

# Getting More from Forages



**Targeted plant modifications:  
Pasture forages**

**Incorporating and Managing  
Superior Forages in  
Grazing-Based Dairy Systems**

**Geoffrey Brink**

# A significant change in dairy farm management...





# Why adopt managed intensive rotational grazing?

## Tangibles:

- Reduced cost of infrastructure/equipment
- Accommodation for profitable smaller herds
- Reduced operating costs
- Improved herd health and cow longevity



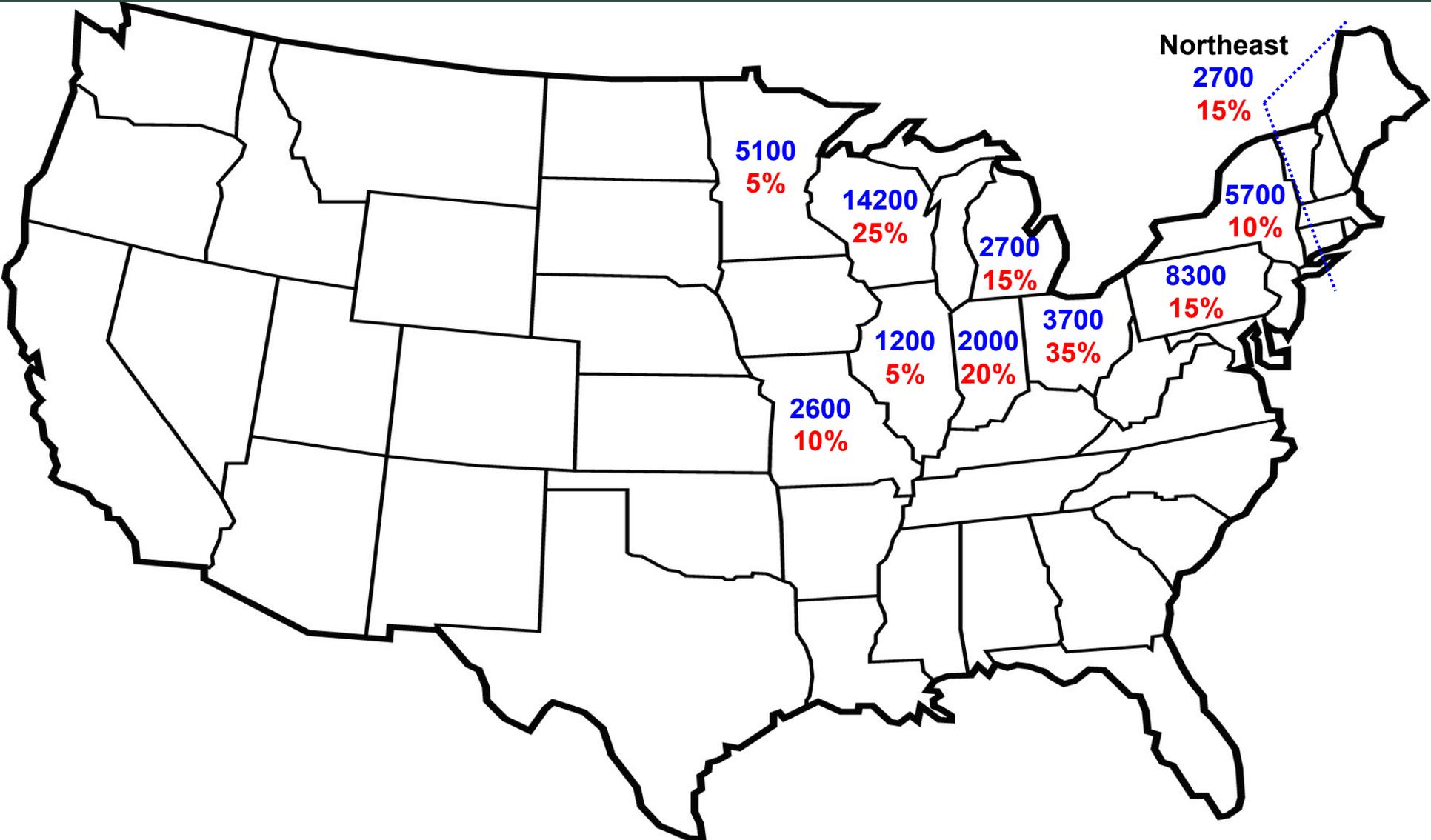
# Why adopt managed intensive rotational grazing?

## Intangibles:

- Perception of greater sustainability
- Perception of improved product quality
- Quality of life issues, personal values
- Improved herd health and cow longevity



# Total no. dairy farms (% grazing-based)

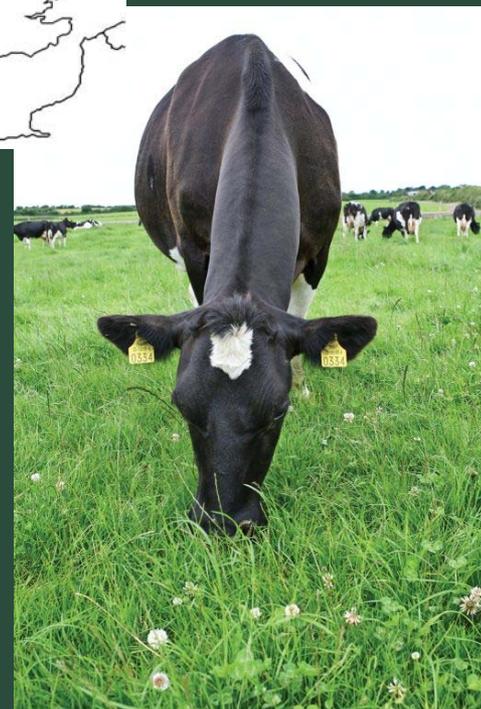


# Appropriate models for grazing-based dairies in the U.S.?

New Zealand



Great Britain







# Conserve forages for winter feeding...



...and provide additional DM when pastures are unproductive during grazing season.



