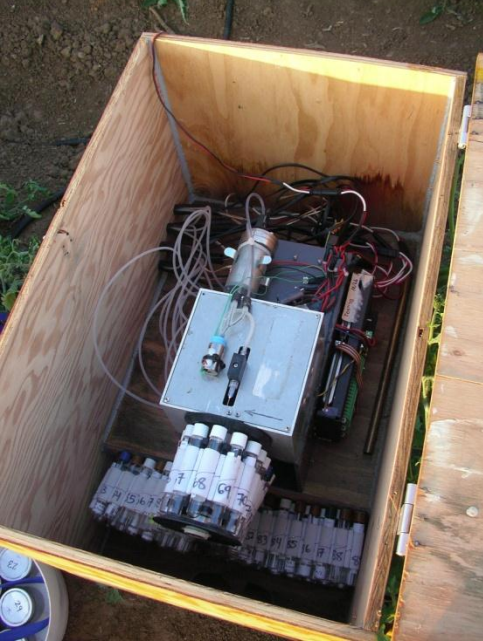


Greenhouse gas emissions and mitigation in perennial and annual agroecosystems of California

Johan Six

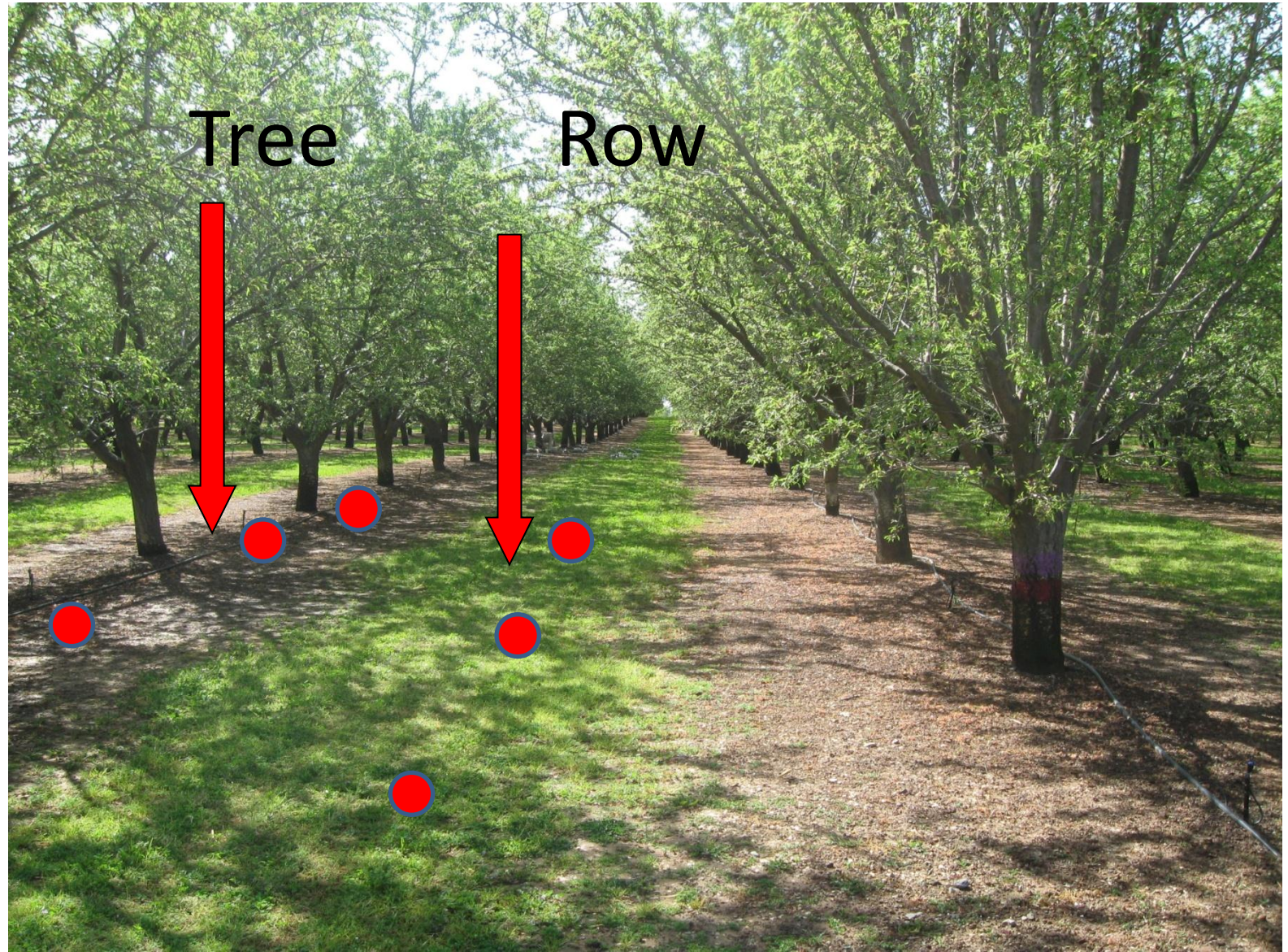






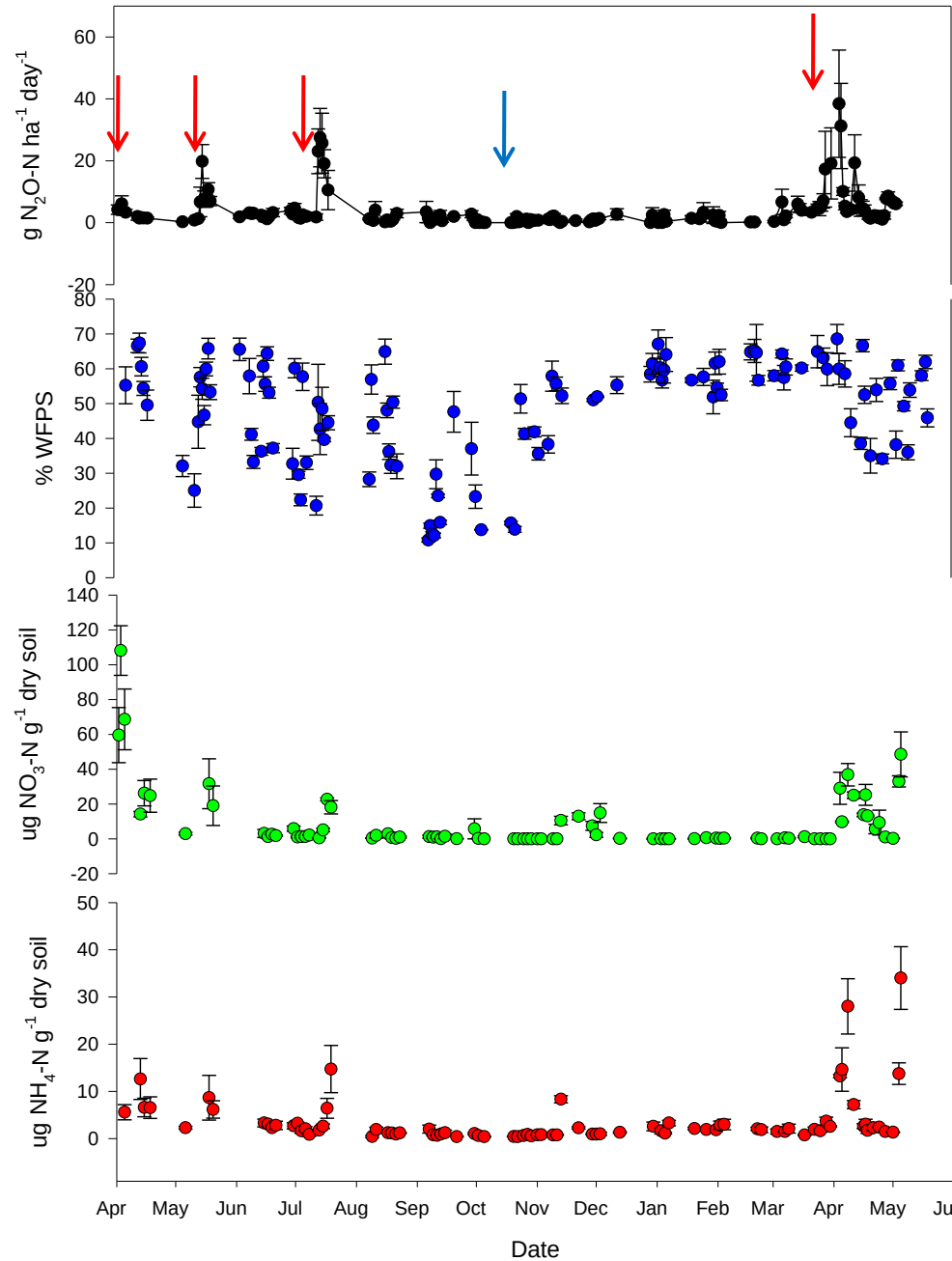


Almond orchard



