Edible dry beans as part of improved crop rotations in Wyoming

Project Design, Year 1 & 2 yield data, and Request for Year 3 & 4 Funding

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Acknowledgements

Preator Bean and ADM for supplying the seed.

PREC staff for help with the planting, sampling, and harvesting.

Study design

- Two tillage systems: minimum till (MT) and conventional till (CT);
  - MT: direct harvest; CT undercut, windrow, combine;
- Two irrigation levels: full and 75% of full;
- Four varieties: Poncho, COSD-7, Monterrey, Windbreaker;
- Imbedded in long-term tillage x irrigation rotation study.

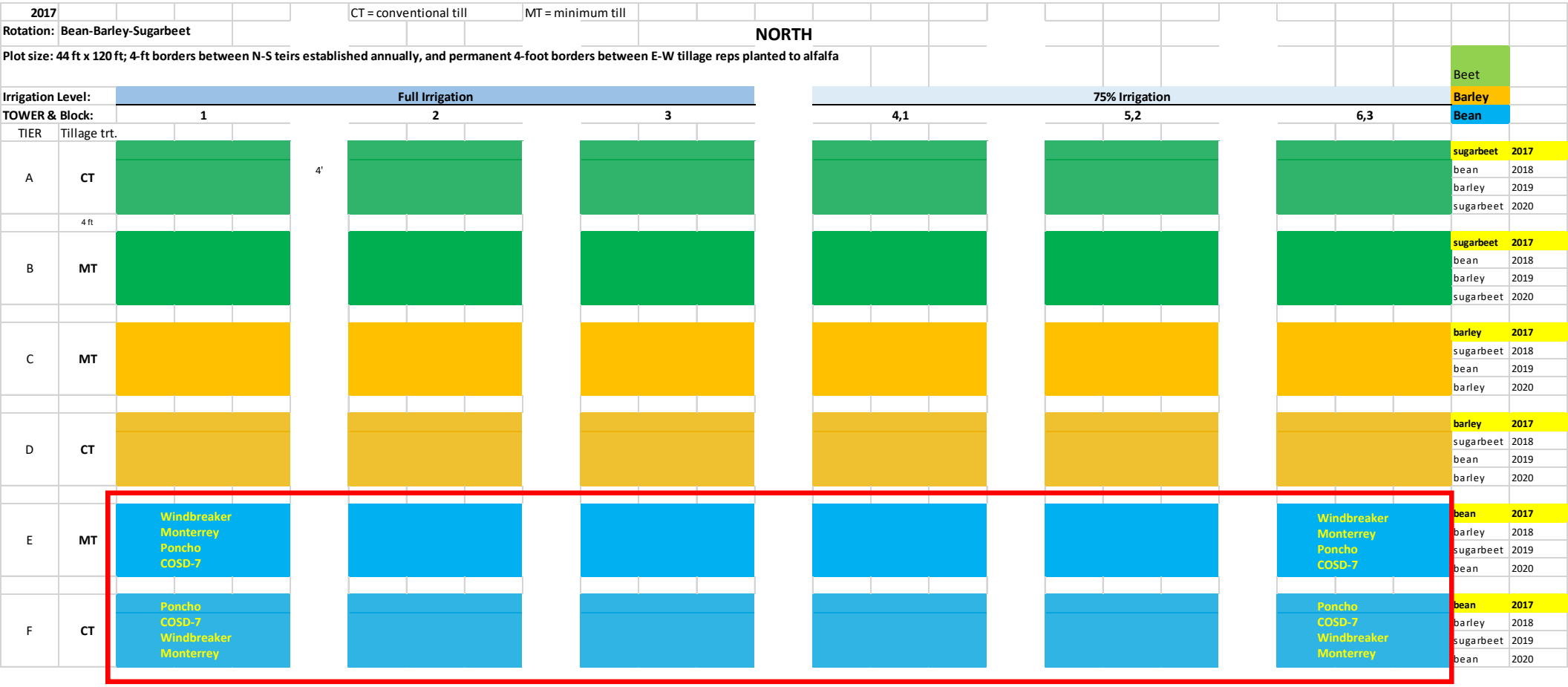
Irrigation Level:		Full Irrigation						75% Irrigation					
TOWER & Block:		1		2		3		4		5		6	
TIER	Tillage trt.												
E	MT	1	Windbreaker	1		1		1		1		1	
		2	Monterrey	2		2		2		2		2	
		3	Poncho	3		3		3		3		3	
		4	COSD-7	4		4		4		4		4	
F	CT	1	Poncho	1		1		1		1		1	
		2	COSD-7	2		2		2		2		2	
		3	Windbreaker	3		3		3		3		3	
		4	Monterrey	4		4		4		4		4	

