Knowing the impact of organic cotton production

System comparison study and on-farm trials on organic cotton in India

Dionys Forster
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Background: DOK Long-term trial Therwil (BL)

Since 1978, DOK Trial, Therwil (BL), Switzerland

- 8 treatments
- 5 crops in a 7 years' rotation
- 4 replications
- 96 plots à 100m²
- 30 year-trial
Selected results of the DOK trial

- Winter wheat yield: Organic 4.7 t/ha; Conventional 5.6 t/ha (−15%)
- Fertilisation (NH₄NO₃ Equivalent): Organic 122 kg/ha; Conventional 360 kg/ha (−60%)
- Energy (Diesel Equivalent): Organic 340 l/ha; Conventional 570 l/ha (−30%)
- Plant protection (Active Ingredients): Organic 0-200 g/ha; Conventional 6.0 kg/ha (−97%)
- Soil fertility (Microbial Biomass): Organic 40 t/ha; Conventional 24 t/ha (+60%)

Mäder et al. (2002), Science 296
Objectives of the long-term system comparison trial

The objective is to quantify:

- How organic agriculture (OA) influences
  - yield and yield stability
  - product quality
  - product storability

- How OA influences the agro-ecological system
  - soil fertility
  - beneficial organisms
  - biodiversity

- How OA influences natural and economic resource effectiveness (output/input relationships)
FiBL long-term system comparison trial

Bolivia

Agro-forestry
> humid
> cocoa

Kenya

Subsistence agr.
> semi-humid
> maize
> vegetables

India

Cash crop
> semi-arid
> cotton
> soya
> wheat
Location and trial setup

- Location: Central Indian cotton belt (Madhya Pradesh)
- Eco-zone: Semi-arid tropics
- Agricultural system: Annual fibre and food crops (cash crops)
- Crop rotation:
  
<table>
<thead>
<tr>
<th>Year 1</th>
<th>Year 2</th>
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<tbody>
<tr>
<td>Cotton</td>
<td>Soya</td>
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<td></td>
<td>Wheat</td>
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</table>
- Treatments: (1) Biodynamic, (2) organic, (3) conventional and (4) GM-cotton
- Trial start: May 2007
- Partners: bioRe India Association
Trial setup and plot allocation

Main road

BD  ORG  CON  BT  
1    2     3     4

BD  ORG  CON  BT  
5    6     7     8

BD  ORG  CON  BT  
9    10    11    12

BD  ORG  CON  BT  
13   14    15    16

Block 1  Block 2  Block 3  Block 4

400m

45m

bioRe Association India Training Centre
Treatments and fertiliser

- Nutrient input to conventional and GM-cotton treatment:
  - Based on Indian Council of Agricultural Research (ICAR)
  - Adjusted to conventional farmers practice
  - 80% chem. fertiliser and 20% organic fertiliser
  - GM-cotton: + 20% chem. fertiliser compared to conv. cotton

- Nutrient input to biodynamic and organic treatment:
  - N + P supply is about 50% of the conventional practice
  - Corresponds to organic farmer’s practice
  - 100% organic fertiliser

- Experience of the last two years
  - Cotton – soya – wheat is an intensive rotation
  - Nitrogen is limiting factor
On-farm validation trials

Based on first experiences of the long-term systems comparison trial:

- Validate and complement the results of the long-term field trial under on-farm conditions
- Support conventional farmers in the conversion from conv. to organic

Participatory technology development activities

- On-farm / on-station trials on green manuring (precrop, undersowing)
  - Leguminous crops (gliricidia, sesbania, crotalaria, mung bean)
  - Brassicaceae
- On-farm / on-station trial on phosphate rock solubility on high pH soils
  - Compost and different additives are tested for phosphate rock solubilisation
Outlook

Issues during the first 4-5 year (conversion period):

- Improve nutrient status through green manures and mulches
- Develop efficient phosphorus sources (e.g. phosphate rock)
- Further adjustment of the trial systems to farmers practices
- First indications on soil fertility are expected after 4-5 years
- Agronomic and economic analysis after first 4-5 years
Partners and donors:
Thank you for your attention!

Visit FiBL on our website: www.fibl.org or contact: dionys.forster@fibl.org