ARIZONA ALFALFA AND GRAIN YIELDS MOVE UPWARD

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Finding the right combination of letters in a cross-word puzzle is difficult. So it is with the production of alfalfa and grain crops. The fund of knowledge and experience developed and available helps, but it takes a master farmer to fill in all the blanks. Arizona has hundreds of master farmers who regularly put together the complex inputs and achieve high crop yields in an effort to optimize returns on their investment.

Average yield records for alfalfa and grain crops in Arizona show clearly the progress made by Arizona farmers, Table 1. During the 30-year period, 1949 to 1978, yields of alfalfa, wheat, sorghum, and corn have more than doubled, and the average yield of barley has increased by more than 50%.

Table 1. Average yields of major forage and grain crops in Arizona, 1949-1978. 1/

	Alfalfa (T/A)	Wheat (lbs/A)	Barley (lbs/A)	Sorghum (lbs/A)	Corn (lbs/A)
1974-1978	6.5	4225	3545	4225	3830 2/
1969-1973	5.9	4010	3525	4155	1680
1964-1968	5.2	2810	3390	4340	1695
1959-1963	4.9	2350	3050	3230	1195
1954-1958	3.5	1840	2660	2000	1445
1949-1953	2.9	1520	2300	1840	675

1/ Source: Arizona Crop and Livestock Reporting Service

2/ Average yield in 1978 was 6440 lb/A.

Record farm yields on individual farms far exceed the state's averages. In each instance, they are more than double average yields attained during 1974 to 1978. It would thus seem that technology for further increases in average yields for Arizona alfalfa and grain crops is already on the drawing board.

Many factors have contributed to Arizona's average per acre yield progress. For alfalfa and grain crops, some cornerstones may be cited. The development of high-yielding, pest-tolerant varieties of alfalfa and information concerning improved cutting and other management practices has helped alfalfa move forward. The introduction and development of high-yielding stiff-strawed "green-revolution" wheats paved the way for dramatic progress with this crop. The introduction of sorghum hybrids accounts largely for the doubling of yield that occurred for this crop.

Highest average yields for sorghum have always been in southeastern Arizona. But corn has now replaced much of the full-season sorghum in this part of the state. The yield potential for shorter-season hybrids used double-crop at the lower elevations after small grain is less. Even so, the state's average yields for sorghum have held up well. Barley is more salt-tolerant than wheat and medium-maturity barleys mature 7 to 10 days earlier than medium-maturity wheats. In some double-cropping situations, the earlier maturity of the barley is an advantage. New varieties of barley recently released are having their impact on the productivity of this crop.

The team that has made Arizona field crop production strong includes Farm Owners, Managers, and Employees, Agri-business, Commodity and other groups, the University of Arizona, the U.S. Department of Agriculture, and others. Agricultural Extension Agents and Specialists of the University of Arizona Cooperative Extension Service, along with their Research counterparts, have been key members of the team. Their goal is to serve the people of Arizona well.

There are some basics to which successful growers give special attention. All select adapted varieties with high yield potentials and use quality seed. They plant paying attention to best dates and populations, while seeking to minimize plant stress caused by inadequate or excessive fertility or water or by weeds, insects, or diseases. They accomplish operations at the correct time, in order for plants to achieve maximum growth and yield.

High yields begin with a soil that has high yield potential. An ideal soil is loamy with a high exchange capacity, has good water holding capacity, and internal drainage. It should be free of toxic materials, pathogens, and weeds. Continuous use of the same crop on the same land year after year requires special care if a good soil is to remain that way. Crop rotation is still a viable building block in a program that seeks to maximize yields and economic returns.

Crop yield is the tangible result of the interaction of genetic potential and environment. Choice of the best planting date is an important building block. It interacts with many things. If it is to achieve its genetic potential, each crop or variety must accumulate a specific number of growing degree days. Also, many crops respond to day-length.

When environmental conditions favoring plant growth are optimized, the major limiting factor to total yield for alfalfa and grain crops appears to be leaf area and the way leaves are displayed by the plant. Most of a plant's dry matter results from photosynthesis. Under ideal conditions, a grower seeks to maximize use of light (energy) by timely planting of an optimum stand. The population goal calls for uniform plants that maximize yield. Generally, for a forage crop stand, it is best to err on the side of too thick rather than too thin. For any crop, yields may be reduced severely when there are areas without plant cover. Thus, stand sets the stage for much that follows after planting.

Top-yield farmers are never satisfied with their current yields and they look everywhere for new ideas. They are almost always humble about their successes. They freely share fine-points concerning their inputs with neighbors and with agricultural scientists. The College of Agriculture often gets excellent ideas for research and extension breakthroughs from these innovative farmers.

The future for productivity of alfalfa and grain crops in Arizona is bright. With continued strong support for Research and Extension, the trend of average yields in Arizona will continue upward and no one can predict the heights that yields will eventually reach.

Cost of Producing Forage and Grain in Arizona

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Alfalfa hay production in Arizona is concentrated in two counties--Maricopa and Yuma--where 77 percent of the crop was produced in 1978 (see Table 1). In 1978 Arizona produced 1.298 million tons of alfalfa hay on 206,000 acres for an average yield of 6.3 tons per acre. Comparing 1978 data with that for the 1972-76 period average, acreage decreased about 2.6% and the yield per acre decreased slightly from 6.4 tons to 6.3 tons.

Wheat production is concentrated in Maricopa, Pinal, and Yuma Counties where 92 percent of the 1978 crop was produced. Arizona produced 289,800 tons of wheat in 1978 on 138,000 acres with an average yield of 2.10 tons per acre. Compared with 1972-76 five year average, 1978 Arizona wheat acreage declined 45 percent.

Maricopa and Pinal Counties are the principal producers of barley, producing 74 percent of the total crop in 1978. Total production in 1978 was 59,640 tons on 35,000 acres with an average yield of 1.70 tons per acre. Barley acreage in 1978 was down 55 percent from the 1972-76 average.

Sorghum grain is produced primarily in Cochise, Graham, Maricopa and Yuma Counties where 81 percent of the 1978 crop was produced. Arizona produced 159,430 tons of grain sorghum in 1978 on 73,000 acres with an average yield of 2.18 tons per acre. Compared to the 1972-76 average, the acreage devoted to grain sorghum declined 32 percent in 1978.

Although corn is produced in several counties with Cochise County as the principal producer, it ranks second in order of production below wheat.

The profit contribution margin (sales less the variable expenses of production) was sufficient to cover all overhead expenses of 1979 alfalfa hay production and to return a profit of $11.23, 15.08, 12.22, 20.50 and 12.86 per ton in Cochise, Graham, Maricopa, Pima and Yuma Counties, respectively (see Table 2). Although the profit contribution margin in Pinal County was positive, (greater than zero) it fell short of covering all overhead expenses of production.

Yuma County was the only county where 1979 wheat produced a profit (see Table 3). In all other counties considered, the profit contribution margin was greater than zero but not sufficiently large to cover all overhead expenses of production.