High Quality Alfalfa Cultivar Yield & Nutritive Value Response to Cutting Schedule Strategies in a Mediterranean Environment

Sultan Begna[1], Brenda Perez[2], Abdelmoneim Mohamed[3], Katherine Swanson[2], Charles Brummer[2], Dong Wang[1], Khaled Bali[3], Dan Putnam[2]

[1]USDA-ARS, Parlier, CA; [2]UC-Davis, CA, [3]UC-KARE, Parlier, CA

United States Department of Agriculture
Agricultural Research Service

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U.S. Major Field Crops

Economic value ($ billion dollars). USDA. NASS

Year	Corn	Soybean	Alfalfa	Wheat	Cotton	Rice
2019	48.9	30.5	9.1	8.9	5.9	2.6
2020	64.3	45.7	8.6	9.4	4.8	3.3
2021	82.6	57.5	9.7	11.9	7.5	3.1

Environmental value – can this be calculated?

	Alfalfa	Soybean	Wheat	Rice	Corn	Cotton
	$$$$$	$	$	$	$	$

True Crop Value = Econ. Value + Env. Value= Sustainable Agricultural Systems

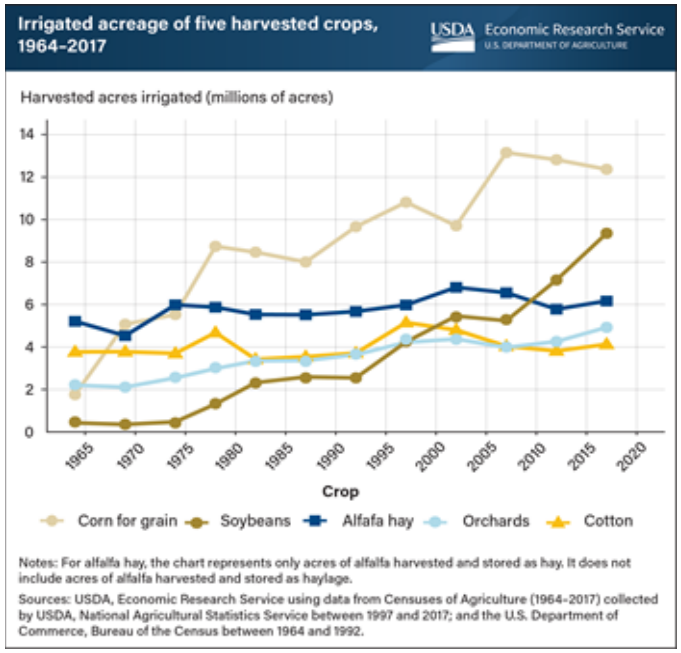
Alfalfa's Environmental Value: Perenniality, Soil, Air, Water, Nitrogen Fixing, Biodiversity, Habitat, Water Use, Drought and Saline tolerance, Low Input, etc.

