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G84-686 Irrigating Dry Beans (Revised September 1984)

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Irrigating Dry Beans

This NebGuide describes furrow and center pivot irrigation techniques and practices that will be helpful to both new and experienced dry bean growers.

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Traditionally, dry bean production in Nebraska has been on irrigated lands in the North Platte River Valley of the Panhandle. However, production acreage is expanding into new areas, north, south, and east from the North Platte Valley.

Annual yields for dryland beans in a 3-year continuous cropping rotation of barley, beans, and potatoes averaged 384 pounds over a 12-year period at Alliance. This can be increased when beans follow fallow or when there is a full soil moisture profile at planting. An obtainable yield for irrigated dry beans in Western Nebraska is 2,400 pounds per acre.

It is advantageous in dry bean production to have the soil moisture profile full at planting. *Figure 1* shows the soil moisture extraction pattern of dry beans. Eighty-five percent of the moisture used by the crop is taken from the top 18 inches of soil. The remainder is extracted below this depth later in the season as the plant reaches its maximum growth stage. The lack of a full soil moisture profile to a depth of 4 feet at planting time will hinder root development to that depth later in the season.

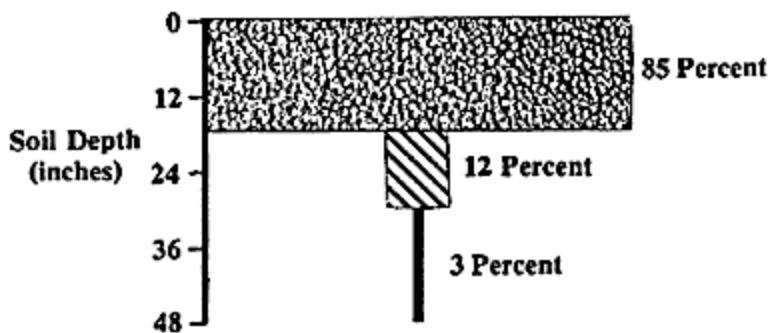


Figure 1. Percent moisture use for dry beans from soil depths of 0-48 inches.

A full profile below 18 inches at planting time on a medium textured soil should meet the full seasonal

moisture needs of the bean plant with less than one inch of additional moisture below that depth during pod fill. The moisture stored in the soil profile serves as a supplement during high water use periods. Based on a full soil moisture profile at planting, the top 18 inches becomes the primary concern of the irrigator.

Seasonal water use of dry beans on a weekly basis is shown in *Figure 2*. Total water use of about 15 inches is normal for dry bean production. Maximum daily water use occurs during a 3-week period beginning with flowering and ending with initial pod fill. Daily water use during this period is about 0.25 to 0.30 inches/day.

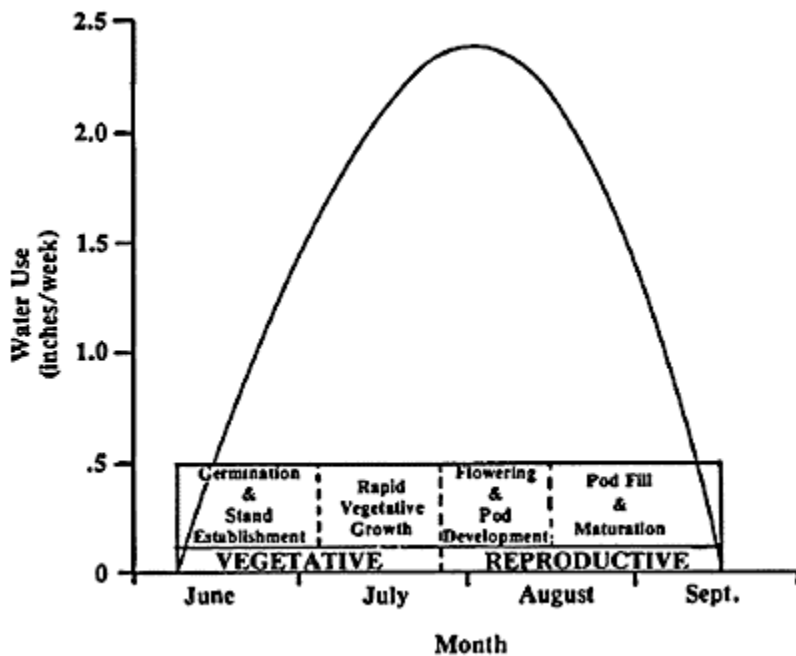


Figure 2. Seasonal water use for dry beans (inches/week).

The first irrigation after planting should be applied when the soil moisture in the root zone reaches 50 percent of the available water capacity of the soil. This irrigation should be within 3 to 4 weeks after planting if spring moisture was not adequate. The root development of the beans at this time is about 12 inches, and a light irrigation is adequate if ample moisture is available below this depth. Delaying irrigation at this time delays maturity and increases the potential for root diseases, but does not necessarily decrease yield in the absence of disease.

