IMPACT OF WIDE DROP SPACING IN CORN

C. Dean Yonts
University of Nebraska
Panhandle Research and Extension Center
4502 Avenue I
Scottsbluff, NE 69361
Phone 308-632-1246
E-mail cyonts1@unl.edu

Brian L. Benham
University of Nebraska
South Central Research and Extension Center
Box 66
Clay Center, NE 68933
Phone 308-762-4437
E-mail bbenham1@unl.edu

Bill Kranz
University of Nebraska
Northeast Research and Extension Center
601 East Benjamin Avenue, Suite 104
Norfolk, NE 68701
Phone 402-370-4000
E-mail wkranz1@unl.edu

Jose Payero
University of Nebraska
West Central Research and Extension Center
461 West University Drive
North Platte, NE 69101
Phone 308-532-3611
E-mail jpayero1@unl.edu

Introduction

In many areas of Nebraska, the summer of 2000 was marked with below normal precipitation and above normal temperature and sunshine. As growing degrees climbed, it became more and more difficult for center pivot sprinkler systems to meet the water demands of the growing corn crop. The result of water stress on the crop was not completely evident until late in the season when the crop was nearly mature. A differential in crop height resulted in many fields and could be seen from the perimeter of the field. Aerial observations of the fields revealed concentric rings that corresponded to sprinkler spacing.

Field Evaluations

To evaluate what was being observed in the field, a series of field samples were collected. Many center pivot systems are designed with wider sprinkler spacing for interior spans and closer sprinkler spacing for the outer most spans where additional sprinklers are needed to meet application requirements. When possible, yield samples and soil moisture data were collected in this transition area to insure similar soil type and cultural conditions.

The location of sprinklers were first identified in relation to the wheel tracks. Then the location of sprinklers were superimposed in that area of the field where the center pivot sprinkler devices run nearly parallel with the planted rows of corn. Corn rows were identified within each sprinkler device spacing section of the pivot. In other words, in those areas with wide spacing or those with narrow spacing. Samples were then collected from those rows of corn that were between a series of three sprinkler devices, regardless sprinkler spacing. Corn yield was determined by sampling 10 feet of row. Soil water content was measured to a depth of 4 feet at one location within each sampled row.

Field Results

The results of field measurements at the different sites are shown in the following figures. As can be seen, the yield at a number of the sites declined between the sprinkler devices when sprinkler spacing was approximately 19 feet while yield tended to be more uniform for the narrow sprinkler spacing of 9 feet.

Because soil water data was collected at the end of the season when the crop was mature, some of the differences in soil moisture content may have been eliminated with late season precipitation or added irrigation. However, a number of the sites still show soil water levels at the 4 foot level to be much less in the rows that are located directly between two sprinkler devices.

Site description and yield and soil moisture results are discussed below:

McCook site 1 had sprinkler devices spaced 6 ft apart and located in the corn canopy at alternating heights of 3.0 and 4.5 ft. Soil moisture was nearly constant across the rows while yield was nearly 25 bu. less in the row directly between the sprinklers.

McCook site 2 had sprinkler devices spaced 10 ft apart at an 8 ft height. At this height, the sprinkler devices were out of the canopy for the bulk of the season. Soil moisture content was constant among the rows and yield varied by approximately 15 bu.

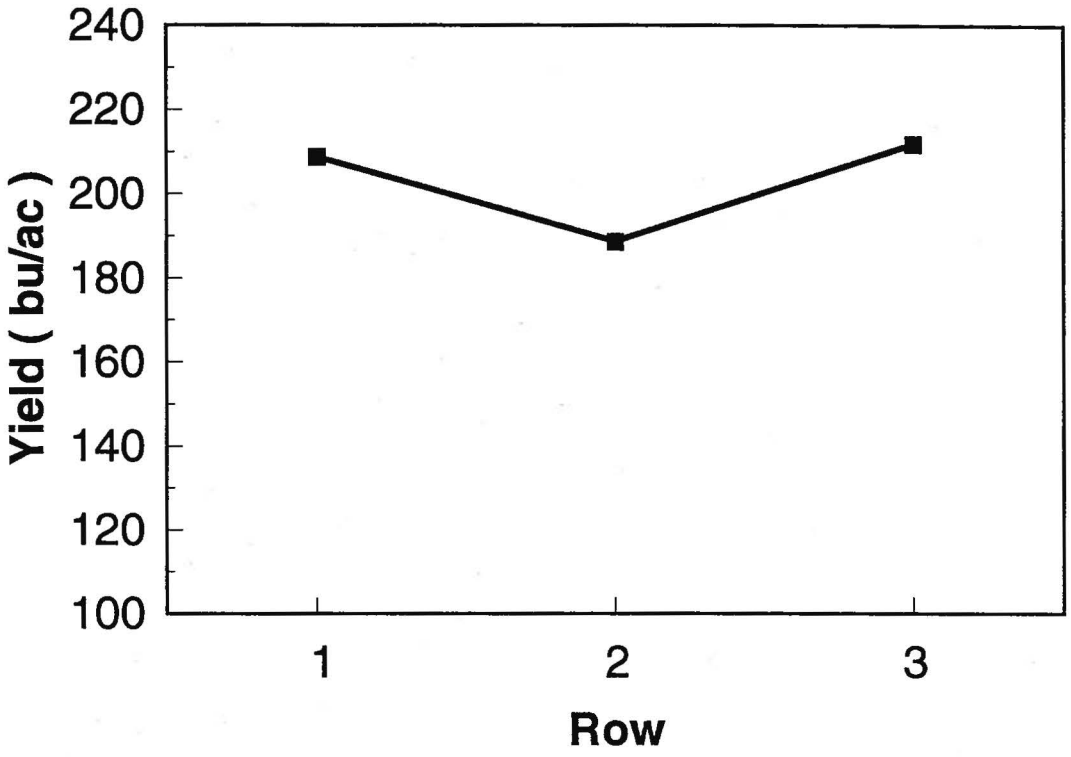
Sprinkler devices were spaced 19 ft apart at a height of 2 ft at McCook site 3. Although yield was similar, soil moisture content declined by nearly 10 % when comparing the row next to the sprinkler device to the row furthest from the sprinkler device.

