

[← Back](#)

ORIGINAL ARTICLE

## Agronomic Responses of Two Major Perennial Forage *Arachis* Species in the Tropics as Affected by Stubble Height

Theyson D. Maranhão, Fagner J. Gomes, Alyce Monteiro, Cristiam Bosi, Bruno C. Pedreira, Patricia M. Santos, Gabriel C. Botechia, Carlos G. S. Pedreira 

First published: 03 February 2026

<https://doi.org/10.1111/gfs.70046>

[VIEW METRICS](#)

### ABSTRACT

The use of forage legumes in pasture systems has been proposed as an option not only for enhancing herbage nutritive value, but also as a tool to aid in the recovery of degraded/degrading grass pastures and an important provider of a variety of ecosystem services. Perennial peanuts (*Arachis* spp.) comprise a group of species whose potential has been widely demonstrated in forage systems in warm areas of the globe, but comparisons across species are scarce in the literature. The objective was to explain the impact of two stubble height on the herbage accumulation (HA), plant-part composition and canopy structural traits of 'Belmonte' pinto peanut (PP; *Arachis pintoi* Krapov. W.C. & Greg cv. Belmonte) and 'Florigraze' rhizoma peanut (RP; *Arachis glabrata* Benth cv. Florigraze) in a tropical environment of southeastern Brazil. Irrigated small plots were harvested at 4 and 8 cm height every 42 days, during both rainy/warm and dry/cool seasons from March 2020 to March 2022 in Piracicaba, Brazil. In the warm season, PP had 46% greater HA than RP (6470 kg DM ha<sup>-1</sup>). In addition, PP had 88% and 37% greater leaf area index and leaflet proportion than RP (2.6% and 47%, respectively) in the harvested herbage. Weed proportion was greater in RP (28%) than in PP (2.8%). During the warm season, the 8-cm stubble height resulted in greater canopy height (16 vs. 12 cm) and stolon proportion (16% vs. 14%), but lower specific leaflet area (228 vs. 243 cm<sup>2</sup> g<sup>-1</sup>) compared to the 4-cm stubble height. In the cool season, at 4 cm stubble height PP had 17% greater petiole proportion (8.8%) and 82% greater stolon proportion (2.8%). Regardless of stubble height and season, PP is a superior option than RP for warmer tropical areas.

### Conflicts of Interest

[← Back](#)

## Data Availability Statement

The data that support the findings of this study are available from the corresponding author upon reasonable request.

### References



Alonso, M. P., J. I. Yasuoka, F. J. Gomes, et al. 2025. "Agronomic Traits of Pinto Peanut Genotypes in Response to Variable Management Strategies." *Semina, Ciências Agrárias* 46, no. 1: 23–36. <https://doi.org/10.5433/1679-0359.2025v46n1p23>.

[Google Scholar](#)

Alvares, C. A., J. L. Stape, P. C. Sentelhas, J. L. Moraes Gonçalves, and G. Sparovek. 2013. "Köppen's Climate Classification Map for Brazil." *Meteorologische Zeitschrift* 22, no. 6: 711–728. <https://doi.org/10.1127/0941-2948/2013/0507>.

[Web of Science®](#) | [Google Scholar](#)

Andrade, C. M. S., and J. F. Valentim. 1999. "Adaptation, Productivity and Persistence of *Arachis pinto* Under Different Levels of Shading." *Brazilian Archives of Biology and Technology* 28, no. 3: 439–445. <https://doi.org/10.1590/S1516-35981999000300001>.

[Google Scholar](#)

Aryal, P., L. E. Sollenberger, M. M. Kohmann, et al. 2020. "Rhizoma Peanut Genotype and Planting Date Affect Biomass Allocation Patterns and Establishment Performance." *Crop Science* 60, no. 3: 1690–1701. <https://doi.org/10.1002/csc2.20142>.

[CAS](#) | [Web of Science®](#) | [Google Scholar](#)

Beinhart, G. 1963. "Effects of Environment on Meristematic Development, Leaf Area, and Growth of White Clover." *Crop Science* 3, no. 3: 209–213. <https://doi.org/10.2135/cropsci1963.0011183x00030030010x>.

[Google Scholar](#)

Bieluczyk, W., M. R. Cherubin, C. E. P. Cerri, et al. 2024. "Greenhouse Gas Fluxes in Brazilian Climate-Smart Agricultural and Livestock Systems: A Systematic and Critical Overview." *Journal of Cleaner*

[← Back](#)[CAS](#) | [Google Scholar](#)

Bourscheidt, M., F. J. Gomes, C. G. S. Pedreira, et al. 2023. "Highlighting the Benefits of Biological Nitrogen Fixation on Agronomic, Physiological, and Nutritive Value Traits of Brachiariagrass." *European Journal of Agronomy* 143: 126730. <https://doi.org/10.1016/j.eja.2022.126730>.

