

NITROGEN MANAGEMENT IN ORGANIC POTATO PRODUCTION: CHALLENGES AND OPPORTUNITIES

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Agriculture and
Agri-Food Canada

Agriculture et
Agroalimentaire Canada

Canada

OUR GOAL

Match amount and timing of N supply to crop N demand to optimize tuber yield and quality



OUR GOAL

**Insufficient N supply results in
loss in tuber yield and tuber size**



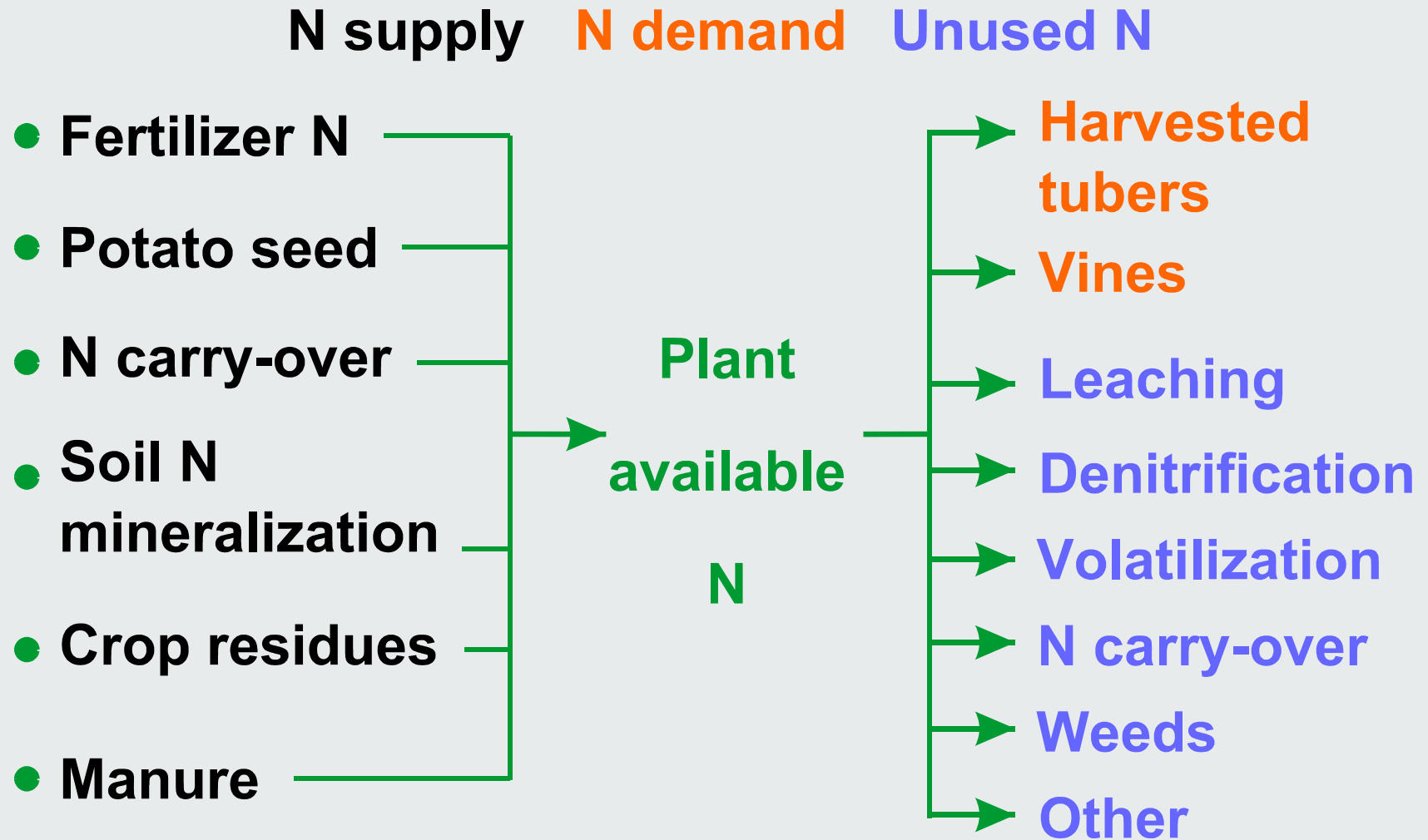
OUR GOAL

Excess N supply can contribute to:

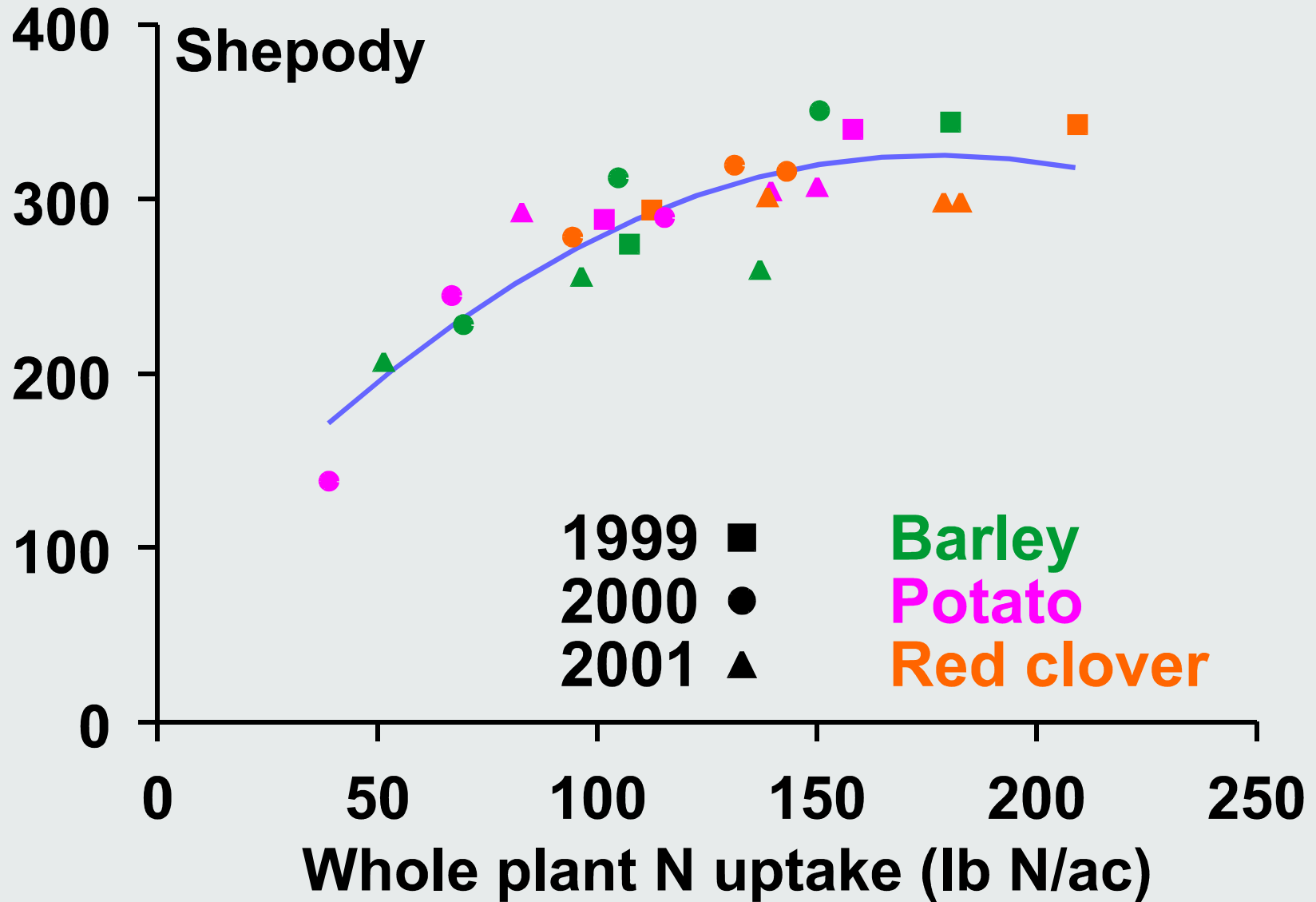
- **Nitrate leaching**
- **Greenhouse gas emissions (nitrous oxide)**