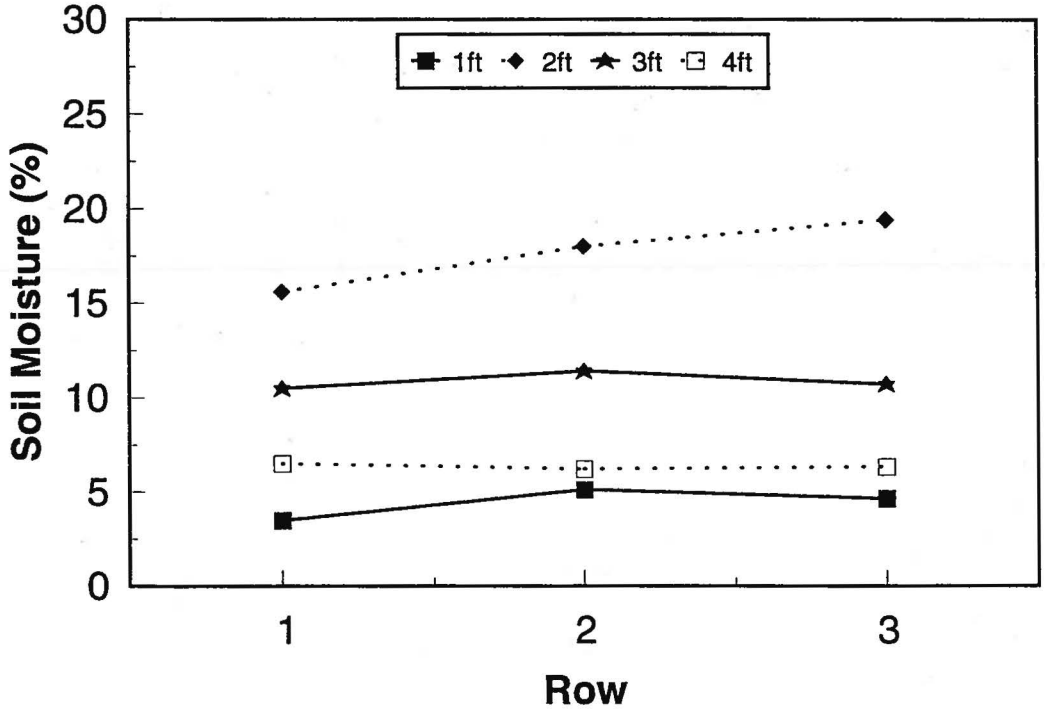
At the Hay Springs sites, data was collected for both wide and narrow sprinkler spacing within the same field. Hay Springs sites1 and 2 were from one field and Hay Springs sites 3 and 4 from another field. Hay Springs site 1 had sprinkler devices located at a 7 ft height and spaced 9 ft apart. There was no reasonable pattern for either yield or soil moisture content at this location. At Hay Springs site 2, sprinkler devices were also at a 7 feet height but spaced 18 feet apart. Soil moisture differences were not detectable at the end of the growing season but corn yield did decline by approximately 25 bu as the distance increased from the sprinkler devices.

Hay Springs site 3 had sprinkler devices spaced 9 ft apart at a height of 7 ft. No differences can be seen in soil moisture content and corn yield averaged approximately 215 bu. At Hay Springs site 4 sprinkler devices were spaced 18 ft apart at a height of 6.5 ft. Both soil moisture content and corn yield declined for the rows furthest from the sprinkler device. Corn yield dropped from over 220 bu to less than 180 bu.

