



The nitrogen footprint of organic food in the United States



Laura Cattell Noll¹, Allison M. Leach², Verena Seufert³, James N. Galloway¹, Brooke Atwell¹, Jan Willem Erisman⁴, Jessica Shade⁵

¹ University of Virginia ² University of New Hampshire ³ University of British Columbia ⁴ Louis Bolk Institute ⁵ The Organic Center

Presentation Outline

1 Comparing Organic and Conventional Production

2 Organic Crop Products

3 Organic Animal Products

4 Comparing Organic and Conventional N Losses



Food Nitrogen Footprint

Food consumption
N

= N that enters
human mouth



Virtual N

= Food production N
= N lost to the
environment during
the food production
process



Virtual Nitrogen Factors = _____

1

Organic vs. Conventional Production : N differences

N Efficiency & N Input Type →



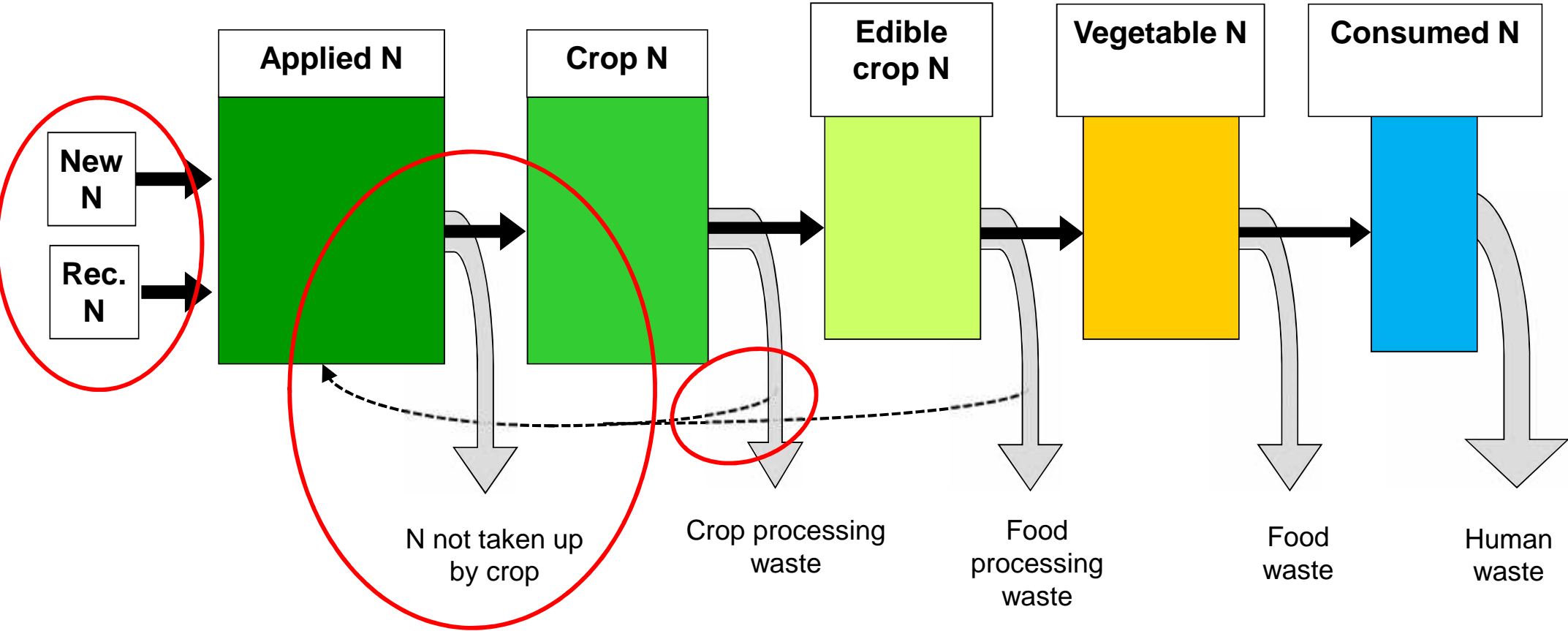
virtual nitrogen factors = _____

New N = mineral fertilizer,
BNF etc.

