RuFaS Grazing Module

Project status and next steps

RuFaS Annual Meeting

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Why do we need a grazing module within RuFas?

13%

NE dairy farmers are grazing

!

Impacts and benefits highly variable and difficult to estimate.

RuFaS: decision support tool to evaluate grazing as an alternative management practice.

Purpose of the grazing module:

To develop a model using **system dynamics tools** to represent the management, nutrient cycling and nutrient efficiency in a grazing system for dairy heifers by incorporating model constraints that are specific to the NE region of the United States.

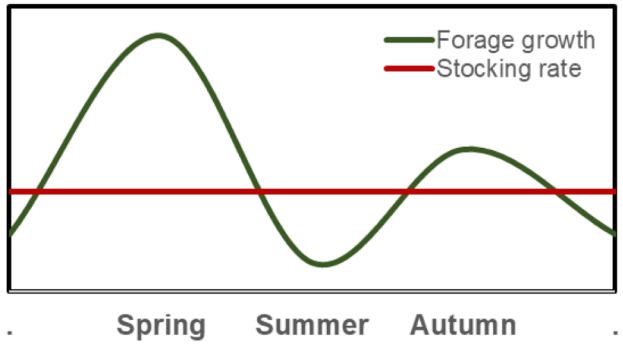
Grazing method

CONTINUOUS

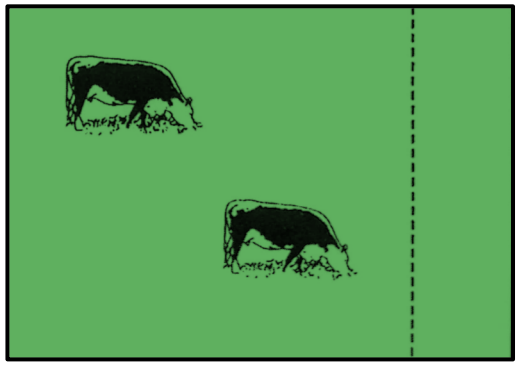
- Low fencing costs
- Minimal labor

- Higher selectivity
- Over and undergrazed areas
- Lower pasture utilization
- Uneven manure distribution

Set stocking rate



Seasonal close-off

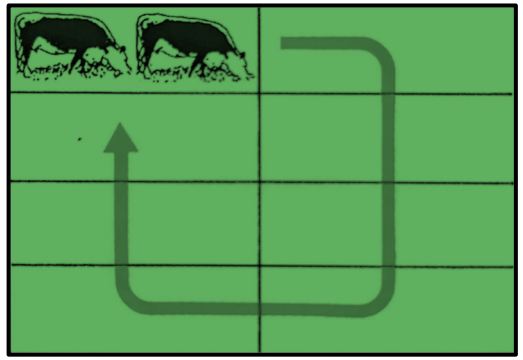


*Southern Forages: Modern Concepts for Forage Crop Management. 3rd Edition (2002)

Grazing method

ROTATIONAL

- Less selectivity
- Increased carrying capacity
- Higher pasture utilization
- Manure distribution



- Time
- Cost and management

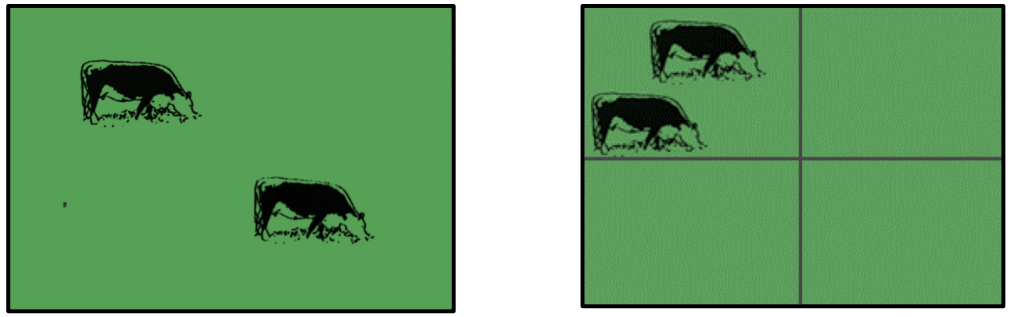
**Southern Forages: Modern Concepts for Forage Crop Management. 3rd Edition (2002)*

$$\textbf{Stocking rate} = \frac{\text{Number of animals}}{\text{Total area} * \text{time}}$$

$$\textbf{Stocking density} = \frac{\text{Number of animals}}{\text{Grazing area} * \text{time}}$$

