EAAP 2013
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EVALUATION OF THE GrazeIn MODEL OF GRASS DRY MATTER INTAKE AND MILK YIELD PREDICTION IN NW SPAIN

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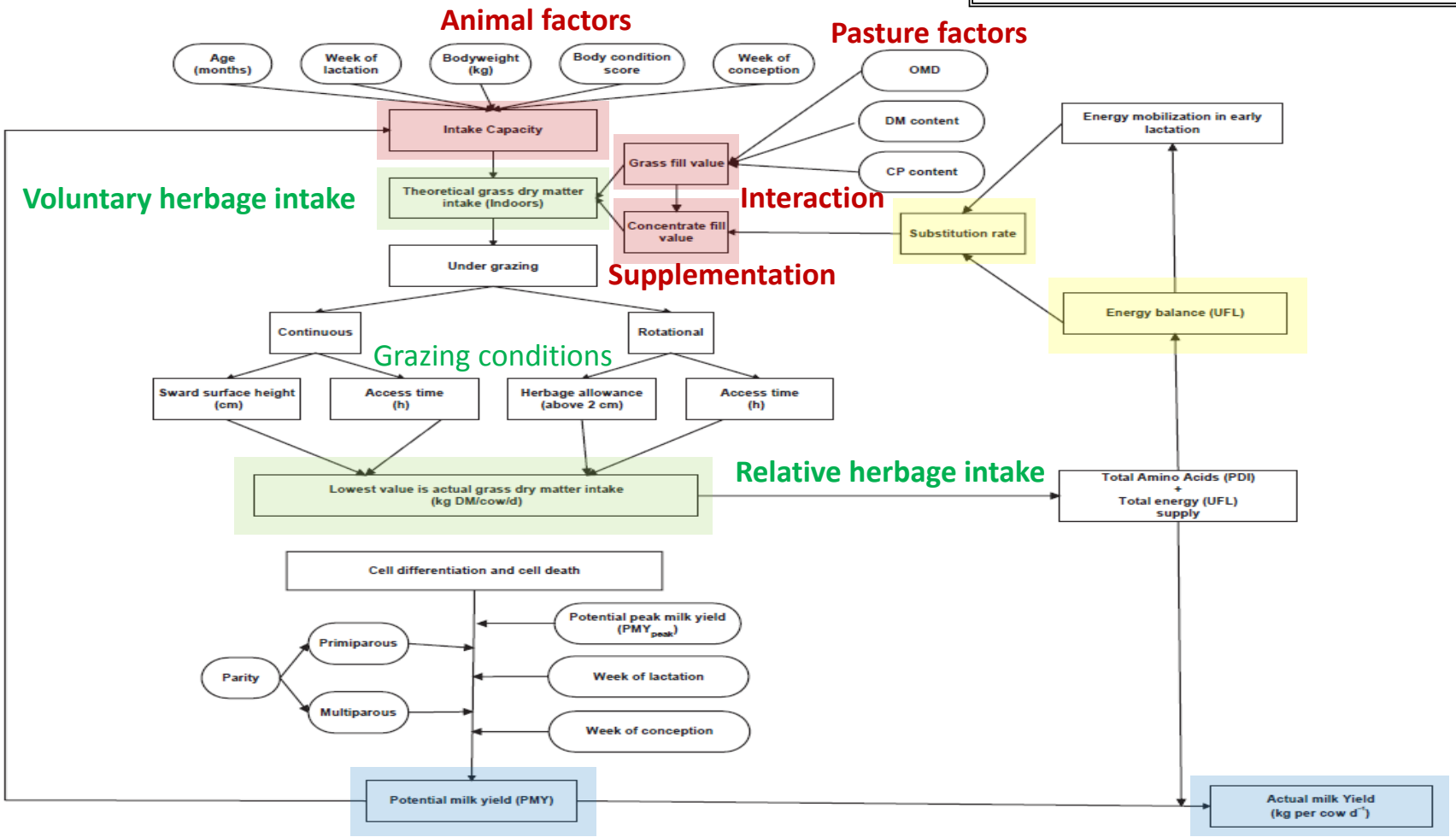
I. BACKGROUND

Feeding of grazing ruminants is **difficult to manage** due to farmers' inability to accurately **estimate nutrient intake** from grazed pastures.

GrazeIn is a **prediction model** that **simulates** herbage dry matter intake (**HDMI**) and milk yield (**MY**) of grazing dairy cows (Faverdin *et al.*, 2011; Delagarde *et al.*, 2011a, b) as part of the Grazemore tool (Mayne *et al.*, 2004).

