

Caribou Body Condition Model

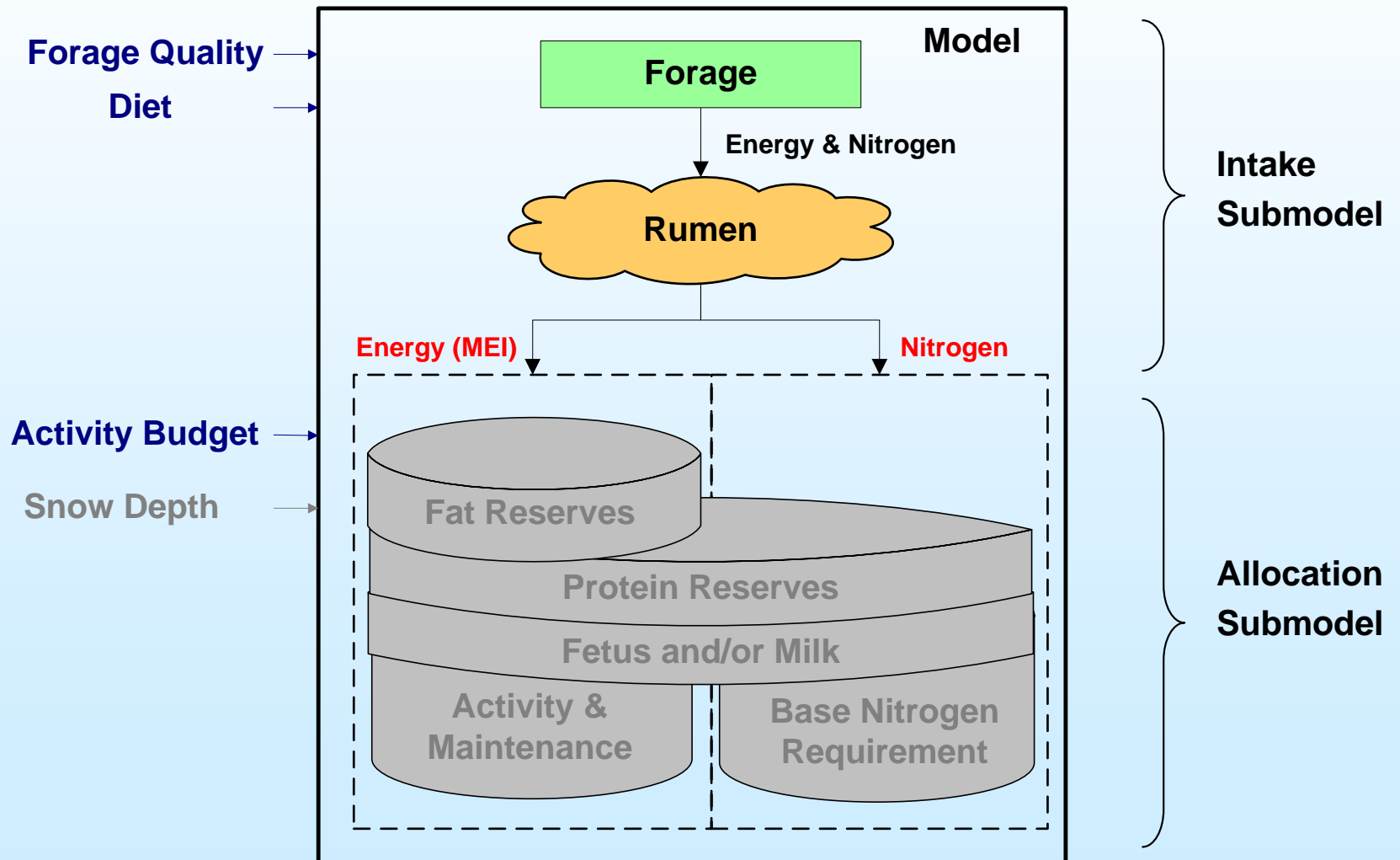
Don Russell

Bob White

Colin Daniel

Model Approach

Objective: To predict daily body condition of individual caribou in response to activity, habitat and environment



Model Inputs

By plant & season:

- **Forage Biomass (kg/ha)**
- **NDF, ADF, BSA (propn.)**
- **Nitrogen content (propn.)**
- **Diet (propn.)**

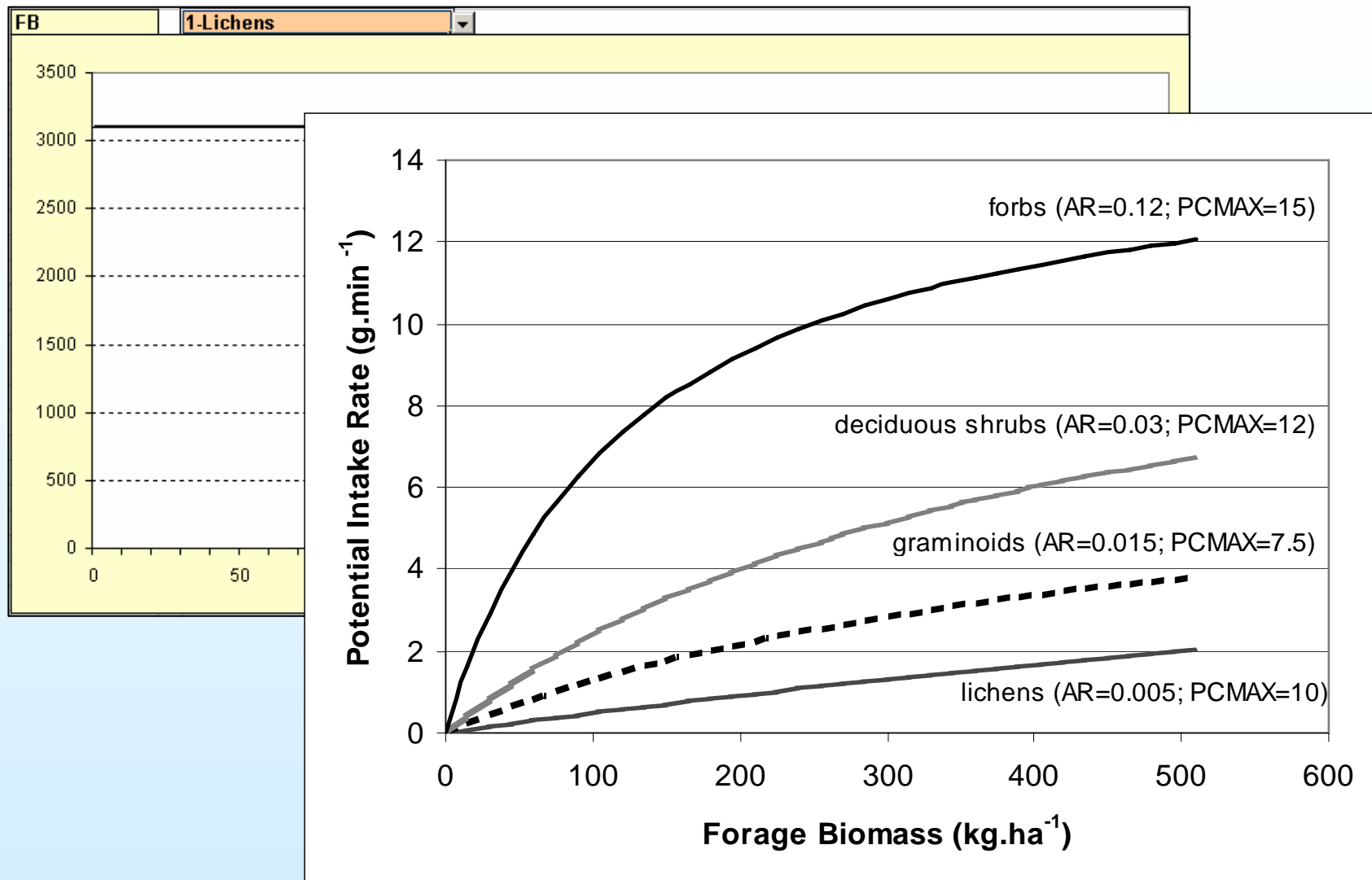
By season:

- **Activity budget (propn.)**

Other parameters

Moss
Lichens
Mushrooms
Horesetails
Graminoids
Deciduous shrubs
Evergreen shrubs
Forbs
Standing dead
Eriophorum heads

