Science Societies

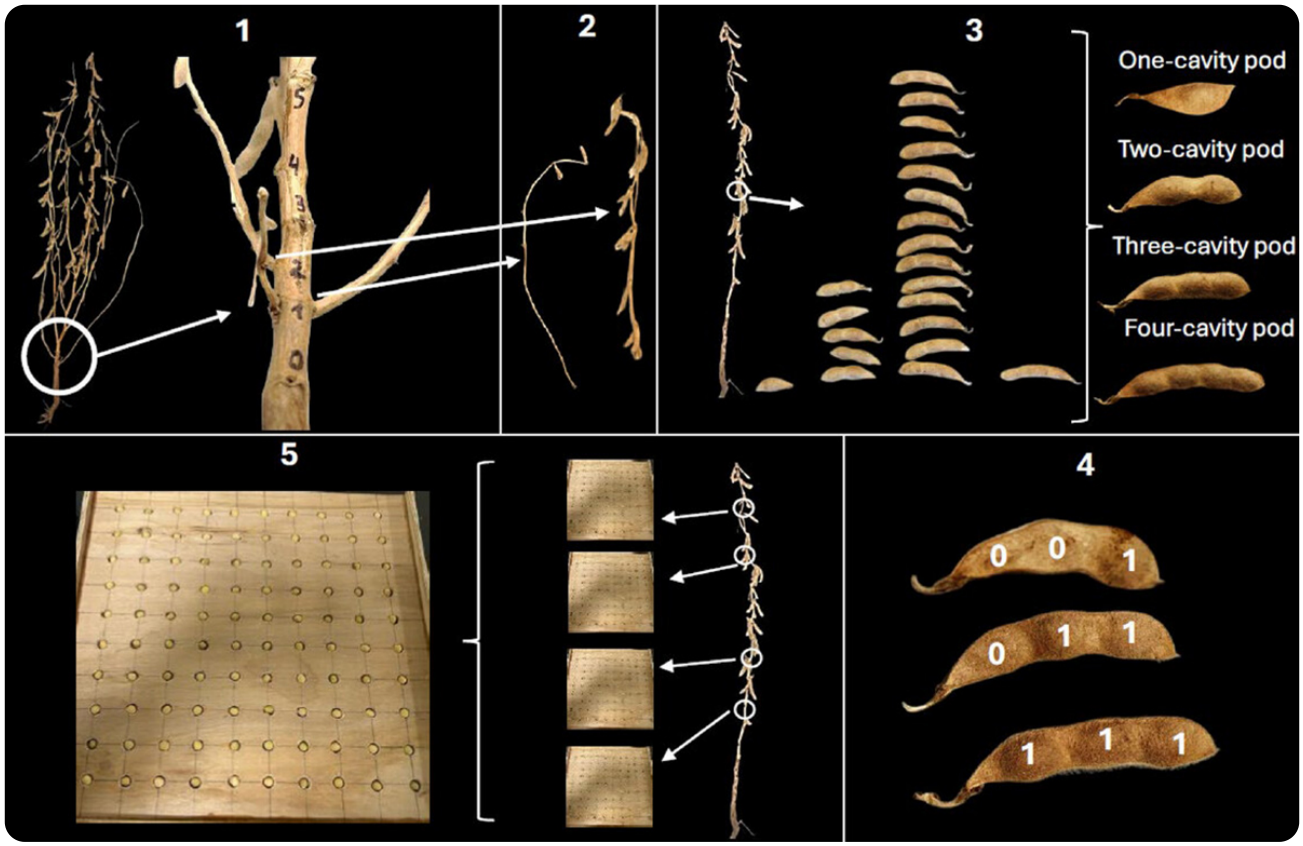
Nitrogen supply affects soybean yield differently within the canopy

October 28, 2025

In a new Crop Science article, researchers evaluated seed yield in different parts of soybean plants that were provided high or limited N. Photo courtesy of Nicolas Cafaro La Menza, University of Nebraska–Lincoln.

Soybean, the most cultivated legume in the world, is influenced by the seasonal availability of resources. One of the most important resources is nitrogen (N), which is becoming a yield-limiting factor in fields with high yield potential due to an asynchrony between N supply (biological N fixation and soil N) and demand. Despite N being one of the most important nutrients for soybean, it is unknown how N availability influences seed yield (i.e., seed number, pod number, seeds per pod, and individual seed weight) across the soybean canopy.

Researchers evaluated nine high-yielding irrigated soybean fields in Nebraska under two treatments: Zero-N (no additional N application, relying on soil N and microbes that “fix” atmospheric N into usable N) and Full-N (ample N supply).
Soybean seed yield and its components were determined at every node throughout the canopy.



Researchers determined seed number and seed weight of soybean plants growing in treatments where no additional N was added and where ample N was added. ***(1)*** *Stem nodes were marked on each plant.* ***(2)*** *Branches were removed from each node.* ***(3)*** *Pods were removed and sorted into one-, two-, three-, and four-cavity pod types.* ***(4)*** *In each pod cavity, there was either a seed (Code 1) or no seed (Code 0).* ***(5)*** *A 100-seed count board was used to draw a random sample of seed to weight. Image courtesy of Nicolas Cafaro La Menza, University of Nebraska–Lincoln.*

Nitrogen limitation decreased total yield by about 984 kg ha^{-1} with a 7% decrease in overall seed number, an 8% decrease in total pod number, and an 11% decrease in individual seed weight. Notably, while limited N decreased seed weight across all nodes, it only significantly decreased seed number and pod number in the middle and upper stem of soybean plants. Pod number was the main yield component explaining seed number changes; the number of seeds per pod showed no changes due to N

limitation.

This study comprehensively examined the effects of resource availability on soybean yield components within the whole canopy, going beyond simply reporting yield differences. By revealing how different parts of the plant respond to N availability, researchers suggest that improving soybean N distribution within the canopy could help optimize yields.

Dig deeper

Bonfanti, L., Sazon, L. A., Specht, J. E., Howard, R., Carciochi, W. D., Grassini, P., Linquist, J. L., Andrade, J. F., & Cafaro La Menza, N. (2025). Soybean seed yield distribution within the canopy as affected by nitrogen supply. *Crop Science*, *65*, e70033. https://doi.org/10.1002/csc2.70033
