

# MILK2024 – A tool to predict energy value of corn silage

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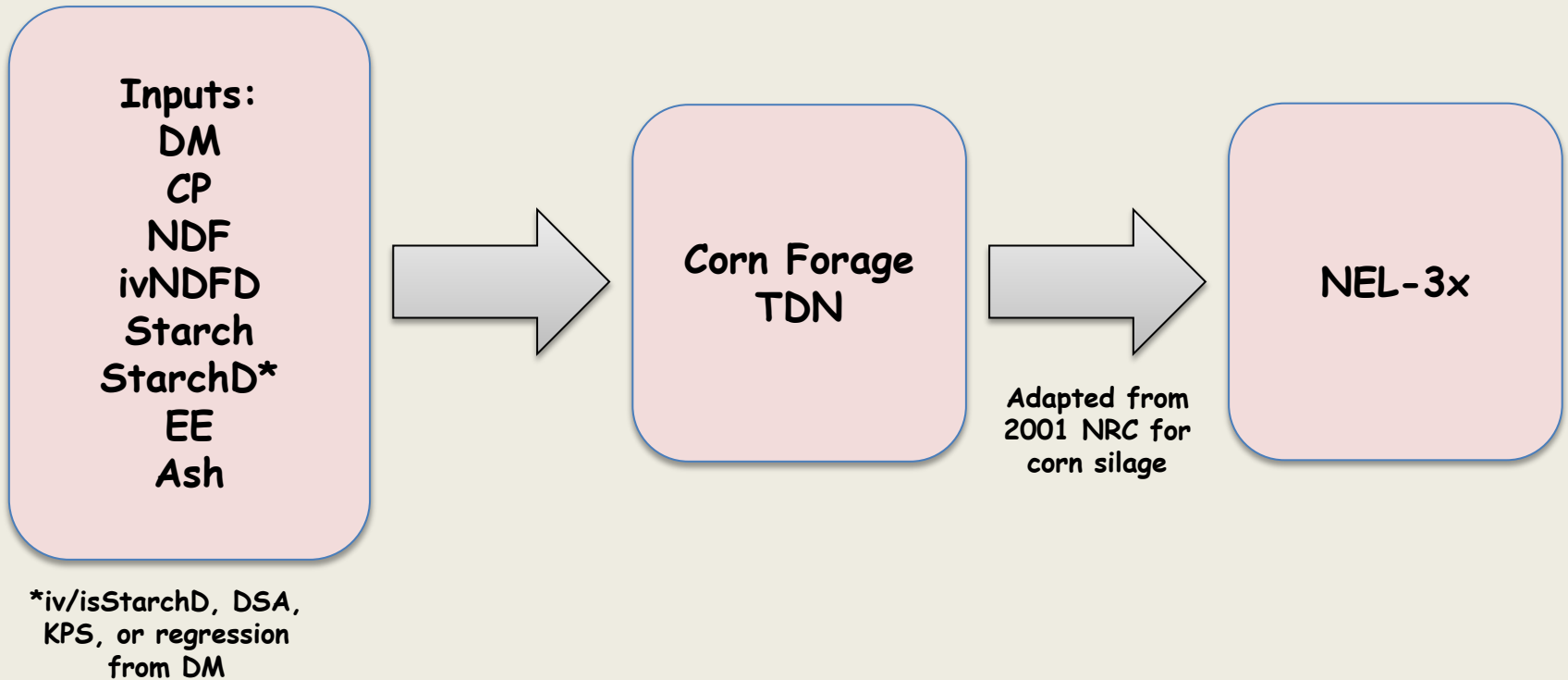


# Introduction

- Hybrid selection for corn silage and other practices are important to maximize nutritive value, but can be challenging
- The MILK index was created to select corn hybrids based on predicted energy content and yield, and is also used to evaluate other management practices
  - Estimates milk yield per ton and milk per acre
- MILK2024 was released last year
  - Last version was MILK2006

