TECHNICAL NOTE

USDA NATURAL RESOURCES CONSERVATION SERVICE HAWAII

Water Technical Note - No. 11

WATER BUDGET WORKSHEET

I. DESCRIPTION OF TECHNICAL NOTE

The Water Budget Worksheet provides an indication of the potential for leaching of pesticides and nutrients through the soil to underlying aquifers.

Specifically, the worksheet calculates **net soil water**, which is the amount of water available in the soil profile after crop evapotranspiration has been accounted for. If net soil water is negative (-), it indicates that there is little potential for leaching during the month. If it is positive (+), it indicates that there is potential for leaching during the month.

The worksheet requires the user to input average rainfall and other data from past records. Because of this, the worksheet provides an indication of potential leaching only, actual rainfall which occurs at the time may change net soil water.

This technical note includes:

- Instructions for completing the Water Budget Worksheet.
- A Crop Coefficient (kc) Values table.
- A completed example copy or the Worksheet.
- A blank copy of the Worksheet included as Attachment 1.
- Instructions for using two Water Budget Worksheet computer files: (Attachment 2)
  - the first file is a Microsoft Word version of the Worksheet, which may be used to print out blank paper copies of the Worksheet and
  - the second file is a Microsoft EXCEL version of the Worksheet, which will perform needed calculations automatically.
- A ~~5-1/2~~ 3½" computer disk containing the two files.

The Water Budget Worksheet may be used to plan any conservation practice in conjunction with the Water Quality Risk Assessment (Water Technical Note - No. 1) to provide a better indication of the potential for leaching than just considering the high rainfall months.

The Water Budget Worksheet shall be used to plan the following conservation practices:

- Nutrient Management (590)
- Pest Management (595)
- Irrigation Water Management (449)
- Waste Utilization (633)

The Worksheet may be completed by either filling-in a paper copy or using the EXCEL spreadsheet. Policy regarding its use is contained in Hawaii Bulletin No. HI-180-0-2.

kc Values in Inches at 30 Day Intervals

(kc = crop coefficient)

Crop	At Planting	Days After Planting					Length of Harvest / Notes
		30	60	90	120	150	
Green beans	.42	1.46	.96	.94			
Carrots	.42	1.27	1.60	1.30	.83		
Celery	.42	1.31	1.59	1.15			100 days
Sweet corn	.42	1.68	1.47				70 days
Grain corn	.42	.94	1.66	1.63	.61		
Crucifers (broccoli, cabbage, cauliflower, brussel sprouts)	.42	1.53	.98				75 days
Cucumbers (fresh) (mach. picked)	 .42 .42	 1.38 1.38	 .78 .94				Harvest can last up to 4 months
Eggplant	.42	1.42	1.52	1.0			Harvest lasts 3 - 4 months
Lettuce	.42	1.46	1.0				
Melons	.42	1.38	1.54	.94	.83		
Grain sorghum	.42	1.24	1.61	.54	.33		
Oats (green manure) (grain)	 .42 .42	 1.46 1.46	 1.69 1.69	 .28			Green manure turn under @ 60 days. Grain 80 days.
Onions (dry) (green)	.42 .42	1.25 1.06	1.46 1.06	.94	.83		45 days
Peanuts	.42	1.05	1.54	.79	.61		
Peas	.42	1.69	1.1				55 days
Peppers	.42	1.53	1.26	.94			High elevation 75 days. Up to 90 days low elevation.
Sweet potato	.42	.94	1.66	1.63	.96	.78	
Radishes	.42	.83					30 days
Daikon	.42	1.23	.84				60 - 65 days
Spinach	.42	1.4	1.05				40 days
Summer squash	.42	1.34	.78				60 days
Tomato	.42	1.66	1.34	.67			90 - 100 days
Zucchini	.42	1.28	1.30	.78			100 - 120 days
Sugarcane (dryland)	.42	1.20 @ 10 months	.98 @ 17 months				
Sugarcane	.42	1.0 under sprinkler irrigation	.8 under drip irrigation				
Grass	.42	.5 newly planted	.9 mature				
Alfalfa	.42	.5 young	1.05 mature				
Pineapple	.42		.2 mature				

