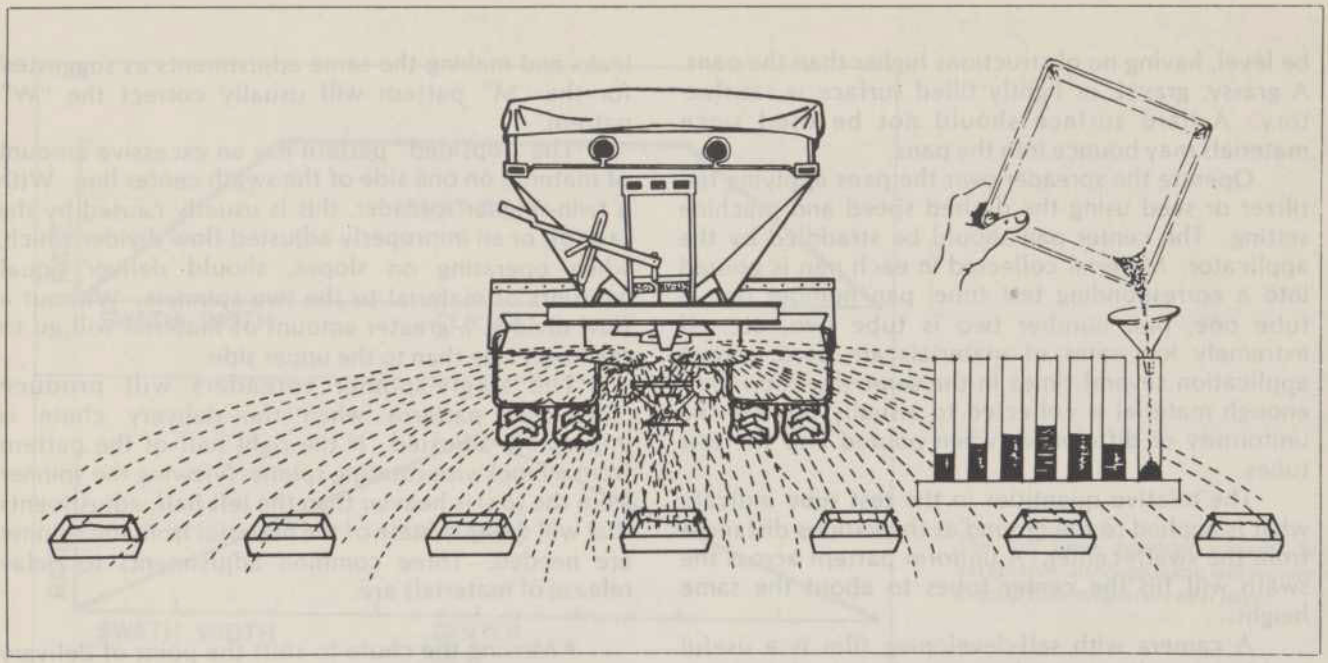


This drawing gives a general idea of how to arrange your collection pans and the cylinders used to measure the levels. Actually, though, you will need 11 or more trays, not the seven shown in the drawing.

Straighten up and spread right

Guide for measuring, correcting, calibrating broadcast spreaders

By E.S. Smith, D.D. Wolf, and M. Lentner

Broadcast spreaders should be checked periodically for uniformity of spreading pattern and proper rates of application. This is especially important when operating conditions, materials, or rates of application are changed. The travel pattern and effective swath width for the most uniform application should be considered.

Uniformity of spread

A check for uniformity of spread may be done by using 11, or more large cake baking pans or plastic greenhouse trays of equal size. A baffle sheet should be placed in the bottom of each tray to prevent ricochet loss of particles. The baffle can be made from ½ × ½ × ½ inch grid, such as used under light fixtures in suspended ceilings. This grid material is commonly available from electrical and building supply dealers in 2 by 4 foot plastic sheets that can be easily cut with a saw to the desired pan dimensions. Terry cloth lining of pans can be used but complete removal of collected material is difficult.