Recycled N = manure, crop
residue, compost etc.



Nitrogen Flow in Crop Production Systems



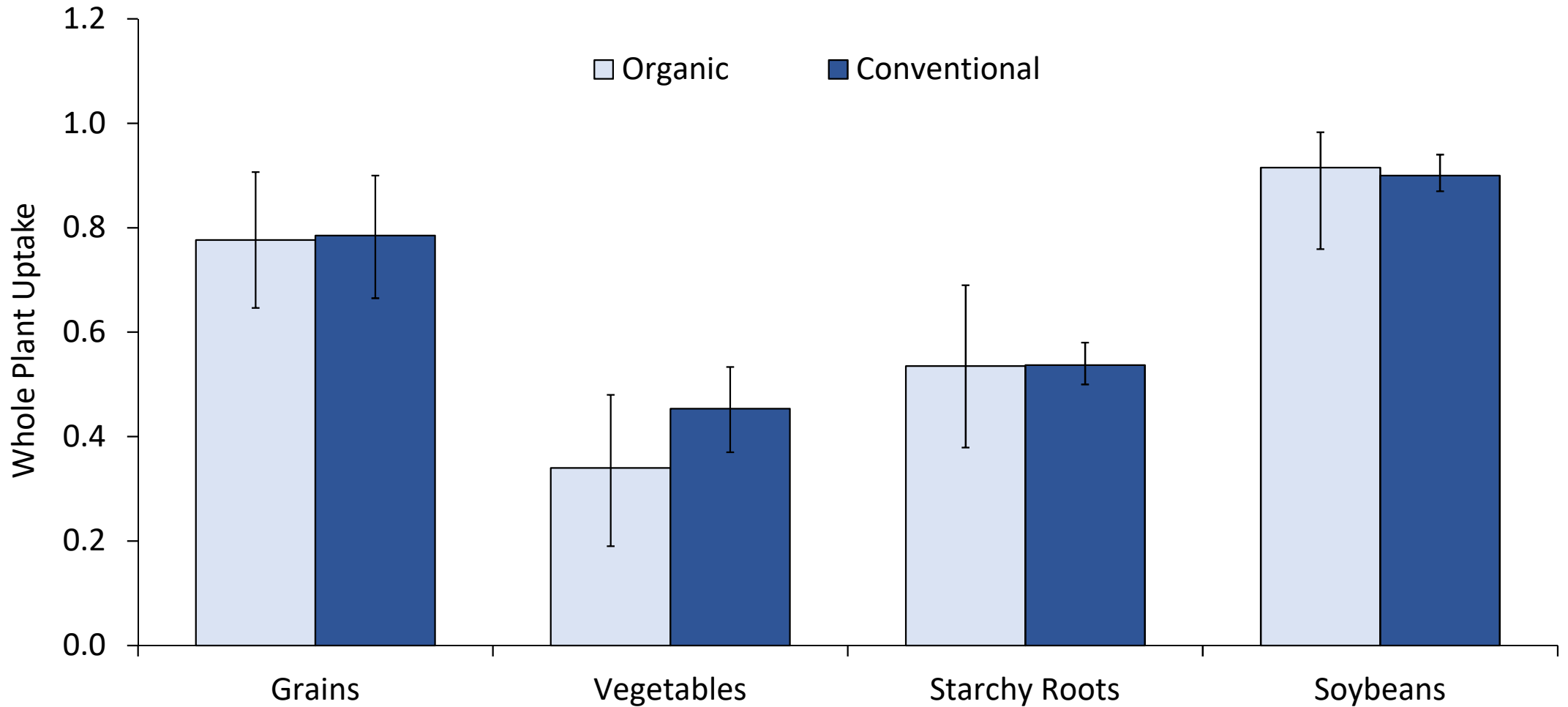
Organic Crop Products

- Literature Review → Reviewed 85 studies, included 126 observations
- Whole Plant N Uptake = _____
- Recycling Rate = 50%