The second irrigation is generally applied during initial flowering and pod development. The peak moisture use period follows during the warm dry periods of July and August. The next irrigation may be required within 7 to 10 days if the weather is warm and dry. If, however, cool moist weather is experienced, this irrigation should be delayed.

Postpone any further irrigation until soil moisture levels are depleted to 50 percent of the available water capacity. Proper timing and amount of irrigation to avoid overwatering is important for developing and maintaining a strong, healthy root system. Dry beans respond best in soils with adequate oxygen content; heavy, frequent irrigations reduce soil oxygen. An increased number of irrigations does not insure higher yields as shown in *Figure 3*.

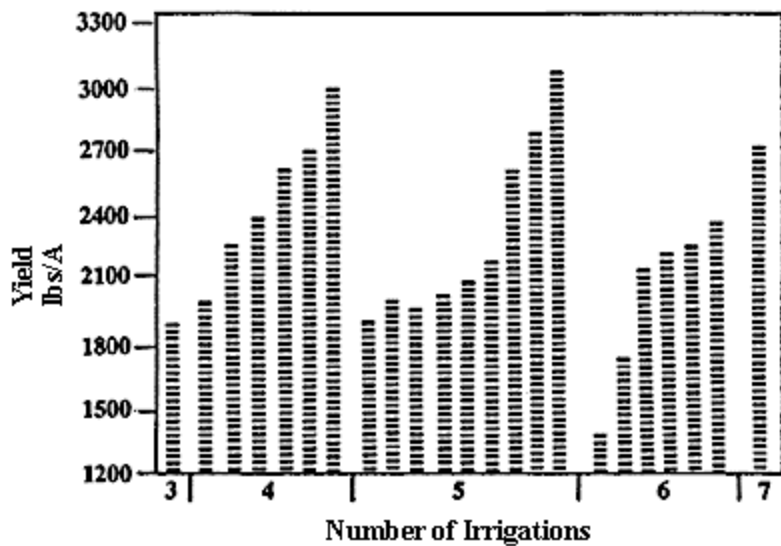


Figure 3. Dry bean yield associated with the number of irrigations for 23 fields in Scotts Bluff County.

Dry edible beans are normally grown using 22- and 30-inch row spacings. For furrow irrigation, every other row irrigation is adequate for 22-inch spacing on medium and heavy textured soils. Coarse textured soils may require every row irrigation for 22- and 30-inch rows.

Beans will mature early if ample moisture is available during vegetative growth and if the last irrigation occurs when the first pods are filling. Late season irrigation tends to delay the final maturity date. Once beans have begun to dry, water is no longer taken up by the plant. The relationship of irrigation to plant maturity is of particular concern with late planted fields and/or long season varieties that could be damaged by an early frost.

Late season irrigation during late pod fill and maturation is often questionable and difficult for furrow irrigators because of plant material blocking water flow in the furrows. If irrigation is needed, make a normal set change regardless of whether the water has reached the end of the field. Keeping the ground saturated for extended periods during late season can cause sudden plant maturity as well as increasing white mold disease.

Irrigating late in the season is not a problem for the center pivot operator. A light application would seem logical to avoid problems with white mold. However, the soil surface and plant canopy will become just as wet with a light application as with a heavy one. Therefore, if irrigation is required, apply a normal application to avoid frequent wetting of the plant canopy.

Four furrow irrigations are needed to obtain maximum yields in most years. The first irrigation is light and is applied during the vegetative period. A second irrigation is applied approximately 2 to 3 weeks later at flowering, and the third 7 to 10 days later during the peak water use period. A fourth irrigation may be required if warm dry weather persists during pod fill and if the first three irrigations were not delayed. Omit this last irrigation if cool, moist conditions prevail.

Although much of the information presented herein was determined for furrow irrigation, the concepts and irrigation timings are also valid for center pivot sprinkler. Total water use by the plant is nearly the same regardless of the irrigation method.

To have meaning for center pivot operators, consider that each furrow irrigation can be assumed to fill the soil profile. Center pivots should apply approximately one inch of water for each rotation. Research has shown that yields can be increased with light, more frequent irrigations. Remember, starting with a full profile is critical; otherwise, the center pivot system may not be able to keep up with the crop demand later in the season. Schedule the irrigation based on that portion of the field that will be irrigated last. Then let the soil profile act as a supplemental source of water for use at a later time.

If the system is on a load management program, it is extremely important to fill the soil moisture profile early. The center pivot operator may have trouble filling the soil profile when the crop is at maximum water use. Because center pivot fields are often large, there can be tremendous difference in soil type within the same field. Monitoring the entire field under a center pivot is important for optimum water use and maximum yields.

File G686 under: FIELD CROPS

F-7, Miscellaneous Crops

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