Secure an equal number of identical test tubes, rain gauges, or similar clear plastic or glass cylinders. Place these containers side by side, using a holding rack if necessary. The Webster Test Kit marketed by S.L. Webster and Son, Inc., Federalsburg, Maryland (cost, about $150) contains all the plastic collecting pans, test tubes, and a test tube rack needed for evaluating distribution patterns, if you would prefer to purchase a complete kit.

Arrange the pans at equal intervals in a line as wide as the expected spread pattern, allowing space between pans for spreader wheels. The ground should

be level, having no obstructions higher than the pans. A grassy, gravel, or lightly tilled surface is satisfactory. A hard surface should not be used since materials may bounce into the pans.

Operate the spreader over the pans applying fertilizer or seed using the desired speed and machine setting. The center pan should be straddled by the applicator. Material collected in each pan is poured into a corresponding test tube; pan number one is tube one, pan number two is tube two, etc. If extremely low rates of materials are used, repeat application several times in the same direction until enough material is collected to visually observe the uniformity or differences when poured into the test tubes.

The relative quantities in the test tube indicate what is applied to the ground at the various distances from the swath center. A uniform pattern across the swath will fill the center tubes to about the same height.

A camera with self-developing film is a useful tool for recording test tube results from each test run. If adjustments are made, pictures showing results of each test run can be used to compare and improve distribution patterns.

Adjustments

The Operator's Manuals should be referred to for procedures to correct nonuniform distribution patterns. The ideal spread pattern is symmetrical having an equal or slightly heavier rate of application in the swath center (behind the spreader) with a gradual decreasing rate to the edges of the swath. The "flat top," "pyramid," and "oval" patterns, as shown in the drawings, are all acceptable and will provide uniform application rates across a field when successive passes are properly overlapped.

The "M" pattern, usually associated with a twin-spinner spreader, has too little material in the swath center (directly behind the machine). This distribution pattern is often caused by operators attempting to get the widest possible spread pattern. An earlier release of the material by the spinners can usually correct this problem. This may be done by making one or more of the following adjustments:

- Move the delivery chute forward which will usually shift the point of delivery of the material to the spinners in a direction opposite to the direction of rotation and closer to the periphery of the spinners.
- Retard the spinner blade tips.
- Increase the spinner speed.

The "W" pattern may be caused by conditions similar to those causing the "M" pattern compounded by a leak permitting some material to miss the spinners and fall directly on the ground. Such patterns may also be caused by an improperly adjusted delivery chute and by material sticking to the conveyor belt with a delayed release as the conveyor returns to the front of the bin. Eliminating leaks and making the same adjustments as suggested for the "M" pattern will usually correct the "W" pattern.

The "lopsided" pattern has an excessive amount of material on one side of the swath center line. With a twin-spinner spreader, this is usually caused by the lack of, or an improperly adjusted flow divider which, when operating on slopes, should deliver equal amounts of material to the two spinners. Without a flow divider, a greater amount of material will go to the lower side than to the upper side.

The single-spinner spreaders will produce "lopsided" patterns when the delivery chute is improperly adjusted. If the right half of the pattern from a clockwise-rotating spinner (viewing the spinner from the top) is heavier than the left half, adjustments that will delay release of the material from the spinner are needed. Three common adjustments to delay release of materials are:

- Moving the chute to shift the point of delivery in a clockwise direction.
- Moving point of delivery closer to the center of the spinner.
- Decreasing the spinner speed.

If the rate left of the swath center is heaviest, make adjustments opposite to those indicated.

Effective swath width

There is often a misunderstanding among operators as to procedures for determining the effective swath width. An approximation of the effective swath width of a "flat top," "pyramid," or "oval" spread pattern can be found by locating the point on the right and left side of the swath where the application rate is one-half the rate through the center section of the swath. This distance between these points is the effective swath width and should be used as the swath spacing.

