

User Guide for Snap2Graze

Welcome

Thanks for using **Snap2Graze**! This tool helps you quickly estimate how much forage is available in your rye pasture using nothing more than your smartphone and a note pad.

How the Tool Works

Snap2Graze estimates biomass based on canopy cover in your image, and is based on multi-year research conducted at University of Nebraska-Lincoln. It was developed for cereal rye and works best when forage is still in a vegetative or immature stage, before seed heads form.

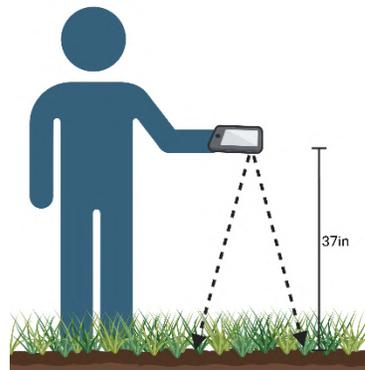
- Designed for rotational grazing systems
- Validated for grazing durations of 3 to 14 days
- Assumes dry matter offered of 4.5% of body weight
- Results are less accurate when pastures are heading out

Note: If the estimated grazing duration exceeds 14 days, suggested information may be less reliable due to changes in forage maturity and reduced utilization efficiency.

How to Take a Good Picture

Taking high-quality top-down images is essential. Follow these steps:

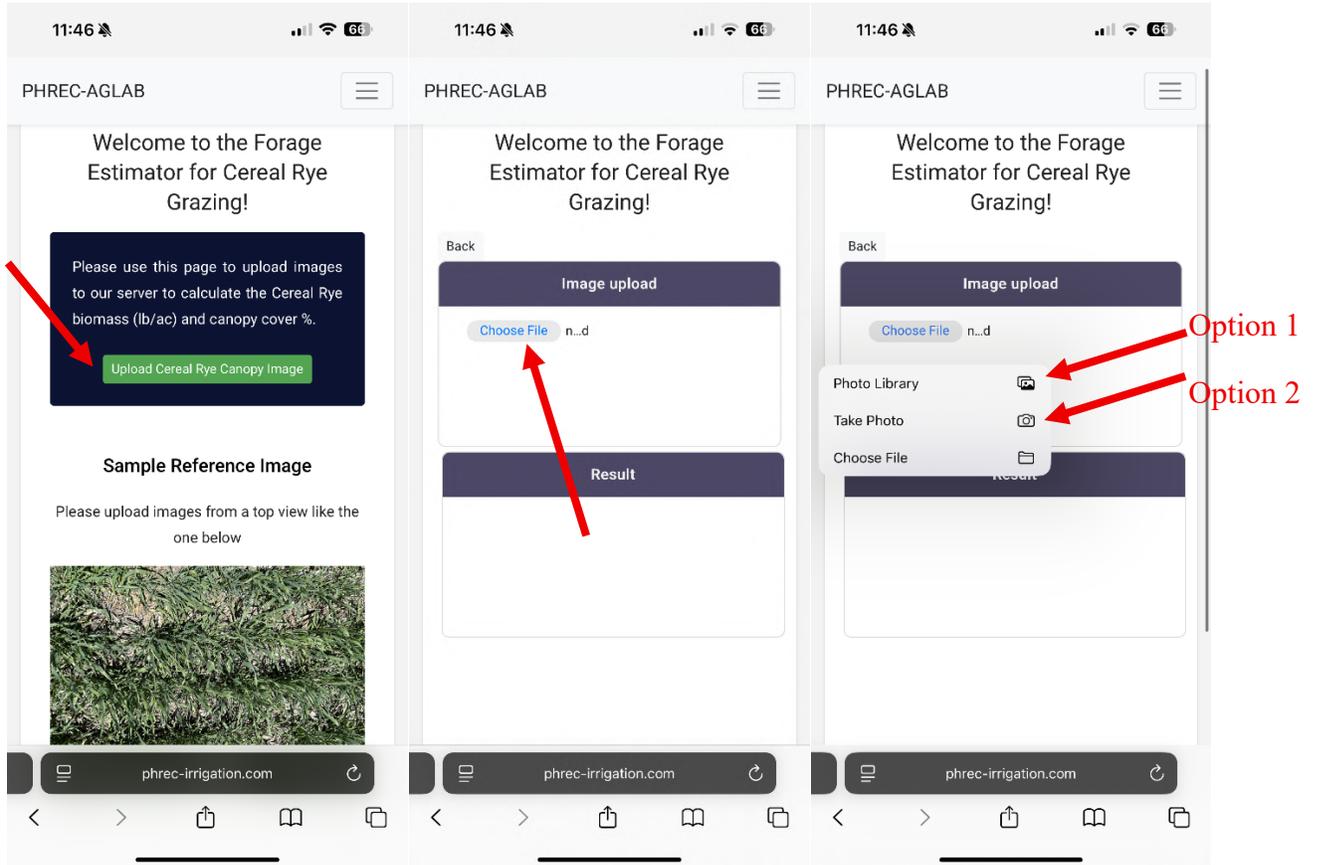
1. Hold your phone at chest height (about 37 inches from the ground).
2. Point the camera straight down at the canopy.
3. Make sure your feet or other objects are not in the frame.



