

Matching P Fertilizer to Soil Properties and Plant Demand

Emeritus Professor Bob Gilkes

The University of Western Australia

In Brazil and Australia farmers invest heavily in the P fertilization of crops and pastures yet there is insufficient knowledge of the relative effectiveness of different P-fertilizers or of the residual value of P fertilizers for different soils and plants. This uncertainty arises from the complex chemical reactions that occur between P-fertilizers and soils together with the various external P requirements of different plant species. Interpretation of the various soil test values for available P depend strongly on soil properties and P demand by plants so that expert knowledge is required to develop P fertilizer recommendations based on soil test values. The relative value of mineral and organic forms of P in soil and the roles of soil biota in assisting plant uptake of soil P remain unclear. In this presentation I will focus on (1) the importance of matching P-fertilizer type to soil properties and (2) the correct procedure for determining the residual value of P fertilizers. The use of rock phosphate fertilizers especially in tropical areas and for 'organic agriculture' has created a demand for improved knowledge of fertilizer-soil-mycorrhiza-plant-interactions. We are now sufficiently confident to be able to predict when rock phosphate may be used in place of water soluble chemical P fertilizers (WSP)

In order to make fertiliser decisions we must have a detailed knowledge of soil and fertilizer properties, climate and the external P demand of the plant species. The residual value of P-fertilizers presents a major investment/ asset for farmers as it reduces the requirement for freshly applied P-fertilizer. However differences in residual value and the diverse declines in residual value with time for different soils remain poorly understood. The use of rock phosphate fertilizers is sometimes promoted on the basis of their superiority (to WSP) in residual value. However glasshouse and field experiments extending over long periods have not supported this assertion. Indeed many years after application the residual effectiveness of WSP and RP fertilizers commonly converge to the same small value. The determination of accurate residual value functions for P-fertilizers enables farmers to predict optimum (most profitable) rates of P fertilization.