Managing more with biology in row-crop agriculture



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KBS LTER Central Question

To what extent can we manage field crops with biology rather than chemistry?

- *– while maintaining / enhancing ecosystem services…*
  - *High yields*
  - *Environmental performance*

Treatment Philosophies

- T1 CONVENTIONAL: *Prevailing norm for tilled field crop farming*
- T3 REDUCED INPUT: *Field crop farming using biologically based management to reduce synthetic chemical inputs*
- T4 BIOLOGICALLY-BASED: *Field crop farming using biologically based management to eliminate synthetic chemical inputs*

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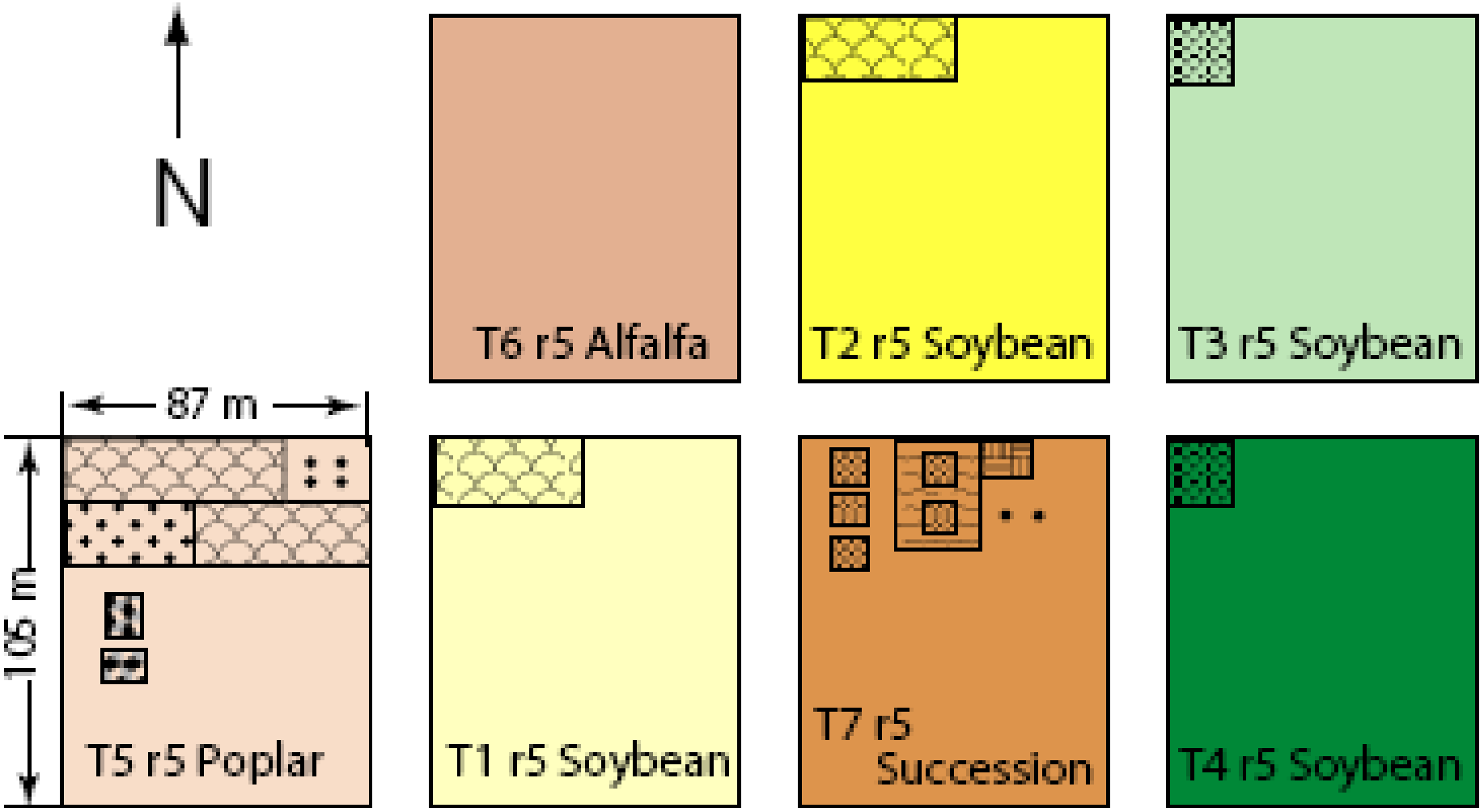
KBS LTER Main Site Treatments

- **T1 and T2 =Conv. & No-till C-S-W**
- **T3=Low input C^{r}-S-W^{rc}**
- **T4=Biological (Organic) C^{r}-S-W^{rc}**