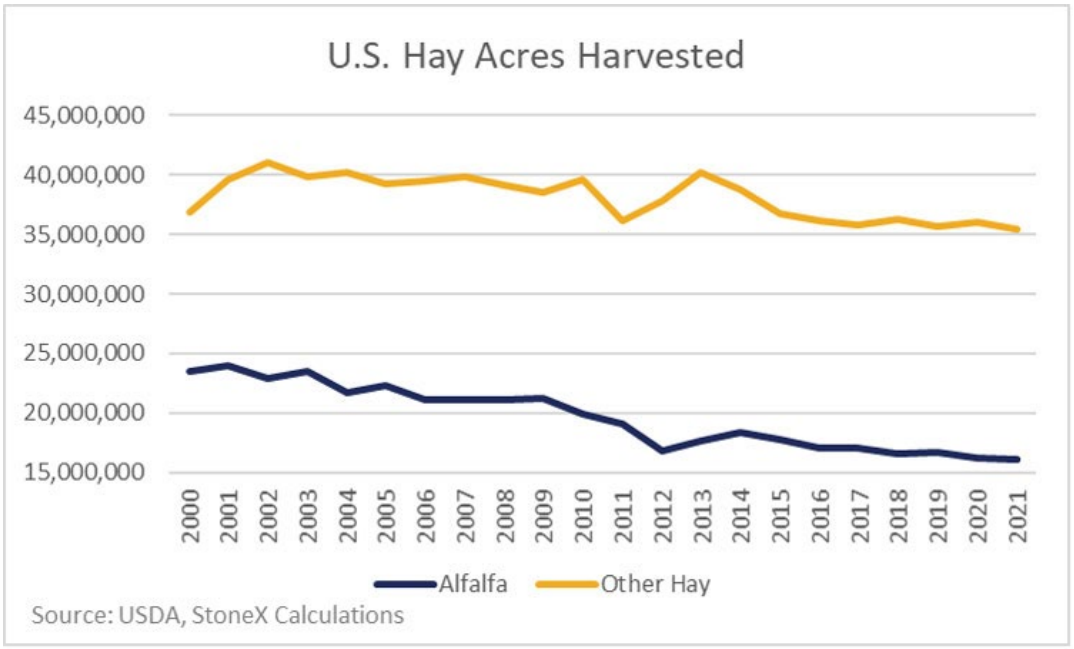
Alfalfa

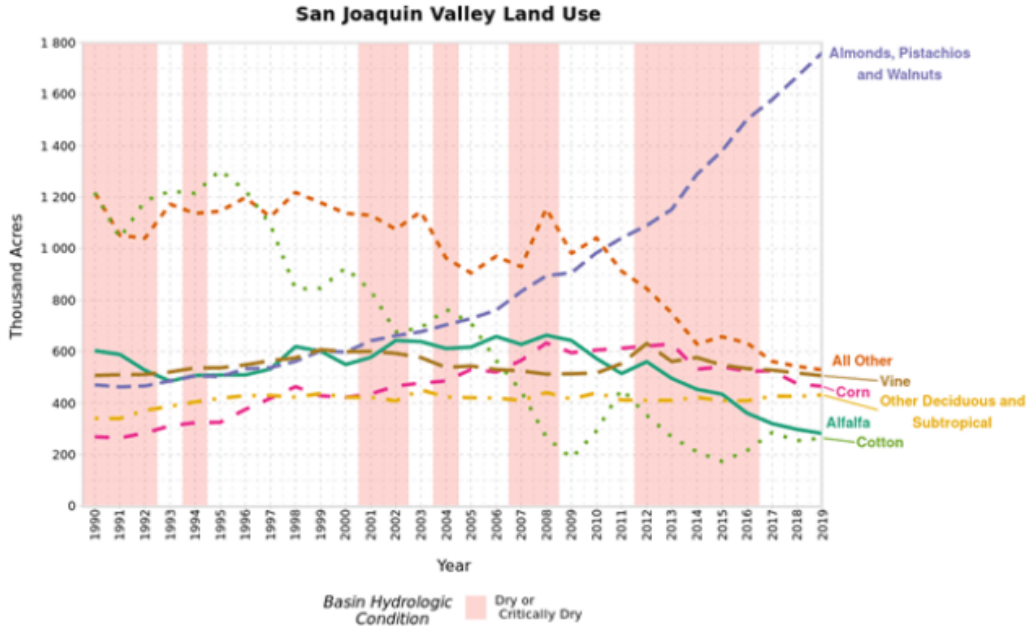
- vital for dairy industry, rural and states economy, and the environment.
- a foundation for sustainable, profitable and resource use efficient agricultural systems.

What are the monetary value incentives to preserve alfalfa's unique and unmatched benefits in the agricultural systems for current and future generations!