Supplementation

Herd management



= stocking rate
≠ stocking density

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Why heifers?

- Start simple
- Replacement programs are one of the largest expenses for dairy farms
- Herd health

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HYPOTHESIS

Whole Farm Level

What are the possible changes that may occur in NE dairy farms as a result of including grazing routines in their systems?

What effects might inclusion of grazing have on N, C and P cycling in NE dairy systems in the future?

Grazing dairy heifers improves nitrogen use efficiency and the carbon footprint at a whole farm systems level

HYPOTHESIS

Grazing paddock level

What are the possible changes observed at the paddock level when choosing a rotational grazing routine instead of a continuous one?

Rotational grazing allows reaching higher rates of forage growth and animal consumption compared to continuous.

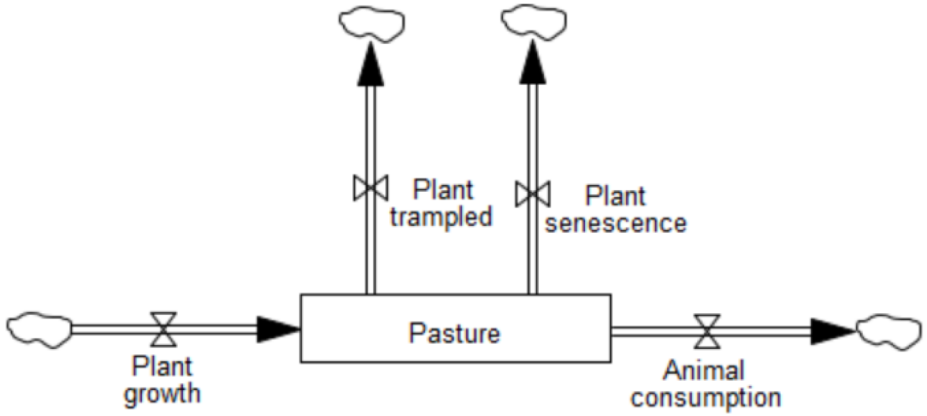
Rotational grazing decreases the amount of trampled and dead pasture compared to continuous.

