COTTON IRRIGATION RESEARCH AND EXTENSION PROGRAMS, NEEDS AND PRIORITIES

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Abstract

Cotton is a very drought tolerant crop; however, properly managed irrigation water can often increase yield. Cotton's water requirements vary widely across the US, from a high of 40 inches in the far western U.S. to as little as 18 inches in the southeast. This has led some to question growing cotton in high water demand regions, but while some areas require twice as much water, they also produce twice as much cotton. This also means such irrigated areas are very land use efficient.

There are at least eight factors driving irrigation research needs and priorities for cotton in the U.S. The **first** is related to the needs of producers to sustainably produce cotton and maintain productivity. Previous studies have shown that approximate 40 to 70 pounds of cotton fiber are generated for each acre-inch of water applied. Even in humid areas, a small amount of irrigation increases fiber yield by as much as 200 pounds per acre based on long-term average comparisons between irrigated and non-irrigated fields. This increase in productivity helps offset the rising cost of inputs. **Secondly**, irrigation allows producers to stabilize yields and minimize risk by having more consistent yields from year to year. Irrigation also improves the overall sustainability of a production system by maintaining high land productivity in drought years and making sure the early season investments of seed and fertilizer are not lost due to crop failure.

A **third** factor is water is becoming a more limited resource across the entire United States. Producers need to revisit the number of water storage ponds they have on their farm and consider other innovative on farm water storage options, such as local ground water recharge if the geology in the area is suitable. Variable rate pivots can also help reduce total water use in some situations – for example where fields contain low areas, farm ponds or ditches by turning the pivot segments off over those areas. As water continues to become a scare resource, this results in the potential for the **fourth** issue of increased regulation of water resources. It is hoped that proactive use of the appropriate technologies by producers will remove the need for increased regulation.

Number **five** on the list is increasing energy costs, as under some conditions (for example, pumping deep aquifers), irrigation can require a significant amount of energy. Cotton input costs are already at historically high levels, so any increase in costs is of concern.

The first five factors have resulted in an increase interest by producers for better tools to make irrigation management decisions. One tool that can be useful is a water balance approach to estimating when the next irrigation is needed. The water used is predicted from weather data and crop specific coefficients. When the water used exceeds water received from rainfall and irrigation, it is likely time to apply water again. However, precisely estimating how much water stays on the field after a heavy rainfall can be a challenge as well as confirming the target irrigation amount was applied to the field. Thus issue number **six** is the need for the ability to measure effective rainfall and irrigation. And because farmers often manage multiple fields at one time, the **seventh** issue is related to the need to get data on the water status of the field wirelessly. Luckily, with the popularity of cell phones, there are now many companies that offer different soil moisture monitoring systems that deliver data affordable over cellular networks. There is for need additional research to fully understand how we can minimize the number of sensors to characterize a field.

The **final** issue impacting cotton's water related research needs is related to water metrics used by those outside the agricultural community. There are now many diverse efforts trying to develop metrics to rank the impact of various products on the world's water resources. Some of these metrics only consider the water "consumed" (defined was water evaporating and leaving the watershed it started in) in a process; as opposed to the total water withdrawn in the manufacture of that product. As all plants (cotton, corn, soybeans, trees, grass) transpire, any agriculturally-based product will tend to have higher water consumption values than one utilizing synthetic inputs. However, when accounting for the total water withdrawn in the creation of a product, man-made materials that have high energy requirements will exceed agricultural ones due to the large amount of water diverted for power generation. Water metrics that properly account for both water consumption and total water withdrawn are needed, and the

metrics need to further account for water scarcity in the region of production, as well as the impact of that scarcity on the local population.

Cotton Incorporated will continue to fund research to optimize cotton water use. A recently released publication related to irrigation management that captures much of the success to date is available at: http://www.cottoninc.com/fiber/AgriculturalDisciplines/Engineering/Irrigation-Management/.