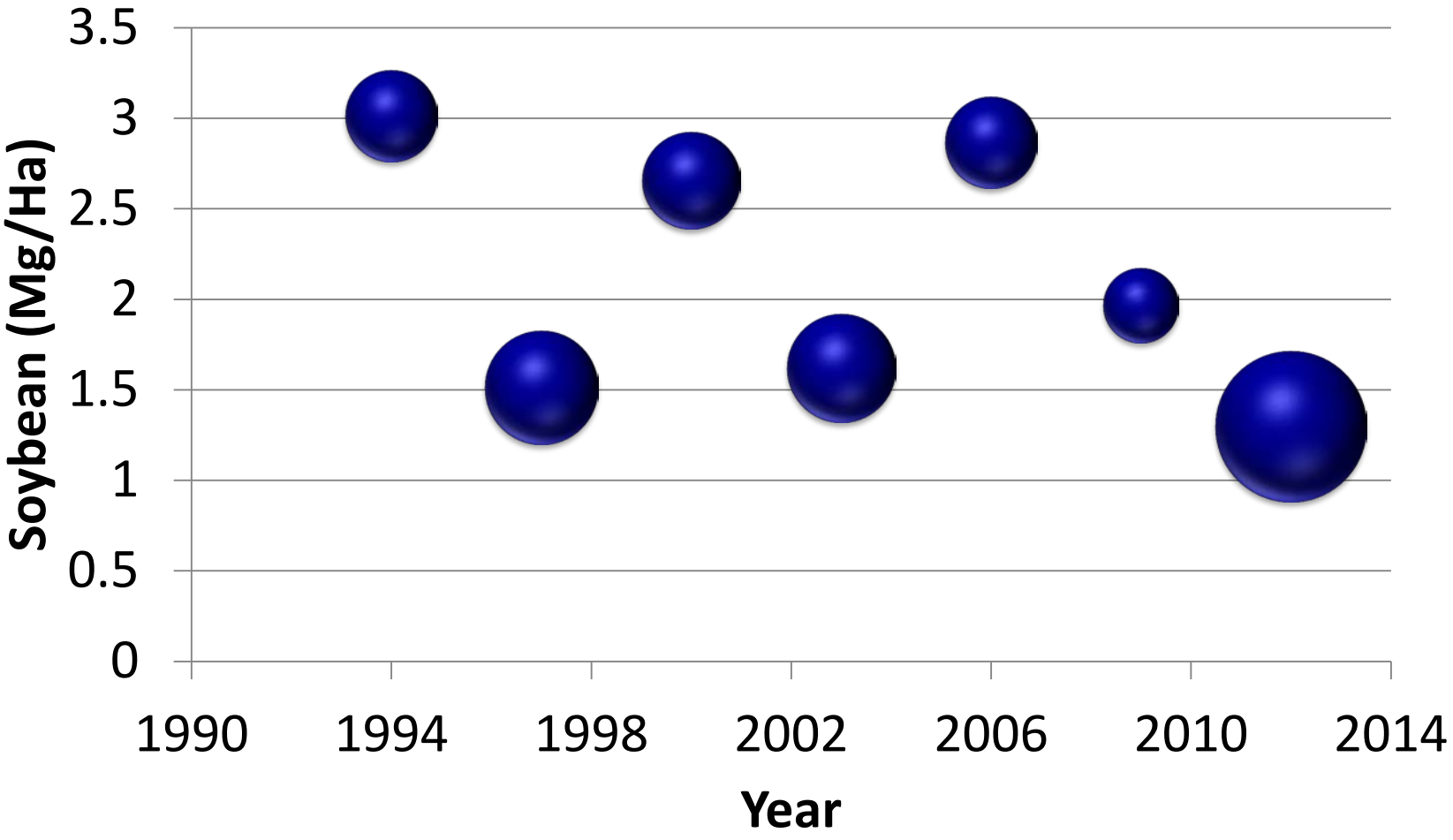
r=rye winter cover

rc=red clover cover

KBS LTER Main Site Rep 5



T1 Conventional Soybean



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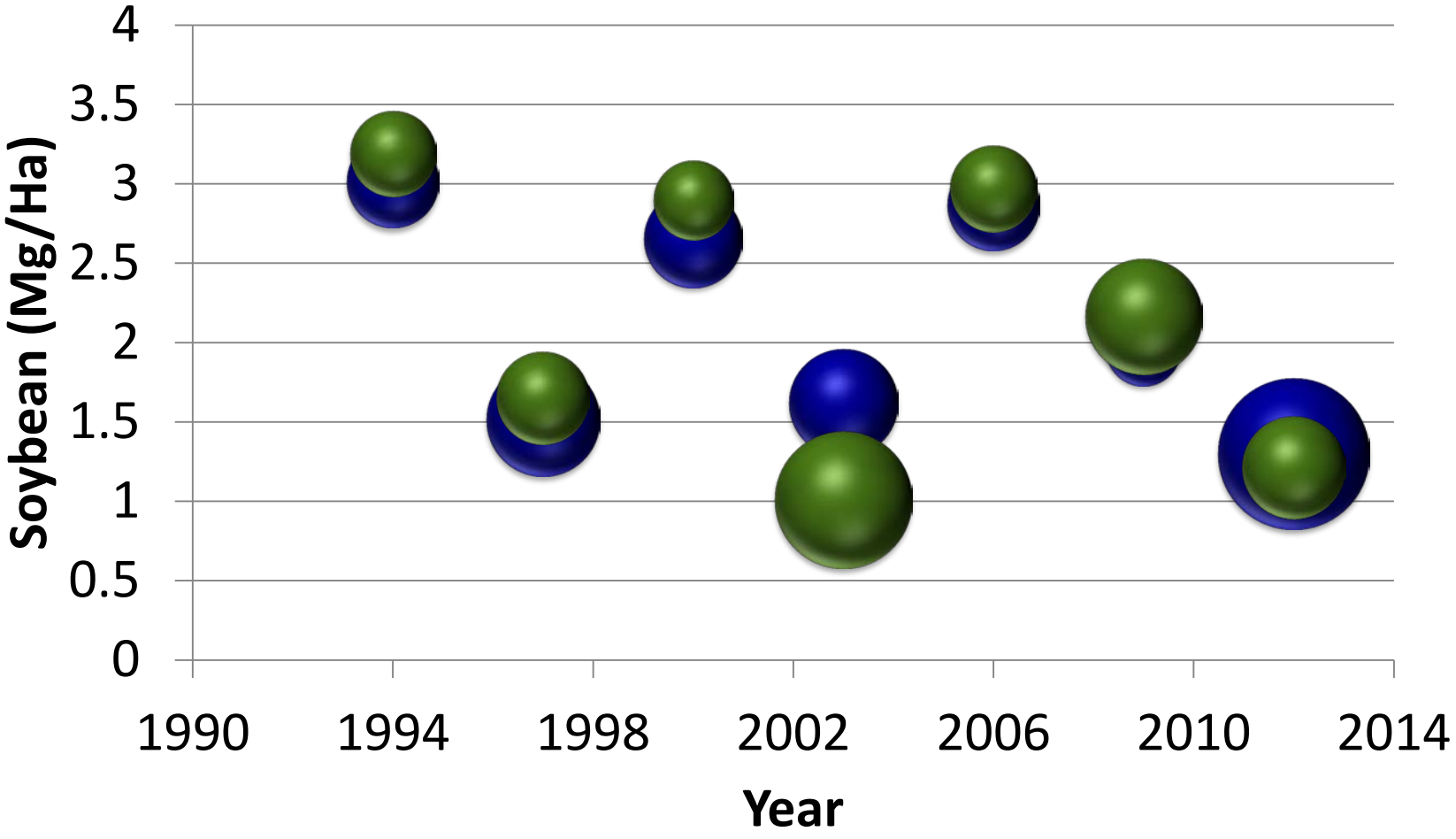
T1 vs T4 Biological Soybean



