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Effective tools for optimal pasture management

Bauer, L*; Carriquiry, E*

*Instituto Plan Agropecuario, Br Artigas 3802, Montevideo, CP 11700, Uruguay.

Key words: Pasture Management, Meal Plate Index, Species composition**.**

Measuring Pasture Availability

Effective pasture management is fundamental for livestock farmers to ensure the sustainability and productivity of their operations. The initial step is to quantify the available biomass at various times throughout the year. This can be achieved by using a calibrated ruler to measure pasture height.

Calculation of the Meal Plate Index

Once the average pasture height is determined, farmers can calculate the Meal Plate Index. This index correlates the pasture available with the pasture required for the current livestock load, effectively indicating the adequacy of the "plate" to meet daily forage demand.

Case study: Las Tres Marías Ranch

At this ranch, pasture measurements were taken seasonally over four years to calculate Plate Index. For instance, in winter 2021, the initial measurement was 2 cm, the Meal Plate Index confirmed the necessity of reducing the livestock load, opposite to the farmer´s visual estimation that the pasture was enough for the season.

Observation on Species Composition

In paddocks with appropriate rest periods and limited grazing days, an increase in frequency and vigor of C4 species, such as *Paspalum dilatatum* and *Coellorachis selloana,* was noted, especially during summer. In damp fields, the last three springs monitoring sessions revealed a high frequency of *Poa lanigera*, a winter species preferred by livestock but highly sensitive to management practices.

Key Management Practices

Livestock farmers should focus on average pasture height, height at animal entry and exit, occupation and rest periods, and livestock load. This knowledge helps in making informed decisions to enhance pasture resilience and livestock productivity.

Introduction

This case study examines three years of data collected at Las Tres Marías Ranch, focusing on the Meal Plate Index (IsPC), pasture height, and species composition. The objectives were to analyze how ranchers manage uncertainty, adapt to variability and base their decisions on balancing stocking rates, pasture availability, weather conditions, and daily management practices, all of which contribute to meat production and profitability.

Methods

Pasture height was measured using a calibrated ruler designed by researchers (Santiago Lombardo et. al, 2021). This method leverages the strong correlation between pasture height (in centimeters) and dry matter availability (kg/ha), enabling precise estimation of forage availability for livestock.

Given the heterogeneity of the native grasslands, a systematic sampling approach was developed to account for variability in species composition, soil types, and topography (meadows vs. hills). Prior to measurements, a detailed survey identified distinct plant communities, ensuring accurate sampling routes.

Measurements were taken at 20-step intervals along predetermined paths. The sampling intensity was adjusted based on paddock size:

- 80 measurements for paddocks >100 hectares
- 40 measurements for paddocks <100 hectares
- 20 measurements for cultivated pastures

Data were collected seasonally, with four measurement rounds per year. In parallel, livestock requirements were determined based on the research from the leading agronomist Martin Do Carmo (2019) of forage consumption for various livestock categories. By comparing forage availability with livestock demands, the Meal Plate Index (IsPC) was calculated, providing a forage balance metric for decision-making.

Results

The Meal Plate Index (IsPC) illustrates the forage balance, with visual indicators resembling traffic lights:

- **Brown zone:** More than 1,2, mature pasture exceeding livestock load.
- **Green zone**: Between 0,8 and 1,2. Adequate forage for livestock
- **Yellow zones**: Between 0,6 and 0,8. Alert of not reaching the objectives.
- **Red zones**: Below 0,6. Increasing risk of forage deficits