Alfalfa: Past, Current & Future Outlook





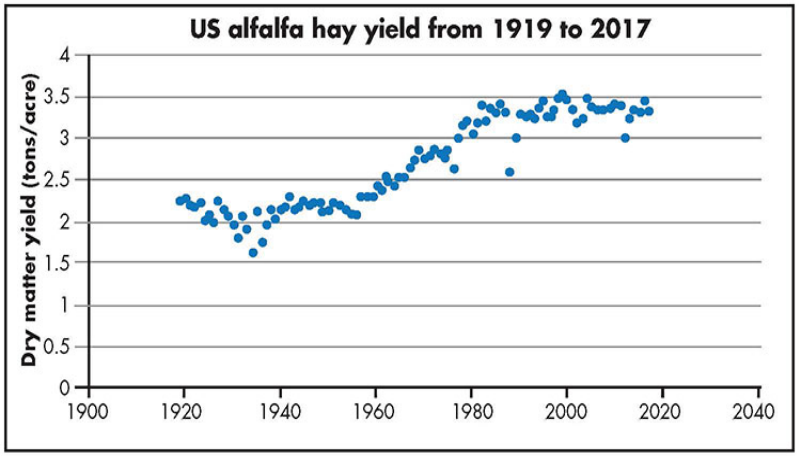


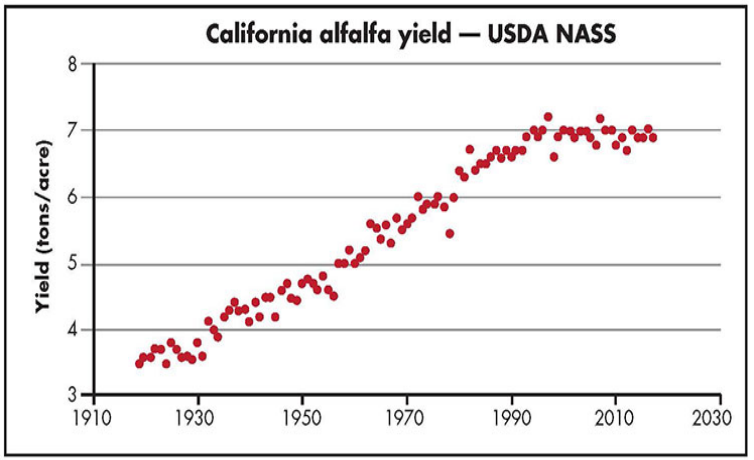
Evolution of most important crops in the San Joaquin Valley from 1990 to 2019 prepared using data from [County Ag Commissioners' Data Listing https://californiawaterblog.com/2021/09/05/lessons-from-three-decades-of-evolution-of-cropland-use-in-the-central-valley/](https://californiawaterblog.com/2021/09/05/lessons-from-three-decades-of-evolution-of-cropland-use-in-the-central-valley/). *José M. Rodríguez-Flores, Spencer A. Cole, Alexander Guzman, Josué Medellín-Azuara, Jay R. Lund, Daniel A. Sumner.* September 5, 2021.

The alfalfa yield gap: What's holding us back?

Charlie Brummer, Dan Putnam. March 2018, *Hay & Forage Grower*.

"Challenges and opportunities for forage researchers and producers in increasing yield"





'Yield enhancement opportunities using multiple strategies'

Genetics and breeding: Genomic technologies in conjunction with remote sensing to predict yield and other traits.
Mechanization and harvest strategies: Shortening dry-down time, such as **hay in a day**!
Irrigation technology: Enhancing uniformity, scheduling, soil moisture monitoring, and timeliness.
Soil fertility and condition: Soil or tissue testing and applying nutrient accordingly.

Harvesting schedule in conjunction with higher quality cultivars (such as reduced-lignin and HiGest) may allow late harvesting to produce high yield while maintaining hay quality. However, more research is needed on these cultivars including their feed value on animal performance.