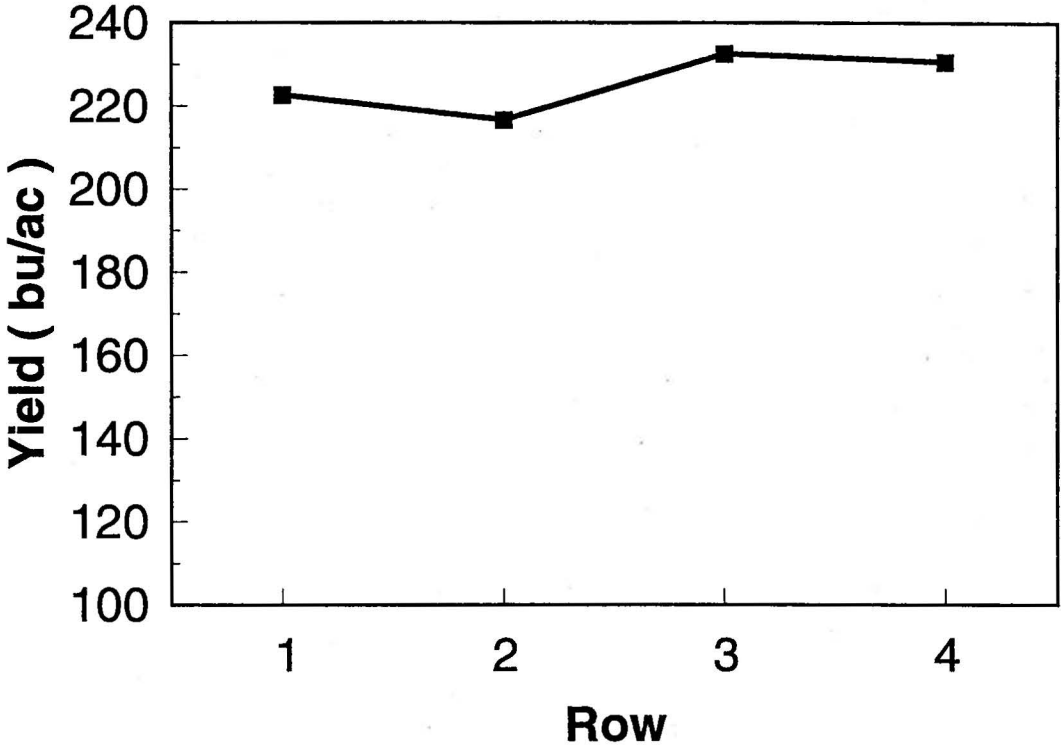
As the cost of pumping increases and water supplies become more restricted, irrigation schedules that more closely match water application to water use will exaggerate the nonuniform application of water due to sprinkler spacing and in-canopy operation of sprinkler devices.