Available Forage Intake

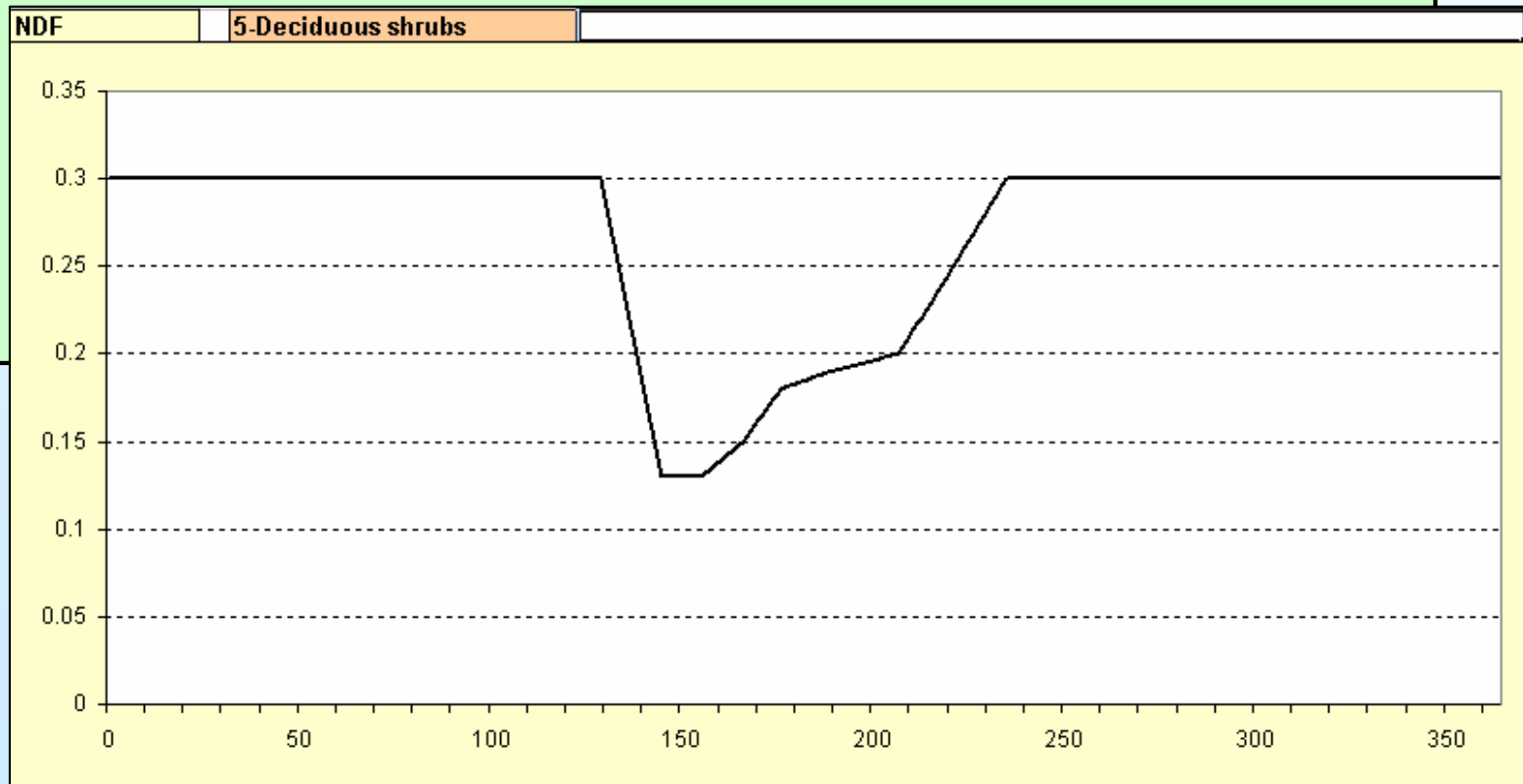
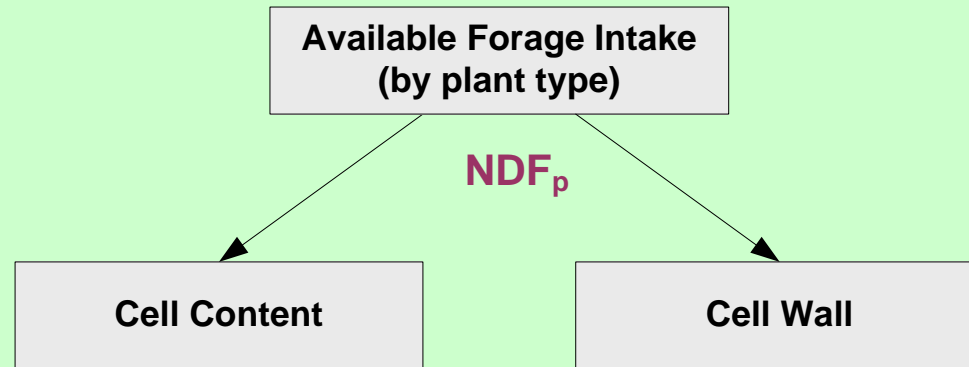


For each plant & day:

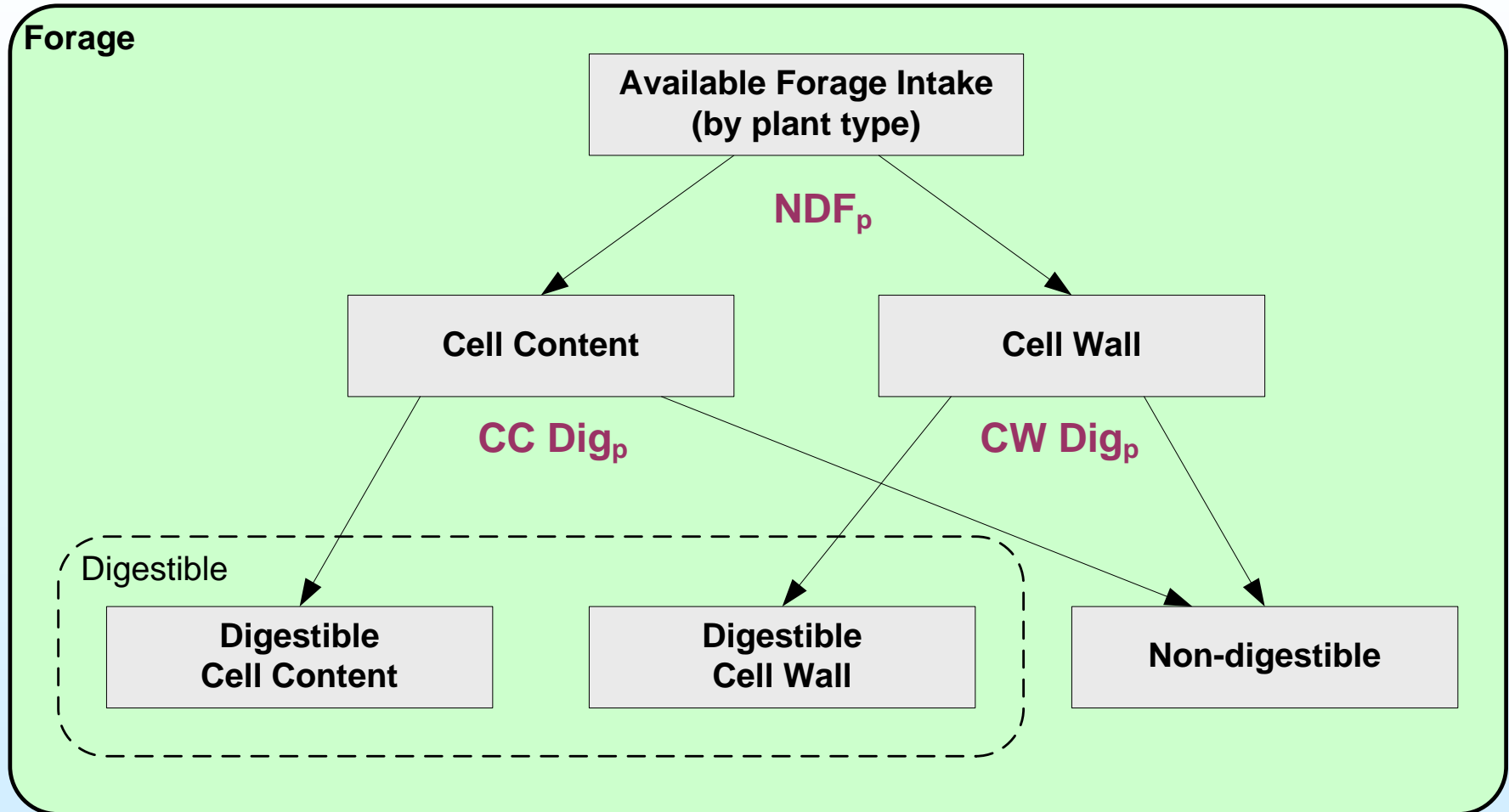
Available Forage Intake = (Potential Intake) X (Propn. Diet) X (Propn. Eating)