Higher Quality Cultivars and Cutting Schedules Experiment

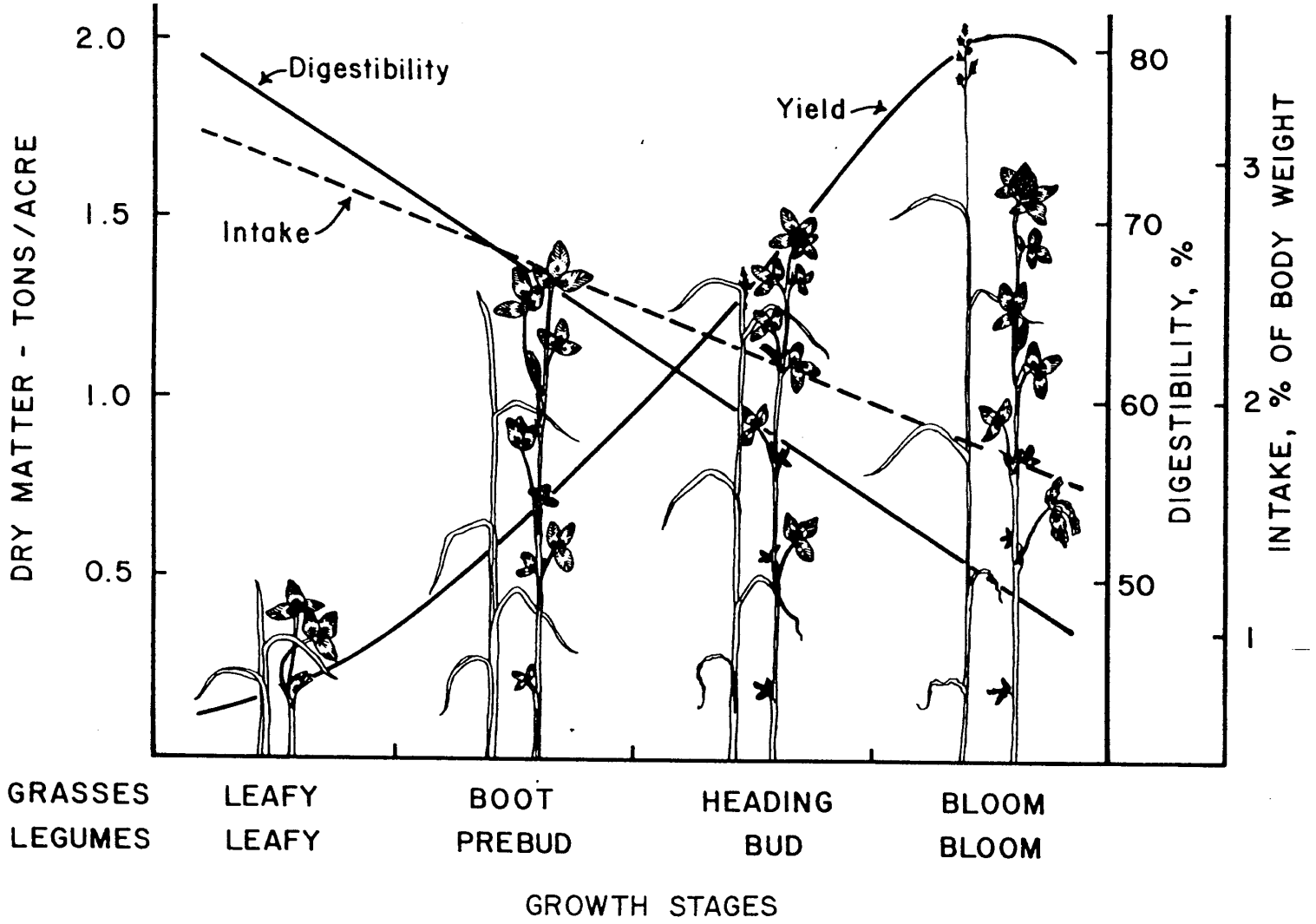
Rationale: Genetically engineered reduced-lignin (HarvXtra) and HiGest conventional cultivars may minimize the yield-quality tradeoff due to crop maturation.

Data is limited on the performance of semi- and non-dormant (FD6-9) cultivar types under long-growing seasons.

There is likely to be a significant interaction with harvest schedules and ‘high quality’ alfalfa cultivars.

Objective: Determine cutting schedule and higher quality cultivars (HarvXtra and HiGest, FD6-9) effect on yield, nutritional and economic value.

Legume/grass Digestibility with Growth Stage & Yield



Material and Methods

- **Study location:** UC-Kearney Ag. Res. & Ext. Center, Parlier CA (2017-2021). Planted in 9/20/2017.

- **Experimental design: Split-plot**. 4 reps
  - **Main plot**: Cutting Schedules.