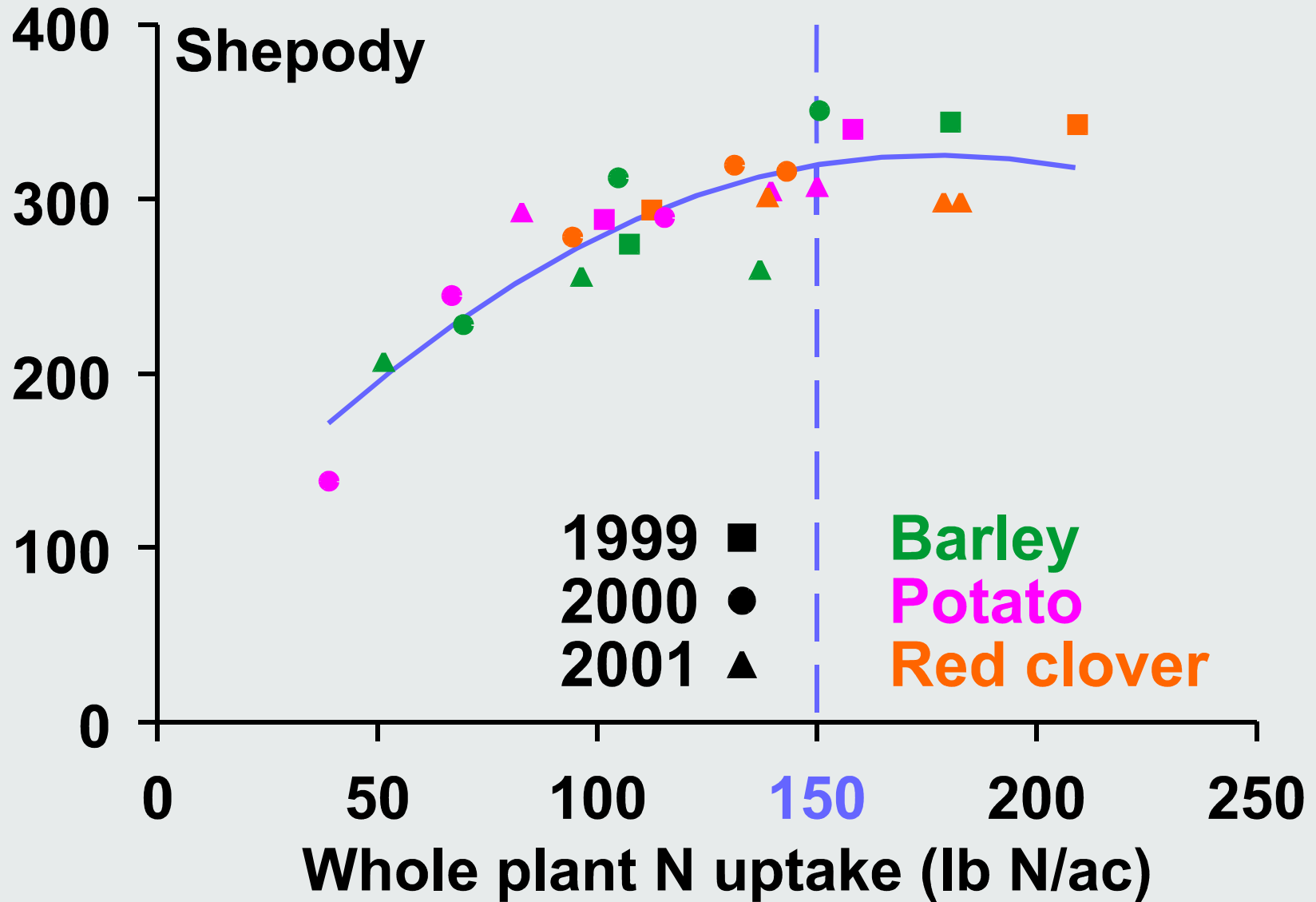
POTATO N BUDGET



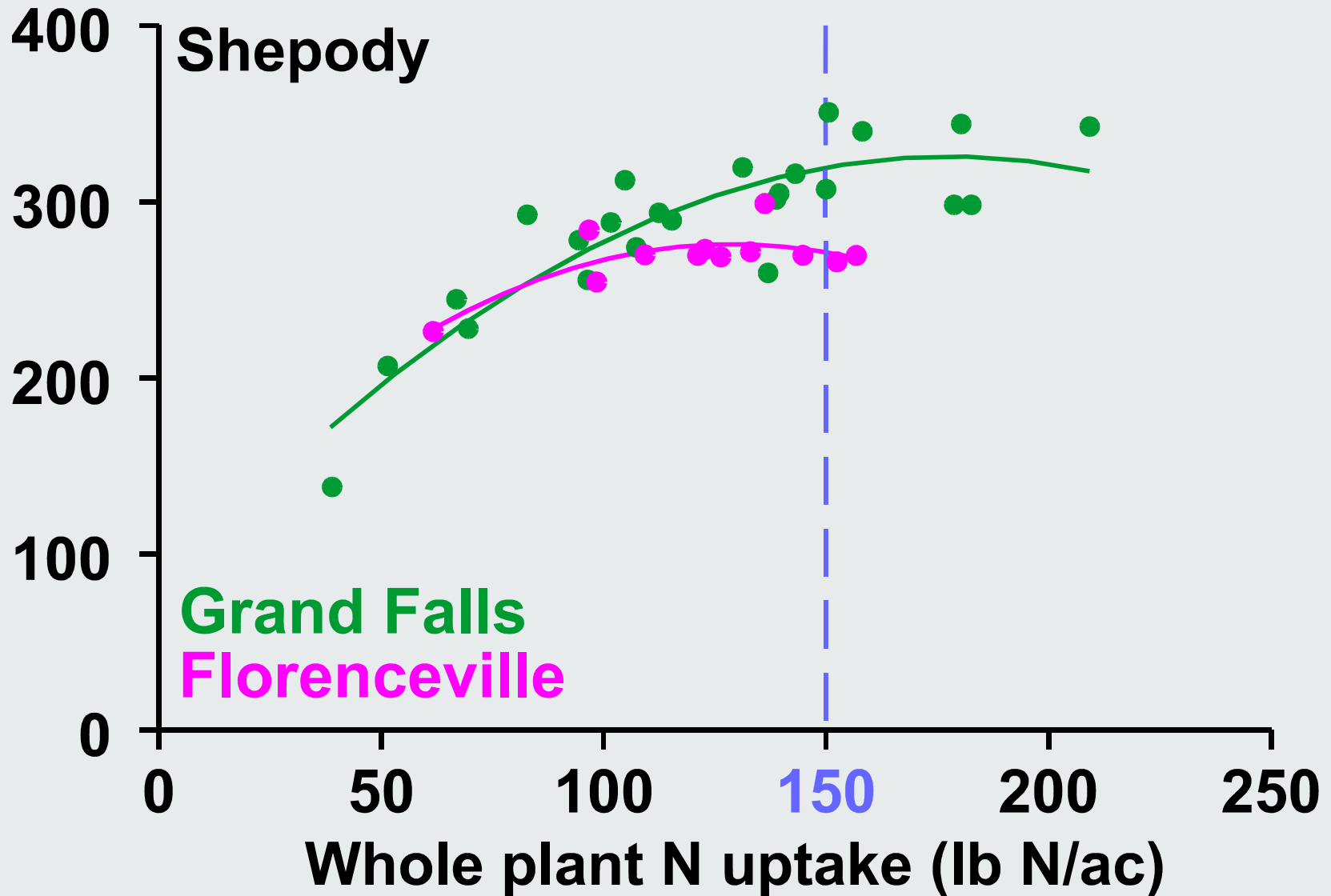
TOTAL TUBER YIELD (cwt/ac)



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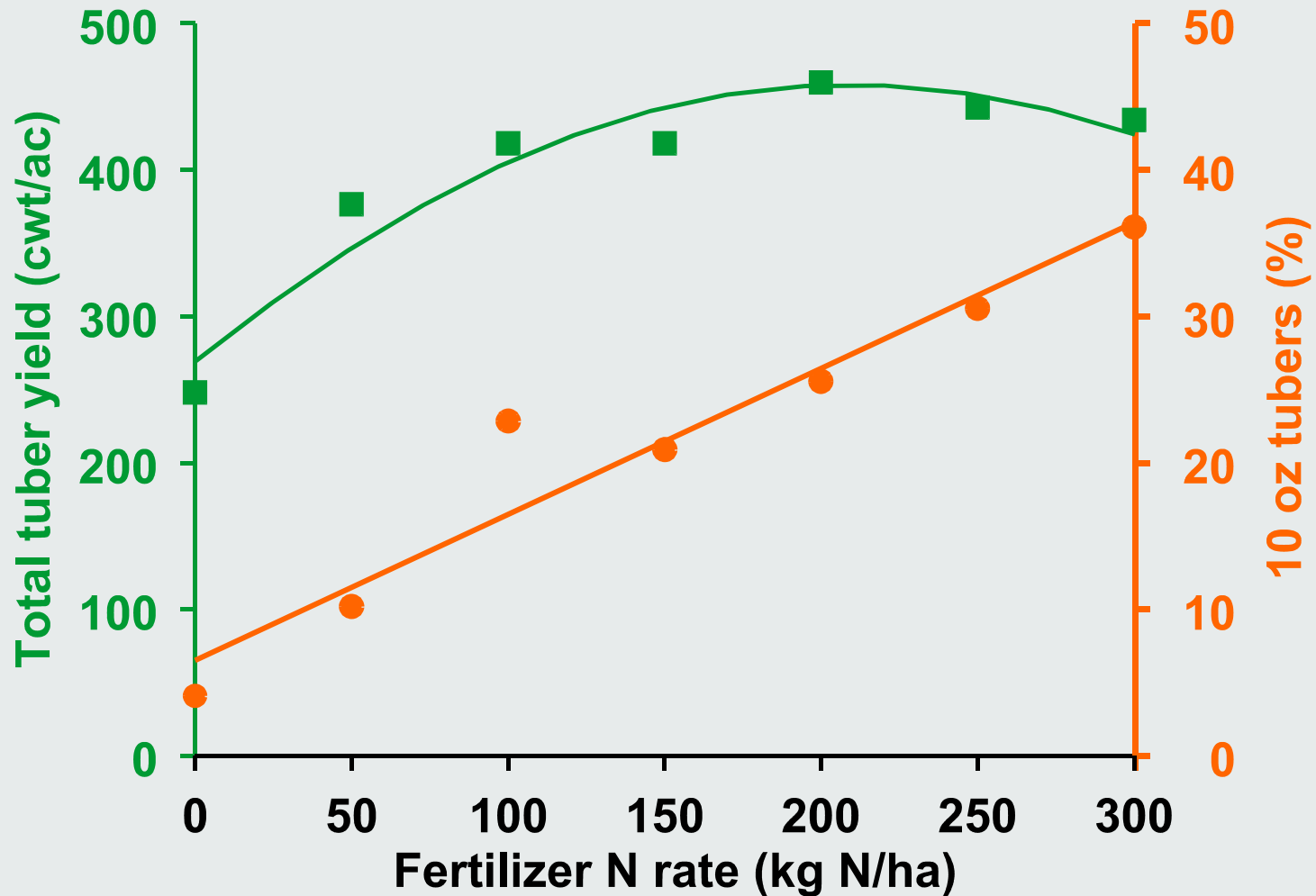


