

Simulating impacts of climate and management on timothy growth in Northern countries

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Introduction

Intensive grass silage production is the basis of livestock and dairy production in eastern Canada and northern Europe where timothy (*Phleum pratense* L.) is one of the most common forage grass species. Virtually non-existent national silage markets and problems in storing silage for more than a year make livestock and dairy production particularly sensitive to severe weather-related yield losses.

The impact of the climate and management on yield development of grasslands can be studied using dynamic grass growth models. Model intercomparisons can show the constraints related to different models and the uncertainties related to model predictions.

Materials and methods

We compared three timothy models (BASGRA¹, CATIMO² and STICS³) for their yield predictions using field trial data from a wide range of climatic conditions in the main timothy production regions of Canada and Northern Europe (Figures 1 and 2).

Observations from 2-3 growing seasons from 7 sites and 33 treatments with differing nitrogen fertilisation rates and cutting regimes were used. 24 treatments were used for cultivar and non-cultivar specific (generic) calibrations. The remaining treatments were used for model evaluation.

Results

Dry matter yield simulation accuracies improved when cultivar-specific data were used for model calibration. At most sites models underestimated the yields – especially the first cut yield (Figure 2). CATIMO and STICS responded best to varying nitrogen fertilisation rates (Figure 3).

References

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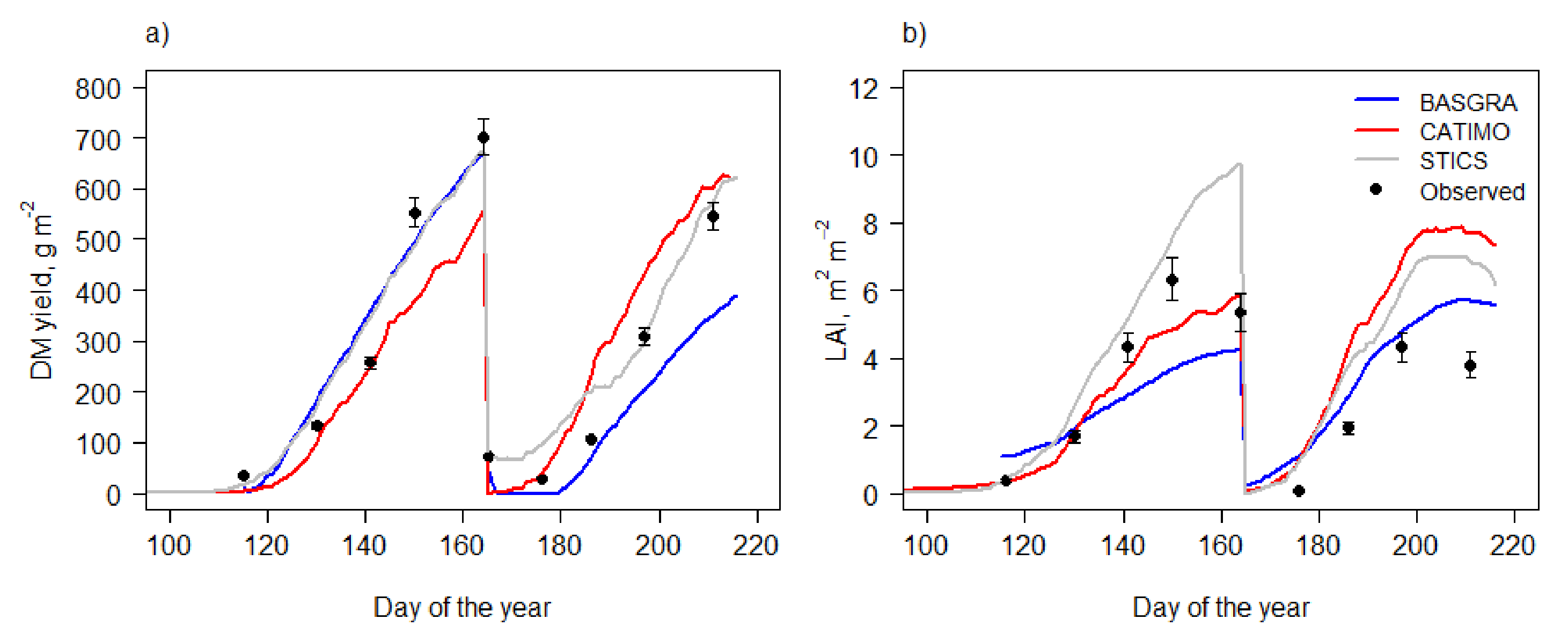


Figure 1. An example of simulated and observed dry matter yield (a) and leaf area index (b) for one treatment (Særheim, 2001). Error bars represent one standard deviation.