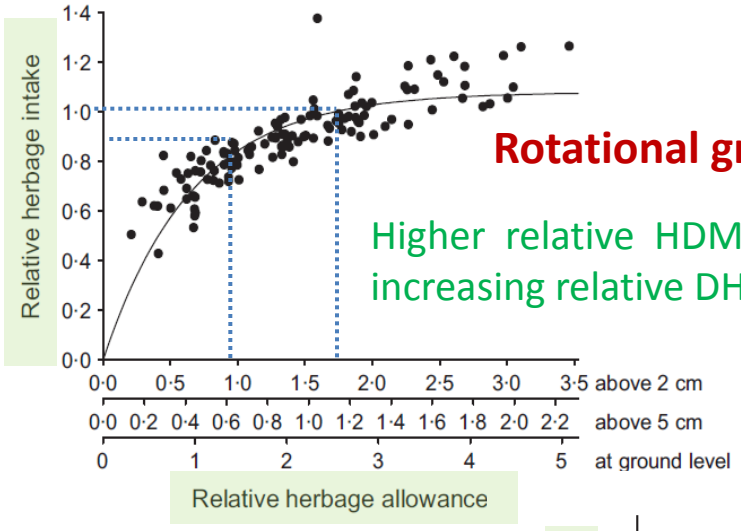
II. INTRODUCTION

STRUCTURE OF GrazeIn MODEL (O'Neill *et al.*, 2013a)



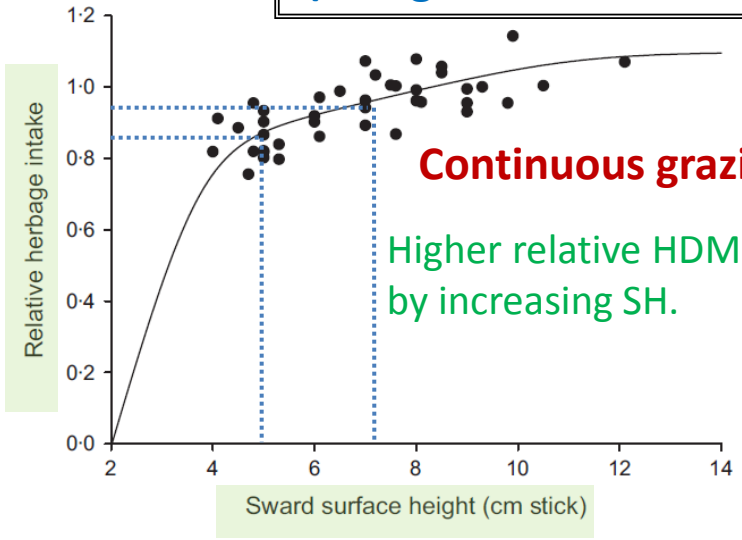
II. INTRODUCTION

FACTORS LIMITING HDMI (Delagarde *et al.*, 2011a)



Rotational grazing

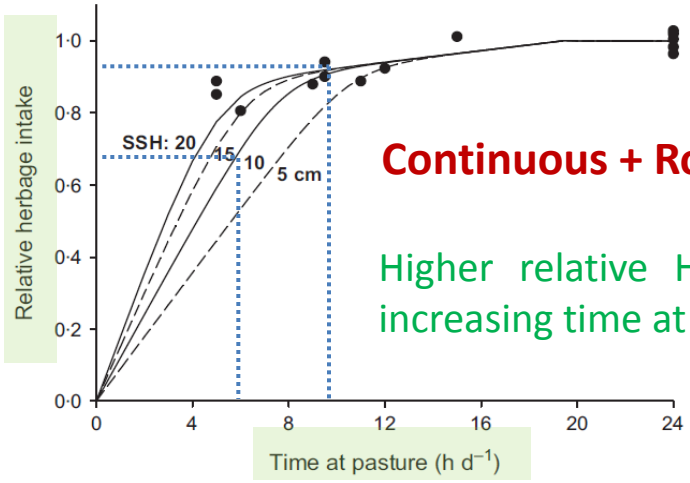
Higher relative HDMI is got by increasing relative DHA.



Continuous grazing

Higher relative HDMI is got by increasing SH.

Relative herbage intake (% indoors voluntary herbage DM intake)



Continuous + Rotational grazing

Higher relative HDMI is got by increasing time at pasture.

III. OBJECTIVES

To **evaluate the GrazeIn model** using a database of sward measurements and milk samples taken from a **grazing trial** using **4 dairy herds** (n=72) managed at **two lactation stages** (LS) and **two levels of daily herbage allowance** (DHA).

This dataset was used to assess the **accuracy of GrazeIn model** for **HDMI at the herd level** and **MY at a cow level**.

The **predictions were compared** with **actual HDMI**, estimated using sward height (SH), and **actual measured MY**.

