Multi-Purpose Crops: A Perspective on Cover Crops

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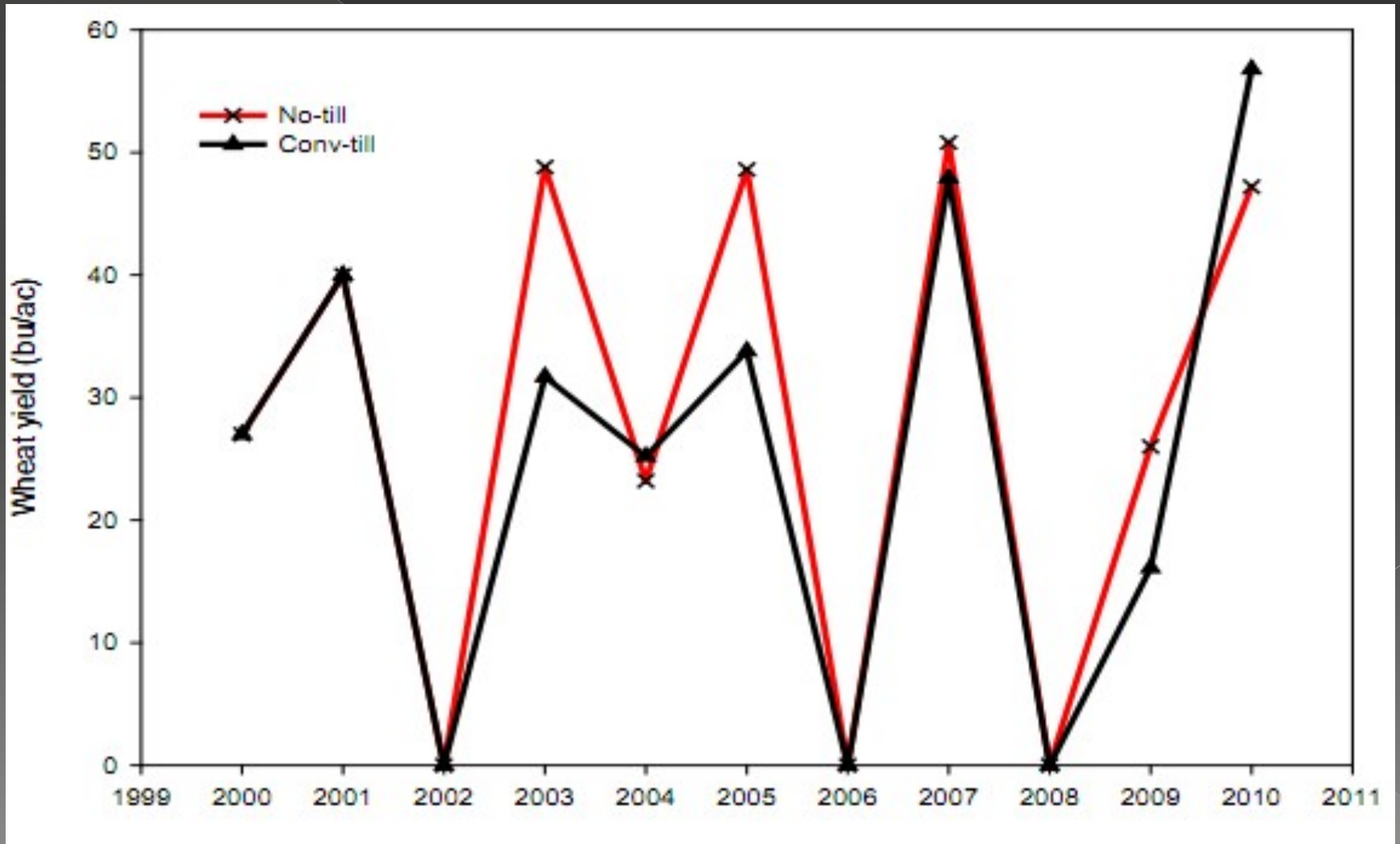
Traditional Cover Crops

- Improve soil structure
- Increase organic matter
- Biologically fix nitrogen
- Translocate nutrients from subsoil
- Reduce soil temperature
- Increase diversity of rotation
- Increase cash crop yield??