4. Take multiple pictures across the paddock (more coverage will lead to more accurate and representative results):
 - If the field is patchy: take around 12 photos
 - If the field is uniform: 4 to 6 photos is usually enough

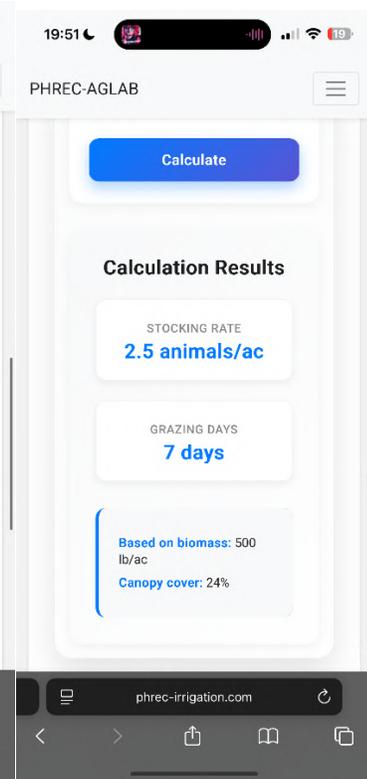
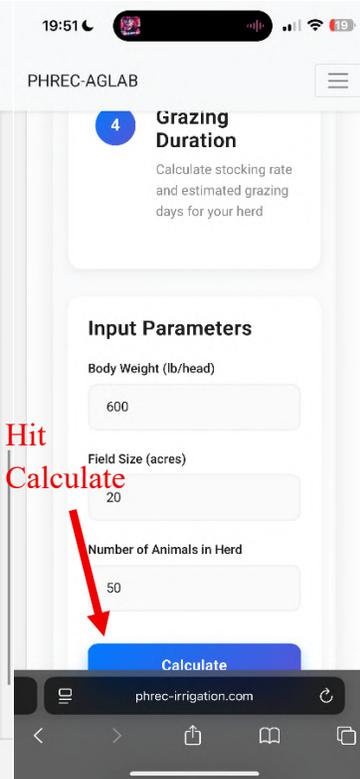
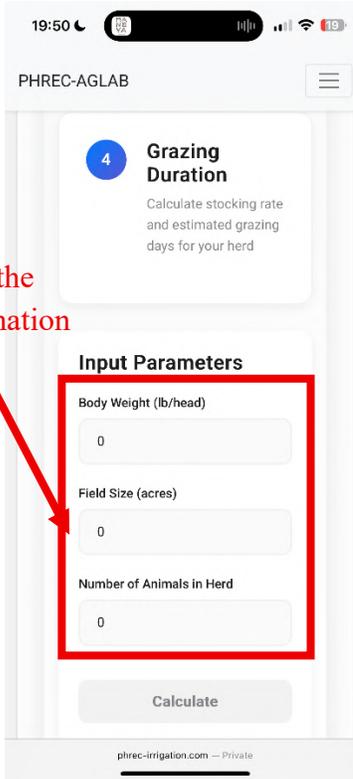
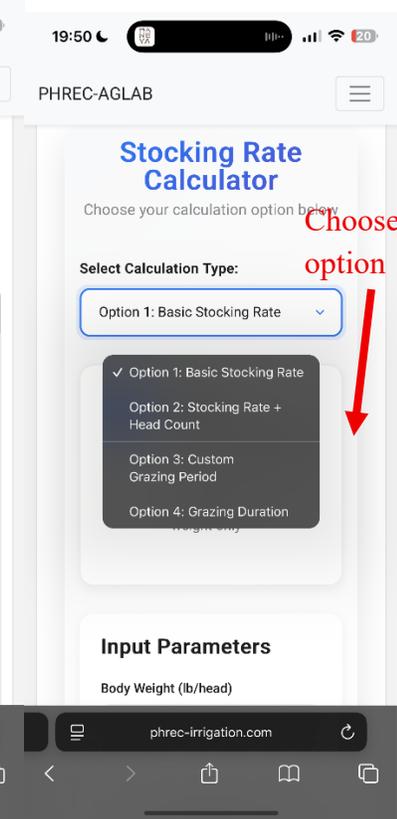
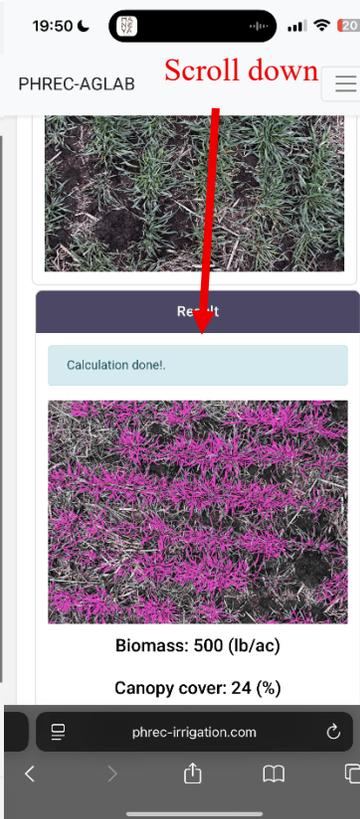
Uploading photos and obtaining results