TREE

N_2O



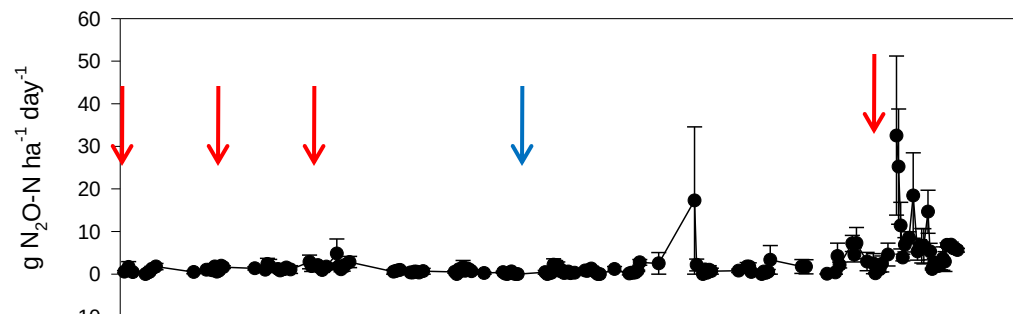
WFPS

NO_3^-

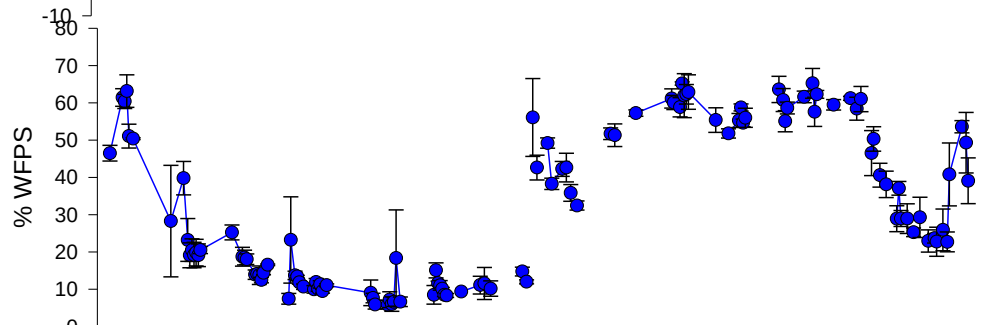
NH_4^+

ROW

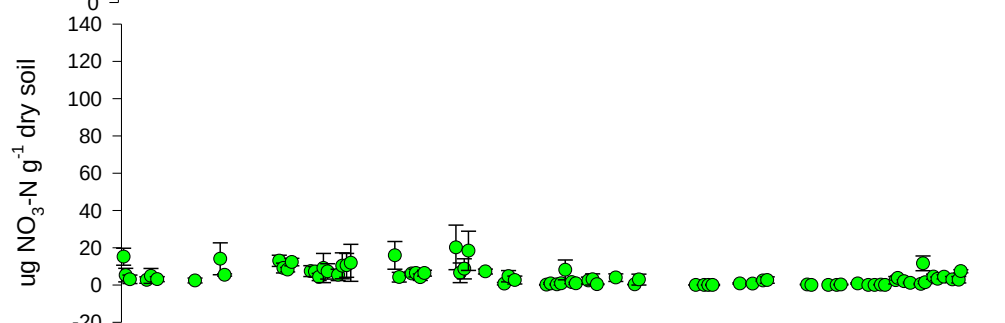
N_2O



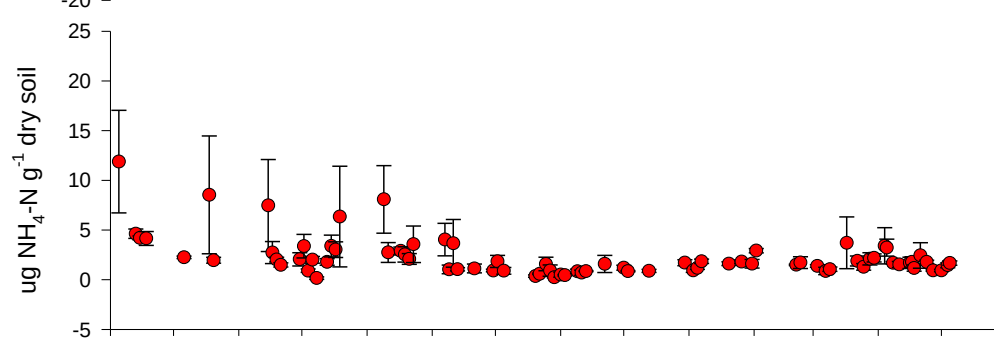
WFPS



NO_3

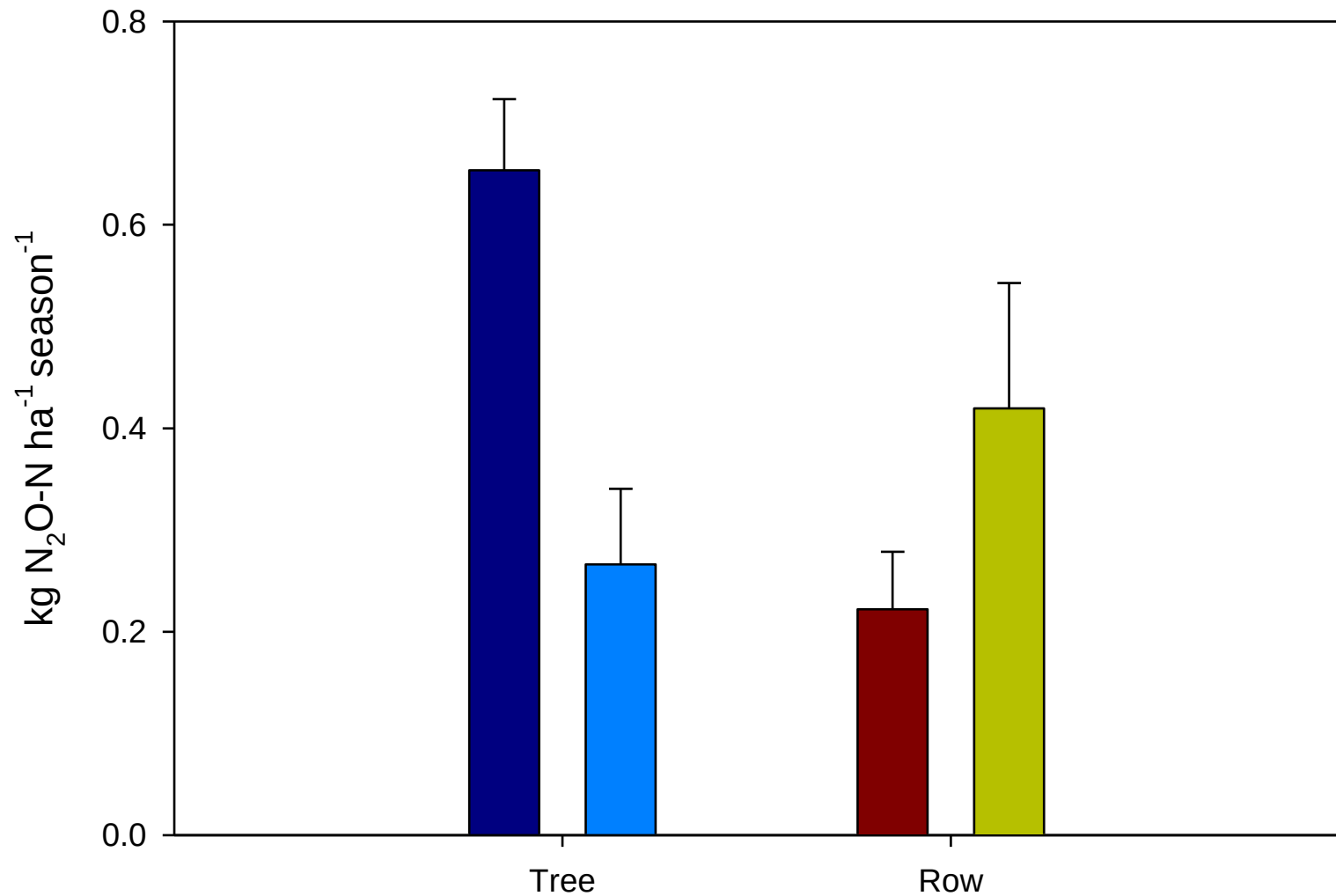