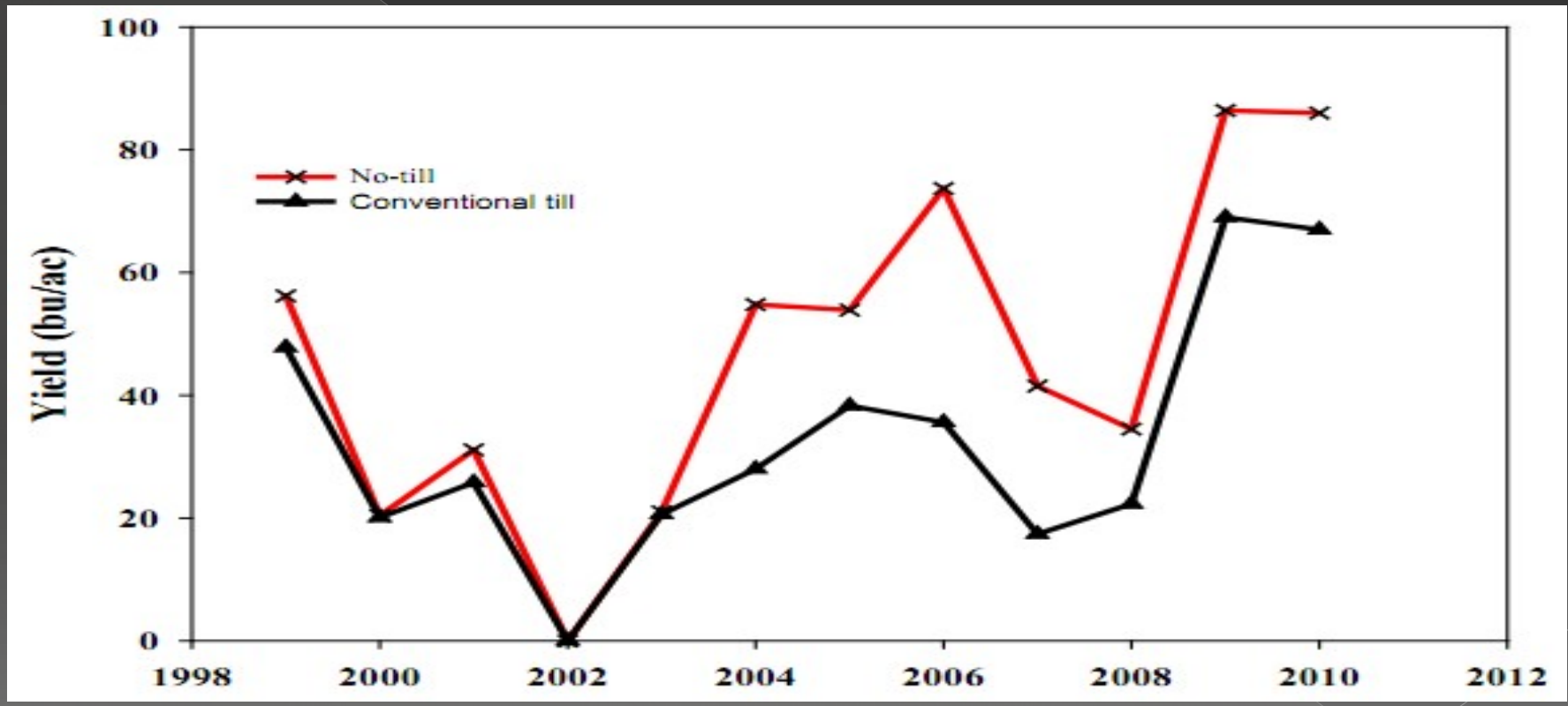
Available Data

- Much of our data has focused on continuous wheat for grain with summer cover
- This has not influenced wheat grain yield
- There is evidence of increased Soil N availability from Legumes
- Reduction of subsoil moisture appears to offset benefits
- Research data shows that wheat ,only periodically, responds Positively to No-till