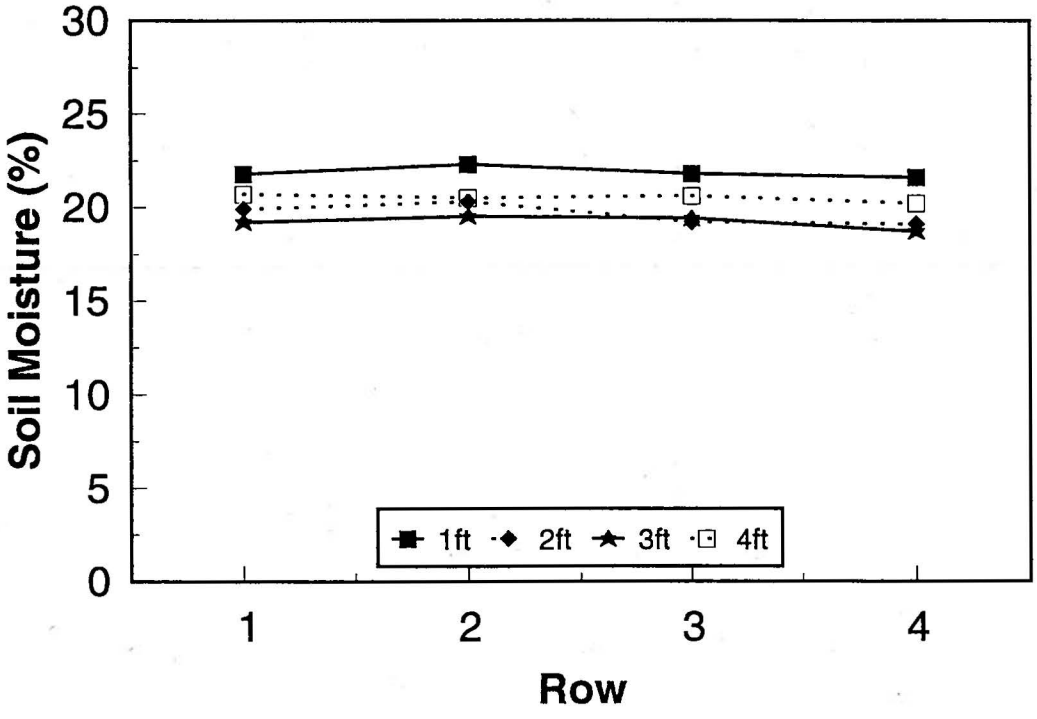
McCook Site 1



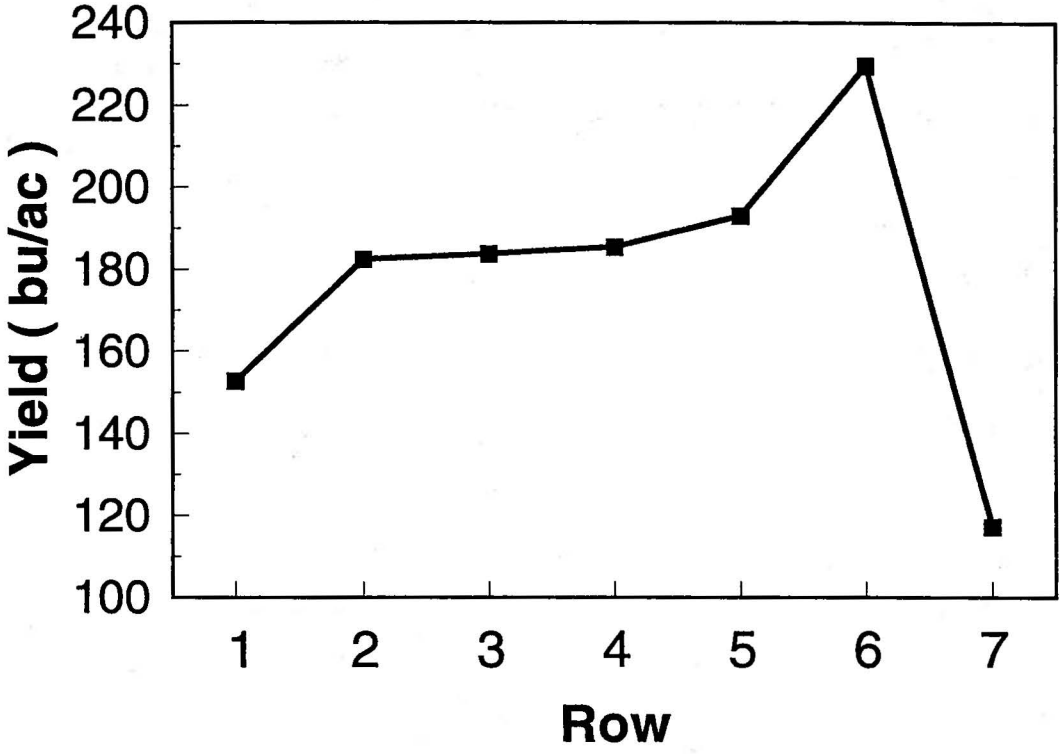


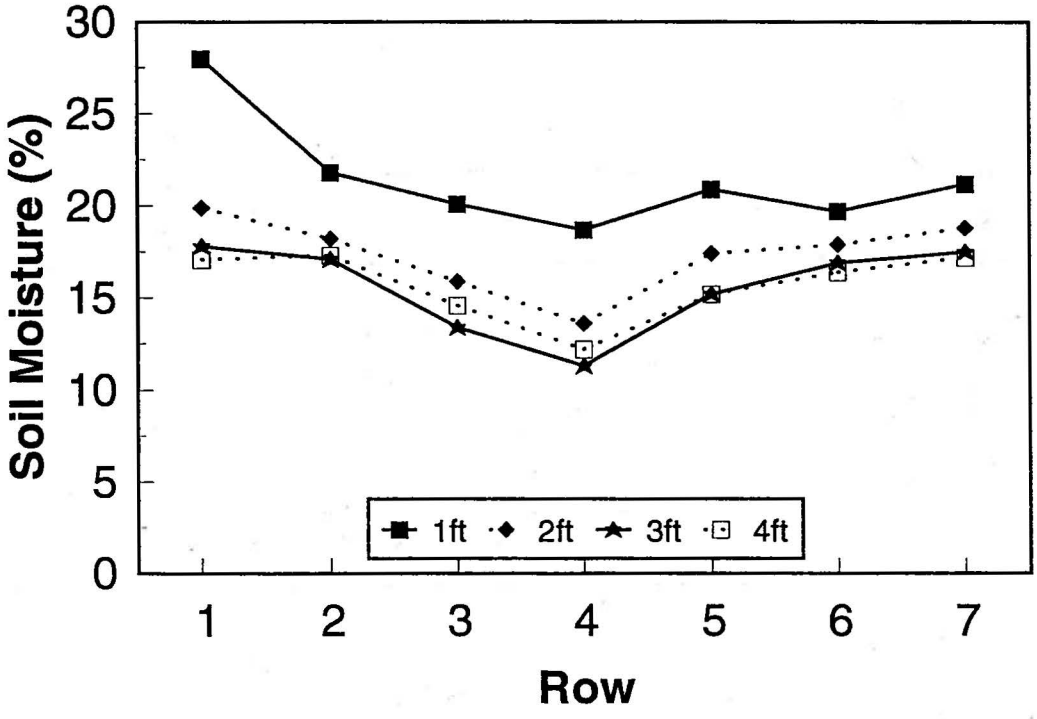
