

KEY FACTORS FOR HIGH ALFALFA YIELDS IN ARIZONA

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Alfalfa production practices in Arizona's lower desert valleys and in southern California are similar. Most other parts of California have counterpart climatic areas in Arizona. For both states temperature, more than any other factor, dictates crop adaptation when one assumes that adequate water of reasonable quality will be available for irrigation.

With a base of 50F, growing degree days in Arizona range from about 8500 at Yuma to 2400 or less in some of the higher, irrigated valleys. In Arizona about one month of growing season is lost for each 1000 feet increase in elevation, and precipitation increases as elevation increases. For Yuma County, where elevation is near sea level, there are about 4 inches of rainfall each year. Southwestern Arizona receives about 16 inches and larger amounts of precipitation occur in the north. Thus, in Arizona most crops grown elsewhere in the country find a home in one or more of the counties. Nearly all of Arizona's crop production is based on irrigation, Fig. 1. About 80% of the acreage of alfalfa is located in the three southwestern counties: Maricopa, Pinal, and Yuma.

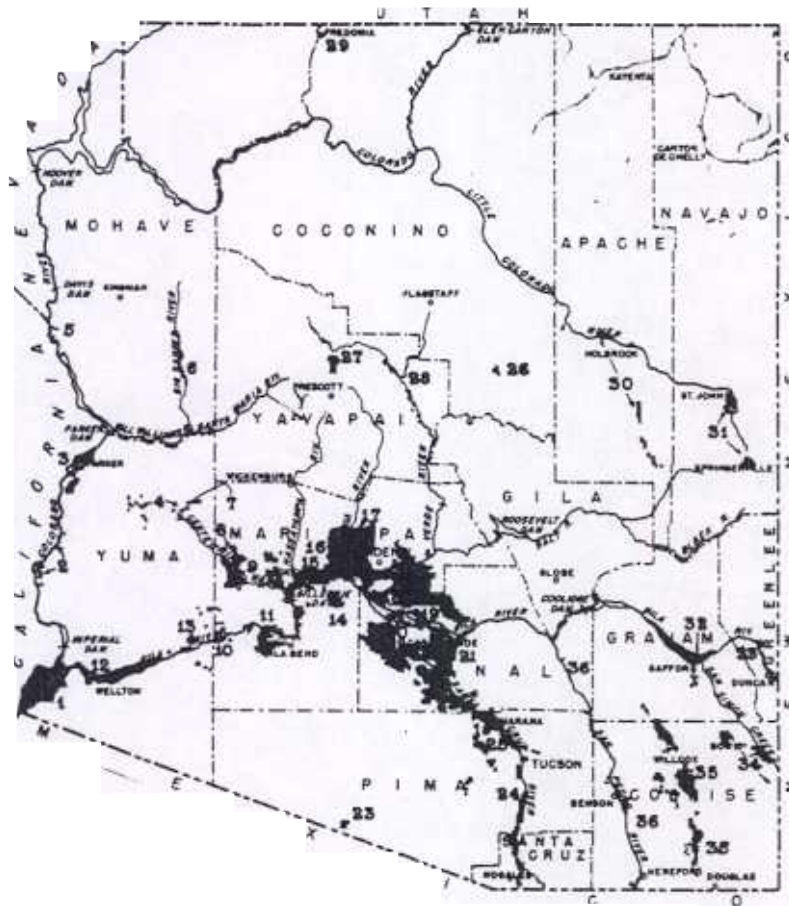


Fig. 1. Location of irrigated land in Arizona. From University of Arizona Folder 101, "Irrigated Areas in Arizona".

There are several irrigation projects based on reservoir supplies in Arizona. However, nearly two-thirds of all irrigation water is obtained from wells, and about 80% of all irrigated land in Arizona receives some water from wells. The Central Arizona Project will add to Arizona's water resources. In the short-run, much of this water will be used for agriculture. Later, central Arizona allocation will shift, with most being assigned to homes and industries other than agriculture. Abundance of sunlight is an important factor

favoring plant growth in the southwest. Cultivars are being developed to more fully use this resource.

Although climate is the primary consideration for crop adaptation, attention should also be given to soil type, salt levels and water availability. For the most part, crops and crop cultivars are recommended primarily on the basis of elevation. Currently, five crop adaptation areas are employed in Arizona, Fig. 2.

