

Alfalfa Production in the Imperial and Palo Verde Valleys

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Abstract: Alfalfa is planted on more acreage than any other crop in the Imperial and Palo Verde valleys of California. Gross returns outrank those from all other crop commodities. Unique climate, soils, and water quality account for the use of management schemes different from those practiced elsewhere in the state. Alfalfa is generally grown for 3 to 5 years as a rotation crop with other field and vegetable crops. Agronomic practices of the low desert valleys are outlined and discussed.

Keywords: alfalfa, open drains, sweetpotato whitefly, CUF101, dry down, salinity, Colorado River water, soils, agronomic practices

Introduction. Alfalfa is, and has been, an integral part of agriculture in the Imperial and Palo Verde valleys of California. For 9 of the last 10 years alfalfa has occupied more acreage than any other crop grown in these low desert valleys. (In 1988 instead of alfalfa, cotton and lettuce ranked first in the Palo Verde and Imperial valleys, respectively.) In 1991, alfalfa accounted for 207,031 acres in Imperial and 44,202 acres in Palo Verde. Gross returns in 1991 from alfalfa outranked all other commodities in the Palo Verde Valley (\$22.3 million), and ranked second only to cattle in the Imperial Valley (\$129 million). Alfalfa retains a prominent role in agriculture in the low desert valleys.

Several unique properties set alfalfa production in these low desert valleys apart from its production in other parts of the state. Environmental factors such as climate, soils, and water are different than in other areas of the state. Agronomic practices have evolved accordingly to address environmental constraints on desert alfalfa production.

Climate. Part of the Sonoran Desert, the low desert is just that - low and dry. Elevations begin below sea level in the Imperial Valley and climb to 300 feet around Blythe in the Palo Verde Valley. Low-intensity winter rains arise from storm systems moving eastward from the Pacific Ocean. Summer thunderstorms originate from storm fronts

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moving northwestward from the Gulf of Mexico. In spite of these storms, total precipitation averages less than 3 inches of rain per year, not enough to support agriculture.

Classified as subtropical desert, the region is hot in the summer. Mean daily maximum temperatures in the hottest month, July, range from 106 to 108 degrees F. Winter is short and mild with frosts possible from December through mid February. The average minimum temperature in the winter months is 37 degrees F. Wide temperature swings are common not just from summer to winter, but also from day to night. Diurnal temperature fluctuations of 30 to 50 degrees F are common.

Photosynthetically active radiation is plentiful in the Imperial and Palo Verde valleys. Even in winter, sunshine exceeds more than 8 hours a day. An average of 4,000 hours of sunlight occurs each year - more than 90% of the possible hours for one year.

As a result of its mild winter climate and plentiful sunshine, this region can produce alfalfa on a year-round basis, although summer yields are not as great as those obtained in spring and fall. Not surprisingly, because of high summer temperatures, evapotranspiration can exceed 6 feet of water per year.

Soils. A variety of soil textures are represented, including silty clays, silty clay loams, clay loams, fine sands, fine sandy loams, and sand. Soils include calcareous alluvial fan and flood plain soils, wind-modified soils, saline and alkali soils, and residual soils of very shallow depth to bedrock. pH's typically run over 7.0. Drainage can be a problem in irrigated areas. Soils are low in organic matter. (The very hot summer temperatures oxidize and destroy organic matter.)

Fine- and moderately fine-textured lakebed sediments from prehistoric Lake Cahuilla (current location of part of the Imperial Valley) are the parent materials of the Glenbar, Holtville, and Imperial soils. These sediments also form the underlying layers of the Meloland and Niland soils. Windblown and river channel silts are the sources of the Indio, Vint and Rositas soils and the surface layer of the Meloland soils.

The desert plain to the east of the old lake basin is a terrace of the Colorado River delta. Terrace sands are the parent materials of the Rositas and Superstition soils. Loamy terrace deposits are the parent

materials of the Antho soils. Clayey materials deposited in the ponded areas during formation of the delta terrace are the sources of the Holtville and Imperial soils. The soil series in the Imperial Valley are representative of those in the Palo Verde Valley.

Water. Irrigation water is supplied primarily from the Colorado River by a network of gravity-fed canals. At the point its waters are diverted to the Imperial Valley, the Colorado River contains about 1.2 tons of salt per acre foot of water (about 1/10 ounce per gallon).

A perched water table exists in the lakebed basin of the Imperial Valley as a result of seepage of water from irrigation canals and excessive irrigation. Consequently, tile drains are a necessity to carry unused water and salts away from irrigated fields. The New and Alamo rivers flow north through the Imperial Valley and serve as conduits connecting a man-made network of agricultural drains to the Salton Sea. Those drains receive runoff from the tile drains installed beneath fields. Ultimately, via this network, drainage water carries excess salts away from irrigated fields and dumps them into the Salton Sea.

In the Palo Verde Valley there is very little runoff. Most of the irrigation water applied goes through the field. A grid of drainage ditches is cut at about 1 mile intervals across the valley. Lateral movement of irrigation water in the subsoil results in any excess water draining out into these ditches which empty directly back into the Colorado River. This system is referred to as "open drains."

Agronomic Practices. Alfalfa is generally grown for 3 to 5 years as a rotation with vegetable and field crops. Late September through early November is the optimum time for planting alfalfa in the low desert valleys. Cultivars with resistance to the spotted and blue alfalfa aphids are grown. CUF101 is the most popular variety.

