

# Predicting grass growth: The MoSt GG model

Elodie Ruelle<sup>1</sup>, Luc Delaby<sup>2</sup> and Deirdre Hennessy<sup>1</sup>

<sup>1</sup>Teagasc, Animal & Grassland Research and Innovation Centre, Moorepark, Fermoy, Co. Cork;

<sup>2</sup>INRA, Physiologie, Environnement, Génétique pour l'Animal et les Systèmes d'Élevage, 35590 St. Gilles, France

## Summary

- The MoSt Grass Growth model was developed to predict grass growth, grass N content and N leaching at paddock and farm level.
- The MoSt GG model has been evaluated across several farms and years and shows good accuracy in grass growth prediction.
- A pilot program is being run across 40 farms with weekly grass growth prediction being sent to farmers each Tuesday.
- The MoSt GG model will soon be incorporated into PastureBase Ireland (PBI) giving each PBI user access to growth prediction specific to their farm.

## Introduction

PastureBase Ireland (PBI) is a grassland management tool for farmers which incorporates grassland management tools such as the spring and autumn planner, and the grass wedge. Currently within PBI, farmers can only make decisions based on historical information. Grass growth is highly seasonal and is dependent on climate conditions and soil type. The incorporation of a predictive grass growth model such as the MoSt GG Model into PBI would improve the decision making of the farmer by providing the farmer with a prediction of future growth at paddock and farm level.

## Model description and evaluation

The MoSt grass growth (GG) model was developed at Moorepark for Irish grazing systems and Irish meteorological conditions. The model predicts daily grass growth (kg DM/ha) depending on weather conditions and management. Farmer decisions which can impact on grass growth in the model are nitrogen (N) fertiliser application as well as pre and post grazing sward height, or pre and post cutting height.

The MoSt GG model was evaluated using experimental data for 2013–2018 from three Teagasc experimental farms - Ballyhaise, Clonakilty and Curtins. Corresponding weather data from a nearby weather station and information about N fertiliser application, grazing and cutting events, as well as biomass and growth (for each herbage mass estimation entered by the farm manager) were imported from PBI. The results of the evaluation of the model are presented at the farm level (Table 1). Overall the model showed a similar accuracy across farms. The model is acceptably accurate at the farm level but somewhat less accurate at the individual paddock level.

**Table 1. Comparison of grass growth (kg DM/ha per day) simulated by the MoSt GG Model and that recorded in PBI for three Teagasc farms at the paddock level**

Farm	Ballyhaise			Curtins			Clonakilty		
	PBI	MoSt	RMSE	PBI	MoSt	RMSE	PBI	MoSt	RMSE
2013	50.7	49.0	12.7	46.6	46.9	16.8	45.5	45.3	15.4
2014	60.0	52.9	17.2	57.0	56.6	15.3	47.4	45.2	14.8
2015	46.6	48.6	11.5	53.5	51.9	13.6	53.6	51.2	13.2
2016	47.9	48.2	15.3	52.1	48.6	15.7	49.6	48.5	17.9
2017	49.7	47.7	14.2	NA	NA	NA	49.6	51.7	14.3
2018	44.1	45.0	17.2	37.3	36.1	16.3	NA	NA	NA
All years	49.7	48.4	6.9	45.8	44.6	9.4	49.1	48.4	7.6

### Pilot program

In 2018, the model was live tested on three farms, two Teagasc farms (Curtins, Co. Cork and Ballyhaise, Co. Cavan) and one commercial farm in Mitchelstown (Co. Cork). The weather forecast for each location was provided by Met Éireann. The other inputs (N fertiliser application, grazing and cutting events) were extracted weekly from PBI for each farm. The model adapted to the different growth patterns on the farms, as well to the extreme conditions of 2018 with a very wet and cold spring and a very dry summer. The feedback from the farm managers was very positive, and the farmers considered the predictions to be very useful aids to decision making in challenging times.

Since January 2019, the model is being used to predict grass growth on 40 farms across Ireland. The farms are representative of a large range in soil type and geographic locations. Historical and forecast weather data are provided for each individual farm by Met Éireann. Information about N fertiliser and grazing and cutting events are imported from PBI weekly. The weekly grass growth prediction is communicated to farmers involved in the study in the form of a map.

### Conclusions

The initial on-farm testing (2018) of the MoSt GG model indicates that the model is capable of adapting to differences on farms and in weather conditions. The on-going pilot study will provide a true indication of the MoSt GG model's ability to provide useful grass growth prediction across soil types, regions and management conditions. If the pilot study is successful, and the accuracy of the model is sufficient across the different farms, the model will be incorporated into PBI.