Science Societies

A new approach to estimate botanical composition in mixed pastures

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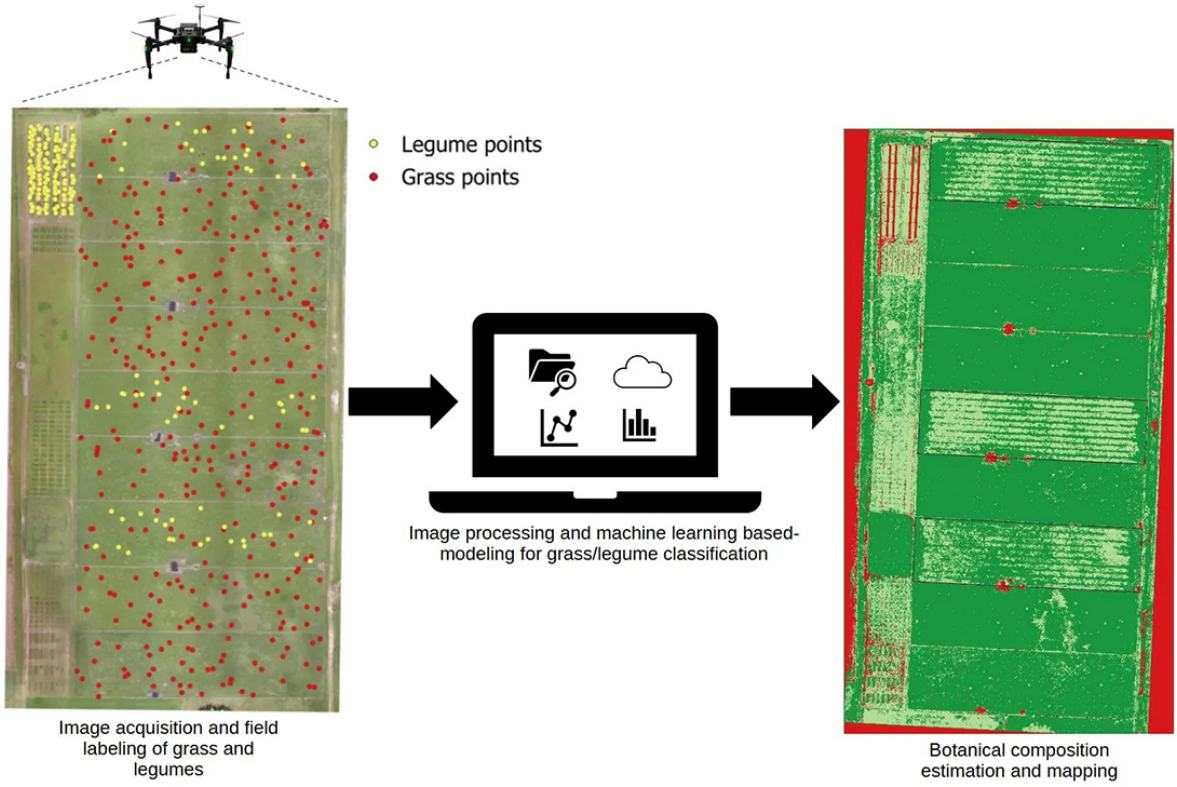

Original drone picture from the pasture area (left) next to a modeling scheme and prediction map of grass and legume distribution generated using a convolutional neural network (right). Grass is shown in dark green and legumes in light green. Red areas represent non-vegetated zones or background. Paddocks are labeled from 1 to 9;

paddocks 3, 5, and 9 contain a bahiagrass–rhizoma peanut mixture, while the others are bahiagrass only. Photo courtesy of Igor Bretas, first author on the study.

Several studies have demonstrated the potential of incorporating forage legumes into grass-based pastures to enhance system sustainability and ecosystem service delivery. Despite these well-documented benefits, the on-farm adoption of grass–legume mixtures remains limited worldwide. This low adoption is largely associated with challenges related to legume persistence and the complexity of managing mixed swards.

Ensuring legume persistence and system sustainability depends primarily on appropriate species selection, particularly considering propagation mechanisms, as well as grazing management strategies. Key early studies indicate that grazing should be managed to maintain legumes within 20–40% of the botanical composition. However, a critical gap remains: How can producers accurately estimate this proportion under practical, farm-level conditions? Currently, there is no widely accessible or reliable method to quantify botanical composition in real time on commercial farms.

Addressing this limitation, researchers from the University of Florida have developed an innovative approach based on drone imagery and artificial intelligence. Over two years, their work resulted in a model capable of accurately classifying grasses and legumes in mixed pastures, achieving approximately 90% accuracy. This technology enables the estimation of botanical composition, offering a practical tool to support grazing management decisions and to monitor legume dynamics such as spread or

decline over time.

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Bretas, I. L., Zhao, C., Dubeux, J. C. B., Xin, Y., Tang, Z., Trumpp, K. R., Acuna, J. P., Small, I. M., & deSouza, C. H. L. (2026). Estimating the botanical composition of bahiagrass–rhizoma peanut pastures using aerial multispectral imagery and deep learning. *Crop Science*, *66*, e70253. https://doi.org/10.1002/csc2.70253

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