Chapter 8

Cotton Variety Selection

Laval M. Verhalen and Bruce E. Greenhagen

Deciding which varieties to grow is one of the most important decisions that producers must make. Many cotton producers in Oklahoma could greatly increase their lint yield and/or fiber quality, thus their net income, by growing varieties better adapted to the state and to their growing conditions. With the same inputs of capital and labor, some cotton varieties provide a much greater return on producers' investments than do others.

Cotton variety tests are conducted each year in Oklahoma to obtain the information necessary for producers to select those varieties they should grow. The experiments include commercially available varieties from throughout the Cotton Belt which have demonstrated superior performance in Oklahoma or have the potential to do so. These tests are conducted in as unbiased a manner as possible at several dryland and irrigated locations. Proper experimental designs are used with randomizations, replications, and statistical analyses of the data. Results from such tests are much more reliable than advertising, testimonials, or unreplicated demonstration plots. The results from this testing program are published and distributed each year to cotton producers throughout the state, to cotton researchers and extension personnel, and to other interested parties.

General Considerations

To select one or more varieties highly adapted to his growing conditions, the producer should study the data from the variety test (or tests) which most nearly corresponds to the characteristics of his farm. Location in the state is important. Obviously, a test closer to his area will be more meaningful to a producer than will one farther away. A variety that consistently does well in such a test will also likely do well on his farm. If his area is intermediate between two test locations, a variety that consistently does well in both tests will also likely do well on his farm. For Oklahoma producers, tests from closely surrounding areas in Texas (specifically on the Rolling Plains) are also of value. High Plains conditions are sufficiently different from those in Oklahoma that variety test results from that area have little meaning here.

Whether the test was irrigated or dryland is also important. Cotton varieties which do well under irrigation may not do so on dryland and vice versa. Except for years with unusually early freezes, irrigated cotton (regardless of the variety) will normally yield more and do so more consistently than will dryland cotton, but some varieties can more efficiently utilize that extra water than can others. Similarly, some cotton varieties can escape or tolerate the stresses of dryland production more readily than can others. A few cotton varieties do relatively well under both conditions. How a cotton variety will perform under irrigation and/or on dryland simply cannot be known until it has been tested there. The producer who irrigates should examine irrigated test results; whereas, the producer who has limited or no irrigation should investigate those from dryland tests.

The producer should consider how the cotton varieties in a test performed **relative** to one another. A variety's performance for a trait as an isolated number is meaningless. It takes on value only when compared to other varieties **in the same experiment(s).** Large differences between varieties for a particular trait are likely at least partially genetically based; small differences may not be.

The producer is cautioned that some traits of cotton are more sensitive to environmental differences than are others. Such traits are said to display more "variety by environment interactions" than do others. Environmentally sensitive traits in cotton include lint yield and fiber fineness (i.e., micronaire). Results from a single experiment for such traits can be, and often are, misleading. More reliable comparisons among varieties can be obtained for such traits in tests averaged over years and/or locations. Differences among cotton varieties in traits such as fiber length and strength are more consistent over environments, and data from only one or two tests will normally give a good indication of their relative varietal performance.

If his cotton acreage is substantial at all, the producer is advised to grow more than one variety. Unforeseen circumstances can occasionally cause a variety to perform below its usual level. Growing more than one variety will tend to moderate those losses, if and when they occur.

Lint Yield

Lint yield is the most important factor the cotton producer must consider when deciding which varieties to grow. It is not unusual in an experiment for one cotton variety to yield 50 to 100% more lint than another treated the same way throughout the entire growing season. Higher lint yields, at the same level of production costs, translate into greater net returns. This is a strong argument for buying cotton planting seed by variety name (as certified seed).