TOTAL TUBER YIELD (cwt/ac)

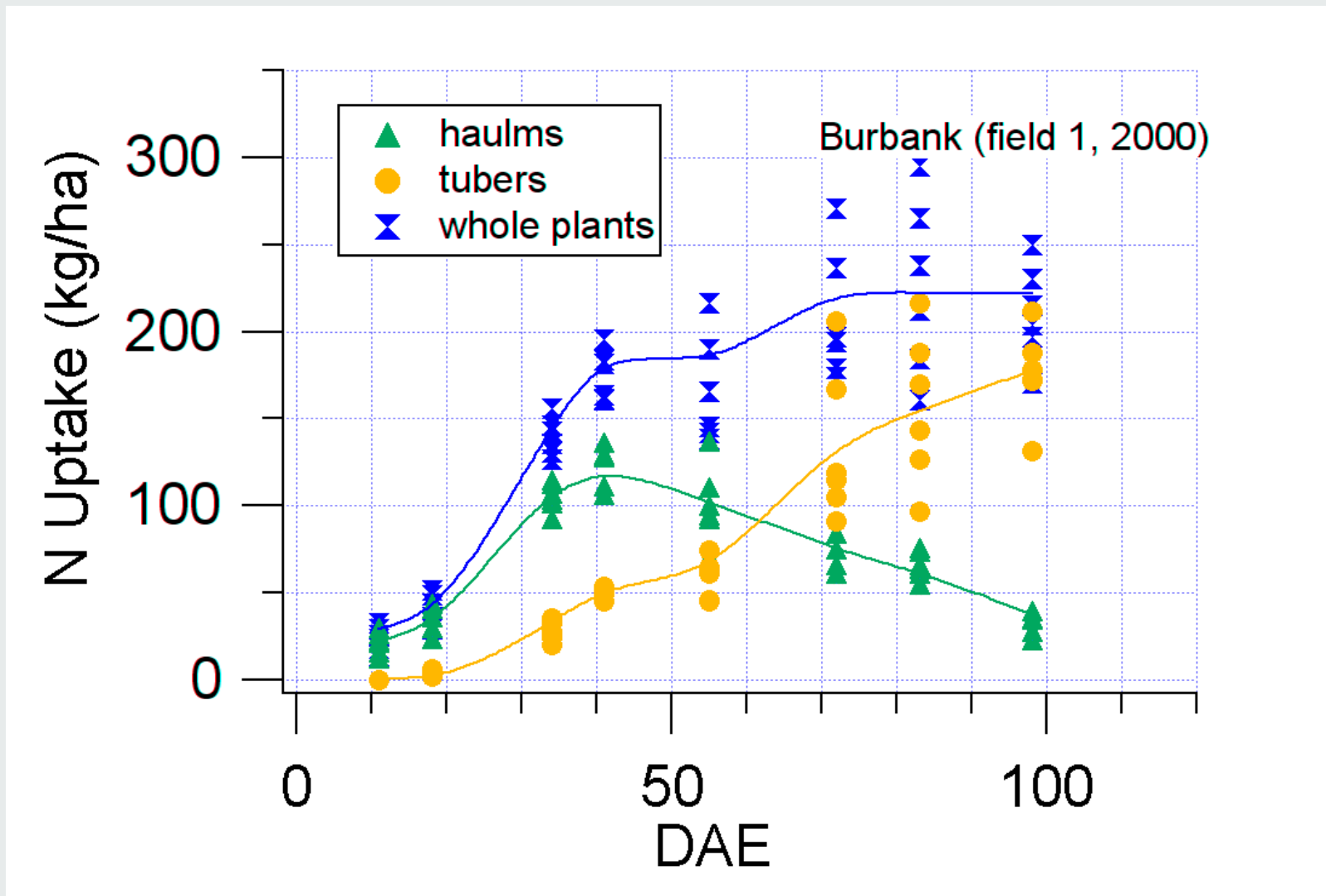


CROP N RESPONSE

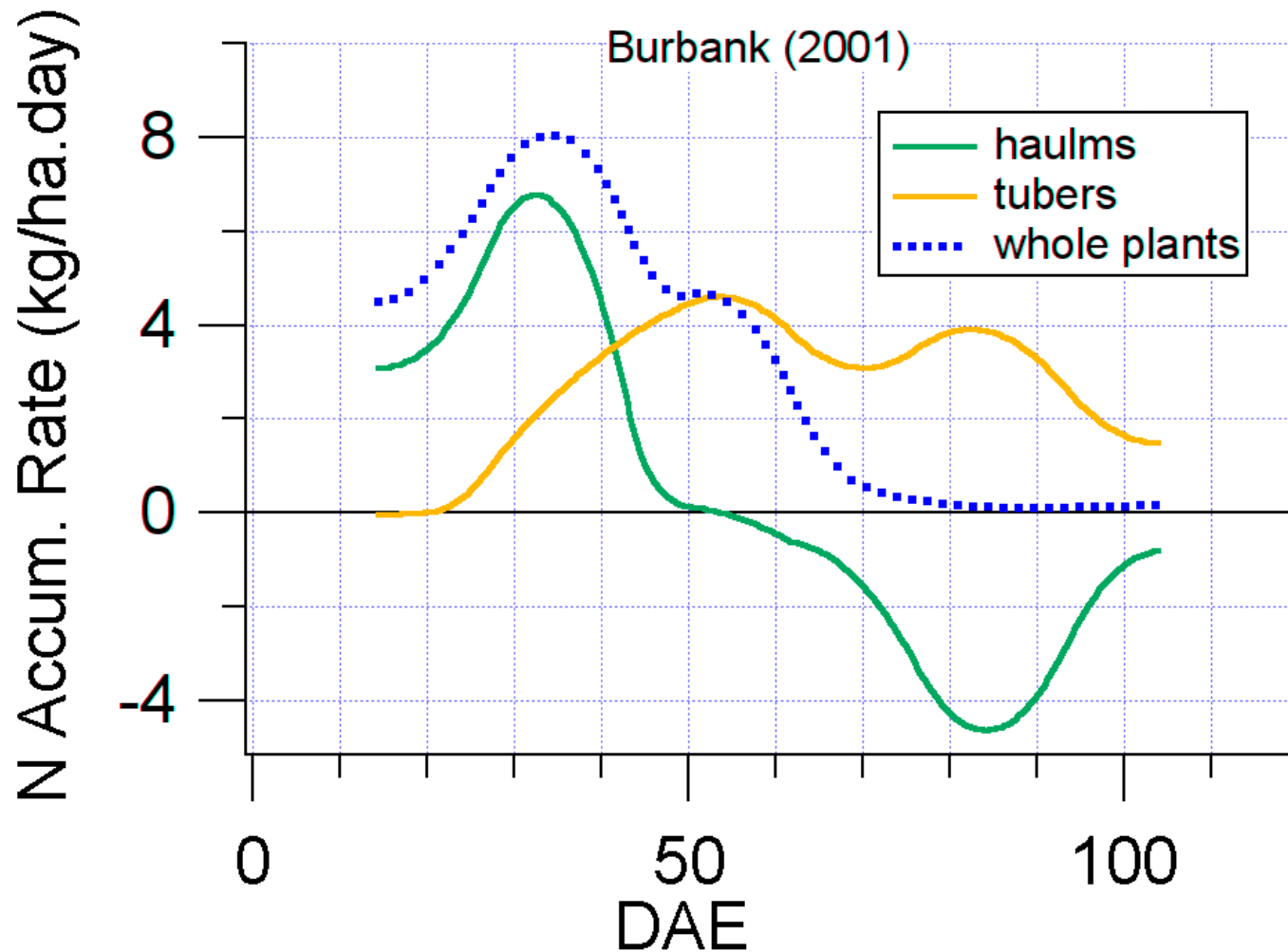
(Botha, unpublished data)