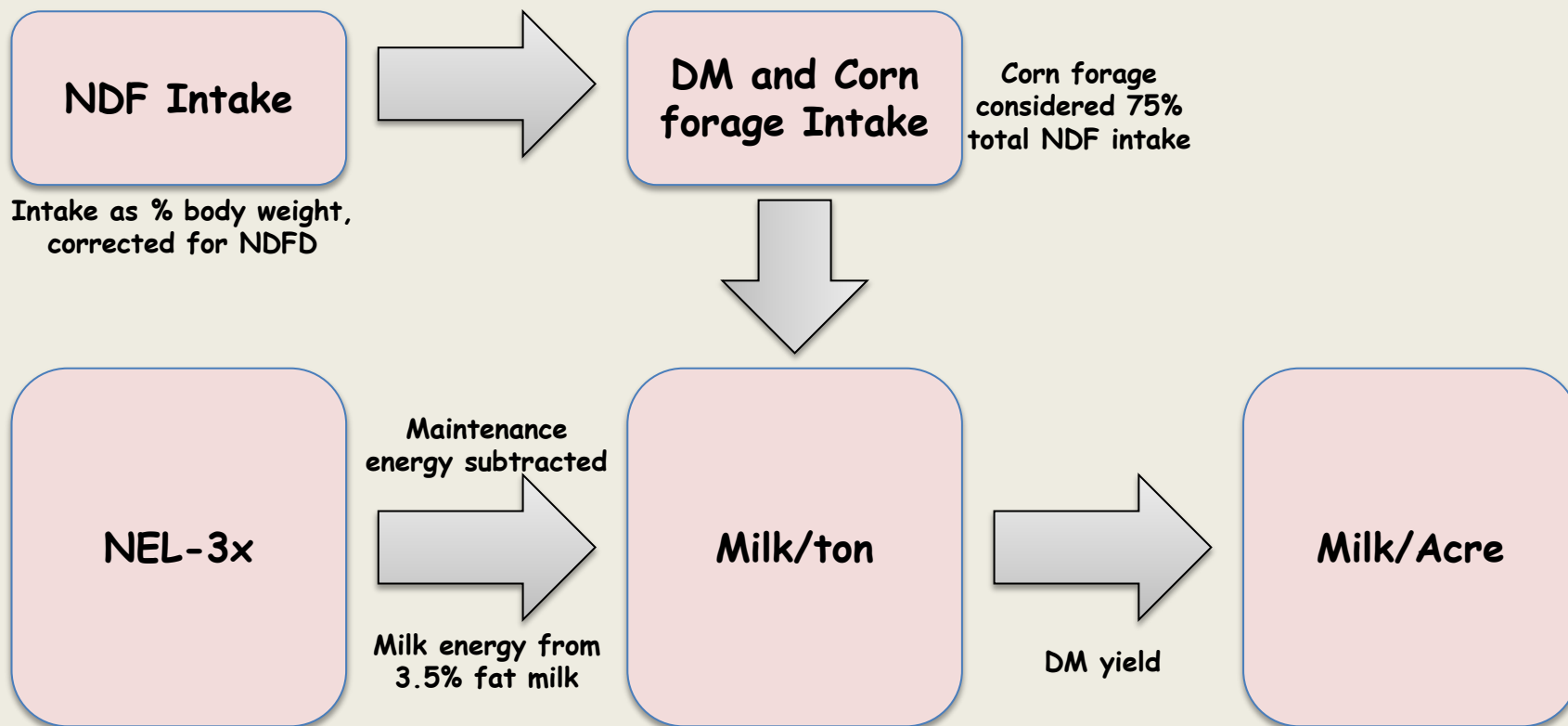
# MILK2006

## MILK index model



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# MILK2006



# MILK Models

- MILK2006 uses TDN-based energy equations
- Since its release new equations and predictions have been developed
- Goal to update the MILK index model, incorporating new energy equations and predictions

# MILK 2024

- New energy equations based on NASEM (2021)
  - Requires basal diet
    - Energy losses subtracted from diet, not corn forage alone
  - 70% basal diet and 30% corn forage