McCook Site 2



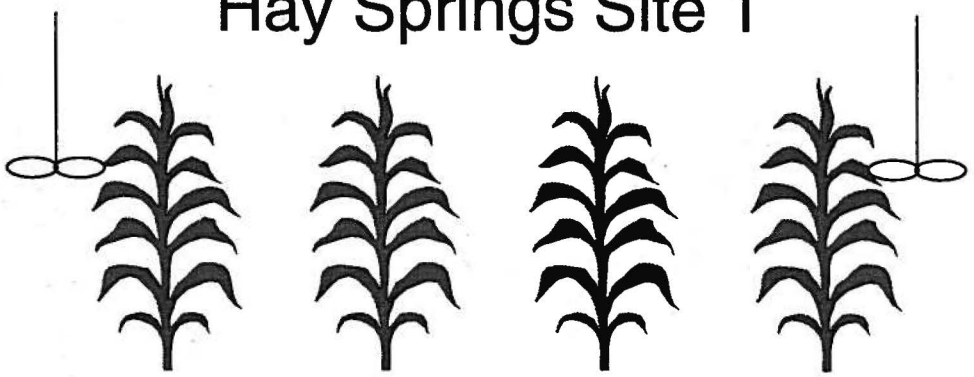


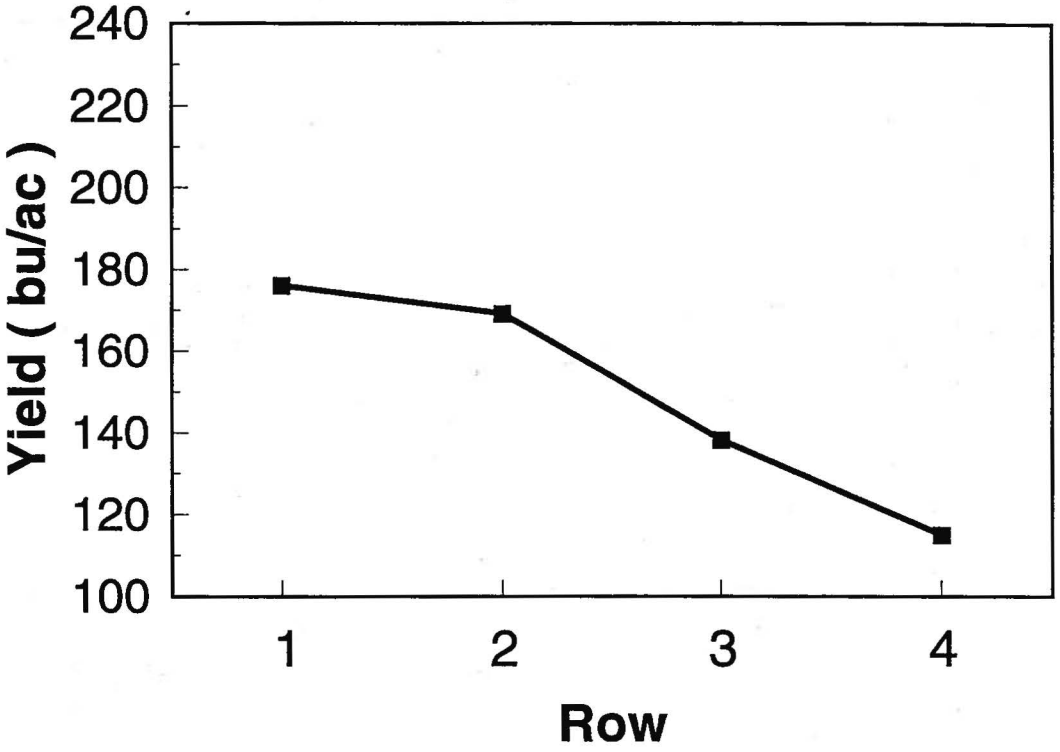
McCook Site 3