Tillage practices

	Sugarbeet	Bean	Barley
Conventional (CT)	**Previous Fall (following barley):** **Moldboard plow to ~9 inches** **Rolling mulcher x 2 or disk to sufficiently level** **Spring:** **Disk to incorporate fertilizer**	**Previous Fall (following beet):** **Moldboard plow to ~9.** **Possible deep rip following beets if compaction detected.** **Rolling mulcher x 2 or disk to level** **Spring:** **Disk to incorporate fertilizer**	**Previous Fall (following bean):** **Moldboard plow to ~9 inches** **Rolling mulcher x 2 or disk to level** **Spring:** **Disk to incorporate fertilizer**
Minimum till (MT)	**Previous Fall: none, or strip till to prep seed bed** **Spring:** **Strip till following fertilizer broadcast (unless it was done in the fall)**	**Previous Fall: none, or strip till to accommodate drill. Possible deep rip following beets if compaction detected.** **Spring: No-till**	**Previous Fall: none, or strip till to accommodate barley drill** **Spring: No-till**

Layout of beet-bean-barley tillage x irrigation study, 2017

Initiated in 2014

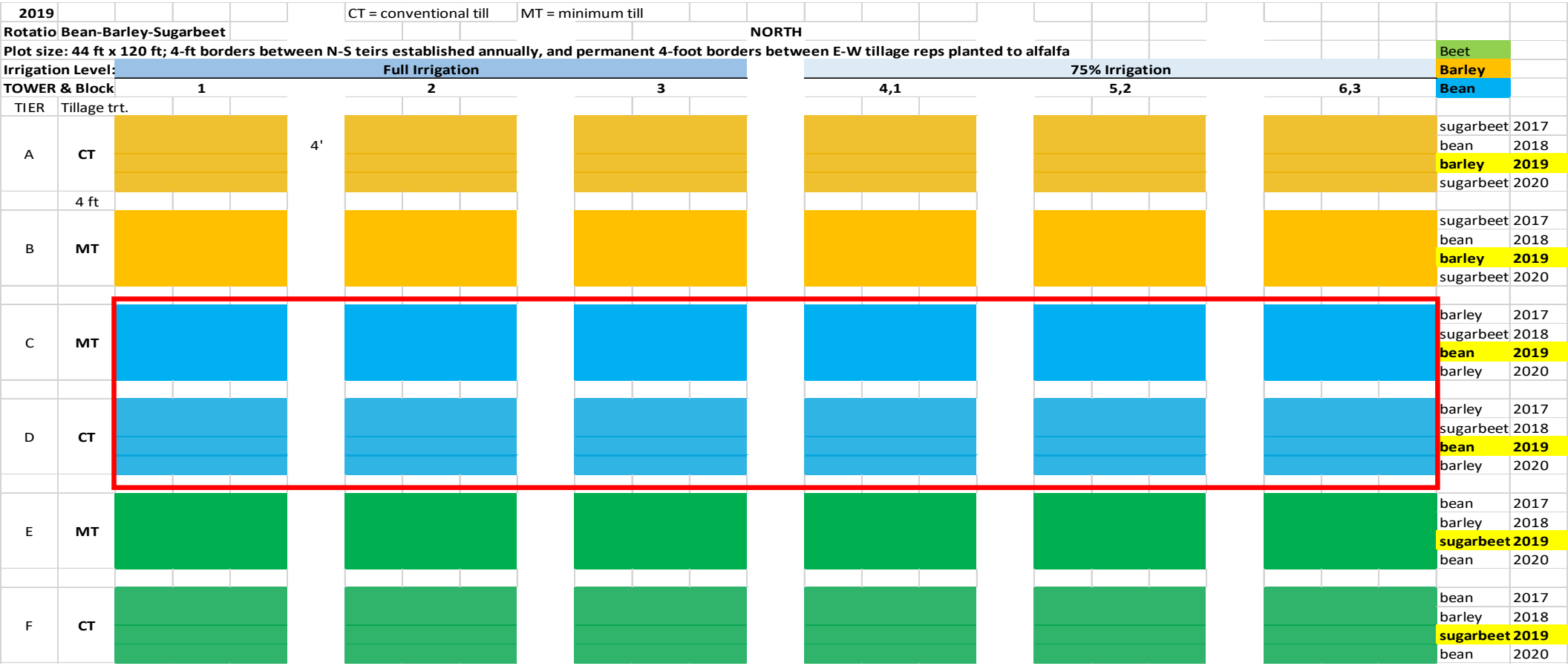


Layout of beet-bean-barley tillage x irrigation study, 2018

Initiated in 2014

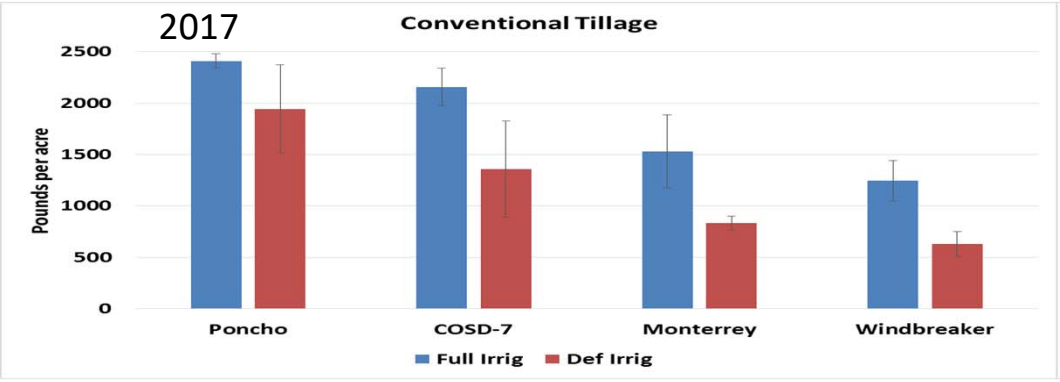
Layout of beet-bean-barley tillage x irrigation study, 2019