Cell Content & Cell Wall Intake

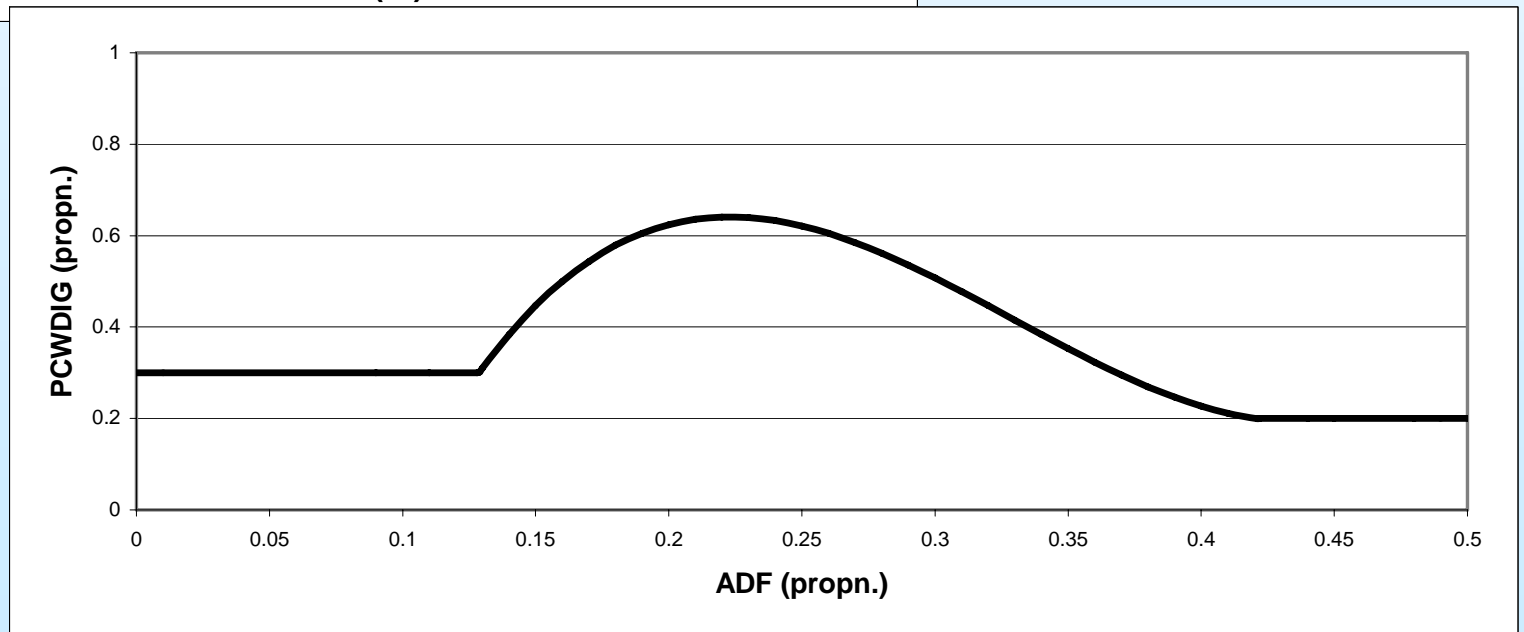
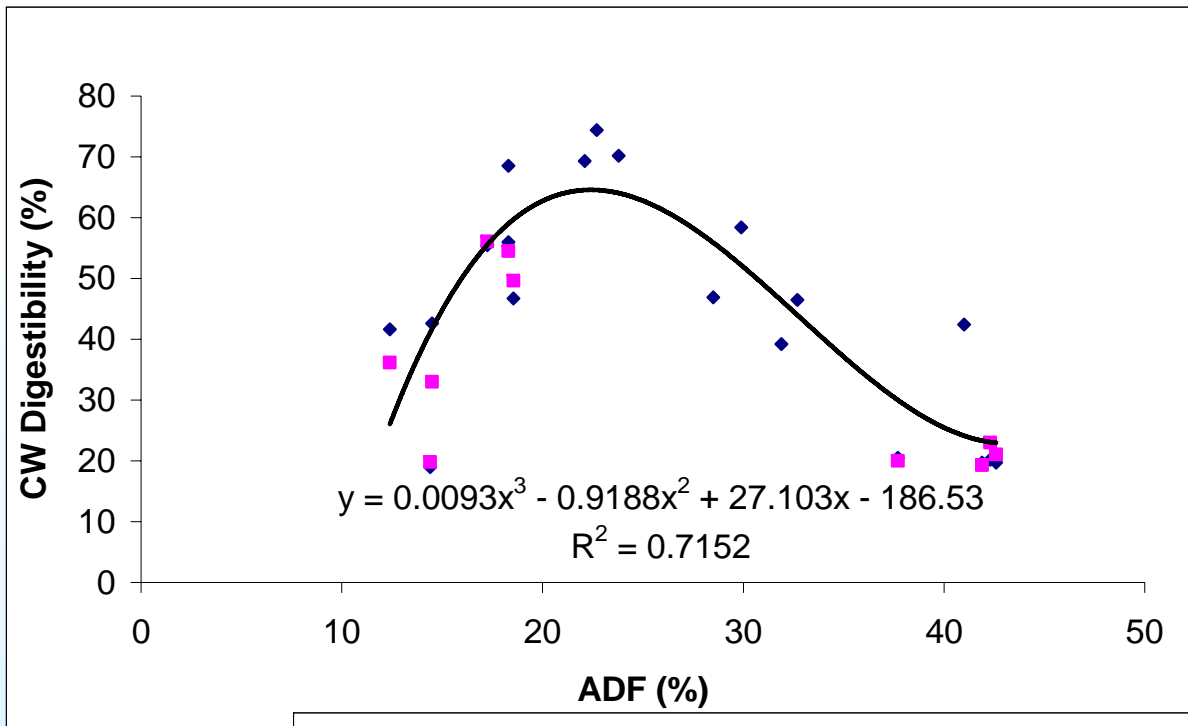
Forage



