Organic cotton and climate change

Jens Soth

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Interlaken, Switzerland
21 – 24 September 2009
Carbon markets as option for additional income for cotton producers?

Agriculture on the agenda of IPCC as LULUCF:
(Land use, land-use change and forestry)

Carbon sequestration in products and soil as change to be sold....
....either within the official emission trading (60 bn US$ in 2007) or private schemes (4 bn US$ by 2010).
Cotton biomass unlikely to be accepted as credit
Major GHG components in cotton production

- GHG Emissions
  - Mineral fertilizer and pesticide production
  - Energy input
  - Carbon fixed in product
  - CO₂ From urea application
  - Nitrous oxide
  - Soil organic matter

GHG Emissions

- SOIL organic matter
- CO₂ from urea application
- Nitrous oxide
- Carbon fixed in product
- Energy input
- Mineral fertilizer and pesticide production
Fertilizer and pesticide production

Worst Case

Best Case

1,7 kg CO₂eq. / kg lint

0 kg CO₂eq. / kg lint
Tillage and planting

Worst Case

Best Case

0.2 kg CO2eq. / kg lint

0 kg CO2eq. / kg lint
Fertilizer & pesticide application

Worst Case

0,1 kg CO2eq. / kg lint

Best Case

0 kg CO2eq. / kg lint
Irrigation pumps

Worst Case

0.8 kg CO₂eq. / kg lint

Best Case

0 kg CO₂eq. / kg lint
Harvest

**Worst Case**

0,1 kg CO2eq. / kg lint

**Best Case**

0 kg CO2eq. / kg lint
Nitrous oxide emissions

**Worst Case**

2.4 kg CO2eq. / kg lint

**Best Case**

0.5 kg CO2eq. / kg lint
## Broad range of data in cotton production

<table>
<thead>
<tr>
<th>Operation OR Factor</th>
<th>Min</th>
<th>comment for low rate</th>
<th>Max</th>
<th>comment for high rate</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>kg CO₂ Eq. / kg lint</td>
<td>%</td>
<td>kg CO₂ Eq. / kg lint</td>
<td>%</td>
</tr>
<tr>
<td>Fertilizer &amp; Pesticide Production</td>
<td>0</td>
<td>0</td>
<td>1,7</td>
<td>31,5</td>
</tr>
<tr>
<td></td>
<td></td>
<td>if organic OR unfertilized</td>
<td></td>
<td>based on application rates from ICAC 2008</td>
</tr>
<tr>
<td>Tillage &amp; Planting (fuel for machines)</td>
<td>0</td>
<td>0</td>
<td>0,2</td>
<td>3,0</td>
</tr>
<tr>
<td></td>
<td></td>
<td>animal traction, unequipped production</td>
<td></td>
<td>few data sources, examples from US</td>
</tr>
<tr>
<td>Applications (fertilizers, pesticides)</td>
<td>0</td>
<td>0</td>
<td>0,1</td>
<td>2,6</td>
</tr>
<tr>
<td></td>
<td></td>
<td>organic production OR unequipped</td>
<td></td>
<td>few data sources, examples from US</td>
</tr>
<tr>
<td>Irrigation pumps</td>
<td>0</td>
<td>0</td>
<td>0,8</td>
<td>16,0</td>
</tr>
<tr>
<td></td>
<td></td>
<td>rainfed</td>
<td></td>
<td>few data sources, examples from US</td>
</tr>
<tr>
<td>Harvest (without Gin &amp; Transport)</td>
<td>0</td>
<td>0</td>
<td>0,1</td>
<td>2,2</td>
</tr>
<tr>
<td></td>
<td></td>
<td>handpick</td>
<td></td>
<td>few data sources, examples from US</td>
</tr>
<tr>
<td>Nitrous oxide emission</td>
<td>0,3</td>
<td>100</td>
<td>2,4</td>
<td>44,8</td>
</tr>
<tr>
<td></td>
<td></td>
<td>rainfed, low N rate</td>
<td></td>
<td>calculated from ICAC 2008 and Scheer et al. 2008</td>
</tr>
<tr>
<td>TOTAL Emissions</td>
<td>0,3</td>
<td>100</td>
<td>5,3</td>
<td>100</td>
</tr>
</tbody>
</table>
Mitigate climate change via sustainability measures

1. Less fertilizers & pesticides
2. Less emissions of N\textsubscript{2}O
3. Organic manures
Examples for quantification per ha (organic cotton)

- **Savings by not applying agrochemicals**
  - 0.3 – 0.8 tons of CO$_2$

- **Carbon sequestration (soil NOT fibre)**
  - 0.4 – 0.9 tons of CO$_2$

- **Nitrous oxide and urea**
  - 0.3 – 1.5 tons of CO$_2$

**TOTAL:** 1.0 – 3.2 tons of CO$_2$ eq.
Example for quantification

TOTAL:

1,0 – 3,2 tons of CO₂ eq / ha

15 € per ton of CO₂

15,00 – 48,00 € per ha

450 kg seed cotton * 0,75 € = 337,50 € per ha revenue

ca. 4.2 - 14% of annual revenue per ha in smallholder production system
Adaptation to climate change

1. Low external input approach
   - Low risk of financial loss
2. Increase of soil organic matter
   - Higher water retention
3. Diversification of crop rotation
   - Low risk of crop loss
Pressure on the agricultural land

- Change of dietary habits
- Soil loss and degradation
- Biofuels
- Population increase -> drastic change of land per capita – food scarcity
- Water scarcity
- Acceleration by climate change
Examples from the Swiss textile industry 1 / 3

Switcher Climate Project: CO₂-neutral T-Shirt

Report Preliminary Study (Draft version 17 January 2006)

Daniel Lehmann Pollheimer

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• Disclosure of carbon footprint:
  www.respect-code.org

• Switcher Project:
  Climate neutral textiles

• Compensation via biomass furnace substituting crude oil
Climate neutral textiles: Compensation via Biogas digesters
Examples from the Swiss textile industry 2 / 3

Shirts for the policemen of the City of Zurich

100% organic cotton fabric ->
previous model PE / conventional cotton

Spinning mill:
Hydropower integration (15%)

Dyehouse:
Heat recovery from dyebaths

Cooperation of Swiss textile companies:
Production radius < 100 km

Excursion #1 on
Friday, 25th

HELVETAS

WCOC 2009 Organic cotton and climate change
Some simple take-aways

Measures to reduce GHG emissions anyway useful

Direct partnerships with textile mills as interesting option

Organic cotton as useful testing ground: certification already included