# Utilize more winter-hardy temperate grasses

Increasing  
winterhardiness



Smooth bromegrass	( <i>Bromus inermis</i> Leyss.)
Reed canarygrass	( <i>Phalaris arundinacea</i> L.)
Meadow fescue	[ <i>Schedonorus pratensis</i> (Huds.) P. Beauv.]
Timothy	( <i>Phleum pretense</i> L.)
Quackgrass	[ <i>Elymus repens</i> (L.) Gould]
Tall fescue	[ <i>Schedonorus phoenix</i> (Scop.) Holub]
Orchardgrass	( <i>Dactylis glomerata</i> L.)

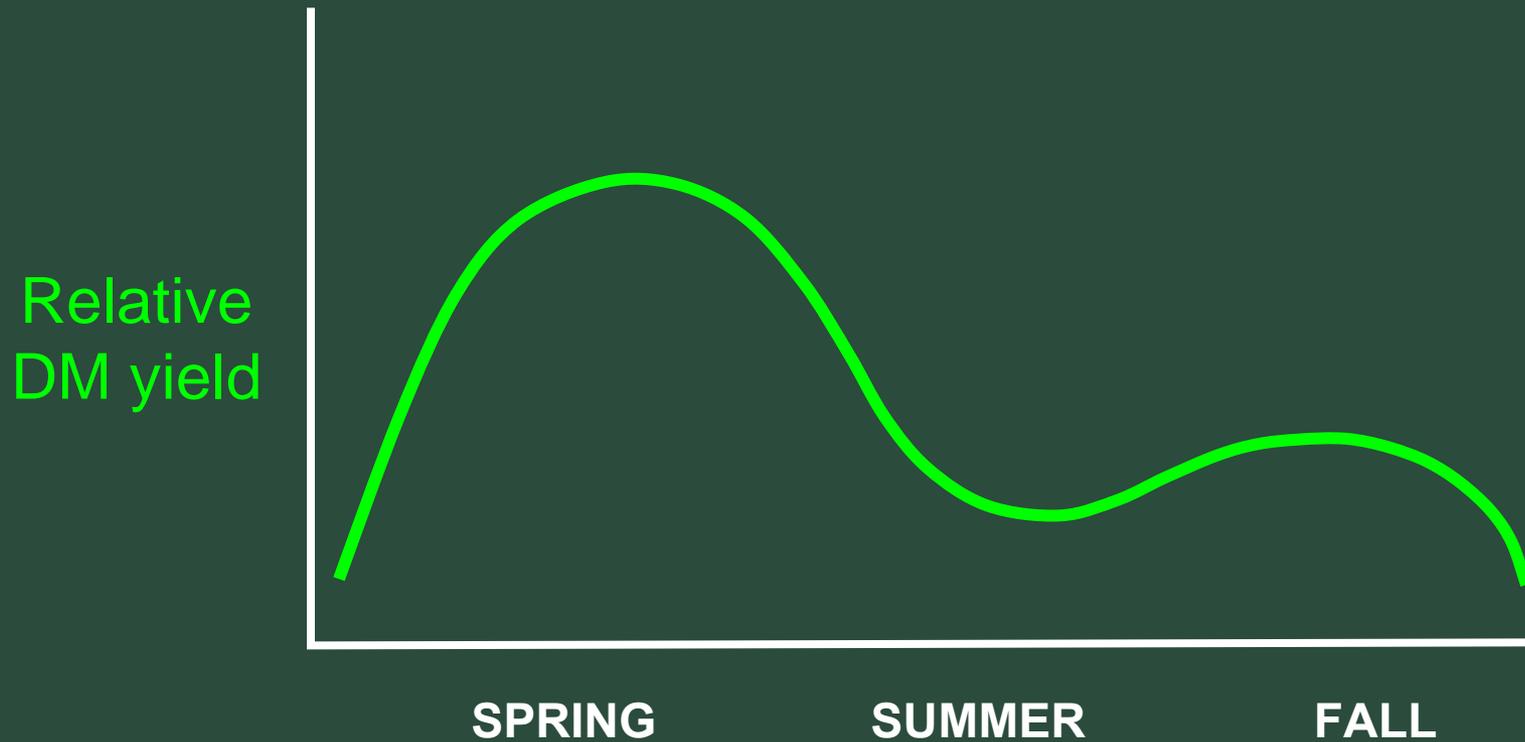




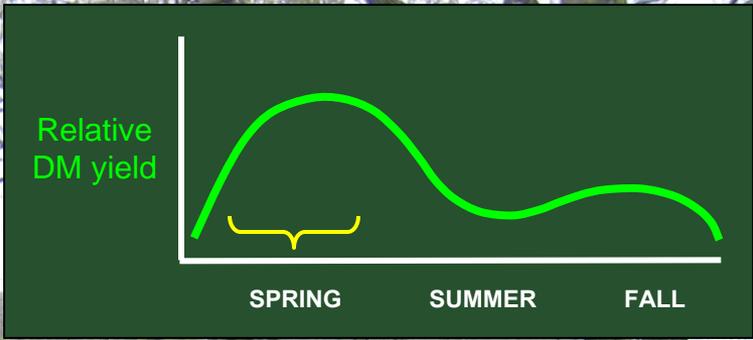
# Some potential limitations of temperate pasture:

1. Seasonal distribution of DM
2. Herbage nutritive value
3. Utilization

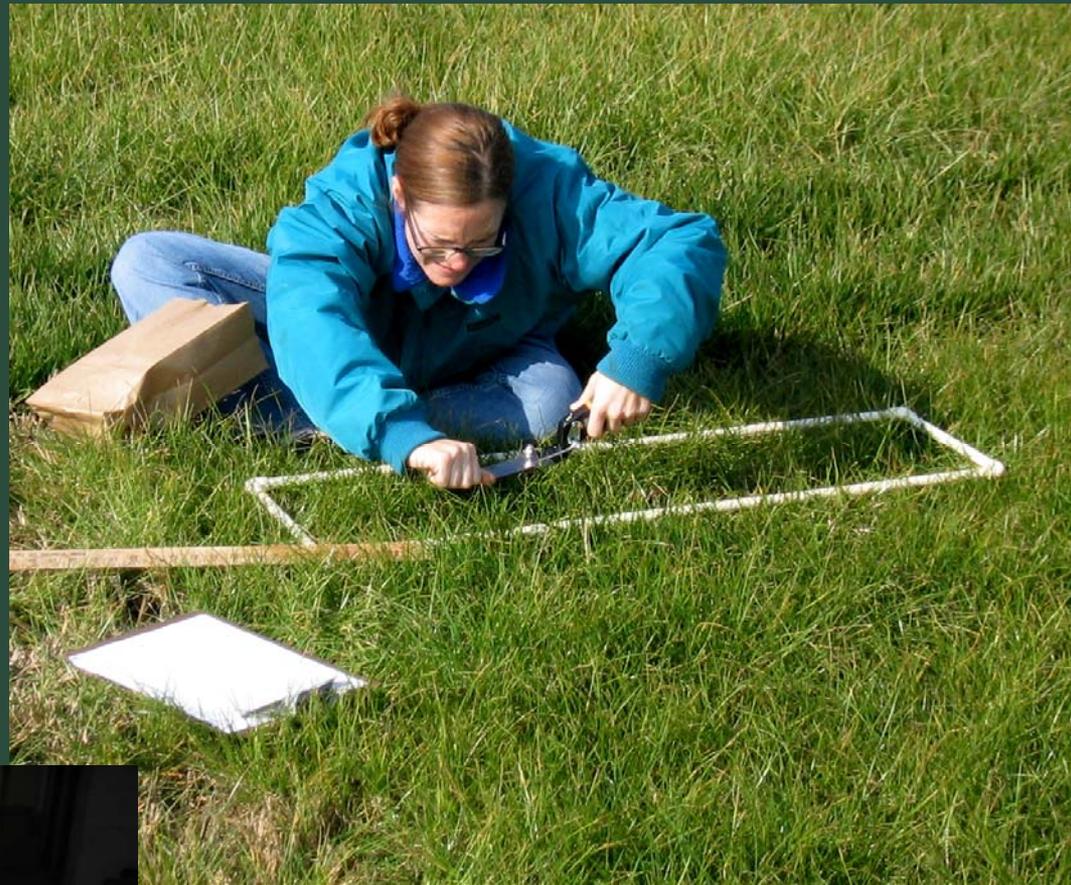
# Seasonal distribution of DM by temperate grasses