[CAS](#) | [Web of Science®](#) | [Google Scholar](#)

Cappelli, S. L., L. A. Domeignoz-Horta, V. Loaiza, and A. L. Laine. 2022. "Plant Biodiversity Promotes Sustainable Agriculture Directly and via Belowground Effects." *Trends in Plant Science* 27, no. 7: 674–687. <https://doi.org/10.1016/j.tplants.2022.02.003>.

[CAS](#) | [PubMed](#) | [Web of Science®](#) | [Google Scholar](#)

Carvalho, L. R., L. E. T. Pereira, M. Hungria, P. B. Camargo, and S. C. Silva. 2019. "Nodulation and Biological Nitrogen Fixation (BNF) in Forage Peanut (*Arachis pintoii*) cv. Belmonte Subjected to Grazing Regimes." *Agriculture, Ecosystems & Environment* 278: 96–106. <https://doi.org/10.1016/j.agee.2019.02.016>.

[Web of Science®](#) | [Google Scholar](#)

Chen, W., and Z. H. Hu. 2020. "Analysis of Multi-Stakeholders' Behavioral Strategies Considering Public Participation Under Carbon Taxes and Subsidies: An Evolutionary Game Approach." *Sustainability* 12, no. 3: 1–27. <https://doi.org/10.3390/su12031023>.

[Google Scholar](#)

Cooley, K. D., L. E. Sollenberger, M. M. Kohmann, et al. 2020. "Rhizoma Peanut Herbage and Root–Rhizome Responses to Extended Regrowth Periods." *Crop Science* 60, no. 5: 2802–2813. <https://doi.org/10.1002/csc2.20236>.

[CAS](#) | [Web of Science®](#) | [Google Scholar](#)

Da Rodrigues Cruz, P. J., M. Vitória Santos, L. D. Da Silva, et al. 2020. "Morphogenetic, Physiological, and Productive of Forage Peanut Responses to Shading." *Pesquisa Agropecuária Brasileira* 55: 1–7. <https://doi.org/10.1590/S1678-3921.pab2020.v55.01746>.

[Google Scholar](#)

[← Back](#) [Google Scholar](#) 

---

Ferreira, A. S., C. G. S. Pedreira, and C. M. Marassatto. 2013. "Sward Structural Characteristics of Perennial Peanut Genotypes as Affected by Harvest Frequency." *Tropical Grasslands-Forrajes Tropicales* 1, no. 1: 74–75. [https://doi.org/10.17138/tgft\(1\)74-75](https://doi.org/10.17138/tgft(1)74-75).

 [Google Scholar](#) 

---

Fisher, M. J., and P. Cruz. 1994. "Some Ecophysiological Aspects of *Arachis pintoi*." In *Biology and Agronomy of Forage Arachis*, 240. CIAT Publication.

 [Google Scholar](#) 

---

Gilson, G., F. Ferrero, L. Bava, et al. 2020. "Forage Systems and Sustainability of Milk Production: Feed Efficiency, Environmental Impacts and Soil Carbon Stocks." *Journal of Cleaner Production* 260: 121012. <https://doi.org/10.1016/j.jclepro.2020.121012>.

 [Google Scholar](#) 

---

Gobbi, K. F., R. Garcia, M. C. Ventrella, A. F. G. Neto, and G. C. Rocha. 2011. "Specific Leaf Area and Quantitative Leaf Anatomy of Signalgrass and Forage Peanut Submitted to Shading." *Brazilian Journal of Animal Science* 40, no. 7: 1436–1444. <https://doi.org/10.1590/S1516-35982011000700006>.

 [Google Scholar](#) 

---

Gomes, F. J., K. J. Boote, C. G. S. Pedreira, et al. 2025. "Using the CROPGRO-Perennial Forage Model to Simulate the Effect of Asymbiotic Nitrogen Fixation on the Growth of Brachiariagrass." *Field Crops Research* 322: 109770. <https://doi.org/10.1016/j.fcr.2025.109770>.

 [Google Scholar](#) 

---

Gomes, F. J., B. C. Pedreira, P. M. Santos, C. Bosi, J. Lulu, and C. G. S. Pedreira. 2020. "Microclimate Effects on Canopy Characteristics of Shaded Palisadegrass Pastures in a Silvopastoral System in the Amazon Biome of Central Brazil." *European Journal of Agronomy* 115: 1161. <https://doi.org/10.1016/j.eja.2020.126029>.