Whole Plant N Uptake = _____

Conclusion: N uptake is similar



* Preliminary Results

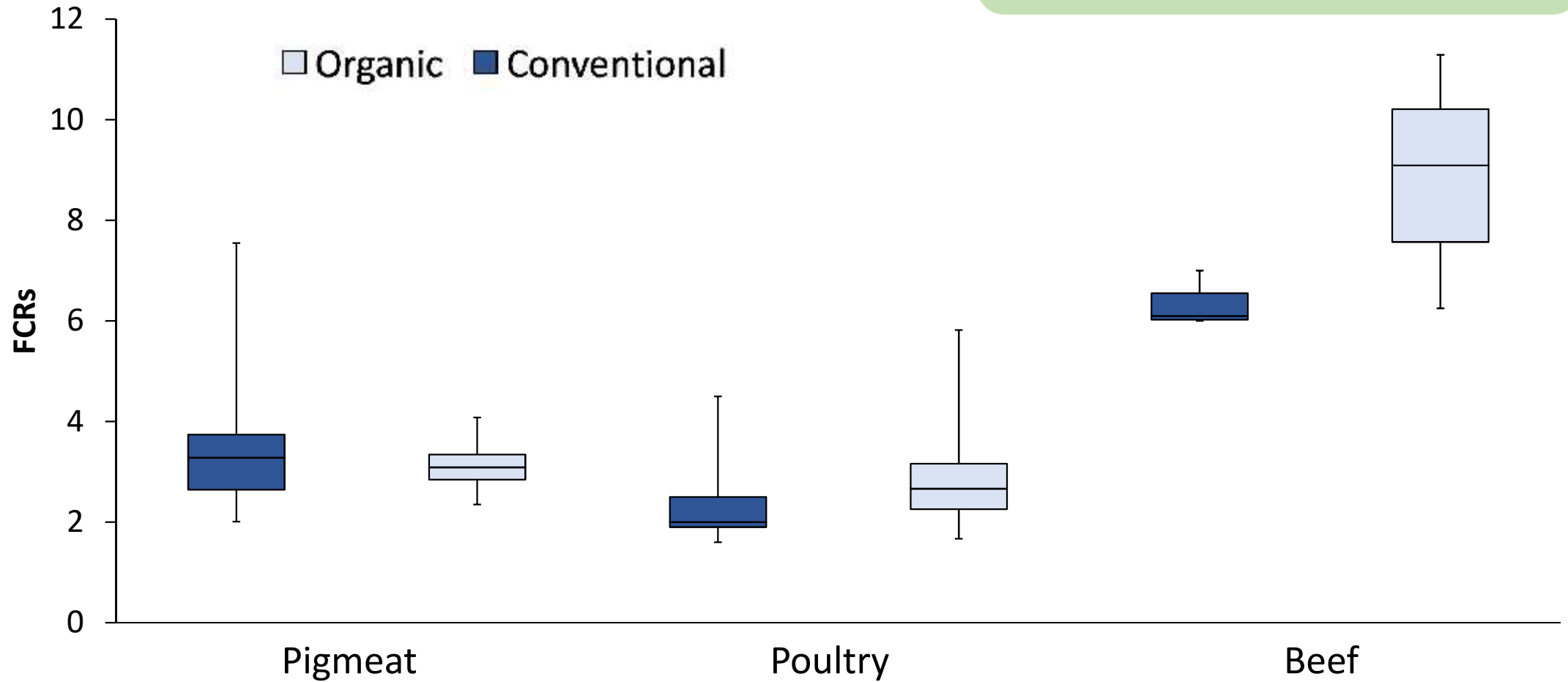
Organic Animal Products

- Literature Review → Reviewed 50 studies, included 137 observations
- Used Feed Conversion Ratio → N Uptake = _____
- Diet → grazing, N content of feed