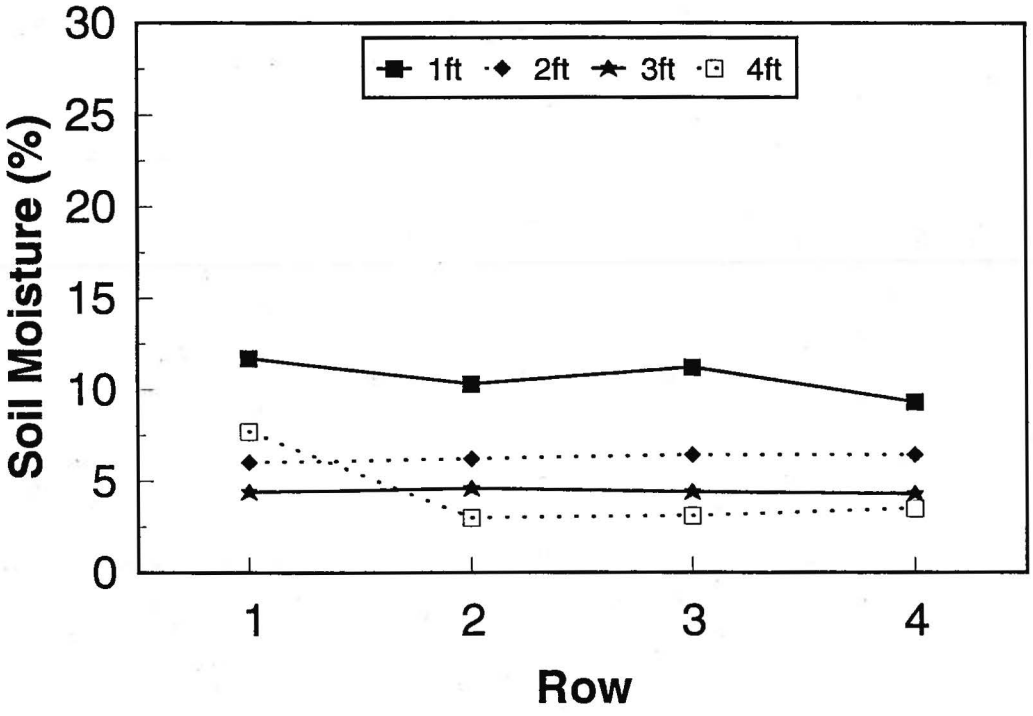




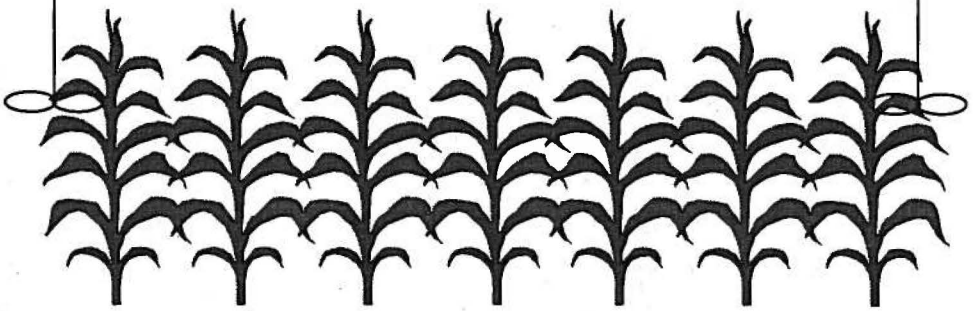
Hay Springs Site 1

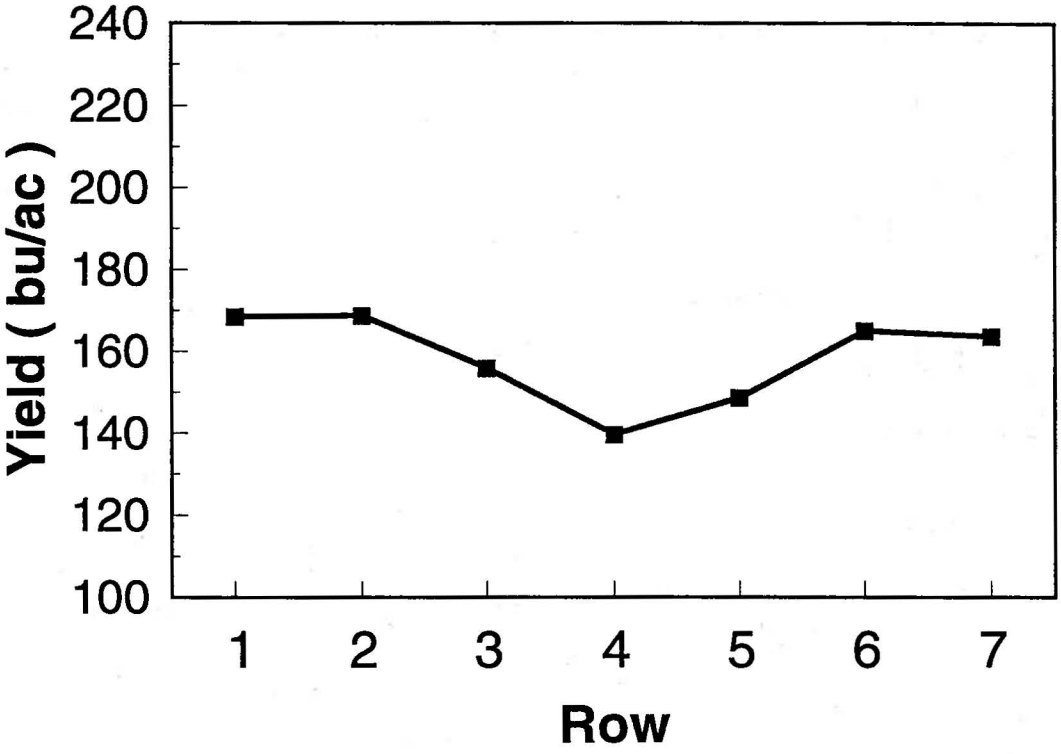


