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Principles of Fertilizer and Irrigation Management[1]

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This publication is one of a series entitled Fertilizer and Irrigation Management in the BMP Era. This series is divided into nine principles described in the Introduction Chapter (HOS-897). This publication is part of Principle 1, "With Plasticulture, Linear Bed Feet are More Important than Field Surface." BMP implementation requires a global approach to production management. However, for presentation purposes, each aspect of vegetable production is described in a separate publication.

Fertilizer Rates

The University of Florida Extension Soil Testing Laboratory (ESTL) employs the Standardized Fertilizer Recommendation System in which all recommendations are expressed in “pounds per acre” (lb/A). These fertilizer rates are based upon typical distances between bed centers for each crop (Table 1). Table 1 also indicates the typical number of planting rows within each bed. The use of “pounds per 100 linear bed feet” (lb/100 LBF) as a fertilizer rate assures that an appropriate rate of fertilizer will be applied, regardless of the total number LBF in the cropped area. The use of lb/A to express the fertilizer rate requires an adjustment based upon actual cropped area.

Definition: The LBF system is a concept of calculating fertilizer and irrigation rates based on the length of planted rows rather than the total area of the field. The LBF approach allows exact calculations of recommended rates of fertilizer and water regardless of the cropping pattern in the field. This system should be used for crops grown with plasticulture or when drip irrigation is used.

Linear Bed Foot (LBF) System – Things to Do

The following worksheets provide step-by-step instructions on how to correctly use the LBF system. Each worksheet assumes a 1-acre field.

Worksheet 1 - How to correctly convert from surface acre to linear feet:

Step 1: 1 acre = 43,560 sq feet

Step 2: Select the typical bed spacing TBS (Table 1) for the crop.

Step 3: LBF in 1 acre = 43,560/TBS, this assumes that the entire field is planted at the typical bed spacing, and that no spray or harvest alleys or irrigation ditches are left unplanted.

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Step 4: If spray alleys are left unplanted, determine the relative area of the field actually planted (RAP). For example, if 1 row is left unplanted every six rows, then the relative area of the field actually planted 6/7 (6/(6+1)). Note that RAP is always expressed as a decimal between 0 and 1. Note that when the whole field is planted (Step 3), RAP=1.0.

Step 5: If spraying alleys are left unplanted, the LBF in 1 acre will be: LBF = RAP x 43,560/TBS.

Worksheet 2 - How to correctly convert fertilizer rates from lb/A to lb/100 LBF:

Step 1: Determine the typical bed spacing from Table 1 for the crop.

Step 2: Locate the column containing the recommended fertilizer rate in lb/A in Table 2. Read down the column until reaching the row containing the typical bed spacing.

Worksheet 3 - How to correctly convert irrigation rates from acre-inches to gal/100 ft:

When overhead or seepage irrigation is used, it is logical to use acre-inches as the unit for irrigation amounts since the entire field surface is wetted. However, when plasticulture and/or drip irrigation are used, flow rates and delivery rates should be expressed in gallon/100ft/hr and gal/100 ft, respectively.

Step 1: 1 acre-inch = 27,150 gal/acre

Step 2. Determine the linear bed feet length of the field using LBF = RAP x 43,560/TBS when RAP=Relative Area Planted and TBS=Typical Bed Spacing (see Worksheet 1 above).

Step 3. An irrigation rate (IR) of 1 acre-inch (but applied by drip irrigation) is equivalent to: IR=100 x 27,150/LBF, in gal/100 ft.

Worksheet 4 - How to calculate fertilizer rates when a non-typical bed spacing is used.

Step 1: In this case, the only correct method is to first express the recommendation from the *Vegetable Production Guide for Florida* in lbs/100 ft (using Worksheet 2 and Table 2).

Step 2: Then, determine the LBF in your field using Worksheet 1 and replace TBS by your actual bed spacing.

Step 3: Finally, multiply the fertilizer rate expressed in lbs/100 ft by LBF (in 100 LBF/A) to get the fertilizer into lbs/A.

Additional Readings

Calculating Fertilizer Rates for Vegetable Crops Grown in Raised-bed Cultural Systems in Florida, HS743, Fla. Coop. Ext. Ser., IFAS, Univ. of Fla. http://edis.ifas.ufl.edu/WQ112

Soil and Fertilizer Management for Vegetable Production in Florida, HS711, Fla. Coop. Ext. Ser., IFAS, Univ. of Fla. http://edis.ifas.ufl.edu/CV101

Table 1. Typical bed spacings for vegetables grown in Florida.

Vegetable Crop	Typical Spacing[z] (ft)	Rows of Plants Per Bed	Bed Length 100 lbf in 1 Acre
Lettuce	4	2	108.9
Strawberry	4	2	108.9
Broccoli	6	2	72.6
Muskmelon	5	1	87.3
Cabbage	6	2	72.6
Pepper	6	2	72.6
Cauliflower	6	2	72.6
Summer squash	6	2	72.6
Cucumber	6	2	72.6
Eggplant	6	1	72.6
Tomato	6	1	72.6
Watermelon	8	1	54.4
z 100 ft = 100 lbf			

Table 2. Conversion for fertilizer rates expressed in lb/A to lb/100 lbf.

Typical Bed Spacing (ft)[z]	Recommended Fertilizer Rate in lb/A (N, P_2O_5, or K_2O)							
	20	40	60	80	100	120	140	160
	Resulting fertilizer rate in lb/100 LBF (N, P_2O_5, or K_2O)							
3	0.14	0.28	0.41	0.55	0.69	0.83	0.96	1.10
4	0.18	0.37	0.55	0.73	0.92	1.10	1.29	1.47
5	0.23	0.46	0.69	0.92	1.15	1.38	1.61	1.84
6	0.28	0.55	0.83	1.10	1.38	1.65	1.93	2.20
8	0.37	0.73	1.10	1.47	1.84	2.20	2.57	2.94
z The number of linear bed feet (LBF) for any cropping pattern is equal to 43,560 square feet divided by the row (bed) spacing (center-to-center).								