Step 1: Getting Biomass Results



- **Upload Later (Option 1)**
If you're offline, save the photos in your photo album and upload them when service (WIFI or cellular) is available.
- **Upload Now (Option 2)**
If you have cell service, you can upload your pictures immediately after taking them.

Step 2: Getting Grazing Management Recommendations



Input the information

Hit Calculate

Getting Reliable Estimates and Recording Your Results

Because pastures vary, each photo will yield slightly different results.

- After uploading each photo, record the result in your notebook.
- Once all photos have been processed, calculate the average of the recorded values.

Record your Snap2Graze results by paddock also helps you:

- Plan grazing rotations
- Track forage trends over time
- Build a decision-making history for future planning

Snap2Graze is a decision-support tool. We recommend users always apply your own experience and observations.

Why Rotational Grazing Matters

Snap2Graze was developed and tested under rotational grazing systems, where cattle are moved every few days (typically 5-day rotations, range from 3 to 14 days) across a 4 paddock system. This grazing strategy helps to:

- Improve forage utilization
- Delay plant maturity to keep nutritional quality high
- Promote faster regrowth and extend grazing potential

When to Start and End Grazing:

To learn more about recommendations for grazing management of small cereals like rye, check out the BeefWatch article [Getting the Most Out of Grazing Cereal Rye and Other Winter-hardy Small Cereals](#) or Watch the Companion YouTube [Video](#).

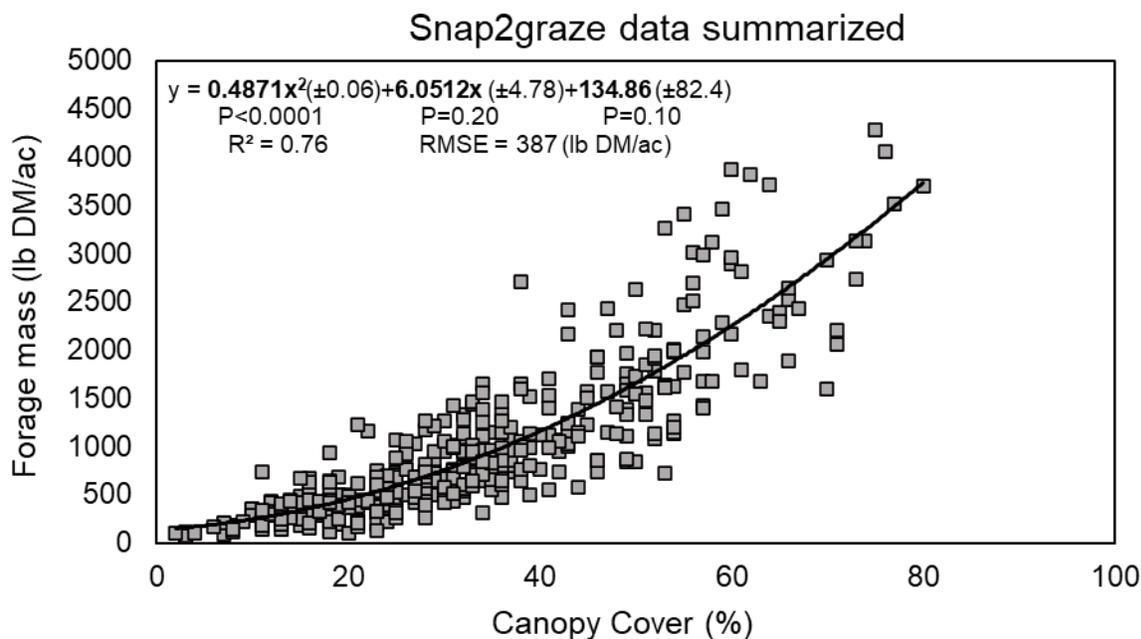
From our previous studies (summarized below), the optimal time to begin the first grazing is when the forage reaches around 5 inches. The first grazing period should end when the grass is about 3 inches. In terms of biomass, this corresponds to roughly 500-1000 lb/ac for pre grazing and about 200-300 lb/ac for post grazing.