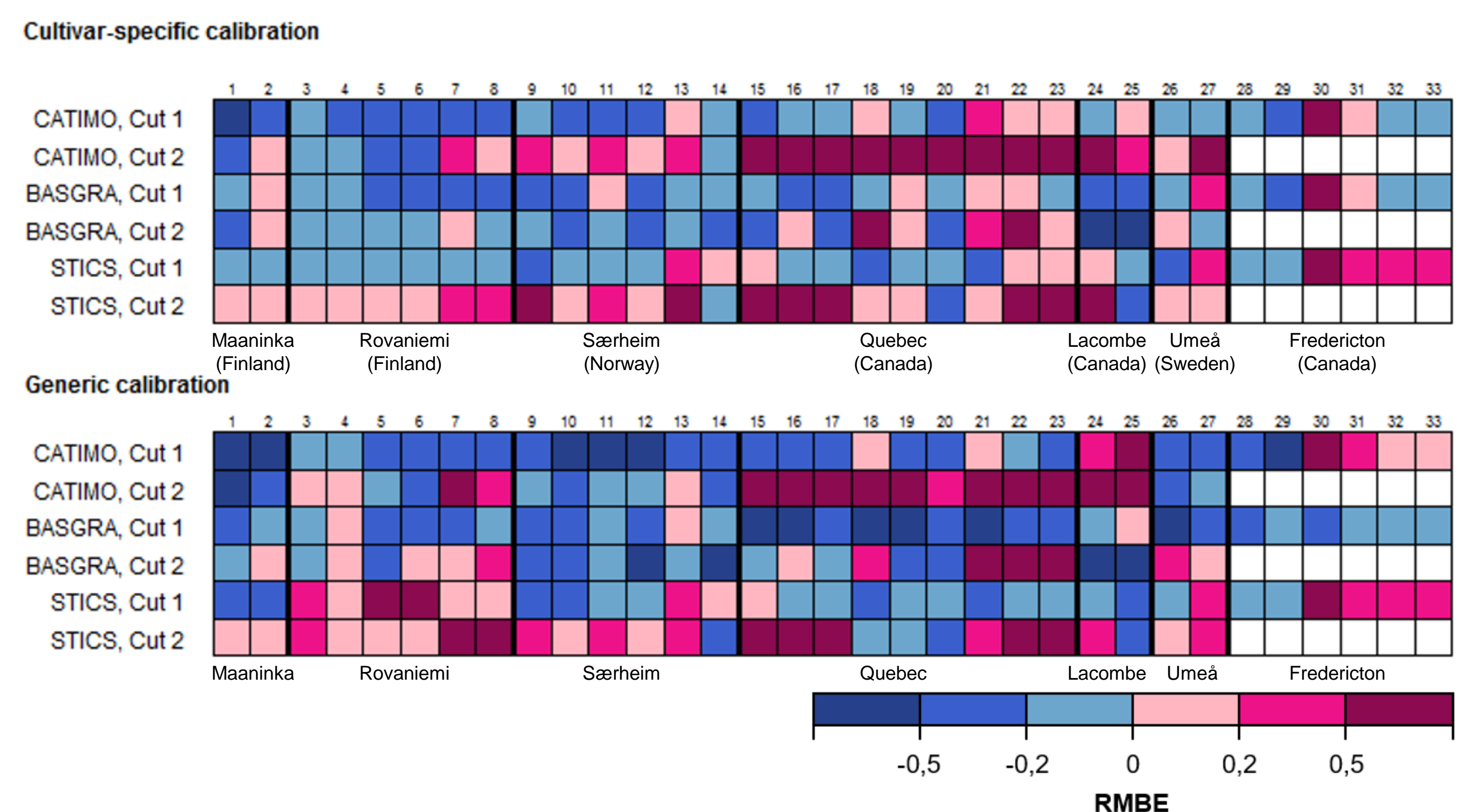


Figure 2. Relative mean bias error (RMBE) for all treatments at all sites with cultivar-specific and non-cultivar specific (generic) calibrations.

