



Tropentag, September 18-21, 2016, Vienna, Austria

“Solidarity in a competing world —  
fair use of resources”

## How Reliable Are Microbial Inoculants in Agriculture for Improving Nutrient Use Efficiency and Growth Promotion? - A Meta-Analysis of Field Studies from 1981 to 2015

LUKAS SCHÜTZ<sup>1</sup>, ANDREAS GATTINGER<sup>2</sup>, MATTHIAS MEIER<sup>2</sup>, ADRIAN MÜLLER<sup>2</sup>, MATHIMARAN  
NATARAJAN<sup>1</sup>, PAUL MAEDER<sup>2</sup>, THOMAS BOLLER<sup>1</sup>

<sup>1</sup>*University of Basel, Environmental Sciences, Switzerland*

<sup>2</sup>*Research Institute for Organic Agriculture (FiBL), Dept. of Soil Sciences, Switzerland*

### Abstract

Application of microbial inoculants, so-called “biofertilisers”, is a promising technology for sustainable agriculture. Rhizosphere microorganisms have evolved together with the plants and represent a valuable resource for improving plant growth and health. Many of them can be utilised to take advantage of their beneficial effects, as they are able to fix nitrogen, help to mobilise soil nutrients, increase water availability or improve plant health. Poor soils are most promising for an application of biofertilisers, and most studies in this area come from tropical and subtropical countries. Centers of research are in India, Iran, Egypt and Argentina. However, soils are highly variable in their composition and soil biota, and the success of inoculation is difficult to predict. We have conducted a meta-analysis to quantify benefits in terms of yield increase, as well as nitrogen and phosphorus use efficiency. Peer-reviewed articles and cross-references published between May 2015 and February 2016 in Web of Science by Thomson Reuter, Scopus by Elsevier and Google scholar were searched with the following keywords: “biofertiliser”, “biofertiliser” and “microbial inoculants”. A total of 544 studies were identified, and 174 studies proved to be eligible for meta-analysis. All data was extracted and integrated into the data matrix. For gap filling of mineral N mineralisation from soil, we employed the nitrogen flux model. These calculations enabled a comprehensive analysis of the influence of biofertiliser technology on nitrogen balance. We found biofertiliser application to be a viable technology to be applied in tropical and subtropical soils. Newly available tools for the analysis of microbial communities will further optimise this technology.

**Keywords:** Biofertiliser, microbial inoculants, nutrient use efficiency