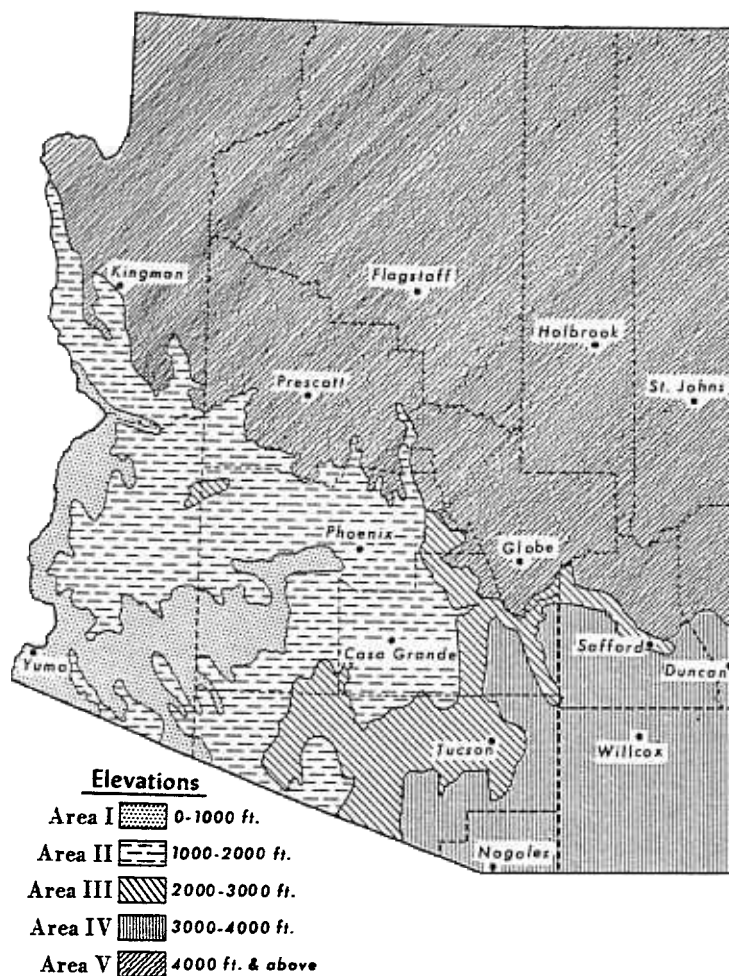


Fig. 2. Major crop adaptation areas in Arizona.

Alfalfa has been very stable in the Arizona crop mix. Acreage has held at about 200,000 each year during the last 20 years. In addition to alfalfa, Arizona produces many other crops such as cotton, sorghum, small grains, sugarbeets, safflower, vegetables, and citrus.

Alfalfa yield increases in Arizona have been dramatic during the past 20 years, Fig. 3. During this period, yield per acre has doubled despite decreases in the amount of applied water and increases in the intensity of many pest problems. In 1978, alfalfa yields are expected to average 6.5 T/A. An additional 1T/A yield is harvested by sheep during the winter as pasture. Many Arizona farmers have average alfalfa yields of more than 10 T/A. Test plots routinely yield 12 to 14 T/A. Thus, technology for another doubling of alfalfa yields is at hand.