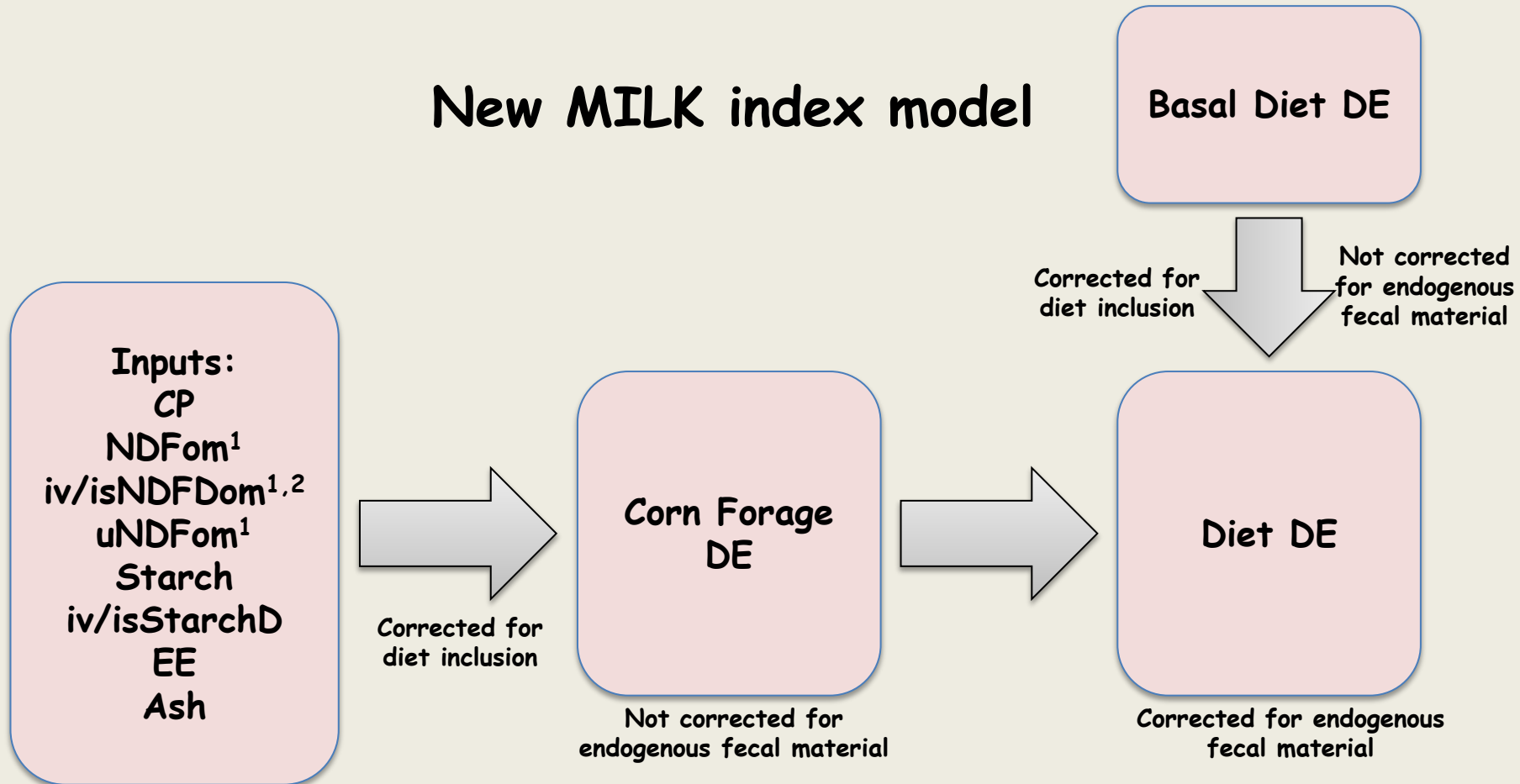
| Item                | Alfalfa Silage | HMC | Whole Cotton Seed | Ground Corn | Soy Hulls | Expeller Meal | Canola Meal | Soy-bean Meal | Protected Fat |
|---------------------|----------------|-----|-------------------|-------------|-----------|---------------|-------------|---------------|---------------|
| Inclusion Rate (DM) | 28%            | 12% | 7%                | 21%         | 6%        | 10%           | 9%          | 2%            | 1%            |