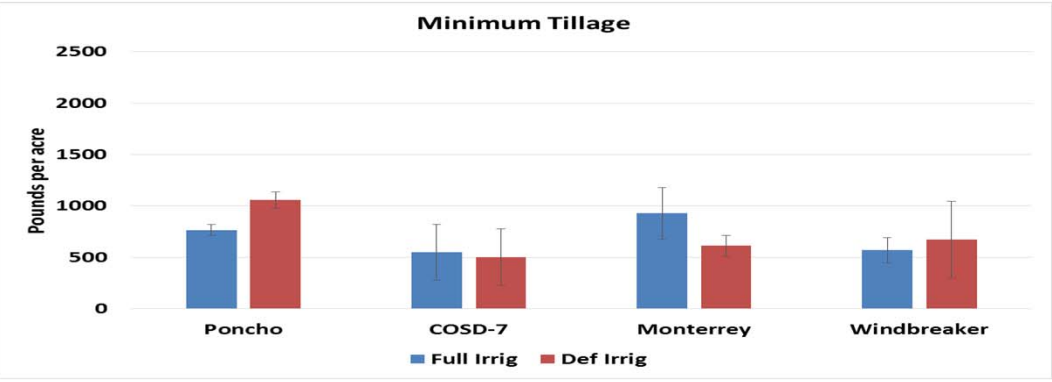
Initiated in 2014

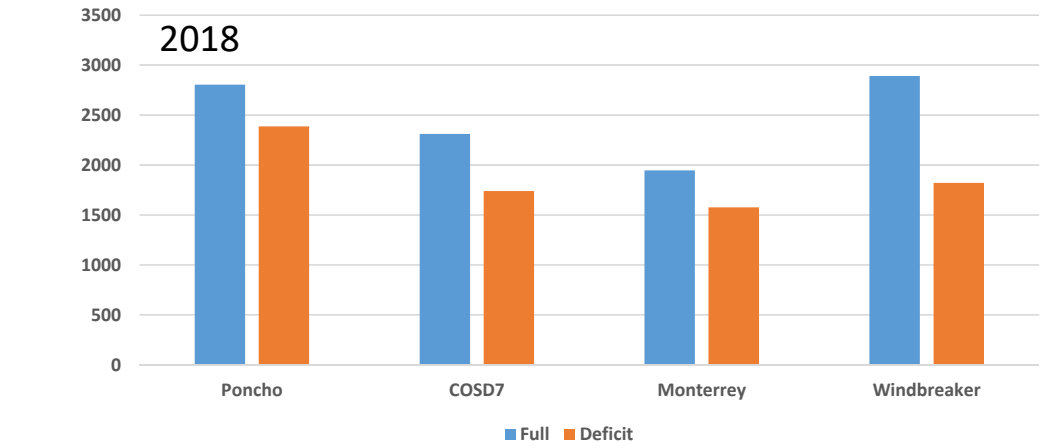


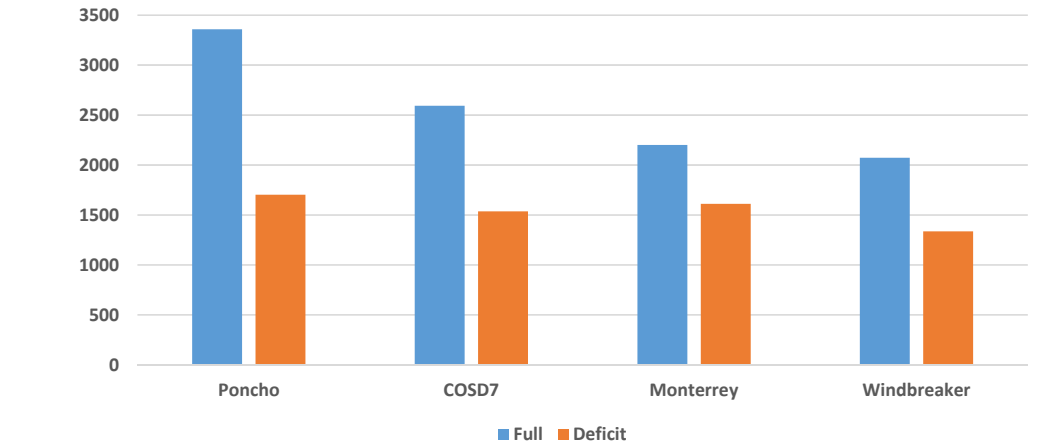
Dry bean yields, hand harvested plots, 2017 & 2018

- Similar but slightly higher yields under CT, but much higher yields under MT in 2018 compared with 2017;
- Under deficit irrigation and MT, cultivar didn't matter, and COSD-7 and Monterrey were apparently not affected by tillage;
- Harvest losses were mostly about 40%, ranging from zero to 55%.



