the boom relative to the foam. In the following example, the *marker is placed at the end of the boom, even with the last nozzle*. If the nozzle spacing is 30 inches, one would move over 30 inches from the foam mark (see *Figure 8*).

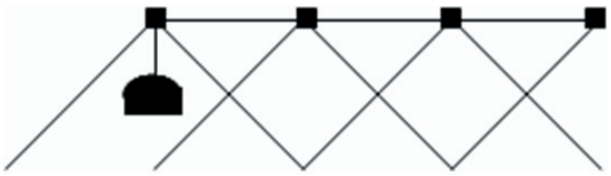


Figure 8. With a foam marker located with the last nozzle, one must move over the width of the nozzle spacing.

Some sprayers have the foam marker placed on an extension that is *50 percent of the nozzle spacing*. In this situation one would have the foam marker directly above the foam on the return pass (see *Figure 9*).

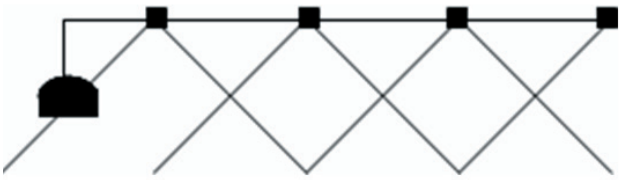


Figure 9. With a foam marker located one-half the distance between nozzles beyond the end nozzle, the marker is directly over the foam.

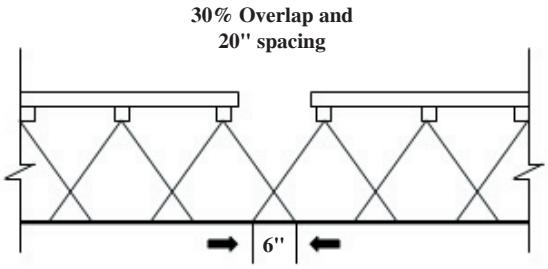


Figure 7. The advantage of more overlap with the spray pattern and wider nozzle spacing when swathing.

Wind Direction: Be aware of nearby crops and the drift potential of the pesticides, fertilizers, etc. Doubling the wind speed (7 to 14 mph) will increase the amount of pesticide 90 feet from the sprayer by 700 percent.

Field Speed: Base your field speed on the slowest speed that the most difficult to negotiate part of the field will permit. This will avoid wide variation in speed which makes uniform application difficult.

Driving too fast:

- increases boom bouncing and whipping;
- distorts pattern (for example, at 12 mph wind will decrease the pattern width by 15-20 percent for a nozzle placed at a height of 4-5 feet);
- creates a wind eddy behind the machine; this can be a serious problem behind large machines driven at high speeds; and
- creates more dust which deactivates certain herbicides.

Reducing Drift Injury

With a rate controller that changes output by pressure, drift may be reduced by slowing down near susceptible vegetation. For example, if an applicator is spraying at 10 mph and 40 psi and slows to 7 mph, the pressure should drop to 20 psi. One needs to stay above the minimum operating pressure for the nozzle tip being used (see *Table I*). This table also shows how pressure is affected as speed increases. When using the table for speeds other than 10 mph, use a percentage. For example if you travel 7 mph use 70 percent, and if you travel 12 mph use 120 percent.

The boom height also can be lowered when going slower. Boom height is the second biggest factor in drift — wind is first. These two factors, reducing pressure and lowering the boom, are two big steps in reducing drift while spraying fields. Boom height must be kept at a minimum height so that patterns will have the correct overlap.

Table I. How changing the speed of the sprayer affects pressure on sprayers with rate controllers. (*Do not operate sprayer so that nozzle tips are outside their recommended pressure range.)*

The example in each speed range is for 40 psi. The pressures are rounded to the nearest whole number. The $\sqrt{40} = 6.32$.

Speed *Present - changed to:*	*Pressure* *Present - changed to:*
10 mph to 9 mph	**60 psi to 49 psi**
	50 psi to 41 psi
0.9 x $\sqrt{40} = (5.69)^2 = 32.4$	**40 psi to 32 psi**
	30 psi to 24 psi
	20 psi to 16 psi
10 mph to 8 mph	**60 psi to 38 psi**
	50 psi to 32 psi
0.8 x $\sqrt{40} = (5.06)^2 = 25.6$	**40 psi to 26 psi**
	30 psi to 19 psi
	20 psi to 13 psi
10 mph to 7 mph	**60 psi to 29 psi**
	50 psi to 25 psi
0.7 x $\sqrt{40} = (4.42)^2 = 19.5$	**40 psi to 20 psi**
	30 psi to 15 psi
	20 psi to 10 psi
10 mph to 6 mph	**60 psi to 22 psi**
	50 psi to 18 psi
0.6 x $\sqrt{40} = (3.79)^2 = 14.4$	**40 psi to 14 psi**
	30 psi to 11 psi
	20 psi to 7 psi
10 mph to 11 mph	**60 psi to 73 psi**
	50 psi to 61 psi
1.1 x $\sqrt{40} = (6.95)^2 = 48.3$	**40 psi to 48 psi**
	30 psi to 36 psi
	20 psi to 24 psi
10 mph to 12 mph	**60 psi to 86 psi**
	50 psi to 72 psi
1.2 x $\sqrt{40} = (7.58)^2 = 57.5$	**40 psi to 58 psi**
	30 psi to 43 psi
	20 psi to 29 psi
10 mph to 13 mph	**60 psi to 101 psi**
	50 psi to 85 psi
1.3 x $\sqrt{40} = (8.22)^2 = 67.6$	**40 psi to 68 psi**
	30 psi to 51 psi
	20 psi to 34 psi
10 mph to 14 mph	**60 psi to 118 psi**
	50 psi to 98 psi
1.4 x $\sqrt{40} = (8.85)^2 = 78.3$	**40 psi to 78 psi**
	30 psi to 59 psi
	20 psi to 39 psi

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