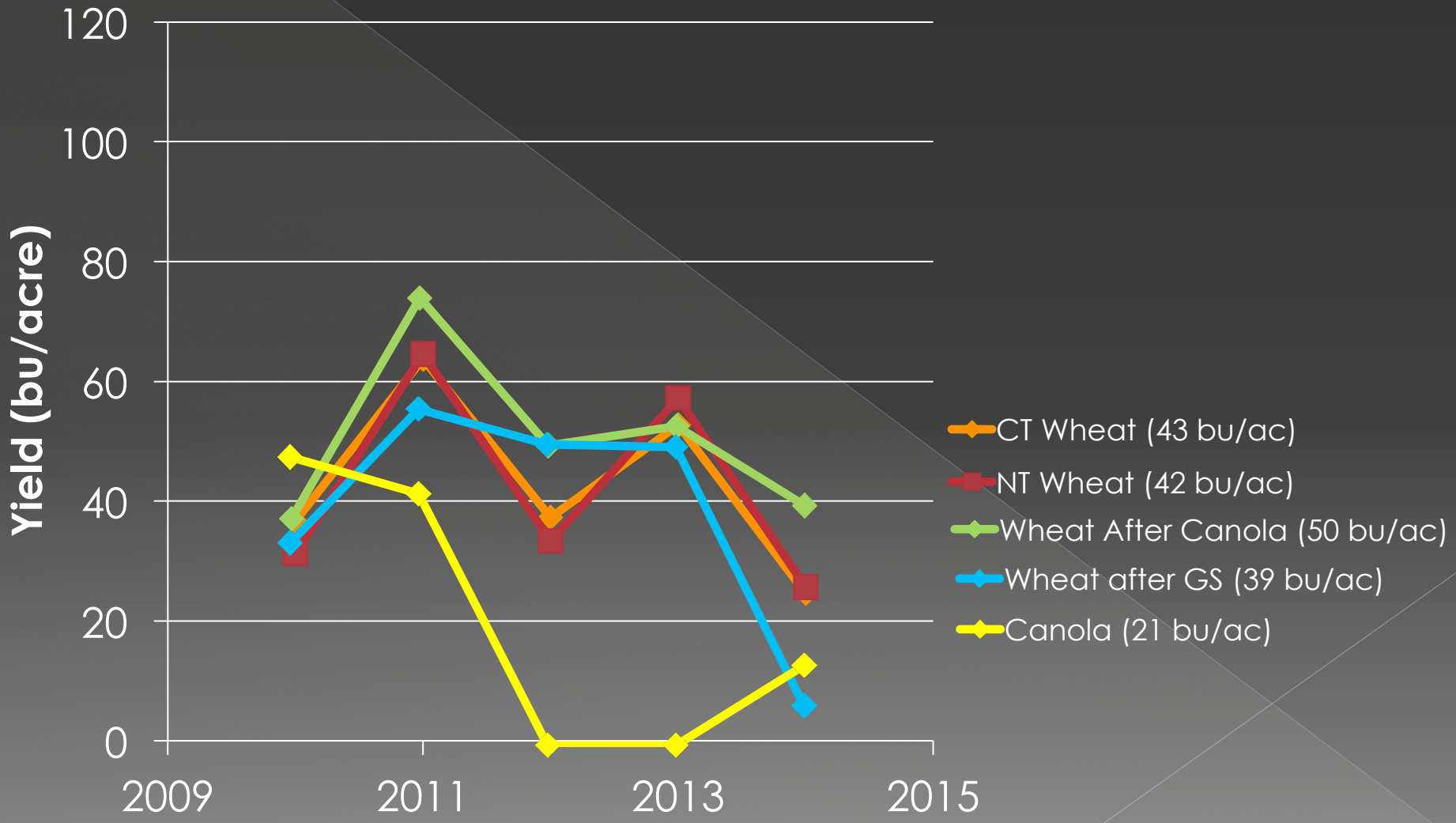
Long-Term Wheat Yields in Goodwell



Long-Term Sorghum Yields in Goodwell



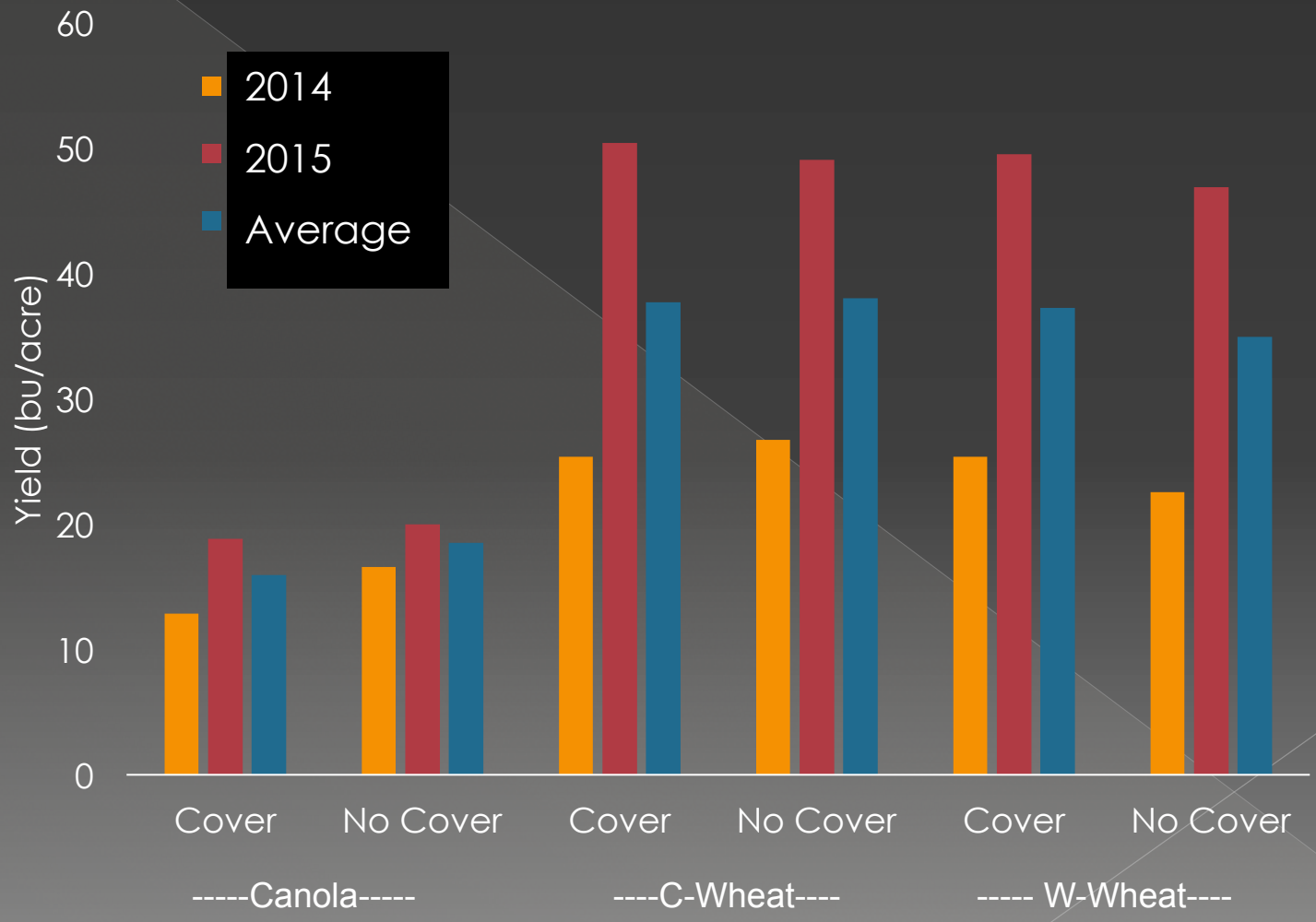
Impact of Canola on Wheat Yields in No-till rotation (Lahoma)



