

Homework Assignment 6

Using the following data sets and the *SIRMOD* software, prepare a design for each during first and later irrigations.

1 FreeDrainingFurrow_1.cfg

The FreeDrainingFurrow_1 data set describes a 69 acre field supplied by a well with a capacity of 2400 gpm. The soil is a silt loam with an average 6-hr intake rate of 0.95 in/hr (Curve No. 1.00). The field is currently irrigated by furrows on 30 inch spacings.

A simulation of these data reveals that substantial over-irrigation occurs at the upper end of the field and substantial under-irrigation occurs at the downstream end. The application efficiency is about 57%, primarily because 42% of the inflow was lost in deep percolation.

2 FreeDrainingFurrow_2.cfg

The FreeDrainingFurrow_2 data describe a 96.5 acre field supplied by a well with a capacity of 2800 gpm. The soil is a clay loam with an average 6-hr intake rate of 0.25 in/hr (Curve No. 0.25). The field is currently irrigated by furrows on 30 inch spacings.

The application efficiency of this system is good at over 72%. However, it achieves the high application efficiency by substantial under-irrigation. The storage efficiency is less than 80%. There is no deep percolation but almost 30% of the inflow resulted in tailwater.

3 FreeDrainingBorder_3.cfg

The following data describe a 96.5 acre field supplied by a well with a capacity of 2800 gpm. The soil is a clay but with an average 6-hr intake rate of 0.54 in/hr in part because of a cracking component.

The field is currently irrigated by free draining borders achieving an application efficiency of nearly 74%. A leaching requirement of 9% is not achieved as only 1% of the inflow resulted in deep percolation. In addition, more than 25% of the inflow resulted in tailwater.

4 Free Draining Border_4.cfg

The FreeDrainingBorder_4 data describe a 24.7 acre field irrigated by canal water supply having a maximum flow rate of 6 cfs and a maximum availability of 48 hours. The soil intake characteristics were selected on the basis of NRCS curve 0.50 which has a 6-hour intake rate is 0.5 inches per hour.

Based on the simulation of this field using the NRCS 0.50 intake curve, the application efficiency of this system would be less than 32% due primarily to a loss of almost 67% of in inflow to tailwater. A 10% leaching requirement was not met as less than 2% of the inflow was deep percolation.

5 Basin_5.cfg

The Basin_5 data comes from a field with a 6-hour intake rate of 0.95 inches/hour which is typical of a silt loam soil. The flow available to the field is only 5.3 cfs and its availability is 48 hours per irrigation.

A simulation of the data as given shows an application efficiency of more than 96% but this is due to substantial under irrigation, the storage efficiency is only computed to be 94%. A 10% leaching fraction is not met as deep percolation only constitutes 3% of the inflow. There is no tailwater. The ponded water infiltrated the basin in about 7 hours.

6 Basin_6.cfg

The Basin_6 data comes from a large 193 acre basin system with a clay soil (the 6-hour intake rate is 0.46 inches per hour). A irrigation district supplies water to the field with an upper limit on flow of 16 cfs and availability of 96 hours per irrigation.

Under present operations, the application efficiency is about 70%. A 5% leaching requirement is exceeded by a combined deep percolation of nearly 30% of the inflow. The water is ponded on the field surface from almost 20 hours.