Forage growth

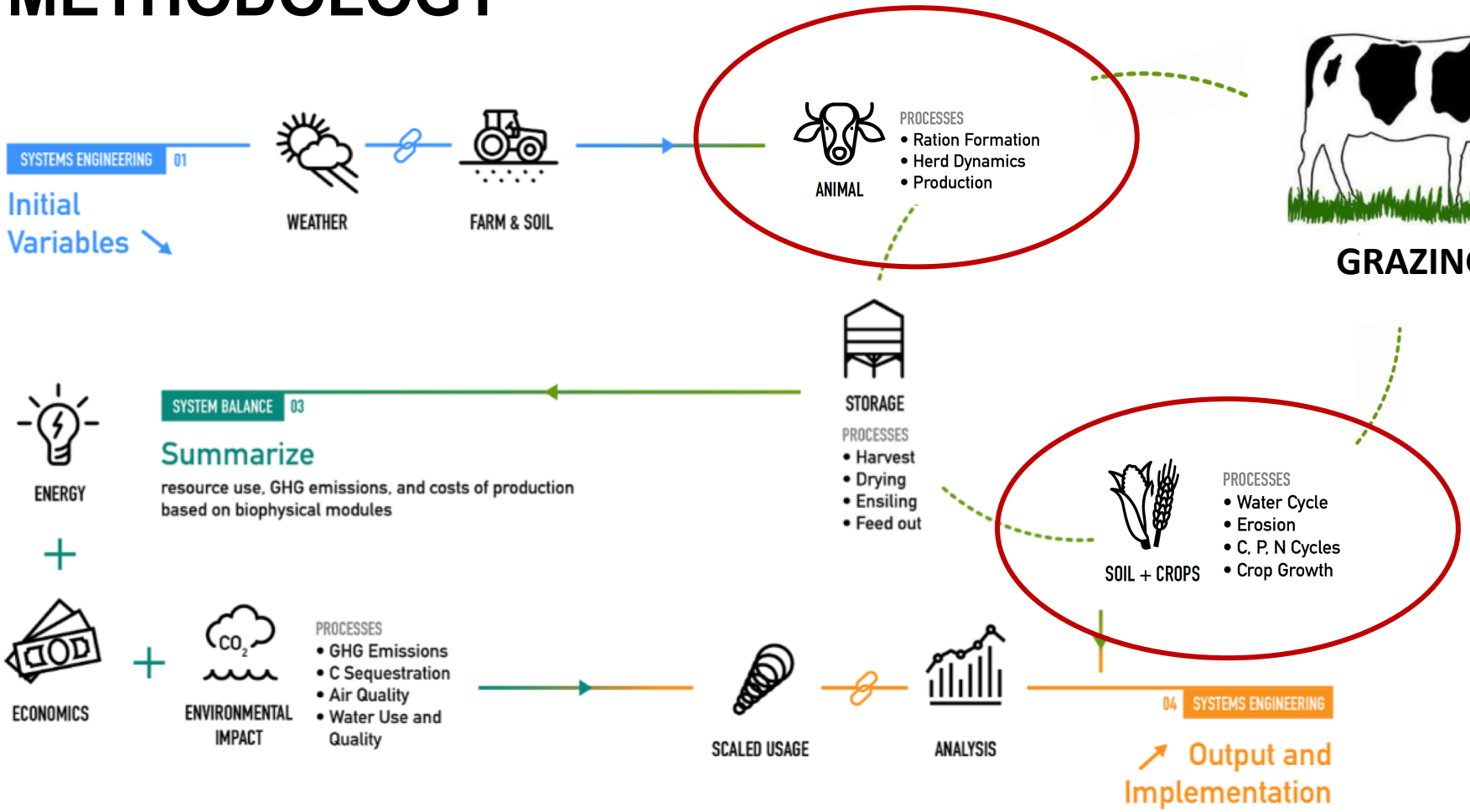
Trampled pasture

Senescence

Animal consumption



METHODOLOGY



GRAZING

PROCESSES

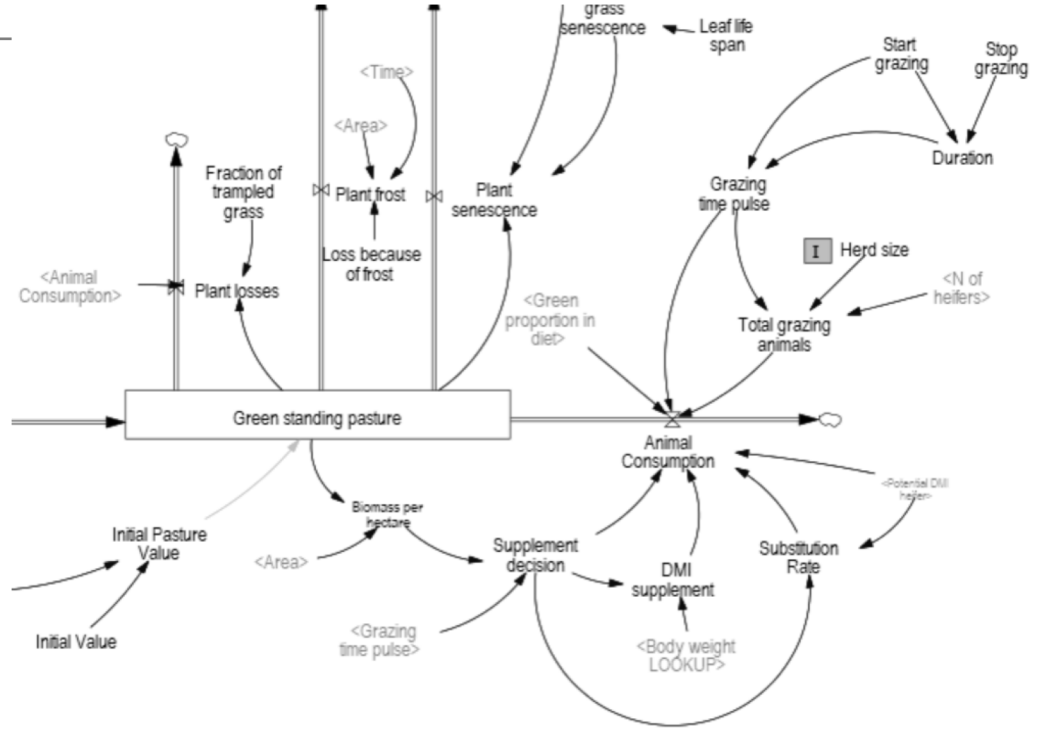
- Animal consumption
- Forage dynamics
- DMI limitations
- Supplementation effects

How?