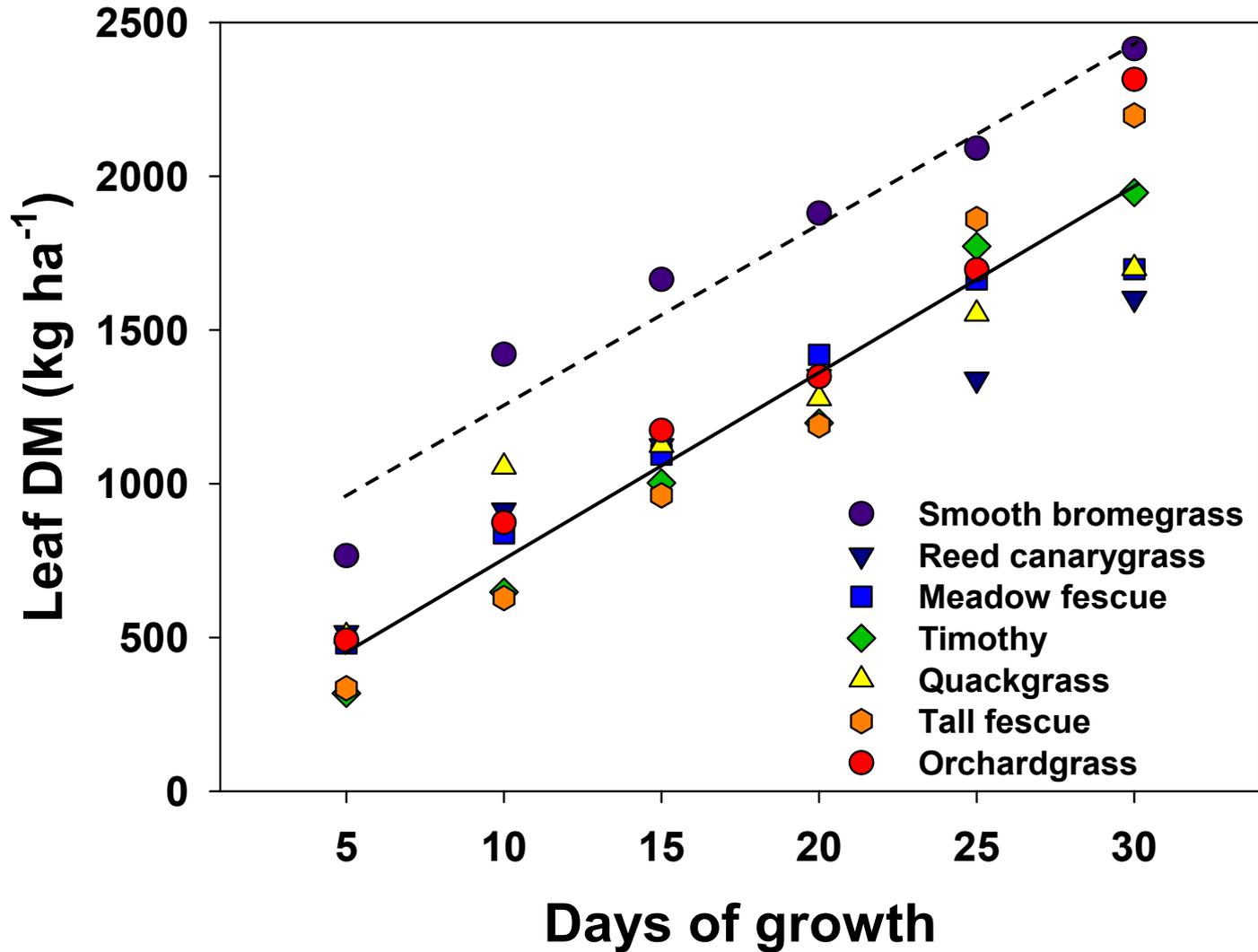




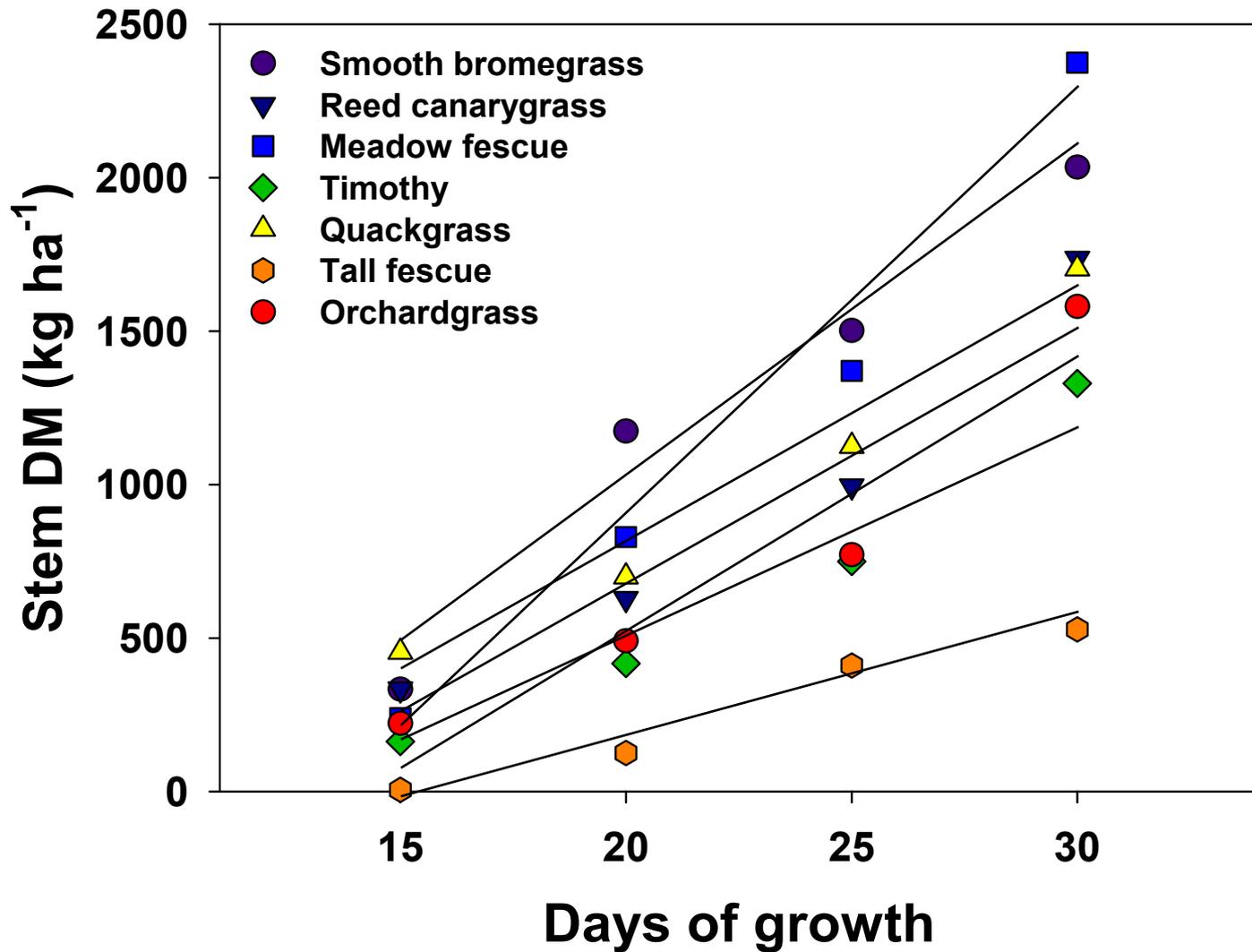
- ▶ Primary growth sampled at 5-d intervals in spring, summer, and fall in four environments.
- ▶ DM and nutritive value of leaf and stem fraction.



