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David against Goliath: Participatory non-GM cotton breeding to safeguard organic cotton production in India

Introduction

Genetically modified F1 hybrids of American cotton *(Gossypium hirsutum)* account for more than 95 % of the cotton area in India. The non-GM cotton seed market became completely eroded and locally adapted Desi cotton *(G. arboreum, G. herbaceum)* almost disappeared. Due to lack of commercial seed, organic cotton growers got engaged in decentralized participatory cotton breeding to develop their own locally adapted cultivars and to reintroduce the traditional more robust Desi cotton species. The main objectives were capacity building and empowerment of male and female farmers, identification of existing non-GM American and Desi cotton which are suitable for organic farming, development of new improved cultivars and initiating cooperation among farmers, breeders, processors, and traders.

Selection of best cultivars by female farmers

G. hirsutum hybrid

G. arboreum varietal line

Results and Discussion

Traditional *G. arboreum* cotton are more resilient against sucking pests and drought than *G. hirsutum* and have higher yields especially under rainfed conditions. However, only few cultivars reach the necessary fibre length. Inbred lines can outyield hybrids under less favorable conditions. Ten promising non-GM cotton cultivars were found with high yield and good fibre quality. A broad range of genotypes is necessary to cover the different growing conditions and demands of the textile industry. Continuous breeding is indispensable to cope with climate change, new pests, and diseases. Participatory breeding is a very effective tool for developing locally adapted cultivars and for strengthening the relationship along the value chain. By engaging farmers using participatory methods, they became researchers and breeders in their own fields.

Methodology

At bioRe in Madhya Pradesh and Chetna Organic in Odisha we established replicated on-station trials of more than 50 genotypes (mother trials) under fertile and shallow soils across 2–3 years, on-farm trials with most promising cultivars (baby trials), performed new crosses and single plant selection, accompanied by farmer training in cultivar testing, seed multiplication, crossing and selection, and networking and awareness rising at local and international level.

Outlook

The project will be continued and upscaled (Green Cotton Phase II: "Seeding the Green Future") with the additional support of the textile industry represented by Organic Cotton Accelerator (OCA) involving additional farmers associations (Pratibha Synthex, Cottonconnect, ASA India) and universities (Gwalior and Akola) in India. We also aim to establish a global organic cotton seed network for improved exchange of knowledge.

Farmer managing his on-farm cultivar trial

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