

COVERAGE CALCULATOR

INSTRUCTIONS

Knowing spread pattern and proper swath overlap is essential to reduce streaking that often occurs in application of granular materials. The UK Coverage Calculator is a simple online tool that calculates the optimum overlap for an applicator based on data collected through a common pan test. It allows the operator to visualize the spread pattern from the machine and know the proper swath width to use to minimize streaks of over- or under-application of granular material. The following instructions explain how to test a spreader and use the UK Coverage Calculator.

Data are collected with what is commonly called a pan test. Collection pans are arranged across the path of a spreader to catch material (Fig. 1), and the amount of material accumulated in each pan is input into the calculator to analyze the spread pattern. The instructions provided in the following five sections will explain how to set up the test, spread the material, collect the data, enter the data into the online UK Coverage Calculator, and evaluate the results.

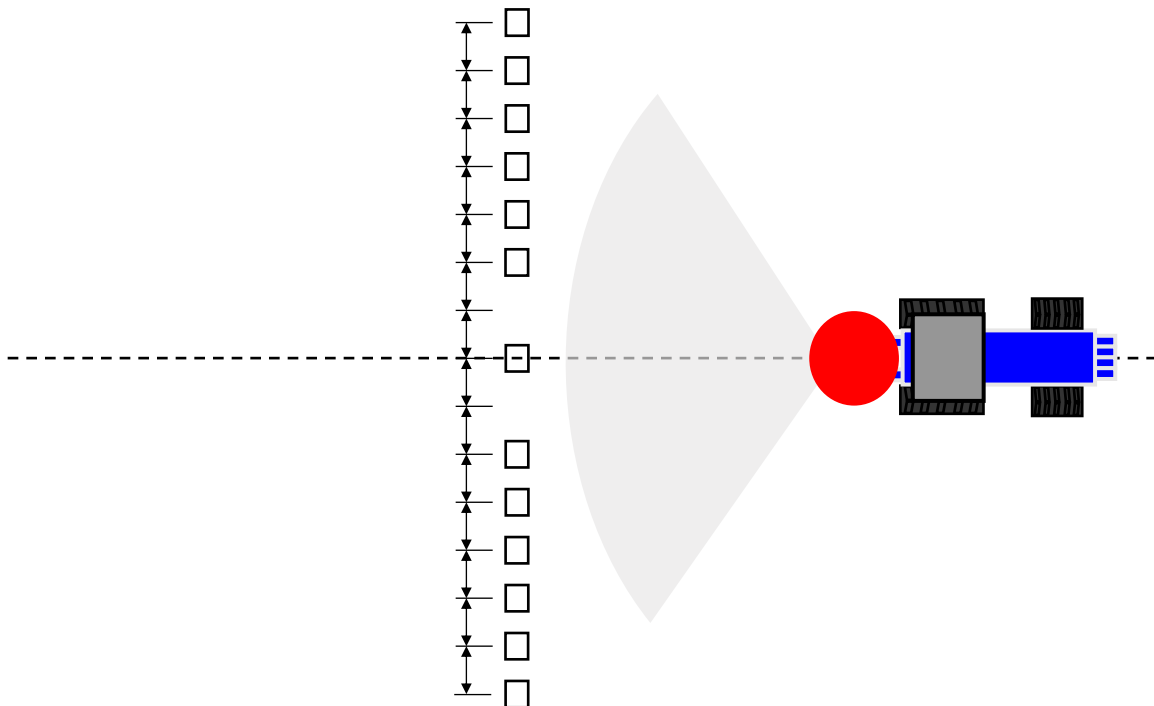


Figure 1. Arrangement of collection pans relative to the spreader. Note the uniform spacing between collection pans.

SET UP THE TEST

Pans

A set of pans to collect spread pattern data are required. The most important requirement when choosing pans is that they are all the same size. Several manufacturers provide spreader test kits that include a set of identical pans; however, a variety of inexpensive containers could be used (Fig. 2). Pans should be between 1 and 3 ft. in length and width. Larger pans will catch more material, which will make measuring the amount of material easier and might require fewer spreader passes. If the pans are rectangular, orient them with the longest dimension parallel to the machine's path.



Figure 2. Examples of pans that are acceptable for the simple pan test. Dividers inside the pan to reduce material bouncing will improve results.