The Science Behind Snap2Graze

Snap2Graze was developed to provide a simple, practical, and research-based way for cattle producers to estimate the amount of forage available in cereal rye pastures using photos. This tool converts canopy cover into forage mass estimates.

Data was collected over two years at the University of Nebraska Eastern Nebraska Research, Extension, and Education Center in Mead, Nebraska, from May 2 to 23, 2023 (Year 1) and from April 3 to May 25, 2024 (Year 2). The experimental area comprised 100 acres, which was subdivided into 8 pastures, and each pasture was further divided into 4 paddocks, in which growing cattle or cows were rotationally grazed. The paddocks ranged in size from 2 to 4 acres each.

Forage mass estimation. Within these paddocks, pre-grazing forage biomass samples were collected, resulting in a total of 400 data points analyzed over the two years. Sampling was conducted by clipping forage down to ground level from 4 randomly selected (5 ft²) areas per paddock. Our data yielded a quadratic regression capable of explaining 76% measured forage mass using canopy cover obtained from the images, with an average magnitude of error of ~400 lb DM/ac.



However, it is important to note that as the cereal rye canopy matured, the relationship between canopy cover and forage mass became increasingly variable. When the forage was immature (1,000 lb DM/ac; ~5 inches) with low cover levels (below 20%), biomass estimates from canopy cover were relatively accurate. However, as canopy cover rose above 40%, the spread in forage mass widened substantially, with some paddocks producing less than 1,500 lb DM/ac while others exceeded 3,000 lb DM/ac at similar cover values. This increasing variability reflects several factors: differences in growth stage as rye transitions from leafy to stemmy tissues, and canopy cover “saturation,” where similar cover percentages mask large differences in plant density and structure. However, Snap2Graze will perform well when used on cereal rye pastures that are kept in a leafy, vegetative state, which is exactly the condition producers should aim to maintain for optimal cattle performance.

Forage allowance and stocking rate suggestions. Forage allowance, the amount of forage offered per animal per day, is a key driver of grazing duration, animal performance, forage quality, and pasture recovery. Managing it well is about keeping forage in the right growth stage and giving paddocks time to regrow. In the first-year forage allowance was intentionally varied from 1.5% to 9.3% BW/d to evaluate impacts on animal performance of growing steers. Due to drought delaying plant growth, grazing lasted a total of 22 days, with an average paddock occupation of 6.3 days and ranged from 1 to 14 days. The average pre-grazing forage height at turn into a paddock was 11.5 inches. It was found that animal performance was not impacted by forage allowance. Thus, lower forage allowances and higher stocking rates resulted in greater gain per acre. However, more rapid rotation was required with lower forage allowances. In Year 2, grazing lasted 52 days, with an average occupation of 4.3 days, ranging from 1 to 7 days. In Year 2, forage allowance ranged from 1.6% to 6.8%, with an average of 4.0% of BW/d. The average pre-graze forage height at entry into a paddock was 10 inches. Across the 73 data points collected over the two years it was found that for every 0.71 to 0.85% of BW/d offered, the grazing duration was increased by one day. Thus, for

to average 5 to 6 day occupation in a paddock 3.5 to 5.0% of BW/d would need to be offered. With a 4 paddock rotation this appeared to result in moving the cattle fast enough to prevent maturity and quality loss, but slow enough to give rest paddocks adequate time to regrow.

References:

Davies-Jenkins, S. L., A. M. Sartin, D.D. Redfearn and M.E. Drewnoski. Effect of Forage Allocation on Steer Performance When Grazing Cereal Rye. [Nebraska Beef Cattle Report](#). p 18-21.

Fernandes, P. H. J., Davies-Jenkins, S. L., Zhao, B., Liang, W., Drewnoski, M. E., & Xiong, Y. 2025. Quantifying Cereal Rye Pastures Biomass with Image Analysis. [Nebraska Beef Cattle Report](#).

Ochsner, T., Rocateli, A., Tomlinson, P., Edwards, J., Lollato, R. P., & Patrignani, A. 2017. Dual Purpose Wheat: Improving Grazing Management Using a Smartphone App. Oklahoma State University Extension. <https://extension.okstate.edu/fact-sheets/dual-purpose-wheat-improving-grazing-management-using-a-smartphone-app.html#how-many-images-are-needed-in-each-field>

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Fernandes, P. H. J., Liang, W., Drewnoski, M. E., & Xiong, Y. 2024-2026 Smart Grazing: A Web-Based Solution for Pasture Management. SARE Graduate Student Grant No. GNC24-397.