IV. MATERIAL AND METHODS

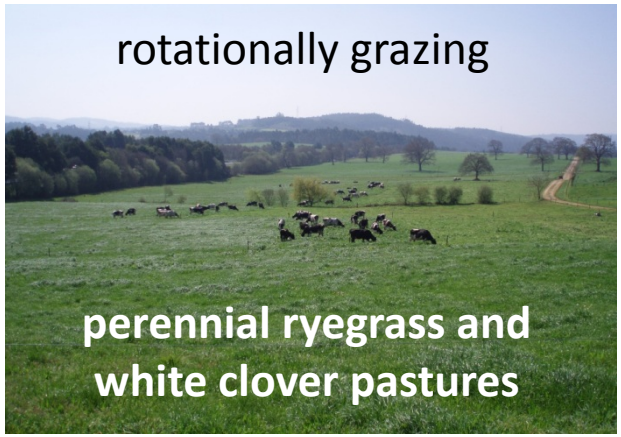
GRAZING TRIAL

LOCATION

CIAM dairy farm
(43º12'24''N; 8º18'36''W)

ANIMALS & PASTURES

Holstein-Friesian cows (n=72)



EXPERIMENTAL DESIGN

A **randomized block design** was established by applying **a 2×2 factorial** arrangement of **four treatments** (**EM**, **EH**, **LM** and **LH**):

two lactation stages and **two levels of daily herbage allowance**

(LS, days in milk) → (**E**, 29) vs. (**L**, 167)

(DHA, kg DM/cow/day) → (**M**, 25) vs. (**H**, 30)

SWARD & ANIMAL MEASUREMENTS

Sward variables:

Pre- and post-grazing SH, grazing management (HM and DHA) and herbage quality (CP and OMD).

Supplementation levels at pasture:

Concentrate and Silage.

Animal variables:

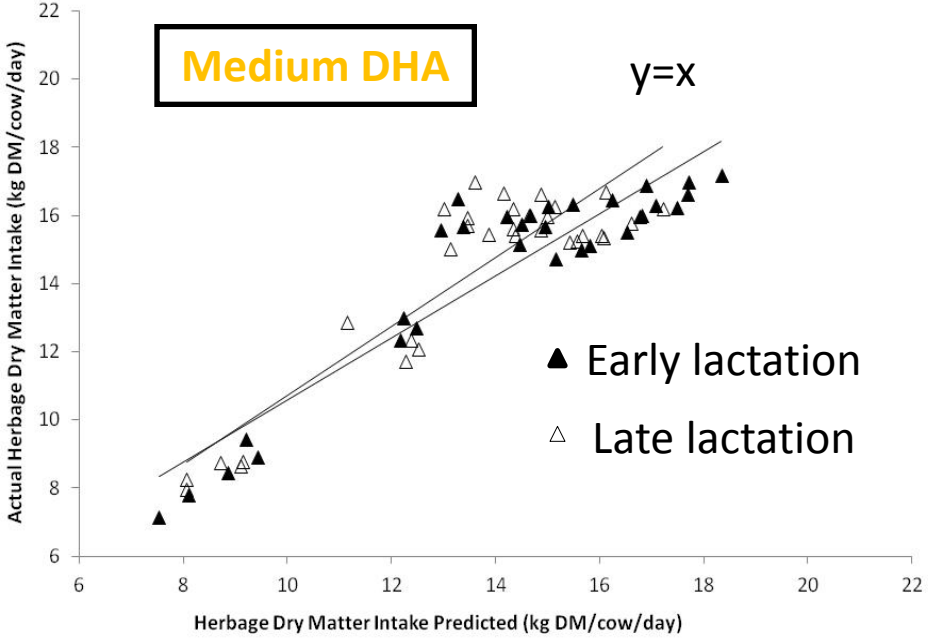
Parity, peak MY, DIM, gestation, BW and BCS.

