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Switch Bioworks partners with Bayer to advance programmable biological nitrogen fertiliser

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The collaboration targets a persistent challenge in microbial fertilisers: balancing root colonisation with nitrogen production, as the companies explore next-generation biological solutions for growers

Switch Bioworks, a California-based biotechnology company developing engineered microbes that produce nitrogen fertiliser on plant roots, has entered into a strategic collaboration with Bayer Crop Science to advance its genetic switch technology and explore next-generation biological crop inputs. The collaboration will initially focus on biological nitrogen fixation, a field attracting growing interest as agricultural companies seek alternatives that can improve nutrient-use efficiency and support more sustainable crop production.

The central challenge has been to develop microbes that can establish themselves reliably on plant roots while producing sufficient nitrogen to deliver measurable benefits in the field. According to Switch Bioworks, engineered strains designed to produce nitrogen continuously can struggle to colonise roots, while those that establish effectively may not generate enough nitrogen to deliver meaningful agronomic value. Switch's programmable biology platform is designed to address this trade-off. Developed initially at Stanford University, its engineered microbes are programmed to establish on plant roots before activating nitrogen production. In controlled grow-room studies, the company reported that this approach generated five times more nitrogen than strains designed to produce it continuously.

The findings represent an early technical result rather than evidence of equivalent performance under commercial field conditions. The collaboration with Bayer is expected to bring together Switch's microbial engineering capabilities and Bayer's expertise in product development, formulation, field testing and commercialisation. "Bayer's commitment to advancing agriculture through innovative biological solutions is unparalleled, and they have long demonstrated a sophisticated understanding of the complexities of nitrogen performance in corn," said Dr Tim Schnabel, founder and CEO of Switch Bioworks. He described the partnership as a significant milestone for the company and an endorsement of the potential of its technology platform.

For Bayer, the collaboration reflects a broader effort to expand the range of biological solutions available to growers as they contend with unpredictable growing conditions, crop-nutrition challenges and rising expectations for more resilient food

systems. "Growers need more options to manage unpredictable conditions, protect crop potential and optimize their crop nutrition programs," said Benoit Hartmann, Insights, Innovation & Partnerships Lead at Bayer Crop Science.

Hartmann said Bayer works with innovators worldwide, combining their scientific expertise with its capabilities in formulation, field evaluation, product development and commercialisation to accelerate the development of agricultural solutions. Switch Bioworks has secured authorisations from the US Department of Agriculture (USDA) and the Environmental Protection Agency (EPA) for field trials of its engineered microbial fertiliser. Trials are underway at multiple sites across the US Midwest. The company has also secured approvals in Brazil from the National Technical Biosafety Commission (CTNBio).

The ongoing field evaluations will be important in determining whether the technology can translate controlled-environment results into consistent performance across agricultural conditions. Its commercial potential will depend on factors including microbial establishment, nitrogen delivery, crop response and the ability to integrate the product into existing farm-management practices. Switch's genetic switch technology is protected by seven patent families. Although the company is initially applying its platform to agriculture, it sees potential applications in energy, industrial biotechnology and other areas involving microbial systems.

For Bayer, the partnership adds another avenue to explore biological crop inputs alongside its established seed and crop-protection businesses. For Switch, working with a global agricultural company offers an opportunity to advance its technology towards commercial development. The immediate focus remains on establishing whether programmable microbial nitrogen can deliver reliable agronomic value at scale. If successful, the approach could broaden the options available to farmers seeking to improve crop nutrition, although its ultimate contribution to fertiliser efficiency and farm economics will depend on further field validation and commercial deployment.