

AGRONOMIC PERFORMANCE OF N- AND P-BBFs

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Substituting conventional inorganic fertilisers with novel biobased fertilisers (BBFs) produced from various organic waste and side streams promotes the circular economy and can potentially reduce environmental and climate impacts of fertiliser production and use. For the substitution to be beneficial for both farmers, environment and food security, the BBFs need to be effective and reliable. We investigated the agronomic performance of seven commercial BBFs supplying nitrogen (N-BBFs) at four different field sites across Europe covering different climates, soil types and crop rotations. In addition, two or three local BBFs were tested at each site, resulting in a total of 18 tested N-BBFs. For phosphorus-supplying BBFs (P-BBFs), P plant availability was assessed through pot and field experiments. Thirty P-BBFs either commercially available or at a high developmental stage were tested in three pot trials conducted under different conditions. A subset of eight fertilizers was also evaluated at five field sites across Europe.

Average first year N fertiliser replacement value was 71%, and most of the 18 N-BBFs can be considered suitable substitutes for mineral N fertilisers. Incorporation rather than surface application tended to increase agronomic performance. Fertilisation efficiency of the P-BBFs could be best explained by the dominant P species as determined via x-ray absorption near-edge spectroscopy. On average, struvites and BBFs classified as inorganic soluble (in neutral ammonium citrate) were as effective as TSP, while fertiliser efficiency for pyrolysed products, inorganic insoluble and organic fertilisers was about 55 %. In the field trials, none of the tested P-BBFs had a significantly lower agronomic efficiency than TSP. From the farmer's perspective, a number of trade-offs must be accounted for when choosing between conventional synthetic or mined inorganic fertilisers and BBFs, i.e. fertiliser cost, yield expectation, agronomic

efficiency, other nutrients, soil fertility benefits, application costs and logistics. Other incentives may be needed for farmers to choose the BBF alternative.

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