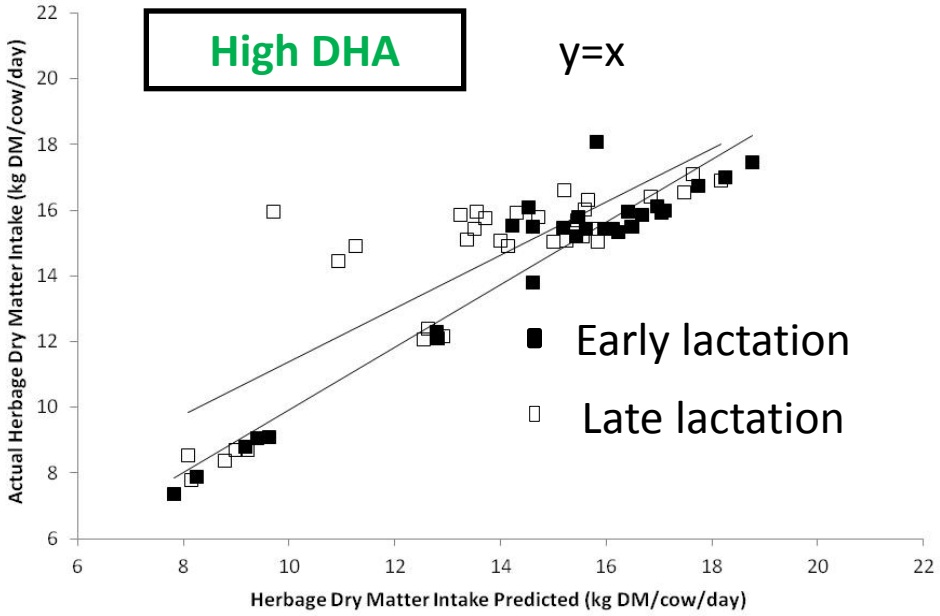
V. RESULTS HDMI

EXTERNAL VALIDATION OF GrazeIn MODEL (HERBAGE DRY MATTER INTAKE)

n=125 sward measurements (grazing rot x trait x paddocks)

Relations between actual-predicted HDMI in cows managed at two LS and two levels of DHA





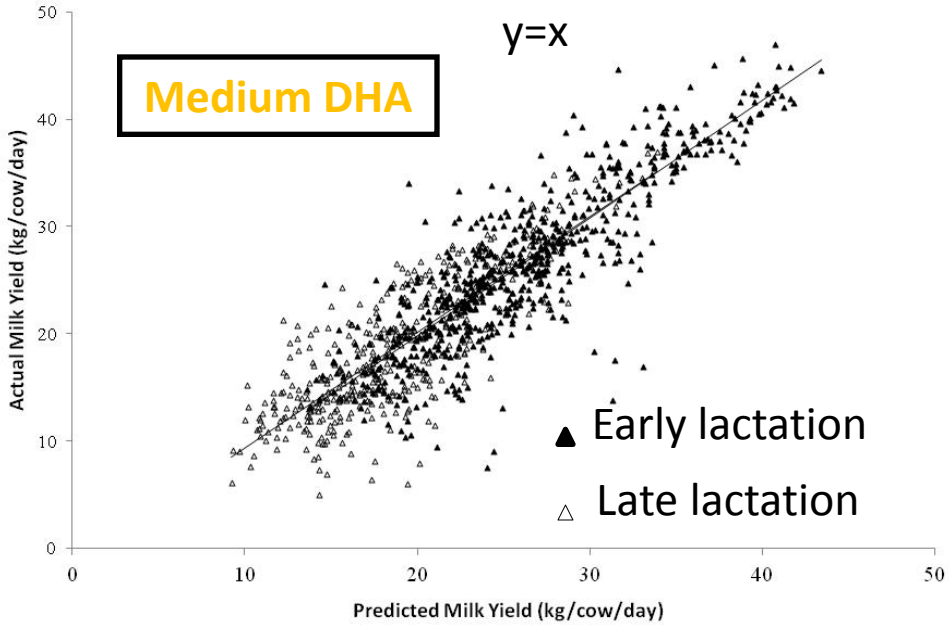
Mean actual HDMI: 14.2 kg DM/cow/day *vs.* **predicted GrazeIn HDMI: 13.8 kg DM/cow/day.**
Mean bias: –0.4 kg DM/cow/day.
Mean RPE: 12% at the herd level.

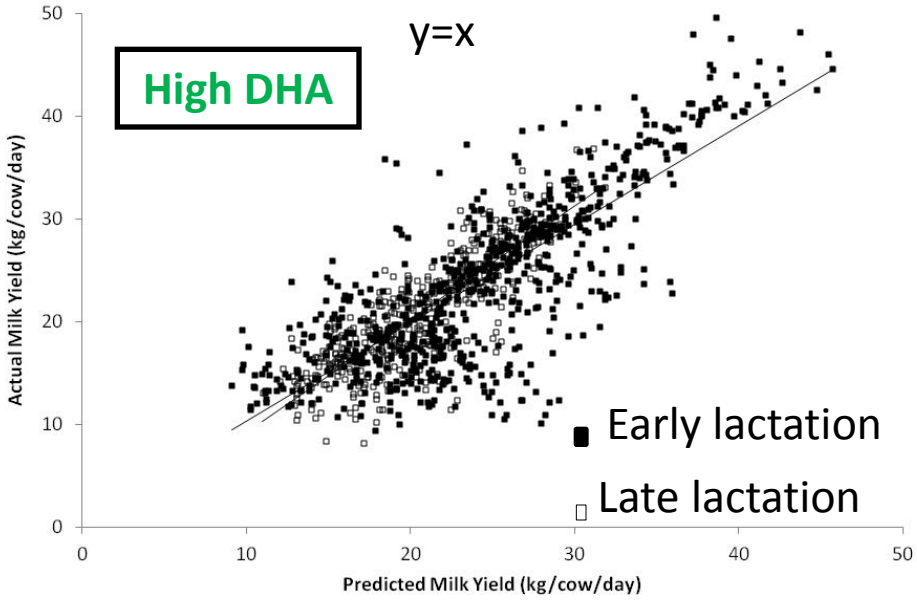
V. RESULTS MY

EXTERNAL VALIDATION OF GrazeIn MODEL (MILK YIELD)

n=528 weekly milk data taken from n=72 Holstein-Friesian cows

Relations between actual-predicted MY in cows managed at two LS and two levels of DHA