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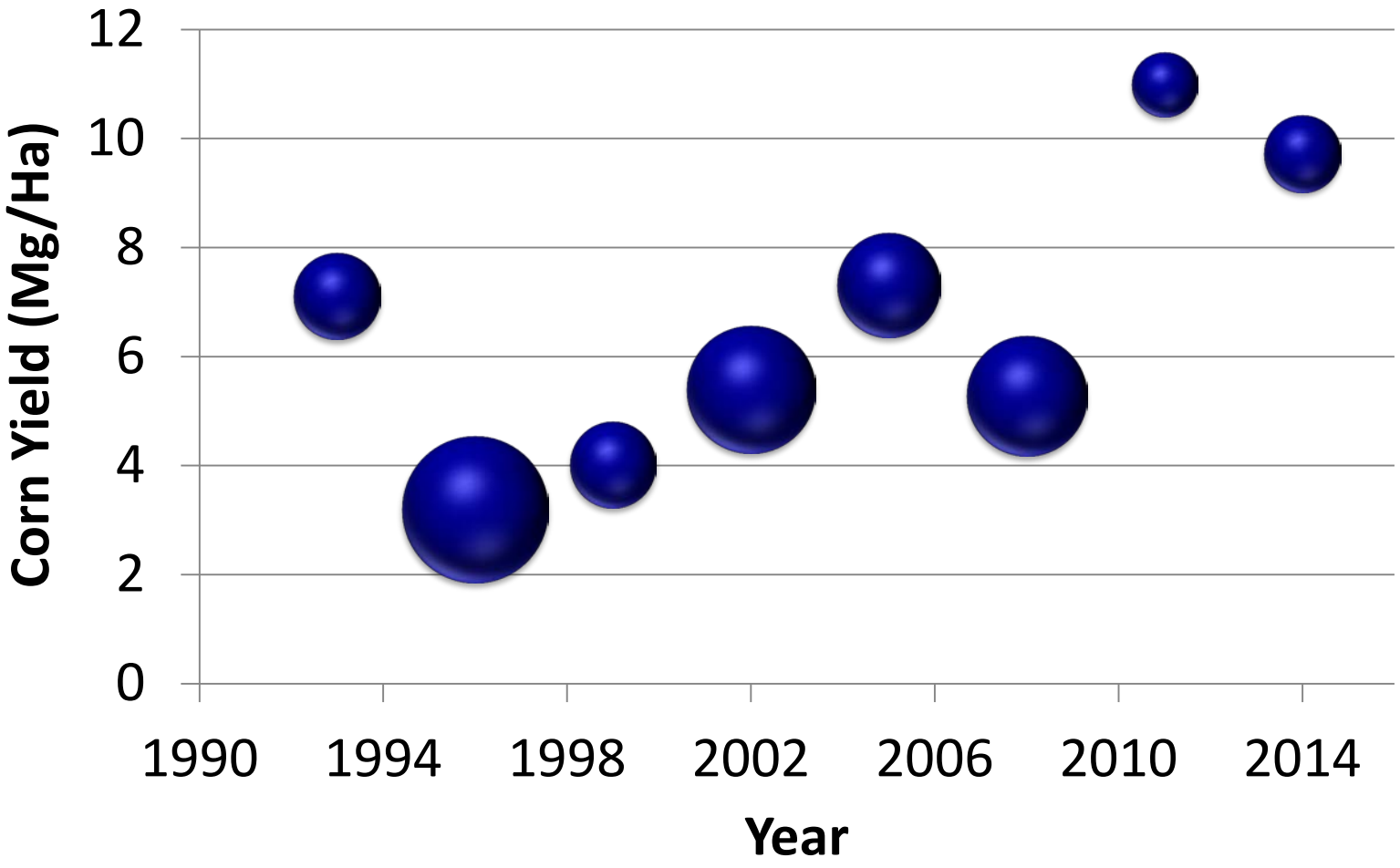
T1 Conventional Corn



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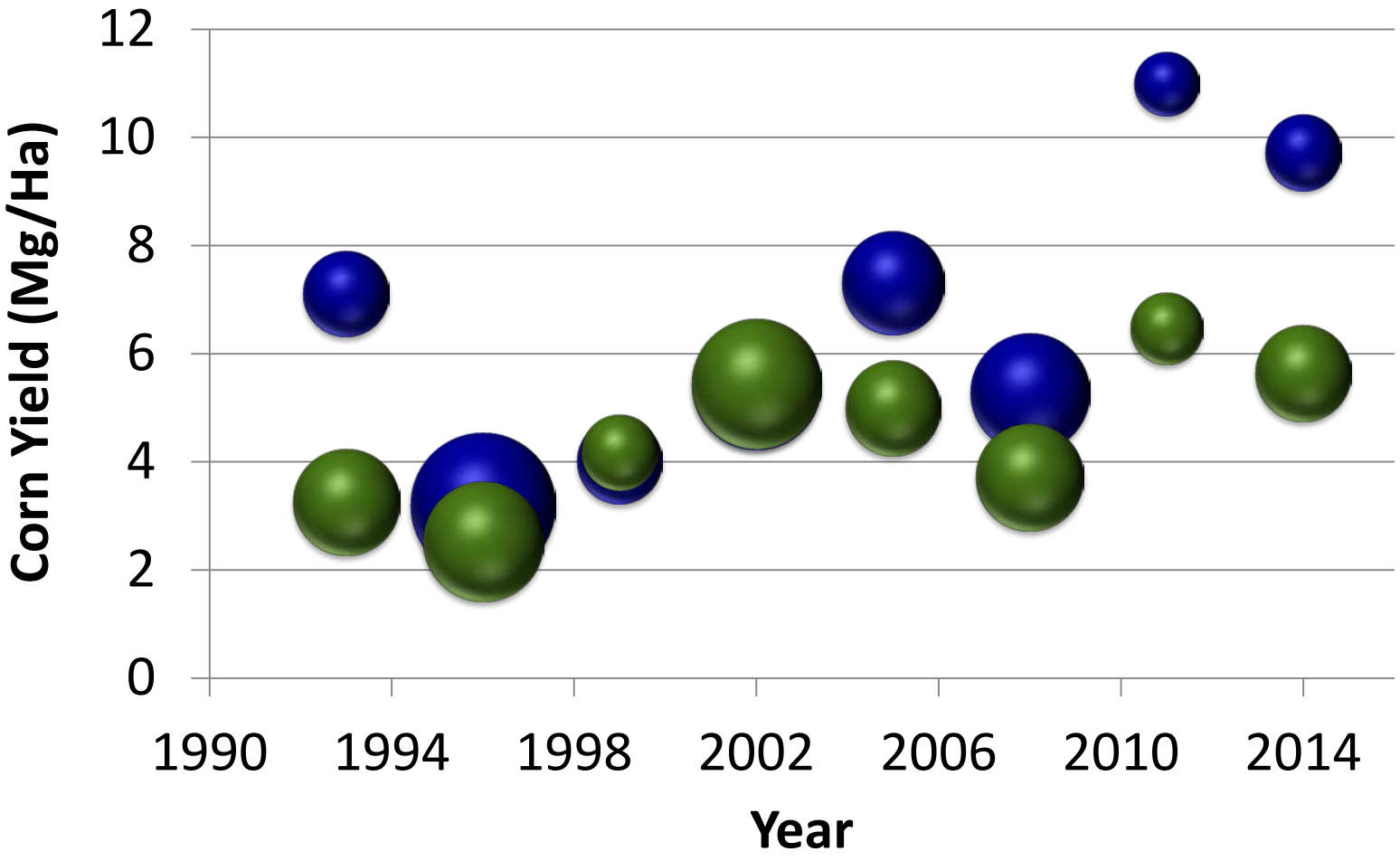
T1 vs. T4 Biological Corn