NH_4

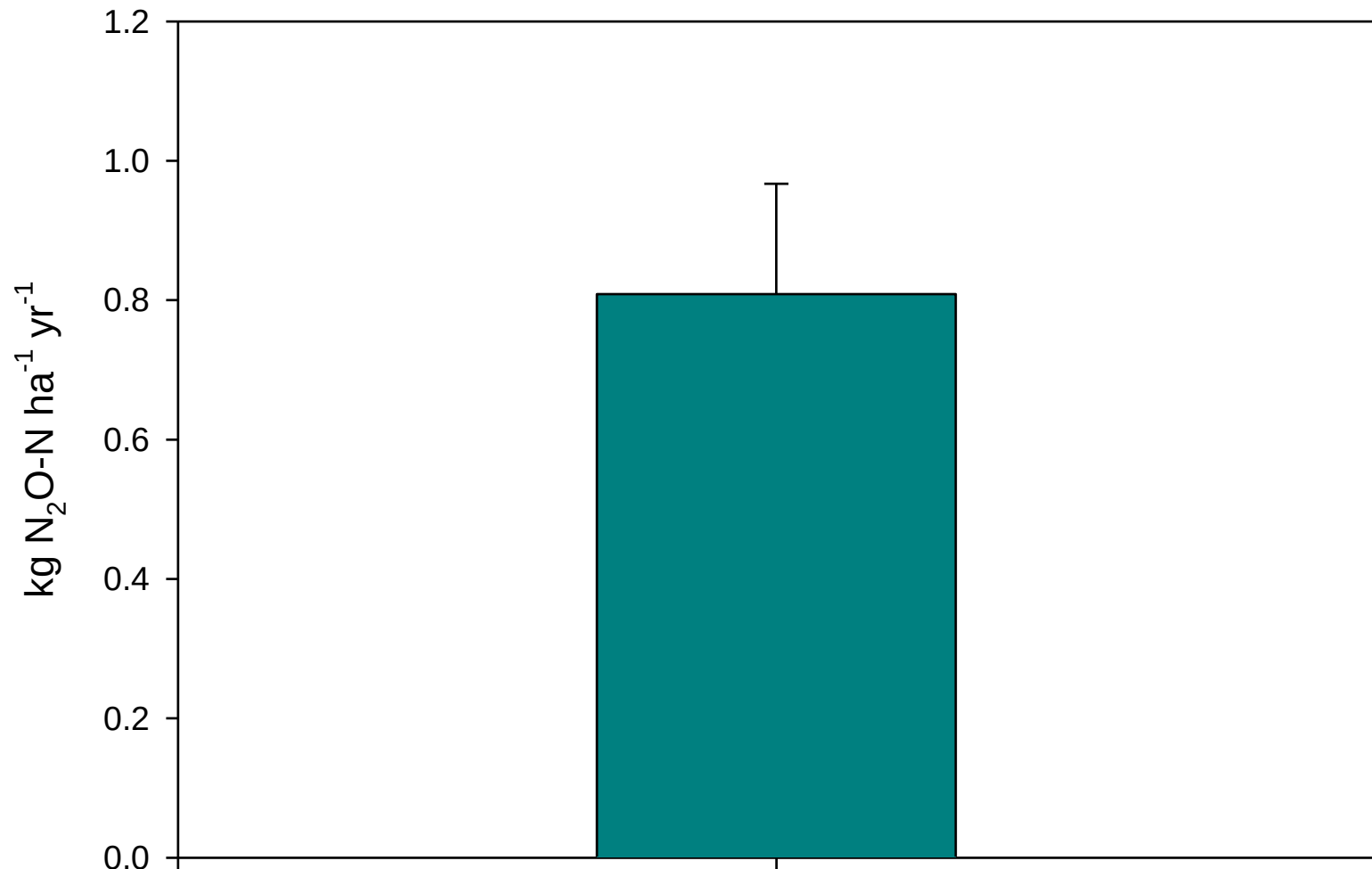


Date

Cumulative seasonal N₂O emissions



Cumulative & weighted N₂O emissions

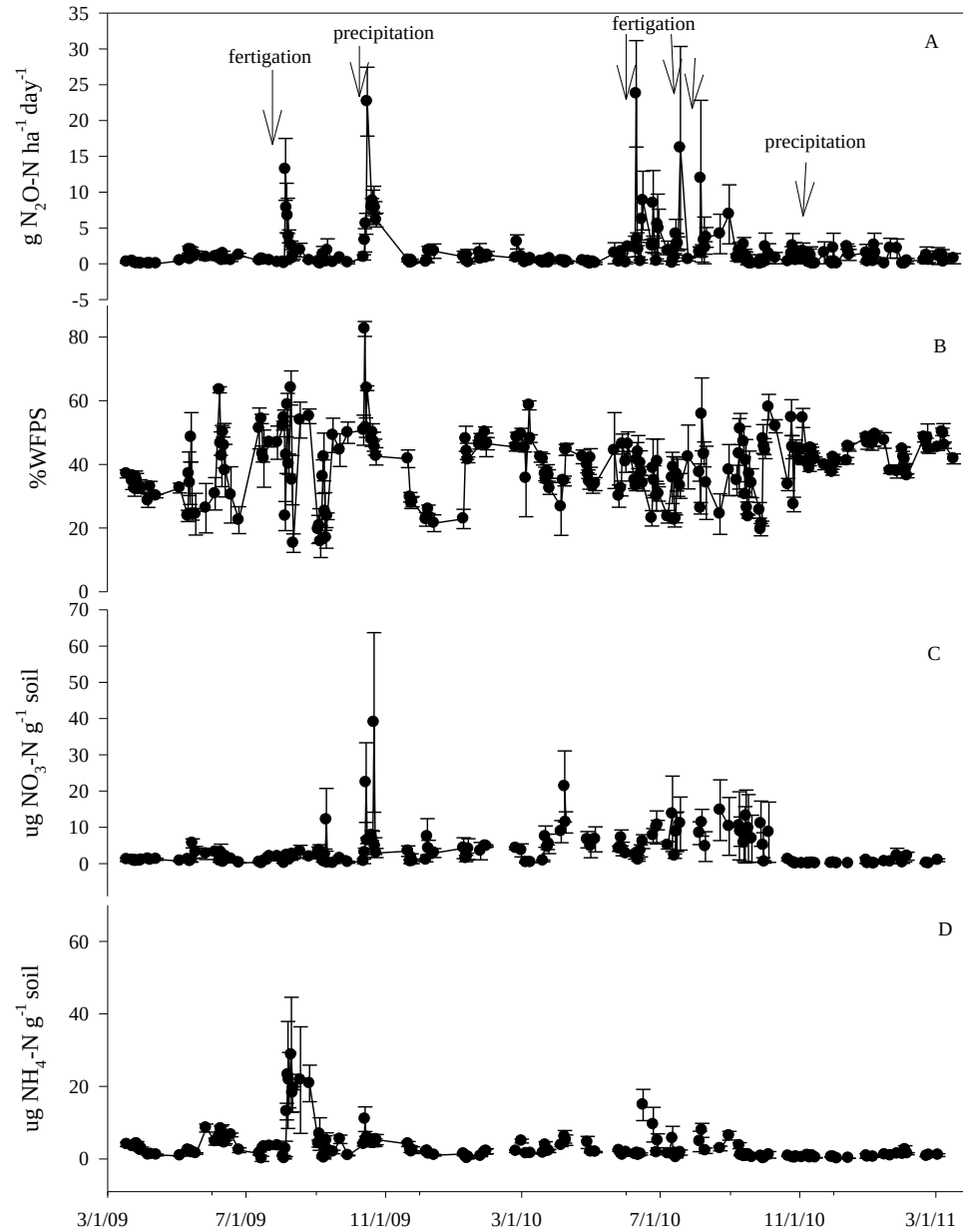


Vineyard



Vine

N_2O



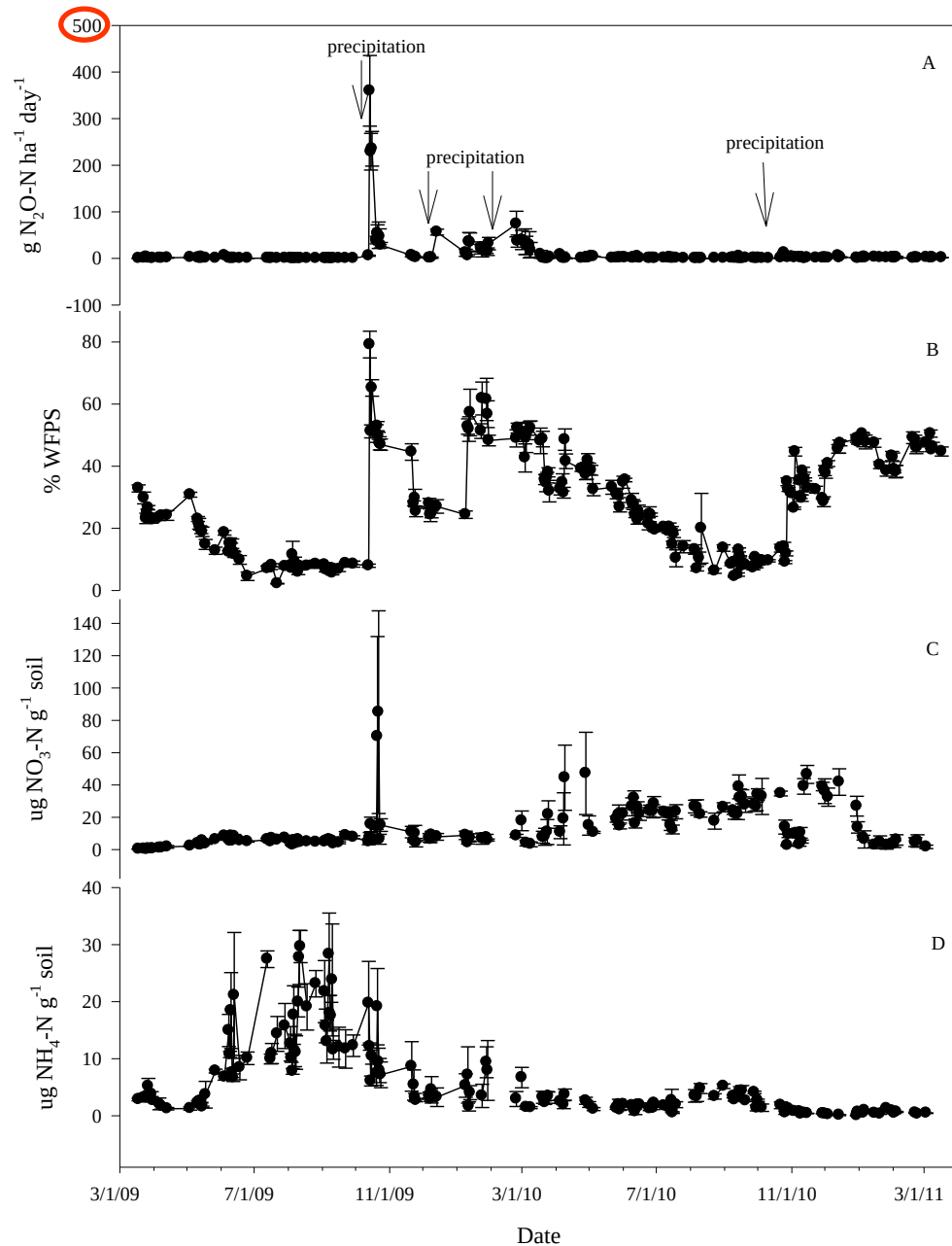
WFPS

NO_3

