Abstract

Food production has to be greatly increased simply to feed a population growing from 7 billion to in excess of 9 billion over the next 35 years and we still have more than a billion undernourished people. To increase global food production is an unprecedented challenge in the history of agriculture, particularly if we consider that the solutions adopted in the past are much less of an option. Previous solutions have been to increase the area made available for agriculture and to enhance land productivity by an increase in crop yields, with the latter being particularly important. Only limited areas of new land are available for adoption by agriculture but soil degradation and urbanization are removing considerable areas from the existing productive land bank. In consequence, intensification of production is going to be essential. At the same time there is an urgent need to reduce the environmental impacts of food production. It will be crucial to close the gap in yield between the climatic potential and what farmers achieve across the different regions of the world, particularly those areas where the difference is greatest due to environmental, economic, and social conditions. The world is not in a position to ignore the possible contribution from any technological solution on ideological grounds and the concept of sustainable intensification of agriculture has to be on the agenda. Among the possible solutions the intentional use of beneficial soil microbes in agricultural systems is only in its early days. There is a much greater need than ever to find ways of exploiting the benefits from the microbes in our soils and to develop tools that will help farmers implement strategies related to sustainable soil use and management. Our focus is on arbuscular mycorrhizal fungi (AMF) that can impact several soil processes, including the cycling of phosphorus and nitrogen, their acquisition by plants and reducing losses of nitrogen by leaching or volatilization, as well as play other crucial roles within the agricultural ecosystem. AMF can protect their host plants from both biotic and abiotic stresses, including root pathogens, toxic metals, and water shortage. Managing the soil microbiota, particularly AMF, has the potential not only to increase production, while decreasing the incorporation of inputs, with the potential to be applied to productive and marginal soils and used in regions of the world where the resources required by farmers are scarce.

Keywords: Population growth; agricultural production; environmental

impacts; sustainable intensification; agricultural land bank; yield gap; technological solutions; soil biota