To limit material bouncing out of the catch pans, it is a good idea to incorporate dividers, egg cartons, foam, or other mat materials into each pan. These anti-bounce devices should not capture and hold the material, thus preventing it from being collected and measured. If a bounce-limiting insert cannot be procured, the test can still be conducted with reasonable accuracy using empty pans.

Test Location

Try to find a place for the test that is relatively level and smooth. Make sure there is enough space before the pans to get the machine up to field speed and have it running correctly before the spread pattern starts to cross the pans. Likewise, make sure there is enough room after the pans to ensure that the material being thrown rearward has completely cleared the pans before stopping the pass. Test standards suggest 100 ft. before and after the row of pans. Use discretion in how much space is needed for the tested machine.

Use the same material and application rate in the test that you plan to use in the field. Be aware that you may have to make several passes across the pans to accumulate enough material to measure, so make sure that multiple applications of the material will not damage the test area.

Orient the path of the machine so that there is not a significant cross wind as this can skew the spread pattern giving bad results.

Pan Layout

When laying out the pans, start with one pan at the center of the machine (Fig. 1). From there, arrange the pans equally spaced in a line perpendicular to the path of the machine. Measure from center to center of the

pans and not between the pans so you know the exact pan spacing. The UK Coverage Calculator will allow input of any pan spacing that you choose, but it is suggested that pans be spaced not more than 3 feet for smaller machines. A wider spacing (up to 5 feet) can be used for larger machines. More pans will give better spread pattern data, but it will take more time to lay them out and collect the material from each pan. Use basic judgment in choosing the number of pans and spacing.

Make sure that the line of pans is wide enough to capture the whole spread pattern of the machine. It is good practice to have one or two pans on the end of the line that will not have any material to ensure that the whole spread pattern is captured.

Use the same number of pans on each side of the center, which means there will always be an odd number of pans in the line. The coverage calculator will sequentially number the pans starting with the left-most pan as number 1.

Once the pans are arranged, remove the pans that will be in the path of the machine tires. Do not adjust the spacing of the other pans. The UK coverage Calculator will allow you to indicate which pans you had to remove and will compensate the spread pattern accordingly.

SPREAD THE MATERIAL

Once the pans are arranged, spread across the pans. As much as possible, spread exactly the same way that material will be spread in the field. Use consistent spreader settings, forward speed, towing vehicle, etc.

It may be necessary to make more than one pass to accumulate enough material in the pans to measure it reasonably. If this is the case, make additional passes in the same direction as the first pass. Spreading in the opposite direction will hide asymmetry problems that may exist in the spreader, and they will not get addressed.

COLLECT PAN DATA

After the material has been spread, collect and measure the amount of material accumulated in each pan. The most important thing is to know the relative amount in each pan. Because of that, many different measurement methods could be used (Fig. 3). The material could be poured into a small cup and weighed on a scale. Inexpensive digital food scales with a capacity of about 2 lb. usually work very well for this application. The material could also be poured into a graduated cylinder to acquire a visual volume measurement. Some pan test kits include these cylinders (Fig. 3).



Figure 3. Examples of graduated cylinders and inexpensive scales that could be used to measure the amount of material collected in each pan.

ENTER THE DATA

On the UK Coverage Calculator input section (Fig. 4), choose the total number of pans including pans removed for tire clearance that were used in the test. This will always be an odd number since the protocol dictates one pan at the center of the machine and an equal number of pans on either side.

Type in the pan spacing and choose the appropriate units for that measurement.

An input table with the total number of pans used in the test will be generated. To help with orientation, the center pan will be highlighted in the table. The location of each pan relative to the center of the machine is also indicated. Negative numbers indicate distances to the left of the machine.

Beginning with the left pan (numbered 1), input the amount of material in each pan. If the pan is empty, make sure to type in "0" for the amount. For pans that are missing from the pattern (e.g. the pans removed to accommodate the tires), leave them blank until all the other data are entered. Then check the box next to the missing pans. This will cause the program to estimate the amount of material that would have been captured in that pan based on the amount in adjacent pans.