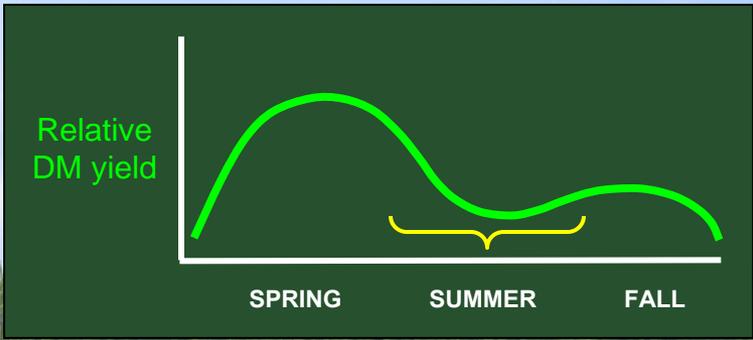
# Leaf accumulation during spring



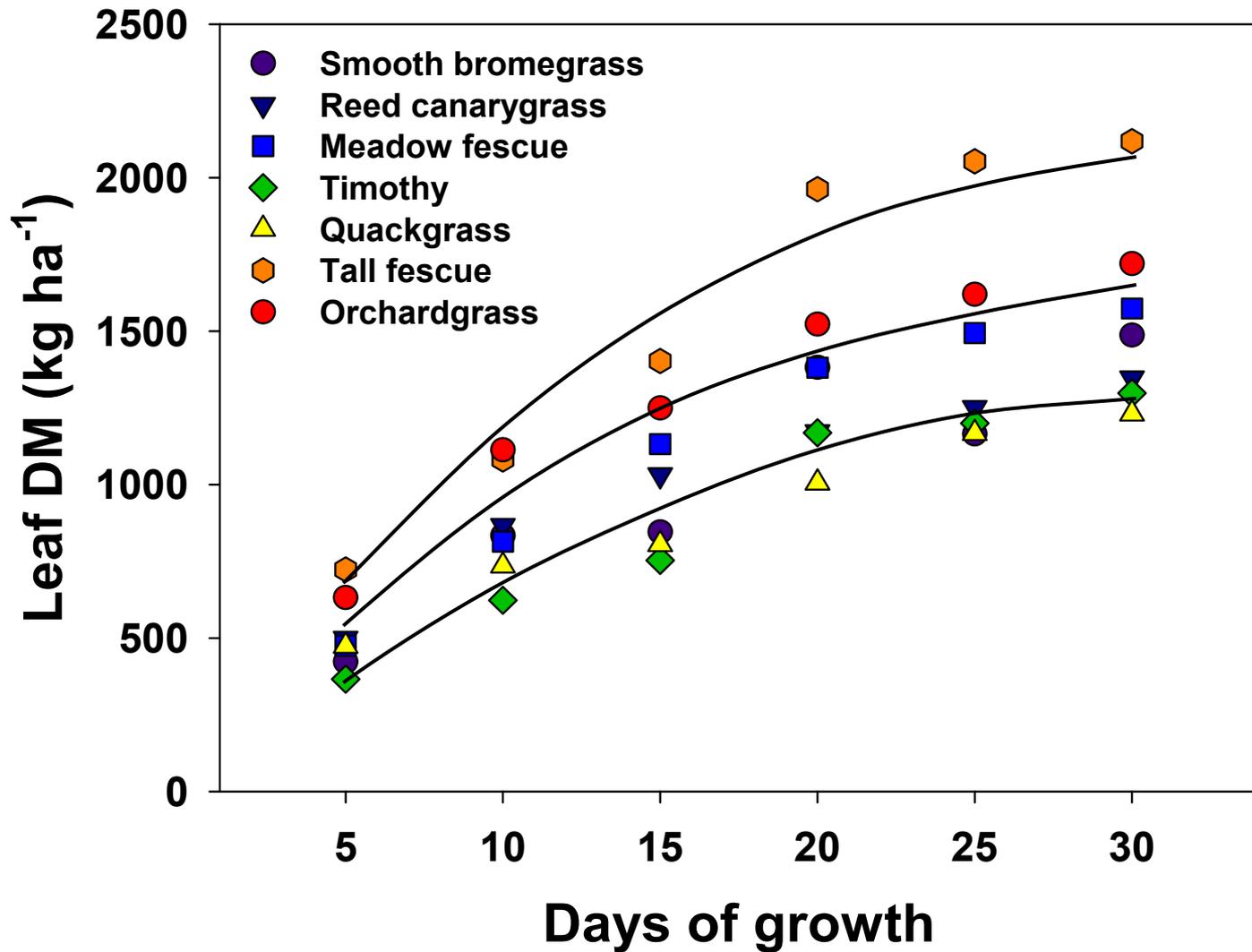
# Stem accumulation during