

Kathleen Hartnett White, *Chairman*  
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Glenn Shankle, *Executive Director*



## TEXAS COMMISSION ON ENVIRONMENTAL QUALITY

*Protecting Texas by Reducing and Preventing Pollution*

August 26, 2005

Dear Stakeholder:

Re: Drip Irrigation Legislation

The Texas Commission on Environmental Quality (TCEQ) invites you to attend a meeting on September 12, 2005, from 1:00 pm - 4:00 pm at the Central Office, 12100 Park 35 Circle, Austin, Texas, Building F, Room 2210. We will update stakeholders on the new subsurface area drip disposal systems legislation and implementing these changes into new rules.

We look forward to seeing you at the meeting. Your input on these issues is very important to our program's success. If you have any questions, please contact Sherry Smith at (512) 239-0572.

Sincerely,

A handwritten signature in black ink that reads "Louis C. Herrin, III". The signature is fluid and cursive, with a long horizontal stroke at the end.

Louis C. Herrin, III  
Wastewater Permitting Section

LCH/ms

## APPLICATION RATE CALCULATOR

Version 1.0

### IMPORTANT NOTICE

The software is comprised of two files: "apprate" (MS ACCESS file format) and the program "Apprate." Both files must be in the same folder or the program will not run.

Data in "apprate" can be changed as long as the file structure (columns of data) remains the same. Additional cities can be added as long as this is done for all four tables: *City*, *Crop*, *ETo*, *Rain*. The *Soil* table list the typical water holding capacity of soils.

### Copyright and Acknowledgment

This software was developed by the Irrigation Technology Center and Texas Cooperative Extension. This material is based upon work supported by the Cooperative State Research, Education, and Extension Service, U.S. Department of Agriculture under Agreement No. 2005-45049-03209.

The software is copyrighted and cannot be sold or distributed without permission.

### GENERAL INSTRUCTIONS AND INFORMATION

All units are in terms of volume (inches per month or year) and percentage.

The calculator using the average monthly ETo (PET) and rainfall data for 21 cities in Texas. This data was updated in August 2005 using total climate record available for each city listed. These are also posted at <http://texaset.tamu.edu>

The plant material is assumed to be warm season grass over-seeded with cool season. The crop coefficients used for these grasses are  $K_c = 0.6$  for warm season and  $K_c = 0.8$  for cool season.

Effective rainfall percent (ER%), initial soil moisture content, and LF% (leaching fraction) are entered as percent (not as decimals).

All other parameters (Application Rate, Leaching Volume, ET, and Seepage ) are in units of inches per month or total inches per year.

ER% (effective rainfall percent) is the portion of rainfall/precipitation (inches) that infiltrates into the soil. Land forming practices, slope, ground cover and amount of depressionary storage all affect ER%. ER% = 0.67 is normally used for agricultural and landscape irrigation water budgeting.

## MONTHLY APPLICATION RATE CALCULATOR

The Monthly calculator computes the Application Rate for the selected month using the following equation:

$$AR = ET - RAINe + SEEP + LEACH \quad (\text{Equation 1})$$

where:

$$ET = ET_o \times K_c$$
$$RAINe = RAIN \times EF\%$$
$$LEACH = LF\% \times AR$$

AR = application rate (inches)  
ET = actual water requirement of grass (inches)  
ET<sub>o</sub> = potential evapotranspiration (inches)  
K<sub>c</sub> = crop coefficient (decimal)  
RAINe = effective rainfall (inches)  
LEACH = leaching volume (inches)  
SEEP = seepage volume (inches)  
EF% = effective rainfall percentage  
LF = leaching fraction (percent)

Soil moisture storage is not considered.

LF% (leaching fraction) and SEEP (seepage volume) are optional inputs. Seepage may include lateral (or horizontal) water flow within the soil profile.

The total leaching volume (inches per month) is automatically calculated using the inputted leaching fraction (LF%). Leaching fraction may be determined using the EC of the applied water and targeted soil salinity level. For details, see TCE publication B-1667, Irrigation Water Quality Standards and Salinity Management Strategies (<http://tcebookstore.org>)

## YEARLY APPLICATION RATE CALCULATOR

The Yearly calculator tests to see if the selected Application Rate fails. Failure occurs when runoff of the applied water becomes likely. A monthly water balance is computed which includes soil moisture storage. Any available soil moisture is carried over to the next month. Failure happens the total water application (rainfall and irrigation) exceeds available soil moisture storage and ET, as well as seepage and leaching if used.

A modified form of equation 1 is used as follows:

$$SMA = ET - RAINe + SEEP + LEACH - AR \quad (\text{Equation 2})$$

where: SMA - change in available soil moisture

SMA is calculated from the soil depth and soil water holding capacity. Soil water holding capacity is defined as the volume of water (inches) held in the soil between field capacity and permanent wilting point.

Seepage is considered only in months when soil is at field capacity. The amount of seepage allowed each month cannot be more than the total amount of water applied.

### Instructions

1. Select month to begin calculations (first month).
2. Enter the Initial Soil Moisture content (percent) at the beginning of the first month.
3. Enter the Application Rate (inches per month) to be tested.
4. Enter Soil Depth (inches) and select Soil Type and nearest City from drop down menus.
5. Enter the Seepage rate (inches per month) and leaching volume (inches per month) if desired.
6. Leaching volumes, if used, must be assign to selected months using the drop down menu. When finished, click on "Set Leaching Rate" to return to the Calculator.

### CONTACTS

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For other information:

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