 [Google Scholar](#) 

[← Back](#)

Bunting, 469–481. Royal Botanic Gardens.

[Google Scholar](#) 

Herautbron, V. 2001. "Phytochrome Mediated Effects on Leaves of White Clover: Consequences for Light Interception by the Plant Under Competition for Light." *Annals of Botany* **88**: 737–743. <https://doi.org/10.1006/anbo.2001.1510>.

[Google Scholar](#) 

Holmes, M. G. 1983. "Perception of Shade." *Philosophical Transactions of the Royal Society of London. B, Biological Sciences* **303**, no. 1116: 503–521. <https://doi.org/10.1098/rstb.1983.0110>.

[Google Scholar](#) 

Jaramillo, D. M., J. C. B. Dubeux, C. Mackowiak, et al. 2018. "Annual and Perennial Peanut Species as Alternatives to Nitrogen Fertilizer in Bermudagrass Hay Production Systems." *Agronomy Journal* **110**, no. 6: 2390–2399. <https://doi.org/10.2134/agronj2018.01.0036>.

[Web of Science®](#)  | [Google Scholar](#) 

Johnson, S. E., L. E. Sollenberger, and J. M. Bennett. 1994. "Yield and Reserve Status of Rhizoma Peanut Growing Under Shade." *Crop Science* **34**, no. 3: 757–761. <https://doi.org/10.2135/cropsci1994.0011183X003400030028x>.

[Web of Science®](#)  | [Google Scholar](#) 

Kenward, M. G., and J. H. Roger. 1997. "Small Sample Inference for Fixed Effects From Restricted Maximum Likelihood." *Biometrics* **53**, no. 3: 983–997. <https://doi.org/10.2307/2533558>.

[CAS](#)  | [PubMed](#)  | [Web of Science®](#)  | [Google Scholar](#) 

Kiniry, J. R., C. R. Tischler, and G. A. Van Esbroeck. 1999. "Radiation Use Efficiency and Leaf CO<sub>2</sub> Exchange for Diverse C<sub>4</sub> Grasses." *Biomass and Bioenergy* **17**, no. 2: 95–112. [https://doi.org/10.1016/S0961-9534\(99\)00036-7](https://doi.org/10.1016/S0961-9534(99)00036-7).

[Web of Science®](#)  | [Google Scholar](#) 

[← Back](#) [Google Scholar](#) 

---

Lambers, H., and H. Poorter. 1992. "Inherent Variation in Growth Rate Between Higher Plants: A Search for Physiological Causes and Ecological Consequences." *Advances in Ecological Research* **23**: 187–261. [https://doi.org/10.1016/S0065-2504\(08\)60148-8](https://doi.org/10.1016/S0065-2504(08)60148-8).

 [CAS](#)  | [Web of Science®](#)  | [Google Scholar](#) 

---

Lascano, C. E. 1993. "Nutritive Value and Anial Production of Forage *Arachis*." In *Biology and Agronomy of Forage Arachis*, edited by P. C. Kerridge and B. Hardy, vol. **240**, 109–121. CIAT Publication.

 [Google Scholar](#) 

---

Lemaire, G., J. Hodgson, A. Moraes, P. C. F. Carvalho, and C. Nabinger. 2000. *Grassland Ecophysiology and Grazing Ecology*. CAB International.

 [Google Scholar](#) 

---

Littell, R. C., G. A. Milliken, W. W. Stroup, R. D. Wolfinger, and O. Shabenberger. 2006. *SAS for Mixed Models*. 2nd ed, 363–365. SAS Institute. <https://doi.org/10.1080/10543400601001600>.

 [Google Scholar](#) 

---

Maranhão, T. D., F. J. Gomes, J. I. Yasuoka, et al. 2025. "Physiological and Canopy Traits of Two Perennial *Arachis* Species in Response to Clipping Height." *Grass and Forage Science* **80**, no. 2: 1–9. <https://doi.org/10.1111/gfs.12721>.

 [Google Scholar](#) 

---

Martin, L. J., B. A. Sellers, P. Devkota, J. A. Ferrell, R. G. Leon, and J. M. B. Vendramini. 2021. "Tolerance of Rhizoma Perennial Peanut to Glyphosate and Triclopyr." *Weed Technology* **35**, no. 4: 525–531. <https://doi.org/10.1017/wet.2020.126>.

 [Google Scholar](#) 

[← Back](#)

Livestock Systems in the Amazon Biome.” *Science of the Total Environment* **906**: 167396. <https://doi.org/10.1016/j.scitotenv.2023.167396>.