spring







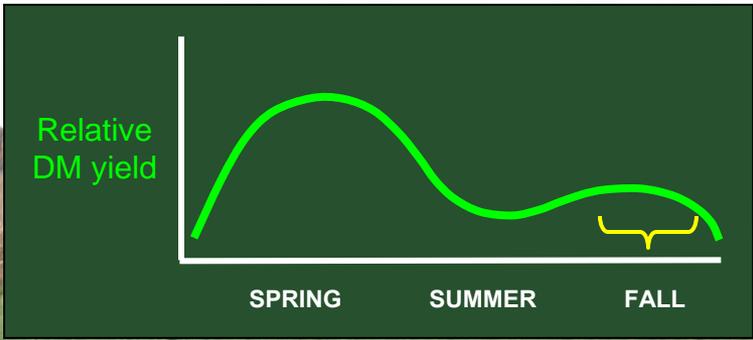
# Leaf accumulation during summer



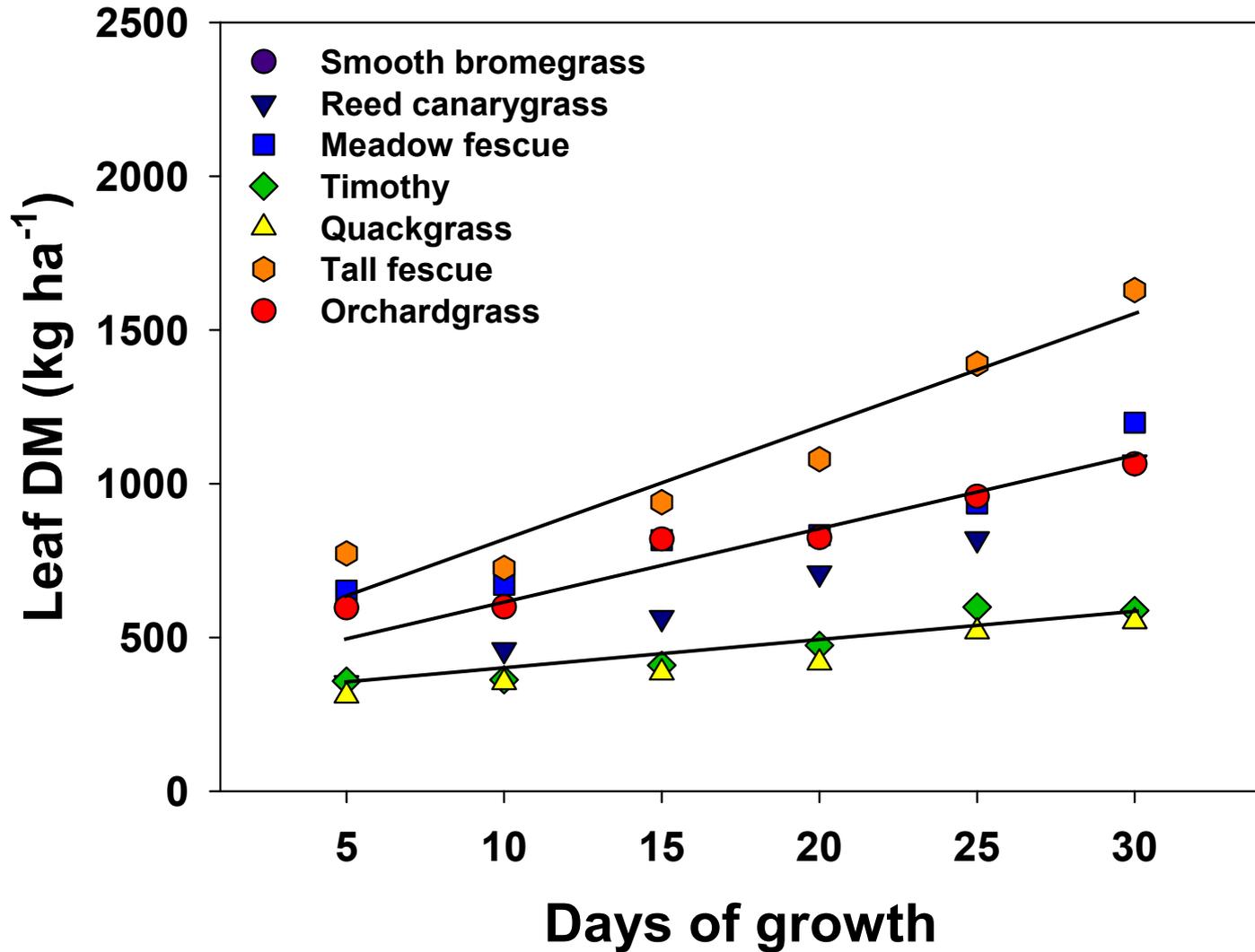








