



Perennial Peanut Living Mulch for Low Input Sorghum and Millet Production

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Introduction

Grain sorghum (*Sorghum bicolor*) and pearl millet (*Pennisetum glaucum*) are both globally important warm-season, annual cereal grain crops. Small-scale farmers who grow these grains can be limited by access to fertilizers and human labor. **Agricultural low input systems** use few commercial inputs, alternative nutrient sources, and weed suppression methods that can save labor.

Living mulch is a cover crop that is not killed before planting the target crop. Instead, it is maintained as a ground cover throughout and between growing seasons. Perennial rhizoma peanut (*Arachis glabrata*; PP) is a warm-season, nitrogen-fixing legume used as a living mulch in citrus and vegetable production systems. A stand of PP is low-growing and can remain established for many years, so it is a good living mulch candidate.

When multiple plants exist in an agricultural system, species compete for limited sunlight, moisture, and nutrients. Selecting a **seedbed preparation method** to suppress PP living mulch before planting sorghum or millet is a vital planning step to reduce competition and improve grain yields.

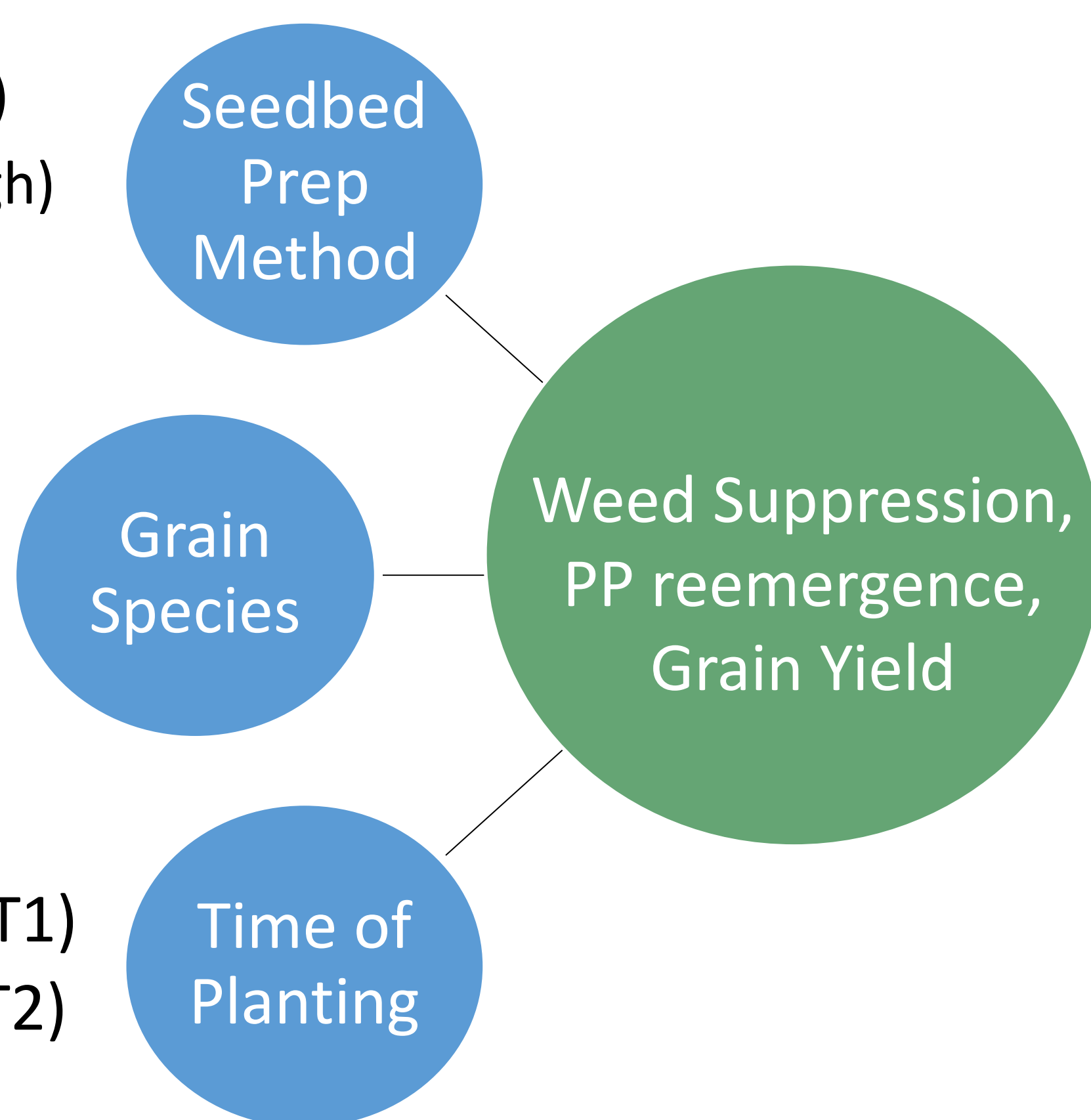
Methods

We prepared an established PP field at the Texas A&M AgriLife Research Station in Stephenville, TX USA as a seedbed for planting sorghum and millet. We measured the effects of three factors (seedbed preparation method, grain species, and time of planting) on weed suppression, PP reemergence following the grain growing season, and grain yield. We used a randomized strip-strip experimental design and replicated over 2 growing seasons (2013, 2014). Grain dry biomass was taken per treatment combination. Weed dry biomass and live PP counts (45 days after seedbed treatment) were also taken in 1-m² quadrants.

- Till (5 cm deep)
- Mow (4 cm high)
- No Till

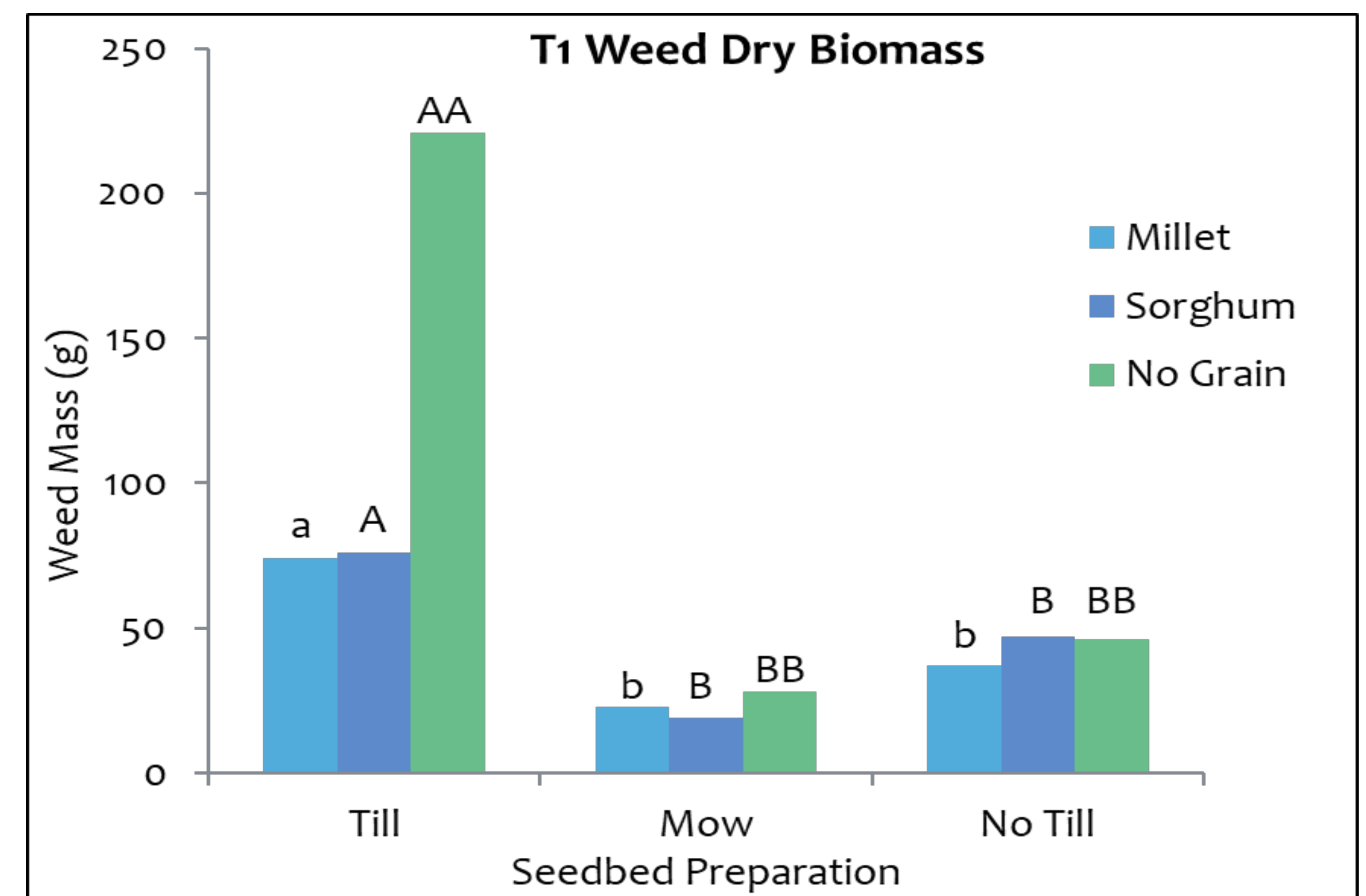
- Sorghum
- Millet
- No grain

- Late April (T1)
- Mid June (T2)



