# Whole Farm Nutrient Mass Balances

**In Summary**

Nutrient Management Spear Program

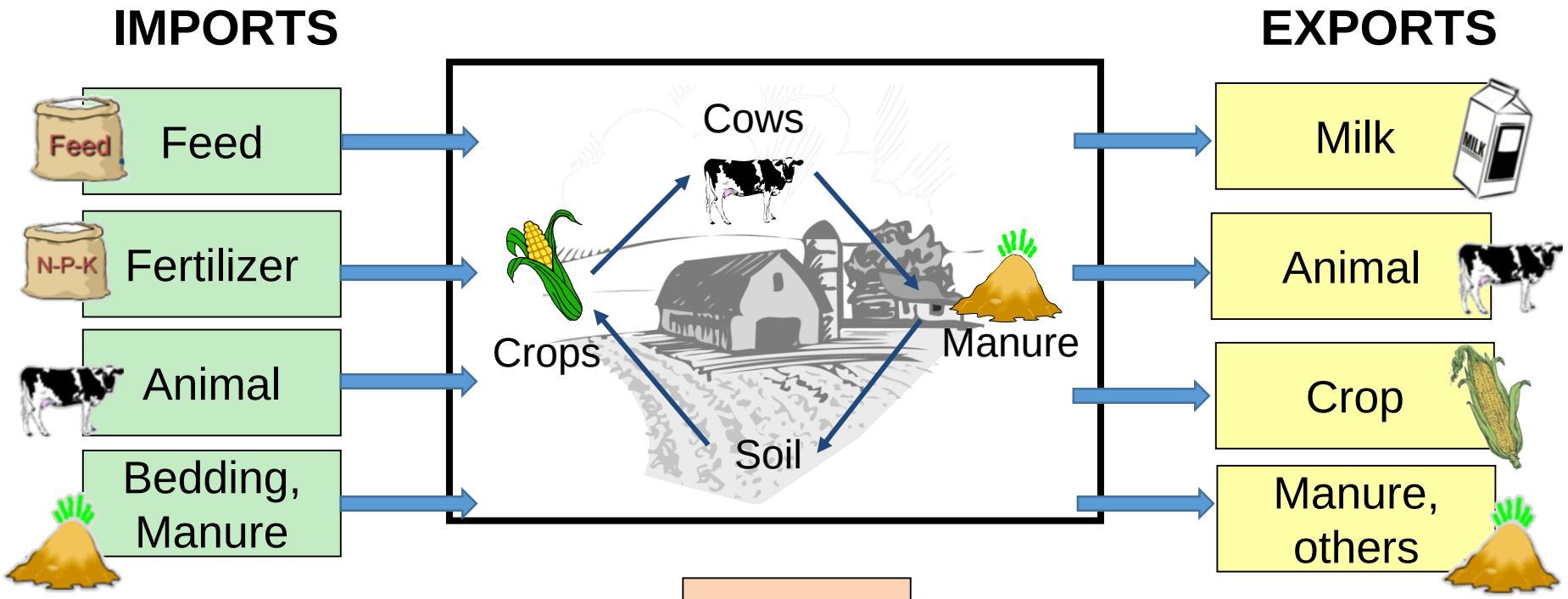
http://nmsp.cals.cornell.edu

Department of Animal Science

Cornell University

# What is a nutrient mass balance?

- **Balance = Imports – Exports** (just farm boundaries).
- We only measure what is **reasonably feasible** to measure.




**Balance**

**Per tillable acre**
(nutrient recycle land base )

**Per cwt of milk**
(nutrient use efficiency)

# Why do we care?

| Mass balance | Time period | Desirable/ Undesirable | Reason |
|---|---|---|---|
| **Negative** (Imports < Exports) | Short term | Desirable | If soil test P and K are high |
| | Long term | Undesirable | Soil P and K mining → yield losses |
| **Surplus** (Imports > Exports) | Short and Long term | Desirable | Inefficiencies in plant and animal production |
| **Large Surplus** (Imports >>> Exports) | Short and Long term | Undesirable | Nutrient losses to the environ. Soil P and K buildup. |
| | | | Low nutrient use efficiency Maybe economic losses |