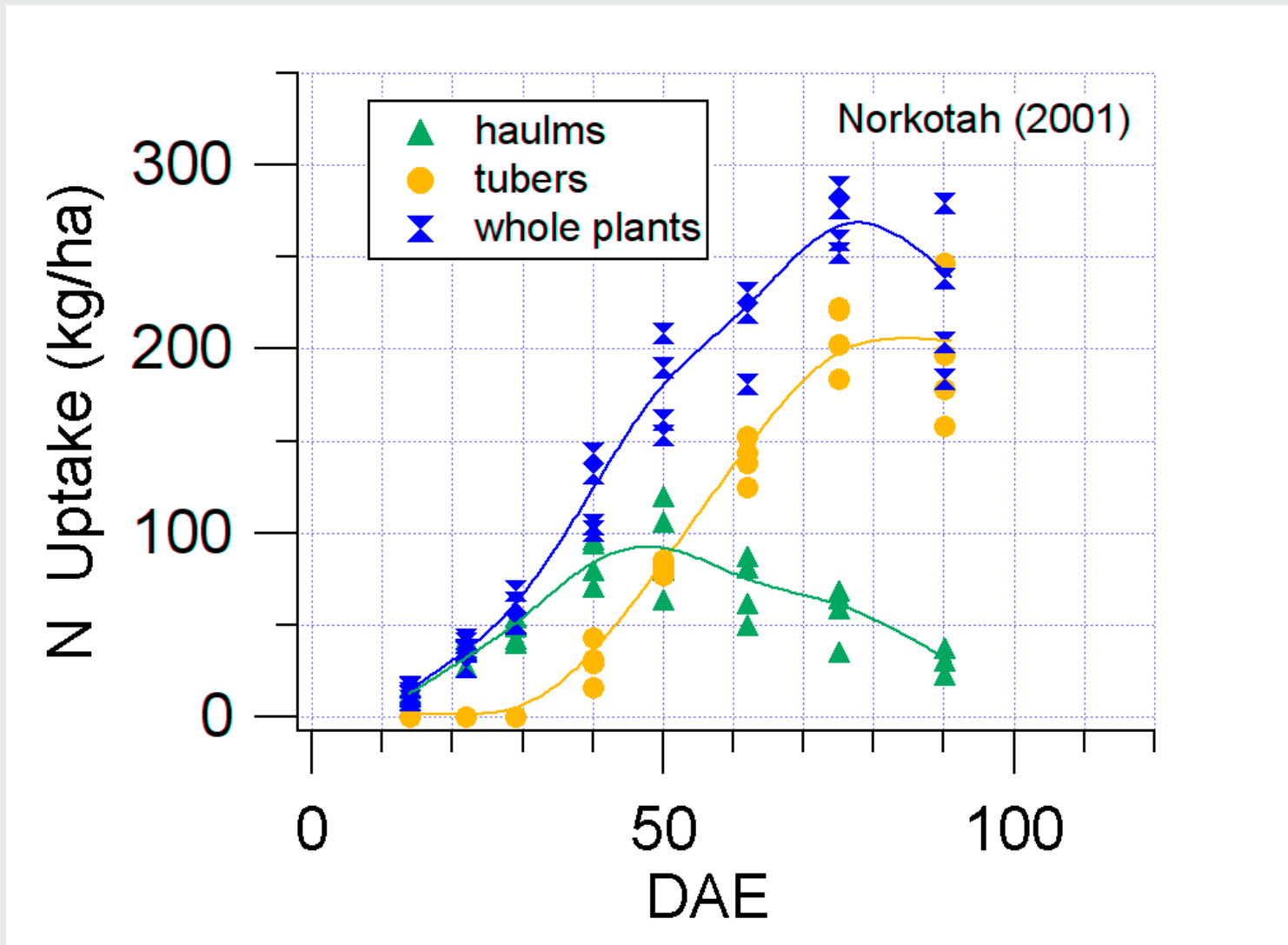
N UPTAKE (Bill Bland)