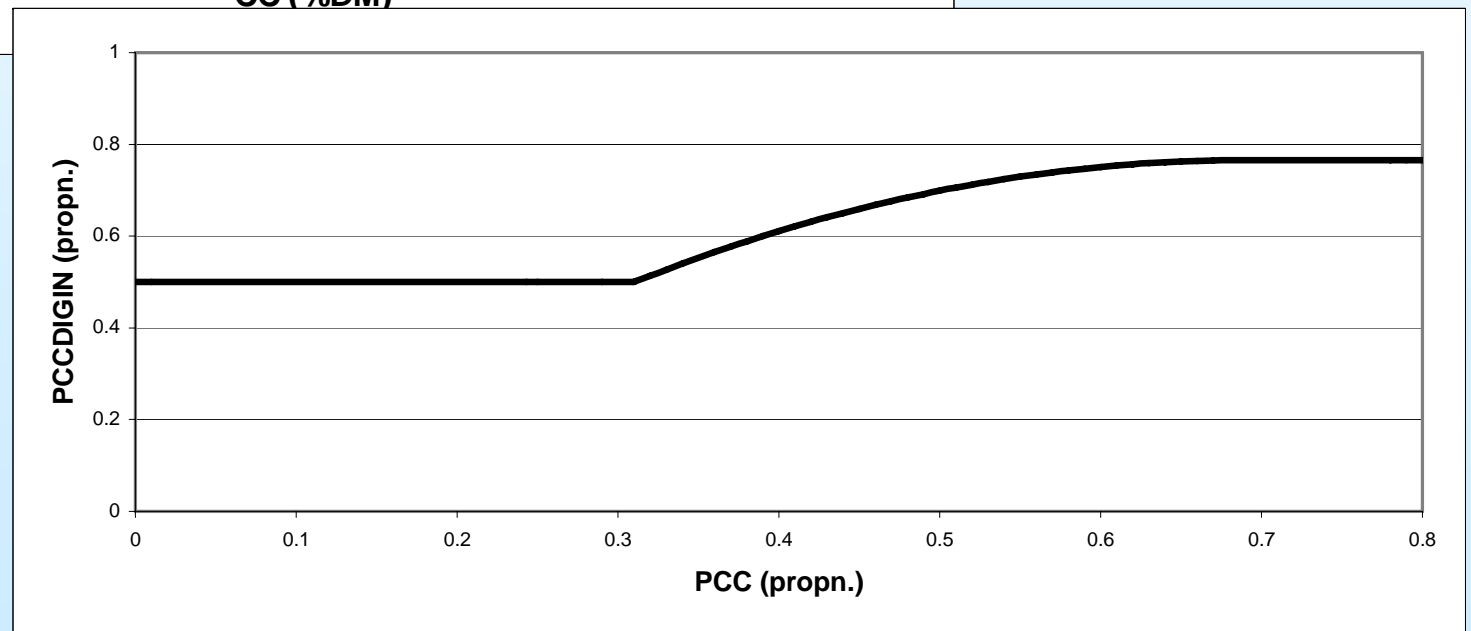
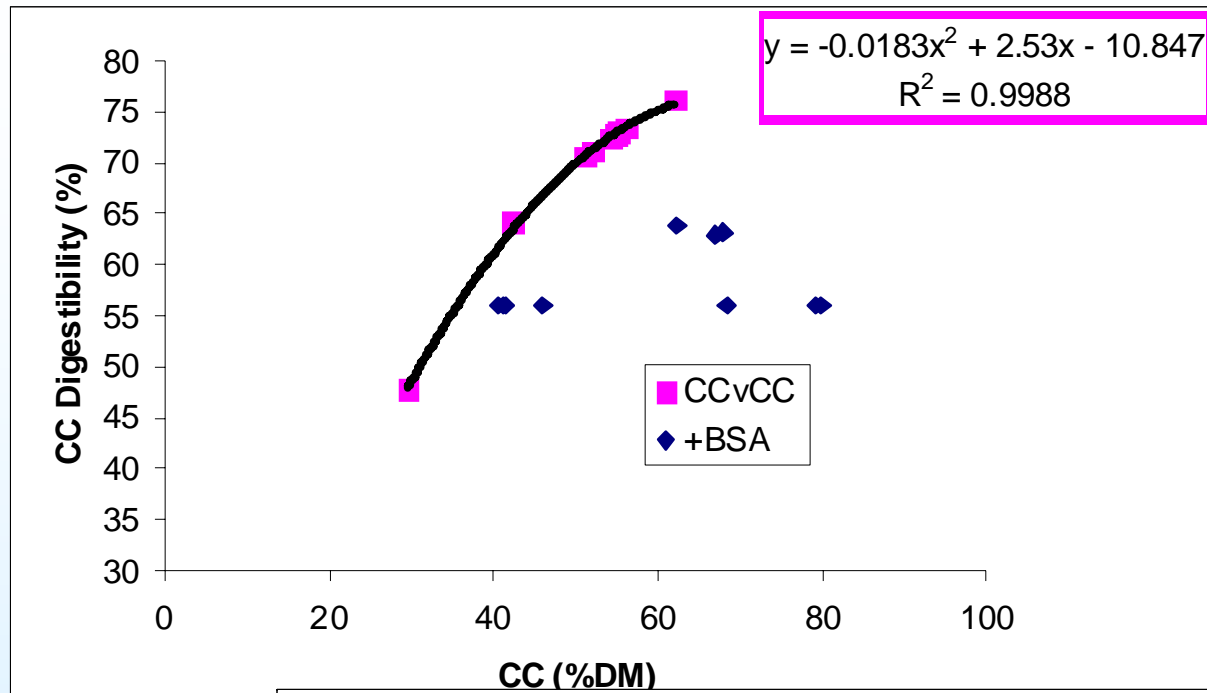
Digestible Intake



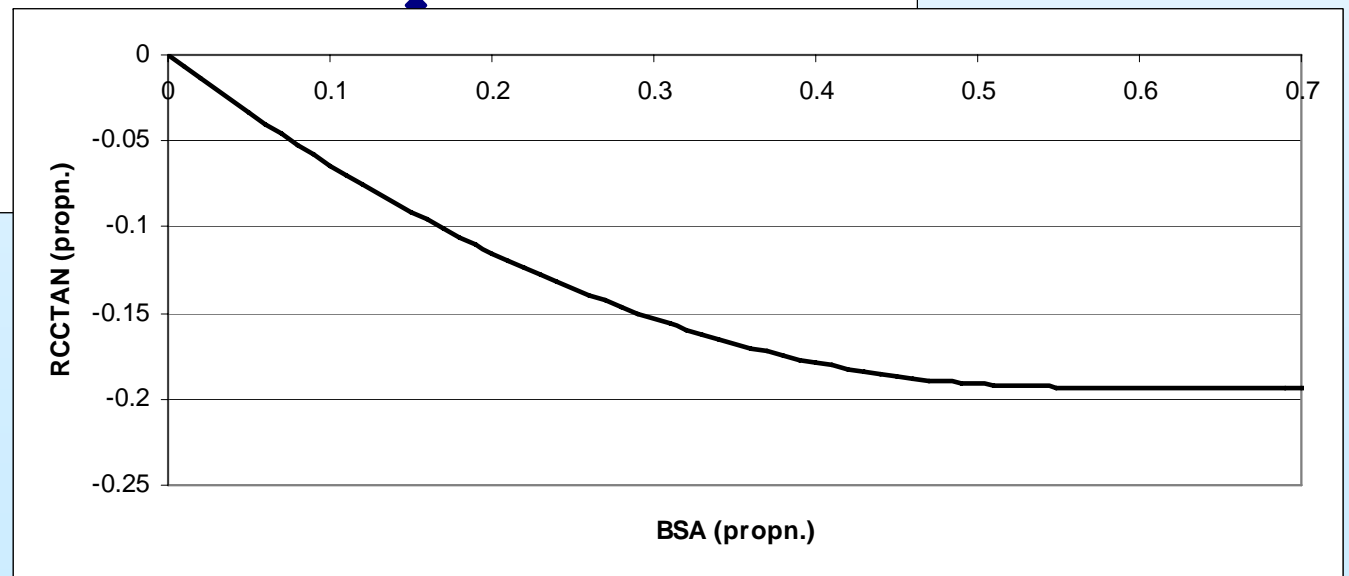
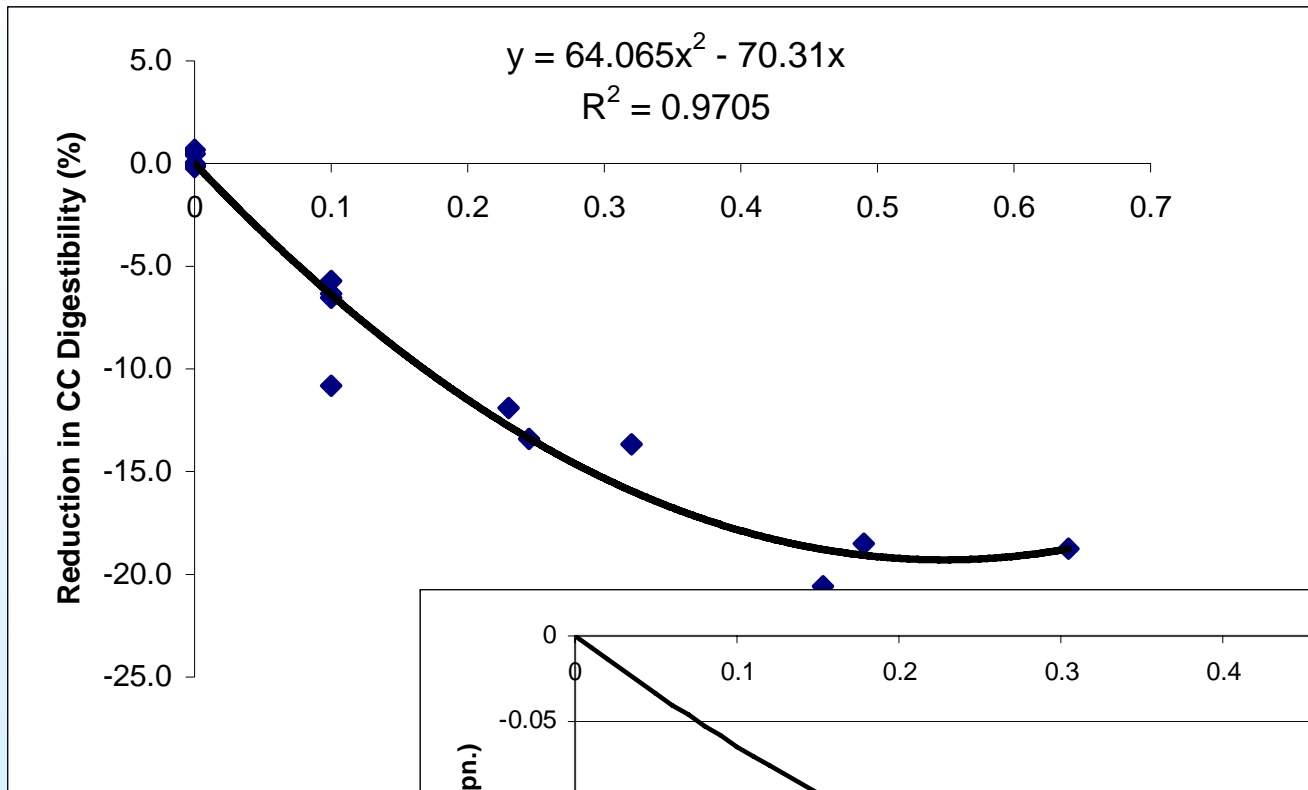
Cell Wall Digestibility