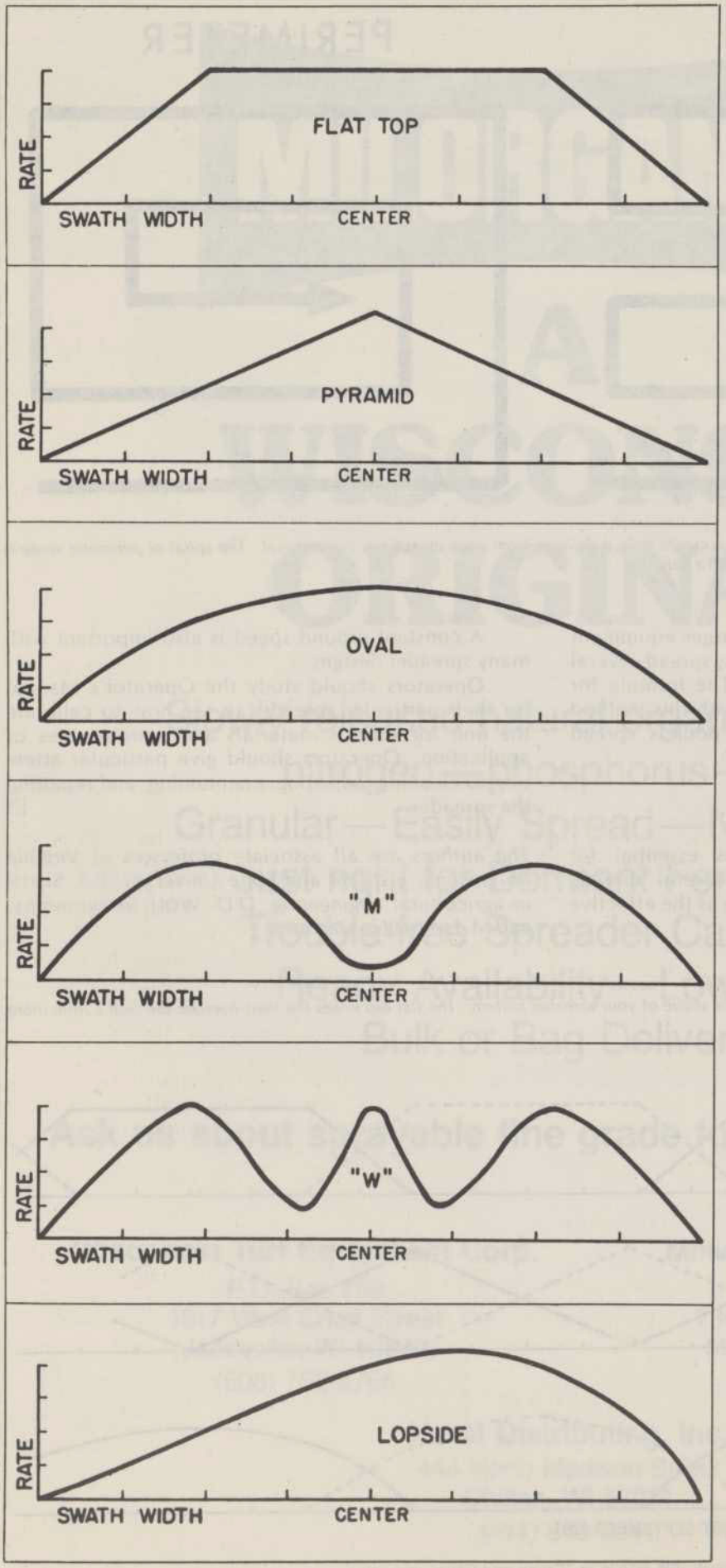
When practical, spreaders should be driven around fields in a perimeter pattern to minimize the effect of variations that might exist in nonsymmetrical spread patterns. The "back and forth" travel pattern should be used only if the distribution to each side is symmetrical and uniform.

Calibration

Once the effective swath width has been determined, the spreader can be calibrated for the proper rate of delivery. One method is to fill the hopper to a given level and travel a distance equal to one acre, under field operating conditions. Then determine the amount of material needed to refill the hopper to the same level.