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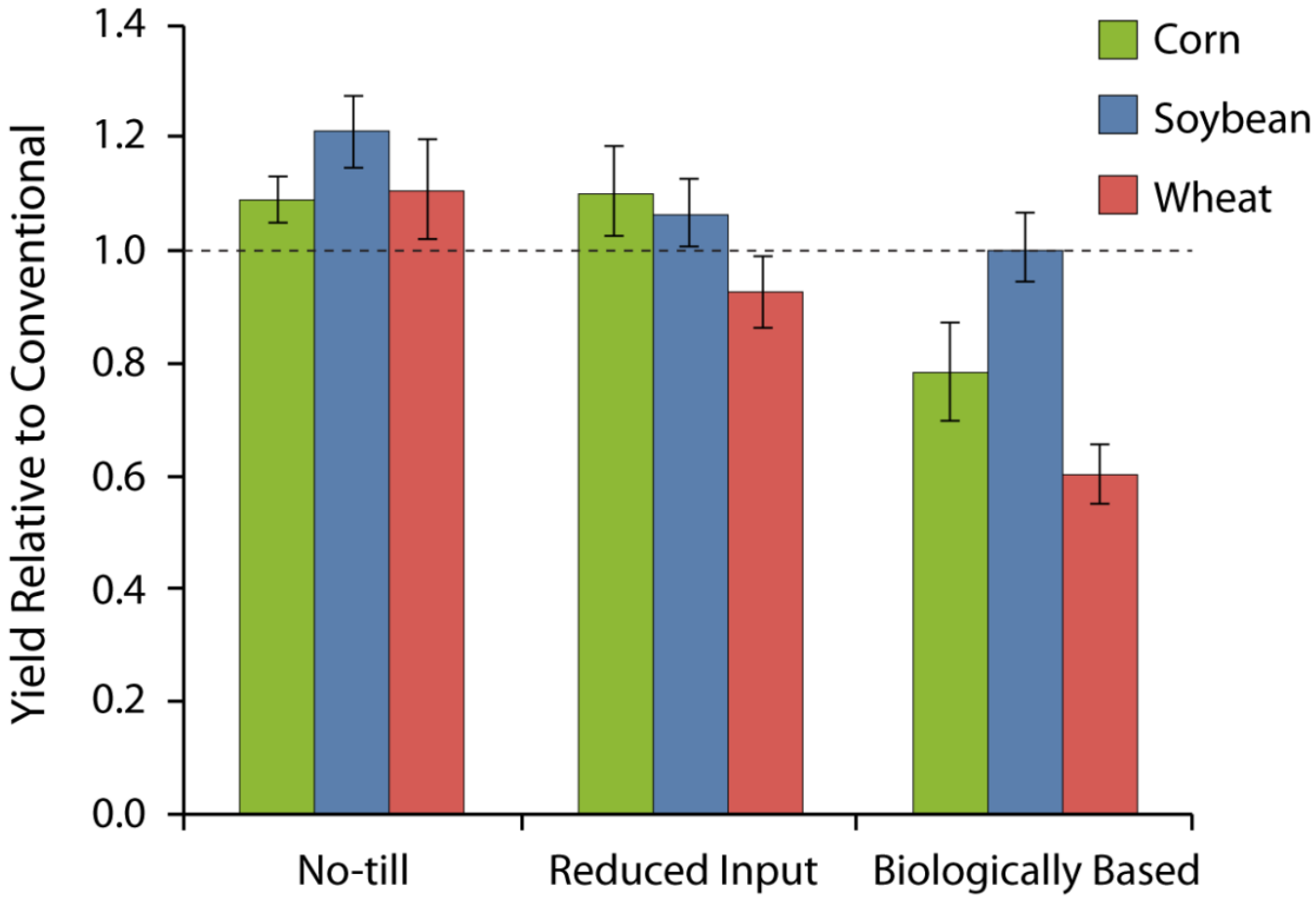
Relative Yields (1989–2012)



Robertson et al., 2014

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Scale-Up

- Treatments (3)

