

Modeling 100 Years of Water-use of a No-Till Double Crop Forage Production System

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ABSTRACT

Forage production in past years has been limited to one crop per year by producers. Due to land use constraints and the need to remain economically viable, agricultural producers need to strive for new ways to remain productive. It may be possible with improved no-till equipment and management to harvest two forage crops in one year. The objective of this project was to look at 100 years of historical weather data and determine the theoretical potential to grow two forage crops in one year. To complete this objective daily reference evapotranspiration (ET) and ET budgets for peas and sorghum forage crops were calculated using the Penman equation for each of 100 years. The Penman equation requires daily maximum and minimum temperatures, precipitation, average wind speed, solar radiation, dew point, and relative humidity. All of this data was available from 1991-2005. For 1905-1990 only daily maximum and minimum temperatures and precipitation were available. Remaining variables for those years were extrapolated using averages from 1991-2005. From 1905-1990, a pea crop was estimated to be stressed 43% (soil water equivalent was less than 111.76 mm in loamy soil) of the time and at a permanent wilt point 8% (soil water equivalent was 0mm of water in loamy soil) of the time. Sorghum was stressed 66% of the time and at a permanent wilt point 20% of the time. From 1991-2005 peas were stressed 20% of the time and at a permanent wilt point 0% of the time. The sorghum was stressed 33% of the time and at a permanent wilt point 7%. From 1905-2005 peas were stressed 40% of the time and at a permanent wilt point 8% of the time. Sorghum was stressed 61% of the time and at a permanent wilt point 18% of the time. The results show that with proper management, advanced equipment, and available soil water, it may be possible to harvest two successful forage crops in one year for most years.