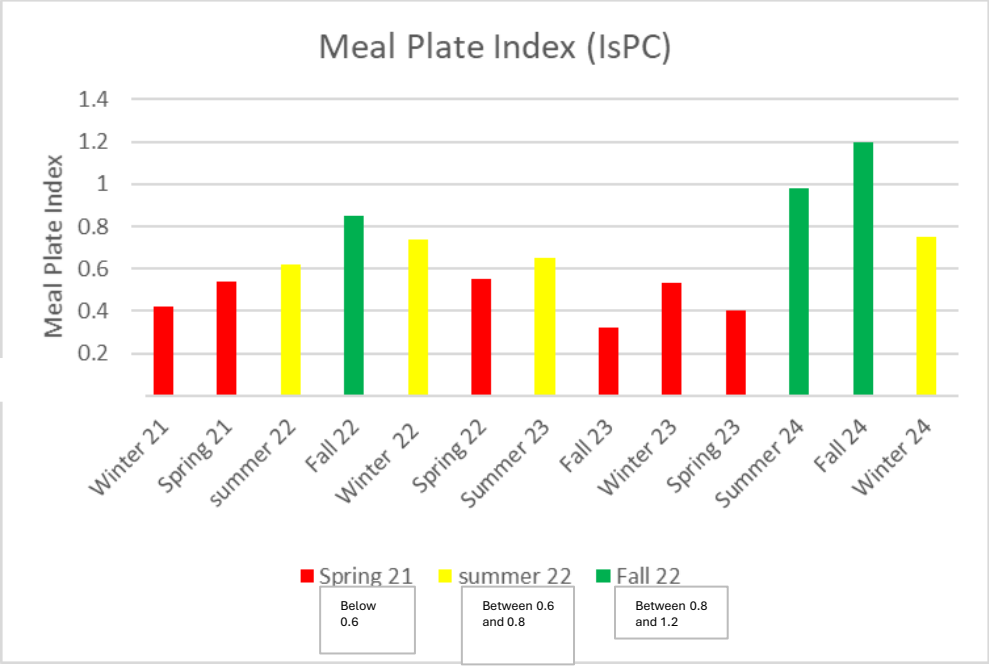

Figure 1: Meal Plate Index (IsPC) in every season that lasted the project in Las Tres Marias Ranch,

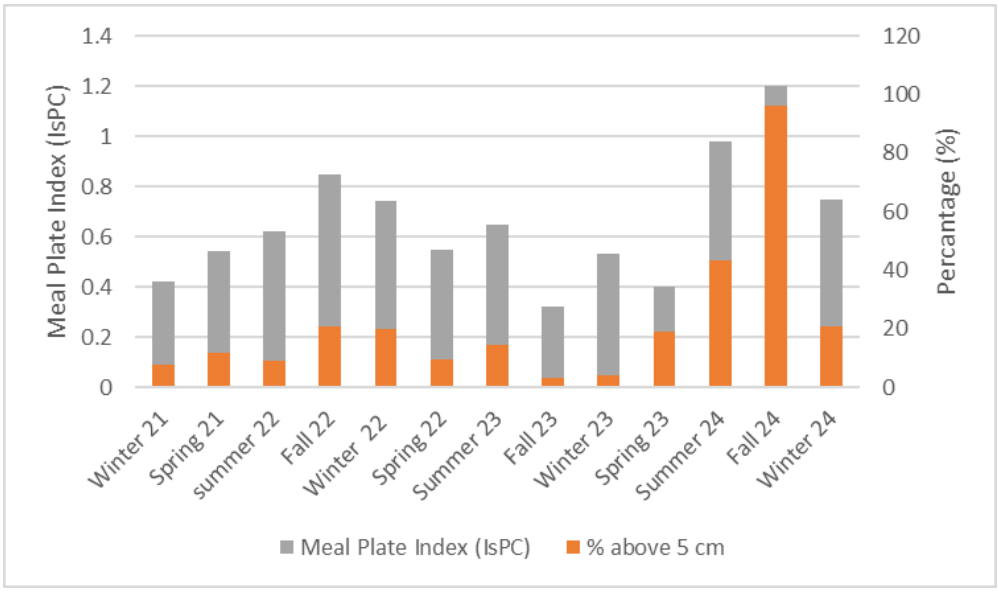

Figure 2: Meal Plate Index along with the % of grass above 5 centimetres.

The colours of the bars in Figure 1 align with the traffic light system previously mentioned: red bars indicate a risk of forage deficit, while green bars represent adequate forage availability for the livestock.

Discussion

Figure 1 illustrates the evolution of the Meal Plate Index (IsPC) over the three-year project period. Initially, the IsPC was notably low, reaching its lowest value during Fall 2023, an expected result due to a hard drought that persisted that year. A comparison of Fall 2023 data across graphics reveals that this period also had the smallest percentage of pasture area with grass taller than 5 cm.