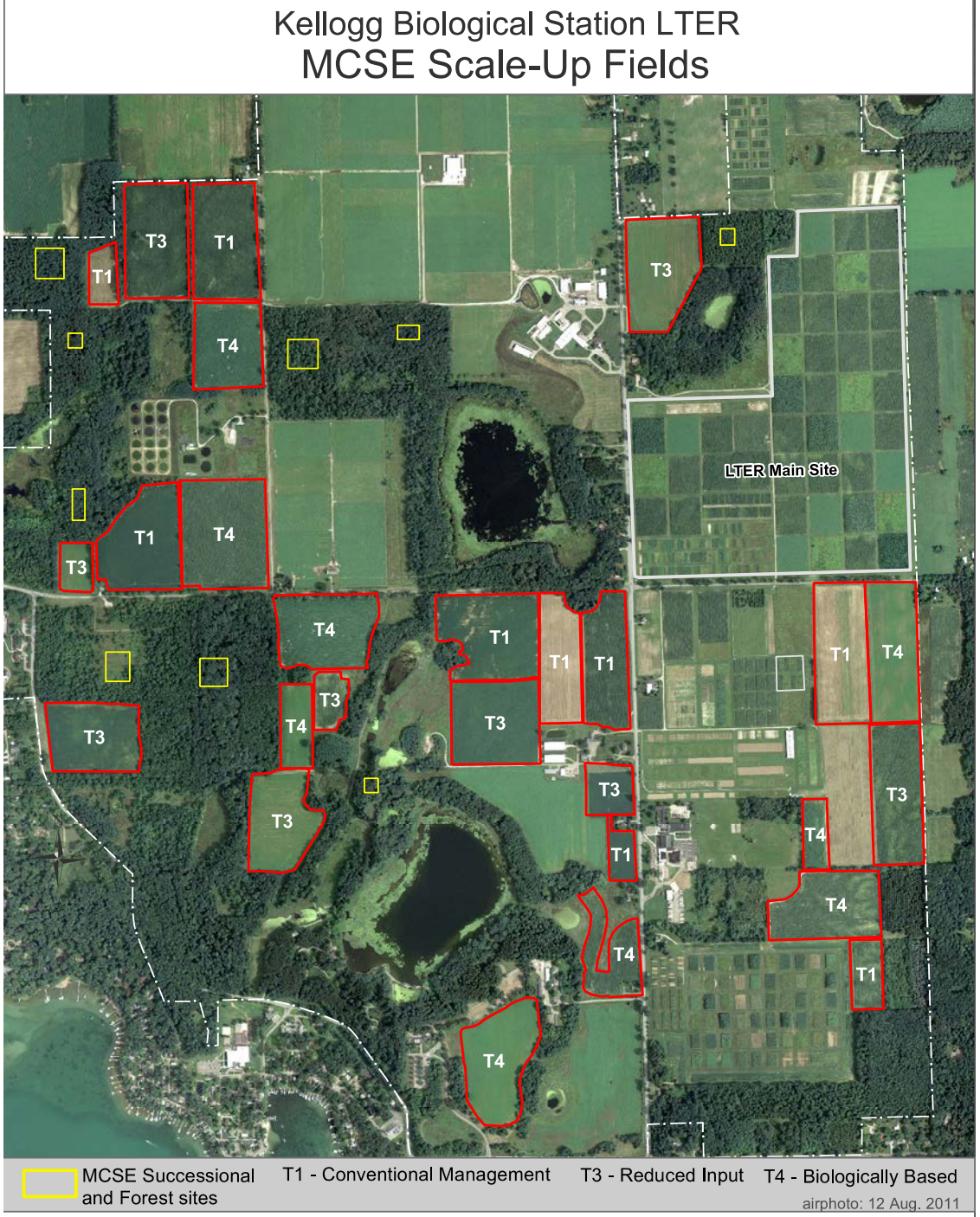
  T1, T3 & T4

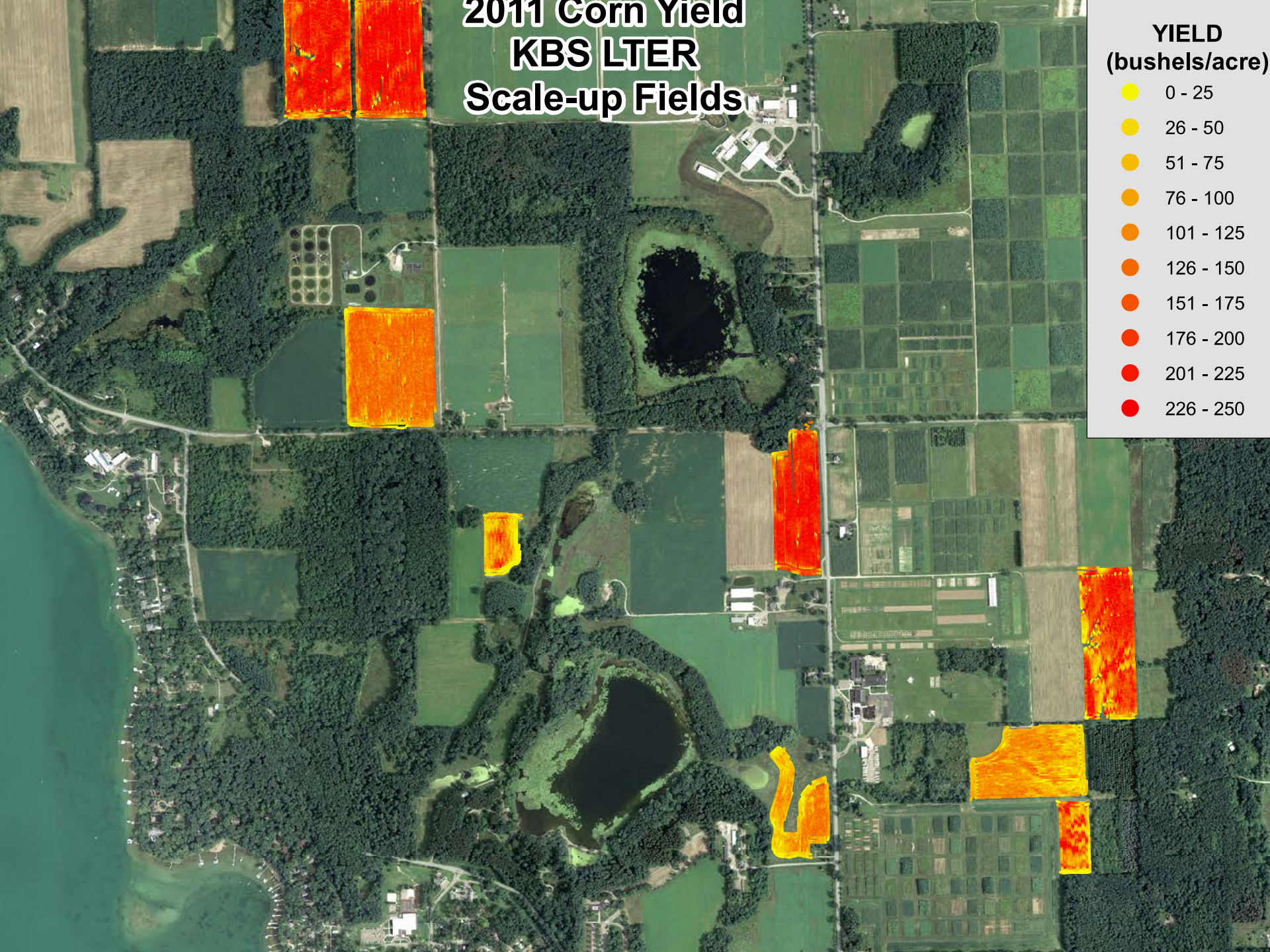
- Crop Phase (3)