Mean actual MY: 23.2 kg/cow/day *vs.* **predicted GrazeIn MY: 21.8 kg/cow/day**.
Mean bias: –1.4 kg/cow/day.
Mean RPE: 23.0% at a cow level, higher **in late** (26%) than **in early** (19%) **lactation cows**.

VI. DISCUSSION HDMI & MY

EXTERNAL VALIDATION OF GrazeIn MODEL (HDMI & MILK YIELD)

COMPARISON BETWEEN RELATIVE PREDICTION ERRORS

Variable	Level	Roca *et al.* (2013)	Delagarde *et al.* (2011b)	O'Neill *et al.* (2013a, b)
HDMI	Herd	12%	16%	12%
	Cow	-----	-----	15%
MY	Herd	-----	14%	13%
	Cow	23%	-----	17%

Higher RPE is observed **at a cow level** than **at the herd level** for both **HDMI** and **MY**.

Our results are line with those presented by other authors.

VII. CONCLUSIONS

The **GrazeIn model predicted HDMI** (12% at the herd level) and **MY** (23% at a cow level) of grazing dairy cows with a **suitable level of accuracy** that would allow it to be used in temperate pasture-based milk production systems.

Average responses of **HDMI** and **MY** to **DHA** and **lactation stage** are **close to the mean reported in the literature**.

GrazeIn predicted MY of cows in late lactation (26%) **with a larger error than in early lactation** (19%). These **errors could be reduced** by adapting the persistency of the potential MY lactation curve for cows.

VIII. ACKNOWLEDGMENTS

THANK YOU VERY MUCH FOR YOUR ATTENTION: QUESTIONS??????

RESEARCH INSTITUTIONS

- INRA St-Gilles, UMR1348 (Rennes, France)
- CIAM (La Coruña, Spain)
- USC (Lugo, Spain)
- INIA (Madrid, Spain)
- Fundación Juana de Vega (La Coruña, Spain)

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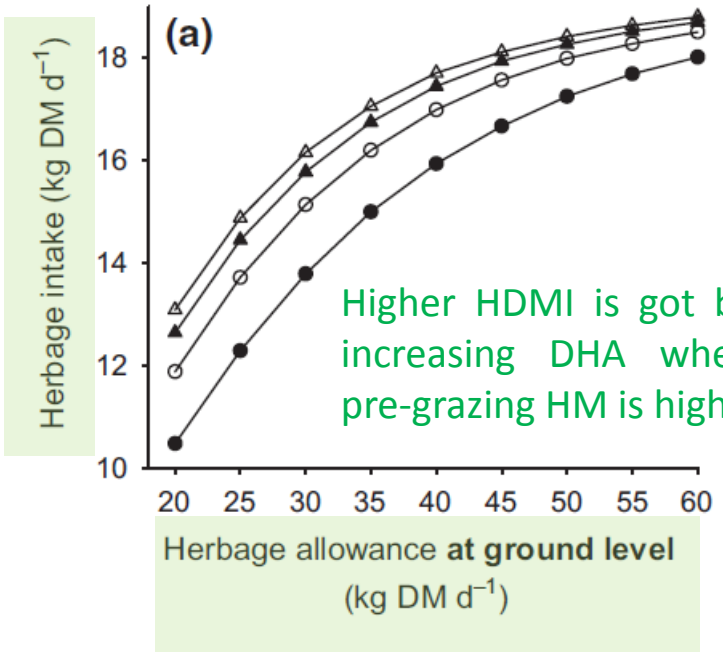
II. INTRODUCTION

INTERNAL VALIDATION OF GrazeIn MODEL (Delagarde *et al.*, 2011b)