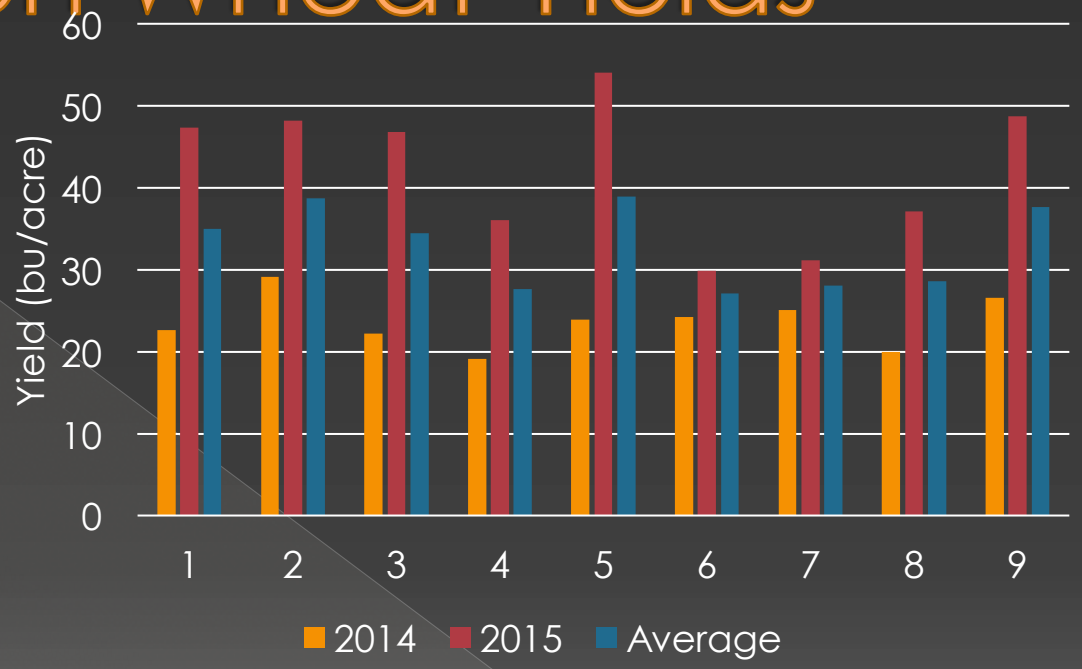
Wheat responds positively to Rotation

- However, rotations that reduce preplant soil moisture CAN reduce yield if rainfall is insufficient to recharge profile
- This is influenced by soil water holding capacity, rainfall, planting and termination date of covers

