SECTION 683.1 ANNUAL WATER REQUIREMENTS

The following maps show the amount of additional net irrigation water that is needed to raise a maximum crop.

The map, which is labeled 10 out of 20 years, is an indication of the average amount of irrigation needed and should be used as an average year.

The map, which is labeled 15 out of 20 years, is an indication of drier years and should be used as an indication of the peak annual demand.

Note that the figures shown are the net irrigation water needed which would indicate a 100% efficiency.

In order to obtain the gross application needed, the net application should be divided by an assumed efficiency.

The maps were derived in the following way.

1. Rainfall data was obtained from weather stations at Scottsbluff, Rushville, McCook, North Platte, Ainsworth, Kearney, York, Wayne, Lincoln, and Falls City.
2. The years of growing season rainfall from April to October were ranked.
3. Penmans formula was used to figure the moisture needed for each month during the growing season and also what the annual needs were at each station.
4. The amount of water that needs to be added was figured for each month for each station for the maximum upper 1/4, median, lower 1/4, and minimum growing seasons. This was done by using Figure 3 in Technical Release 21.
5. An estimate was made of the difference in available moisture between fall and spring (the moisture gain) at each station for average years and a dry year.

This data was then used to determine what the maximum needs would be in 10 out of 20 years and 15 out of 20 years.

An example problem is: What is the average amount of water that a land user would need to raise sorghum in southeast Custer County on 100 acres. If the source of water is a surface supply, what would be the maximum amount of water that will be pumped? Assume that the irrigation will be 65% efficient.

Average amount (10 out of 20 years) = 12 in.

$$\frac{12\ in\ x\ 100\ Ac}{.65\ x\ 12\ in/\ ft} = 153\ Ac\ Ft$$

Maximum amount of water (15 out of 20 years) = 14.5"

$$\frac{14.5"\ x\ 100\ Ac}{.65\ x\ 12\ in/\ ft} = 185\ Ac\ Ft$$

Based on these figures, the landuser should have a supply of water that will furnish at least 185 Ac Ft of water on an annual basis to raise a maximum sorghum crop. Average annual energy costs should be based on the assumption that 153 Ac Ft of irrigation water will be used. Three things should be emphasized when an analysis has been made:

1. The maximum yield may not be the optimum yield when all the economics are considered. It may be possible for a land user to reduce these maximum amounts of water and realize more profit.
2. Irrigation needed for 15 out of 20 years obviously won't satisfy the needs in the driest year. The maximum amount of water required would be when there is no rainfall or stored moisture in the soil profile for the entire growing season. It is possible that this situation could occur, but it wouldn't be good economics to base a design on this assumption.
3. Crops differ in their ability to get by with reduced amount of water. Table 682-3 pinpoints the periods of critical water needs for different crops.