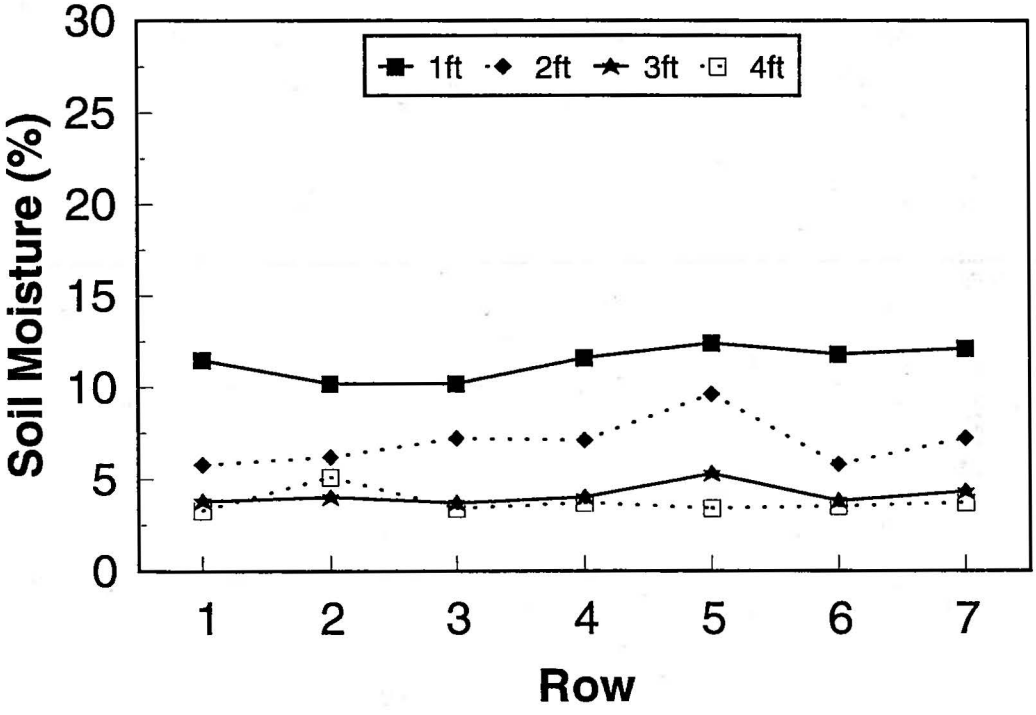




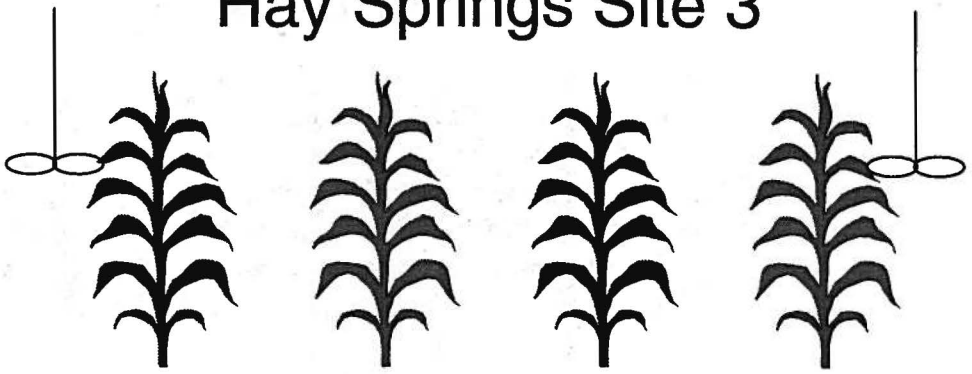
Hay Springs Site 2