Canola and Wheat Yields



Impact of Cover Crop Selection on Wheat Yields



Treatment	Species/N Rate
1	Cowpea, Sunn Hemp
2	Cowpea, Sunn Hemp, Buckwheat, G. Millet, Laredo Soybean
3	Cowpea
4	Cowpea, Mungbean, Laredo Soybean, Sorghum-Sudan, P. Millet
5	Cowpea, Mungbean, Sunn Hemp, Laredo Soybean
6	Cowpea, Sunn Hemp, Radish, G. Millet
7	P. Millet, Sorghum-Sudan, G. Millet
8	Cowpea, Sunn Hemp, Sterile Corn, Sorghum-Sudan, Sunflower
9	UAN 36

Lack of impact on winter crop yields

- Very common
  - at least 10 site-years of data support our recent finding
- Yield suppression is more common than yield increases
- Insufficient time to all for soil moisture recharge
  - Offsets beneficial impacts of improved soil health
- Growing cover in summer does not decrease in-crop weed pressure
- If we do use this system we must utilize it as a forage!!!

How can we utilize cover crops

- Multi-purpose crops
- We can increase our crop diversity
- But we must :
  - Adopt a dynamic management approach
  - Think about what we want from the crop before we plant it.

Where might Multi-Purpose crops fit?

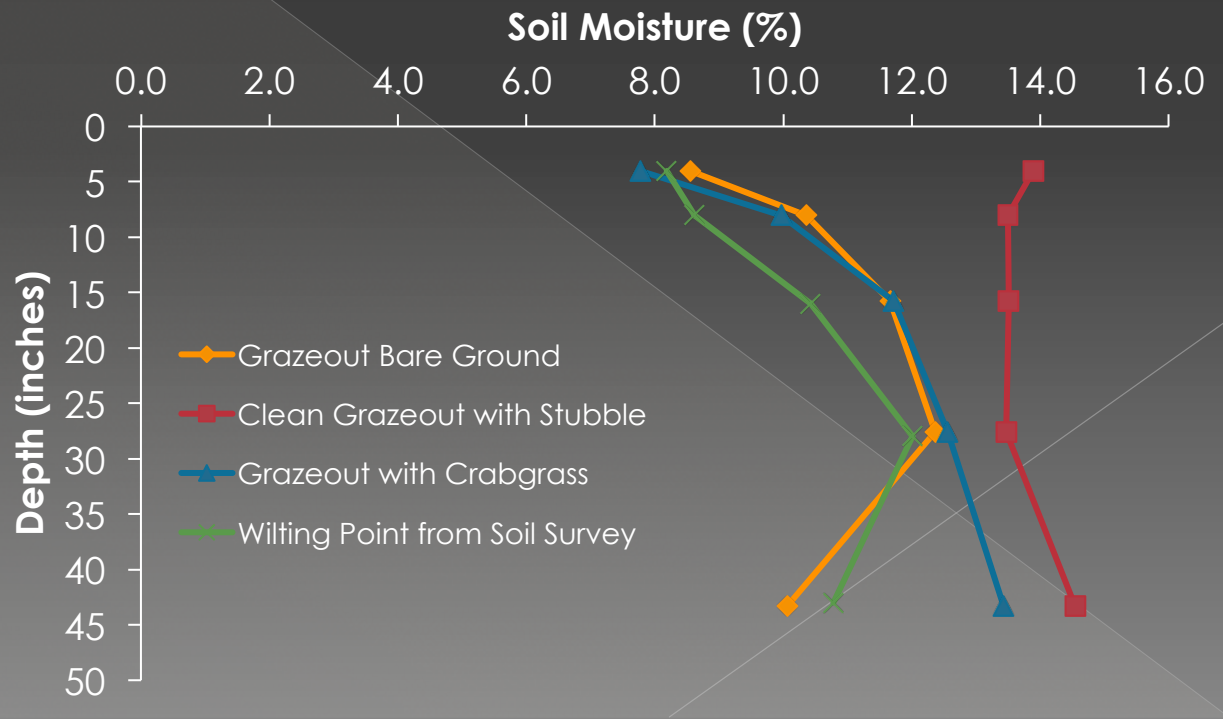
- If you want to grow wheat for grain on every acre every year
  - summer cover crop is unlikely to increase your average yield
- Late summer/fall droughts will reduce yield
- It can increase your forage base

Where might Multi-Purpose crops fit?

