Dryland Systems Yields Over 24 Years As Impacted By Potential ET Site and Soil Landscape Position

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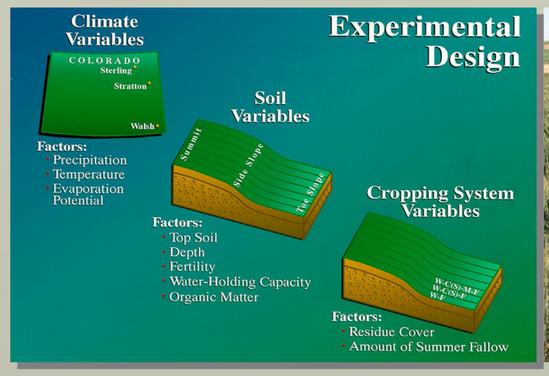
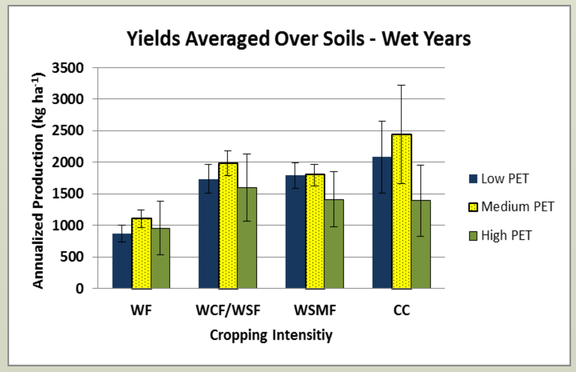
ABSTRACT No-till management in the Central Great Plains has allowed for more diversified cropping systems with both spring and fall planted crops. The success of failure of a dryland cropping system in this semi-arid region often depends on the timing and amount of precipitation. Our research over environmental factors of potential ET (PET) and soil types along a catena landscape has focused on diversity of cropping system. This study has allowed for the evaluation of systems during above to average precipitation years to predominately drought years. The 1st 12 years of the study were predominately above average rainfall (wet years) whereas the 2nd 12 year period was in moderate to severe drought (dry years). Annualized cropping system yields during the wet years showed that as cropping intensity increased so did the yields with the highest on the toeslope landscape across all 3 PET sites. Average annualized cropping system yields during the dry years (13-24 years) showed yields on toeslopes were higher but cropping system has less impact. This is due to a change in rotations after the 1st phase whereby wheat (*Triticum aestivum*)-fallow (WF) and wheat corn (*Zea mays* L.)-millet (*Panicum miliaceum*)-fallow (WCMF) were replaced by WCM and WWCM systems. This resulted in only one system that had a summer fallow phase which was WCF. Averaged over the three landscape positions in the dry years at each PET site, annualized yields were similar across all rotations with the highest yields found in the continuously cropped (CC) system which also had the highest variability. Comparisons of wet and dry years averaged over soils, indicated that all rotations had higher average annualized yields compared to the WF system at all PET locations.

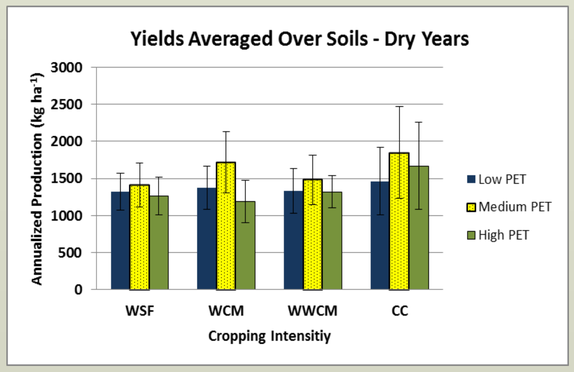
EXPERIMENTAL DESIGN AND METHODS



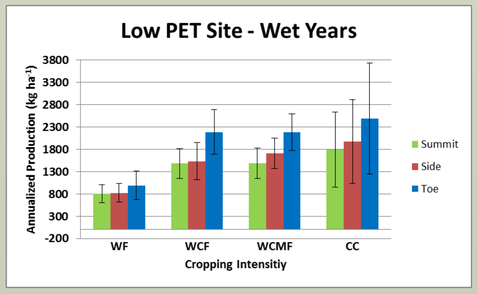
- No-till rotations of winter wheat (Triticum aestivum) – fallow (WF), wheat-corn (Zea Mays) or sorghum [Sorghum anthus annus (L.) Moench] – fallow (WCF/WSF), and wheat-corn/sorghum-millet (Panicum miliaceum) – fallow (WCMF), and continuous cropping (CC) and planted native grass species were in place during the 1st 12 years (Wet Years). The 2nd 12 year period (Dry Years) the WF and WCMF systems were dropped and replaced with WCM and WCM.
- Each phase of each rotation is present each year. Grain and above ground biomass samples were taken at each PET site by landscape position. Grain yields were taken using a small plot combine and corrected to a dry weight.
- Annualized yields were determined by adding up the yields of each individual phase of a cropping system and dividing it by number of years in the rotation. Example: 6 years of wheat yields from the wet years of a WF system divided by 12 years is the annualized yield.
- The error bars on the graphs are SEM.
- This study is currently in the 3 phase of cropping systems which include a grain only based system, a forage only based system and a mixed grain and forage based system.
- This past cropping season concluded the 30th year of the Long-Term Agroecosystem Study.