NH_4

ROW

N_2O

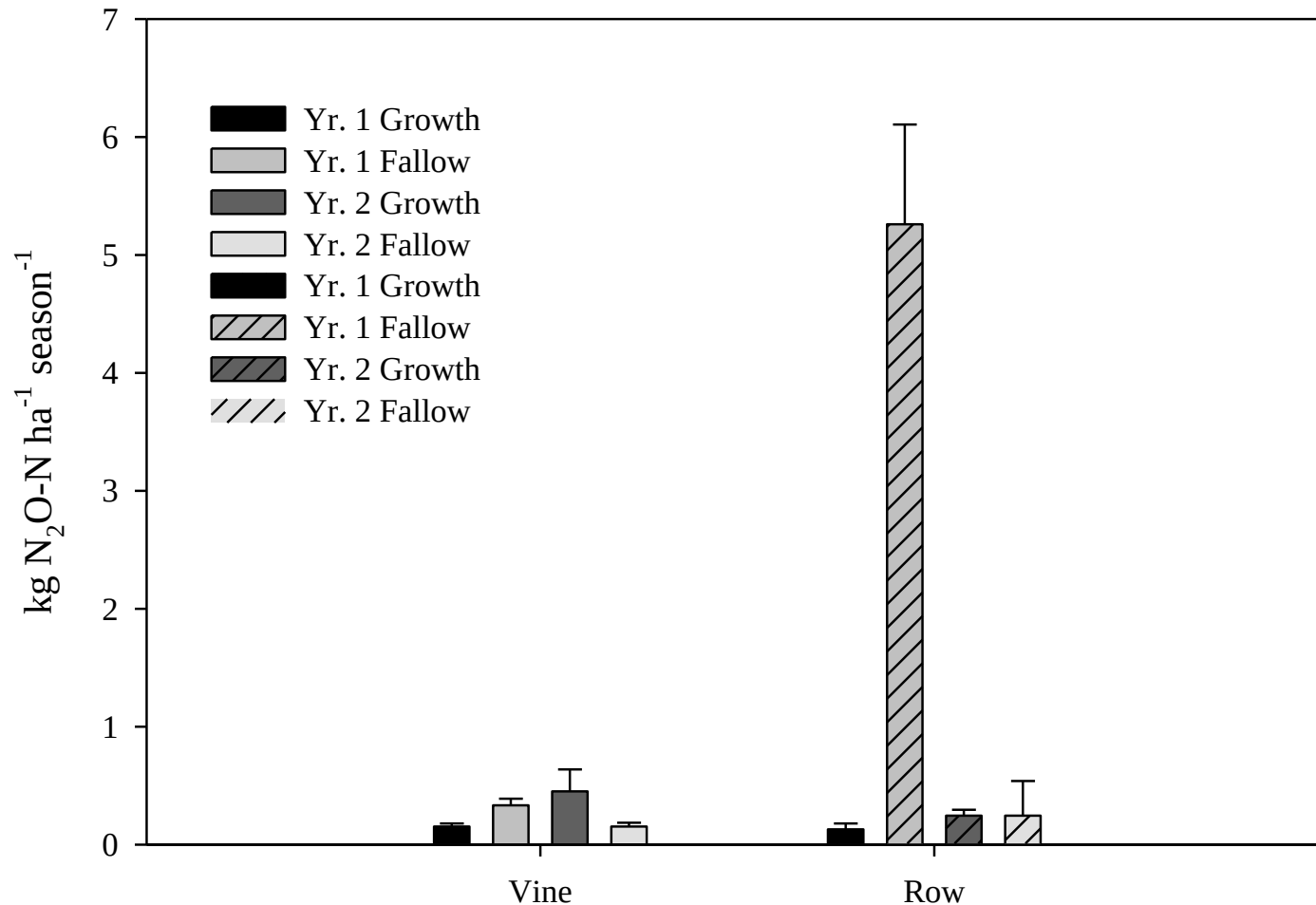


WFPS

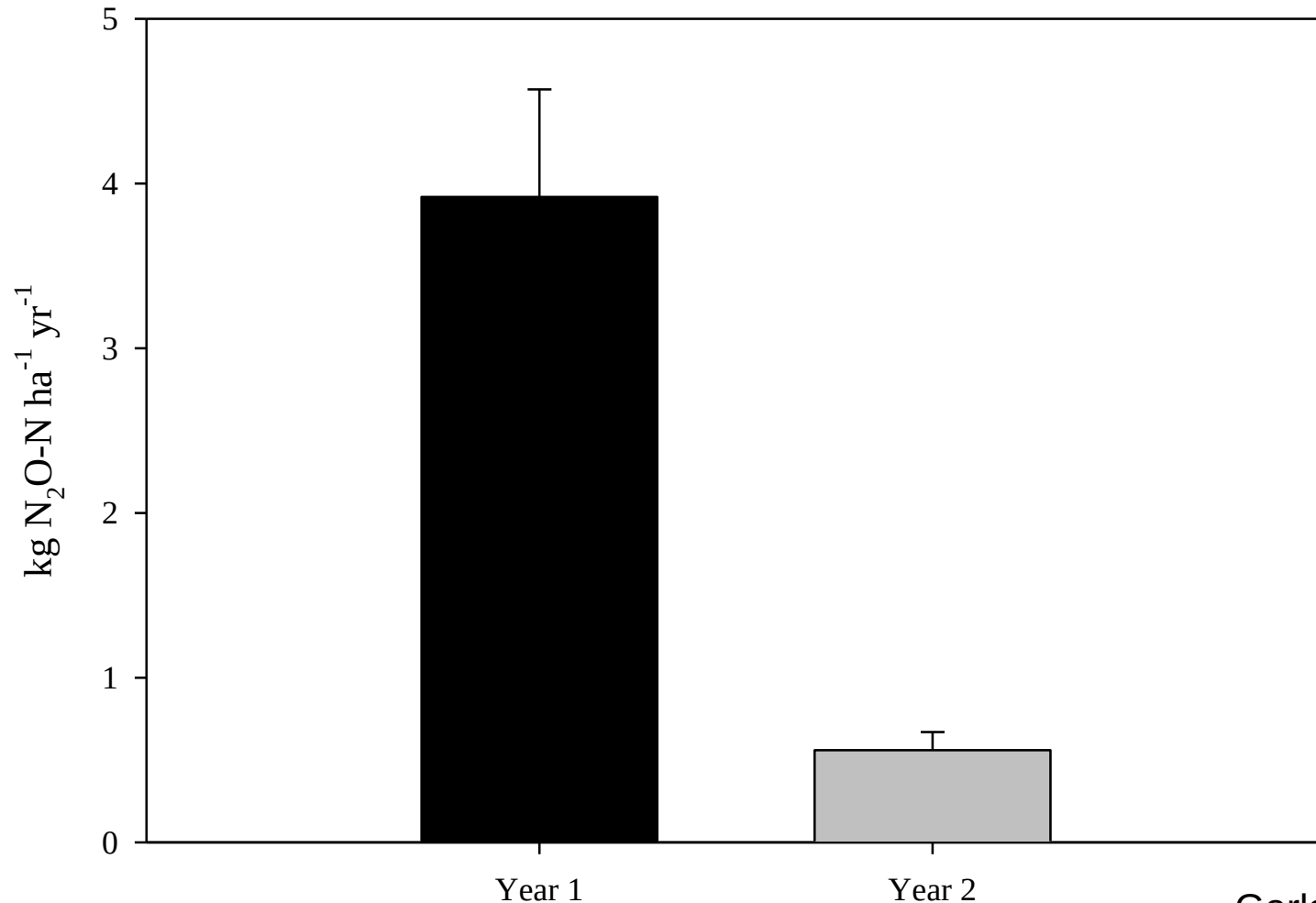
NO_3

NH_4

Cumulative seasonal N₂O emissions



Cumulative annual N₂O emissions



Typical Tomato Managements

Conventional

- Conventional Tillage