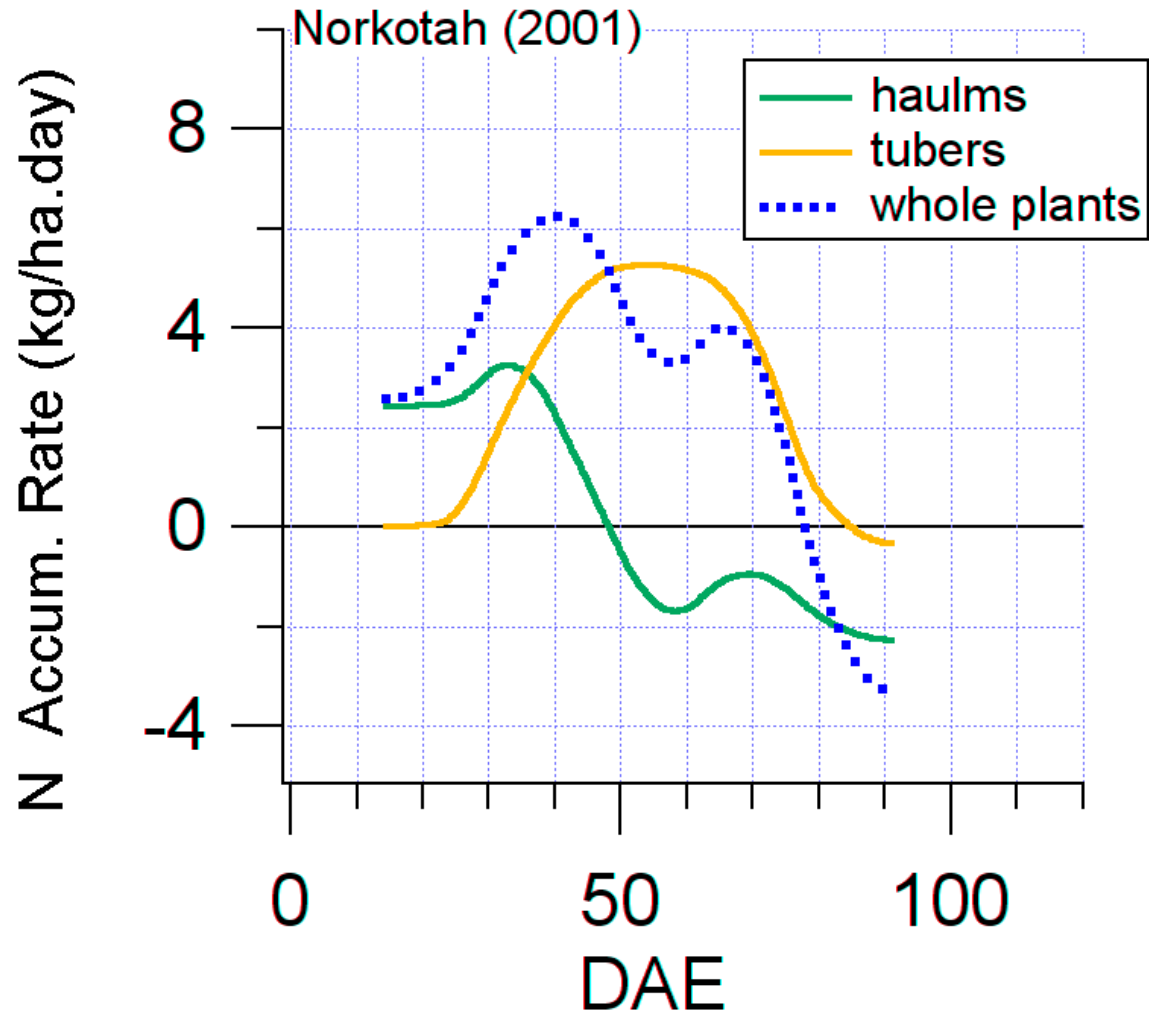
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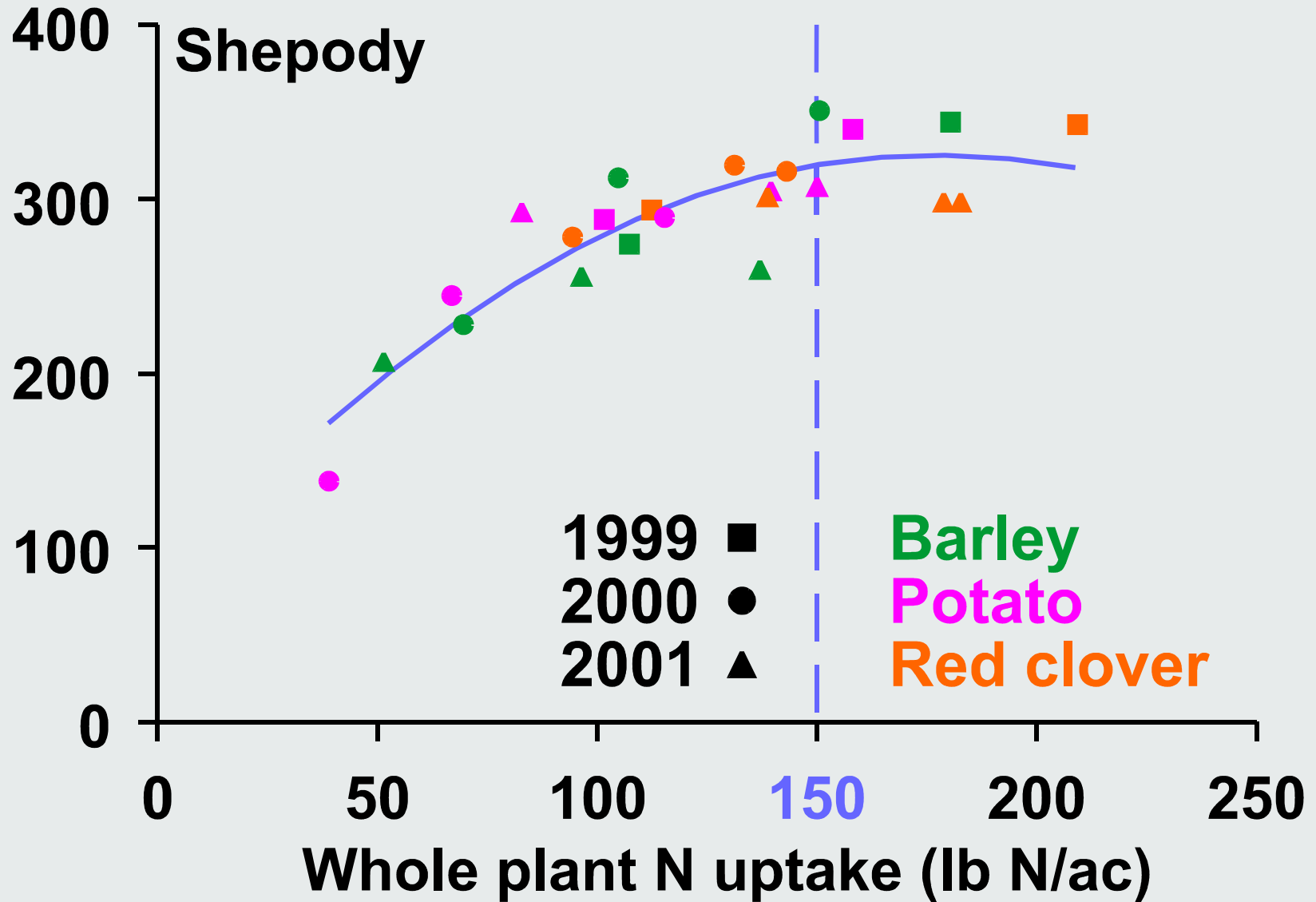
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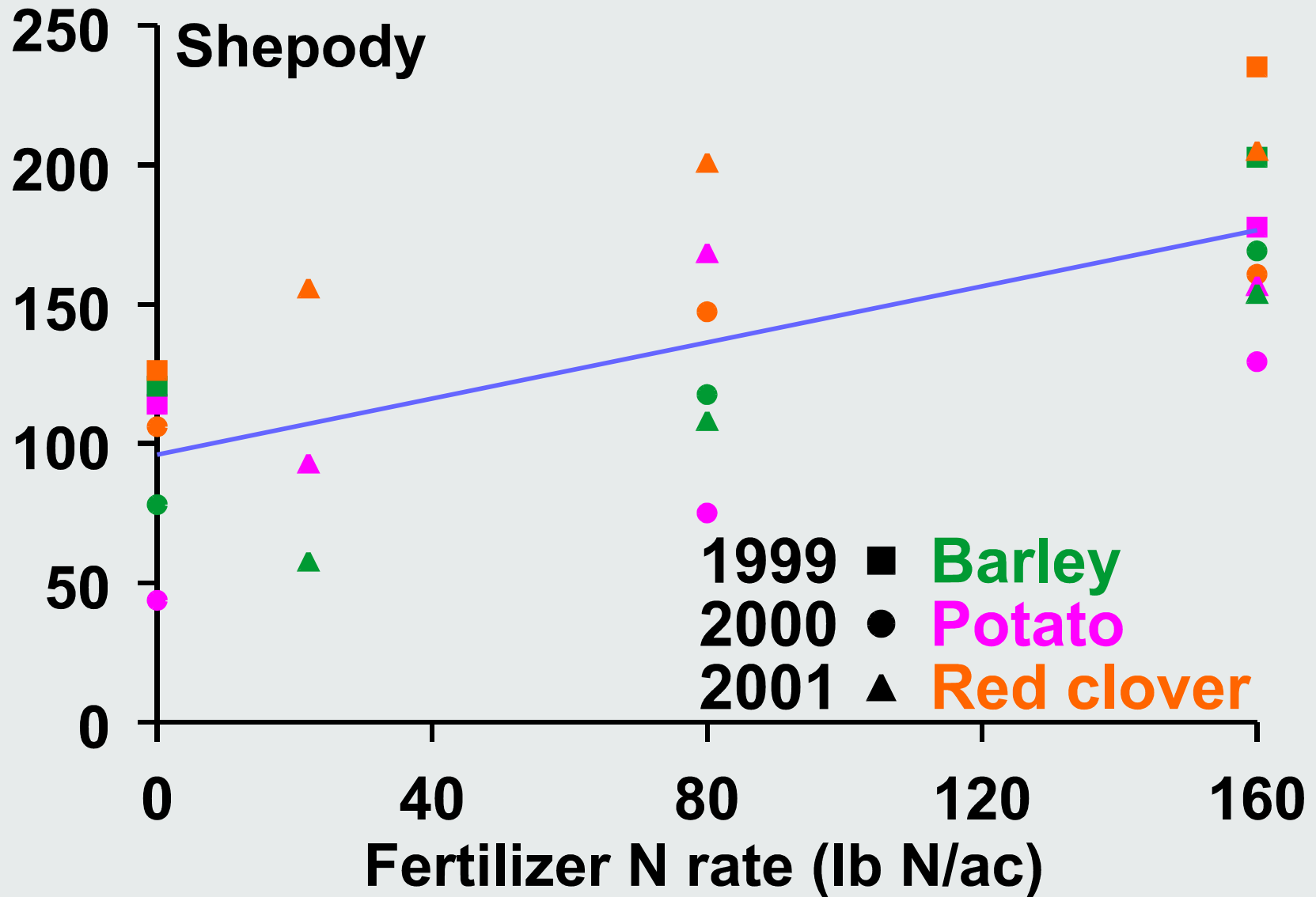
