

SITE DESCRIPTION FOR THE UNIVERSITY OF NEBRASKA'S SANDHILLS  
AGRICULTURAL LABORATORY

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## ABSTRACT

The Sandhills Agricultural Laboratory is operated by the University of Nebraska. The laboratory is located in the south-central part of the Nebraska Sandhills near Tryon, Nebraska (41° 37' N; 100° 50' W). The laboratory is surrounded on the west and south by native rangeland vegetation, on the south by a large field of corn irrigated by a center pivot, and on the east by wheat stubble. This site is appropriate for moisture stress studies since rainfall is almost always inadequate to meet evaporative demands of agricultural crops during most of the growing season and the sandy soils (Valentine fine sand) at the site do not store large quantities of water. Various levels of water stress are achieved through irrigation from solid set sprinklers.

## HISTORICAL SUMMARY

Remote sensing research began at the laboratory in 1978 with a canopy temperature study designed to determine relationships between crop water use, grain yield and canopy temperatures of corn and sorghum. In 1979, a study was conducted to demonstrate the feasibility of using canopy temperatures to schedule irrigation in corn. In 1980 a pilot study was conducted to determine the feasibility of growing soybeans in the Sandhills and to evaluate the use of canopy temperatures in monitoring crop water stress.

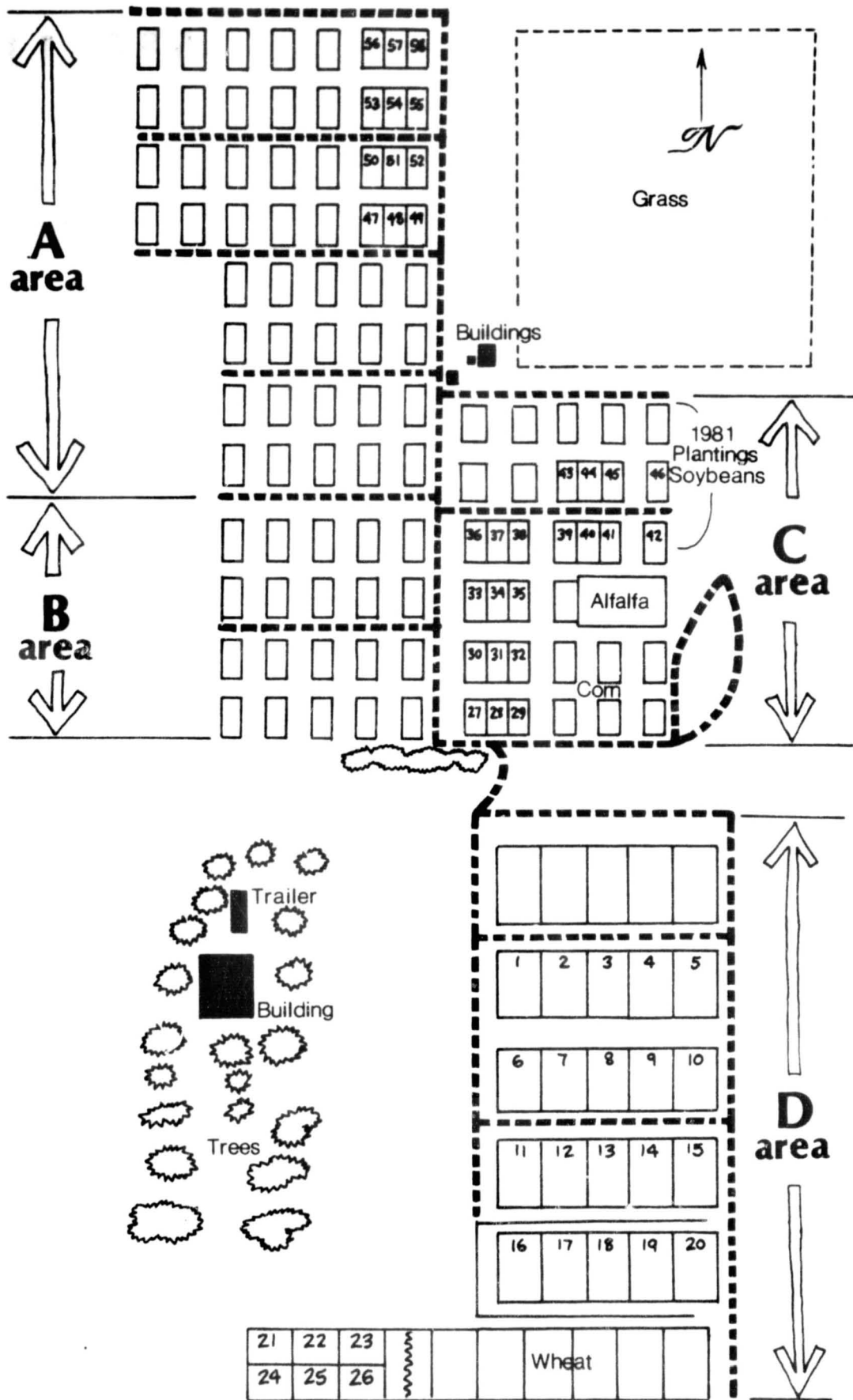
In 1981, the laboratory became involved in AgRISTARS research using the eight-band Barnes radiometer, which simulates the Thematic Mapper wavebands. Experiments have been conducted on corn and soybeans. These experiments have addressed techniques for remote estimates of biomass, leaf area and yields and water stress, canopy geometry and hybrid effects on canopy reflectance. Although the AgRISTARS program no longer exists, research in this area has continued.

The laboratory has been involved in a broad range of agricultural research in addition to its remote sensing efforts. Studies have been conducted on nitrogen levels in corn, corn-grass inter-cropping systems, variety testing, wheat, sorghum and soybean agronomic studies. In addition, studies have been conducted on the inter-actions between irrigation and spider-mite populations. Physiological studies of leaf-water potential, stomatal resistance, photosynthesis and transpiration are also conducted. In short, the laboratory has been the site of a wide range of studies of importance to agricultural scientists.

## 1984 STUDY

The areas of primary interest in 1984 were located in the south portion of the lab, known as D area and in C area (see figure). There were sixty plots used in this study. Each plot measured approximately 18 meters E to W and 9 meters N to S. Twelve plots were planted to soybeans (cultivar, Corosoy). The remaining 48 plots were planted in a completely randomized design to five hybrids of corn. Four of these plots contained a population study of Pioneer 3901, wherein the populations ranged between 15000 and 30000 plants/ha. The remaining 44 plots of corn were planted to Pioneer 3901, B73xMol7, and three experimental hybrids designated: S3, S6 and S12. Two irrigation treatments were used: 1. full irrigation and 2. 33% of full irrigation.

Phenology and plant height measurements were made weekly. Wet and dry weights of leaves, ears and stalks were obtained every two weeks. Canopy temperatures were measured several times weekly between 1400 and 1600 local time. Canopy reflectances were measured in the Thematic Mapper wavebands approximately weekly, or whenever conditions permitted. Diurnal studies of canopy temperature, photosynthesis and stomatal resistance were conducted on selected days. Sixty feet of row were harvested per plot for grain-yield estimates at the end of the season. Soil moisture contents were measured with a neutron probe on a weekly basis. Phenological data were collected at least twice weekly and on a daily basis during the pollination period.



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