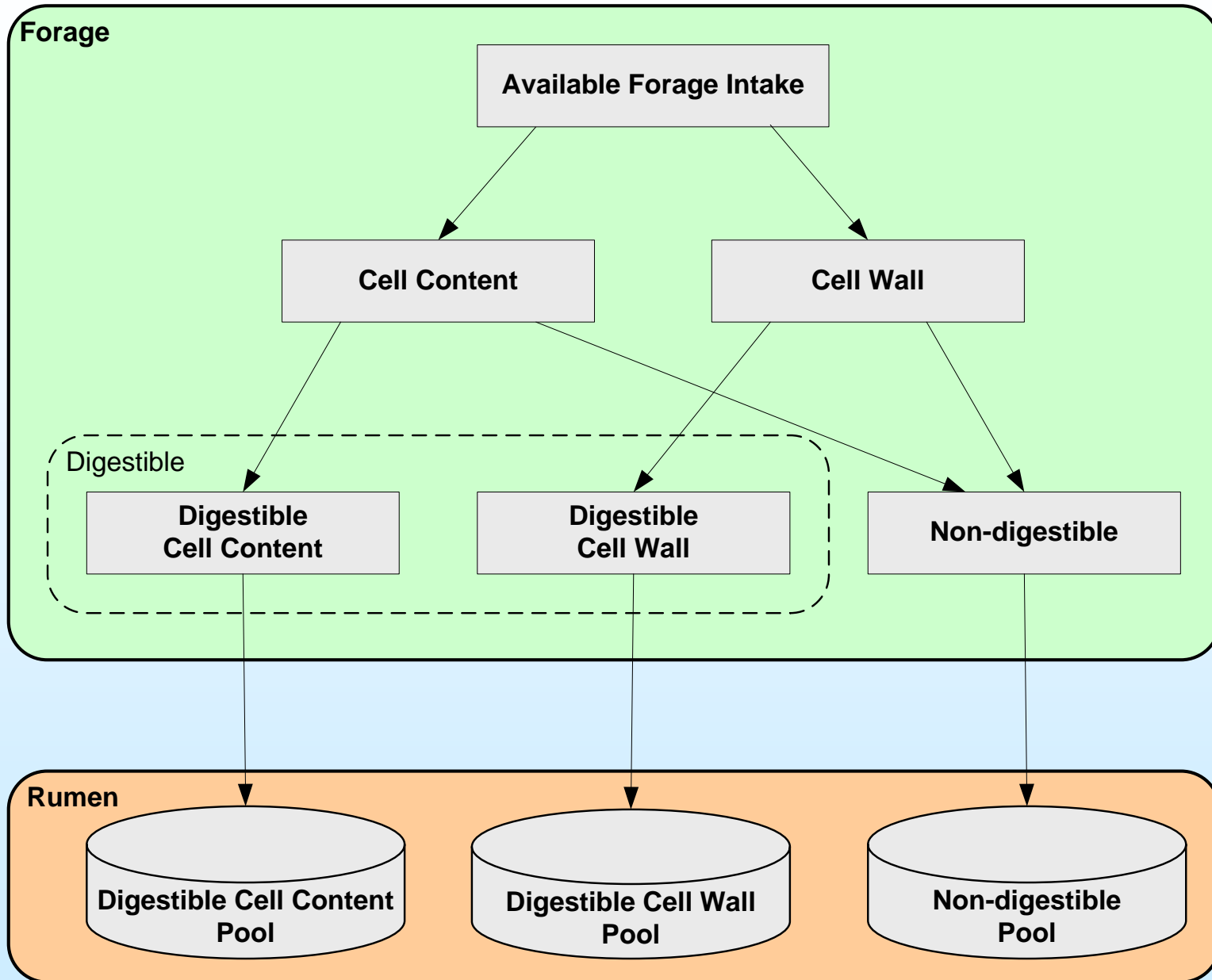
Cell Content Digestibility



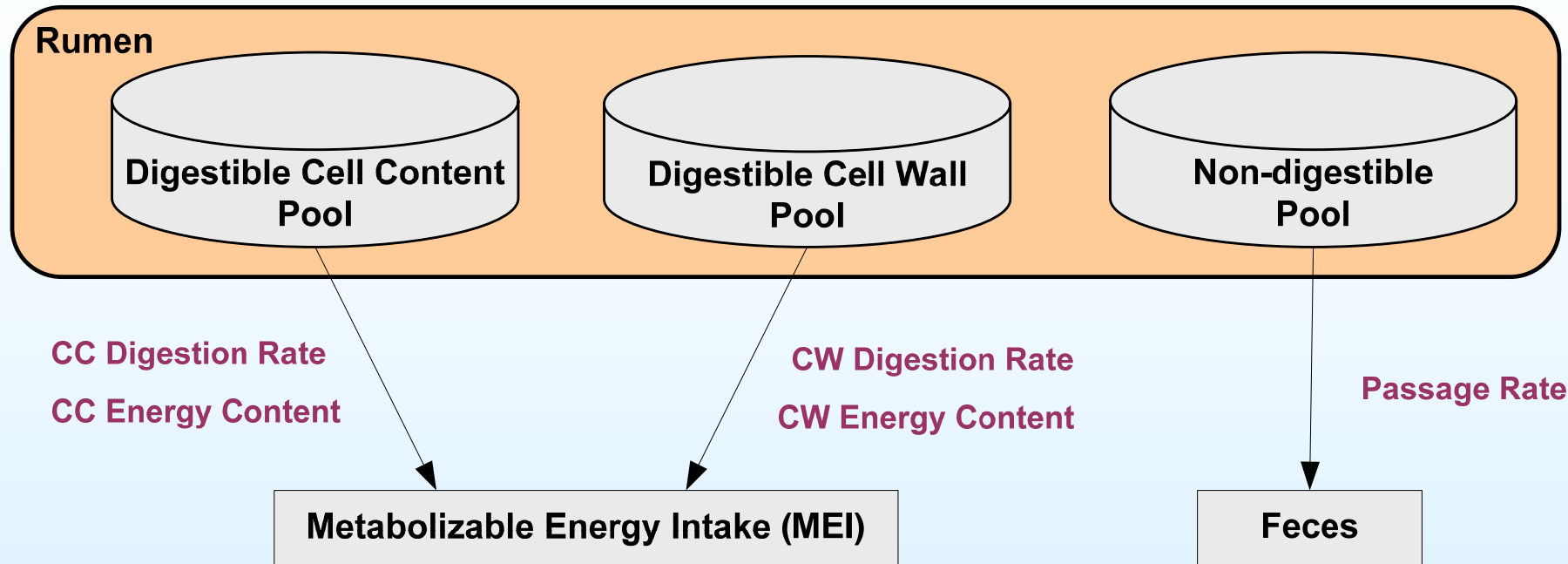
Effect of Tannins on Cell Content Digestibility



