MANY FACTORS TO CONSIDER FOR EFFICIENT WATER USE

by

D.F. Peterson, Jr.

1955

On any farm the factors which enter into the determination of irrigation efficiency include:

1. Water-holding capacity of the soils.
2. Slope of the field.
3. Depth of the soil.
4. Soil erodibility.
5. Rate of water infiltration into the soil.
6. Crop grown.
7. Preparation of the land.
8. The method used for applying the water, such as corrugation, borders or wild flooding.
9. Length of the irrigation run.
10. Size of the stream used for irrigating.
11. Farm irrigation structures.

Only the first five factors appear to be relatively beyond the farmer's control; however, he can alter even these to some degree. Water-holding capacity of the topsoil can be changed by addition of or loss of organic matter. Some minor adjustments in slope can be made by a land levelling program. Soil erodibility is also very much related to organic matter content and the structural condition of the soil, both of which can be greatly influenced by cropping and tillage practices. The rate of water infiltration canalso be greatly affected by organic matter content and tillage practices as well as by drainage. Increased organic matter increases the infiltration rate.

By good cropping and tillage practices and by good drainage the soil can be placed in a condition which will make good water conservation practices possible.

With regard to the other six factors (6 to 11), proper adjustment of these factors is entirely within the farmer's control.

The elaborateness with which a farmer is able to prepare his land for irrigation depends on a number of factors. Deep soils can be levelled to a highly desirabel condition, whereas shallow soils cannot. Thin topsoil underlain by cobbles or gravels like many of our Colorado mountain meadows cannot stand extensive preparation. The farmer's long-range plan should be to achieve the best land preparation consistent with the soil conditions on his farm. Closely related to land preparation is the selection of an irrigation method.

The writer chooses to classify surface irrigation methods as follows:

1. Wild follding
   - A. Uncontrolled wild flooding
   - B. With border ditches
   - C. With corrugations

(Continued on next page)

II. Border strip flooding
    A. Without corrugations
    B. With corrugations
III. Furrow irrigation
    A. Standard
    B. Ridge method

Uncontrolled wild flooding requires the least preparation of the land and, of course, is not usually a very efficient way to irrigate. Where the soil will not stand preparation it may be the only practical way. Better control can be obtained using corrugations, and still better, border ditches. Border ditches run at regular intervals in the direction of the slope. The stream is cut out of the ditch and spreads laterally over the strip between ditches.

Border strip irrigation, if properly designed, can be a highly efficient way to apply irrigation water. This method is very effective where slopes are moderate and where good levelling can be accomplished. Where levelling may be incomplete, corrugations can be used also to achieve better control until the levelling work can be completed.

In this method, border dikes running in the direction of the slope are constructed at intervals. The spacing, which usually varies between 20 and 75 feet, depends on the size of stream that can be used. The size of stream per foot width of border depends upon slope and rate of infiltration. Considerabel data on the desirabel size of stream per foot width of borderare available and preliminary suggestions can be made by your county extension agent or soil conservationist. Final selection of proper size of stream and border spacing should be determined by actual trials. The size of stream per border should be small enough so that erosion will not occur at the top before the stream spreads.

The length of the border should be such that the advancing sheet of water is over a point in the field only approximately long enough to allow the soul to fill up to field capacity. For instance, if the soil will hold six inches and the average rate of infiltration is 1.5 inches per hour, the sheet of water should pass or stand over a point in the filed not more than 4 hours.

Length of run and size of stream for any set of conditions is also the major consideration in efficiency of furrow irrigation. The furrows should be spaced in such a manner that the lateral movement of water closes between the furrows at approximately the same time that the water penetrates the depth of the root zone. If streams are too large, serious erosion will occur. The farmer can determine the maximum allowable stream by a field trial in which several different size streams are tried in different furrows.

Any particular size of stream turned in at the top of the furrow will decrease as the water infiltrates out of the furrow and will eventually reach a point in the furrow beyond which the water will not progress. The absolute minimum length of run is controlled by the maximum size non-

(Continued on next page)

erosive stream. The desirable length of run is one such that the water has filled from 1/4 to 1/6 of the soil capacity at the head end by the time the stream reaches the lower end of the furrow.

Since the infiltration rate decreases as time goes on, the size of the stream shoud be cut back after the lower end of the furrow is reached so that little if any water is lost from the lower end of the field. Use of s simple probe can be very helpful in checking the depth of water at different points in the field. For successful furrow irrigations, the size of the furrow streams must be carefully equalized and there are a number of commerical spills available which are well worth the expense for this purpose.

Determination of length of runs, spacing of borders and furrows and sixe of streams is quite technical. Your county extension agent can help you or can arrange for expert help with this problem.