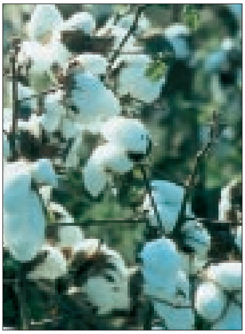
Producing 5-Bale Cotton and More

By A.E. Ludwick



How high is high? In the desert environment of Arizona, yields greater than 4 bales/A (480 lb lint/bale) are not all that uncommon with top management. A commercial yield of 5.41 bales/A was reported in central Arizona in 1982 (Pennington, Dean. 1983. "Aiming for 6-Bales/A Cotton in Arizona", *Better Crops with Plant Food*, Fall, pp. 10-11). Such a yield does not come easily. In this case a major innovation was drip irrigation.

Biotechnology advances such as varieties with the *Bacillus thuringiensis* (Bt) gene and new fertilizer strategies have created opportunities for cotton growers to aim for increasingly higher yields. A yield of 5.41 bales/A was documented in 1982. Yields over 6 bales/A could be a reality.

Water use efficiency receives a lot of attention in Arizona and California where water costs are a significant production component. Drip irrigation is widely used for high value crops such as trees, vines and vegetables. Advantages include substantially greater water use efficiency (more yield with less water), precise and frequent fertigation, and less leaching of nutrients and chemicals below the root zone. During the early 1980s, there was considerable interest among cotton growers to maximize yields. Cotton prices and production costs seemed to favor the high input, high yield approach. Growers in Arizona and California experimented with drip irrigation and production techniques to take full advantage of a long growing season.

Low cotton prices in recent years have discouraged many growers from aiming at achieving actual high yield potentials. Biotechnology, however, is a new and powerful tool that is helping to change attitudes and create new production opportunities. One new tool is Bt cotton.

Arizona growers produce their highest yields by setting two crops — a bottom crop and a top crop. Producing the late season (top) crop has been economically questionable in the past due in large part to the high cost of late-season pest control. In Bt varieties, frequent costly spraying to keep down the pink bollworm population to protect the top crop is no longer necessary. Biotechnology...Bt cotton...has solved (at least minimized) this particular problem.

Mr. Ron Rayner of the A Tumbling T Ranches near Phoenix made a presentation at the 1998 Beltwide Cotton Conference where he discussed the benefits of producing 4.5 to 5 bales of cotton per acre. His comments were summarized in an article appropriately titled, "High Inputs, High Yields", *Cotton Grower*, August 1998, pp. 10-11. He pointed out that producing high yields requires a total management plan including:

- Plant as early as possible using high seeding rates (of Bt cotton) and a fungicide.
- Push plants early with irrigation and fertilizer.
- Use low, multiple applications of Pix.
- Protect against whitefly and lygus by using integrated pest management (IPM) strategies that utilize insect growth regulators and university developed thresholds.
- Irrigate on short intervals, six to eight days during the hot weather, and use

shorter set times if possible. Assure adequate fertility; August nitrogen (N) application may be necessary.

- Keep irrigating to assure adequate moisture for late-season boll fill (on some soils as late as October 1).
- Defoliate with high rates of most materials in mid- to late-October.
- Begin harvest in mid-November.

Mr. Rayner, his brothers, and a nephew produced 2,439 lb lint/A (5.08 bales) in one field in 1997 using the above strategy, netting about $360/A based on 60-cent cotton. Breakeven yield was 1,840 (3.83 bales).

Producing 5-plus bales/A requires cooperative weather. Unusually cool spring conditions can retard the crop's development, making it impractical to manage for a second set. At the other end of the season, cool and wet fall weather can make defoliation difficult. Both situations may require in-season changes in strategy, emphasizing the importance of growers staying on top of their particular production situation.

Fertilizer requirements are necessarily high for 5-bale cotton. Each bale removes about 31 lb N, 12 lb P_2O_5, and 14 lb K_2O from the field. Therefore, 5 bales contain approximately 155 lb N, 60 lb P_2O_5 and 70 lb K_2O. Actual nutrient uptake by the cotton plant is substantially greater, but the vegetative portion recycles nutrients into the soil when it is incorporated. Inadequate fertilization with potassium (K) over several decades of cotton production and its rotational crops has left many California fields depleted, requiring buildup applications to overcome resultant K fixation problems. University recommendations in these cases are for rates up to 400 lb/A of K_2O to correct the problem. Repeated applications may be necessary to return difficult fields to their full yield potential.

Total seasonal requirements of nutrients are only part of the story. Daily demand varies with the plant's stage of growth and must be considered in the in-season management strategy. Recent research in California and other Cotton Belt states, for example, has suggested that in-season foliar applications of K can boost yield potential. This particular practice has been shown to enhance yields in fields with good yield potential even where soil K fertility was considered adequate.

The cotton boll is a strong sink for K. During its formation, most crops take up K at the rate of 1.9 to 3.0 lb/A/day (2.3 to 3.6 lb/A of K_2O). Inadequate absorption of K during this peak demand period, if only for a week or so, could significantly limit yield of potentially 3-bale crops, not to mention 5-bale crops. Where appropriate, the University of California recommends two foliar applications of 10 lb/A K_2O, at 7 and 14 days after first flower. This is simply another management tool at the grower's disposal in planning a high-yield strategy. BC

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conserve soil not only support high-yield management but also minimize the risk of P loss to surface waters. Buffers along waterways also help to ensure clean water. Indexes that integrate source and transport factors can help identify the particular combinations of soil texture, landform, nutrient source, and application methods that allow for use of sufficient inputs for high yield management.

The corn and soybean crops of the future will likely continue to increase in stress tolerance and in efficient use of all plant growth resources. Managing the crop of the future will demand attention to supplying the critical resources to support yields closer to the potential that has been demonstrated in maximum yield research. BC

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