- Furrow Irrigation
- Rip and reform Beds

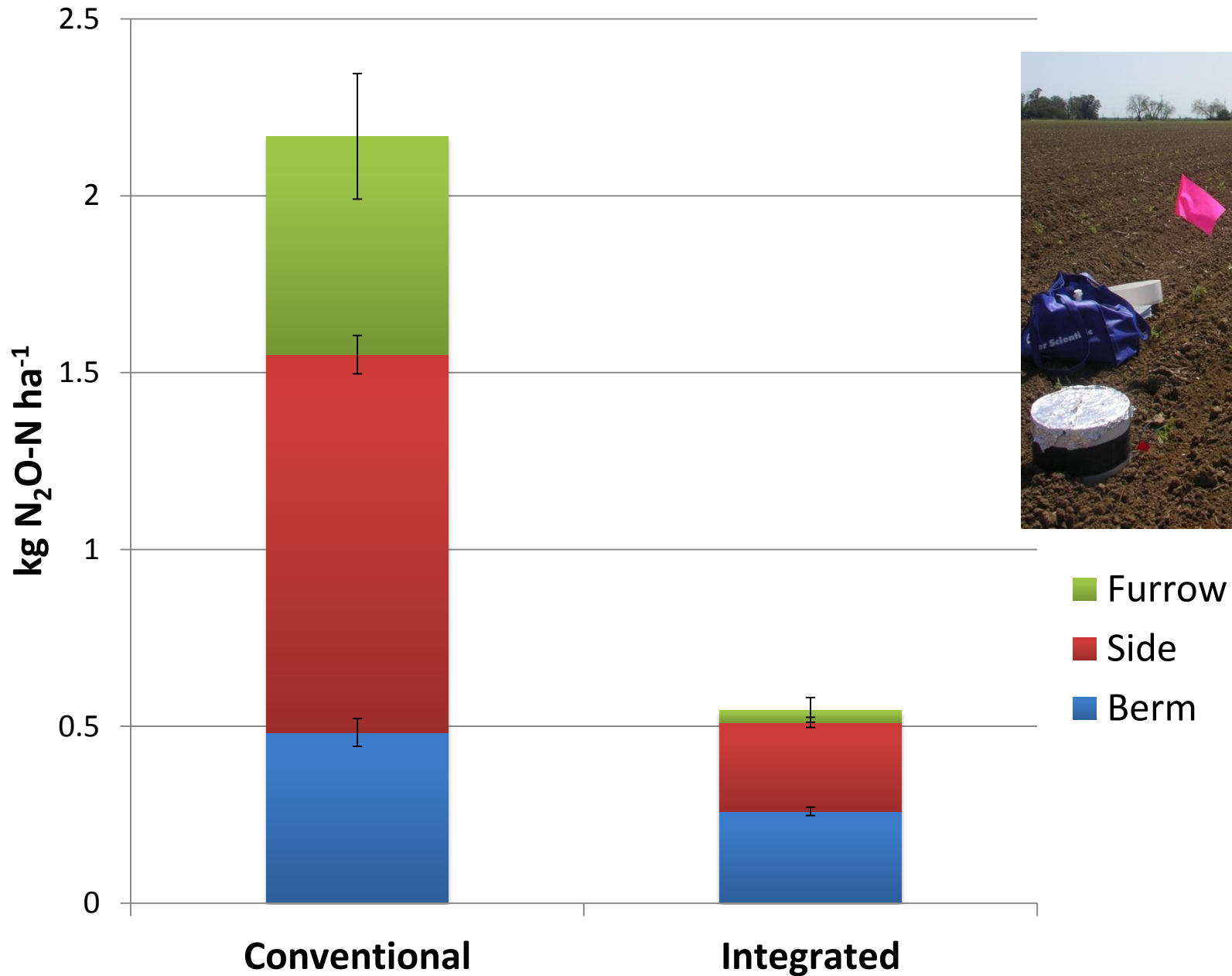


Integrated

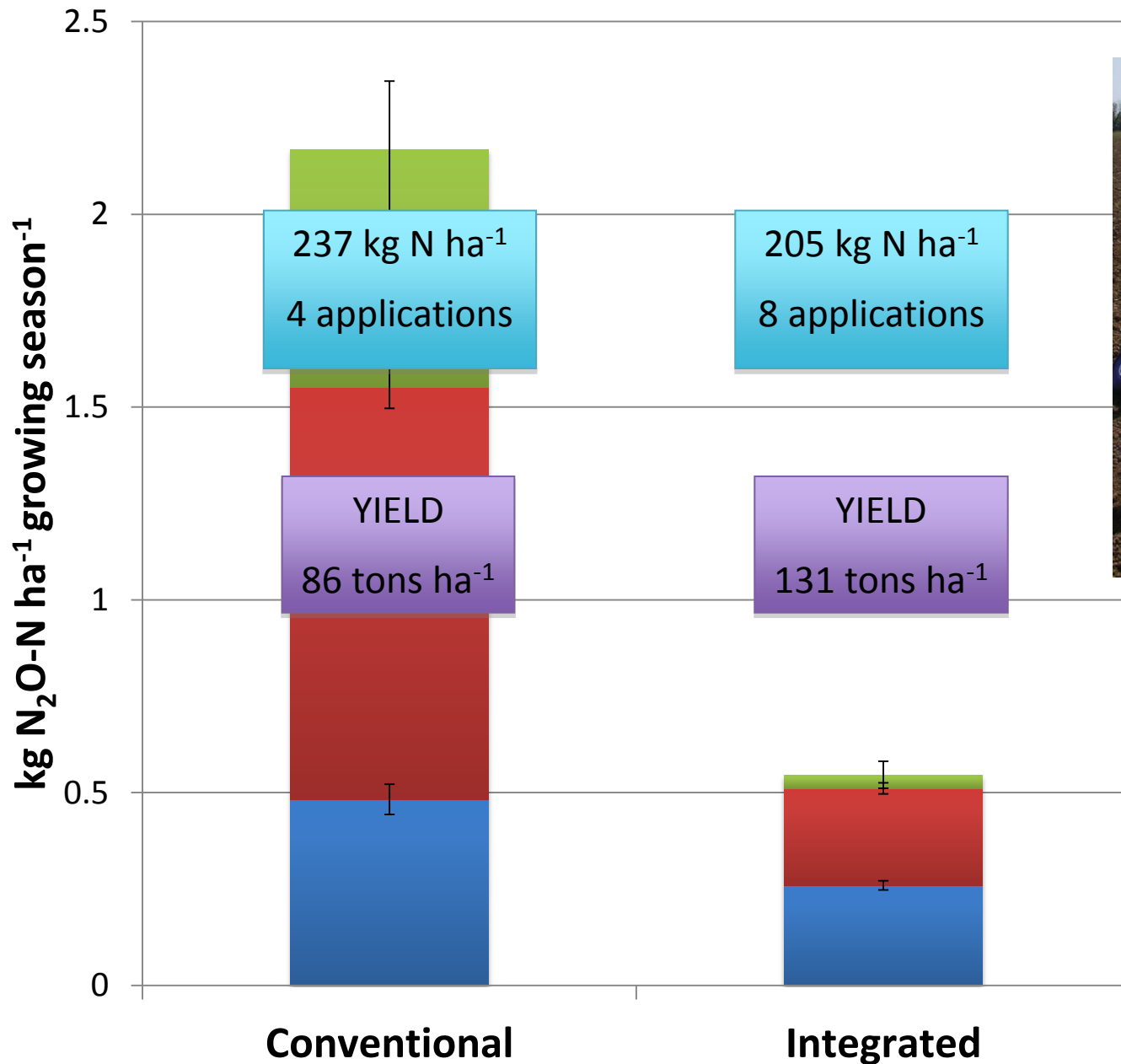
- Reduced Tillage
- Subsurface Drip Irrigation
- Winter Grain Cover Crop (*Triticale trios*)
- Preserve Planting Beds