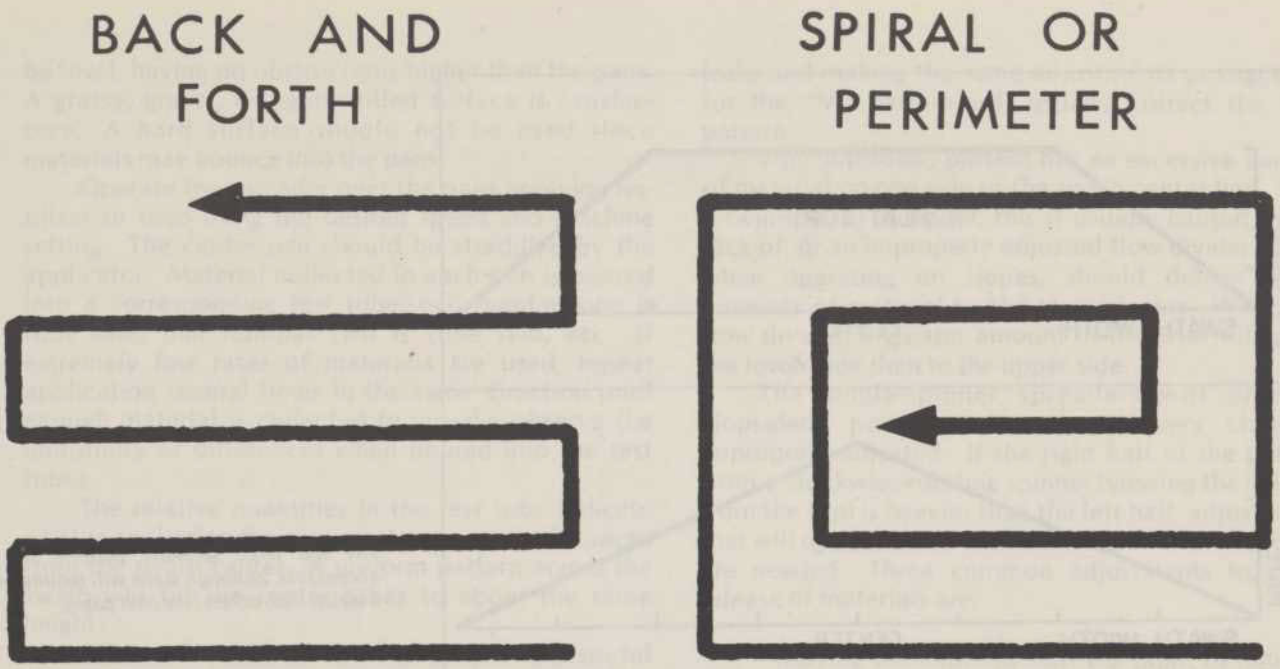
Travel distance (feet) per acre equals 43,560 square feet per acre, divided by effective swath width in feet.

While this method is practical for use with small equipment and small loads, it is difficult to determine the exact amount of material used from, say a 30,000-



The top three spreader patterns are all acceptable, although some will require more overlap than others (see next page).

The bottom three spreader patterns can be corrected by following the directions listed in this article.



The back-and-forth route across a field, left, is accurate only if delivery from your spreader is symmetrical. The spiral or perimeter route is generally considered the best route to take through a field.

pound-capacity truck. When using larger equipment it is more accurate to weigh the truck, spread several acres, then weigh the truck again. The formula for measuring your rate of application with this method would equal the total number of pounds spread divided by the number of acres spread.

Skilled operators

Accurate spacing of swaths is essential for uniform application; this requires careful driving. The swath spacing should be the same as the effective swath width.

A constant ground speed is also important with many spreader designs.

Operators should study the Operator's Manual for their particular spreader to see how to calibrate the unit for various materials and various rates of application. Operators should give particular attention to cleaning, adjusting, maintaining, and repairing the spreader. □

The authors are all associate professors at Virginia Polytechnic Institute and State University; E.S. SMITH *in agricultural engineering,* D.D. WOLF *in agronomy, and* M. LENTNER *in statistics.*

The amount of overlap you need depends on the shape of your spreader pattern. The flat top needs the least overlap; the oval a little more, and the pyramid the greatest.