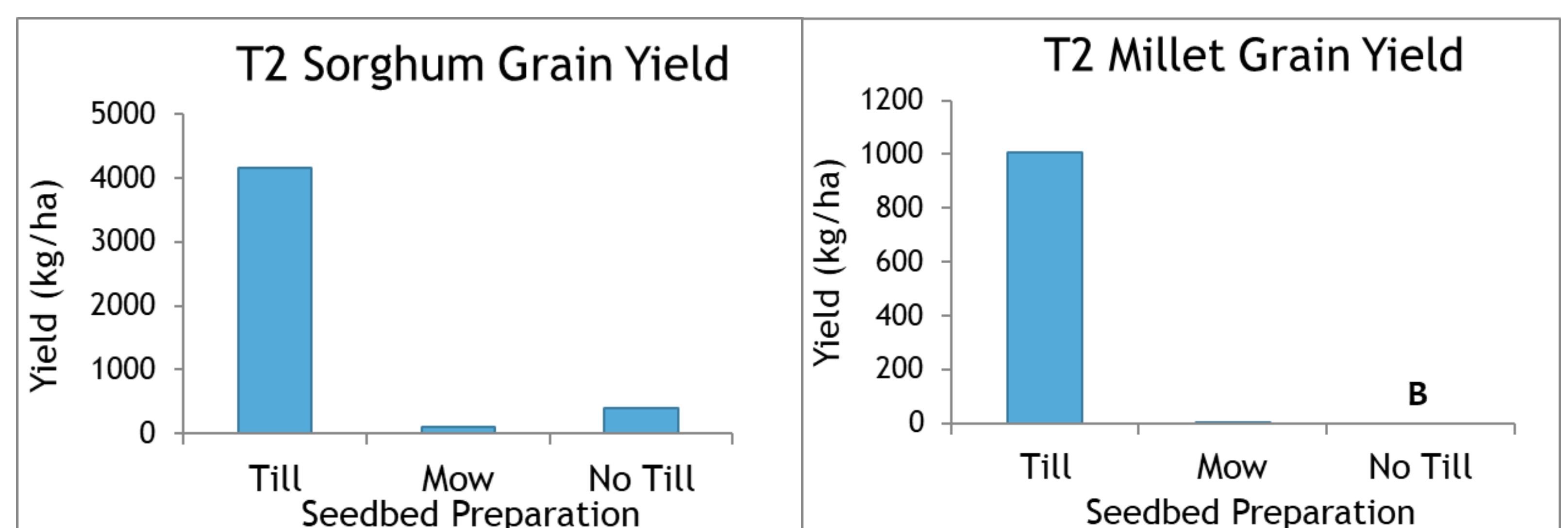
Seedbed preparation: mow (left) and till (right) before planting grains.

Results



Weed dry biomass (g) across seedbed preparation methods and grain species. Letters above each bar denote difference ($P \leq 0.05$). Weed dry biomass with late April (T1) grain sowing was greater in the tilled seedbeds than mow or no till. The same was true in mid June (T2); data not shown. Mowing and practicing no till in the PP living mulch were more effective weed suppression methods than tilling.

PP Reemergence	
2013	2014
<ul style="list-style-type: none"> • Greater in T2 than T1 across seedbed and grain treatments • 2x greater in no till than till in T2 • 3x greater in mow than till in T1 	<ul style="list-style-type: none"> • 2x greater in T1 than T2 across seedbed and grain treatments • Greatest in till • 2x greater in mow than no till
Possible contributing factors to opposing results include differing winter soil moisture and initial PP population across times and seedbed prep methods.	



Tillage was the only seedbed preparation method to yield grain in T1, but the yield was still very low. This could be due to combined low rainfall and soil N.

Conclusions

- ✓ Tilling was the most effective seedbed prep method for grain production.
- ✓ Tilling was also the least effective weed suppression method.
- ✓ Planting later in the season yielded the most sorghum and millet grain.
- ✓ Mowing resulted in steady PP reemergence at both planting times.

Further Research Questions

- How would this system perform over 5+ years?
- How strip-tillage where grain seed is sown perform?
- What effects do seedbed preparation methods have on soil health?
- What is this system's economic feasibility?
- How would animal grazing compare to mowing?