Cumulative N₂O Emissions

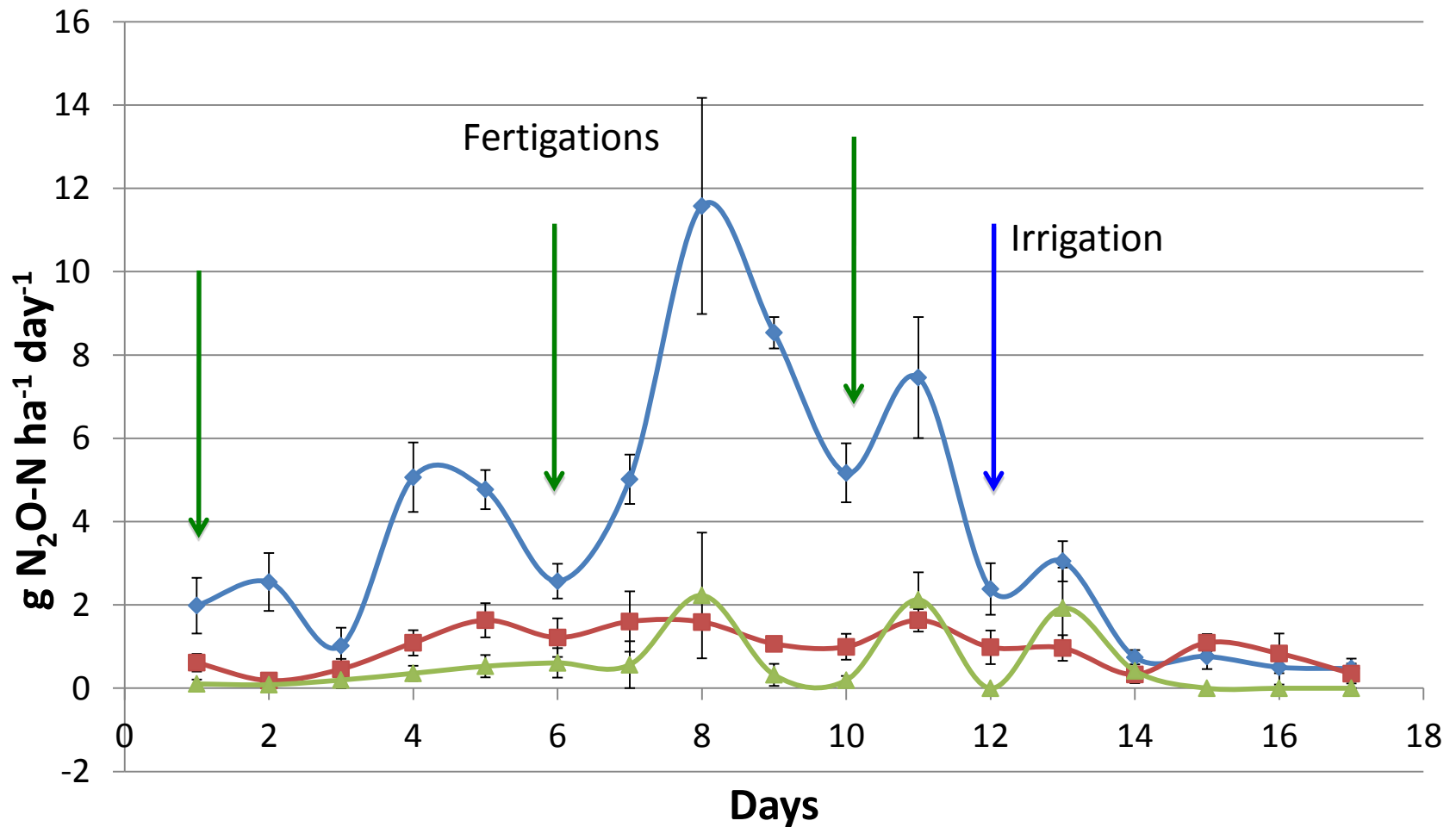


Cumulative N₂O Emissions



- Furrow
- Side
- Berm

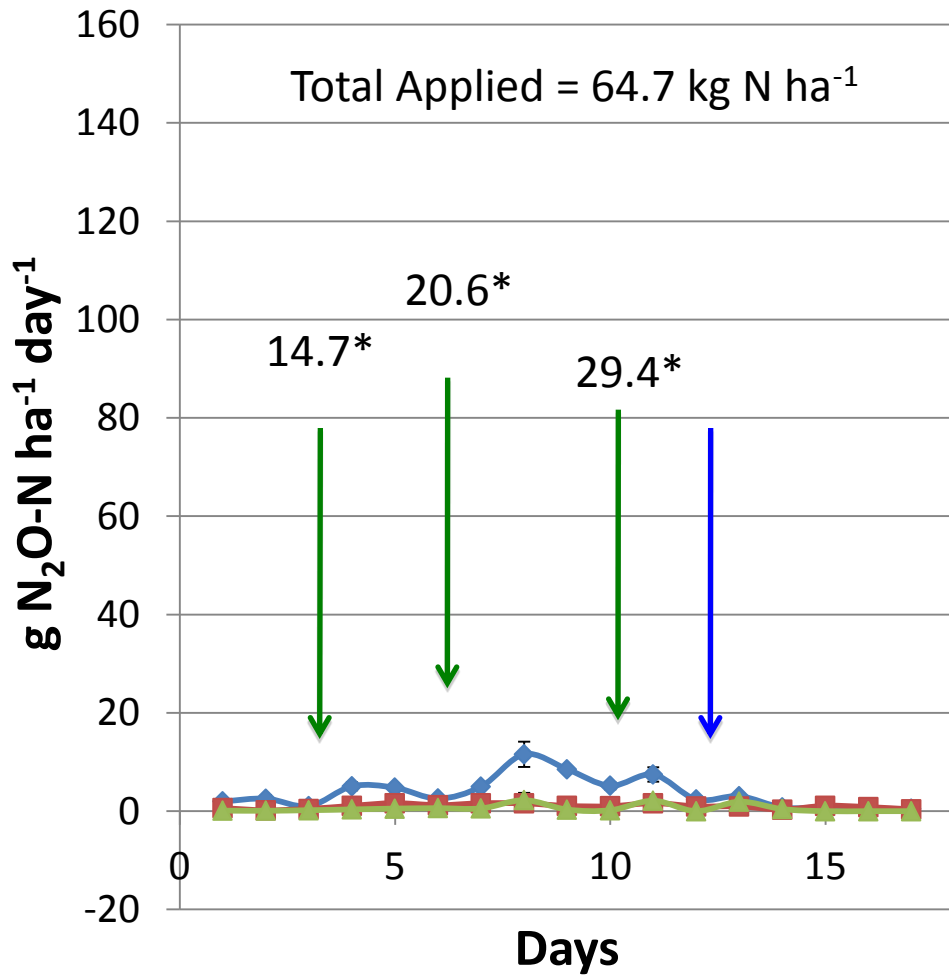
Integrated Fertilization



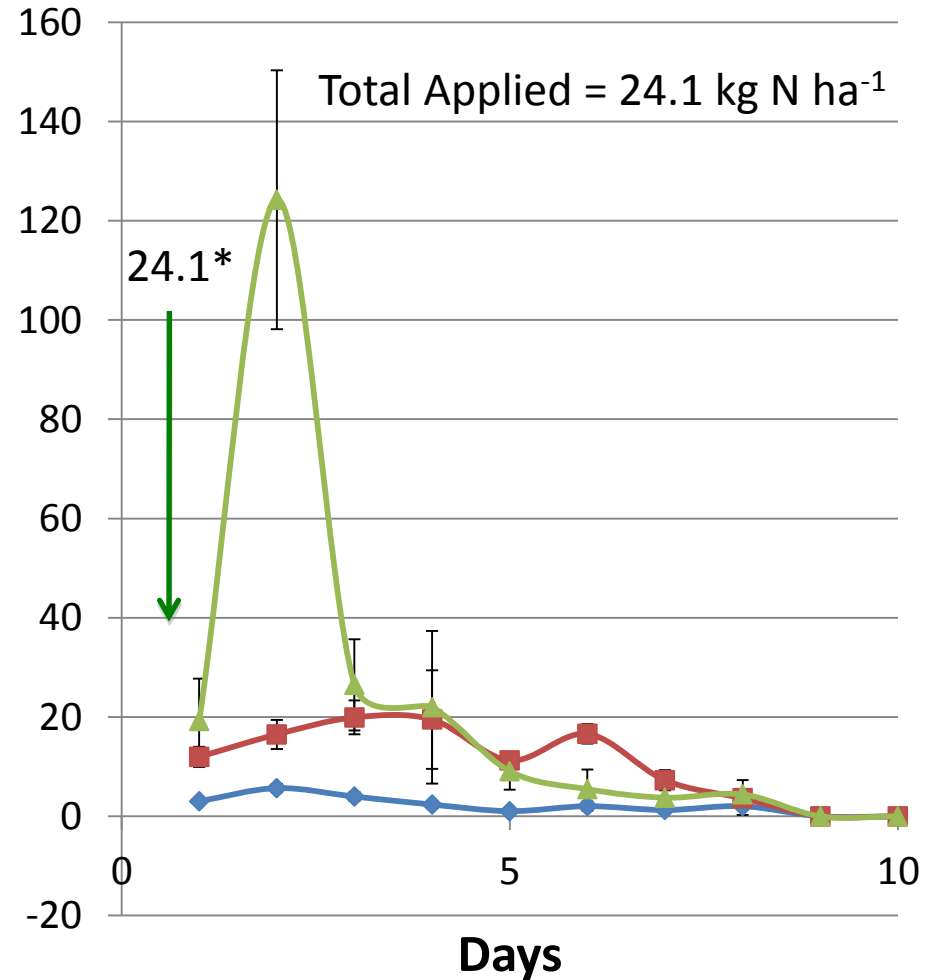
FERTILIZATION EVENT

—◆— Berm —■— Side —▲— Furrow

Integrated



Conventional



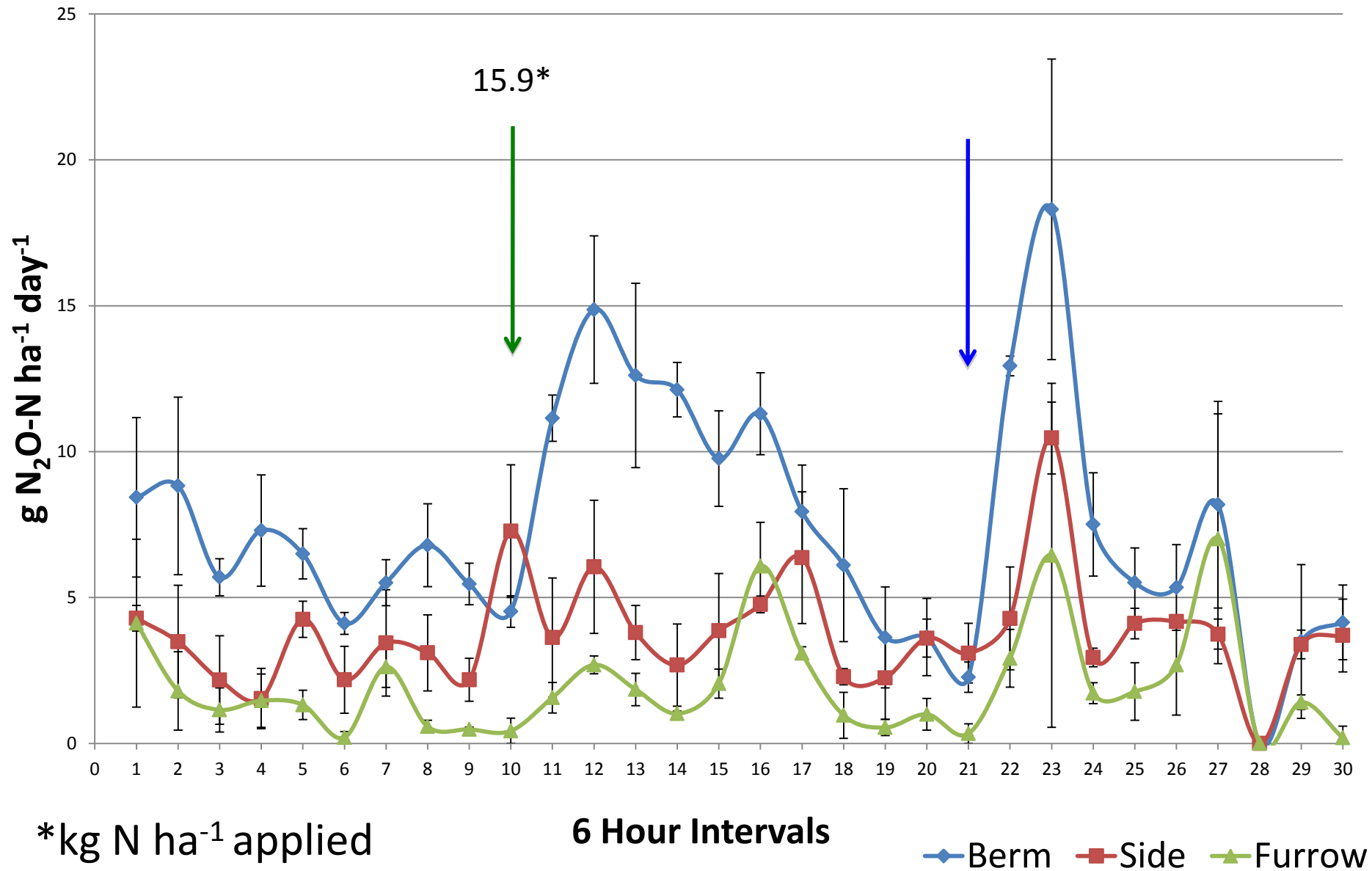
FERTILIZATION EVENT

*kg N ha⁻¹ applied

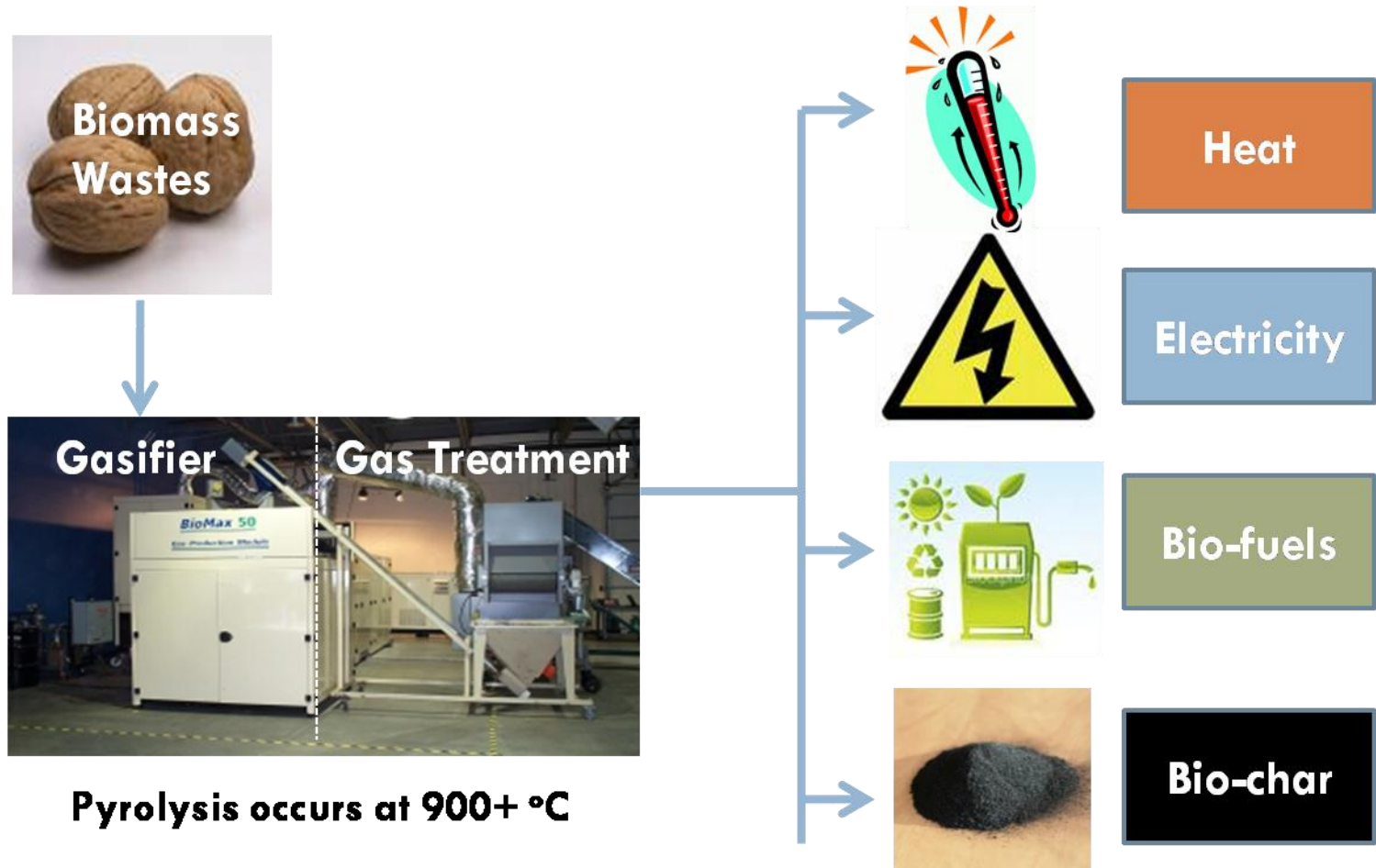
—◆— Berm —■— Side —▲— Furrow

Sampling Frequency:
4X/day

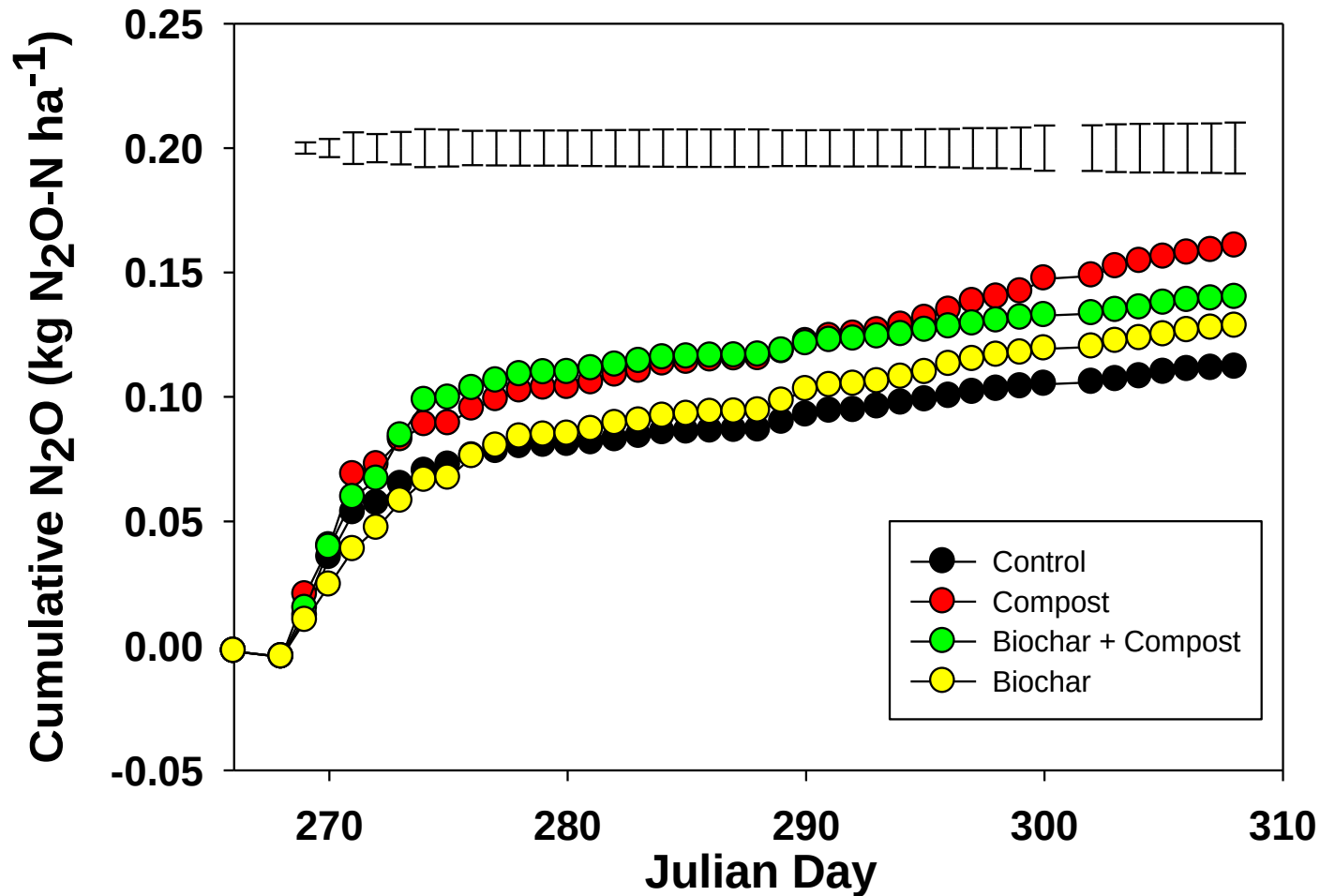
Integrated Fertilization



Biochar

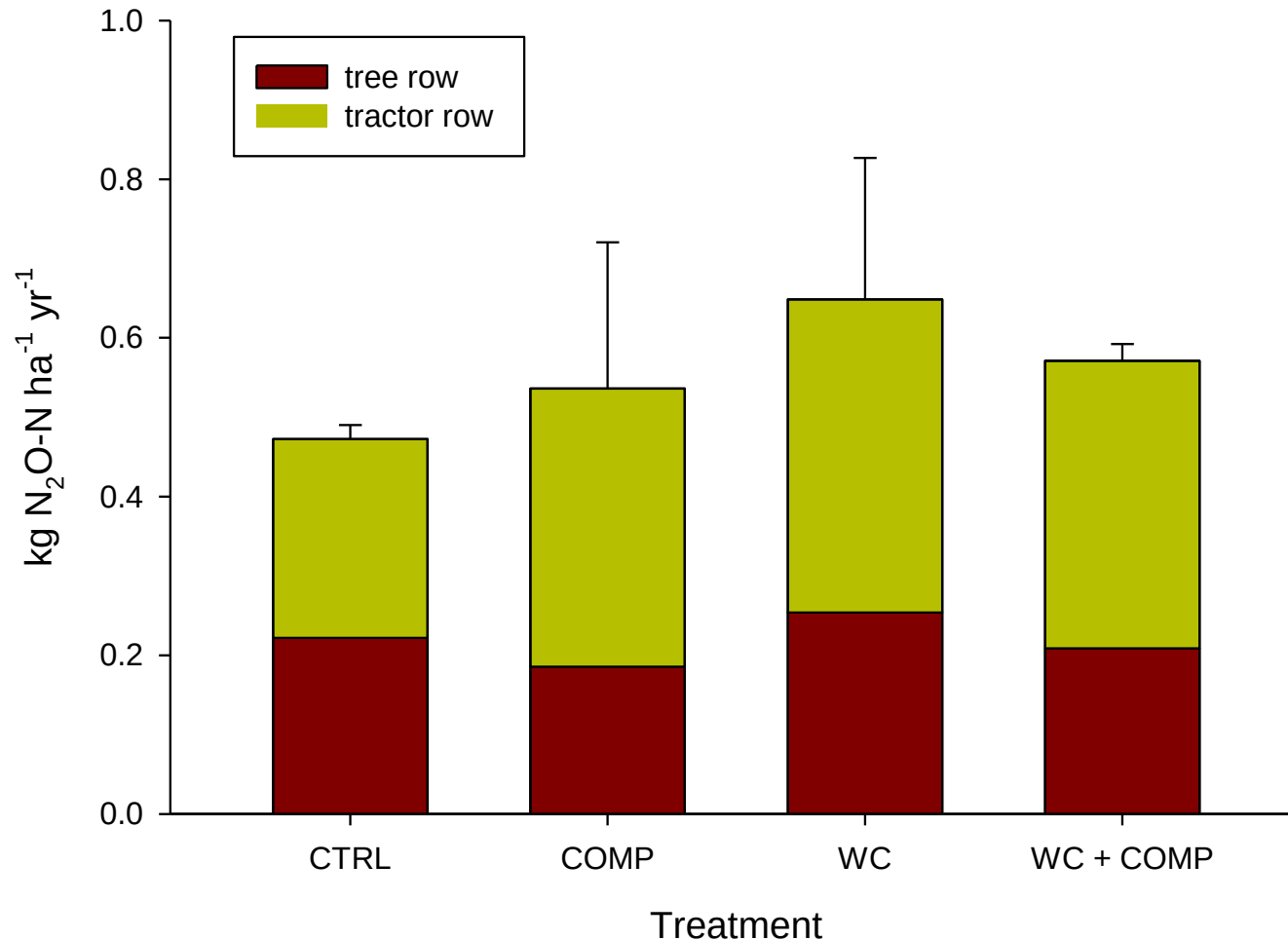


Cumulative N₂O emissions (Lettuce)