Seed yield is important as well. However, seed in Oklahoma are only 10 to 20% of the value of the crop; whereas, lint accounts for 80 to 90%. Lint and seed yield are very highly and positively related. As one tends to increase, so does the other. However, this relationship is not perfect; therefore, selections should be based on yield of lint (the more valuable component) rather than on seed (the less valuable). Selections should not be based on yield of seedcotton (a confounded measure of lint and seed) because in a sample of seedcotton, the seed normally weigh about twice as much as the lint, and a 1 to 2% variation in yield of seed (the less valuable component) can obscure a 2 to 4% variation in yield of lint (the more valuable).

Lint Percent

Lint percent (sometimes called “gin turnout”) influences ginning costs. It may be calculated on a picked and/or a pulled basis. Picked lint percent is the percent lint in a sample of seedcotton while pulled lint percent is the percent lint in a sample of snapped cotton. Producers who harvest with mechanical pickers should compare picked lint percents while those who harvest with strippers should study pulled lint percents. As the price of cottonseed increases, the importance of a high lint percent declines. In addition, a variety with high lint yield per acre (but with a moderate lint percent) often gives higher net returns than does a lower yielding variety with a higher lint percent. Differences in lint yield mean considerably more in terms of net returns than do differences in lint percent.

Maturity

Early maturity of cotton varieties is important in Oklahoma because the growing season in the state is comparatively short for the crop. Also, earliness helps provide some escape from late-season insects such as the boll weevil and bollworm and from late-season diseases such as verticillium wilt and boll rot. Under irrigation in Oklahoma, extreme earliness is not as critical for maximum performance as it is under dryland conditions. Under irrigation, a moderate degree of earliness is sufficient. Earliness is commonly estimated in experiments with two (or more) harvests as percent first harvest. The value is estimated by dividing the lint weight from the first harvest by the total lint yield and expressing the result as a percentage.

Fiber Properties

Fiber length, micronaire, and strength are the three fiber properties commonly reported which partially determine the price per pound the producer receives for his lint. Fiber length uniformity and elongation are important in the manufacturing process; but at present, little or no price incentives are received for either. Grades influence price, but are not routinely determined in this type of research...as grades are influenced more by environment, cultural practices, and handling than by varietal differences. One exception is the smooth leaf trait, a varietal character. Varieties with smooth leaves generally give higher grades than do those with normally or densely hairy leaves. Longer, stronger, more uniform fiber with better grades and more elongation is generally more desirable than the alternatives. Micronaire is acceptable anywhere within the “base” range of 3.5 to 4.9 units inclusive. The “premium” rang is between 3.7 and 4.2 inclusive. If the fiber is too fine (below 3.5) or too coarse (above 4.9), the price per pound of lint is reduced. Because the penalties are more severe for micronaires below 3.5, the producer should probably choose varieties with micronaire values toward the upper end of the range. Fiber properties are determined by High Volume Instrument (HVI) measurements conducted in USDA

cotton classing offices and selected laboratories. A detailed discussion of the importance of these and numerous other fiber properties is provided in Chapter 15 entitled "Classing of Fiber Quality in Upland Cotton".

Boll and Plant Type

Varieties differ in boll and plant type (both of which influence method of harvest, i.e., mechanical picking vs. stripping). Varieties with the open-boll type are typically harvested with pickers; those with stormproof bolls with strippers; and those with storm-resistant bolls may be harvested with either machine. If the proper boll type is chosen to match the producer's harvest method, plant type normally will not be a problem. Cotton breeders strive, more-or-less successfully, to combine the appropriate characters together into the same plant for a particular harvest method. In general, the plants of varieties adapted to picker harvest will be taller, be more open, have longer side branches, have longer internodes, have open bolls borne well off the ground, and be medium to late in maturity. Conversely, the plants of stripper varieties tend to be shorter, be more compact, have shorter side branches (may even be cluster or semicluster in form), have shorter internodes, have storm-resistant or stormproof bolls borne closer to the ground, and be medium to early to very early in maturity.

