

Alfalfa Irrigation Practices and Salinity Management in the Imperial Valley

TMDL-TAC meeting 4/24/02

Khaled M. Ball

Irrigation/Water Management Advisor

Email: kmball@ucdavis.edu

<http://ceimperial.ucdavis.edu>

University of California Cooperative Extension-
Imperial County

Imperial Valley

~ 450,000-500,000 acres of irrigated agriculture

~ 2.6-3.0 MAF/year

(Ag. flow to the Salton Sea: ~30%)

~ Agricultural runoff:

Surface runoff (~15-17%)

Subsurface drainage (~13-15%)

Field Crops	78%
Vegetable & Melon Crops	20%
Fruit & Nut Crops	1%



Alfalfa (3-5 year crop)

170,408 acres (Average 1995-1999, IVACR)

~178,750 acres (2002, IID)

Average water use 6.5 ac-ft/ac per year

Colorado River water: 1.0-1.1 dS/m (1 dS/m ~ 640 mg/L)

Salinity in irrigation water: 700 mg/L ~ 0.96 ton of salts per ac-ft

Total annual salt load ~ 6 tons/ac

Annual rainfall: less than 3 inches

Leaching is needed to maintain salt balance



Alfalfa

Planting:

October-November (spring planting not common)

Fertilizer applications:

N: only on soils low in nitrogen (20-30 lbs N). Alfalfa fixes atmospheric nitrogen

Source: Mayberry et al. 2000. UCCE Guidelines to Production Costs and Practices-Imperial County-Field Crops 2000-2001.

Alfalfa

Fertilizer applications:

P: 100-150 lbs of phosphate (P_2O_5) per acre is recommended prior to planting. Annual applications of phosphate: 100 lbs/acre* to maintain maximum hay production (alfalfa P uptake** 5.2 lbs P/ton)

Dry P fertilizers: 11-52-0 $\frac{3}{4}$

Liquid P fertilizers: 10-45-0 (0.98 lb of P_2O_5 /gal.)

0-52-0 (Phosphoric acid, 7.38 of P_2O_5 /gal.)

Avg. yield in the IV: ~ 8 tons/ac per yr

Note: (100 lbs P_2O_5 ~ 43.7 lbs of P)

K: 0

Source: Mayberry et al. 2000. UCCE Guidelines to Production Costs and Practices-Imperial County-Field Crops 2000-2001.

* UC DANR Leaflet 210P7

** UC DANR publication 3312 (IPM for Alfalfa Hay)

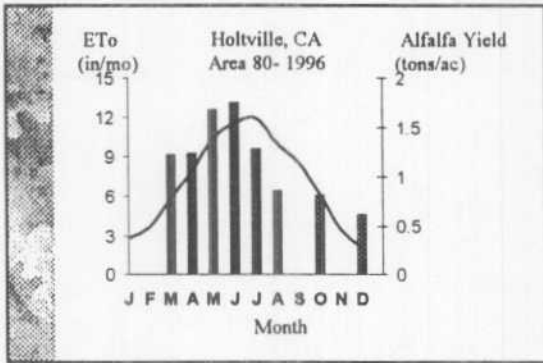
Alfalfa

Nutrients removed from an acre of alfalfa in one year by a 10 ton crop.

Pounds/acre in 10 tons

N	550 (no net removal, alfalfa plant adds more than it removes)
P	52
K	400

Source: UC DANR publication 3312 (IPM for Alfalfa Hay)



Alfalfa
Irrigation and cutting:
 1-2 irrigations are needed to establish stand
 1-3 irrigations per cutting are necessary (most common: 2 irrigations/cutting)