  corn, soybean

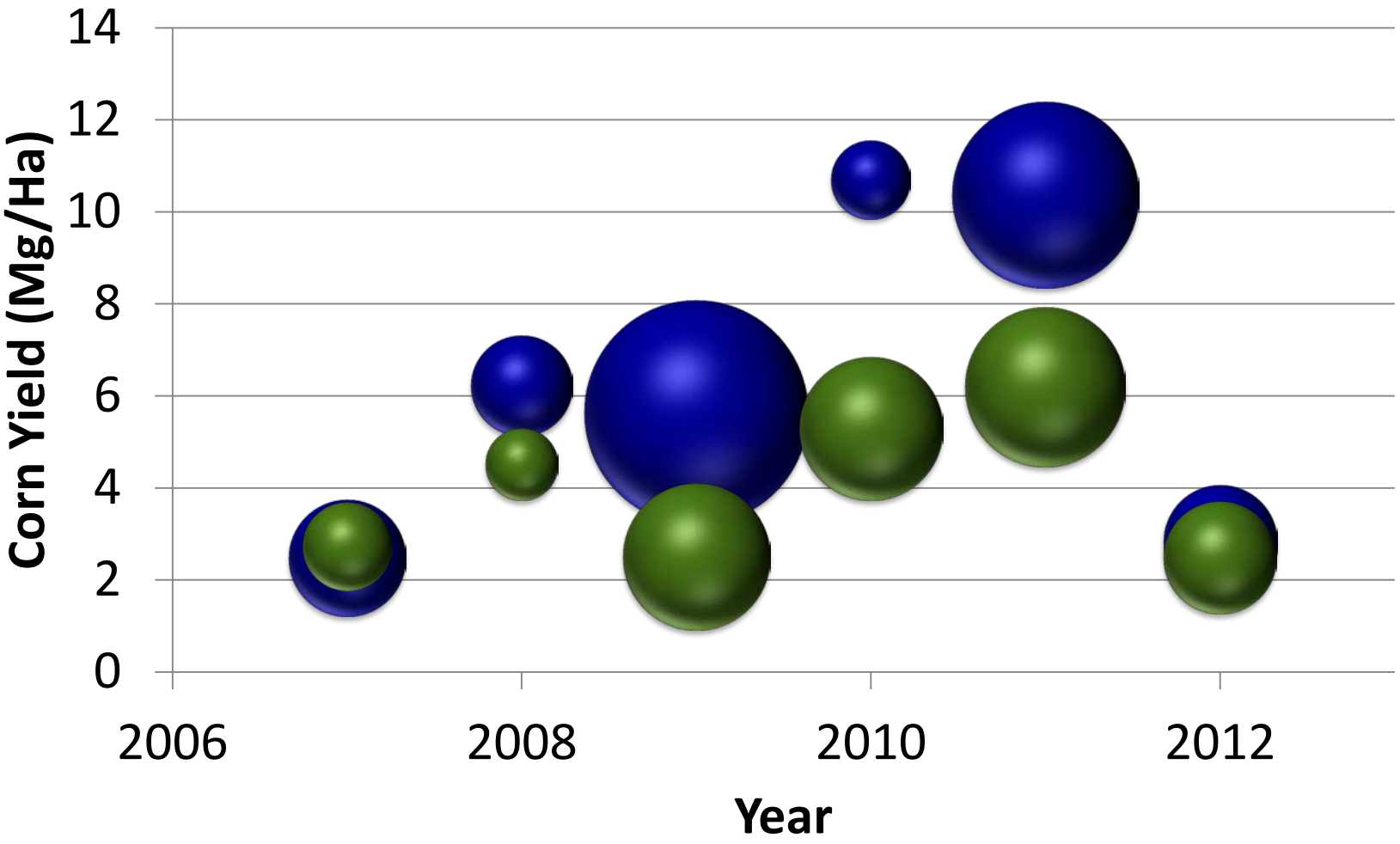
  & wheat

- Replicate fields (3)




2011 Corn Yield
KBS LTER
Scale-up Fields
YIELD
(bushels/acre)
0 - 25
26 - 50
51 - 75
76 - 100
101 - 125
126 - 150
151 - 175
176 - 200
201 - 225
226 - 250

Scale up: Conv. vs Biological Corn



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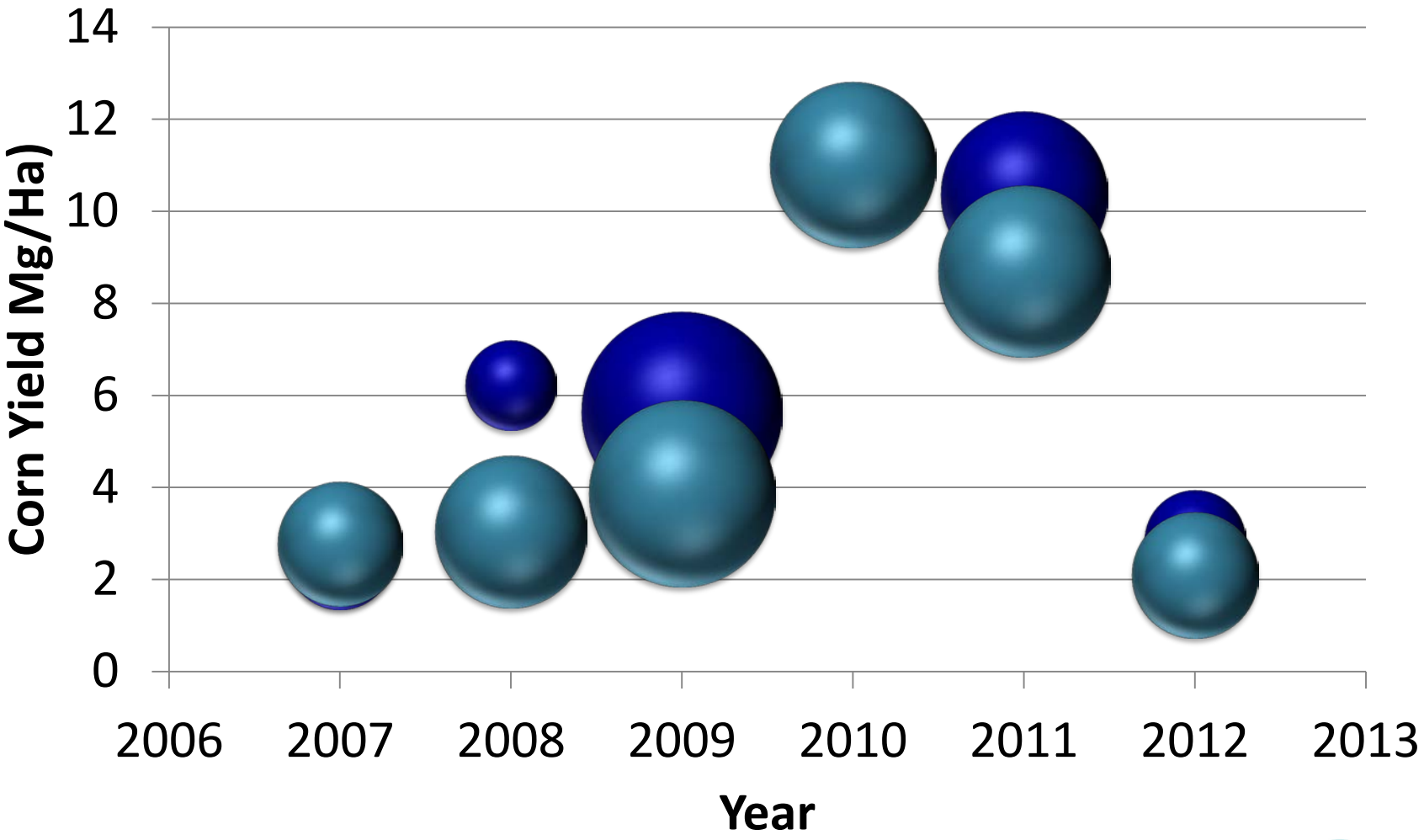
Scale up: Conv. vs Low Input Corn