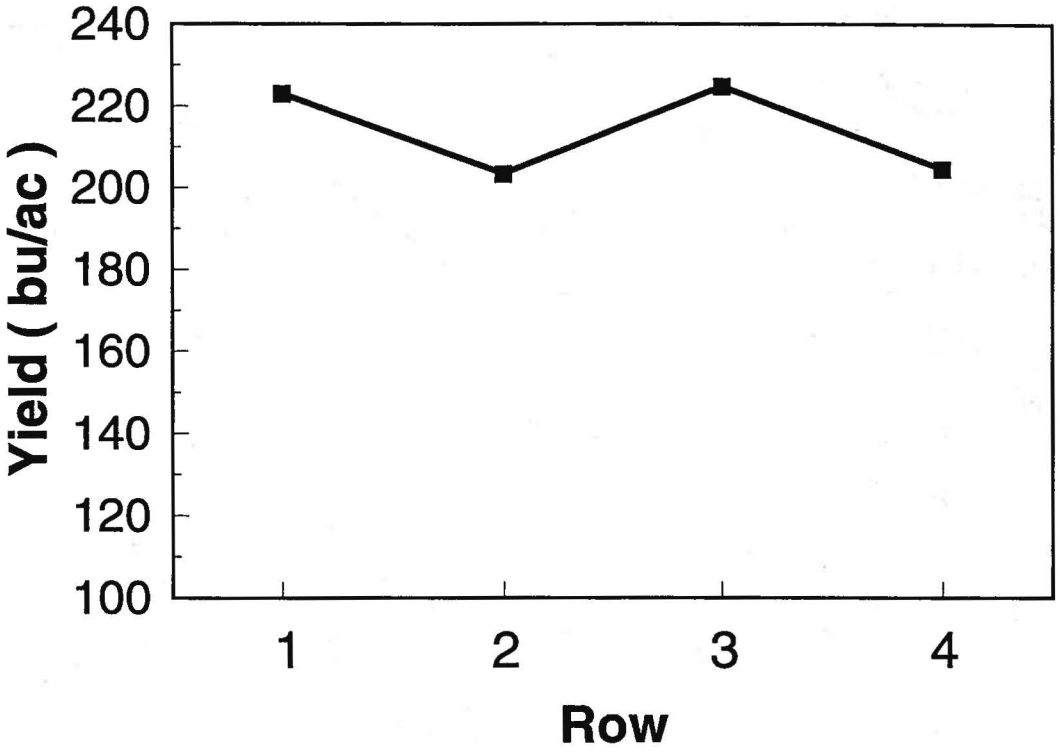


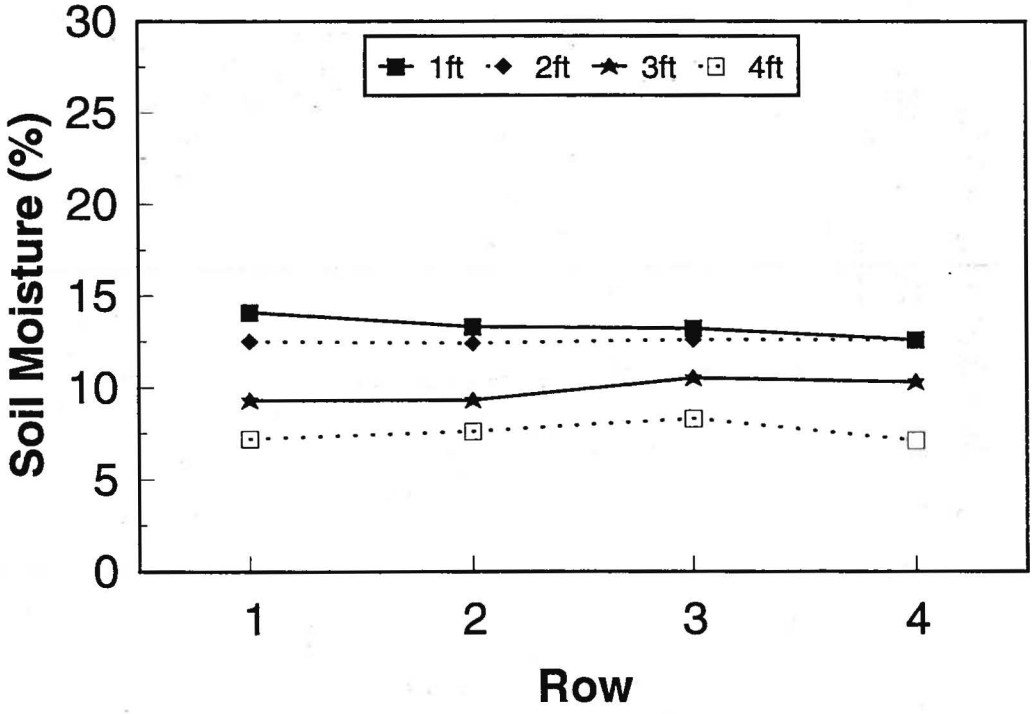




Hay Springs Site 3







Hay Springs Site 4