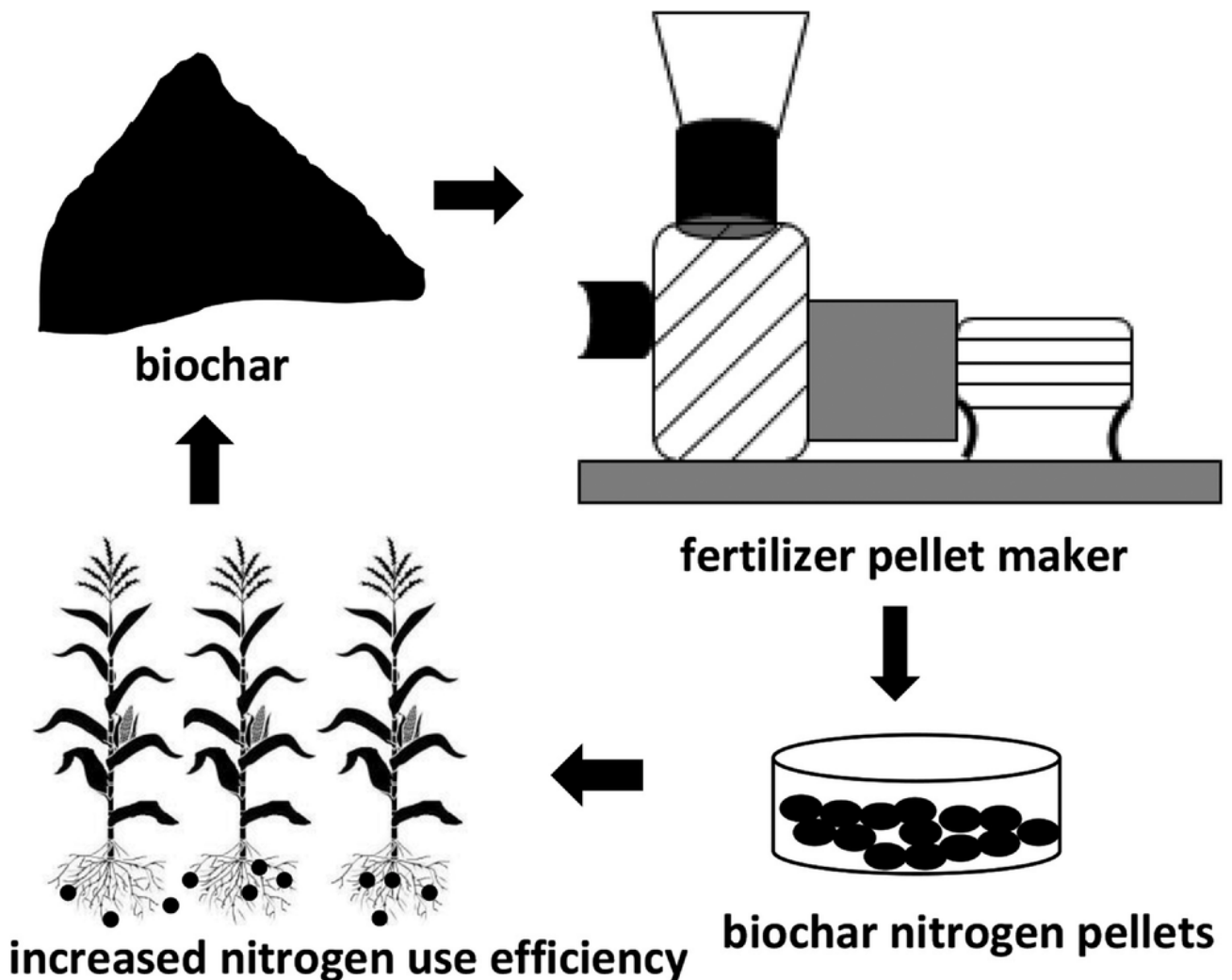




# Biochar-Based Fertilizer Boosts Nitrogen Use Efficiency

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*Biochar and urea can be processed through a pellet mill to produce nitrogen (N) fertilizer pellets that can slowly release N to crop plants. This can increase N use efficiency to plants and reduce N loss to the environment. Illustration by Chumki Banik and Santanu Bakshi.*

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Long-term use of nitrogen fertilizers has negative environmental impacts, and new strategies are necessary to improve plant nitrogen use efficiency. Biochar, the carbon-rich co-product of biomass pyrolysis, is gaining interest as a soil amendment to build soil quality and sequester carbon. However, little is known about its influence on nitrogen in the soil.

Researchers at Iowa State University have developed biochar-based nitrogen fertilizers and tested their efficacy as a slow-release nitrogen source using maize as the model crop. The fertilizers were prepared at lab and pilot plant scales, and experiments were conducted on bench and greenhouse scales. Laboratory-based nitrogen release data revealed that the biochar-based fertilizers retained significantly more nitrogen under accelerated urea release conditions than did traditional urea fertilizers. Similarly, in the greenhouse experiment, the biochar-based fertilizers significantly decreased nitrate leaching loss relative to the traditional fertilizers, and root biomass for the biochar-treated plants increased significantly, improving the overall nitrogen use efficiency.

**Adapted from** Banik, C., Bakshi, S., Laird, D. A., Smith, R. G., & Brown, R. C. (2023). Impact of biochar-based slow-release N fertilizers on maize growth and nitrogen recovery efficiency. *Journal of Environmental Quality*, 52, 630–640.

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