# Distribution of mass balances across New York dairies

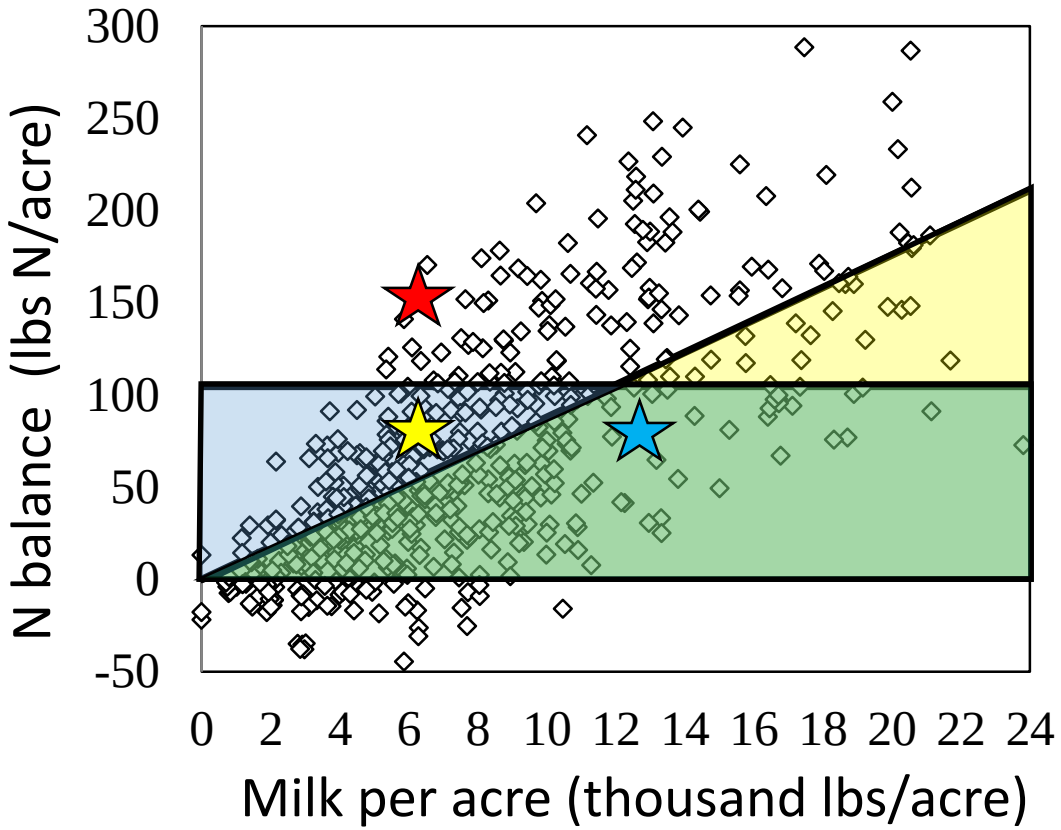
- New York dairy farms operate with a wide range of mass balances per acre and per cwt, regardless of their size.

| Distribution Across NY dairies* | NMB (lbs/acre) | | | NMB (lbs/cwt) | | |
|---|---|---|---|---|---|---|
| | N | P | K | N | P | K |
| Minimum | -35 | -7 | -45 | -1.3 | -0.11 | -0.73 |
| Maximum | 211 | 45 | 132 | 2.6 | 0.47 | 1.69 |
| **"Feasible"** | **0 to 105** | **0 to 12** | **0 to 37** | **0 to 0.88** | **0 to 0.11** | **0 to 0.30** |

*Based on 102 dairy farms in 2006

- **Farms with "feasible" mass balances have:**
  - low risk of losing nutrients to the environment (per acre)
  - high nutrient use efficiencies (per cwt).