- Covers after grazeout appear to provide more benefits
- Replace residue lost from grazeout wheat
- This will prevent the accumulation of near surface compaction
- Will keep soil surface cooler for next wheat forage crop
- Can plant and terminate earlier

Impact of Grazeout Management on Soil Moisture (July 2009)

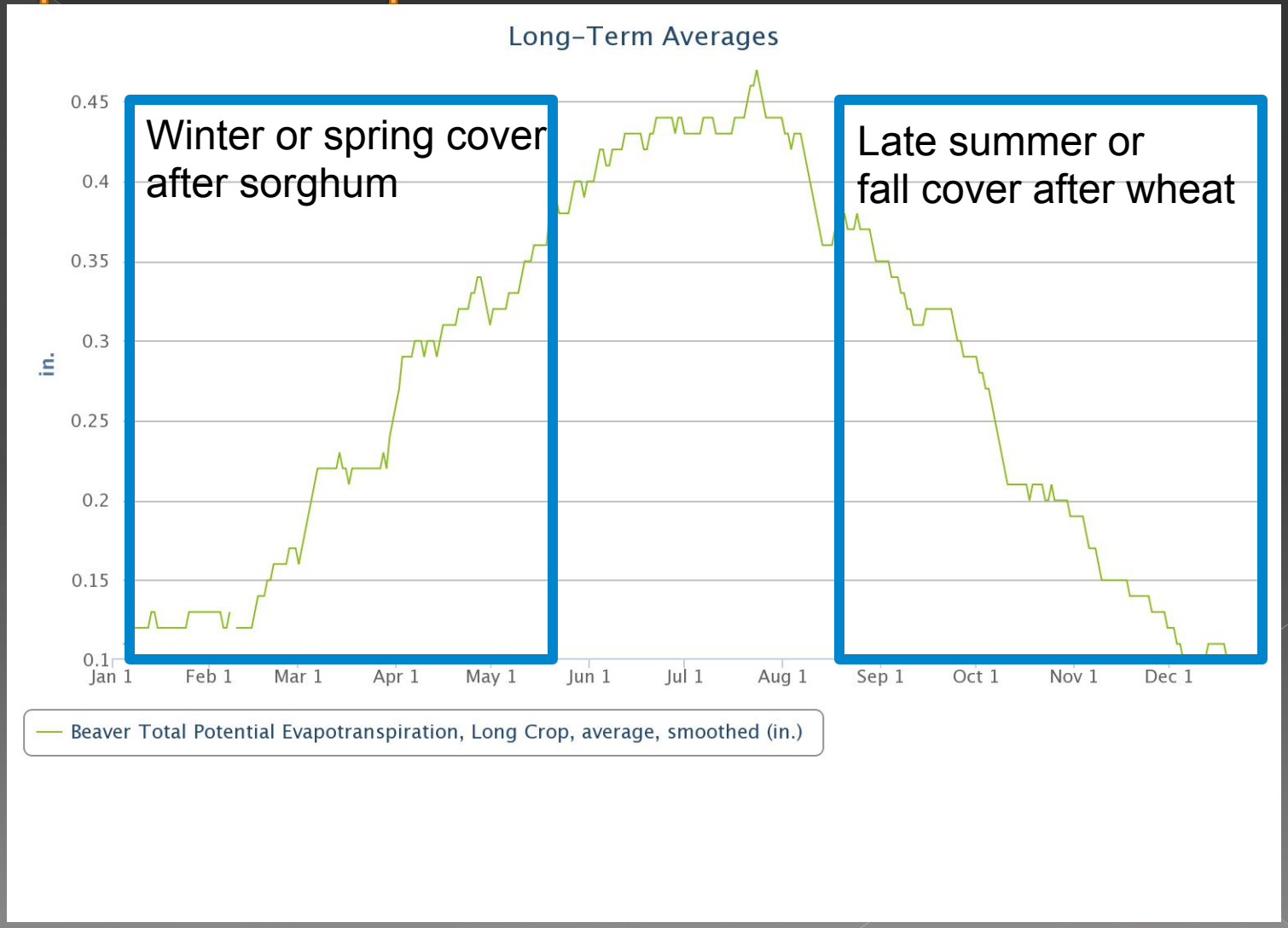
- Norge Silt Loam, 3-5% slope (near Geary, OK)
- Under Bare ground grazeout was comparable to solid stand of crabgrass



Where might Multi-Purpose crops fit?

- Multi-purpose cover crops might fit in a wheat-fallow-sorghum rotation
- Can regain residue after crop failure
- Can provide forage resource
- Must be thoughtful of water use
  - There is very limited data on this rotation

Avoid periods of high Evapotranspiration



Moisture under Oat/winter pea mix (harper county)

- Planted in March, terminated in July
- Will be planted to wheat in Oct.