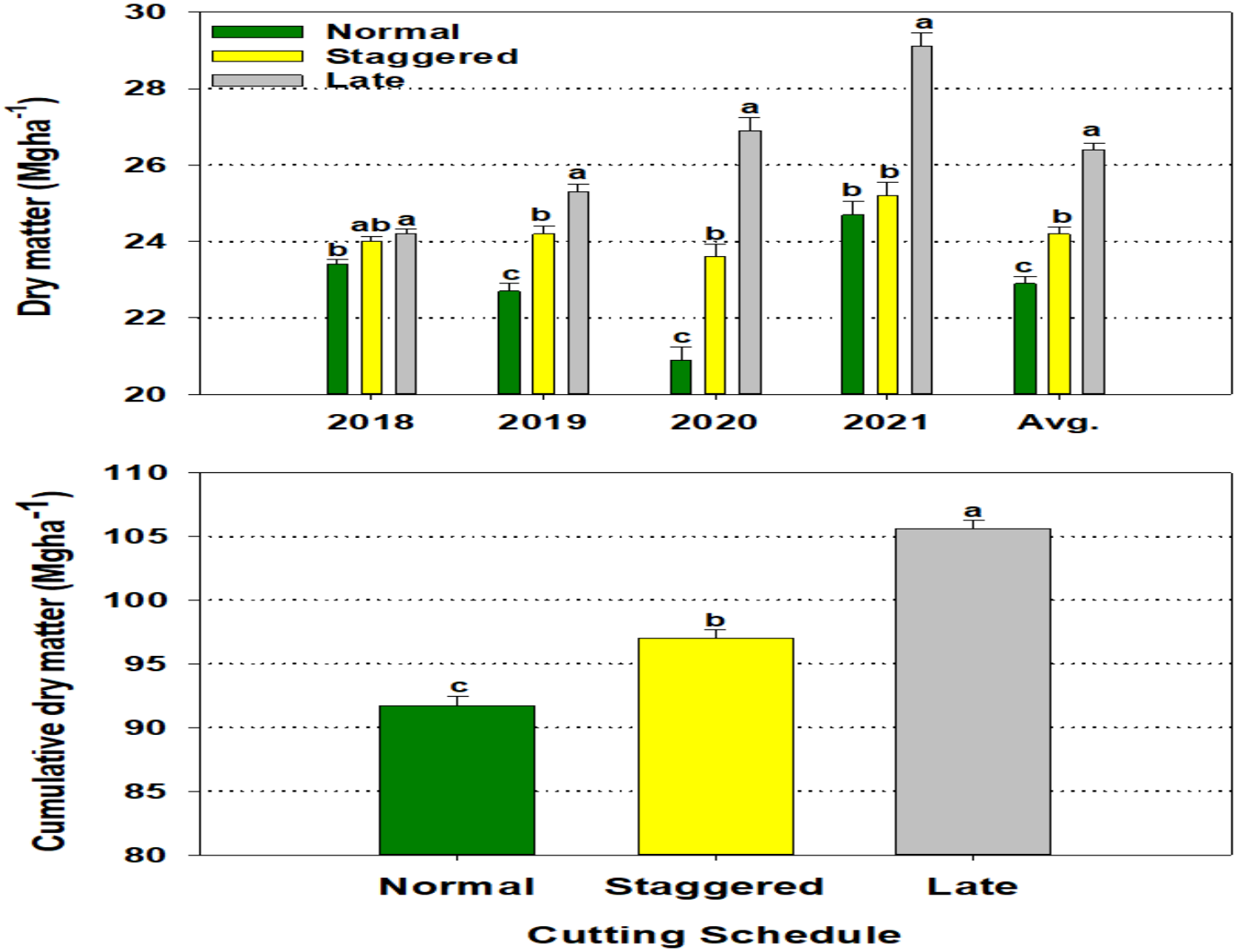
    Normal (28 days), Staggered (21/35 days alternating), Late (35 days).
  - **Sub-plot** : 8 Cultivars of 6-9 Fall dormancy (FD). 2 HarvXtra: H0615T514, RRL913T4-FD 6 & 8; 2 HiGest: HiGest660, AFX960-FD 6 & 9, and 4 conventional: RRAlf200, SW6330, DKA84-10RR, SW9720-FD 6-9, respectively).

Data: Forage yield and nutritional value.