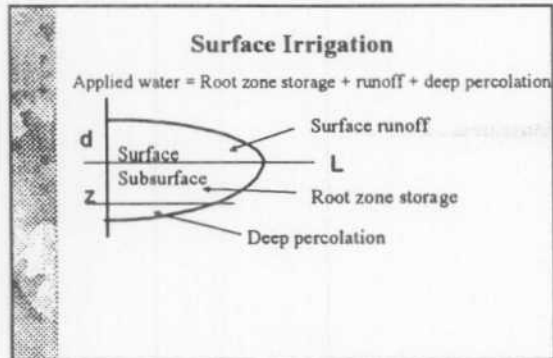
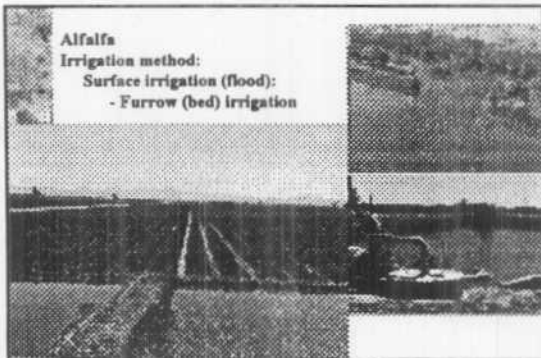
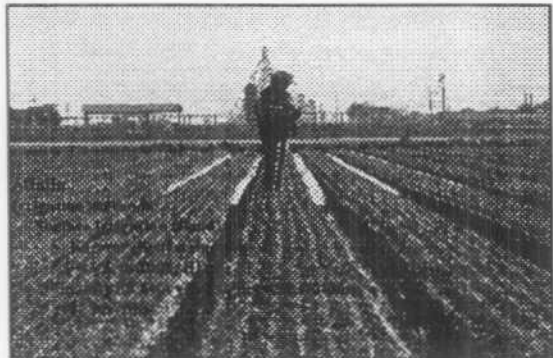
First cut: Feb-March, and then every 4-8 weeks (summer-winter)
 Avg. 8-9 cuttings per year (Avg. yield: 8 tons/ac)
 Avg. of 16 irrigations per year (3.5-5.5 inches per irrigation)

Source: Mayberry et al. 2000. UCCE Guidelines to Production Costs and Practices-Imperial County. Field Crops 2000-2001.

Alfalfa
Irrigation methods:
Surface irrigation (flood):
 - Border (flat) irrigation
 (-57% in 2002, IID)
 1200 or 2400 ft runs
 Width: 100+ ft
 Slope: 0.1-0.15%

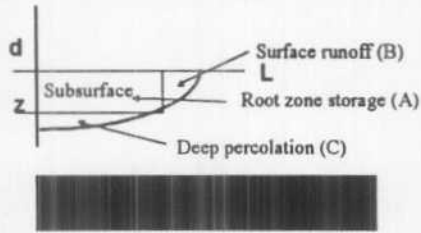
Summer time: fewer lands are irrigated to increase flow rate per land (to prevent scalding a condition causing death to plants by suffocating roots when temperatures exceed 105°F).
 Irrigation time per set: 4-6 hrs (water turned off when it reaches about 80% of the length of the field)

Source: Mayberry et al. 2000. UCCE Guidelines to Production Costs and Practices-Imperial County. Field Crops 2000-2001.

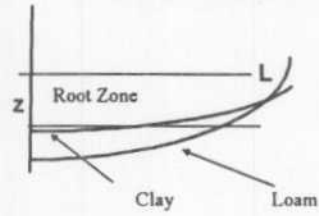


Surface Irrigation

Applied water = Root zone storage + runoff + deep percolation



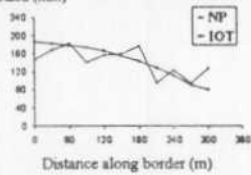
Surface Irrigation



Irrigation Management

Runoff & deep percolation:
Infiltration characteristics vary in space and time

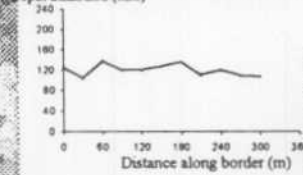
Depth infiltrated (mm) First Irrigation (Cracking clay soil)



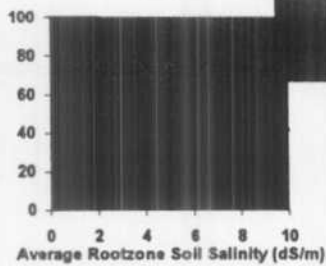
Irrigation Management

Runoff & deep percolation:
Infiltration characteristics vary in space and time

Depth infiltrated (mm) Third Irrigation (Cracking clay soil)



Relative Yield (%)



Tons/ac Crop: Alfalfa, Area 80
Alfalfa yield (tons/ac) MAY 1998