Disease Resistance

Plant diseases are serious limitations to cotton production in Oklahoma. Greatest lint yield losses in the state have been attributed to the early-season seedling disease complex followed in order by late-season verticillium wilt (on heavier soils, especially under irrigation), the fusarium wilt--root-knot nematode complex (prevalent on sandy soils), bacterial blight (under hard driving rains or sprinkler irrigation), ascochyta blight (in wet weather), the late-season boll rot complex, and phymatotrichum root rot (on highly calcareous soils in counties immediately north of the Red River). Growing an early-maturing variety will provide some escape from late-season diseases. Resistant cotton varieties are available for fusarium wilt--nematodes and bacterial blight as are tolerant varieties for verticillium wilt. When one or more of those diseases are detected in his fields, the producer should consider growing resistant and/or tolerant varieties adapted to the area. Doing so is generally considered more effective and more economical than the alternative use of cultural methods. By not waiting until the disease reaches epidemic proportions, serious losses may be averted. (Some varieties are advertised as possessing tolerance to the seedling disease complex and/or to phymatotrichum root rot. Such claims may eventually be proven true, but they are not universally accepted at the present time.)

Insect Resistance

Early-maturing cotton varieties provide some escape from late-season insects. Such varieties have been grown in Oklahoma for many years. A few varieties now have characters such as nectariless, smooth leaf, and/or okra leaf which confer tolerance to some insects, but not others. Growing **adapted** varieties with such characters could reduce the number of insecticide applications required or, in some instances, eliminate them entirely. On the other hand, glandless varieties are more vulnerable to attack by some insects, but not others. If grown, they should be monitored even more closely than normal and sprayed promptly when insect populations reach economic levels of infestation.

Producers with bollworm--tobacco budworm infestations year after year may choose to grow varieties with the Bollgard gene (Bt cottons). Because of the expense involved, such varieties are considered more economically feasible under irrigation than on dryland in Oklahoma. If insect populations are very high, some insecticide applications may still be necessary with such varieties.

Herbicide Tolerance

Producers with infestations of weeds that are controllable using Roundup Ultra may wish to grow cotton varieties tolerant to that herbicide. Several such "Roundup Ready" varieties are now available which can be sprayed over-the-top as very young seedlings (see label), but older plants mush receive a postemergence directed spray. These varieties (like the Bt cottons) have a technology fee and several restrictions on their use. Most annual grasses and broadleaf weeds are effectively controlled by Roundup Ultra. It's especially effective for johnsongrass;

however, at approved over-the-top rates, it's less effective for many other perennial weeds. Varieties with tolerance to Bucrtril, 2,4-D, or other herbicides may be available in the future; but they are not yet commercially obtainable and/or are not yet approved for application using that specific herbicide.

New Variety Releases

The cotton producer should not be content to grow the same varieties year after year. In general, newer releases have higher yield potential, better fiber qualities, improved disease resistance, etc. than do previous releases. Maintaining the status quo on varieties prevents the producer from taking advantage of those breeding advances and restricts his ability to compete in the marketplace. On the other hand, one should not make wholesale changes in a capricious manner. The producer might use the following method, or a similar one, for making his decisions:

1) Use data from variety tests and replicated demonstration plots to narrow down his list of potential candidate varieties.
2) Buy a bag(s) of seed of each candidate variety.
3) Plant those varieties on his farm adjacent to the varieties he normally grows. The varieties should be planted at the same seeding rate on the same day, treated the same way throughout the growing season, and actual performance data (especially for lint yield) determined on each variety. (Visual estimates of yield are difficult to make and are often highly misleading.)
4) Grow those varieties which did well (relative to his standard varieties) on increased acreage in subsequent years. Drop those which did not.
5) Repeat the cycle every few years to stay reasonably current.

A good general rule of thumb is that no matter how well a cotton variety performs, after 5 years, it's beginning to be obsolete. After 10 years, it almost certainly should be replaced by another.