**MAT 458**

**Application of Factorial Design in Soil Field Capacity**

**Project Proposal**

**Background**

Agriculture is an ever-growing concern in the modern world. With growing populations occurring on every continent, the concept of food and water scarcity are no longer relegated to the realms of academia. Food and water scarcity are now a fact of life and will present unprecedented challenges in the coming decades. While addressing these concerns, scientists are conducting experiments to determine how to increase total and percentage yield for staple crops. One crop of particular concern is maize. Maize is main staple crop across many cultures and is center to the production of many industries.

Maize is the most produced crop on this planet, surpassing even that of wheat and rice. Most of this crop is not used for human consumption, but is instead used in products such as ethanol, animal feed, cornstarch and corn syrup. With increasing populations and increased demands on energy consumption, optimizing resources used to grow maize is becoming important. One such resource is water. Scientists who specialize in growing maize want to know the optimal amount of water needed to achieve maximum growth crop growth. Part of this process involves measuring the soil field capacity.

The United States Department of Agriculture (USDA) conducted an experiment in an attempt to understand field soil capacity. This experiment was conducted at the Limited Irrigation Research Facility (LIRF) in Greeley, Colorado. The average annual precipitation in the region is around 350 mm. Irrigate maize is the dominant crop grown in the region. Maize grain yields are around 11 Mg per hectare in this area. Olney fine sandy loam soil is primary used in the region. Other less frequently used soils are Nun clay loam and Otero sandy loam.

**Purpose of Project**

The purpose of this project is to test for differences in soil field capacity at LIRF, with respect to water stress and soil depth. There are five treatments plus a control, where each treatment represents a proportion of the control. Each treatment is labeled: T1, T2, T3, T4, T5, T6. T1 represents the control, meaning that the soil will be given 100% crop water requirements. There are seven levels of soil depth: (0-15 cm), (15-45 cm), (45-75 cm), (75-105 cm), (105-135 cm), (135-165 cm) and (165-200 cm). Each treatment combination has a sample size of four, giving a total sample size of 168.

The data is first gathered from the USDA database. The data would be imported onto SAS 9.4 where analysis will begin. The assumptions for ANOVA will be checked, these include independence, equal variance and normality. ANOVA will be conducted as a fixed two-way factorial design. Examining the data, we expect that there would be no difference in treatment. All results from the ANOVA will reported along with the code and the dataset