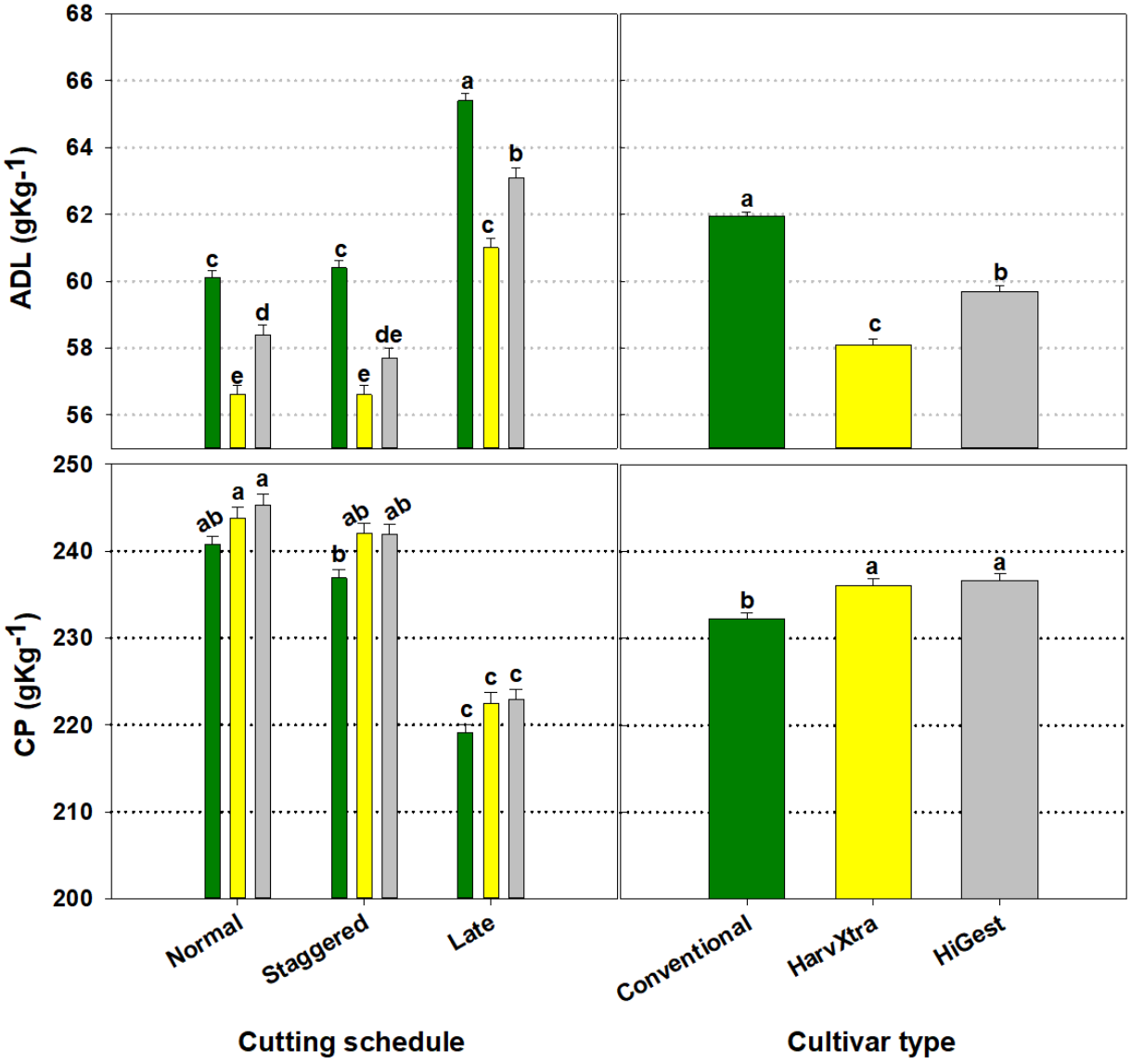
The ‘staggered’ Schedule Concept

- Allows several ‘long’ cutting schedules over the season
- Periodically Regenerates root reserves for subsequent regrowth
- ‘High quality’ harvest followed by ‘high yield’ harvest
- e.g. 21 day followed by 35 day (vs. all 28 d)