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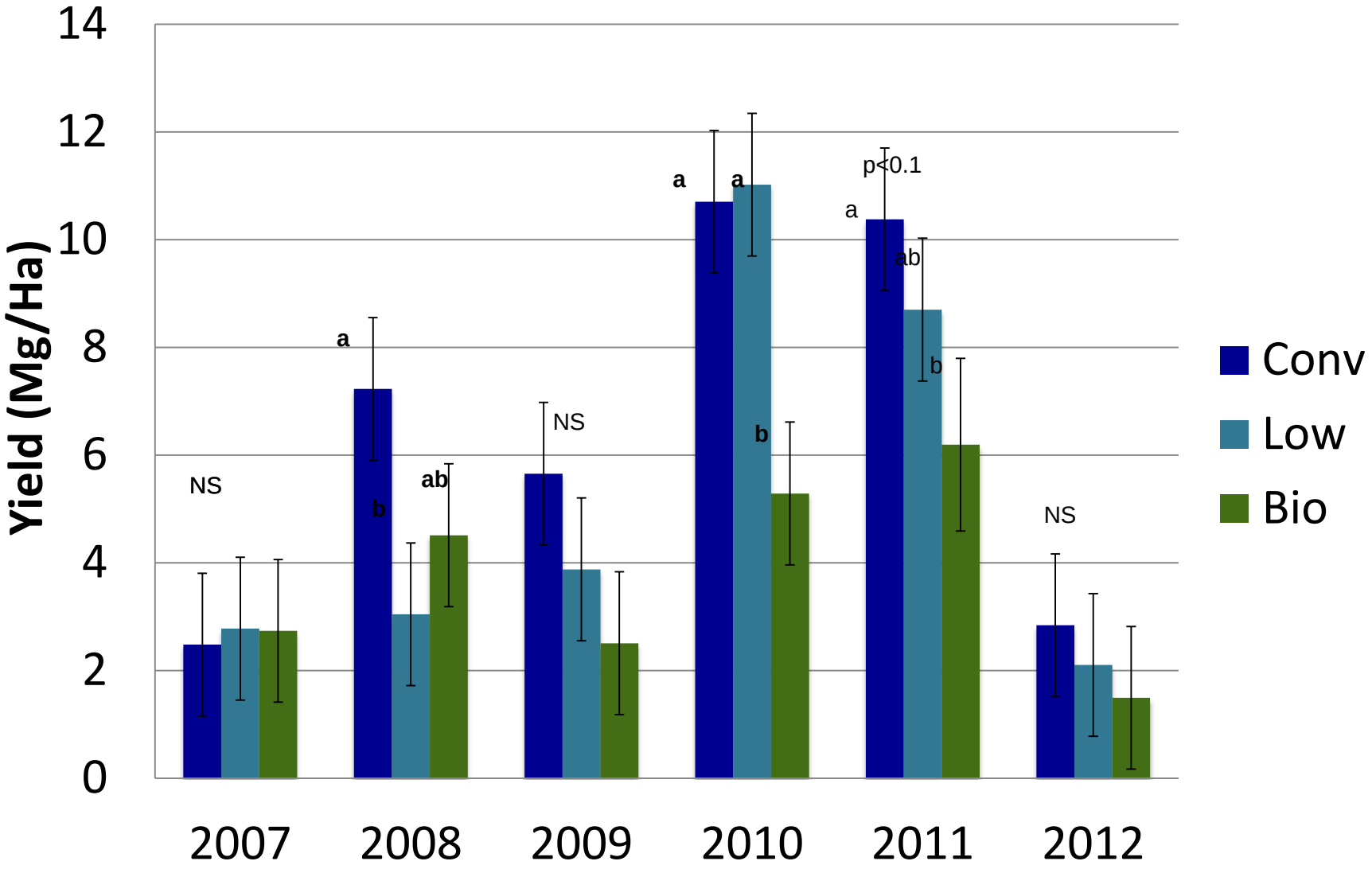
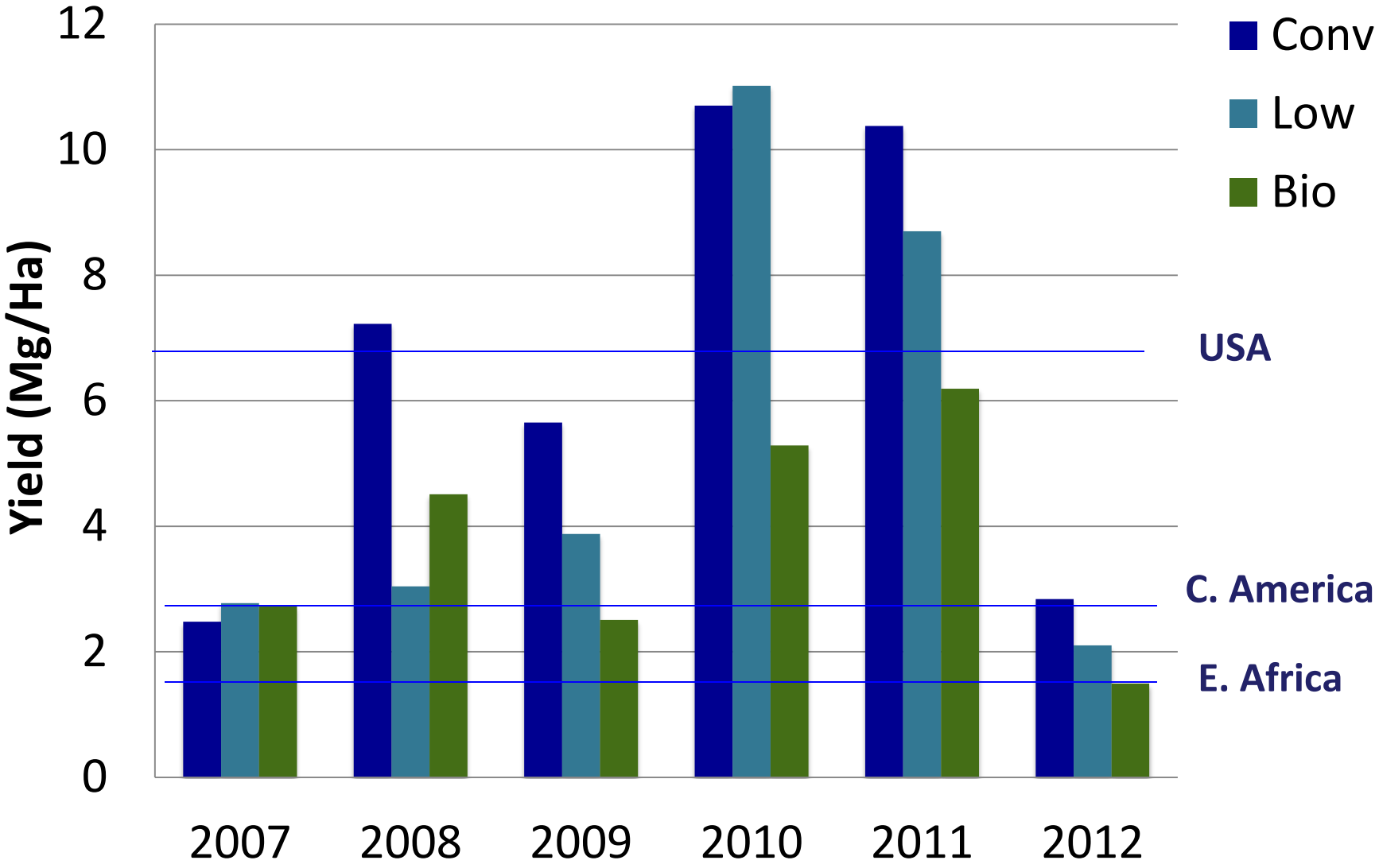
Scale up: Corn Yields