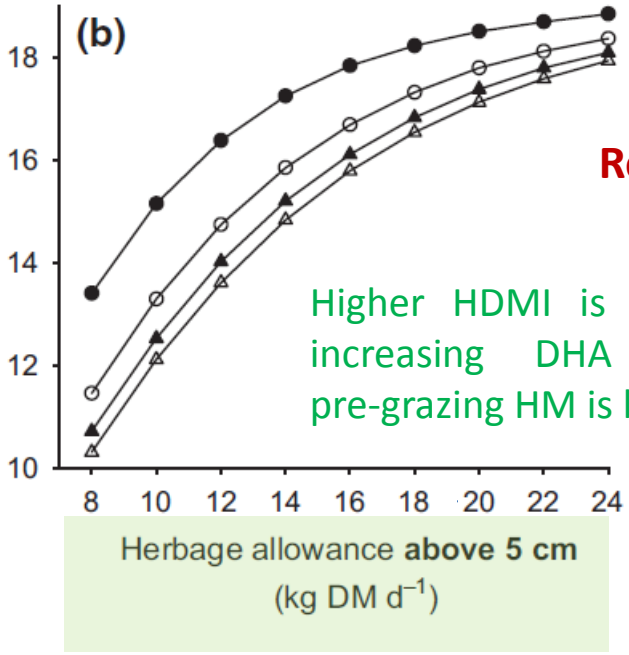
Simulated effect of DHA on HDMI according to 4 levels of pre-grazing HM

3 (•), 4 (o), 5 (▲) and 6 (△) t DM/ha at ground level

1 (•), 2 (o), 3 (▲) and 4 (△) t DM/ha above 5 cm



Higher HDMI is got by increasing DHA when pre-grazing HM is high.



Higher HDMI is got by increasing DHA when pre-grazing HM is low.

Rotational grazing

II. INTRODUCTION

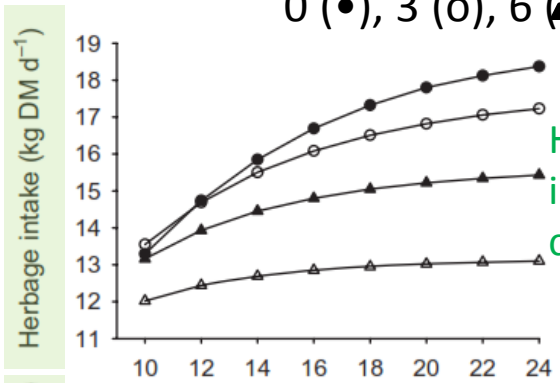
INTERNAL VALIDATION OF GrazeIn MODEL (Delagarde *et al.*, 2011b)

Simulated effect of concentrate supplementation level on HDMI, MY, SRt and MR according to DHA

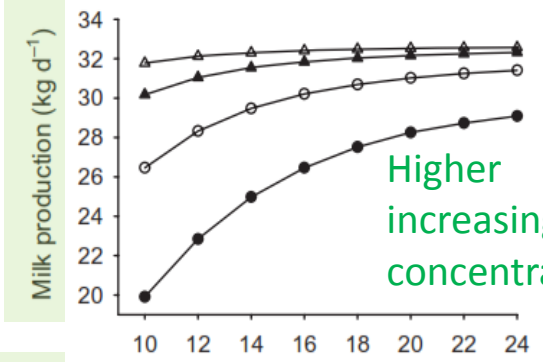
4 levels of concentrate

0 (•), 3 (o), 6 (▲) and 9 (△) kg DM/cow/day

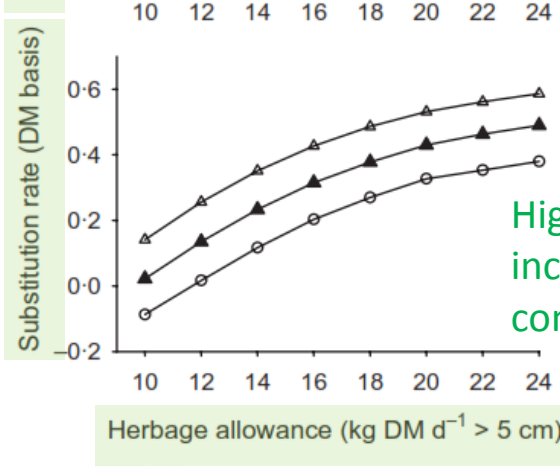
Rotational grazing



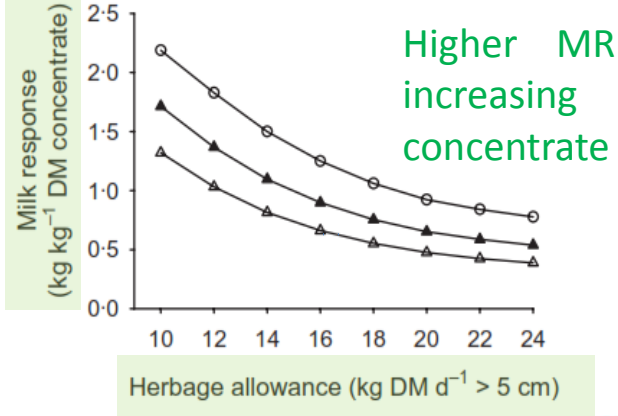
Higher HDMI is got by increasing DHA when concentrate level is low.



Higher MY is got by increasing DHA when concentrate level is high.



Higher SRt is got by increasing DHA when concentrate level is high.