Conversely, the highest IsPC was recorded in Fall 2024, with a value of 1.2 and 96% of the ranch exceeding the 5 cm grass height threshold. This improvement was primarily attributed to the favorable rainfall conditions during that season.

Analysis underscores a critical threshold: maintaining a high percentage of pasture with grass taller than 5 cm significantly influences both physical and economic outcomes.

The findings indicate that the Meal Plate Index is not inherently tied to seasonal patterns but is strongly correlated with the proportion of the ranch maintaining grass height above 5 cm. This emphasizes the importance of measuring grass stock and utilizing this indicator to inform ranch management and decision-making processes.

Forage Utilization and Meat Production

Figure 3 correlates meat production per hectare with the Meal Plate Index (IsPC) over three years. The data suggest a relationship between maintaining pasture height above 5 cm and achieving favorable IsPC values in the green zone, ultimately supporting higher meat production.

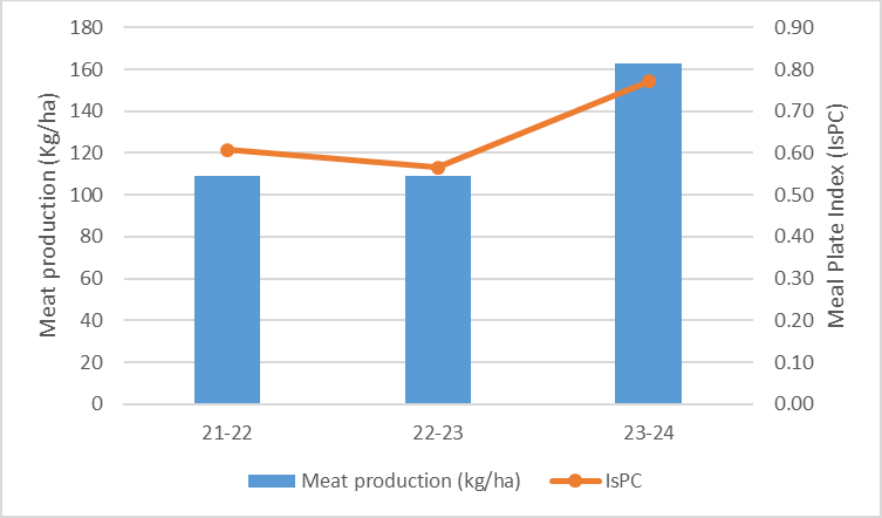

Figure 3: Meat production per hectare and Meal Plate Index (IsPC)

Species Composition Observations

An unused paddock with tall, mature grassland was transformed through targeted grazing management. A water trough and a protein supplement were introduced, and 400 cows rotationally grazed the area in small paddocks. This intervention rejuvenated the grassland:

- Mature grasses were consumed, allowing light to reach the soil.
- Initial colonization by herbs and small weeds protected the soil.
- Over time, native and non-native species (e.g., ryegrass) flourished, creating a more diverse and productive pasture.

The rejuvenated grassland provided high-protein forage in its juvenile state and evolved into a mix of cool- and warm-season grasses, demonstrating the potential for converting underutilized areas into high-quality forage systems through strategic management.

This tool had a significant impact on the Meal Plate Index (IsPC) as the pasture area increased. The newly gained hectares were predominantly of good quality, enhancing the forage available to meet the same requirements.

Conclusions

The Meal Plate Index (IsPC) has proven invaluable for quantifying forage availability and guiding management decisions. Over the three years, the project demonstrated the importance of measuring grass stock and incorporating it into decision-making processes.

Weather played a significant role, with a severe drought in the first two years followed by favorable rainfall in the final year. This variability underscored the importance of adaptive management and maintaining sufficient paddocks with grass taller than 5 cm. Understanding plant communities, their rest periods, and strategic utilization is critical for optimizing forage production and profitability.

Acknowledgments

This study was supported by the Instituto Plan Agropecuario (IPA) and the Instituto Nacional de Investigación Agropecuaria (INIA), whose financial and technical contributions were instrumental in its success.

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