FO-01322 Revised 2002

Irrigation Scheduling Checkbook Method

Contents

INTRODUCTION

Irrigation scheduling is planning when and how much water to apply in order to maintain healthy plant growth during the growing season. It is an essential daily management practice for a farm manager growing irrigated crops.

Proper timing of irrigation water applications is a crucial decision for a farm manager to: 1) meet the water needs of the crop to prevent yield loss due to water stress; 2) maximize the irrigation water use efficiency resulting in beneficial use and conservation of the local water resources; and 3) minimize the leaching potential of nitrates and certain pesticides that may impact the quality of the groundwater.

Effective irrigation is possible only with regular monitoring of soil water and crop development conditions in the field, and with the forecasting of future crop water needs. Delaying irrigation until crop stress is evident, or applying too little water, can result in substantial yield loss. Applying too much water will result in extra pumping costs, wasted water, and increased risk for leaching valuable agrichemicals below the rooting zone and possibly into the groundwater.

Several scheduling tools are available to assist a farm manager in irrigation scheduling: soil probes, soil moisture sensors, in-field weather stations, crop water use estimators, daily soil water balance checkbook worksheets, computerized daily soil water balance accounting programs, and private consultants.

The purpose of this bulletin is to describe the set-up and operating procedure for a manual soil water balance accounting method, commonly referred to as the **CHECKBOOK** method. A computer spreadsheet beta-version of this method (which creates monthly soil water balance graphs) is available from author Jerry Wright, or spreadsheet co-author Tom Scherer, Extension Agricultural Engineer at North Dakota State University.

CHECKBOOK SCHEDULING

The **CHECKBOOK** method of scheduling enables an irrigation farm manager to monitor a field's daily soil water balance (in terms of inches of **soil water deficit),** which can be used to plan the next irrigation. This method requires the manager to monitor the growth of the crop, observe the maximum air temperature each day, select the daily ET estimation from the crop water use table, measure the rainfall or irrigation applied to the field, and calculate the new soil water deficit balance. To calculate the new soil water deficit and keep a record of daily changes, the data is entered into the soil water balance

sheet like the example. The best time for daily update is early morning after the in-field rain gauges are measured.

Items to Conduct Checkbook Irrigation Scheduling

- Two or more rain gauges
- Max-Min thermometer or access to local temperature reports
- Soil probe or in field moisture sensors
- Daily crop water use table or local ET hotline or website report
- Soil water balance worksheets

The water balance worksheet is operated just like a "checkbook." Each day the estimated crop water use is added to the previous day's soil water deficit, and any rainfall or irrigation amounts are subtracted from this deficit. If a daily rainfall or irrigation event minus the daily crop water use is greater than the current deficit, most of the excess is considered lost due to deep percolation below the rooting zone, and the new deficit balance is generally set to zero. However, for most soils some of the excess water is still available to the plant during deep percolation. This period of excess soil water may last from one day on sandy soils to over two days on a heavy textured soil. **Therefore, during this period or until the excess water is consumed by crop water use (ET), the soil water deficit should be kept equal to zero.**

To decide when to start irrigating, the farm manager should compare the latest soil water deficit balance in relationship to the selected irrigation water management strategy for that crop, the crop's projected water needs, and the weather forecast.

An irrigation water management strategy outlines the manager's plans for irrigating, including the manager's selected allowable soil water deficit limits for different growth stages of the crop. The crop's soil water balance should be maintained within the set deficit limits by either rainfall or irrigation.

Effectiveness of the **CHECKBOOK** method depends on the accuracy and regularity of the in-field observations and measurements made by the manager. Since crop water use estimates are influenced by more climatic factors than considered in this method, **to be successful, regular field visits every 3 to 7 days are necessary to determine the existing soil water deficit in the field and then compared to the soil water balance sheet prediction. If found to be different, change the balance sheet prediction to the in-field estimation. Note that when using the crop water use tables, the week after emergence should be adjusted to correspond with the existing growth stage of the crop.**

If for any reason the soil water balance worksheet is interrupted and a period of time elapses, the balance sheet can be easily restarted anytime by the farm manager to assist in scheduling future irrigations.

The **CHECKBOOK** method can be used to schedule several fields in no more than 1 to 3 hours each week, depending on the number of crops grown and the field locations. However, each field's soil water balance should be kept on individual balance sheets because of the differences in soil, crop, planting date, rainfall, and plant growth rates.

To setup and operate an effective soil water accounting system like the **CHECKBOOK** method, several field characteristics and soil-water-plant factors (of which many are interrelated) need to be understood and quantified by the operator.

Home **Starting the Checkbook Method**

Community \ **Environment** \ **Family** \ **Farm** \ **Garden** \ **Living**
Home \ Search \ Product Catalog \ News \ Workshops \ Online Shopping
About Extension \ County Offices \ Partners

Produced by Communication and Educational Technology Services, University of Minnesota Extension Service.