# PICKER VS. STRIPPER HARVESTING IN THE TEXAS HIGH PLAINS: AGRONOMIC IMPLICATIONS

**Randy Boman**
**Mark Kelley**
**Chris Ashbrook**
**Texas AgriLife Extension Service**
**Lubbock, TX**
**John D. Wanjura**
**USDA-ARS**
**Lubbock, TX**
**Eric Hequet**
**Texas Tech University Fiber and Biopolymer Research Institute**
**Lubbock, TX**

## Abstract

Many changes have occurred during the last decade in the Texas High Plains which have resulted in increased cotton yields and improved fiber quality. The main factors associated with both higher lint yield and quality include a shift in varieties planted, with virtually no "storm-proof stripper types" being planted now, and a substantial increase in sub-surface drip irrigated (SDI) acres. A significant labor shortage can occur during harvesting operations, and many producers are investigating various avenues to increase the efficiency of harvesting operations. The advent of new picker harvesters with on-board moduling systems may play a role in increasing farm-scale harvesting efficiency. However, many High Plains producers are not accustomed to using more complicated and more costly picker harvesting machines. The brush-roll stripper harvester is the predominant harvester type used in the region, but these machines typically exhibit lower productivity compared to picker harvesters when harvesting high-yielding SDI cotton. With this in mind, commercial-scale experiments were conducted with the objective to compare picker and stripper harvesting and ginning methods. The harvest/ginning systems were compared based on yield, fiber quality measured by USDA-AMS High Volume Instrument (HVI) classing, "economics based on custom harvesting rates," and ultimately Advanced Fiber Information System (AFIS) testing and yarn quality. Since AFIS and spinning trials are ongoing at this time, these data are not presented.

Tests were conducted in producer/cooperator SDI fields across the Texas High Plains region over the period from 2008 through 2010. The protocol included generating one commercial module per experimental unit for both the picker and stripper harvesters. A total of four replicates (modules) per site were obtained for each harvester type (4 picker modules and 4 stripper modules per site). Total plot area per harvester varied from ~ 25-40 acres per site depending upon lint yield and plot row length. Locations included:

- Acuff, TX 2008 (Mimms Farms): FiberMax 1880B2F was planted to a SDI field with 1250 ft long rows. This site was harvested November 2, 2008 using a John Deere (Moline, IL) 9986 basket picker provided by a custom harvester and a John Deere 7460 stripper with field cleaner provided by Mimms Farms. A total of 63 picker bales were classed from 18.37 acres, and 44 stripper bales classed from 12.24 acres. These numbers do not include remnant bales generated during detailed ginning, but remnant lint weights were included in plot yield totals. Cotton harvested from this site was ginned by the Acuff-McClung Co-op Gin located at Acuff, TX.
- Ralls, TX 2008, 2009, and 2010 (Verett Farms): FiberMax 9180B2F was planted to the same SDI field during all three years and plot row lengths were 2740 ft. Plots were harvested November 10, 2008 with 53 picker bales classed from 15.08 acres and 50 stripper bales classed from 13.40 acres. Plots were harvested on November 16, 2009 with a total of 38 picker bales classed from 17.11 acres and 36 stripper bales classed from 14.59 acres. Differential harvesting dates were possible in 2010 and the picker plots were harvested on November 4 while stripper plots were harvested November 18. A total of 51 picker bales were classed from 19.69 acres and 52 stripper bales classed from 19.70 acres. For all three years, a John Deere 9996 was used to harvest the picker plots (operated by USDA-ARS) and a John Deere 7460 stripper with field cleaner (provided and operated by the cooperating producer) was used to harvest the stripper plots. For all three years, cotton harvested from this site was ginned by Owens Co-op Gin located near Ralls, TX.
- Ralls CIH 2010 (Verett Farms): The fifth SDI location used was also located near Ralls, TX in 2010. The cultivar used at this site was FiberMax 9170B2F, which is typically somewhat lower in storm resistance than FiberMax 9180B2F. Plot length at this location was 1660 ft long. Differential harvesting dates were

encountered in this trial, with picker harvesting occurring on October 13 using a CaseIH 625 Module Express and stripper harvesting conducted on November 1, 2010 using a John Deere 7460 stripper with field cleaner (both harvesters and support equipment were provided and operated by the cooperating producer). A 4-5 inch rainfall event occurred between the two harvest dates on October 21. A total of 39 picker bales were classed from 12.19 acres, and 38 stripper bales were classed from 12.17 acres. Cotton harvested from this site was ginned by the Texas Star Gin located at Wilson, TX.

During ginning, all modules were weighed and ginned separately by cooperating ginners. Great care was taken to clear the gin stream between modules and any remnant bale remaining in the press was ejected and weighed for each individual module. Cooperating ginners agreed to modify the gin stream for picker harvested modules where one to two stick machines were bypassed and only one stage of lint cleaning was used. The "normal" gin sequence was used for stripper harvested modules which typically included two stages of extractor type cleaners (stick machines or combination burr/stick machines) with two stages of lint cleaning. Commercial bales were classed by the USDA-AMS Classing Office in Lubbock, TX. One bale ginned from the center of each module was acquired by the Texas Tech University Fiber and Biopolymer Research Institute for additional AFIS fiber testing and yarn quality evaluation.