[CAS](#) | [PubMed](#) | [Web of Science®](#) | [Google Scholar](#)

Nautiyal, P. C., N. R. Rachaputi, and Y. C. Joshi. 2002. “Moisture-Deficit-Induced Changes in Leaf-Water Content, Leaf Carbon Exchange Rate and Biomass Production in Groundnut Cultivars Differing in Specific Leaf Area.” *Field Crops Research* **74**, no. 1: 67–79. [https://doi.org/10.1016/S0378-4290\(01\)00199-X](https://doi.org/10.1016/S0378-4290(01)00199-X).

[Web of Science®](#) | [Google Scholar](#)

Nautiyal, P. C., K. Rajgopal, P. V. Zala, et al. 2008. “Evaluation of Wild *Arachis* Species for Abiotic Stress Tolerance: I. Thermal Stress and Leaf Water Relations.” *Euphytica* **159**: 43–57. <https://doi.org/10.1007/s10681-007-9455-x>.

[Google Scholar](#)

Nautiyal, P. C., V. Ravindra, and Y. C. Joshi. 1995. “Gas Exchange and Leaf Water Relations in Two Peanut Cultivars of Different Drought Tolerance.” *Biologia Plantarum* **37**, no. 3: 371–374. <https://doi.org/10.1007/BF02913981>.

[Google Scholar](#)

Nautiyal, P. C., V. Ravindra, and Y. C. Joshi. 1999. “Net Photosynthetic Raate in Peanut (*Arachis hypogaea* L.): Influence of Leaf Position, Time of Day, and Reproductive-Sink.” *Photosynthetica* **36**, no. 1: 129–138. <https://doi.org/10.1023/A:1007079022742>.

[Google Scholar](#)

Ortega, S. J. A., L. E. Sollenberger, K. H. Quesenberry, C. S. Jones, and J. A. Cornell. 1992. “Productivity and Persistence of Rhizoma Peanut Pastures Under Different Grazing Managements.” *Agronomy Journal* **84**, no. 5: 799–804. <https://doi.org/10.2134/agronj1992.00021962008400050008x>.

[Google Scholar](#)

Ottaviani, G., J. Martínková, T. Herben, J. G. Pausas, and J. Klimešová. 2017. “On Plant Modularity Traits: Functions and Challenges.” *Trends in Plant Science* **22**, no. 8: 648–651. <https://doi.org/10.1016/j.tplants.2017.05.010>.

[← Back](#)

Prine, G. M., L. S. Dunavin, J. E. Moore, and R. D. Roush. 1986. "Registration of 'Florigraze' Rhizoma Peanut." *Crop Science* **26**, no. 5: 1084–1085. <https://doi.org/10.2135/cropsci1986.0011183x002600050060x>.

[Web of Science®](#) | [Google Scholar](#)

Quesenberry, K. H., A. R. Blount, P. Mislevy, E. C. French, M. J. Williams, and G. M. Prine. 2010. "Registration of 'UF Tito' and 'UF Peace' Rhizoma Peanut Cultivars With High Dry Matter Yields, Persistence, and Disease Tolerance." *Journal of Plant Registrations* **4**, no. 1: 17–21. <https://doi.org/10.3198/jpr2009.07.0397crc>.

[Web of Science®](#) | [Google Scholar](#)

Saldivar, A. J., W. R. Ocumpaugh, R. R. Gildersleeve, and G. M. Prine. 1992. "Total Nonstructural Carbohydrates and Nitrogen of 'Florigraze' Rhizoma Peanut." *Agronomy Journal* **84**, no. 3: 439–444. <https://doi.org/10.2134/agronj1992.00021962008400030017x>.

[Web of Science®](#) | [Google Scholar](#)

Santos, E. R. S., J. C. B. Dubeux, D. M. Jaramillo, et al. 2020. "Herbage Responses and Nitrogen Agronomic Efficiency of Bahiagrass–Legume Mixtures." *Agronomy Journal* **112**, no. 5: 4057–4068. <https://doi.org/10.1002/agj2.20278>.

[CAS](#) | [Web of Science®](#) | [Google Scholar](#)

Schultze-Kraft, R., I. M. Rao, M. Peters, R. J. Clements, C. Bai, and G. Liu. 2018. "Tropical Forage Legumes for Environmental Benefits: An Overview." *Tropical Grasslands-Forrajes Tropicales* **6**, no. 1: 1–14. [https://doi.org/10.17138/TGFT\(6\)1-14](https://doi.org/10.17138/TGFT(6)1-14).