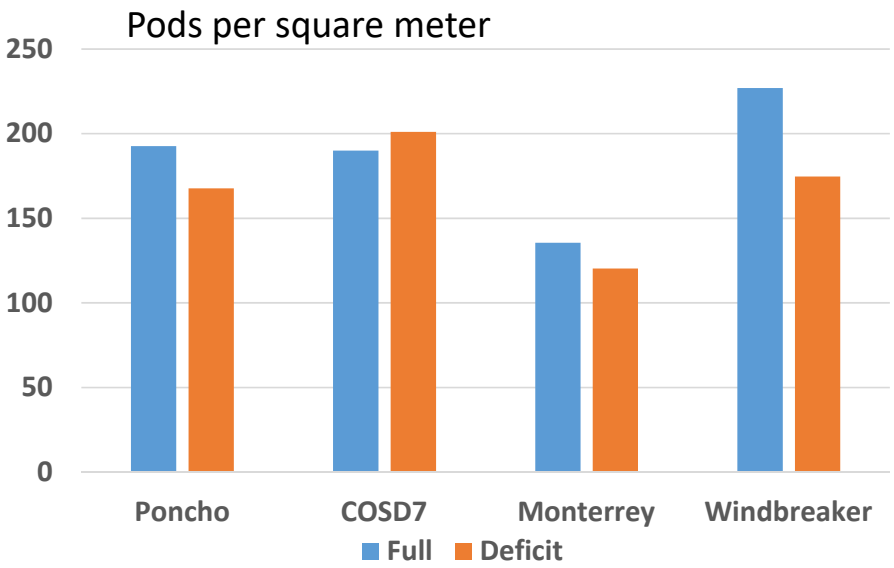


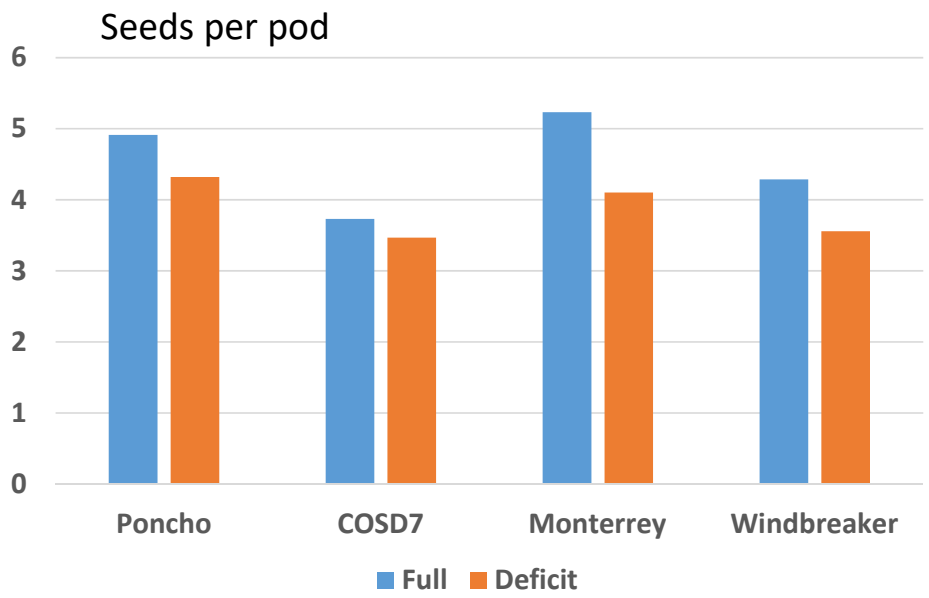




Yield components, 2019

- On average, full irrigation increased the number of pods by 25%
- And the number of seeds per pod by 18%





Research outcomes

- Data indicate variety performance is affected by tillage and irrigation amount;
- With effective weed control, minimum tillage slightly out performed conventional tillage;
- Harvest losses were significant, but need more analysis;
- Still analyzing soil parameters, including biological nitrogen fixation, total and labile soil organic matter components, and nitrogen and phosphorus use efficiency;
- Costs shared with Wyoming Dept of Ag specialty crop grant, and grants supporting other research in the long-term rotation study;