Feed Conversion Ratios

Conclusion: FCRs are similar, except for beef



* Preliminary Results

4

Comparing Organic and Conventional Losses

N Efficiency & N Input Type →



virtual nitrogen factors = _____

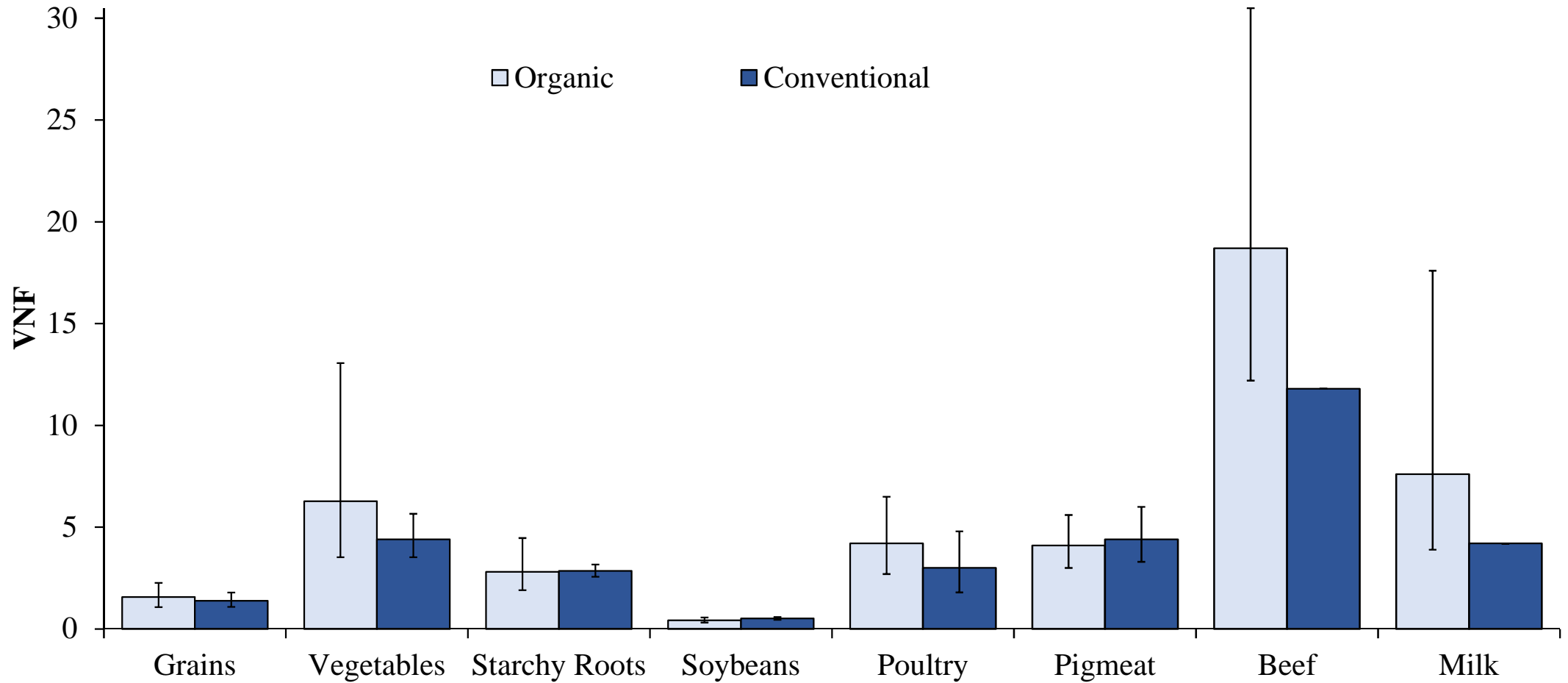
New N = mineral fertilizer,
BNF etc.

Recycled N = manure, crop
residue, compost etc.