EXAMPLE **Water Budget Worksheet** ***EXAMPLE***

Prepared for: Business Name: Aloha Farms, Inc. Client Name: Joe Farmer Owner/Operator: Owner

Prepared by: Name / Title: Tom Planner, Soil Conservationist Date: 10/1/99 **Project Site:** Farm/Tract/Field#: 1/1/1

Step ↓ Month →	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.
1. Enter **Rainfall in mm.**	75	100	125	100	75	50	50	75	75	50	100	100
2. Divide mm (#1) by 25.4 to	/ 25.4	/ 25.4	/ 25.4	/ 25.4	/ 25.4	/ 25.4	/ 25.4	/ 25.4	/ 25.4	/ 25.4	/ 25.4	/ 25.4
get **Rainfall in Inches.**	3.0	3.9	4.9	3.9	3.0	1.97	1.97	3.0	3.0	1.97	3.9	3.9
3. Enter **Annual Pan** in inches. Closest Station #: 485.10	92											
4. Enter **Station Pan** in inches.	4.48	4.34	5.62	5.75	6.90	8.24	9.62	10.20	9.15	8.07	5.01	7.73
5. Add all Station Pans (#4) & enter **Total Pan** for year.	85.11											
6. Divide Annual Pan (#3) by Total Pan(#5) & enter **Ratio.**	1.08											
7. Multiply Station Pan (#4) by Ratio (#6) to get **Site Pan** in inches.	4.84	4.69	6.07	6.22	7.46	8.91	10.40	11.03	9.89	8.72	5.42	8.36
8. Multiply Site Pan(#7) by 0.80 Kp to get	X 0.8	X 0.8	X 0.8	X 0.8	X 0.8	X 0.8	X 0.8	X 0.8	X 0.8	X 0.8	X 0.8	X 0.8
Monthly Eto in inches.	3.87	3.75	4.86	4.97	5.97	7.13	8.32	8.82	7.91	6.98	4.33	6.68
9. Enter **Monthly kc Value** in inches for crops to be planted.	0.42	1.12	0.98	0.98	1.42	1.56	1.34	0.88	0.88	0.42	0.56	1.20
Name crops to be planted:	celery	celery	corn	corn	corn	corn	gr beans	gr beans	gr beans	celery	celery	celery
10. Multiply Monthly Eto (#8) by Monthly kc Value (#9) to get **Monthly Pet** in inches.	4.46	3.98	2.04	8.20	9.31	7.91	3.49	12.88	7.60	2.93	5.68	10.70
11. Minus Monthly PET (#10) from Rainfall in Inches(#2) to get **Net Soil Water** in inches.	-1.50	-0.04	2.88	-4.27	-6.36	-5.94	-1.53	-9.93	-4.64	-0.96	-1.74	-6.76

Water Budget Worksheet

Prepared for: Business Name: _____ Client Name: _____ Owner/Operator: _____

Prepared by: Name / Title: _____ Date: _____ **Project Site:** Farm/Tract/Field#: _____

Step ↓ Month →	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.
1. Enter **Rainfall in mm.**												
2. Divide mm (#1) by 25.4 to	/ 25.4	/ 25.4	/ 25.4	/ 25.4	/ 25.4	/ 25.4	/ 25.4	/ 25.4	/ 25.4	/ 25.4	/ 25.4	/ 25.4
get **Rainfall in Inches.**												
3. Enter **Annual Pan** in inches. Closest Station #:												
4. Enter **Station Pan** in inches.												
5. Add all Station Pans (#4) & enter **Total Pan** for year.												
6. Divide Annual Pan (#3) by Total Pan(#5) & enter **Ratio.**												
7. Multiply Station Pan (#4) by Ratio (#6) to get **Site Pan** in inches.												
8. Multiply Site Pan(#7) by 0.80 Kp to get	X 0.8	X 0.8	X 0.8	X 0.8	X 0.8	X 0.8	X 0.8	X 0.8	X 0.8	X 0.8	X 0.8	X 0.8
Monthly Eto in inches.												
9. Enter **Monthly kc Value** in inches for crops to be planted.												
Name crops to be planted:												
10. Multiply Monthly Eto (#8) by Monthly kc Value (#9) to get **Monthly Pet** in inches.												
11. Minus Monthly PET (#10) from Rainfall in Inches(#2) to get **Net Soil Water** in inches.												