# MILK 2024

- Residual organic matter, total FA, protein digestibility from NASEM (2021)
- Mechanistic models used for starch and NDF digestibility
  - 7h iv/isStarchD estimates kd
  - 30 or 48h ivNDFD estimates kd

# MILK 2024

## New MILK index model



<sup>1</sup>can be predicted with fiber measurement and ash  
<sup>2</sup>30 or 48h timepoint

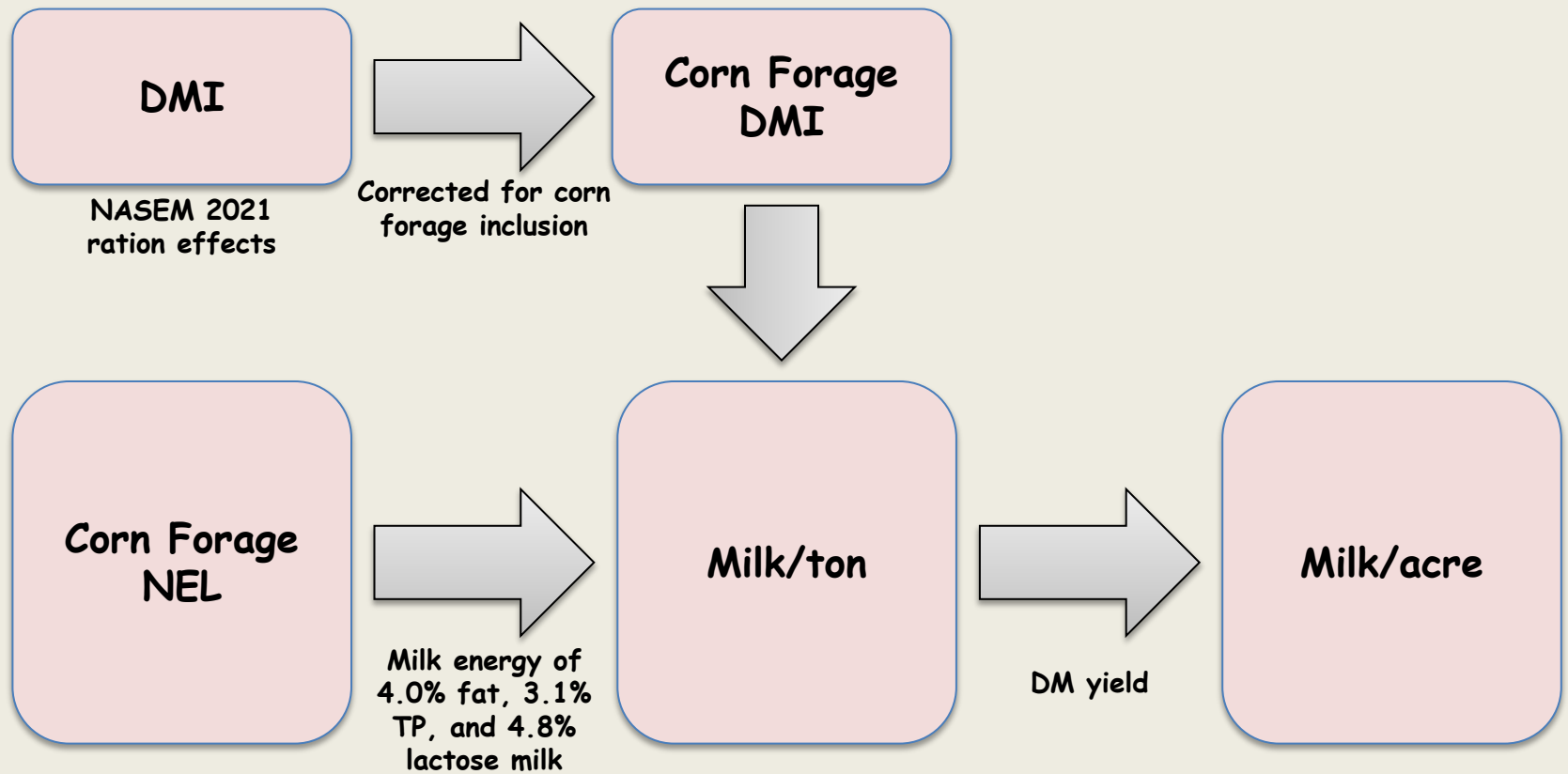
# MILK 2024



\*Corn forage DE/diet DE used to estimate corn forage NEL for this model, not representative of actual NEL contributions of corn forage/silage in a dairy cow diet

