

Chapter 2

The Importance of Microbiology in Sustainable Agriculture

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Abstract Deriving from various naturally-occurring microorganisms such as bacteria and fungi, microbial technologies can protect crops from pests and diseases and enhance plant productivity and fertility. They enable farmers to increase yield and productivity in a sustainable way and are expected to play a significant role in agriculture.

As the global population's rapid growth is set to continue, the need to significantly increase agricultural output without increasing pressure on the environment also grows. Microbial solutions enable farmers to drive yield and productivity in a sustainable way. Deriving from various naturally-occurring microorganisms such as bacteria and fungi, these solutions can protect crops from pests and diseases and enhance plant productivity and fertility.

Microbial solutions make up approximately two thirds of the agricultural biologicals industry. Representing roughly US\$ 2.3 billion in annual sales, agricultural biologicals have posted double-digit sales growth each of the last several years. There are numerous biological products currently on the market that contain microorganisms as active ingredients, including seed treatment and foliar applied products. Microbial technologies can help improve nutrient acquisition, promote growth and yield, control insects and protect against disease. These emerging agricultural biological technologies complement the integrated systems approach that is necessary in modern agriculture, bringing together breeding, biotechnology and agronomic practices to improve and protect crop yields.

There has been significant interest in agricultural biologicals in the past few years from major crop chemical manufacturers, including Bayer's acquisition of Agraquest, BASF's acquisition of Becker Underwood, and Syngenta's acquisitions of Pasteuria and Devgen. Most recently, Novozymes and Monsanto established The

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BioAg Alliance in December 2013, with a goal to discover, develop and sell microbial solutions that enable farmers worldwide to increase crop yields with less chemical input. Novozymes brought an established product portfolio and strengths within microbial discovery, application development and fermentation to this partnership. Combined with Monsanto's highly-developed seeds and traits discovery, field-testing and extensive commercial network, the aim is to deliver a comprehensive research, development and commercial collaboration from which agriculture, consumers, the environment and society at large can benefit.

Microbial solutions provide more choice for farmers and help meet the demand for more sustainable agricultural practices. Such solutions can increase crop yields and develop a more sustainable industry impact profile, ultimately resulting in more food to feed the growing world and new opportunities to protect the planet.