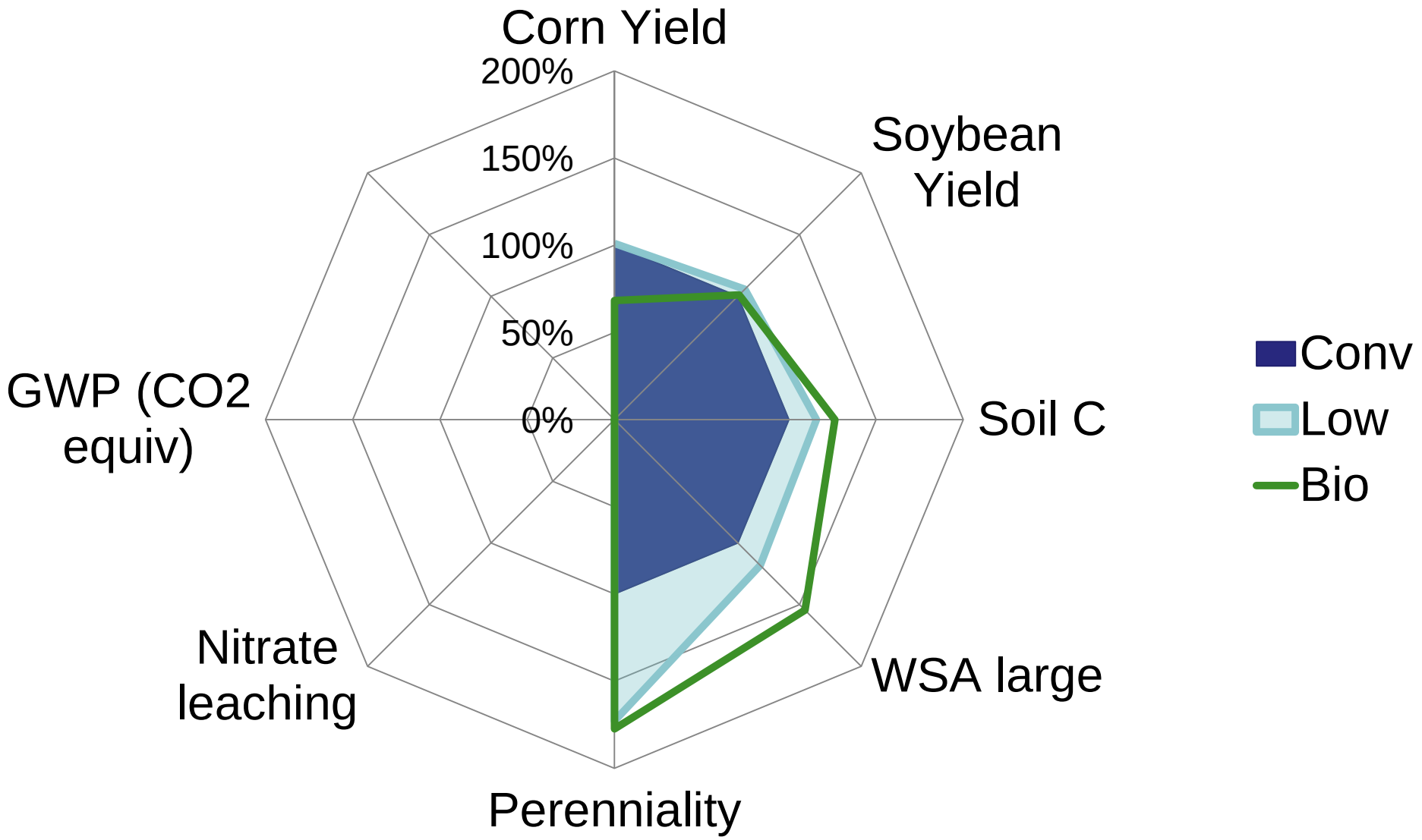
Krachenko et al., unpublished

Scale up: Corn Yields

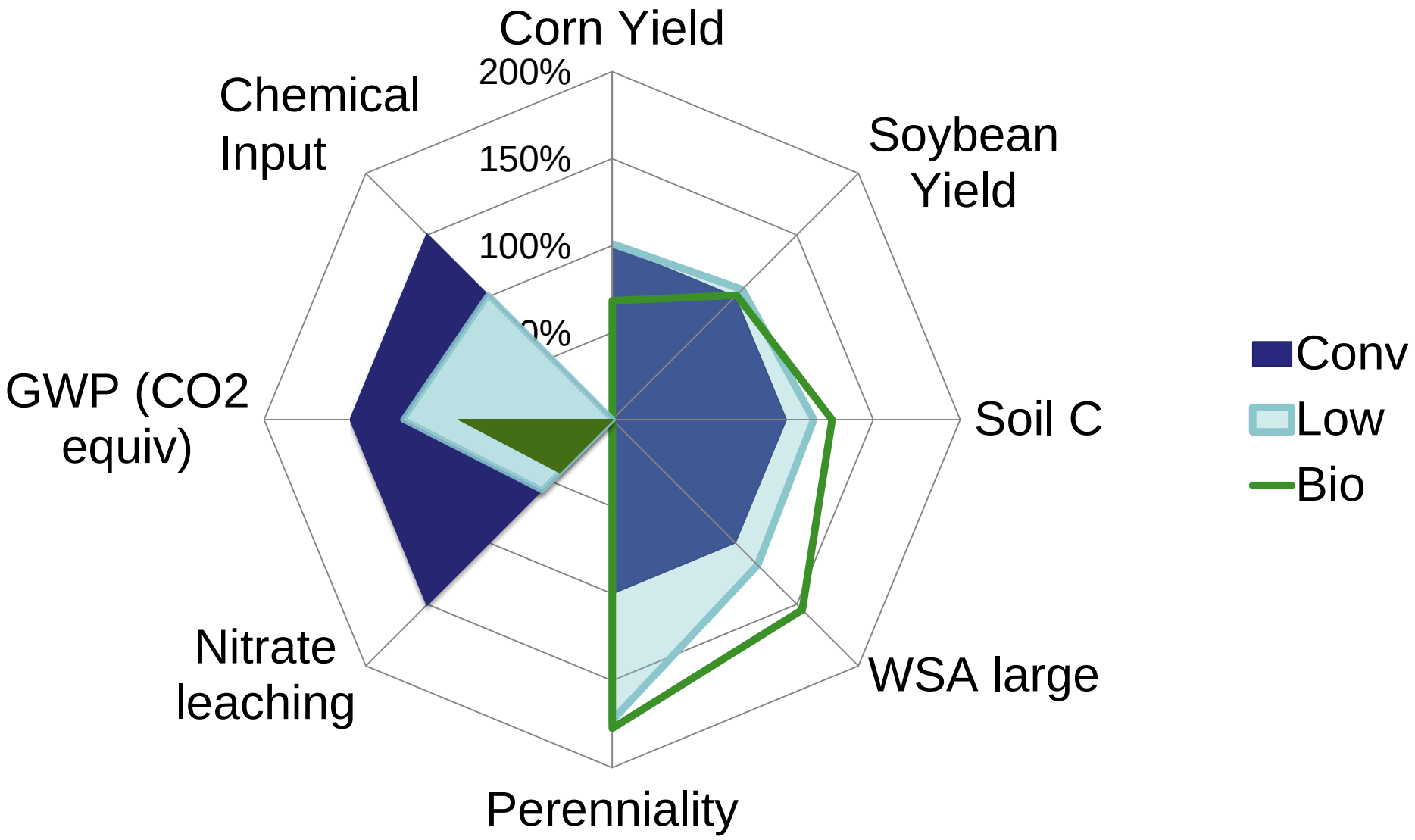


Krachenko et al., unpublished

LTER: Ecosystem services



LTER: Ecosystem (dis) services



Can biology vanquish chemistry?

In a world with less corn…