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# MILK 2024



# Model Comparison

- Milk/ton calculated from the normal range of a large commercial dataset (n = 101,025) of corn silage samples for MILK2000, MILK2006, and updated MILK2024 index<sup>1</sup>

| Item    | CP, %<br>DM | NDF <sub>om</sub> ,<br>% DM | NDFDom,<br>% NDFom | uNDFom,<br>% DM | Starch,<br>% DM | StarchD,<br>% starch | EE, %<br>DM | Ash, %<br>DM |
|---------|-------------|-----------------------------|--------------------|-----------------|-----------------|----------------------|-------------|--------------|
| Average | 7.6         | 37.3                        | 58.5               | 10.4            | 34.8            | 77.1                 | 2.9         | 4.0          |
| SD      | 0.51        | 2.32                        | 2.97               | 1.56            | 2.94            | 5.35                 | 0.37        | 0.65         |
| Minimum | 6.6         | 32.3                        | 52.5               | 6.8             | 26.3            | 65.4                 | 2.1         | 2.7          |
| Maximum | 8.8         | 43.1                        | 66.7               | 15.1            | 40.7            | 88.2                 | 3.9         | 5.6          |

<sup>1</sup> MILK2000 uses DM (36.8% as fed  $\pm$  3.72; Min = 23.3; Max = 57.6), MILK2000 and MILK2006 use NDF (38.4% DM  $\pm$  2.30; Min = 32.4; Max = 47.7) and NDFD (57.7% NDF  $\pm$  2.88; Min = 52.0; Max = 65.6)

# Model Comparison

Outputs from final dataset of corn silage samples for MILK2000, MILK2006, and MILK2024

| Item    | MILK2000<br>milk/ton | MILK2006 <sup>1</sup><br>milk/ton | MILK2006 <sup>2</sup><br>milk/ton | MILK2024<br>milk/ton |
|---------|----------------------|-----------------------------------|-----------------------------------|----------------------|
| Average | 1835                 | 1734                              | 1493                              | 1547                 |
| SD      | 78                   | 78                                | 58                                | 42                   |
| Minimum | 1508                 | 1414                              | 1256                              | 1400                 |
| Maximum | 2057                 | 1977                              | 1748                              | 1680                 |

<sup>1</sup> MILK2006 calculated with DM concentration

<sup>2</sup>MILK2006 calculated with 7h starchD

# Model Comparison

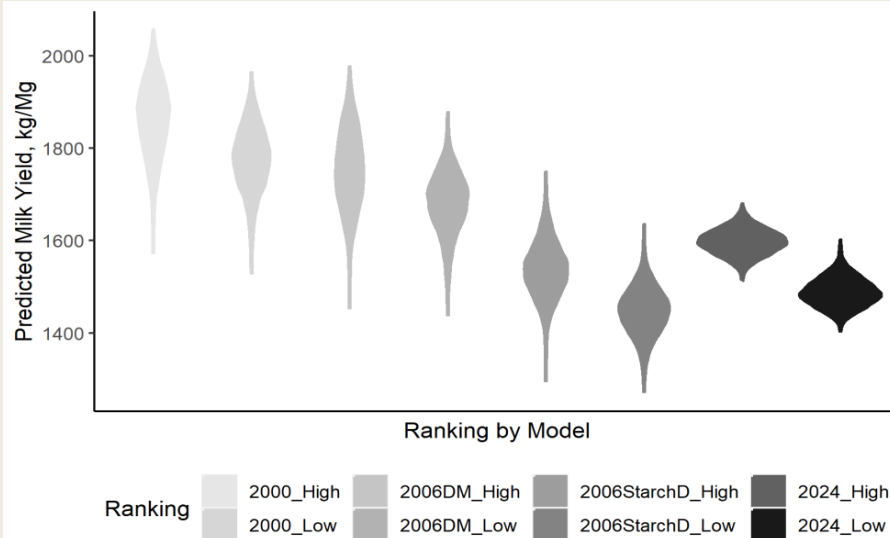
- Dataset of corn silage samples ranked by NDFom concentration, 30h NDFDom, starch concentration, and 7h starchD to compare performance of MILK 2000, MILK2006 and Updated milk/ton Index.
  - Top and bottom 10% or 25% of samples from the normal range were used to represent high- and low-quality silage samples, depending on the variable
  - The overlap between high- and low-quality samples was calculated as the percentage of high-quality samples below the maximum of low-quality samples