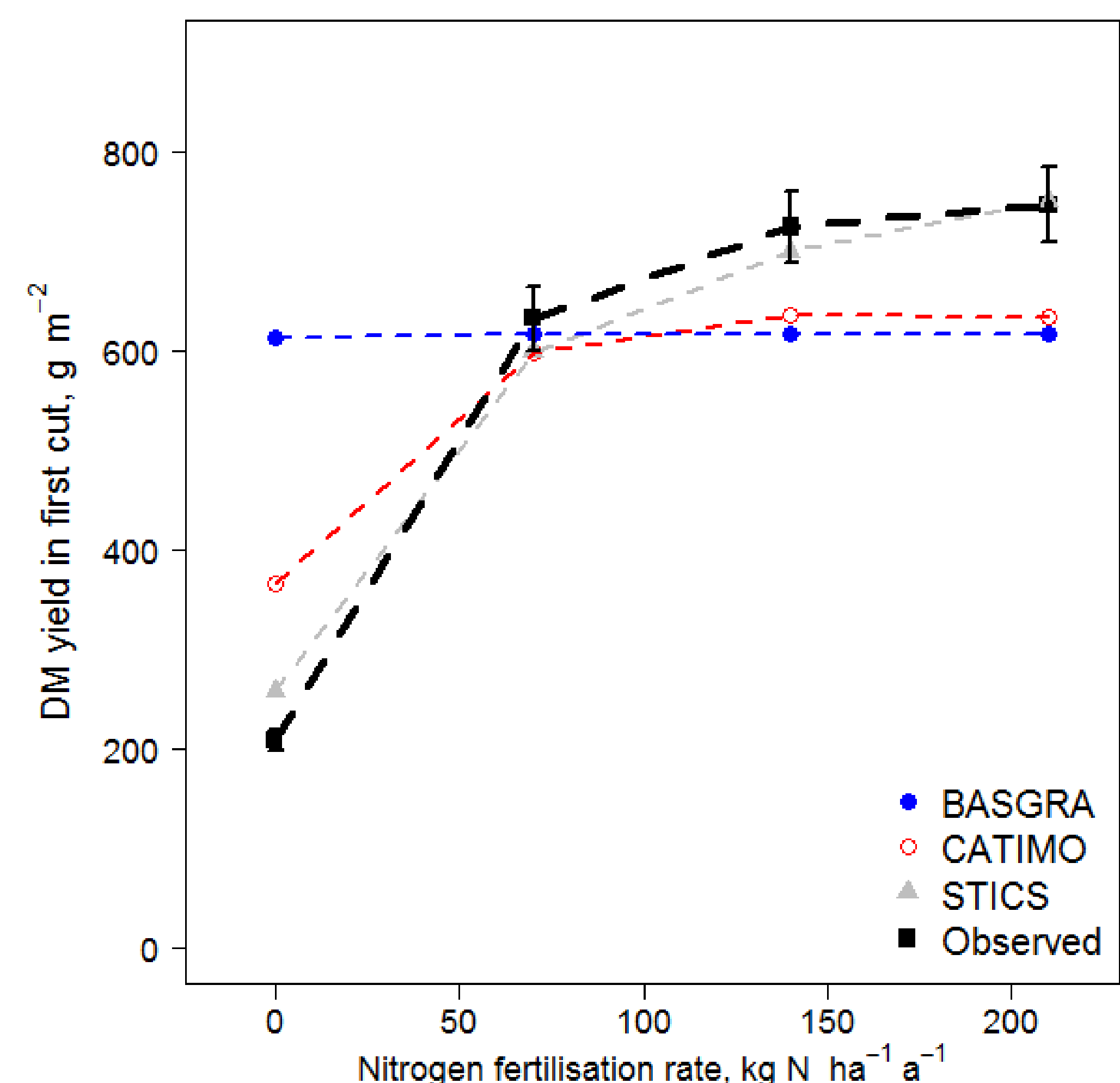


Figure 3. The first cut dry matter yield estimates of the models with varying nitrogen fertilisation rates at Fredericton (1993). Error bars represent one standard deviation.