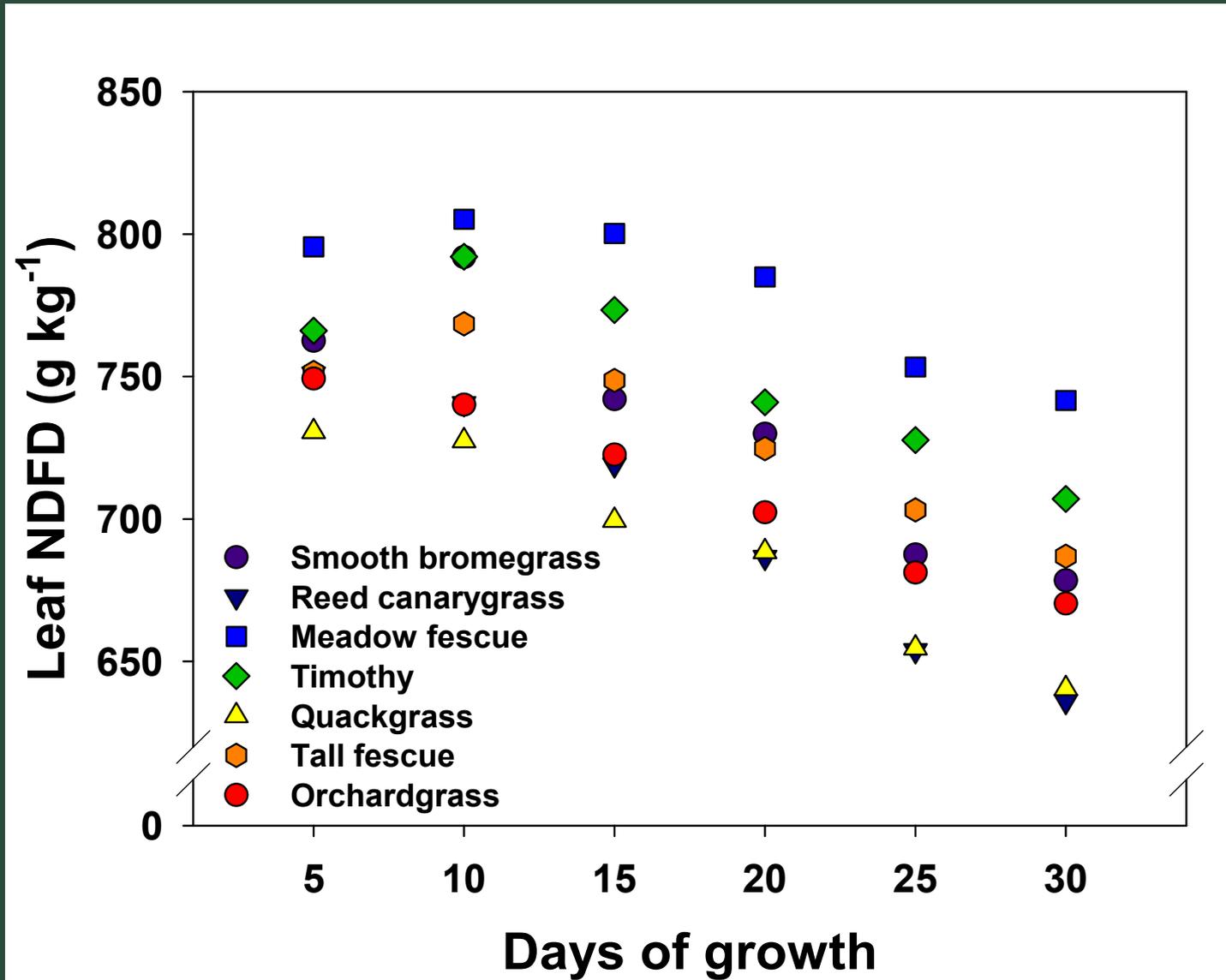
# Leaf accumulation during fall



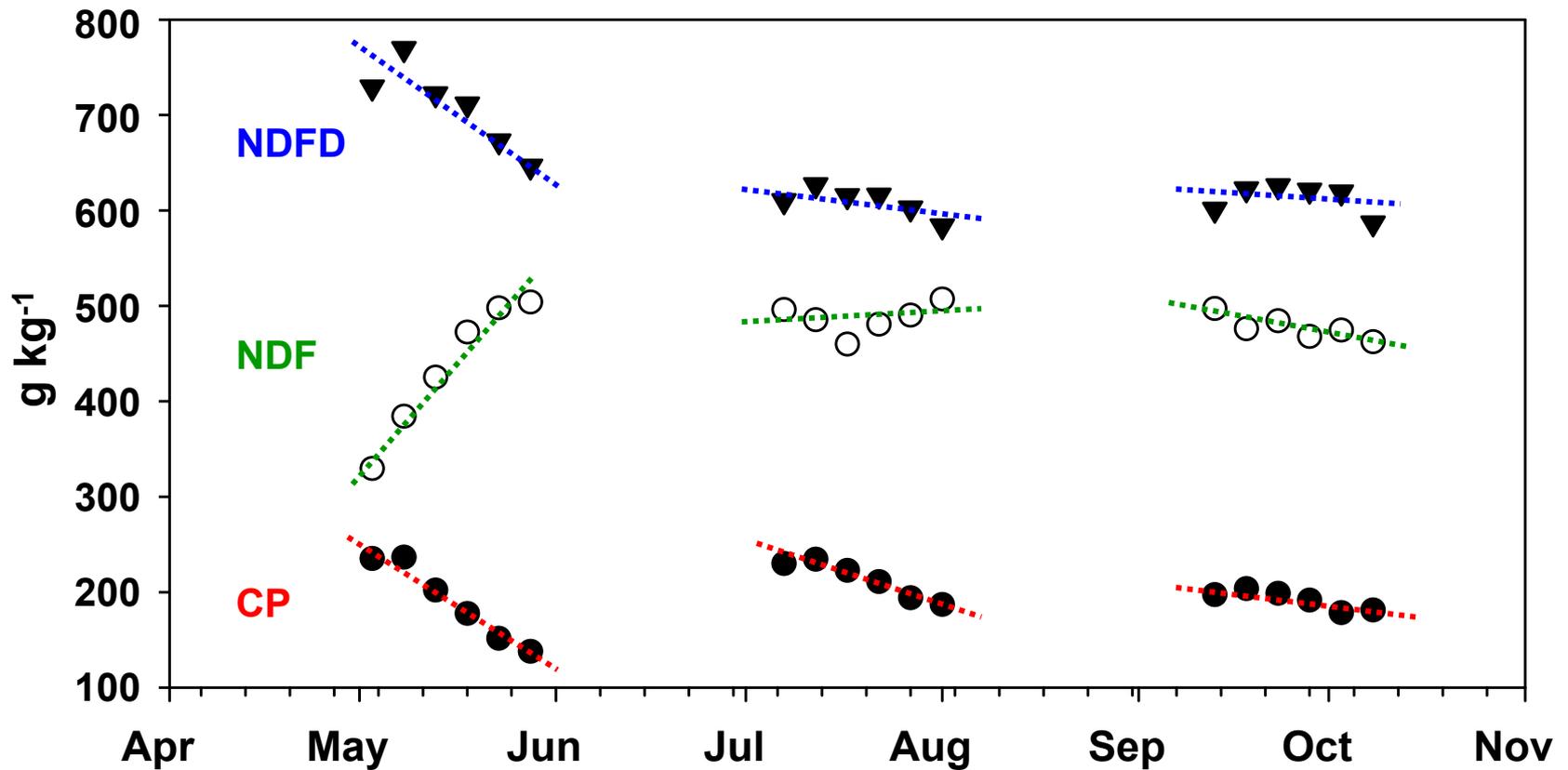
# Some potential limitations of temperate pasture:

1. Dry matter yield and seasonal distribution
2. Herbage nutritive value
3. Utilization

# Leaf NDFD (season mean)



# Change in forage nutritive value of temperate grasses



# Some potential limitations of temperate pasture:

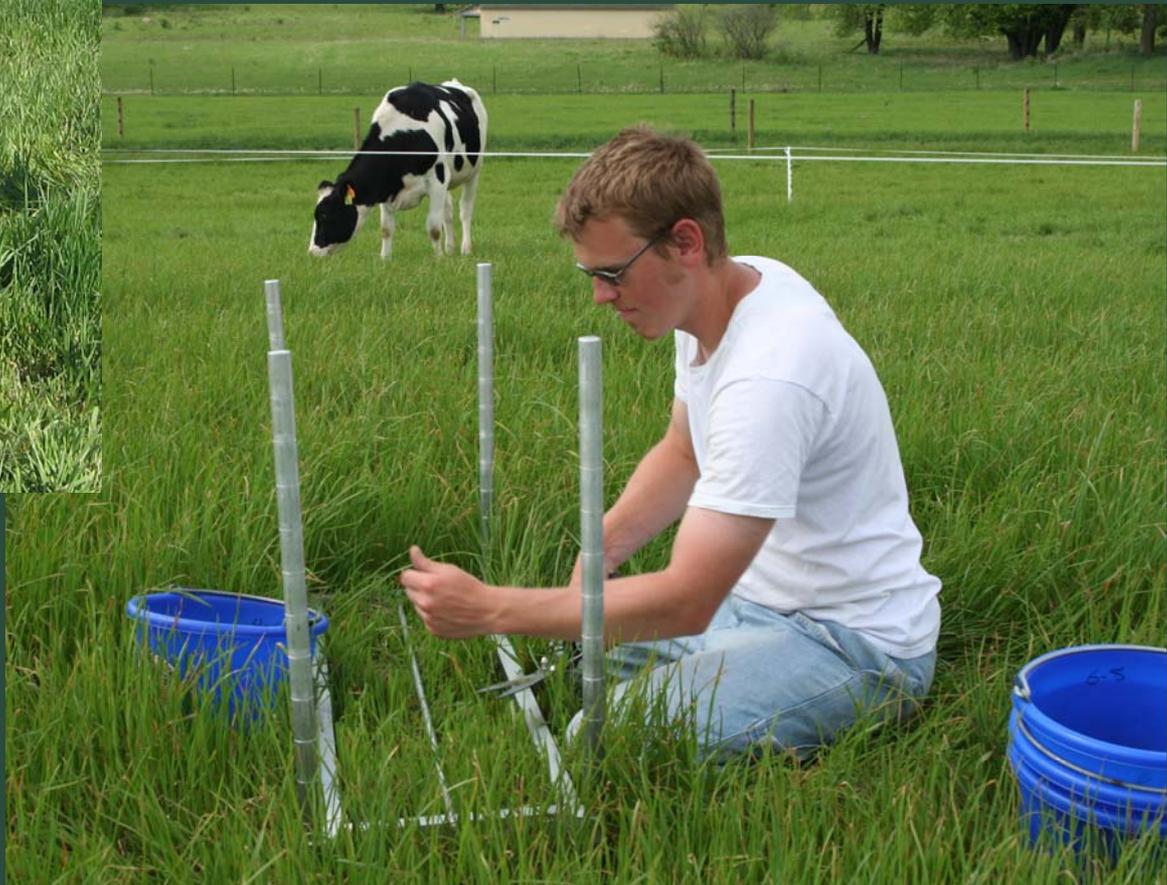
1. Dry matter yield and seasonal distribution
2. Herbage nutritive value
3. Utilization

## Factors affecting DM intake in (grazing) dairy cows:

- ▶ Variables most relevant for pasture DM intake were **pasture allowance**, total supplementation, interaction of pasture allowance and supplementation, fat-corrected milk, body weight, daily change in BW, percentage of legumes, and pasture NDF (*Vazquez and Smith, 2000; J. Dairy Sci. 83:2301–2309*).
- ▶ **NDF digestibility** of grass (timothy, wheat, sorghum) hay or silage was positively associated with DM intake and milk yield (*Oba and Allen, 1999; J. Dairy Sci. 82:589–596*).
- ▶ Sward **leaf yield and proportion** were major factors influencing intake by grazing animals (*Chacon and Stobbs, 1976; Aust. J. Agric. Res. 27:709-727*).

- ▶ **Meadow fescue, orchardgrass, quackgrass, and reed canarygrass monocultures (25-35 cm canopy height) in 0.40 ha paddocks.**
- ▶ **Following 7-d adjustment period, 5 sub-paddocks grazed for 24 h each in spring, summer, and fall for 2 yr.**
- ▶ **DM allowance  $\geq 3X$  expected intake (10-20 kg head<sup>-1</sup> d<sup>-1</sup>) of bred Holstein heifers (mean BW = 465 kg).**











Estimated DM intake of dairy heifers in **spring** (mean of 5 d and 2 yr), canopy structure, and *in situ* DM digestibility at 24 h (mean of 3 replicates within each of 2 animals).

	Estimated intake	Leaf fraction	Stem fraction	<i>in situ</i> DM dig.
	kg hd <sup>-1</sup> d <sup>-1</sup>	----- g m <sup>-2</sup> -----		g kg <sup>-1</sup>
Meadow fescue	4.7	83	12	640
Orchardgrass	5.3	77	8	680
Quackgrass	4.9	117	30	600
Reed canarygrass	5.5	105	24	660
<b>LSD (0.05)</b>	<b>NS</b>	<b>18</b>	<b>6</b>	<b>NS</b>





Estimated DM intake of dairy heifers in **summer** (mean of 5 d and 2 yr), canopy structure, and *in situ* DM digestibility at 24 h (mean of 3 replicates within each of 2 animals).

	Estimated intake	Leaf fraction	Stem fraction	<i>in situ</i> DM dig.
	kg hd <sup>-1</sup> d <sup>-1</sup>	----- g m <sup>-2</sup> -----		g kg <sup>-1</sup>
Meadow fescue	9.5	104	12	490
Orchardgrass	12.3	149	9	470
Quackgrass	8.8	95	24	410
Reed canarygrass	8.1	131	81	380
<b>LSD (0.05)</b>	<b>1.2</b>	<b>21</b>	<b>10</b>	<b>60</b>

Estimated DM intake of dairy heifers in **fall** (mean of 5 d and 2 yr), canopy structure, and *in situ* DM digestibility at 24 h (mean of 3 replicates within each of 2 animals).

	Estimated intake	Leaf fraction	Stem fraction	<i>in situ</i> DM dig.
	kg hd <sup>-1</sup> d <sup>-1</sup>	----- g m <sup>-2</sup> -----		g kg <sup>-1</sup>
Meadow fescue	16.2	153	8	560
Orchardgrass	14.7	168	7	490
Quackgrass	12.8	112	1	540
Reed canarygrass	10.2	127	39	500
<b>LSD (0.05)</b>	<b>1.4</b>	<b>18</b>	<b>8</b>	<b>40</b>

## Summary:

1. Under conditions typical of the midwestern USA, differences in herbage accumulation among temperate grasses during spring are due primarily to accumulation of the stem fraction.
  - Tall fescue possessing improved traits (non-endophyte, fine or soft leaf) has the greatest production potential among typical temperate grasses for pasture-based systems.
  - Meadow fescue's adaptation to a range of environments, annual productivity, and high nutritive value indicate that it has significant value for grazing-based dairies.

## Summary:

2. The relative proportion of the leaf and stem fraction, and its location within the canopy, has the greatest influence on temperate grass pasture utilization when forage allowance exceeds animal requirements.
  - Given the absence of or minimal stem fraction, the influence of herbage digestibility on intake increases.

# Comments or questions?

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