Soils of the low desert valleys tend to be well supplied with potassium. Phosphorus, however, is likely to be deficient. An application of at least 100 to 150 pounds of phosphate per acre prior to planting is recommended. Additional annual applications of 100 pounds of phosphate, applied as phosphoric acid in the irrigation water, are advised.

On valley soils low in nitrogen, an application of 20 to 30 pounds of nitrogen will stimulate initial seedling growth. Once established, the plants rely on symbiotic bacteria (*Rhizobium* spp.) to fix nitrogen from

the air. Excess nitrogen can suppress development of root nodules and the nitrogen-fixing abilities of their symbiotic bacteria.

Laser leveling is used to ensure even irrigation and lessen the likelihood of salinity, scald and root rot problems. About 7 to 8 acre feet of water are used on an alfalfa crop in one year. Most growers plant alfalfa on the flat with 120 foot borders and 1/4 mile runs in the Palo Verde valley. In the Imperial Valley, 60 foot borders are more common. Flood irrigation is used at both locations.

Some growers corrugate their fields at planting as a means of controlling salinity and root rot. Ideally, salt moves to the peaks of the corrugations and the water is directed more uniformly across the field in the troughs. Without having to modify one's harvesting equipment, this variation gives some of the advantages of planting on beds.

A third planting method is on beds, utilizing furrow irrigation. Advantages include better salinity and moisture control, and the fact that equipment runs in the troughs and not over the crowns of the plants. A disadvantage is that most equipment needs to be modified to deal with alfalfa on beds.

This year many growers reinstated a practice common in the Imperial Valley in the 1950's - namely, drying down their fields over the summer. The rationale behind this action was twofold. First, by cutting alfalfa in July and withholding water until October, the growers were removing the alfalfa canopy which served as a feeding and breeding ground for the sweetpotato whitefly. Second, alfalfa produced in the summer months brings a poor price, a reflection of its low quality compared to spring or fall hay, and a value not giving the grower any income. Unfortunately, whereas alfalfa stands of the 1950's showed little loss, many growers' stands were devastated by this practice this year. Possible explanations may include the fact that different cultivars of alfalfa were grown, and that the alfalfa stand was already weakened by whitefly feeding.

Insect, Pathogen, and Weed Pests. The spotted and blue alfalfa aphids can cause damage on nonresistant alfalfa. The Egyptian alfalfa weevil and the pea aphid sometimes require control measures in February and March. Alfalfa caterpillar and beet armyworm usually require control in mid to late summer. Occasionally outbreaks of cutworm occur in fall and spring months. Alfalfa planted on beds is more susceptible to cutworm damage than flat planted alfalfa.

Root rots caused by *Rhizoctonia* and *Phytophthora* can cause severe problems. *Rhizoctonia* root canker often infects where fields are uneven and drainage is poor. It can develop in fields suffering scald damage. Some *Phymatotrichum omnivorum*, Texas root rot, has appeared in the region. All of these fungal pathogens are best controlled by good irrigation management.

Sooty molds covering the leaf surfaces of the alfalfa plants are an increasingly severe problem in alfalfa fields this year. The sooty molds grow on the honeydew exuded onto alfalfa leaves by feeding sweetpotato whitefly nymphs. The honeydew, excrement from feeding nymphs, is rich in carbohydrates and provides a good substrate for fungal growth. Loss to the grower is significant. The honeydew gums up harvesting equipment, and no one wants to buy black, moldy hay.

Winter broadleaf weeds can be a problem in new stands of alfalfa. Annual summer grasses can be troublesome in established stands. Purple nutsedge can occur in both new and old stands. The best weed control in alfalfa is to get a good stand established and to keep it healthy.

Harvesting. Alfalfa is normally cut and baled 9 to 10 times a year from February until November. The yields per acre and the cutting cycles used vary throughout the year. Spring cuttings may yield more than 2 tons on a 35 to 42 day cutting cycle. Summer yields may drop to 1/2 to 3/4 ton per cutting on a 24 to 28 day cycle. During the hottest part of the year, in order to avoid losing leaves from overly-dry cut alfalfa, growers will bale at night to increase the moisture content and concomitant leaf retention of the hay. In 1991 average yields per acre were 9 tons.

Most bales weigh around 120 pounds. Those bound for the horse market are generally 80 to 90 pounds. Some growers are putting up 1 ton bales.

Marketing. A grower's total costs per acre of alfalfa are estimated at \$789.28 for the 1991-1992 season.² A grower can break even by getting \$80 for yields of 11 tons/ acre, \$90 for 9 and 10 tons/

² Guidelines to costs and practices, 1991-1992. Imperial County Field Crops Circular 104-F. UC Cooperative Extension, Holtville, CA 92250.

acre, and \$100 for 8 tons/ acre.³ This summer, alfalfa was bringing between \$40 and \$45 per ton.

Some growers graze feeder lambs on established fields between September and March. In this way the grower has a steady net income. The lamb grazier pays him a grazing fee.

Dairies around Chino buy most of the quality alfalfa hay produced. About half of the hay from the Palo Verde Valley goes to dairies around Phoenix. Some alfalfa is bought by the Imperial Valley feed lot owners for their cattle, some goes to horse owners, and some goes to processors for making cubes, pellets, and compressed bales for domestic and export markets.

³ Ibid.