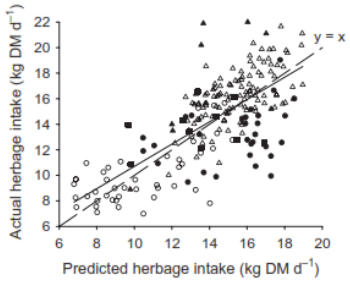
Higher MR is got by increasing DHA when concentrate level is high.

VI. DISCUSSION

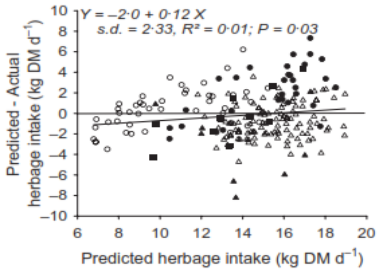
EXTERNAL VALIDATION OF GrazeIn MODEL (Delagarde *et al.*, 2011b)

n=206 grazing dairy herds from 5 research centers

Relations between actual-predicted HDMI

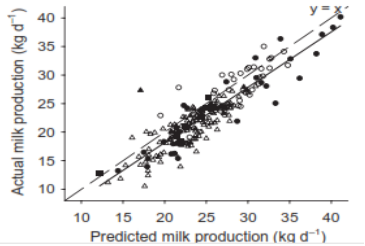


Relations between bias GDMI-predicted HDMI

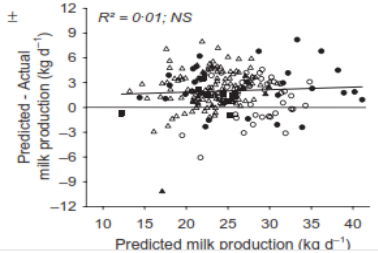


Mean actual HDMI: 14.4 kg DM/cow/day *vs.* **predicted GrazeIn HDMI: 14.2 kg DM/cow/day.**
Mean bias: –0.2 kg DM/cow/day. Mean RPE: 16.0% at the herd level.

Relations between actual-predicted MY



Relations between bias MY-predicted MY



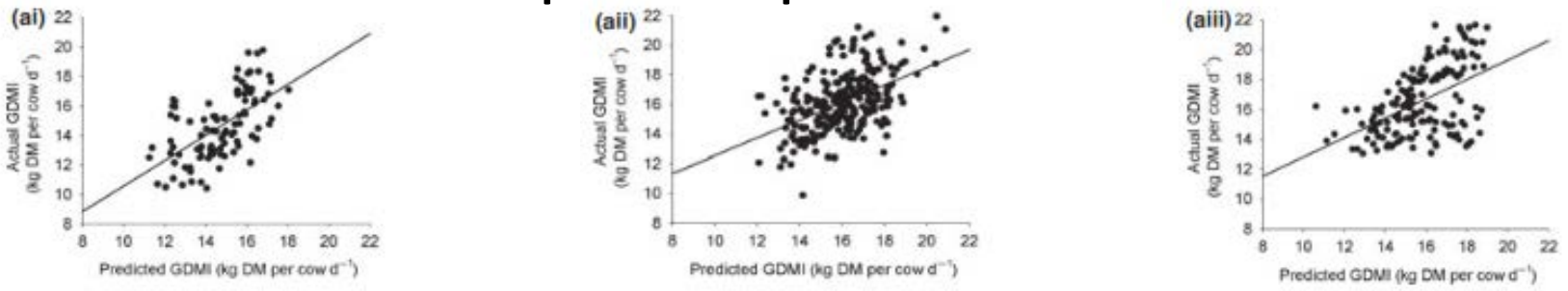
Mean actual MY: 22.7 kg/cow/day *vs.* **predicted GrazeIn MY: 24.7 kg/cow/day.**
Mean bias: +2.0 kg/cow/day. Mean RPE: 14% at the herd level.

VI. DISCUSSION

EXTERNAL VALIDATION OF GrazeIn MODEL (O'Neill *et al.*, 2012a)

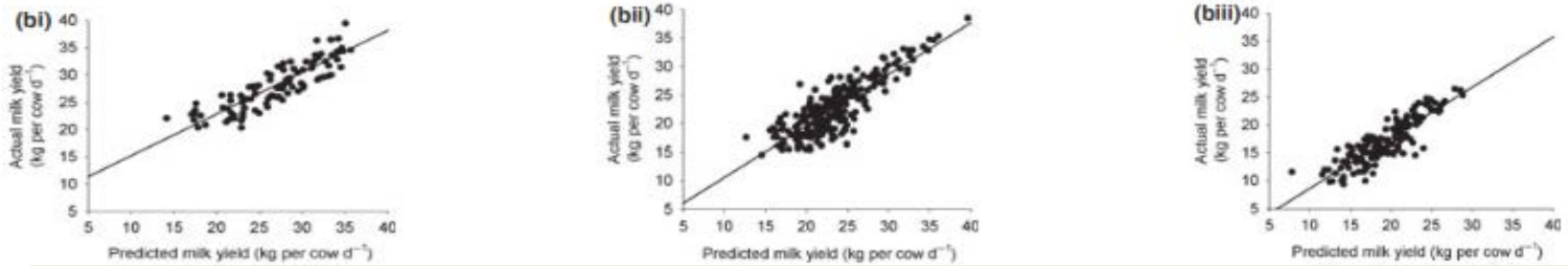
Grazing herds examined: (i) 98 in spring, (ii) 256 summer and (iii) 156 autumn