Number of pans used:

Pan Spacing:
 in ft cm meters

	Pan Number	Amount in Pan	Distance from Center
<input type="checkbox"/>	1	2.2	-30
<input type="checkbox"/>	2	3.2	-27
<input type="checkbox"/>	3	3.5	-24
<input type="checkbox"/>	4	3.5	-21
<input type="checkbox"/>	5	5.5	-18
<input type="checkbox"/>	6	5.5	-15
<input type="checkbox"/>	7	5.7	-12
<input type="checkbox"/>	8	7.2	-9
<input type="checkbox"/>	9	9.4	-6
<input checked="" type="checkbox"/>	10	11.1	-3
<input type="checkbox"/>	11	12.8	0
<input checked="" type="checkbox"/>	12	10.8	3
<input type="checkbox"/>	13	8.8	6
<input type="checkbox"/>	14	6.4	9
<input type="checkbox"/>	15	7.2	12
<input type="checkbox"/>	16	5.5	15
<input type="checkbox"/>	17	4.8	18
<input type="checkbox"/>	18	4.6	21
<input type="checkbox"/>	19	4	24
<input type="checkbox"/>	20	3.5	27
<input type="checkbox"/>	21	2.5	30

Figure 4. Data input section of UK Coverage Calculator.

EVALUATE THE RESULTS

The first thing to assess is the spread pattern for the machine (Fig. 5). Look for potential problems. Is the pattern symmetric? Are there obvious spikes or dips that will cause streaking even with an optimized swath spacing? Make any adjustments or repairs that are necessary and then rerun the test. Consult the owner's manual for the tested machine to determine proper adjustments.

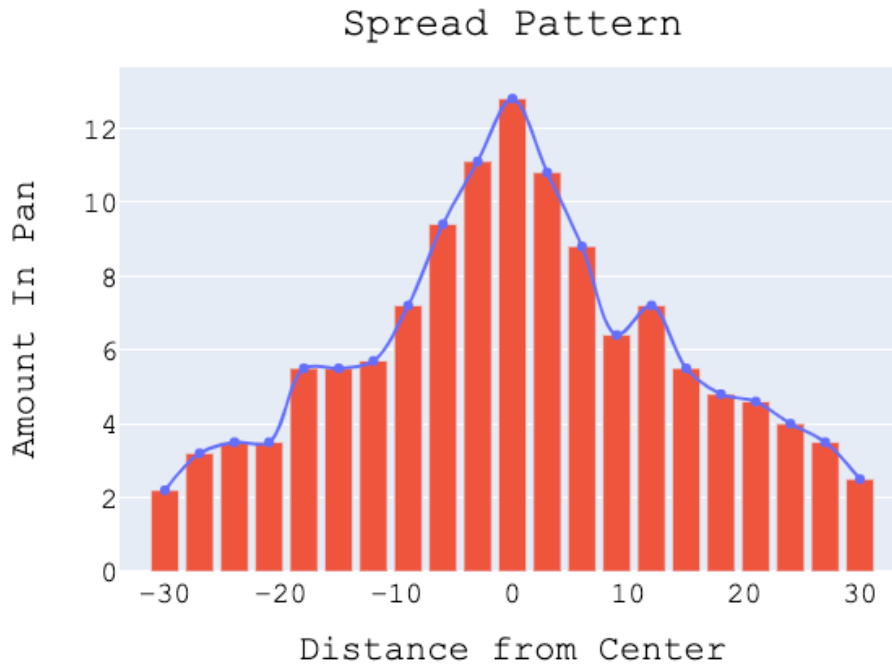


Figure 5. Example spread pattern visualization.

The program calculates a normalized symmetric spread pattern characteristic of the spreader. This normalized pattern is used to calculate the optimum swath width based on the minimum Coefficient of Variation (CV) that is achieved by overlapping adjacent patterns. The CV is a percentage number that indicates how much the resulting application deviates from the average.

The CV graph (Fig. 6) indicates several important things. First, consider the actual value of the CV. Generally, CVs less than 10-15% are considered good. This would mean that the expected point-to-point variation in application across the field would be less than 10-15% from the target application rate. If the minimum CV of the spreader is higher than that, it would be prudent to see if there is anything that could be done to the machine to change the spread pattern. Consider adjusting things like spinner speed, blade angles, drop point on discs, etc. so that the spread pattern can be adjusted and overall CV improved.