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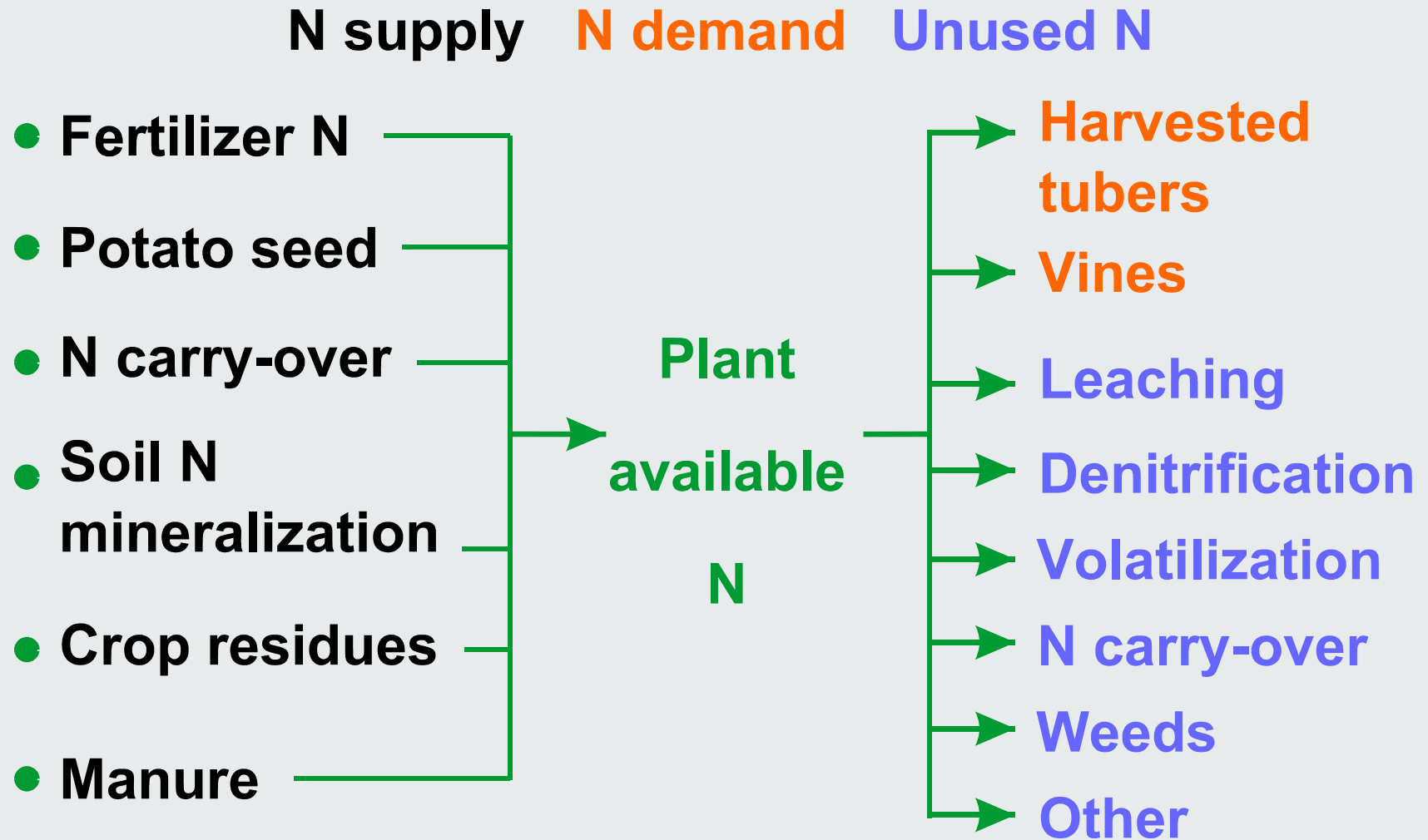
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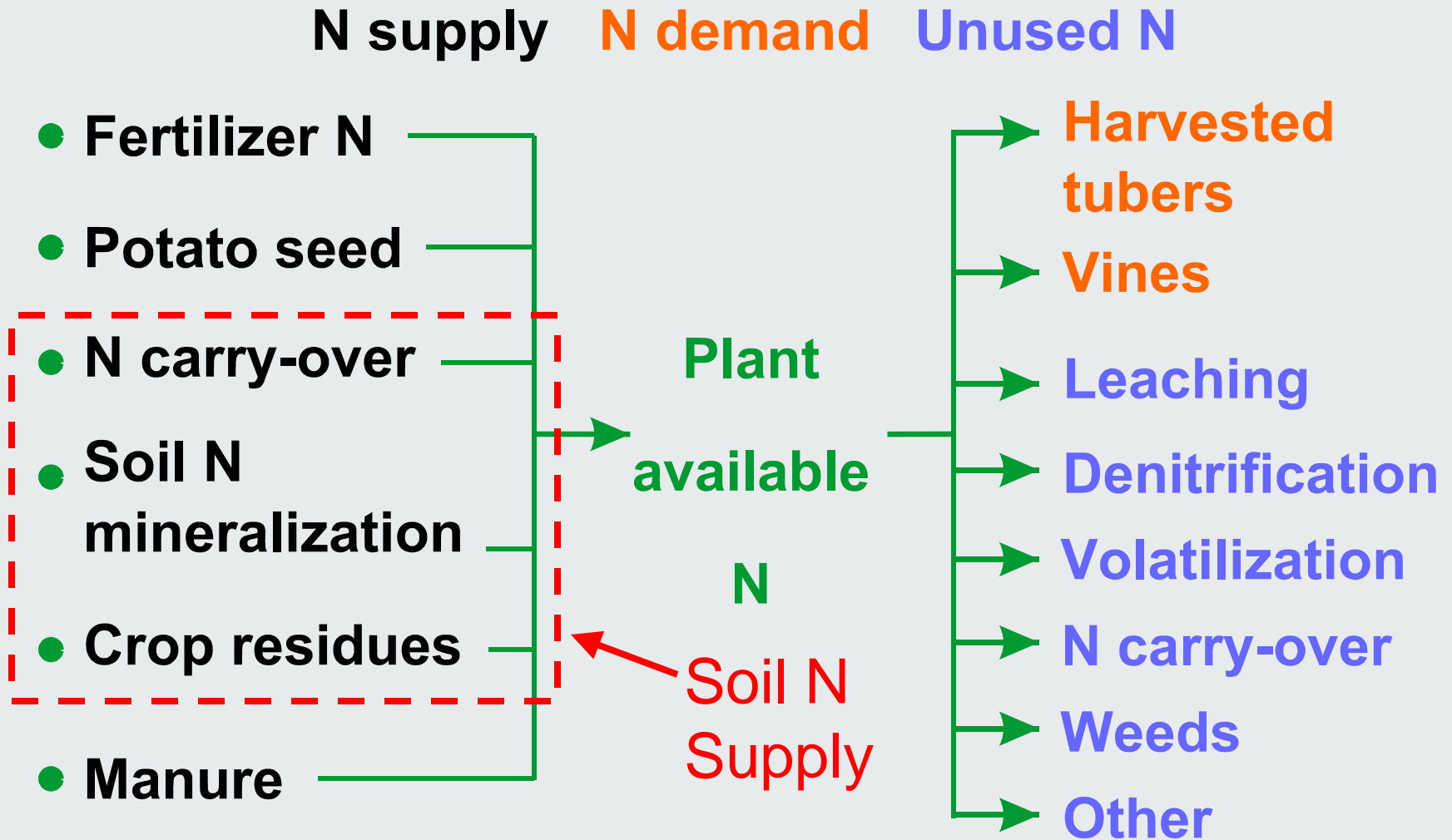
PLANT N UPTAKE (lb N/ac)