# Model Comparison – NDFom Rankings

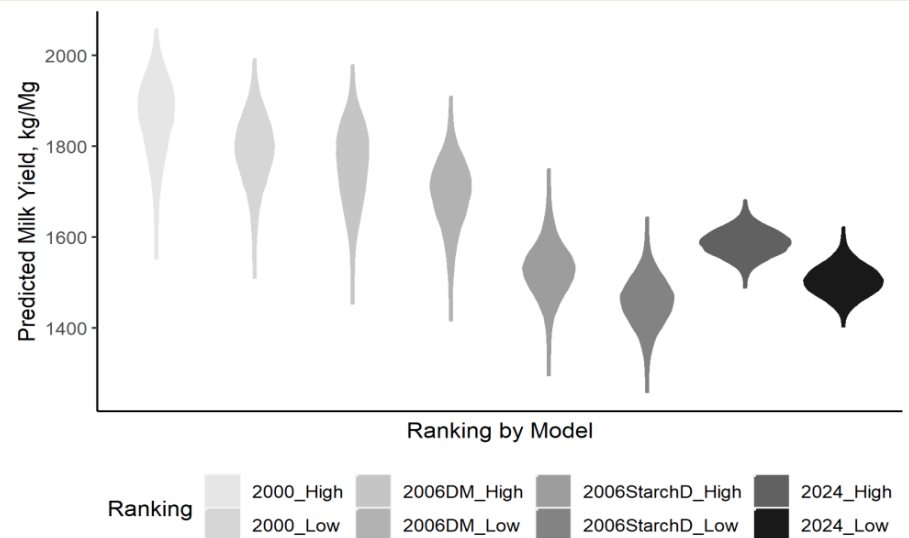
| Item                     | Low Quality<br>High NDFom | Average Quality<br>Moderate NDFom | High Quality<br>Low NDFom |
|--------------------------|---------------------------|-----------------------------------|---------------------------|
| DM, % as fed             | 35.2 ± 3.42               | 36.5 ± 3.50                       | 39.3 ± 3.65               |
| CP, % DM                 | 7.6 ± 0.53                | 7.6 ± 0.51                        | 7.7 ± 0.48                |
| NDF, % DM                | 42.4 ± 0.73               | 38.2 ± 0.48                       | 34.9 ± 0.58               |
| NDF <sub>om</sub> , % DM | 41.5 ± 0.66               | 37.2 ± 0.19                       | 33.7 ± 0.55               |
| NDFD, % NDF              | 57.1 ± 2.80               | 57.6 ± 2.82                       | 58.5 ± 2.89               |
| NDFDom, % NDFom          | 57.8 ± 2.89               | 58.3 ± 2.92                       | 59.2 ± 2.99               |
| uNDF, % DM               | 11.7 ± 1.60               | 10.4 ± 1.36                       | 9.0 ± 1.17                |
| Starch, % DM             | 31.0 ± 1.95               | 35.1 ± 2.21                       | 37.6 ± 1.73               |
| StarchD, % DM            | 75.7 ± 5.02               | 76.7 ± 5.20                       | 79.4 ± 5.55               |
| EE, % DM                 | 2.9 ± 0.35                | 2.9 ± 0.36                        | 2.8 ± 0.39                |
| Ash, % DM                | 4.0 ± 0.63                | 4.0 ± 0.65                        | 4.1 ± 0.66                |
| MILK2000                 | 3549 ± 133                | 3678 ± 143                        | 3722 ± 152                |
| MILK2006                 | 2888 ± 98                 | 2982 ± 100                        | 3066 ± 115                |
| MILK 2024                | 2956 ± 60                 | 3090 ± 54                         | 3197 ± 53                 |

