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# Agronomic and economic performance of organic, conventional and GM-cotton in Central India

## First results of a long-term farming systems comparison

### Background

Over the past five years the organic cotton production in India has grown many folds. In the conventional cotton arena, the genetically modified cotton is growing at an unprecedented rate. In view of these developments, it was considered necessary to carry out a systematic comparison between the various cotton production systems common in the area. Further, this research attempts to address the larger issues:

- Put the discussion regarding the benefits and drawbacks of organic agriculture on a rational footing;
- Help to identify challenges for organic agriculture that can then be addressed systematically;
- Provide physical reference and meeting points for stakeholders in agricultural research and development and thus support decision-making and agricultural policy dialogue at different levels.

### Methodology

Environmental and economic performance of organic agriculture is assessed in a field experiment in the cotton belt of Central India (Madhya Pradesh). It comprises four treatments: (1) bio-dynamic cotton; (2) organic cotton; (3) conventional cotton; and (4) genetically modified Bt cotton. All four systems are practised by farmers in the project area. The treatments have four replicates. Agronomic performance, product quality, natural and economic resource efficiency, soil fertility, plant – insect interactions and biodiversity are evaluated in a 2-year crop rotation including cotton, soya and wheat. The experiment started in 2007 and will be operated for 10 to 20 years. One-way ANOVA and Tukey test ( $\alpha = 0.05$ ) were used to analyse the results of the first year.

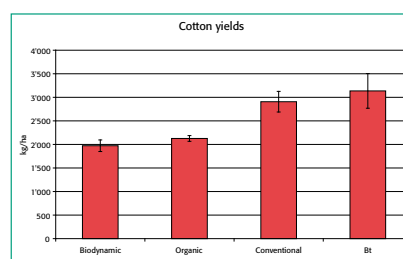
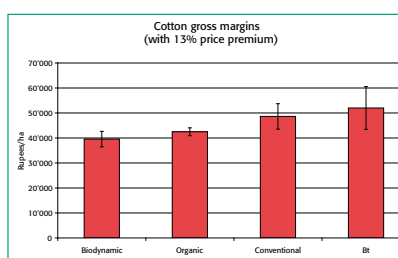


Figure 1. Yields (kg/ha) of biodynamic, organic conventional and Bt cotton in the first year after conversion. Vertical bars are standard errors of the means

Figure 2. Gross margins (Rupees/ha) of biodynamic, organic, conventional and Bt cotton in the first year after conversion, including a price premium of 13% for biodynamic and organic cotton. Vertical bars are standard errors of the means.



Farmers are highly interested in the trial. About 15 farmers' groups visited the field in the first cotton season. Insert: the cotton crop one month after sowing.

### Results of the first year

The first year (Fig. 1) produced organic and biodynamic cotton yields that were 32% lower than the conventional and Bt cotton yields ( $P = 0.0013$ ). There was neither a difference between biodynamic and organic cotton yields, nor between conventional and Bt cotton yields, however. Production costs, although lower in organic and biodynamic cotton than in conventional and Bt cotton, had only a marginal effect on the gross margins. A premium of 13% on top of the regular cotton price levelled the differences between the gross margins of the four treatments out ( $P = 0.1435$ ; Fig. 2).

### Discussion

The low biodynamic and cotton yields are typical for the first years after conversion from conventional agriculture. It is expected that yield levels of organic and biodynamic cotton will increase in the coming years. To which level they can raise in the mid to long term, is subject of this trial. The results show the importance of premium prices for organic cotton to make organic cotton production economically interesting and thus sustainable.

### Beyond India

Similar trials are run in sub-humid Kenya in a maize/beans/vegetable farming system and in humid Bolivia in cacao grown in agroforestry systems.

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