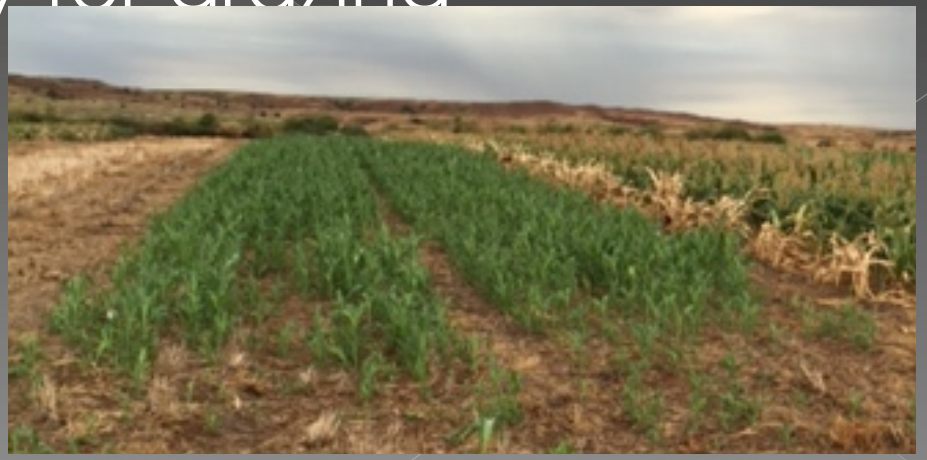



Moisture under Oat/winter pea mix (harper county)

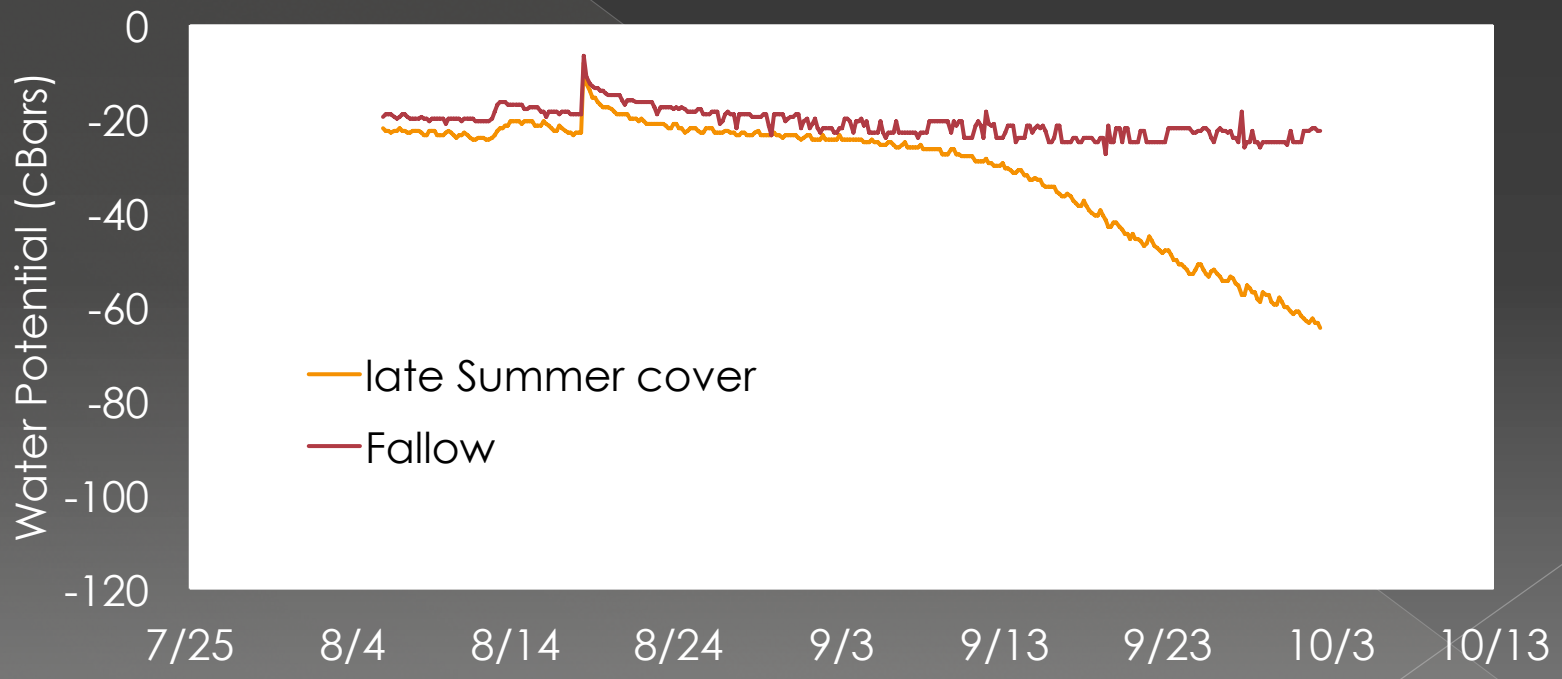
- Moisture was reduced but rebounded in 30 days

Late Summer cover

- Sorghum sudan/Cow Pea/radish mix
- Planted in August
- Will be planted to grain sorghum in spring
- Compare to wheat stubble
- Provides opportunity for grazing