- Vensim → visually based dynamic modeling software program
- Two scenarios: continuous / rotational

Assumptions

Decision rules

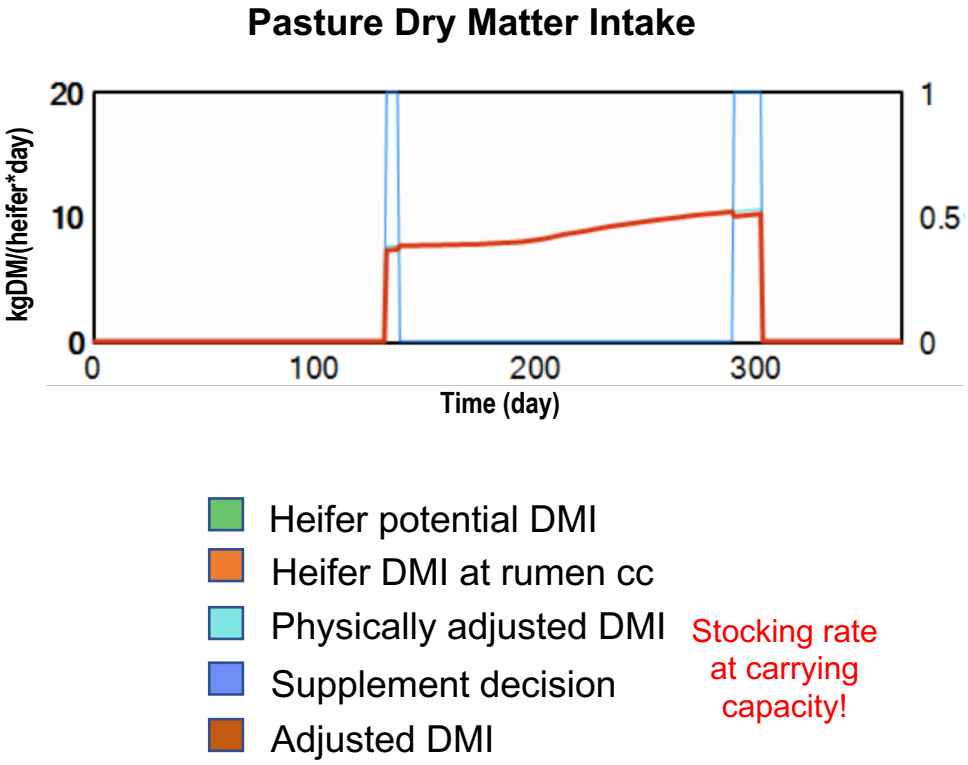


CURRENT STATUS

- Two functional scenarios
- Dynamics represented:
  - ✓ Animal: energy and protein requirements, potential and adjusted DMI