POTATO N BUDGET

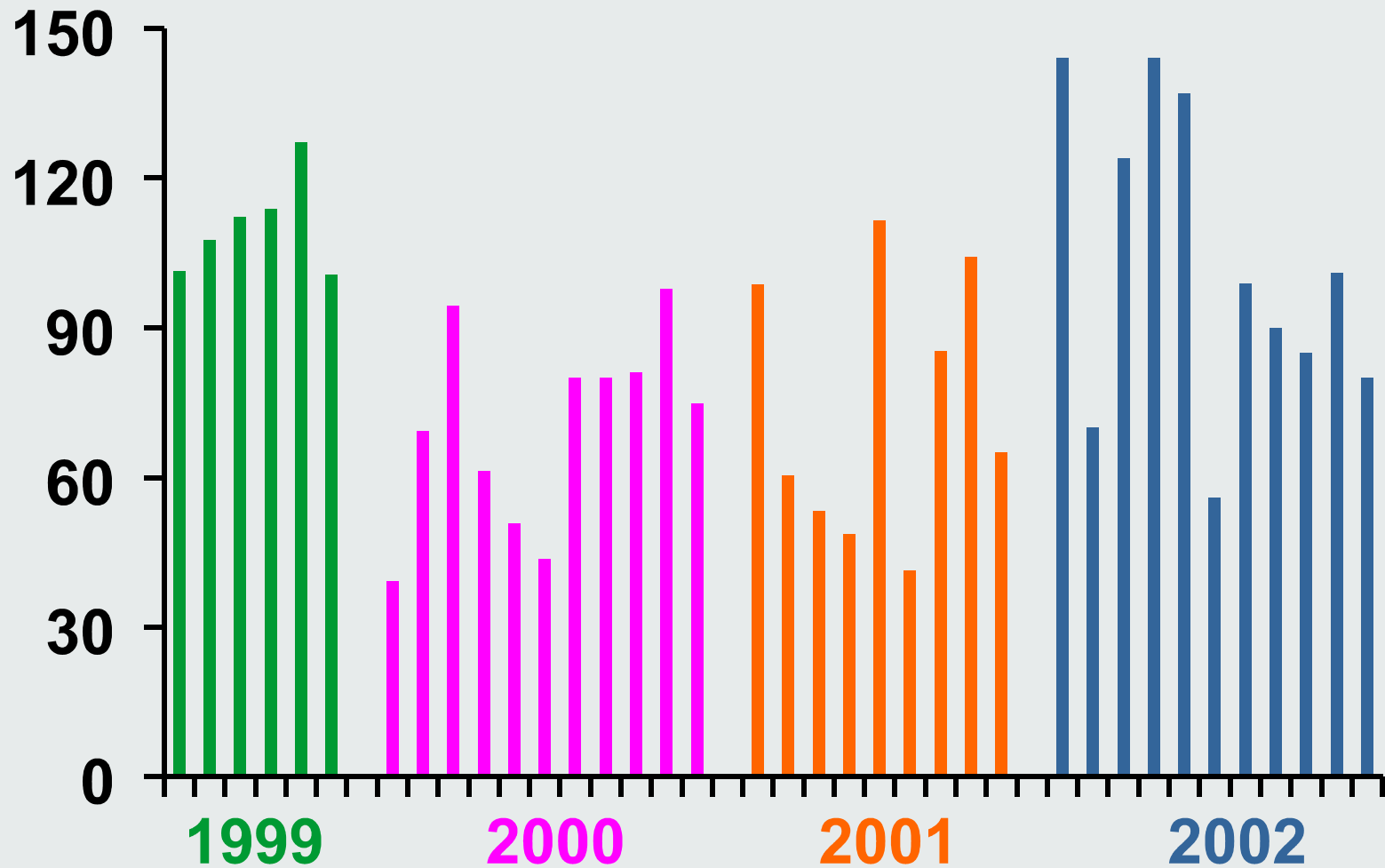


POTATO N BUDGET



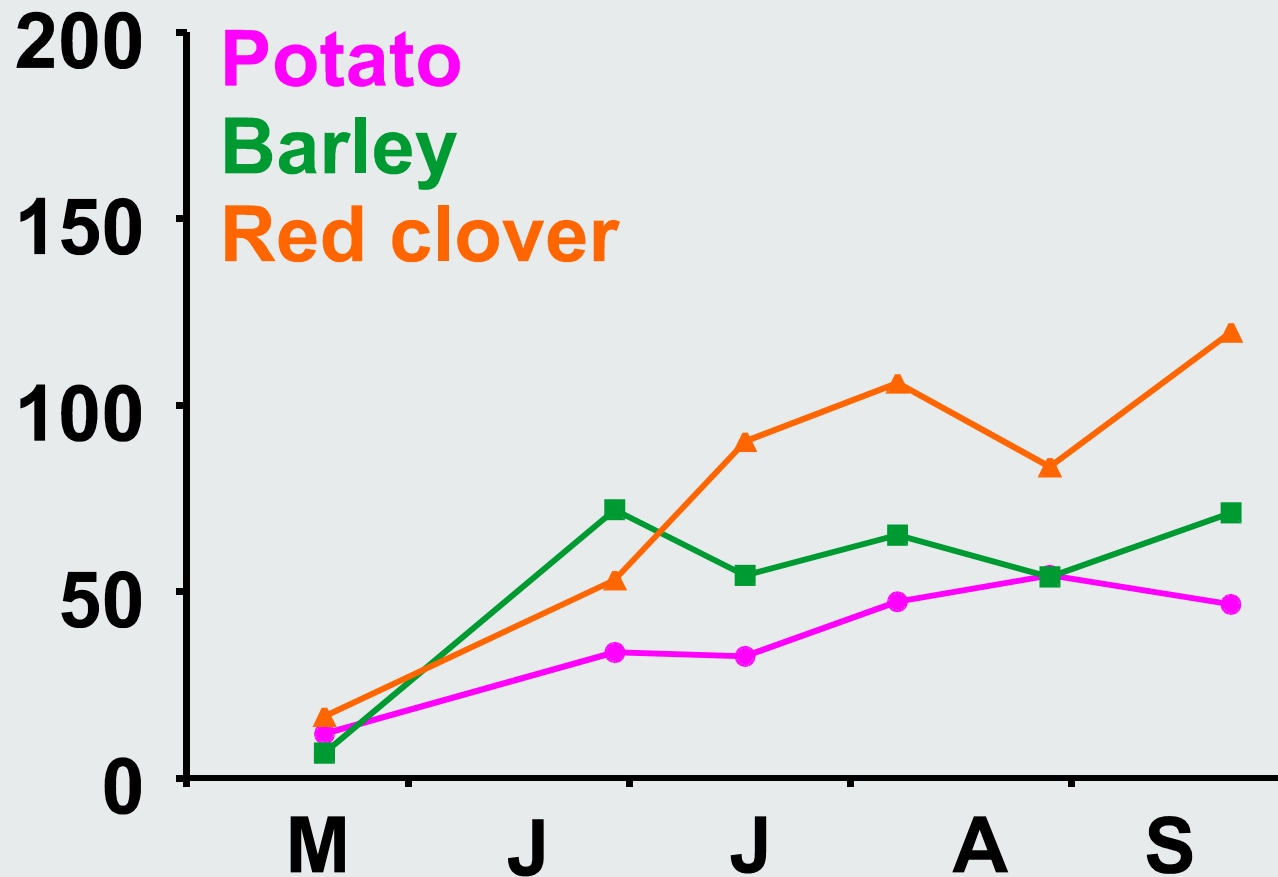
SOIL N SUPPLY

Potato crop N uptake with no N applied (lb N/ac)



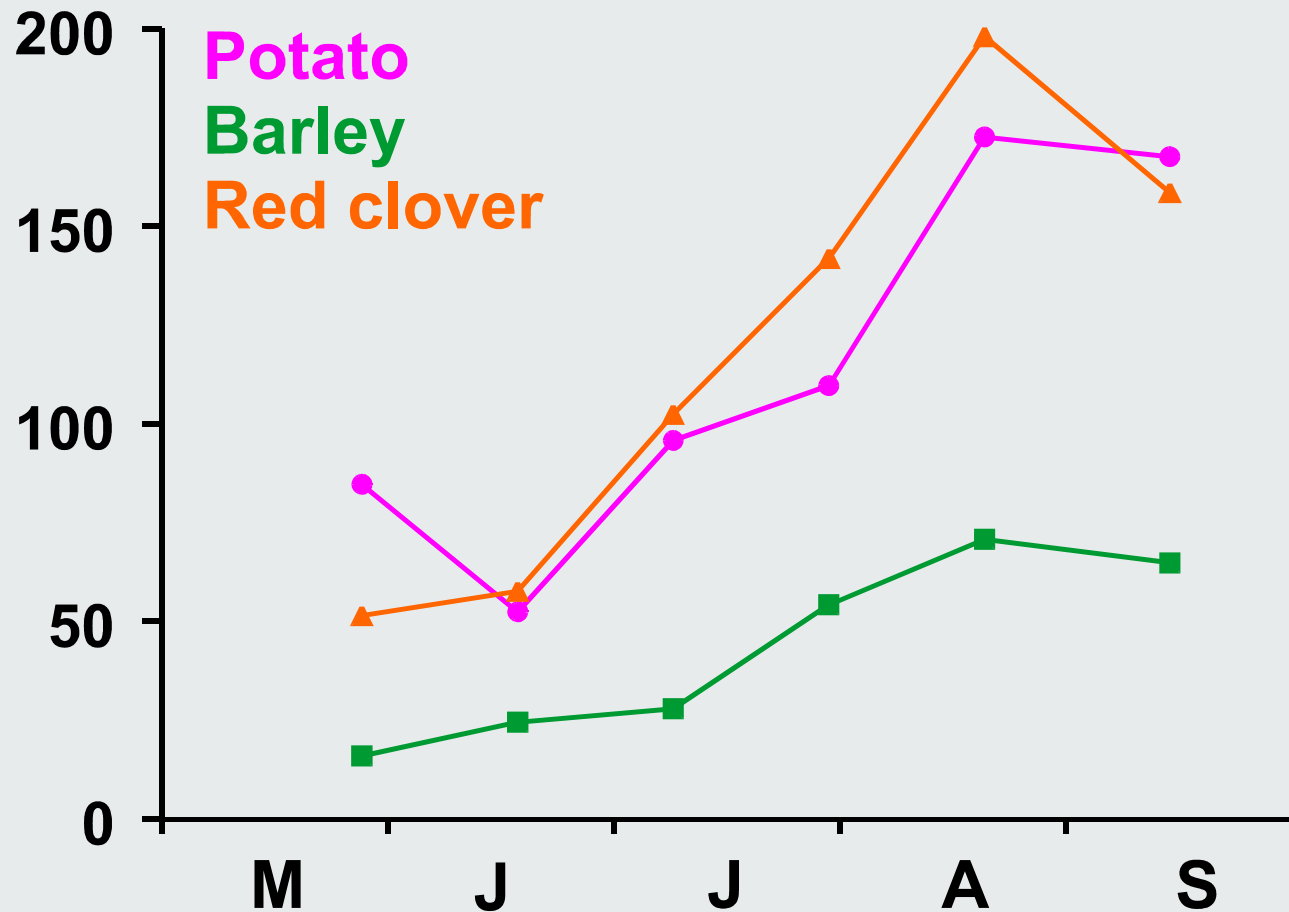
SOIL N SUPPLY

Soil nitrate-N to 30 cm depth in bare soil plots at Grand Falls in 2000 (kg N/ha)



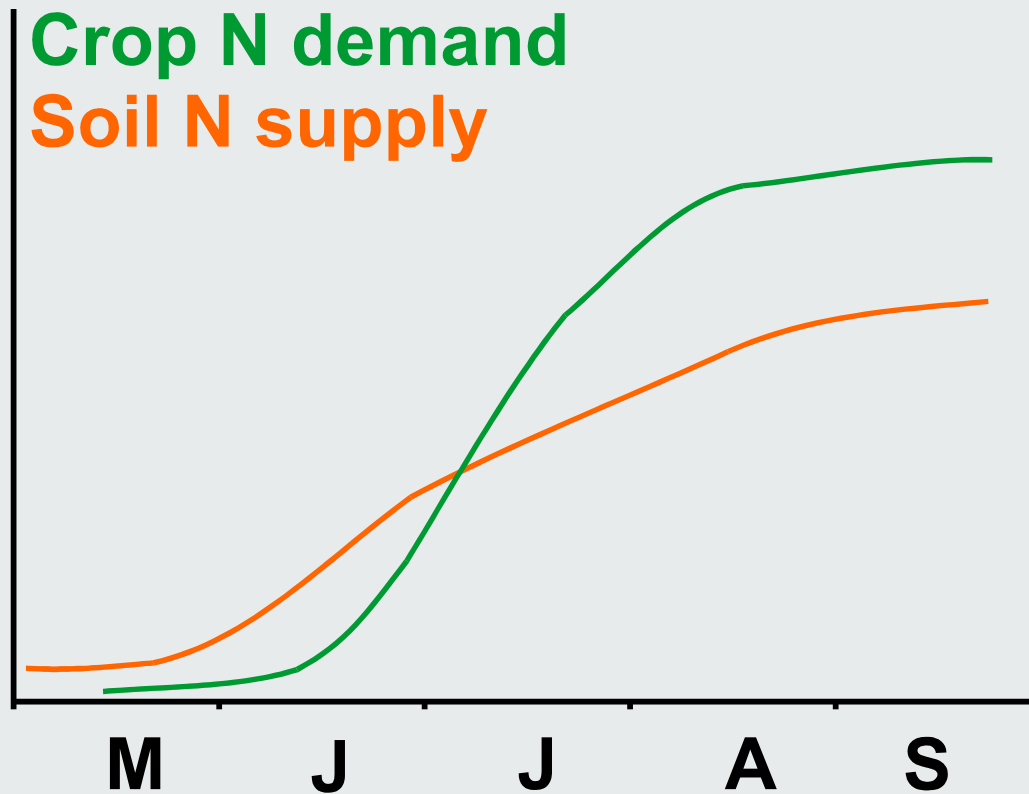
SOIL N SUPPLY

Soil nitrate-N to 30 cm depth in bare soil plots at Grand Falls in 2001 (kg N/ha)