Relationship between predicted and actual HDMI



Mean actual HDMI: 16.0 kg DM/cow/day *vs.* **predicted GrazeIn HDMI: 15.7 kg DM/cow/day**.
Mean bias: −0.3 kg DM/cow/day. **Mean RPE: 12% at the herd level**.

Relationship between predicted and actual MY



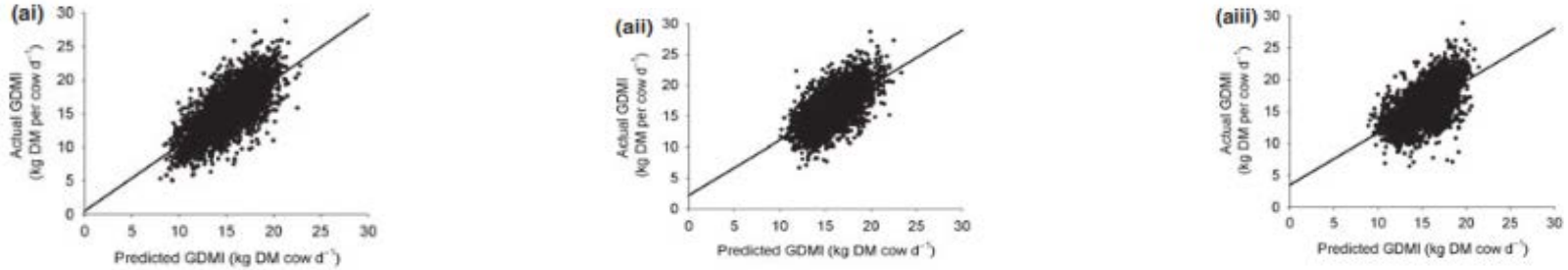
Mean actual MY: 21.9 kg/cow/day *vs.* **predicted GrazeIn MY: 22.8 kg/cow/day**.
Mean bias: +0.9 kg/cow/day. **Mean RPE: 13% at the herd level**.

VI. DISCUSSION

EXTERNAL VALIDATION OF GrazeIn MODEL (O'Neill *et al.*, 2012b)

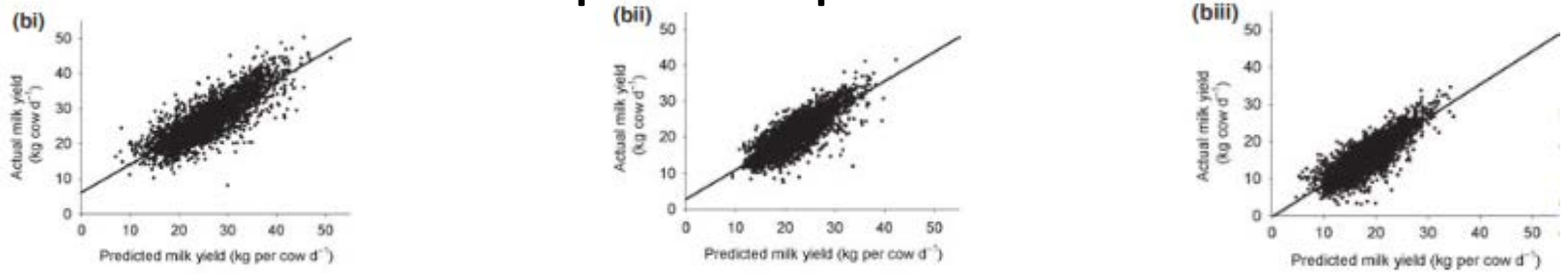
Grazing cows examined: (i) 2957 in early, (ii) 2826 middle and (iii) 3007 late lactation

Relationship between predicted and actual HDMI



Mean actual HDMI: 15.9 kg DM/cow/day *vs.* **predicted GrazeIn HDMI: 15.5 kg DM/cow/day.**
Mean bias: −0.4 kg DM/cow/day. Mean RPE: 15% at a cow level.

Relationship between predicted and actual MY



Mean actual MY: 21.3 kg/cow/day *vs.* **predicted GrazeIn MY: 22.2 kg/cow/day.**
Mean bias: +0.9 kg/cow/day. Mean RPE: 17% at a cow level.