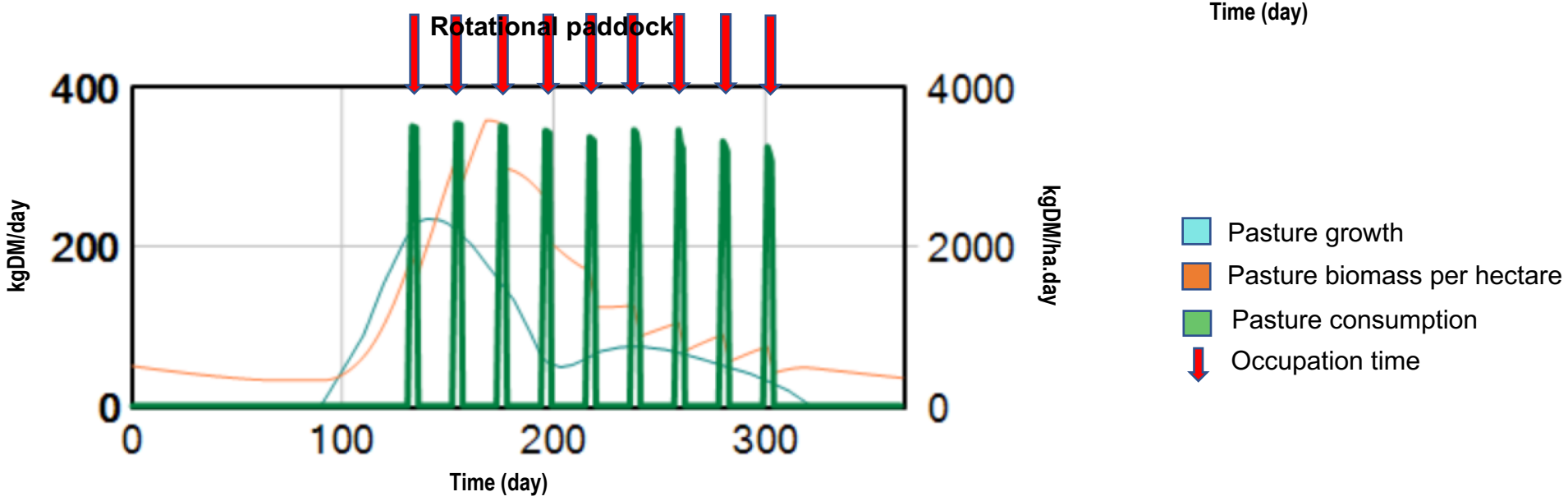
1. Potential heifer DMI (NASEM 2021)
2. Intake at rumen capacity 1.2%NDF (Tedeschi *et al*, 2018)
3. MIN (1, 2) → Physically adjusted DMI
4. ME balance + available forage → Supplement decision

   (Yes=1, No=0)
5. Substitution effect → Adjusted DMI



CURRENT STATUS

- Dynamics represented:
  - ✓ Stocks of green and dry standing pasture
  - ✓ Pasture losses due to consumption, senescence, trampling
  - ✓ Pasture composition?



TO SUMMARIZE

OUTPUTS AVAILABLE

PASTURE

- ☑ Grazing period
- ☑ Green and dry pasture stocks
- ☑ Senescence and frost losses
- ☑ Decomposition

PASTURE - ANIMAL

- ☑ Stocking rate
- ☑ Diet selectivity factor
- ☑ Trampling losses
- ☑ Fill effect of diet
- ☑ Herbage allowance limit

ANIMAL

- ☑ Adjusted DMI
- ☑ Supplement feed intake
- ☑ Substitution rate

TIMELINE & NEXT STEPS

- Address paddock level objectives
- Start manuscript draft

- N model

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Questions / comments?

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