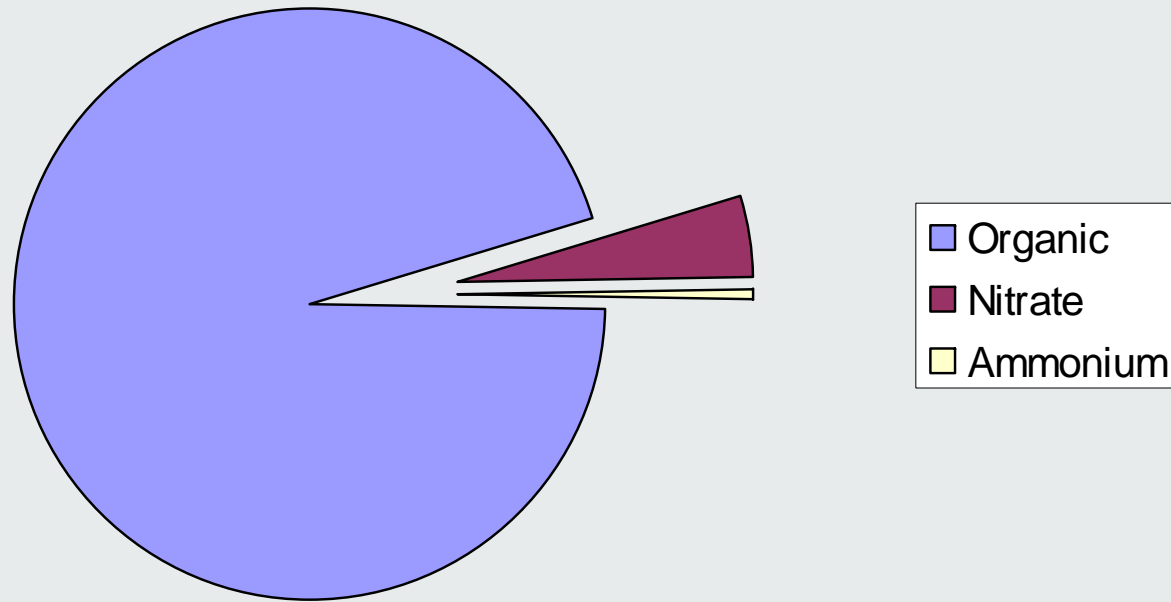
SOIL N SUPPLY

Soil N supply compared to crop N demand



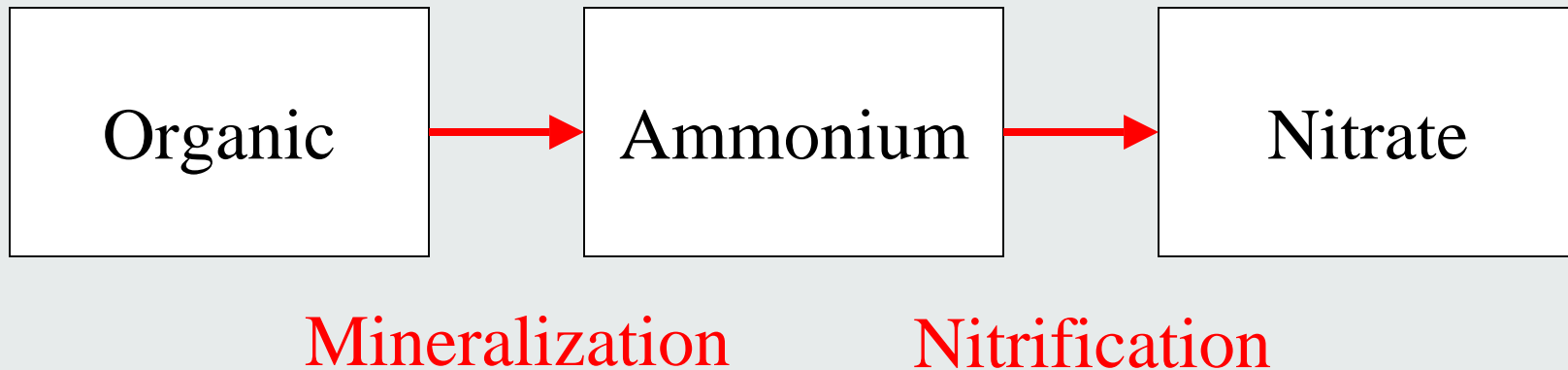
SOIL N SUPPLY

Forms of N in soil



SOIL N SUPPLY

Soil N processes



N SOURCES

- **Availability of N in organic amendments and crop residues is controlled by:**
 - **Application rate**
 - **N concentration**
 - **Availability of carbon**
 - **Carbon to N ratio**
 - **Particle size (exposed surface area)**
 - **Soil properties and environmental conditions**

N SOURCES

- **Crop residues**
 - **N mostly in organic form**
 - **Increased potential for soil N mineralization**
 - **May be a large contribution to plant available N in year of application**
 - **Amount and timing of N availability is variable depending on properties of the crop residues**

N SOURCES

- **Manure (or incomplete composting)**
 - **N in organic and ammonium forms**
 - **Increased potential for soil N mineralization**
 - **Addition of plant available N**
 - **Can make significant contribution to plant available N in year of application**

N SOURCES

- **Compost (mature)**
 - **N in organic form**
 - **Increased potential for soil N mineralization**
 - **Limited contribution to plant available N in year of application**

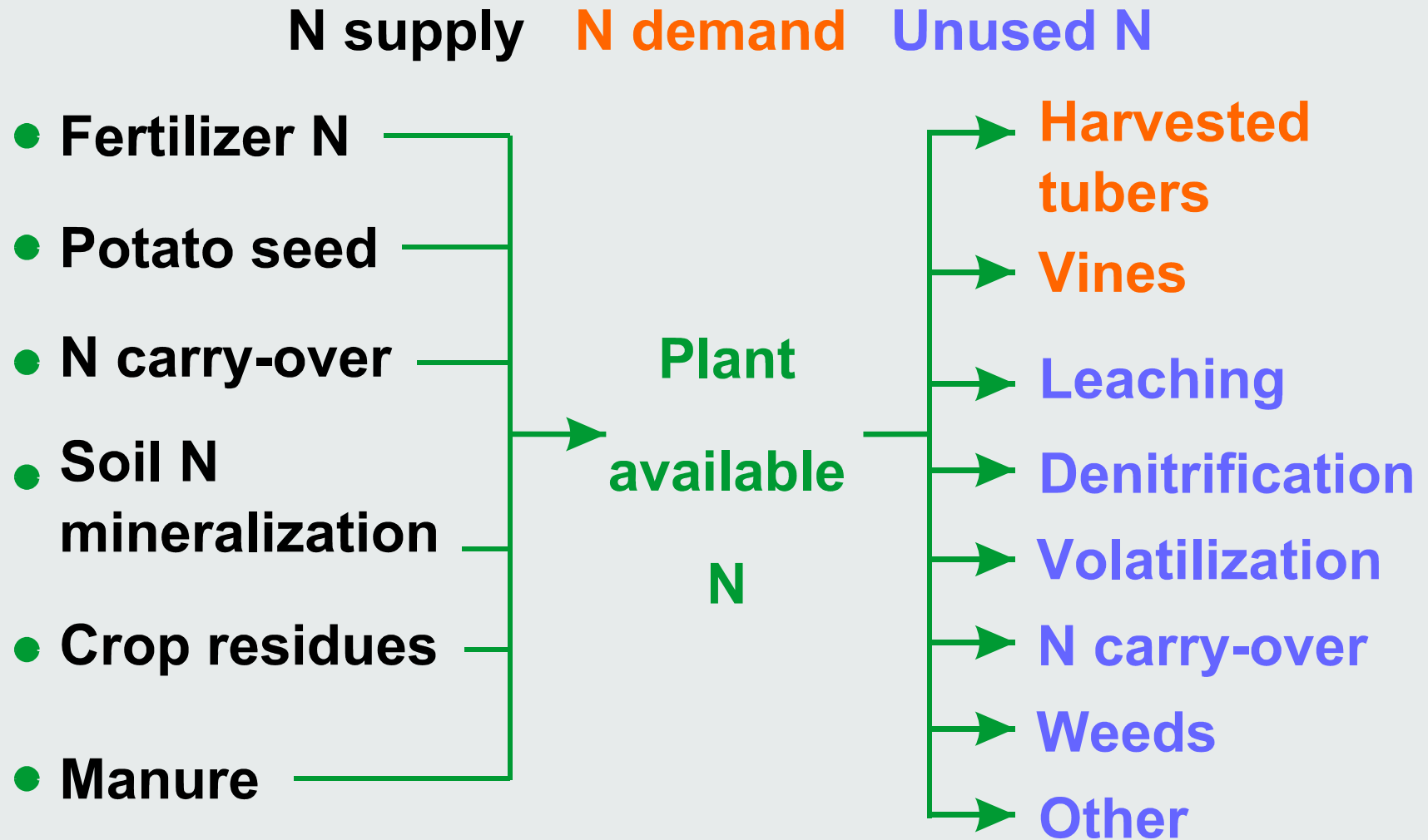
N SOURCES

- **Organic amendments**
 - **N mostly in organic form**
 - **Increased potential for soil N mineralization**
 - **May contain readily mineralizable N**
 - **Can make significant contribution to plant available N in year of application, but availability of N may be delayed**

N SOURCES

- **Organic fertilizer products**
 - **Amounts and forms of N vary with source material and production process**
 - **Increased potential for soil N mineralization**
 - **Addition of plant available N**
 - **Can make significant contribution to plant available N in year of application**

POTATO N BUDGET



WEEDS

N in potato crop and weeds (lb N/ac) at topkill



THANK YOU