Next, look at all points where the CV is low. The program gives the mathematical minimum as the optimal swath width. In the example in figure 5, the mathematical minimum is at a swath width of 21 ft. However, at a swath width of 25 ft., the expected CV is a little higher, but still quite good, so it may be prudent to use a swath width of 25 ft. to achieve a good uniformity but with fewer trips across the field.

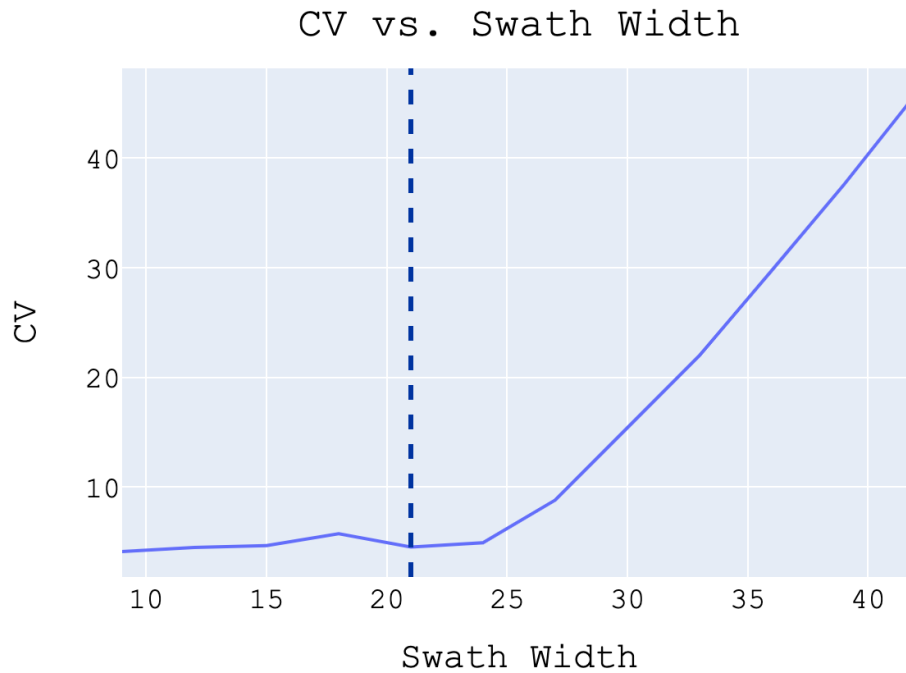


Figure 6. Example Coefficient of Variation vs. Swath Width plot.

The final graph (Fig. 7) illustrates the expected variation in the distribution between two adjacent passes of the machine across the field at the selected swath width. By adjusting the swath width slider, the user can visualize the expected distribution at different swath widths. Extremely high or low areas indicate areas where streaks would be expected between swaths.

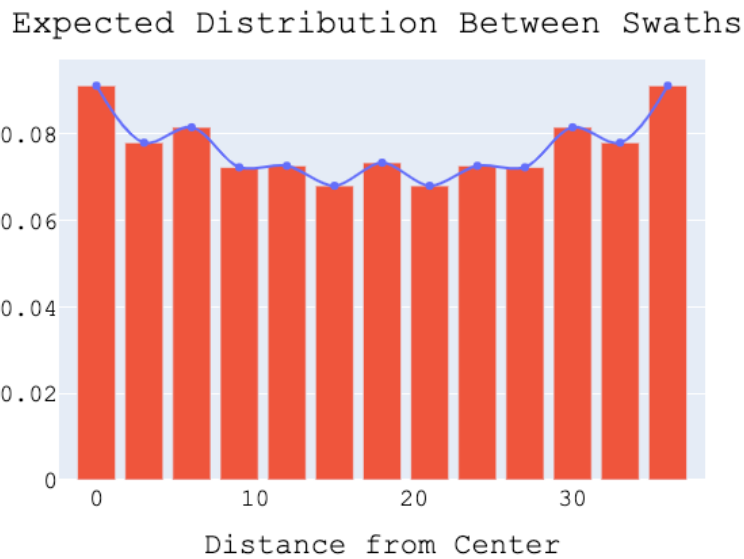


Figure 7. Example visualization of the spread variation between swaths.

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