Climatology of Soil Water

A long term study (at least 5 years) was initiated in August 1985 to determine the climatology of soil water on continuous spring wheat at the Carrington, Dickinson, Hettinger, Langdon, Minot, Streeter, and Williston Branch Experiment Stations and at the Fargo Station. A second objective is to develop a fall soil water recharge model.

Soil water content of 8 layers to depths of 48 inches was measured at 3 sites on biweekly intervals from spring thaw until fall freezeup by station personnel. Precipitation was measured nearby. During the spring the soil at each site was sampled by layer for determination of various soil characteristics including bulk density, particle size, field capacity, and wilting point. A permeameter was used to estimate porosity and infiltration.

These data will be used over many years to develop a climatology (averages and variations) of soil water throughout the year and may help explain other research results on these plots. In addition, they will be used to develop a model to predict soil water recharge in the fall. Such a model would eliminate the need for a state wide soil water survey in late autumn. Unfortunately, fall 1985 and 1986 were very wet. Preliminary analysis shows that soil water content was near field capacity throughout the 1986 growing season at several stations. Thus prediction of fall recharge may not be possible with only two years of data. Analysis of these data is continuing.

The project's ultimate success will depend on the continued cooperation of Branch Experiment Station personnel since this is the most economical way to collect accurate measurements on soil water throughout the year at several locations statewide.

Table 46. Sampling Data – Dickinson, 1986

Station	Sampling Date	Sampling Depth (in)	Available Water To 4 Feet (in)	Total Water To 4 Feet (in)
Dickinson	8/22/85	48	5.70	13.79
Dickinson	10/25/85	48	4.10	12.18
Dickinson	4/01/86	48	4.25	12.33
Dickinson	4/23/86	48	3.92	12.00
Dickinson	5/12/86	48	7.69	15.77
Dickinson	5/28/86	48	4.64	12.72
Dickinson	6/10/86	48	2.43	10.51
Dickinson	6/25/86	48	(0.04)	8.05
Dickinson	7/09/86	48	1.27	9.35
Dickinson	7/23/86	48	1.41	9.50
Dickinson	8/07/86	48	(0.61)	7.47
Dickinson	8/22/86	48	(0.79)	7.29
Dickinson	9/17/86	48	0.02	8.11
Dickinson	10/01/86	48	3.16	11.24
Dickinson	10/14/86	48	2.38	10.46
Dickinson	10/29/86	48	1.21	9.29

Table 47. Soil Analysis – Preliminary Results

Station	Depth (in)	Organic Matter (%)	Bulk Density (g/cm^3)	Vol. Water at 15 Bar (%)	PSA		
					Sand (%)	Silt (%)	Clay (%)
Carrington	6	3.50	1.36	12.13	40.0	46.0	14.0
	12	1.70	1.30	11.40	32.5	52.2	15.3
	18	1.50	1.25	11.00	27.5	54.8	17.7
	24	1.10	1.34	10.89	27.5	54.8	17.7
	30	0.81	1.39	9.65	32.5	53.3	14.2
	36	0.67	1.44	7.89	47.5	38.3	14.2
	42	0.13	1.47	5.85	47.5	41.8	10.7
	48	0.07	1.51	6.01	60.0	31.7	8.3
Dickinson	6	2.20	1.32	15.22	32.5	42.8	24.7
	12	1.90	1.36	16.17	32.5	40.4	27.1
	18	1.20	1.51	25.70	20.0	38.2	41.8
	24	1.10	1.54	23.67	30.0	33.0	37.0
	30	1.60	1.47	12.72	55.0	23.9	21.1
	36	1.70	1.48	12.03	62.5	19.8	17.7
	42	0.74	1.57	12.62	57.5	24.9	17.6
	48	1.00	1.57	16.67	37.5	36.5	26.0

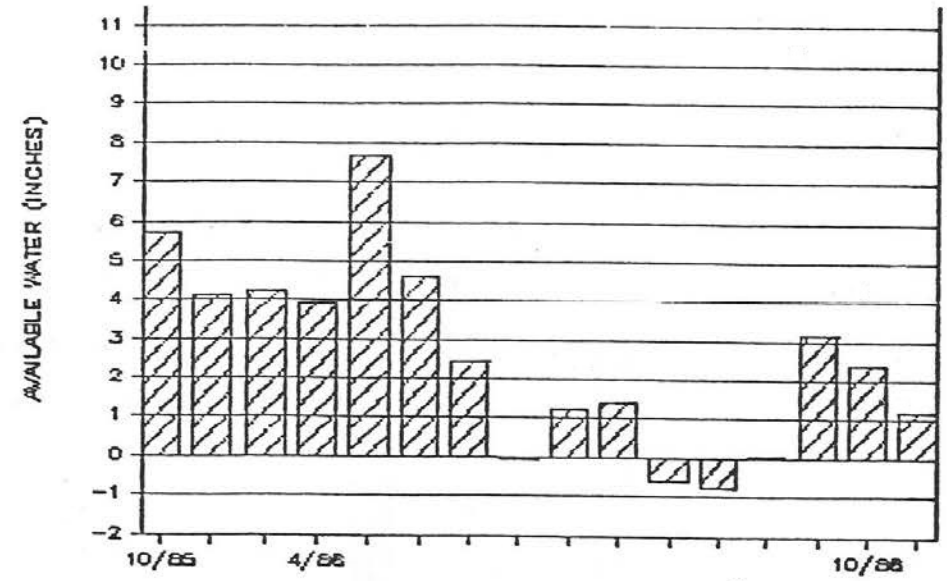

Figure 1. Available water to 4 feet - Dickinson, 1986.