Virtual Nitrogen Factors = _____

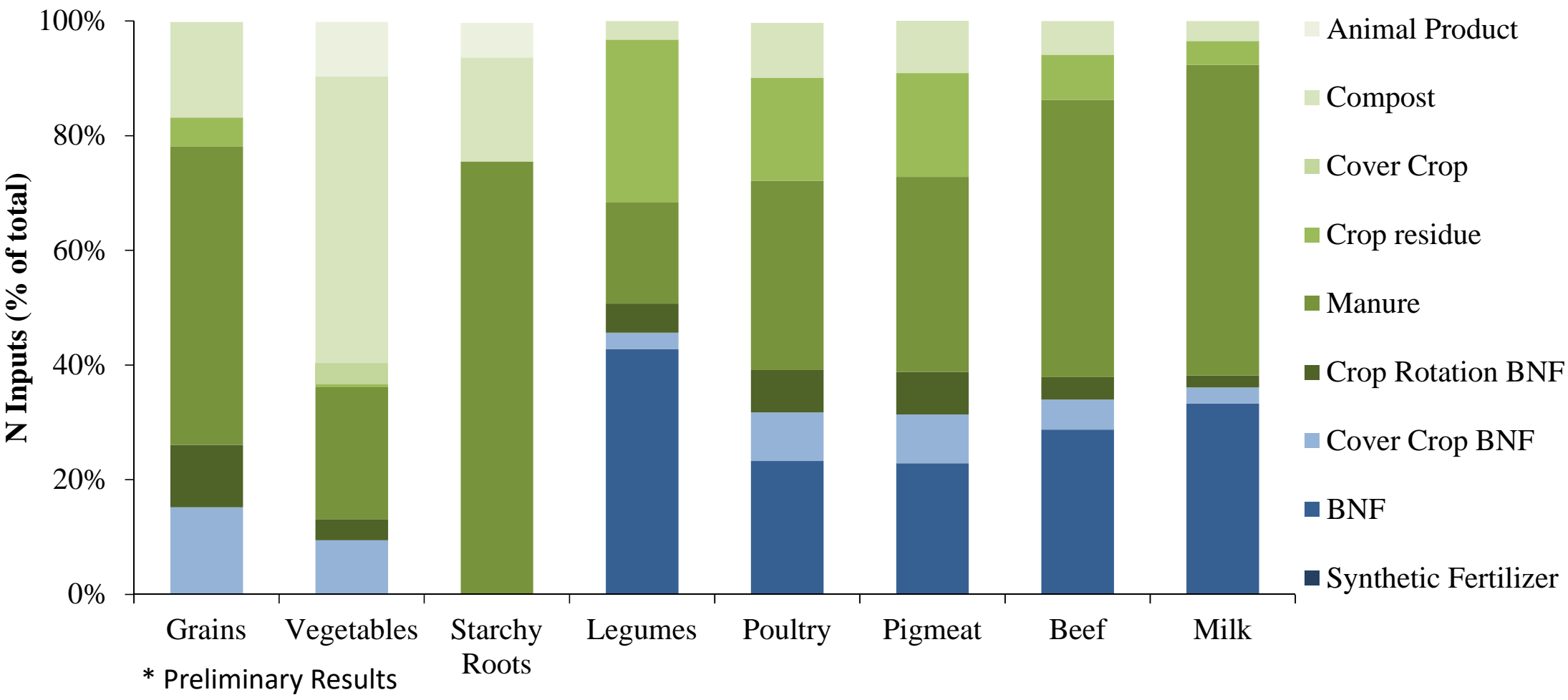
Conclusion: VNFs are comparable



* Preliminary Results

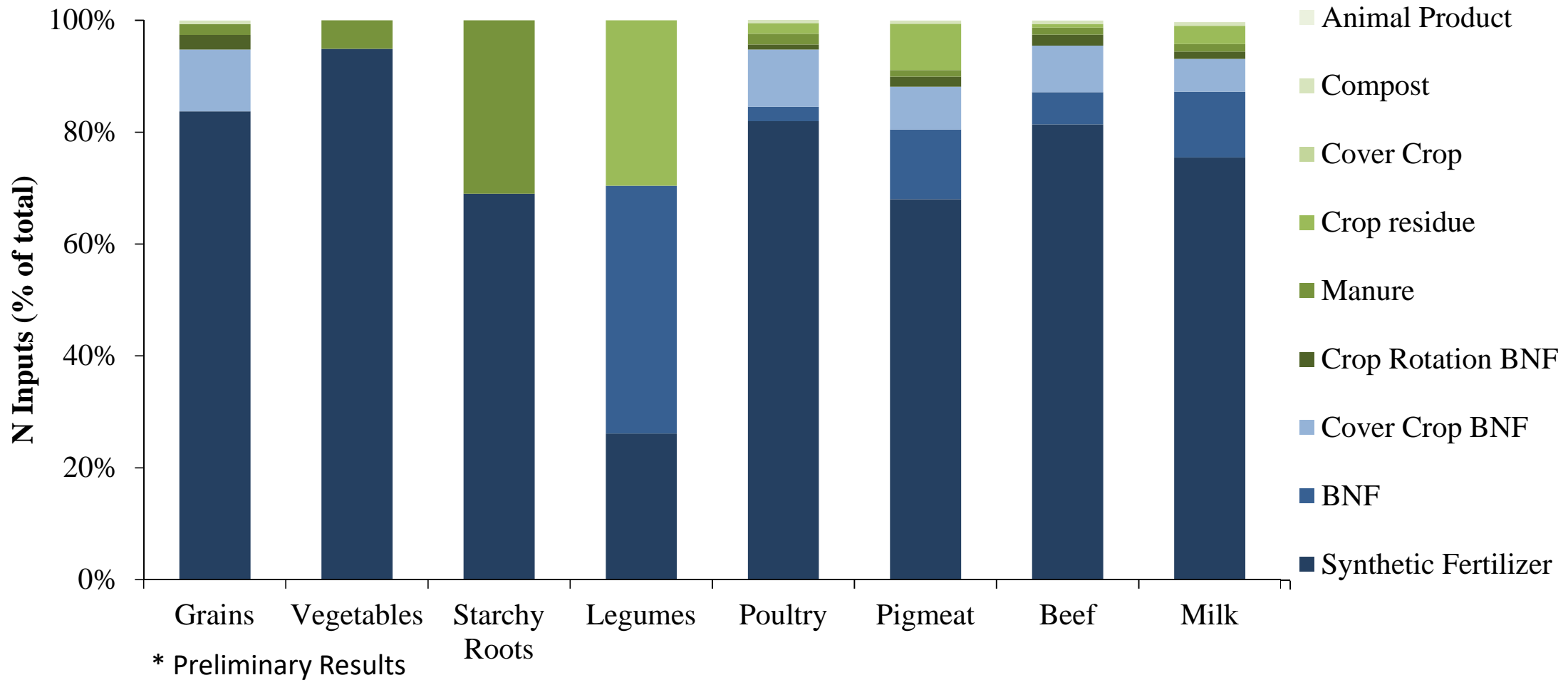
N Input Types - Organic

Conclusion: Organic products use mostly recycled N



N Input Types - Conventional

Conclusion: Conventional products use mostly new N



A cow is grazing in a field of tall grass. In the background, there are green trees and a clear blue sky. The scene is brightly lit, suggesting a sunny day.

Conclusions

- Organic and conventional systems are highly variable
- Consuming organic food has little impact on N footprint
- Differences in N input types: new N vs recycled N

Conclusion: Nr losses from organic production are comparable to Nr losses from conventional production, but organic has the potential to introduce less new Nr to the global pool

Thank You

Special Thanks to:

Albert Bleeker – Netherlands Environmental
Assessment Agency

Ariel Majidi – University of Virginia

Virginia Mathurin – University of Virginia

Izzy Castner – University of Virginia

Shana Jiang – University of Virginia

Mark Powell - USDA

Cliff Snyder – IPNI

Rick Kohn – University of Maryland