# Model Comparison - NDFom

## 10% Ranking



## 25% Ranking



## Overlap of high- and low-quality samples

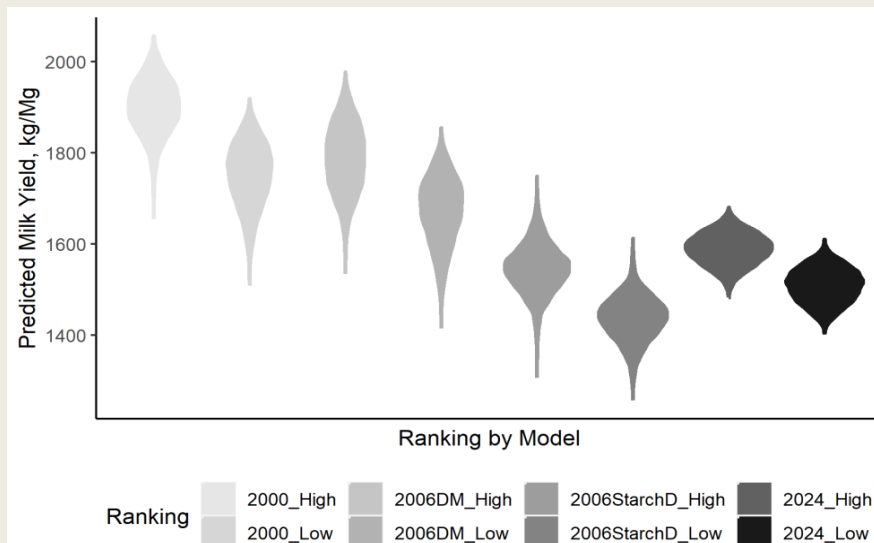
| Model             | 10% Ranking | 25% Ranking |
|-------------------|-------------|-------------|
| 2000              | 91          | 97          |
| 2006 <sup>1</sup> | 93          | 98          |
| 2006 <sup>2</sup> | 95          | 98          |
| 2024              | 56          | 88          |

<sup>1</sup> MILK2006 calculated with DM concentration

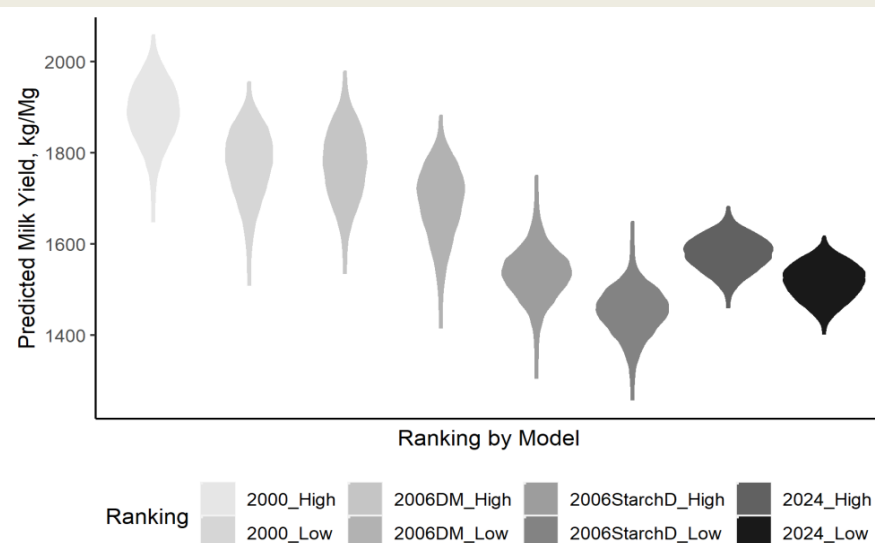
<sup>2</sup> MILK2006 calculated with 7h starchD