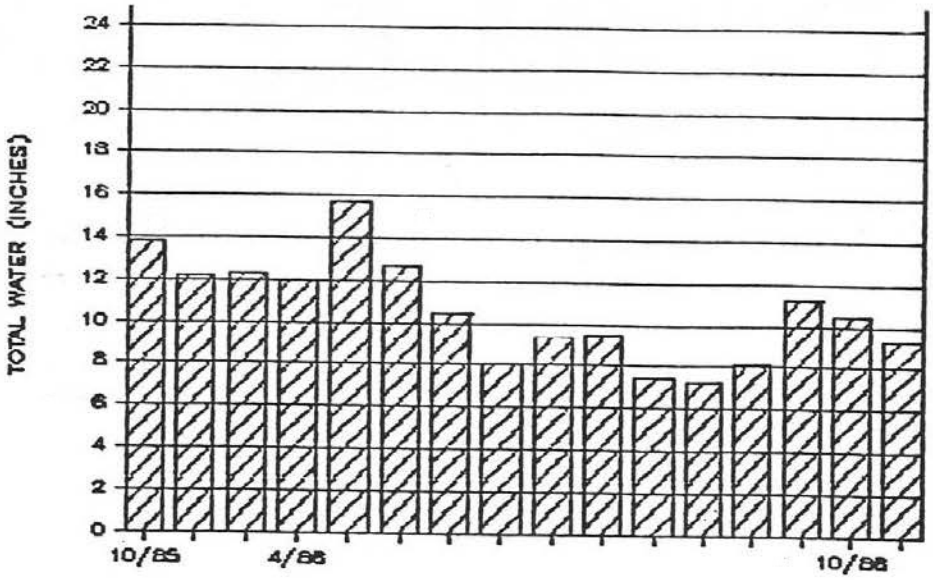

Figure 2. Total water to 4 feet - Dickinson, 1986.

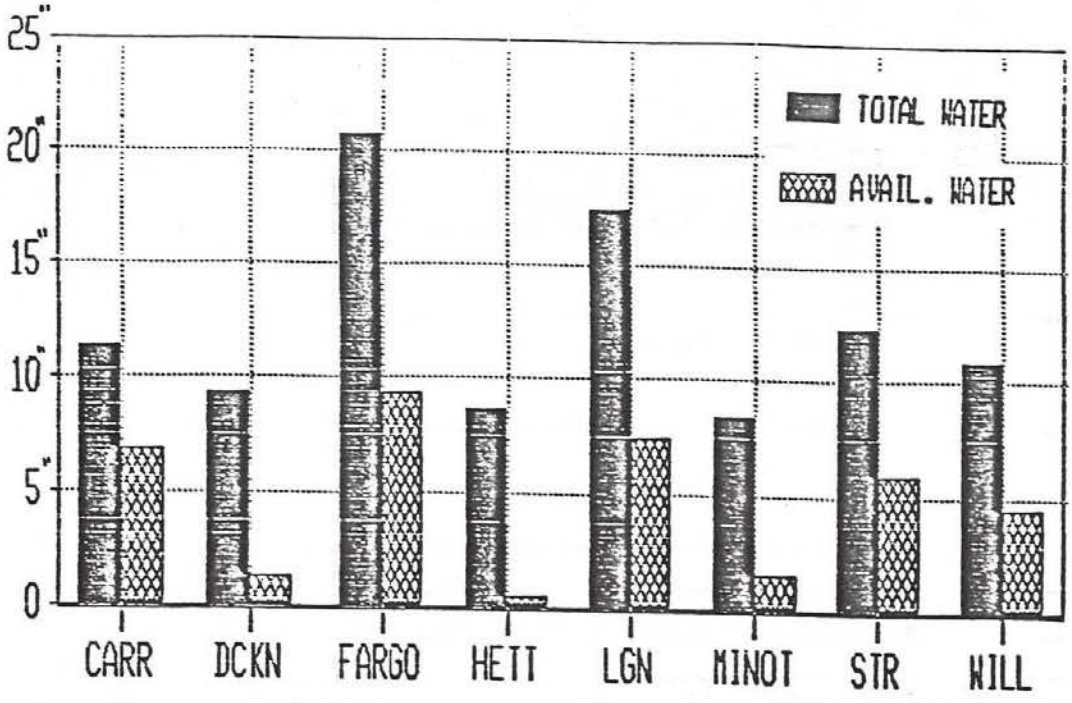

Figure 3. Soil water in 4 foot profile, October, 1986.