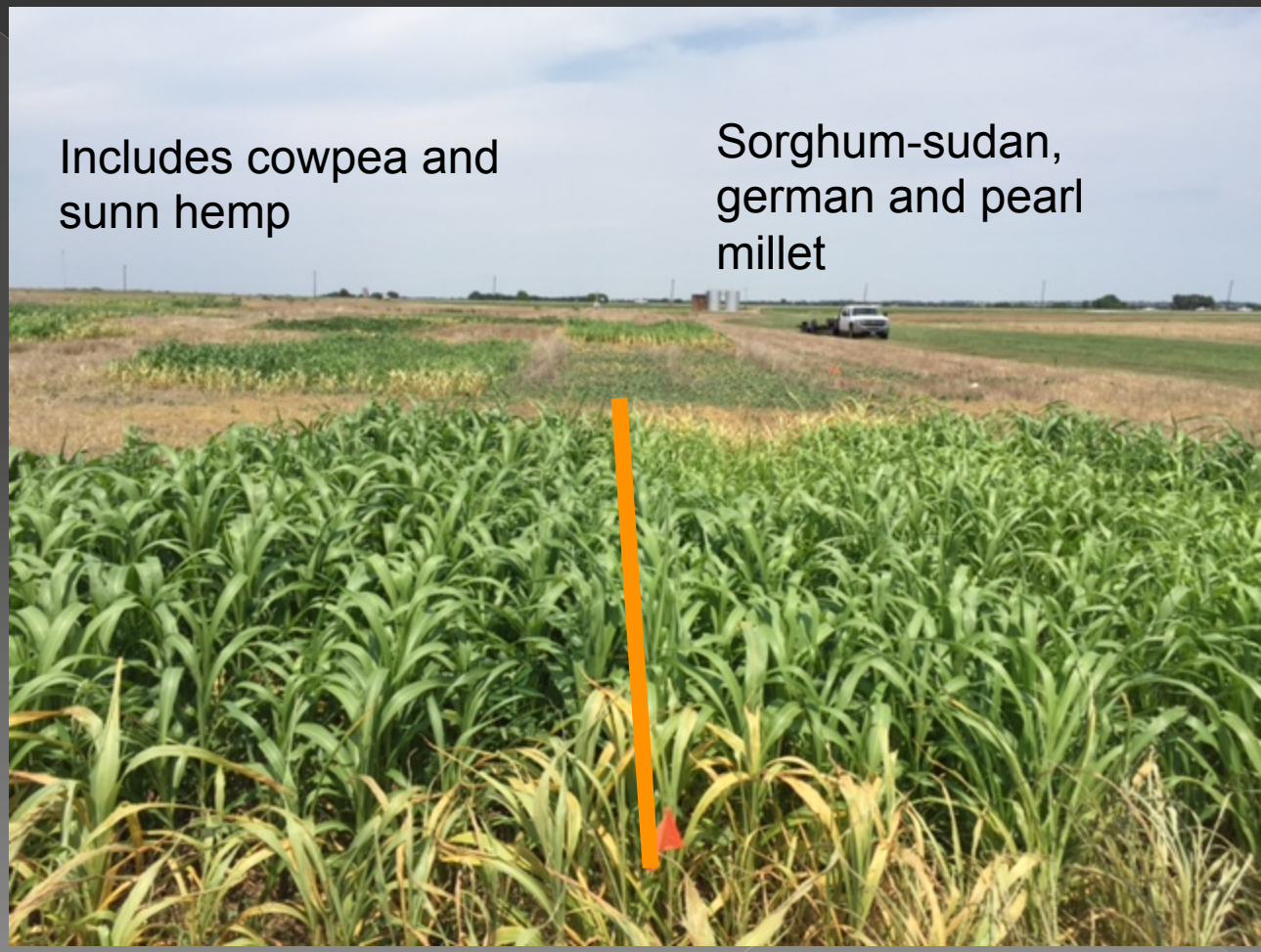
Moisture at 6 inches under Sorghum-Sudan/radish/cowpea mix



Think about what you want before you Plant

- If you want hay plant hay
  - plan on fertilizing to optimize efficiency and reduce impact on following crop
  - Haying legumes is still removing nutrients
  - Including legumes will increase protein but can reduce tonnage
- Grazing reduces nutrient removal and provides opportunity to maintain residue
  - Including legumes in grass mixture can offset N uptake on grasses

Impact of legumes on mixture



Consider toxicity of species in mixtures

- Sorghum-sudan, millets, and corn
  - Prussic acid and Nitrate
- Legumes
  - Sweet clovers, yellow clovers and white clovers contain Coumarin
  - Others can cause bloat
- Be thoughtful about grazing plants you know little about, low to moderate grazing will allow animals to be selective
- K-state ANSI. is working on Publication

Demonstration Farm in Texas County

Soil Health can make a difference

Question

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