# Model Comparison - 30h NDFDom

## 10% Ranking



## 25% Ranking



## Overlap of high- and low-quality samples

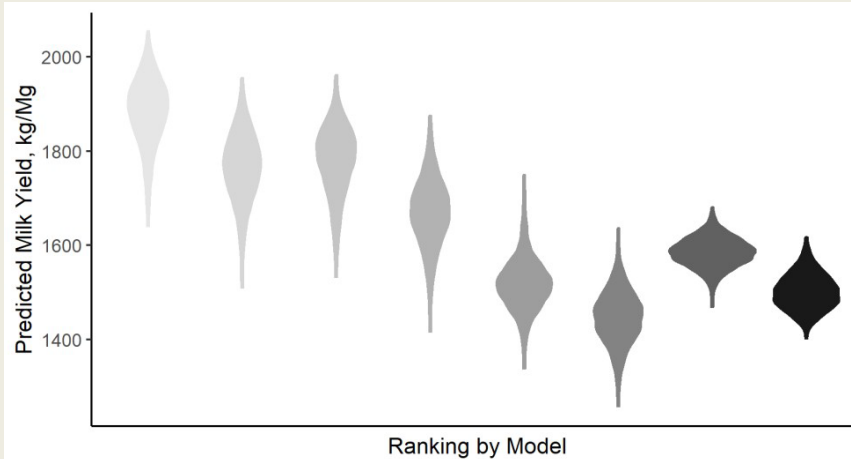
| Model             | 10% Ranking | 25% Ranking |
|-------------------|-------------|-------------|
| 2000              | 60          | 84          |
| 2006 <sup>1</sup> | 80          | 93          |
| 2006 <sup>2</sup> | 90          | 98          |
| 2024              | 71          | 84          |

<sup>1</sup> MILK2006 calculated with DM concentration

<sup>2</sup>MILK2006 calculated with 7h starchD

# Model Comparison - Starch

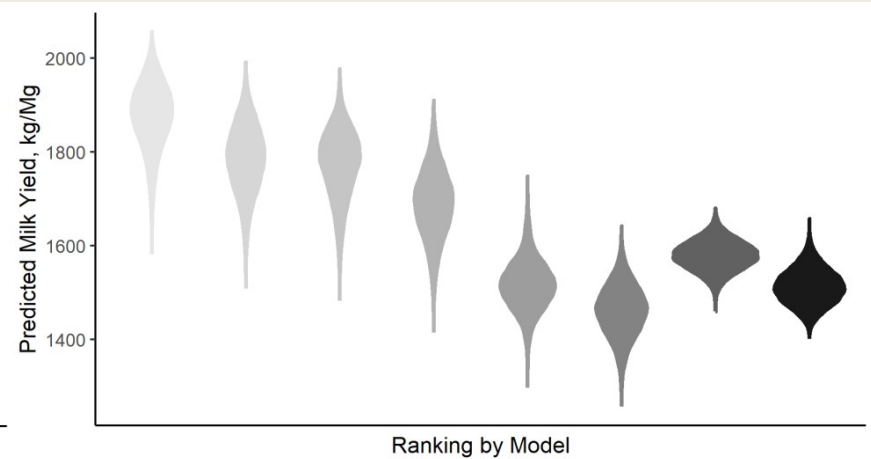
10% Ranking



Ranking

|           |             |                  |           |
|-----------|-------------|------------------|-----------|
| 2000_High | 2006DM_High | 2006StarchD_High | 2024_High |
| 2000_Low  | 2006DM_Low  | 2006StarchD_Low  | 2024_Low  |

25% Ranking



Ranking

|           |             |                  |           |
|-----------|-------------|------------------|-----------|
| 2000_High | 2006DM_High | 2006StarchD_High | 2024_High |
| 2000_Low  | 2006DM_Low  | 2006StarchD_Low  | 2024_Low  |

## Overlap of high- and low-quality samples

| Model             | 10% Ranking | 25% Ranking |
|-------------------|-------------|-------------|
| 2000              | 85          | 97          |
| 2006 <sup>1</sup> | 93          | 99          |
| 2006 <sup>2</sup> | 98          | 98          |
| 2024              | 85          | 100         |

<sup>1</sup> MILK2006 calculated with DM concentration

<sup>2</sup>MILK2006 calculated with 7h starchD



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# Questions



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