

# **Propane-Fueled Cotton Defoliation**

## Timely harvesting with improved leaf kill and insect control

o ensure an efficient harvest, cotton growers must defoliate their plants, removing the green leaves that hamper harvesting efforts. Leaves hide valuable cotton fibers from harvesting machines, lowering crop yield. Leaf sap can adhere to picker spindles, increasing downtime. It can also stain cotton fibers, lowering the price grade of the cotton.

While cotton growers commonly use chemicals to defoliate plants, chemicals are difficult to apply in wet or windy weather, and they require 10 to 14 days to take effect. Good farming practices and environmental regulations also restrict the use of chemicals near urban areas and sensitive crops due to the risk of chemical spray drift.

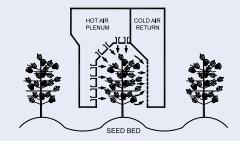
Advances in thermal defoliation with propane are creating a new option for farmers looking to effectively remove leaves for a more timely harvest. This technology quickly terminates the plant for a timely harvest while reducing insect populations and fiber degradation. It is of particular interest to organic and sustainable growers (who strive to reduce or eliminate harvest-aid chemicals) but may also offer benefits to conventional growers.

Propane-fueled cotton defoliation may be a key avenue for increasing the annual volume of off-peak propane sales. If just 2 percent of the 12 million acres of cotton in the U.S. were defoliated by propane-fueled machines, using 25 gallons of propane per acre, late-summer propane consumption would increase by 6 million gallons each year.

#### **Convection Speeds Defoliation**

The greatest challenge in thermally defoliating cotton is working quickly without scorching the crop. A new propane defoliator improves on slow-moving designs that relied on still air for radiant heat transfer.

The new defoliator propels a stream of moving air, heated to 380 degrees fahrenheit (193 degrees celsius), through the cotton canopy. The moving air more efficiently transfers heat to kill the leaves while preserving the cotton. The design includes a return air path that boosts air penetration while reducing fuel consumption.



### **Project Description**

To realize this opportunity, the Propane Education & Research Council (PERC) initiated research to develop and test propane-fueled defoliation machines. After successful field trials with a two-row machine, three additional research efforts were begun: Harvest Preparation Demonstrations and Tests Using Prototype Thermal Defoliator (Docket 11729), Cotton Defoliation (Docket 11416), and Cotton Defoliator Logistical Support 2008-2009 (**Docket 15221**). Together, these projects aimed to do the following:

- Scale up from field-testing a two-row defoliator to a larger, six-row commercial prototype.
- Measure gains in speed, performance, and harvest output achieved with commercial-scale defoliation.
- Modify the design of the commercial defoliator, as needed, to improve its efficiency and agility.





#### **Project Implementation**

To investigate the effectiveness of the defoliation process under varying conditions, the U.S. Department of Agriculture (USDA) oversaw a field test of the six-row commercial defoliator. The unit was tested on nearly 100 acres of organic cotton in California to determine defoliation efficiency and fuel consumption rates.

The unit has multiple fan and burner sections that are two rows wide and arranged on a frame to provide coverage to six rows at once. Propane fan and burner assemblies blow hot air into each row. A 330 horsepower engine supplies power for propulsion, fan motors, and auxiliaries.

#### **Project Completion: Key Conclusions**

The six-row commercial unit defoliated nearly 100 acres of organic cotton during its trial. It recorded a field efficiency of 67 percent and used an average of 25 gallons of propane per acre.

#### **Next Steps**

Various design alterations to the six-row defoliator to improve efficiency and mobility were made during the summer of 2008. Analysis of the economics of the defoliation treatment and the fiber quality and trash content of the resulting cotton will be conducted. Additional testing is expected to continue through 2009 and the results will be shared with the industry to promote the expanded use of thermal cotton defoliation.

#### **Key Benefits**

Propane-fueled thermal defoliation offers major benefits over chemical treatments:

- Speed. Thermally defoliated crops may be harvested 24 hours after treatment.
- Effectiveness. Thermal defoliation works in a single application in all weather conditions and produces greater leaf kill and drier, more crumbly leaves than chemical defoliation.
- Insect control. Thermal defoliation provides immediate and continuous suppression of aphid and silverleaf whitefly populations.
- Environmentally sound. Thermal defoliation has no chemical drift, which contaminates the surrounding environment and waterways, and it is an approved method for organic cotton production.
- Cost. The cost of propane is equivalent to that of defoliation chemicals, with lower environmental risk.
- Flexible harvest timing. Time of harvest does not affect yield. This means farmers can harvest early to avoid damage from lateseason storms.
- · Quality fiber. Thermal defoliation results in no damage to lint value or yarn.

#### **Propane Defoliation Systems**

On each machine, the defoliation apparatus includes:

- Crop dividers.
- · Treatment tunnels.
- · Motor-driven fans.
- · A burner, which heats the air to 380 degrees fahrenheit (193 degrees celsius).
- · Distribution and return air duct work.







Six-row defoliator

December 2008

**Project Partner:** 

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