Important assumptions utilized for each location included: $0.08/lint-lb custom stripper harvesting rate and $0.10/lint-lb custom picker harvesting rate; $3.00/cwt for ginning cost; $175/ton seed value; and lint value was assumed to be the CCC (Commodity Credit Corporation) Loan values for average fiber quality across all bales for each module. CCC Loan values for all sites were determined from the 2010 CCC Loan chart. The General Linear Model procedure in SAS was used for by-site analysis, and the Mixed procedure was used to combine all sites. Site and replicate nested within each site were considered random effects while harvester type was considered a fixed effect. Least squares means were generated, and the PDIFF option was used for mean separation. It should be noted that the 2008 and 2009 crop years encountered somewhat early freezes in the region whereas the 2010 crop year was one of greater heat unit accumulation which resulted in better overall crop maturity.

While some site to site variation existed in the yield, fiber quality, and agronomic data, the 5-site averages are reported for the purposes of this abstract. Field-cleaned bur cotton yield for the stripper system was 5058 lb/acre and for the picker system, seed cotton yield was 4067 lb/acre ($P>|t| <0.0001$). Stripper system cotton averaged 30.6% lint turnout, whereas picker system cotton averaged 36.1% ($P>|t| <0.0001$). Lint yield averaged 1552 lb/acre for the stripper system and 1470 lb/acre for the picker system ($P>|t|$ 0.0002), a difference of 82 lb/acre. Lint loan value was greater ($P>|t| <0.0001$) for the picker system ($0.5632/lb) than the stripper system ($0.5382/lb). This difference can be attributed to somewhat improved leaf grade average for the picker compared to the stripper (2.6 vs. 2.9, respectively $P>|t|$ 0.0007); lower percentage bark incidence for the picker compared to the stripper (2.4% vs. 55.2%, respectively $P>|t| <0.0001$); somewhat higher micronaire for the picker compared to the stripper (3.92 vs. 3.75, $P>|t| <0.0001$); and higher uniformity for the picker compared to the stripper (81.4% vs. 80.9%, with a $P>|t|$ 0.0002). Fiber properties generally unaffected by harvest method included staple in 32nds inch (37.3 for picker, 37.2 for stripper) and strength in g/tex (30.4 for both). Small but statistically significant differences were noted for HVI color components with reflectance (rd) averaging 81.5% and 80.9% for the picker and stripper systems, respectively, and yellowness (+b) averaging 7.22% for the picker system and 7.46% for the stripper system. When combined into color grade, no differences were observed with respect to harvester/ginning system type. When using the assumptions outlined above, net returns defined here as (gross Loan value/acre + seed value/acre) – (ginning cost/acre + custom harvest cost/acre) for the picker system ($736/acre) were not statistically different from the stripper system ($753/acre) ($P>|t|$ 0.1049). If a higher lint value of $1.25/lb is assumed regardless of fiber quality (e.g. the case where fiber quality improvements arising from the picker system are less important in marketing), this same dataset results in highly significant ($P>|t| <0.0001$) lower net returns for the picker system ($1,837/acre) compared to the stripper system ($1,940/acre). Therefore, the conclusions one might make based upon a highly competitive global fiber quality market compared to a high-lint value market can differ.

Although individual site data are not reported above, the cropping year effect in the Texas High Plains remains considerable. Good to excellent September and October heat unit accumulation is important to obtain adequate boll maturity and exertion to improve picker harvesting efficiency. Cultivar selection may be important, especially in low maturity years, as bolls in cultivars typically planted in the region with greater storm resistance may not properly exert for efficient picker harvesting. However, this may not be as much of a factor in years with warm, open fall conditions. In some years, adverse weather events such as late-season rainfall or an early freeze can

exacerbate bark contamination problems associated with stripper harvesting. Picker harvesting under these conditions can reduce or eliminate bark contamination. In many years, earlier harvesting dates for pickers compared to strippers can be of fiber quality and perhaps yield preservation value. This potentially results in lower production risk. Future work comparing economic parameters between picker and stripper based harvest systems should include both conventional basket type and new picking systems with the ability to build modules onboard the harvester. Based on experiences over the last few years, picking will 1) not substantially increase micronaire, but can somewhat improve it, 2) substantially reduce or eliminate bark contamination, 3) many times result in higher Loan value for lint, 4) leave seed cotton in the field, which can be a significant income loss (both lint and seed) and will likely increase volunteer cotton challenges in the next crop, 5) likely reduce expenditures for harvest aid-chemicals as no sequential application of paraquat is generally needed beyond the typical ethephon plus defoliant initial applications generally used for stripper harvesting.

## Acknowledgements

The authors thank Plains Cotton Growers – Plains Cotton Improvement Program and Cotton Incorporated for financial support of this work; John Deere for providing use of the 9996 cotton picker; producer/cooperators Mimms Farms – Acuff, TX and Verett Farms – Ralls, TX for their land, time, and equipment; and cooperating ginners Rex Tomlinson – Acuff-McClung Co-op Gin, Steve Newton – Owens Co-op Gin, and Buzz Cooper – Texas Star Gin for their outstanding and critical ginning cooperation.