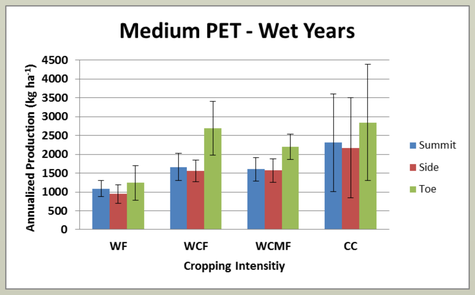
Potential ET LOCATION

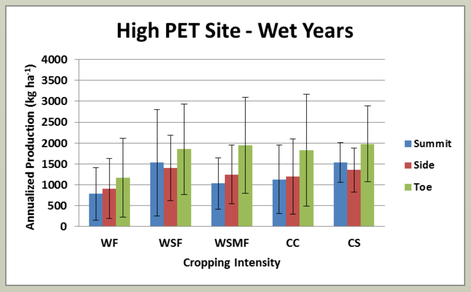


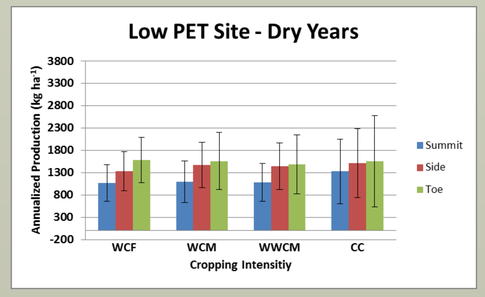


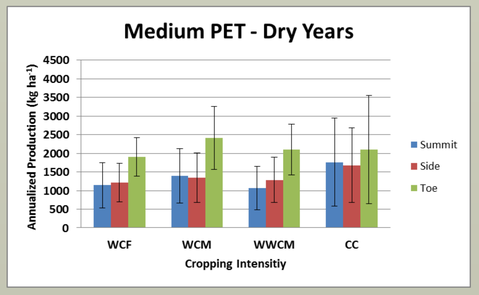
SOIL LANDSCAPE POSITION

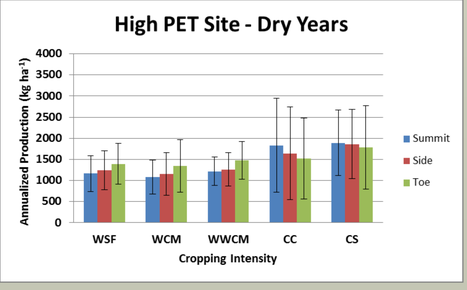




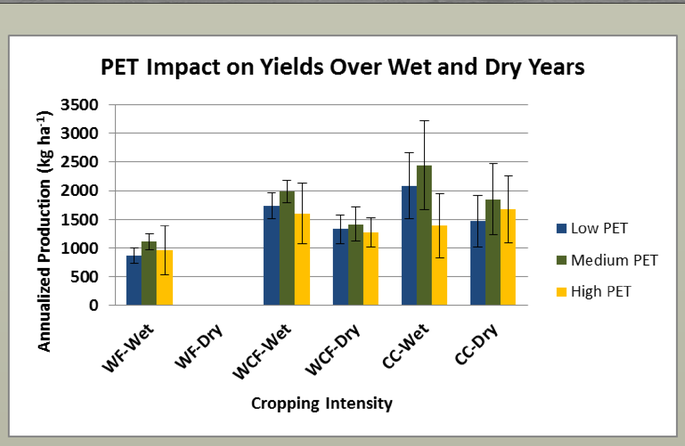


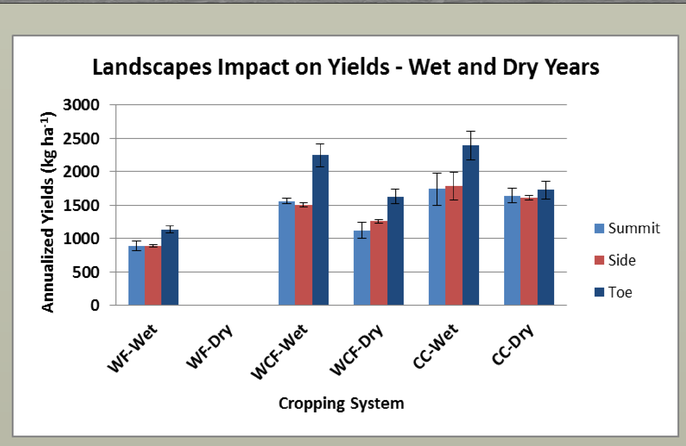






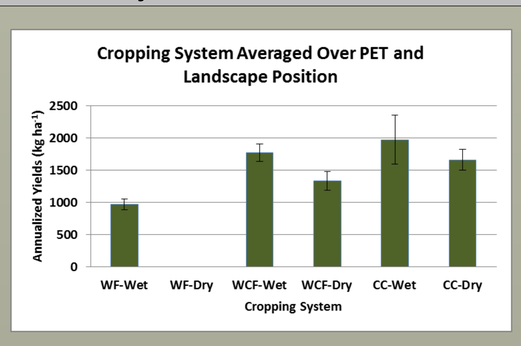
CROPPING SYSTEMS YIELDS OVER WET AND DRY YEARS





CONCLUSIONS

- No-till rotations that maximize production on average have higher yields than the traditional WF system in both wet and dry years.
- Landscape position had more impact in the wet years.



Acknowledgments

Our Producers

Gilbert Lindstrom, Ray, Ben and George Miltonburger, and Bill Wright.

SUPPORT

USDA-ARS Plains Area Fort Collins, CO

Soil & Crop Sciences Department.