[Web of Science®](#) | [Google Scholar](#)

Silva, G. P., C. A. Fialho, L. R. Carvalho, et al. 2018. "Sward Structure and Short-Term Herbage Intake in *Arachis pintoi* cv. Belmonte Subjected to Varying Intensities of Grazing." *Journal of Agricultural Science* **156**, no. 1: 92–99. <https://doi.org/10.1017/s0021859617000855>.

[Google Scholar](#)

[← Back](#)

org/10.1016/j.agry.2017.02.001.

[Web of Science®](#) | [Google Scholar](#)

Silva, V. J., C. G. S. Pedreira, L. E. Sollenberger, M. S. S. Carvalho, F. Tonato, and D. C. Basto. 2016. "Growth Analysis of Irrigated Tifton 85' and Jiggs Bermudagrasses as Affected by Harvest Management." *Crop Science* 56, no. 2: 882–890. <https://doi.org/10.2135/cropsci2015.07.0430>.

[Web of Science®](#) | [Google Scholar](#)

Simpson, C. E., A. Krapovickas, and J. F. M. Valls. 2001. "History of *Arachis* Including Evidence of *A. hypogaea* L. Progenitors." *Peanut Science* 28, no. 2: 78–80. <https://doi.org/10.3146/i0095-3679-28-2-7>.

[Google Scholar](#)

Sollenberger, L. E., M. M. Kohmann, J. C. B. Dubeux, and M. L. Silveira. 2019. "Grassland Management Affects Delivery of Regulating and Supporting Ecosystem Services." *Crop Science* 59, no. 2: 441–459. <https://doi.org/10.2135/cropsci2018.09.0594>.

[CAS](#) | [Web of Science®](#) | [Google Scholar](#)

Thorntwaite, C. W., and C. W. Mather. 1955. "The Water Balance." In *Drexel Institute of Technology – Laboratory of Climatology*, edited by N. J. Centerton, vol. VIII, 1. Publications in Climatology.

[Google Scholar](#)

Vandermeulen, S., C. A. Ramírez-Restrepo, Y. Beckers, H. Claessens, and J. Bindelle. 2018. "Agroforestry for Ruminants: A Review of Trees and Shrubs as Fodder in Silvopastoral Temperate and Tropical Production Systems." *Animal Production Science* 58, no. 5: 767–777. <https://doi.org/10.1071/AN16434>.

[Web of Science®](#) | [Google Scholar](#)

Wanapat, M., C. Suriyapha, G. Dagaew, et al. 2024. "Sustainable Livestock Production Systems Are Key to Ensuring Food Security Resilience in Response to Climate Change." *Agriculture and Natural Resources* 58, no. 4: 537–546. <https://doi.org/10.34044/j.anres.2024.58.4.13>.

[← Back](#)

Ward, D. A., and H. W. Woolshouse. 1986. "Comparative Effects of Light During Growth on the Photosynthetic Properties of NADP-ME Type C4 Grasses From Open and Shaded Habitats. II. Photosynthetic Enzyme Activities and Metabolism." *Plant, Cell & Environment* 9, no. 4: 271–277. <http://doi.org/10.1111/1365-3040.ep11611683>.

[Web of Science®](#) | [Google Scholar](#)

Wolfinger, R., and M. O'Connell. 1993. "Generalized Linear Mixed Models a Pseudo-Likelihood Approach." *Journal of Statistical Computation and Simulation* 48, no. 3: 233–243. <https://doi.org/10.1080/00949659308811554>.

[Google Scholar](#)

You, Y., Y. Liu, T. Xiao, and F. Hou. 2023. "Effects of Grazing and Nitrogen Application on Greenhouse Gas Emissions in Alpine Meadow." *Science of the Total Environment* 894: 164894. <https://doi.org/10.1016/j.scitotenv.2023.164894>.

[CAS](#) | [PubMed](#) | [Web of Science®](#) | [Google Scholar](#)

[Download PDF](#)

## ABOUT WILEY ONLINE LIBRARY

[Privacy Policy](#)[Terms of Use](#)[About Cookies](#)[Manage Cookies](#)[Accessibility](#)[Wiley Research DE&I Statement and Publishing Policies](#)

## HELP & SUPPORT

[Contact Us](#)[Training and Support](#)[DMCA & Reporting Piracy](#)[Sitemap](#)

## OPPORTUNITIES

[← Back](#)

**CONNECT WITH WILEY**

The Wiley Network

Wiley Press Room

Copyright © 1999-2026 John Wiley & Sons, Inc or related companies. All rights reserved, including rights for text and data mining and training of artificial intelligence technologies or similar technologies.

**WILEY**