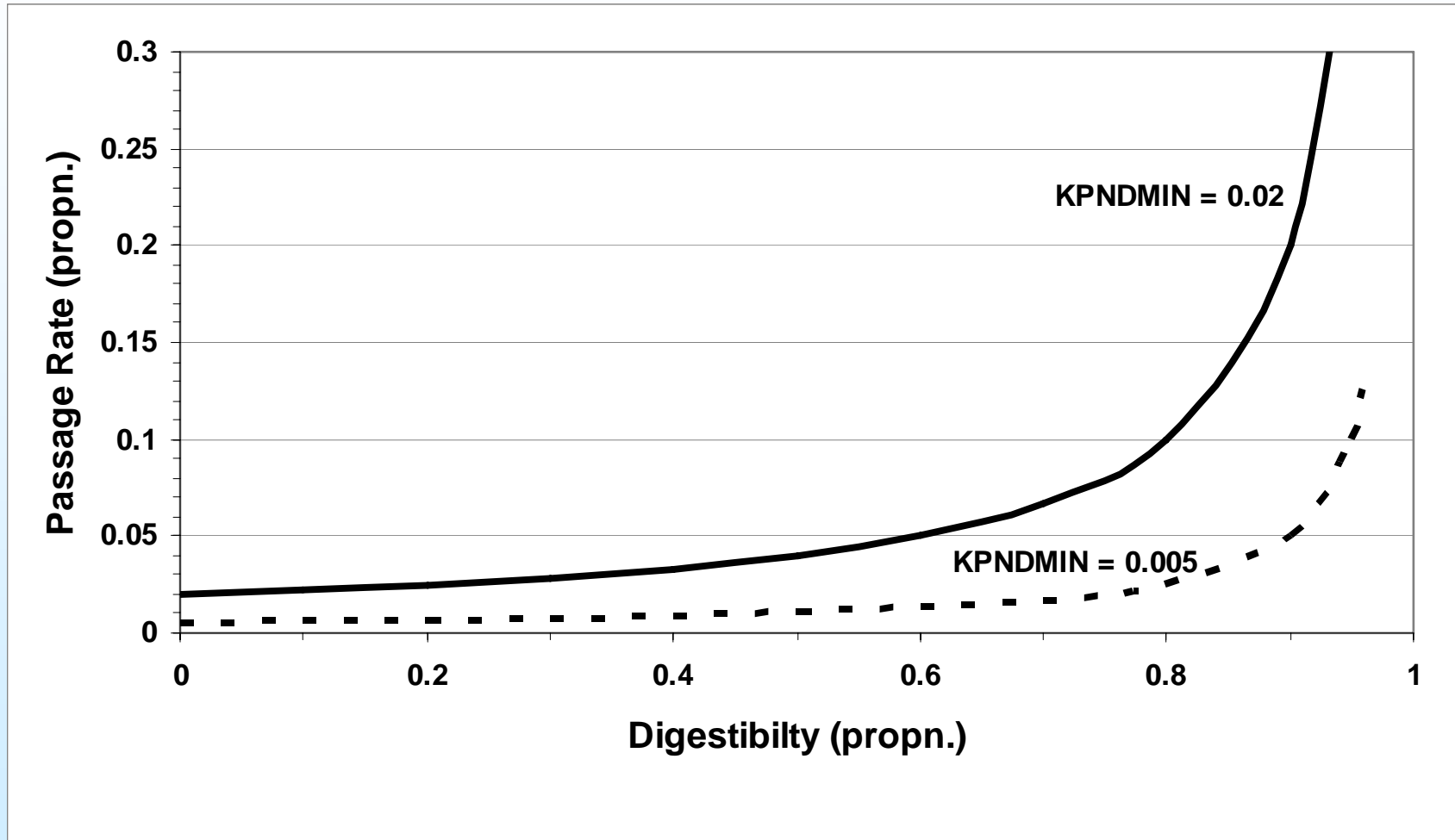
Rumen Pools



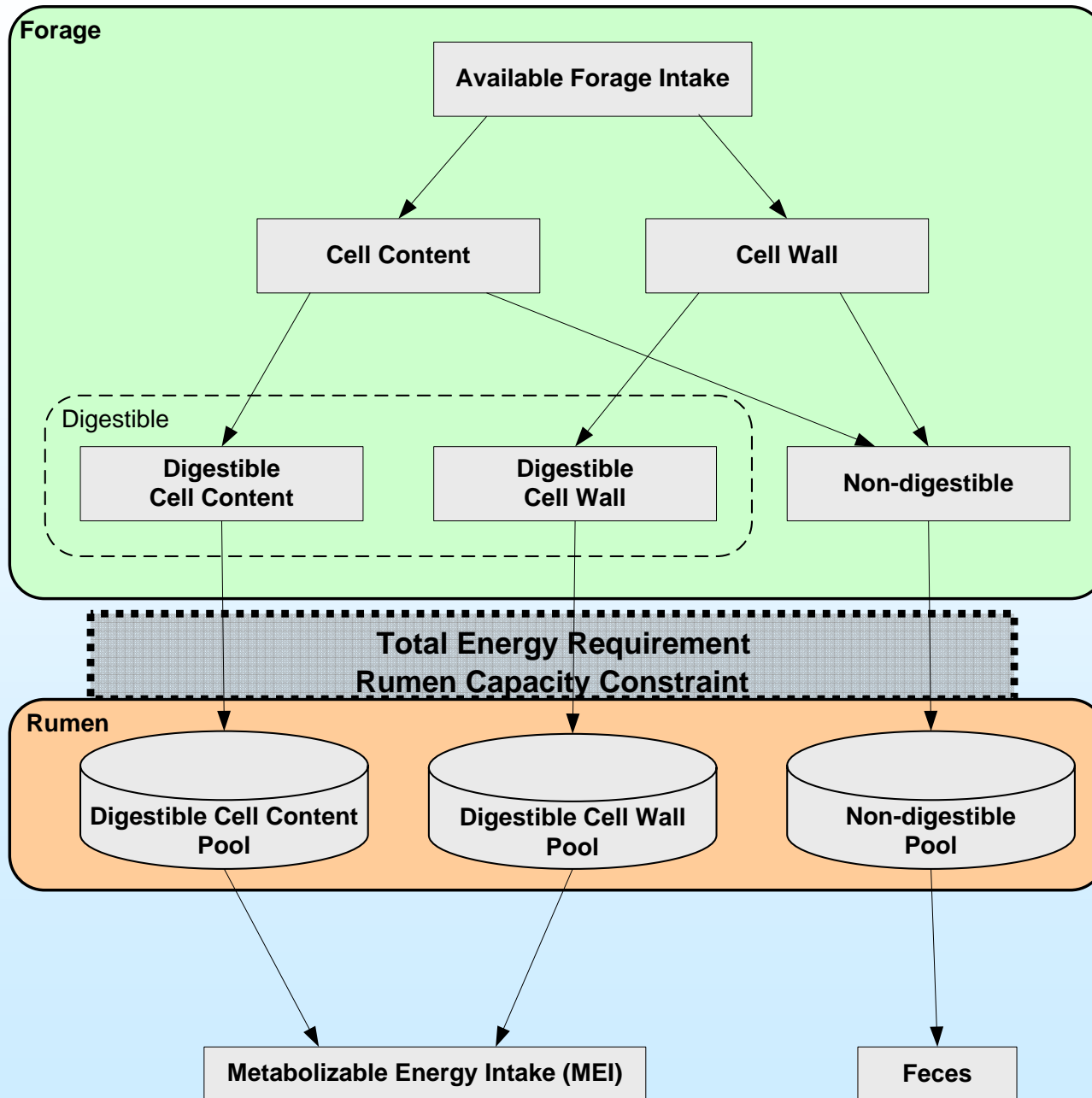
Rumen Digestion



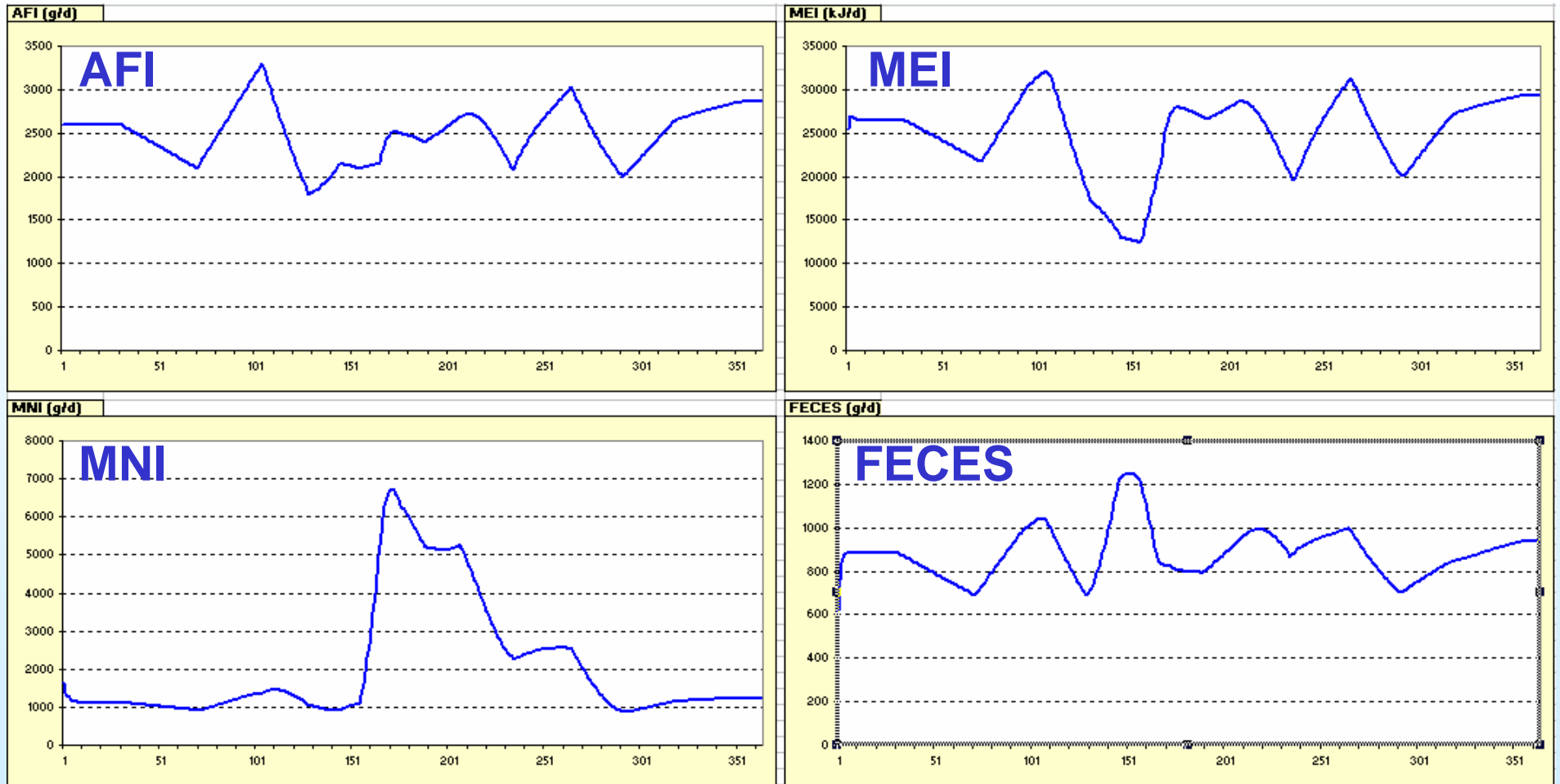
Passage Rate



Intake Constraints

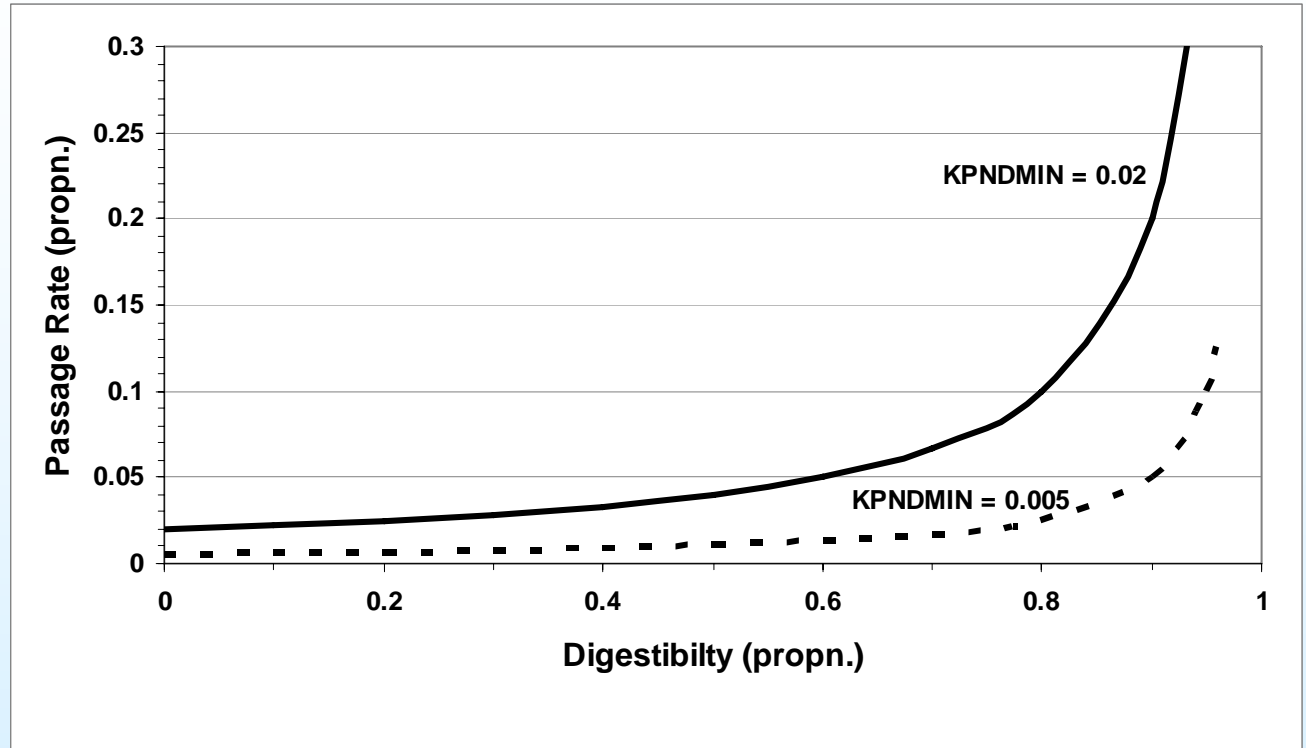


Model Output



Next Steps

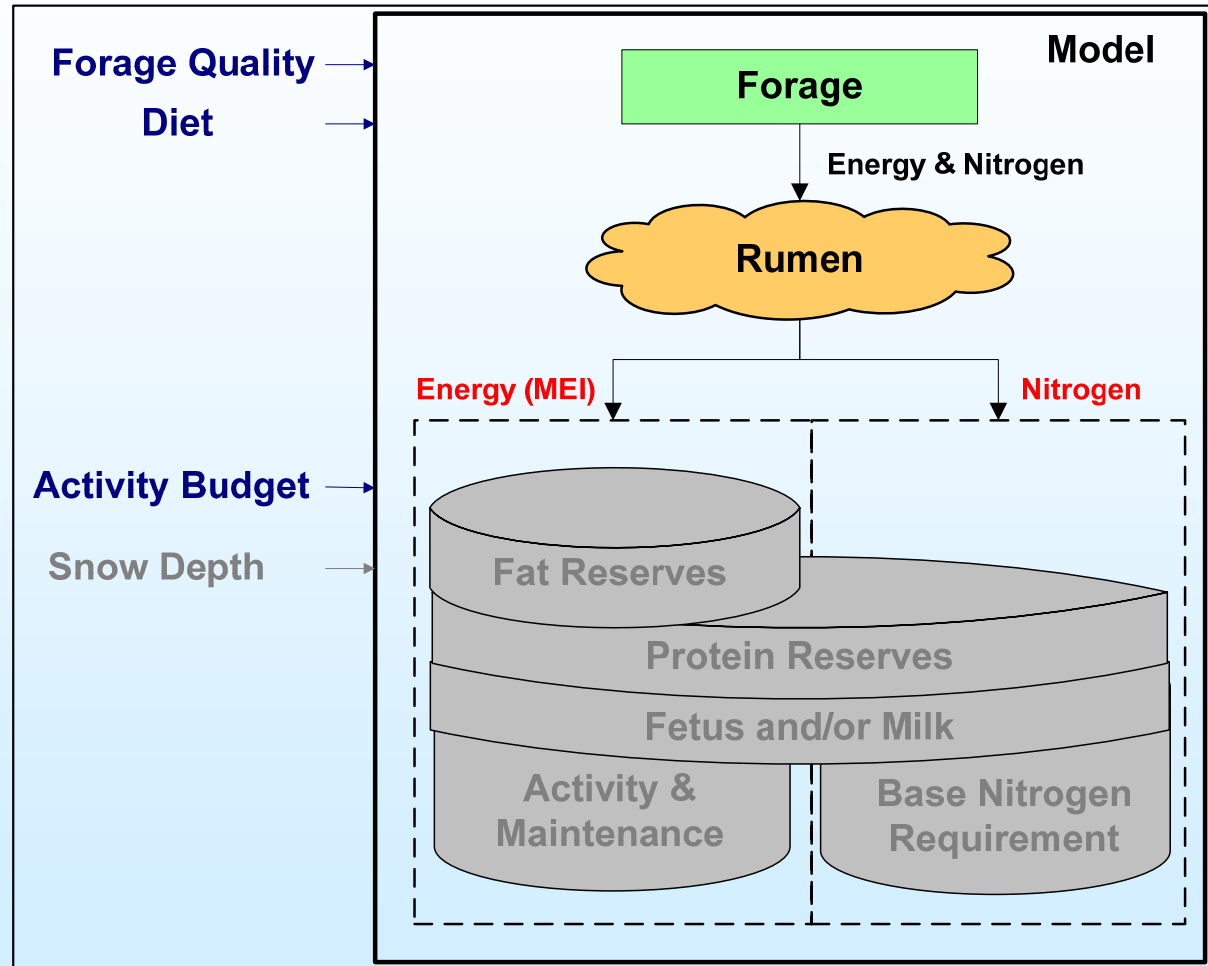
1. Sensitivity Analysis



Next Steps

1. Sensitivity Analysis

2. Allocation Model



Next Steps

1. Sensitivity Analysis

2. Allocation Model

3. Peer Review

Potential Forage Intake Rate

The potential rate at which forage can be ingested per minute for each plant group is calculated daily from plant encounter rates and available biomass as (see Figure 3):

$$PFIP_{p,d} = (AR_p * FB_{p,d}) / (1 + ((AR_p * FB_{p,d}) / PCMAX_{p,d})) \quad (1)$$

where:

$PFIP_{p,d}$ = potential per minute forage intake rate of plant group p on day d ($g \cdot \text{min}^{-1}$)

AR_p = user-specified coefficient dictating the steepness of the curve relating eating rate to biomass for each forage class; in biological terms this coefficient is equivalent to a searching and handling efficiency for each forage class ($g \cdot \text{ha} \cdot \text{kg}^{-1} \cdot \text{min}^{-1}$)

$FB_{p,d}$ = user-specified available forage biomass for plant group p on day d ($\text{kg} \cdot \text{ha}^{-1}$)

$PCMAX_{p,d}$ = user-specified maximum forage intake rate for plant group p on day d ($g \cdot \text{min}^{-1}$)

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'Eqn 1: Calculate potential forage intake rate
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PFIP(p) = (AR(s, p) * FB(s, p, d)) / (1 + ((AR(s, p) * FB(s, p, d)) / PCMAX(s, p, d)))
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'Eqn 2: Available forage intake
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AFI(p) = PFIP(p) * 60 * DIET(s, p, d) * PFOR(d) * PFOREAT(d)
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'Eqn 3: Available cell wall intake
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ACWFI(p) = AFI(p) * NDF(s, p, d)
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'Eqn 4: Available cell content intake
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ACCFI(p) = AFI(p) - ACWFI(p)
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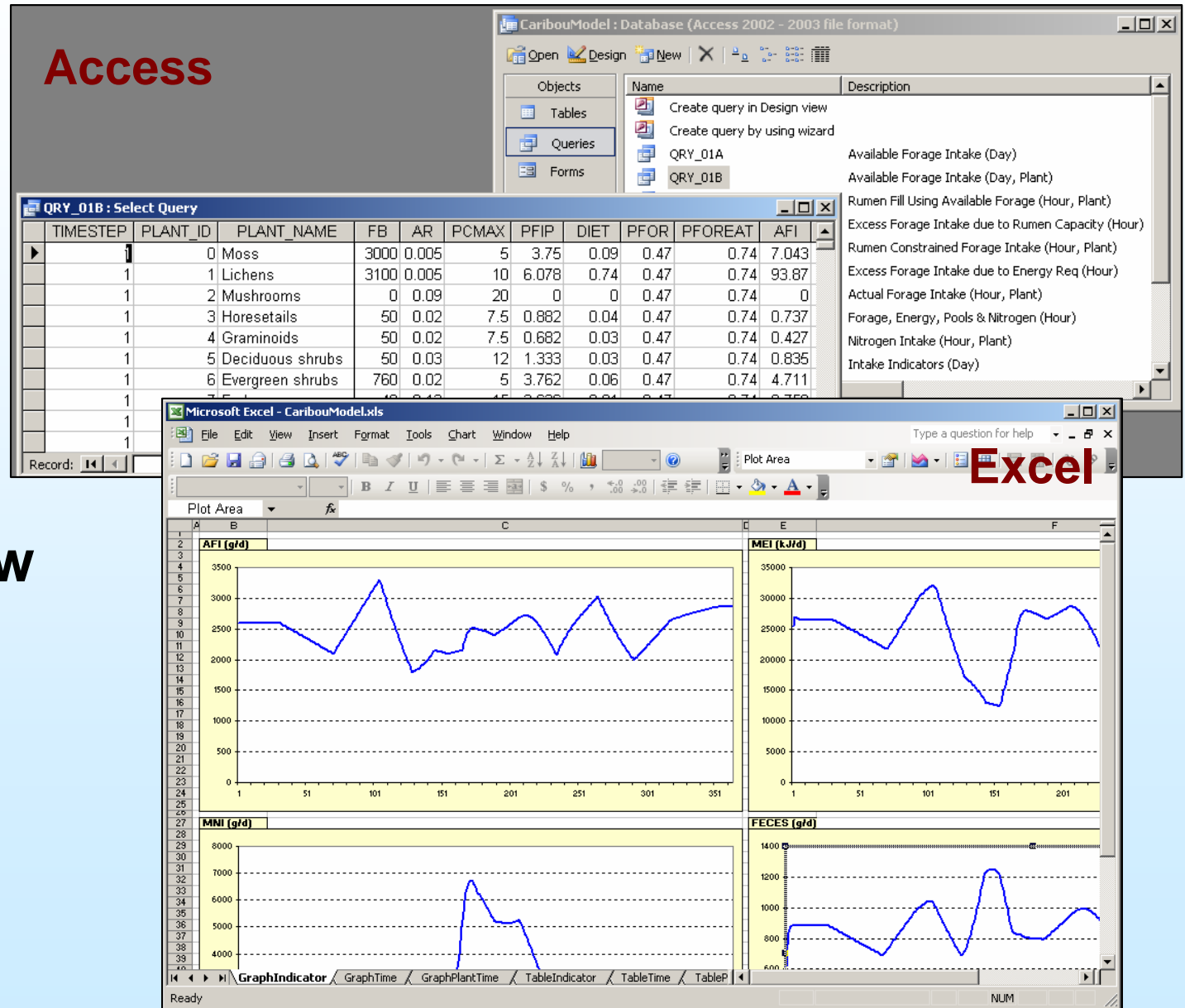
VB.NET

Next Steps

1. Sensitivity Analysis

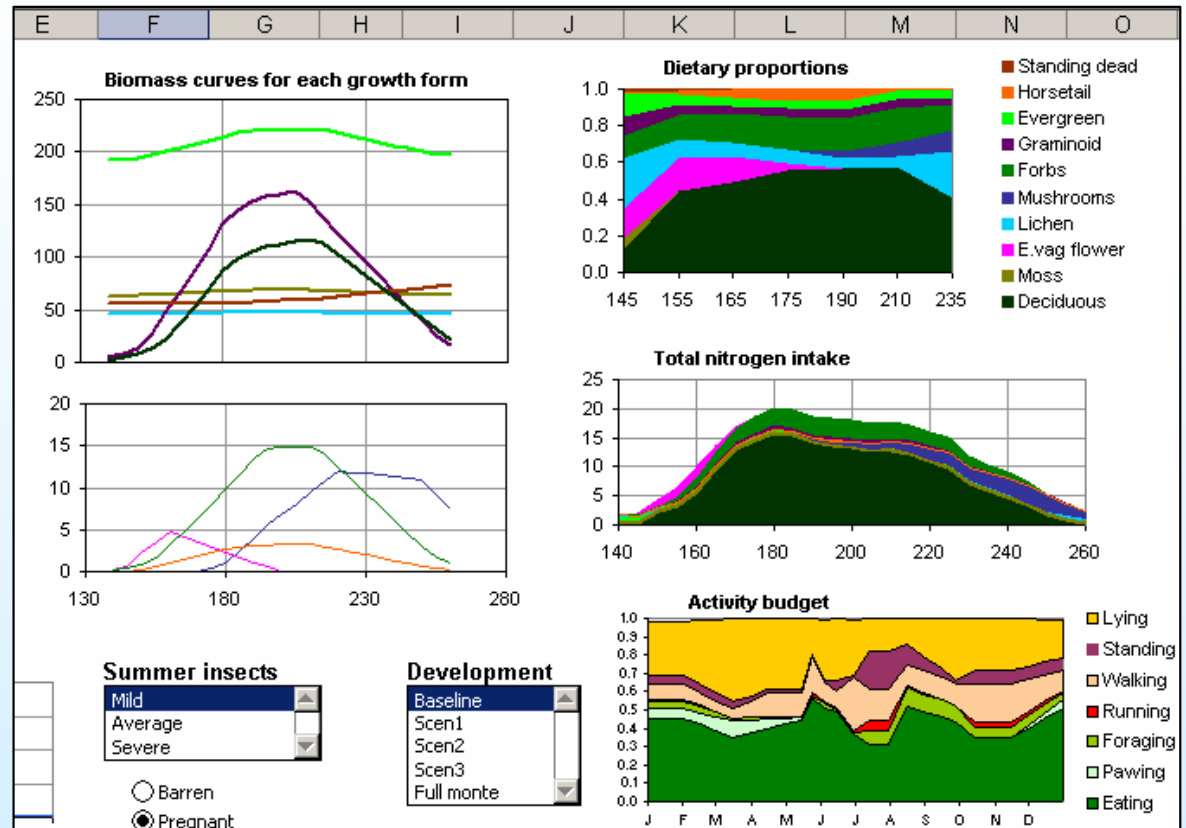
2. Allocation Model

3. Peer Review



Next Steps

1. Sensitivity Analysis
2. Allocation Model
3. Peer Review
4. Herd Parameterization



Next Steps

1. Sensitivity Analysis
2. Allocation Model
3. Peer Review
4. Herd Parameterization
5. User Interface

