

Chapter 7

Modifying Seeding Rates to Achieve a Stand of Cotton

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Cottonseed are irregularly pearshaped and about three-eighths of an inch long. They number on the average about 4,500 per pound. However, seed size is influenced by variety and ranges from large in some varieties to small in others. The higher-yielding varieties developed and released in recent times have tended toward smaller seed. Thus, the seeding rates employed in the past (in terms of pounds per acre) can be too high for many modern cotton varieties.

Cotton was formerly planted at rates now considered excessive. The higher rates were thought necessary because of the unknown percent germination of producer-saved seed. Also, skippy stands frequently resulted from planting fuzzy seed, and the poor control methods then available for seedling disease often meant reduced stands. Germination tests are now commonly available; seed are typically delinted (which with improvements in planters allows for more accurate seed metering); and the routine application of fungicides to planting seed reduces, though does not eliminate, the hazard of seedling disease. In the past, cotton stands after emergence were often excessive; and the extra seedlings were removed with a hoe. However, the labor and cost required to thin stands became intolerable in modern agriculture. The person thinning cotton seedlings had to walk nearly 2.5 miles and made approximately 20,000 strokes with the hoe per acre. "Planting to a stand" became a major goal for the producer who was trying to reduce costs. Today, even if stands are too thick, cotton is rarely thinned.

For efficient mechanical harvest, the optimum plant population for cotton at the end of the season should be in the range of 30,000 to 50,000 uniformly spaced plants per acre. Yield and harvester performance are acceptable with populations between 20,000 and 60,000 plants per acre. However, outside that range, lint yield and harvesting efficiency decline. Excessive plant populations also cause increased preharvest loss, height of the first fruiting branch, and

small leaf trash; they decrease boll size, rooting depth, plant height and width, and fiber length. At very high plant populations, probably the worst weed in cotton is cotton itself. Experience in Oklahoma suggests that populations nearer the lower end of the range are more suitable for dryland production; whereas, those nearer the upper end perform better under irrigation.

With 40-inch rows, there are 13,069 feet of row per acre (43,560 square feet per acre divided by 3.333 feet row width). Plant populations of 20,000, 30,000, 40,000, 50,000, and 60,000 per acre are equivalent to 1.5, 2.3, 3.1, 3.8, and 4.6 plants per foot of row, respectively. Yet, in many Oklahoma cotton fields, it is not uncommon to see a dozen or more plants per row foot. Twelve plants per row foot equal 157,000 plants per acre! Those higher populations not only increase seed costs unnecessarily, but also reduce lint yield and fiber quality. In doing so, such populations reduce net income.

The producer should first determine the number of seed per pound for each cotton variety he intends to plant. Rather than count the number in an entire pound, he could count the seed in a fraction of a pound and then convert that number to a pound basis. We will assume that has been done and that the variety in question is average in seed size, i.e., it had 4,500 seed per pound. Because growing conditions during seed development (and other factors) can influence seed size, the number of seed per pound should probably be determined for each variety each year it is planted.

Not all cottonseed in the bag are viable. Most analysis tags claim 80% germination. The germination was at least 80% at the time of testing. It probably was somewhat higher to assure compliance with the tag. Assuming germination is 80%, one seed in five is useless even before they are planted. However, the fewer assumptions that have to be made, the greater confidence the producer can have in his decisions. To check the analysis tag claim for germination, multiple

samples of commercial cottonseed were submitted to the Oklahoma Crop Improvement Association for testing in 1994 (10 varieties) and in 1995, 1996, and 1997 (11 varieties each year). In 1994, varieties ranged from 85 to 96% germination (with an average of 90%). In 1995, the range was 95 to 99% (with an average of 97). In 1996, the range was 90 to 98% (with an average of 94); and in 1997, it was 86 to 99% (with an average of 93). Clearly, if a producer assumes 80% germination for the seed he plants and it's actually 85 to 99%, a major contributor toward overplanting has been identified. A more accurate percent germination for each variety should enable the producer to achieve closer to optimum stands.

Not all cottonseed that germinate under "ideal" laboratory conditions will germinate under "less than ideal" field conditions, nor will all that germinate emerge. Seedling disease, soil-borne insects, nematodes, cooler than optimum temperatures, soil drying, spot flooding, etc. will from time to time exact their toll. This estimate of emergence is probably the most inexact number in the equation. In good years, it may be quite high; in poor years, it may be so low that replanting is necessary. For estimation purposes, we'll assume 80% emergence. (Many believe the "cool germination" test for cotton more accurately reflects a seed lot's ability to reach a stand than does the standard germination test.)

Not all cotton seedlings that emerge will survive until harvest. However, except under unusual circumstances (wind-blown sand, hail, lightning, some diseases, etc.), most will. Again, for estimation purposes, we'll assume 95% survival to harvest.

Of the 4,500 cottonseed per pound, 0.80 germination X 0.80 emergence X 0.95 survival to

harvest (or about 2,736 seed) will be present as plants in the field at harvest. If the producer irrigates and is aiming for 50,000 plants per acre, he will need to plant 18.3 pounds of seed per acre (50,000 divided by 2,736). Conversely, if the producer grows dryland cotton and is aiming for 30,000 plants per acre, he will need to plant only 11 pounds of seed per acre (30,000 divided by 2,736). The amount to be planted depends on number of seed per pound (known), percent germination (known reasonably well especially if the actual germination is determined), percent emergence (not known very well), and survival to harvest (known reasonably well). The exact amount obtained depends largely upon weather conditions following planting. In the above examples, 50,000 and 30,000 plants per acre were deliberately chosen because final stands would have to differ by more than 10,000 plants per acre before yield and harvester performance would suffer significantly.

Postscript

Persons wanting more accurate germination counts for their varieties can send a one-half pound sample of delinted, treated cottonseed in separate, labeled containers for each variety to the: Oklahoma Crop Improvement Association, Department of Plant & Soil Sciences, Oklahoma State University, Stillwater, OK 74078 [(405) 624-7117]. Include with the shipment the name and address where the results and the bill are to be sent. Allow about 2 weeks for the tests to be conducted. Current costs are \$8 per sample.