Reduced plant stands frequently occur throughout the cotton belt due to poor seed germination and inhibited seedling growth. Factors reported to reduce plant stands in the field include imbibition and chilling problems in seed germination, poor seedbed preparation, soil microenvironment issues, and soil impedance problems such as crusting. Reduction in stands after emergence are often reported during in given production season from numerous causes such as seedling diseases, insect damage, herbicide injury and weather issues such as sandblasting and hail damage. Historically, reduced plant stands have always been an issue due to unforeseen environmental conditions occurring during the planting season, but problems with low plant stands appears to be more common now due to the willingness of growers to reduce their initial seeding rates in order to offset the high costs of planting seed and biotechnology trait fees. Reported effects of varying plant populations on cotton yield and fiber quality have been inconsistent in the literature. Therefore, reduced plant stands from poor seedling emergence and delayed development can result in a serious dilemma for growers on whether to replant or proceed with the existing plant stand.

Materials and Methods

Several replicated field trials were conducted to determine the impact of reduced plant populations and large skips on the growth and development of cotton.

**Study 1: Uniform Stand Reduction Trial.**

A replicated field trial was conducted at the Central Crops Research Station located in Clayton, NC in 1992 and 1993 to determine the response of cotton to uniform stand reductions. Treatments consisted of two divergent plant populations of a normal stand of 3.7 plants/ft of row and a reduced plant population of 0.6 plants/ft of row. Plots were over-sown and hand-thinned at the 3 to 4 leaf stage to the appropriate treatment populations. Plots consisted of six 38-in rows that were 40 ft long and the experimental design was a randomized complete block design with 4 replications. During the season, all white blooms from the fourth row of each plot were tagged with color-coded tags so bolls from specific tagging dates could be identified at season’s end. Open bolls were hand-harvested from the tagged row and plants were mapped at season’s end.

**Study 2: Replanting Trial**

A replicated field trial was conducted at the Delta Branch Experiment Station located in Stoneville, MS in 1995 and 1996 to determine the impact of replanting cotton following a reduced plant stand. Treatments consisted of six planting scenarios:

- a) early planting (early-May), good stand (3.7 plants/ft of row)
- b) early planting (early-May), poor stand (1 plant/ft of row)
- c) late planting (late-May), good stand (3.7 plants/ft of row)
- d) late planting (late-May), poor stand (1 plant/ft of row)
- e) replanted into scenario b with good stand
- f) replanted into scenario b with poor stand

Poor stand created by planting A 60:40 mixture of killed seed and viable seed seeded directly with a planter. Treatments c and d simulated replanting by starting over without the existing plant stand and treatments e and f simulated replanting directly into the existing plant stand. Plots consisted of four 40-in rows that were 40 ft long and the experimental design was a randomized complete block design with 4 replications. At season’s end, plants
were mapped to determine boll distribution and fruit retention, and the middle two rows of each four row plots was machine-harvested. Seedcotton was ginned on a 10-saw gin and gin turnout calculated, and fiber quality determined by HVI analysis at Star Lab (Knoxville, TN). Data were evaluated by analysis of variance (SAS Institute Inc., Cary, NC).

**Study 3: Skippy Stand Trial**
Replicated field trials were conducted in Florence, SC at the Pee Dee Research and Education Center from 2007 to 2009 and at the Delta Research Center in Portageville, MO in 2007 to determine the impact of skippy stands on cotton growth and development. Both locations were planted at 4 seeds/ft of row. Treatments consisted of an untreated check (normal stand) and five stand reductions (50, 60, 70, 80, and 90% stand reduction). Stands were reduced by three different methods: a) by planting reduced seeding rates, b) by using SAS generated random numbers and hand-thinning based on these random numbers at the 3 to 4 leaf stage, and c) by mixing non-transgenic and glyphosate resistant transgenic cotton seed at the appropriate blend ratios and killing the non-transgenic plants with glyphosate at the 4 leaf stage. Plots consisted of four 38-in rows that were 40 ft long and the experimental design was a randomized complete block design with 4 replications. At season’s end, plants were mapped to determine fruit distribution and retention and the length of all skips in each row was measured. The middle two rows of each four row plots was machine-harvested with a Case 1822 2-row picker. Seedcotton was ginned on a 10-saw gin and gin turnout calculated, and fiber quality determined by HVI analysis at Star Lab (Knoxville, TN). Data were evaluated by analysis of variance (SAS Institute Inc., Cary, NC).

**Summary**

**Study 1: Uniform Stand Reduction Trials**
Final lint yields were not significantly different between the two divergent plant populations (0.6 vs. 3.7 plants/row ft)

Reduced plant population resulted in delayed crop maturity (flower development delayed, boll development delayed, harvesting delayed) of about 2 to 3 weeks.

Reduced plant population resulted in greater importance of later-developing bolls for maximal lint development (developed during time of reduced environmental conditions)

Reduced plant population resulted in increased boll size and micronaire of individual bolls, which could result in lint quality issues under certain environmental conditions

**Study 2: Replanting Trials**
No differences in lint yield occurred among the early-planted treatments (treatments a & b, good stand vs poor stand) and the treatments replanted into the existing stand (treatments e & f).

However, both late-planted treatments resulted in significantly reduced lint yields (treatments c & d).

Reduced plant stands resulted in delayed maturity, increased boll weight, and increased micronaire.

No advantage was found in replanting cotton under these conditions compared to existing stands of 1 to 1.6 plants/row ft.

**Study 3: Skippy Stand Trials**
Random, blend, and low rate reduction methods produced similar results.

Highest yield losses to reduced plant stands (90% reduction – 0.3 plants/row foot) were 18% in SC and 22% in MO compared to check (approx. 3 plants/row foot).

Fiber micronaire increased and lint yield decreased as the number of 3 foot or greater skips increased.