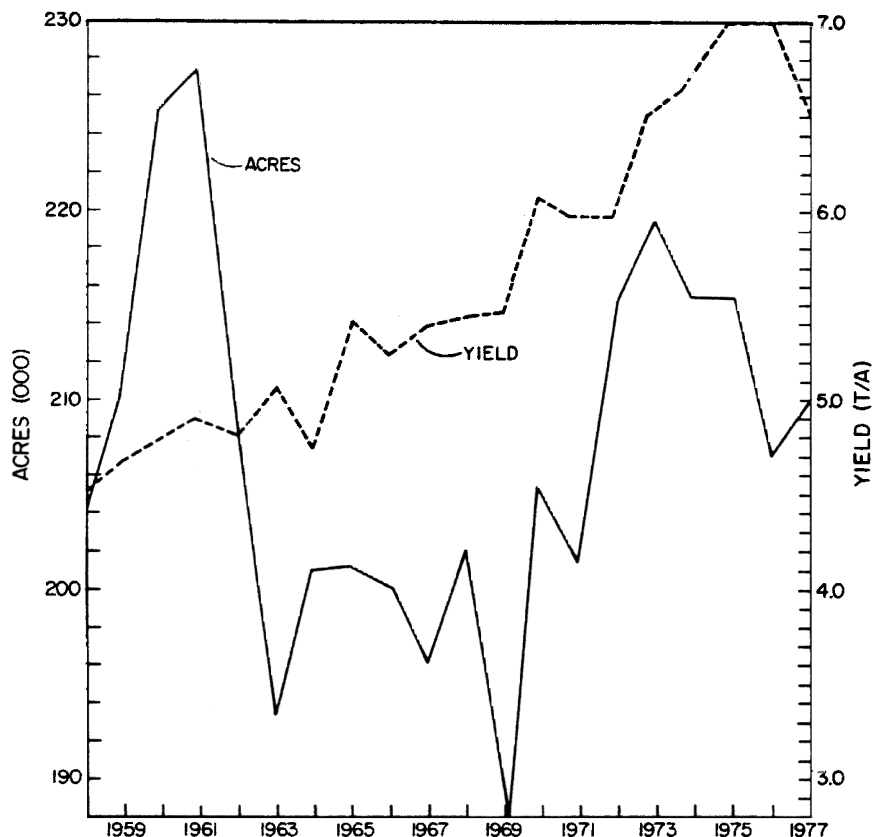


Fig. 3. Acreage and yield of alfalfa hay in Arizona 1958-1977

Many factors account for the alfalfa yield increases achieved during the past 20 years. Increases have primarily resulted from a team effort of Farmers, Agri-Business, University, and U.S. Department of Agriculture personnel.

The non-dormant cultivars of alfalfa are used for most of Arizona's acreage; however, intermediate-dormant and winter-dormant cultivars persist well and are better suited to the higher elevations. In the development of new cultivars, major attention is concentrated on the achievement of greater insect tolerance, particularly tolerance to the Spotted and Blue alfalfa aphids. Melvin Schonhorst, University of Arizona Alfalfa Breeder, Mervin Nielson, Entomologist, U.S. Department of Agriculture, and Rex Thompson, Agronomist at Mesa have lead the effort resulting in improved Arizona cultivars. Dick Hine and Fred Gray, University of Arizona pathologists, working closely with other members of the team have developed the stem-nematode-resistant cultivar Lew. Tolerance to Phytophthora root rot has also received attention and tolerant lines are available. Each advance in the development of improved cultivars has been in close cooperation with California and Nevada alfalfa research workers.

Evaluation of alfalfa cultivars in Arizona occurs mostly on University of Arizona Branch Experimental Farms. Tests performed on farms supplement those by experiment station personnel. Currently, the Arizona Extension Service conducts on farm alfalfa tests primarily to observe and evaluate tolerance to pests and stand persistence for the purpose of increasing yields.

At the lower elevations, alfalfa can be planted throughout the year, but best results are obtained with early fall seedings after temperatures have moderated. Care must be taken to prepare a seedbed that is firm and fine but not over-worked. Some growers in central Arizona prepare the seedbed in late August or early September and plant in dry soil. When the rains occur in September, they irrigate. Rainfall dilutes salt, and is usually associated with lower night temperatures. These factors improve seedling emergence

For Arizona, as other places in the southwest, a good seedling stand averages about 35 plants per square foot.

Alfalfa plants can persist for years with good treatment. The cutting interval is especially important. Most alfalfa plants have a tap root and nearly all re-growth is from crown buds. "In a four-year study at the University of Arizona Mesa Experimental Farm, with Moapa alfalfa, essentially maximum yield and stand survival were maintained by harvesting through the season at 50% bloom or by cutting at 10% bloom and delaying two harvests in May, June and July until 95% bloom." Cutting at 1/4 to 1/3 bloom through July with two 5-inch irrigations between cuttings has been very effective in maintaining stands in central Arizona.

Irrigation management is receiving considerable attention in Arizona. Most irrigation is by flooding. Care must be taken to avoid having water stand on the soil surface for more than eight hours. Consumptive use of water by alfalfa exceeds 0.3 in/day during the warmer months. The new emphasis on laser and other leveling of soil is helping to prevent ponding of water and subsequent death of plants. Albert Dobrenz, University of Arizona Alfalfa Physiologist, and Melvin Schonhorst are cooperating in the development of heat and salt tolerant lines and cultivars.

Phosphorous is usually the only fertilizer needed by alfalfa in Arizona. However, significant amounts of nitrogen are applied by growers even though University tests show no benefits from this application. Occasional dramatic responses from foliar application of iron sulfate are obtained. Victoria Marcarian, University of Arizona Research Agronomist, is currently conducting nitrogen fixation and related studies.

About 2/3 of Arizona's alfalfa crop is harvested by baling, and most of the remaining 1/3 by cubing. Soil compaction and loss of stands resulting from harvest operations are continuing problems. Growers have found that maintenance of a strong stand is the best method of weed control. However, herbicides for control of grass are frequently used. At the intermediate and higher elevations, very effective ways of removing tansy mustard with a single winter herbicide application have been developed. Occasionally, weevil or other insect control is required. Texas root rot also continues to be a disease problem.

The team effort within Arizona and between Arizona, California, and Nevada has lifted the profitability of alfalfa in the southwest. For Arizona, alfalfa is a very important part of the crop rotation. The foundation for future improved productivity and profitability of alfalfa in Arizona will be based on good stands established with superior cultivars and on optimum cutting, irrigation, fertilizer and other management practices.