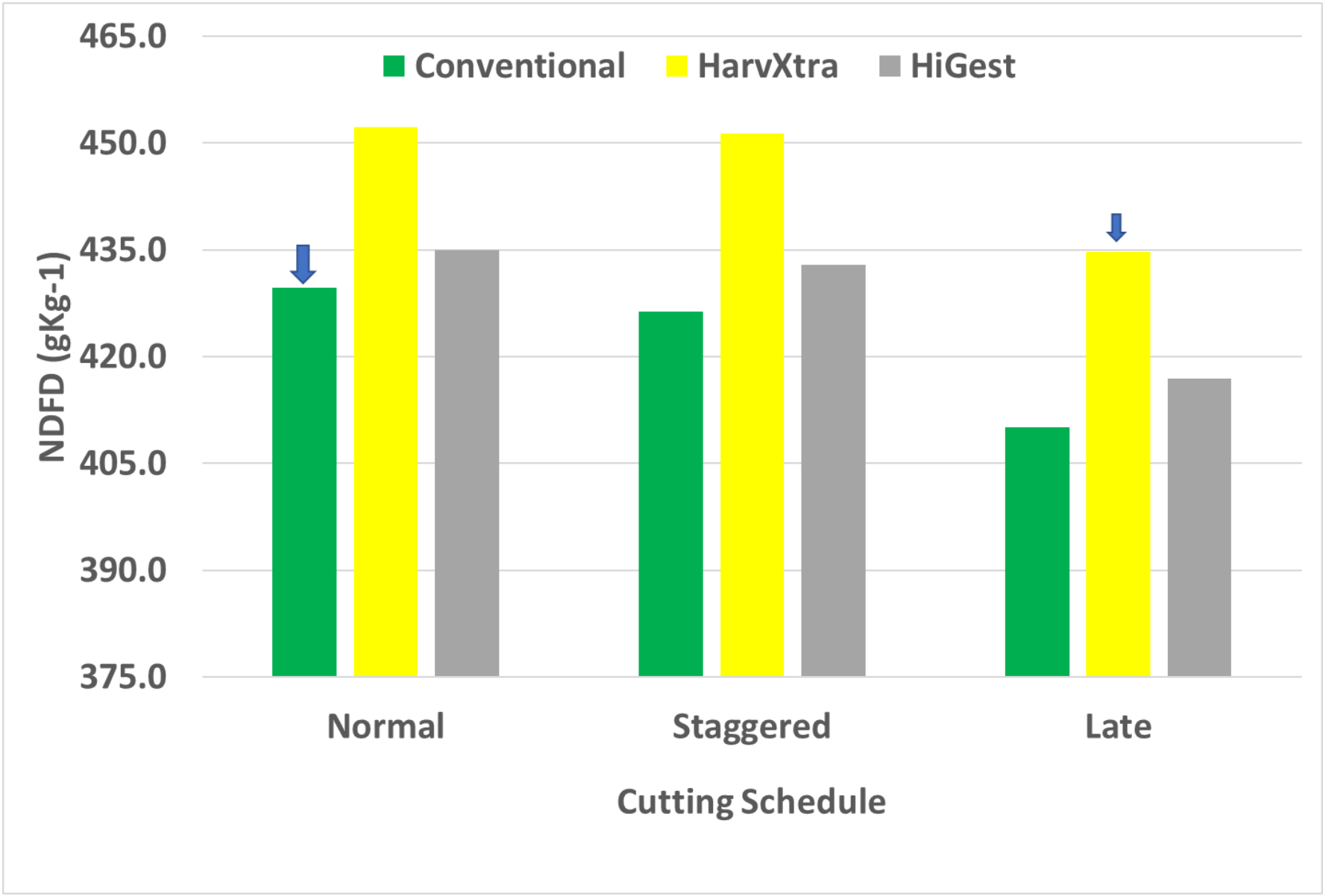
Cutting schedule effect on yearly & 4 yrs. sum yield



Cutting schedule & cultivar type effect on acid detergent lignin (ADL) & crude protein (CP)



Cutting schedule & cultivar type effect on neutral detergent fiber digestibility (NDFD)



Summary

- **'Staggered' Harvest Schedules improved yields compared with 28 d schedule and improved quality vs. 35 d schedule.**

- **HiGest cultivars produced the greatest 4-yrs sum yields under all harvests, followed by two of the conventional, then HarvXtra and the least yields by two of the other conventional cultivars.**

- **Only HarvXtra harvested at 35 d achieved similar NDF Digestibilities compared with conventional cultivars harvested at 28 d**

- **Strategies to combine extended harvest schedules with appropriate cultivars can improve yields, quality, and (potentially) stand persistence.**

- **However, more research is needed on these type of cultivars including their feed value on animal performance.**

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