DROUGHT MANAGEMENT IN SMALL GRAIN PRODUCTION

Wheat, oats and other small grains originated in the dry regions of the world, and have multiple mechanisms to survive or avoid drought. There are, however many management decisions that farmers and ranchers can make that affect water use efficiency and reduce risk of production in water deficit conditions. How effective these techniques are depends not only upon the amount, but the timing of precipitation and/or irrigation.

The following are a series of techniques to conserve moisture or improve water use efficiency in small grain production:

***Fallowing** or planting crops in alternate years allows for the accumulation of precipitation during the 15- to 18- month period between crops. This technique is practiced in the driest production regions in the world and is moderately effective. However, in most of Texas this is not an efficient technique, because significantly more wheat can be produced on an annual basis than can be produced in a wheat-fallow-wheat system.

***Planting date** has a great effect on water usage. To maximize water use efficiency, plant as late as is feasible. Early planting increases the fall and winter grazing potential, but greatly reduces grain yield potential. In studies in the Texas High Plains, it has been shown that wheat planted in late August uses as much as 5 inches more water in the fall than does wheat planted in early November. On the other hand, planting too late reduces rooting depth, and can result in less extraction of stored water from deep in the soil. Winter planted wheat tends to have a much deeper root system than does spring planted wheat, and as a consequence, may recover more stored soil moisture. In dry years, plant wheat slightly later than is normally considered optimum for grain production but not so late that the crop cannot develop a deep root system before dormancy. One down side aspect of delayed planting is that rainfall probabilities are greatest in the Concho Valley, Rolling Plains, and High Plains in late August through September, and decrease greatly into October and November.

***Early maturing varieties** avoid late season drought and high water demand associated with warm temperatures and high evaporative demand in the mid- to late- grain fill period. Adapted early maturity varieties therefore have greater water use efficiency than do later maturing varieties. Wheat during grain fill typically uses 0.33 inches of water per day. Using this figure, we can extrapolate a demand of 3.3 inches more water for a 10 day delay in wheat maturity.

***Tillage practices** to enhance water storage can be very profitable in dry conditions. No-till systems which leave large amounts of residue on the surface reduce evaporative losses. Deep tillage causes rapid losses of stored soil moisture. Chemical fallow or shallow sweep tillage which leaves a dust mulch and large amounts of crop residue on the surface should be considered in dry years. One inch of stored water will typically result in 2.5 to 3.0 bu/ac wheat yield increase. Use chisel plows only in fields that have a tillage pan. Examine the soil and plant root systems closely before primary tillage. If significant root limiting hard pans are not present, skip deep tillage.

* **Adequate fertility** can greatly improve water use efficiency. In recent TAMU trials, deep, banded P fertilizer increased forage yields an average of 57% in dry fall conditions and increased grain yields about 40% where conditions remained dry through the spring. Nutrient starved wheat is not efficient with respect to water use efficiency. Placing P fertilizer at the 6- to 8- inch depth greatly improved yield, whereas shallow P application did not improve water use efficiency in dry conditions. Be careful with N rates. Excessive N is not helpful in drought conditions. Consider using a low rate of fall applied N, followed by a topdress application if conditions warrant in the spring.

*__Insect and mite control__ are important under dry production conditions. Greenbug, Russian wheat aphid and winter grain mites do more damage under drought conditions than in conditions where wheat is growing rapidly. Consider using systemic seed treatment insecticides at low rates and scout carefully for damaging populations of pests. Insect management decisions should be based upon projected yield at the time of infestation.

*__Weed control__ of summer and winter weeds is very important under drought conditions. Weeds are very effective competitors for moisture. Effective pre-emergence herbicides should be considered if weed populations are expected to be high. Weed control decisions should be made early to minimize water extraction by the weeds and when herbicides are most effective.

*__Irrigation management__ is particularly important in years with little rainfall. Irrigation applications should be based on PET (Potential Evapotranspiration) models or in field moisture meters. The preplant and pre-bloom irrigations are the most critical and should not be missed if at all possible. Use all or a combination of the other practices listed above to reduce water use and increase efficiency.