

**Section 8 of 22 (8b - Gross Crop Irrigation Water Requirement Guide)**

Steps to Calculate the Crop Irrigation Water Requirement		Enter Results	Example Calculation (Alfalfa)	Results	NM IWM Manual References & Notes:
STEP 1	$F_c = EC_{e(ct)}/EC_{iw}$ $F_c$ = Ratio of the Crop Threshold Salinity ( $EC_{e(ct)}$ ) to the Electrical Conductivity of irrigation water ( $EC_{iw}$ ). Units: dS/m		$F_c = 2.0/1.0 =$ Alfalfa $EC_{e(ct)} = 2.0$ dS/m $EC_{iw} = 1.0$ dS/m	<b>2.0</b>	<ul style="list-style-type: none"> <li>➤ Crop Salt Tolerance Table for NM</li> <li>➤ Irrigation Water Quality Sampling</li> </ul>
STEP 2	$LF = 0.3086/F_c^{1.702}$ $LF$ = Leaching Fraction (for conventional irrigation; e.g. surface irrigation).		$LF =$ $LF = 0.3086/2.0^{1.702}$ $LF = 0.3086/3.254$	<b>0.095</b>	<ul style="list-style-type: none"> <li>➤ Salinity Assessment GUIDE for Selected Crops</li> </ul>
STEP 3	$NIR = ET_c/(1 - LF)$ $NIR$ = Net Irrigation Requirement (in.) $ET_c$ = Crop Evapotranspiration (in.)		$NIR =$ $NIR = 40.01/(1 - 0.095)$ $NIR = 40.01/0.905$ $ET_c = 40.01$ inches for Alfalfa	<b>44.21"</b>	<ul style="list-style-type: none"> <li>➤ NM Crop Consumptive Use Requirements (NRCS FOTG – Section 1: Irrigation Guide for NM)</li> </ul>
STEP 4	$E_a = \text{Irrigation needed (in.)} \div \text{Irrigation applied (in.)}$ $E_a$ = Irrigation Application Efficiency		$E_a =$ $E_a = 2.06/2.5$ $2.06''$ (Irr. needed) $\div$ $2.5''$ (Irr. applied) <u>Irr. applied:</u> $7.5$ (cfs) $\times$ $2.0$ (hrs.) $\div$ $6.0$ (acres) = $2.5''$ applied.	<b>0.824</b> (82.4%)	<ul style="list-style-type: none"> <li>➤ Irrigation Water Req. Guide (e.g. 3' root zone &amp; Silt Loam soil @ 10% LF = 2.06'' needed)</li> <li>➤ QT = DA Calculations for Assessing IWM Requirements</li> </ul>
STEP 5	$F_g = NIR/E_a$ $F_g$ = Gross Irrigation Application needed		$F_g =$ $F_g = 44.21/0.824$	<b>53.7"</b>	<ul style="list-style-type: none"> <li>➤ The calculation of <math>F_g</math> is used in the Planning &amp; Design of Irrigation Systems and the development of IWM Plans</li> </ul>
STEP 6	$(\# \text{ Irr. /yr.}) \times (\text{in. applied/Irr.}) = \text{Total in. applied/ac./yr.}$ (Note: in. applied/Irr. is based on an avg.)		$13$ Irrigations $\times$ avg. of $2.5''/Irr. =$ (e.g., Irrigated field approximately every 2-wks on a fixed schedule (Apr. – Oct.))	<b>32.5"</b>	<ul style="list-style-type: none"> <li>➤ Amount of Irr. Water applied can differ substantially from the planned Gross Irrigation application needed</li> </ul>
STEP 7	$F_g - (\text{Total in. applied/ac./yr.}) =$ (Note: evaluate reason(s) for the difference between $F_g$ & Total in. applied/ac./yr.)		$53.7''$ ( $F_g$ ) $- 32.5''$ (Total in. applied/ac./yr.) =	<b>21.2"</b>	<ul style="list-style-type: none"> <li>➤ In this example, it is clear that consumptive use is not being met.</li> </ul>

$EC_{e(ct)}$  is taken from a soil saturation extract & the  $EC_{iw}$  value is taken from a water test (EC units: dS/m = mmhos/cm = mS/cm).

The LF equation used for High Frequency Irrigation is:  
 $LF = 0.1794/F_c^{3.0417}$  (e.g. Drip irrigation)

rudy.garcia.2008