# Feasible Balances and Optimal Operational Zone



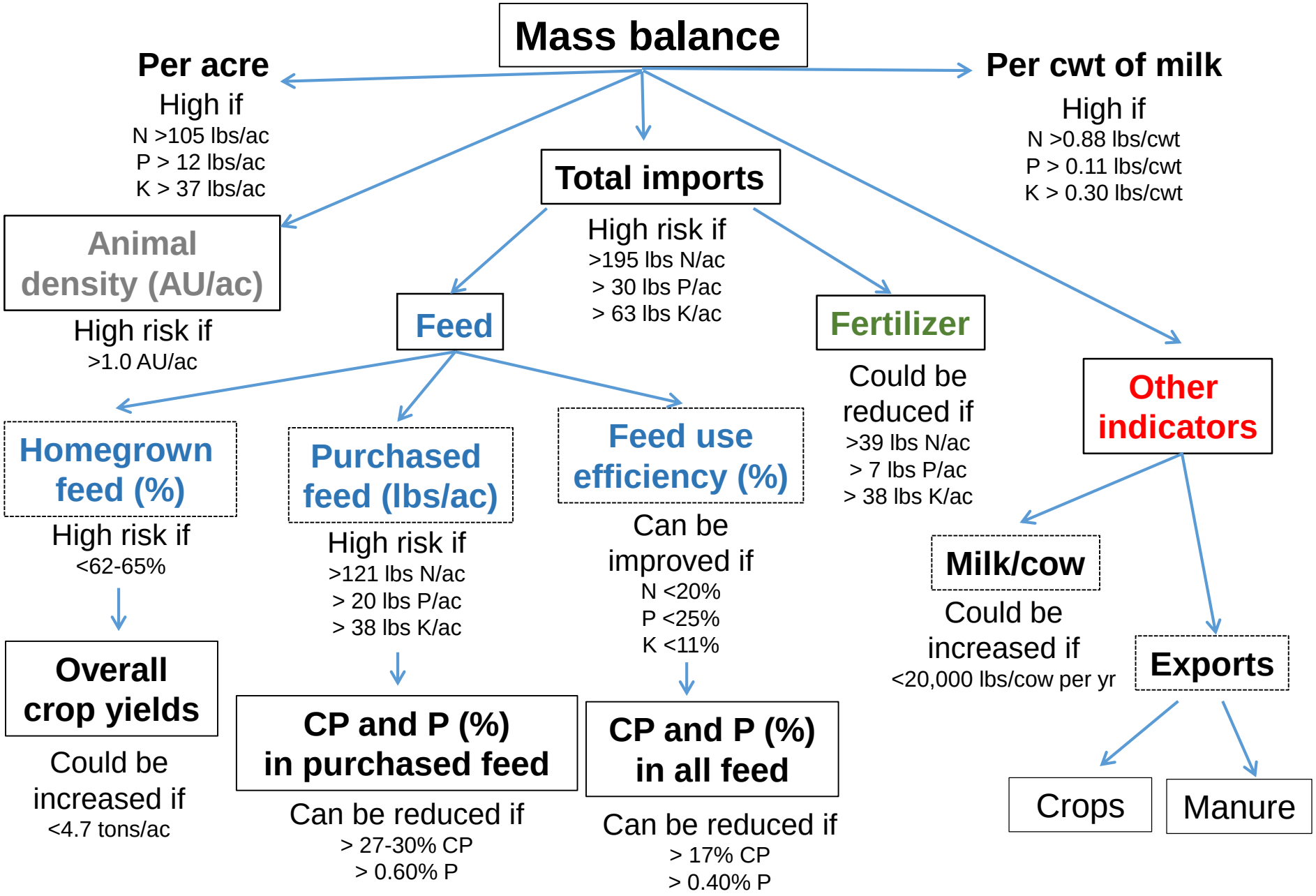

| NMB (lbs/acre) | Nutrient | NMB (lbs/cwt) Feasible | NMB (lbs/cwt) Excessive |
|---|---|---|---|
| **Feasible** | Losses Risk | LOW | LOW |
| | Use Efficiency | HIGH | LOW |
| **Excessive** | Losses Risk | HIGH | HIGH |
| | Use Efficiency | HIGH | LOW |

**Green Area** = Optimal Operational Zone

**EXAMPLE 1** ★ and ★ produce the same amount of milk per acre (6,000 lbs/acre), but ★ has lower NMB, and hence a lower risk of losing nutrients to the environment.

**EXAMPLE 2** ★ and ★ have the same NMB per acre (80 lbs/acre), but ★ produces twice more milk, and hence has a higher nutrient use efficiency. Indeed, ★ works in the Optimal Operational Zone.

# What causes excessive NMB?



# Contact

- **Mass balance software and input data sheets**

  → http://nmsp.cals.cornell.edu/projects/massbalance.html

- **Mass balance website**

  → http://nmsp.cals.cornell.edu/NYOnFarmResearchPartnership/MassBalances.html

- **To get more information, please contact**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