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“Reconcile land system changes  
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## Economic viability of phosphate-solubilising inoculant application in common bean farming

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### Abstract

The use of inoculants based on phosphate-solubilising microorganisms is an option to increase phosphorus availability to plants, reduce the quantity of chemical fertilisers, and lower the production costs of common bean crops. This study aimed to evaluate the economic viability of applying a phosphate-solubilising inoculant as a strategy to reduce phosphorus fertilisation in common bean production systems. Four field experiments were conducted (Mafra – Rainy Season 2020/21, Santo Antônio de Goiás – Winter 2021, Luziânia – Rainy Season 2021/22 and Santo Antônio de Goiás – Winter 2022) using a randomised complete block design with five replications and seven treatments: absolute control (AC), 50 % phosphorus fertilisation (P50B0), 100 % phosphorus fertilisation (P100B0) and four treatments with different doses of BiomaPhos<sup>®</sup> (inoculant based on *Bacillus subtilis* and *Bacillus megaterium*) combined with 50 % phosphorus fertilisation: 1 mL (P50B1), 2 mL (P50B2), 3 mL (P50B3), and 4 mL (P50B4). The economic analysis was based on grain yield and current market prices and indices. The treatment P100B0 resulted in the highest production cost, averaging US\$ 1,152 ha<sup>-1</sup>. The P50B4, yielded the highest average gross revenue (US\$ 3,610 ha<sup>-1</sup>), net profit (US\$ 2,472 ha<sup>-1</sup>), and benefit-cost ratio (3.35). Inoculation with 4 mL of BiomaPhos<sup>®</sup> led to a benefit-cost ratio 5 % to 22 % higher than absolute control, 50 % phosphorus fertilisation and 100 % phosphorus fertilisation. Inoculation with phosphorus solubilisers not only resulted in high grain yields but also significantly increased profitability. This technology shows great potential for reducing the use of phosphorus fertilisers without compromising yield or economic returns in common bean production.

**Keywords:** *Bacillus* sp., Benefit-cost ratio, Cost of production, *Phaseolus vulgaris* L., phosphate solubilisation, yield