



Sustainable intensification of transgenic cotton in India - A review

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ABSTRACT

World population is projected to reach over nine billion by the year 2050, and ensuring fiber security while mitigating environmental impacts represent a major agricultural challenge. Conventional cotton (*Gossypium* sp) production technologies had significant effects on the environment and farm profitability in the past. New era transgenic or *Bt* cotton production technology can be used to simultaneously reduce the environmental footprint and enhance the profitability of cotton production. Information on these two sustainability aspects of transgenic cotton is missing in the scientific literature. Here, we review the potential advantages of insect tolerance *Bt* insect resistant technology used in hybrid cotton by comparing with the major cereal based rotations in India. Our results suggested that by using this technology, there was significant reduction in pesticide use roughly by 40%, and yield advantages of 30-40%. These resulted in saving on fossil fuels and decreasing CO₂ emissions– which are major bonus for climate change mitigation. During the last decade, significant increase in cotton area and production in India is attributed to better returns realized by the farmers, which were largely due to better management practices followed to grow transgenic cotton. Most of the studies conducted in India, concluded that *Bt*-cotton is more efficient in input use and had a lower environmental impact quotient, which indicates less damage to the environment than non-*Bt*-cotton. However, *Bt*-cotton based cropping systems have less profitability and energy efficiency in comparison to the major cereal based rotations in India due to lesser productivity potential of cotton crop particularly in rain-fed ecosystems. This was mainly attributed to the lesser dissemination of proven energy-efficient research technologies to the farmer's fields. Although, *Bt*-cotton can contribute to a “sustainable intensification” strategy favoured by many science academies worldwide, which allows productivity/production to be increased in the current crop land, thereby saving forests and biodiversity.

Key words: Cotton, Cropping systems, Economics, Environment, Sustainability, Transgenic