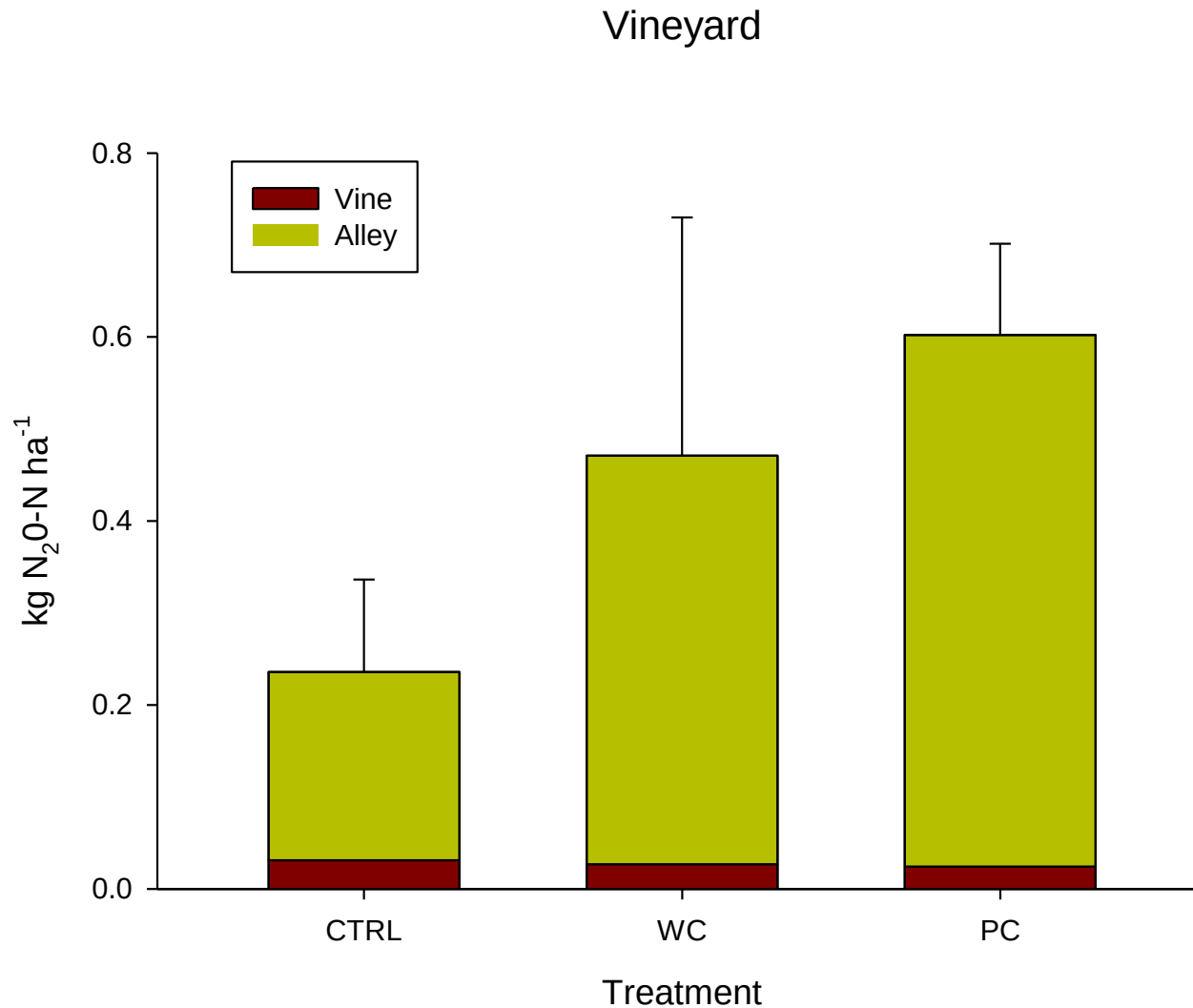


Cumulative annual N₂O emissions

Walnut Orchard



Cumulative N₂O emissions 11/6/2010-8/5/2011



Summary annual N₂O emissions

Cropping system	Management	N ₂ O flux kg N ₂ O ha ⁻¹	N input rate kg N ha ⁻¹ yr ⁻¹	Emission Factor %
Almond Vineyard	BAU	0.81 ± 0.08	230 (Fert)	0.35
	BAU	3.92 ± 0.65	52 (5 Fert + 47 CC)	7.5
	BAU	0.56 ± 0.11	5.4 (Fert)	10.4
	<i>BAU</i>	<i>0.24 ± 0.10</i>	<i>71 (46 Fert + 25 CC)</i>	<i>0.33</i>
	<i>Biochar</i>	<i>0.47 ± 0.26</i>	<i>73 (46 Fert + 27 CC)</i>	<i>0.65</i>
	<i>Biochar</i>	<i>0.60 ± 0.10</i>	<i>73 (46 Fert + 27 CC)</i>	<i>0.82</i>
Walnut	Organic	0.47 ± 0.02	40 (CC)	1.17
	<i>Biochar</i>	<i>0.65 ± 0.18</i>	<i>40 (CC)</i>	<i>1.63</i>
Tomato	<i>BAU</i>	<i>2.39 ± 0.17</i>	<i>237 (Fert)</i>	<i>0.87</i>
	<i>Integrated</i>	<i>0.58 ± 0.06</i>	<i>205 (Fert)</i>	<i>0.29</i>
Lettuce	<i>Organic</i>	<i>0.14 ± 0.01</i>	<i>115 (Feather Meal)</i>	<i>0.12</i>
	<i>Biochar</i>	<i>0.14 ± 0.02</i>	<i>115 (Feather Meal)</i>	<i>0.12</i>

Fluxes in bold and italic are seasonal fluxes

Conclusions

- N₂O emissions are significant in agriculture
- BUT, there are options to reduce it
- AND not only through reducing fertilizer use and impacting yields
- SO, simple emission factors do not really work!

Acknowledgements

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