Solving Africa’s Weed Problem:
Increasing Crop Production &
Improving the Lives of Women

Leonard Gianessi, CropLife Foundation
Sub-Saharan Africa

- 43 Countries
- 700 Million People
- 180 Million Farms
- 170 Million Crop Hectares
Typical Smallholder Farm
1 hectare: 2.5 Acres (1 U.S. city block)
Weedy Maize Field

Weeds compete with crops for space, nutrients, sunlight and moisture reducing crop yields.

Maize Yield Reduced 90%
## African Yields (Tons/hectare)

<table>
<thead>
<tr>
<th></th>
<th>Maize</th>
<th>Rice</th>
</tr>
</thead>
<tbody>
<tr>
<td>Experimental Plots</td>
<td>8</td>
<td>4</td>
</tr>
<tr>
<td>Average Farmer</td>
<td>1-2</td>
<td>1</td>
</tr>
</tbody>
</table>

DeVries and Toenniessen, 2001
Tittonel, et al, 2007
Optimal Yields on Experimental Plots

- Plant at Right Time
- Weed at Right Time
- Fertilize at Right Time
Weeds Need to be Removed Before Planting a Field
Removing Weeds Before Planting with Hand Hoes

60 hours/hectare

Enete, Nweke, & Tollens, 2002
Weeds Need to be Removed During the Growing Season

30-40% Yield Loss
Handweeding is the Predominant Weed Control Practice in Sub-Saharan Africa

- 50-70% of the labor in crop production is spent weeding.

Chikoye, et al, 2007
Female Labor Contribution to Weeding - Nigeria

<table>
<thead>
<tr>
<th>Crop</th>
<th>%</th>
</tr>
</thead>
<tbody>
<tr>
<td>Maize</td>
<td>95</td>
</tr>
<tr>
<td>Cassava</td>
<td>90</td>
</tr>
<tr>
<td>Cowpeas</td>
<td>100</td>
</tr>
<tr>
<td>Rice</td>
<td>80</td>
</tr>
</tbody>
</table>

Ukeje, 2004
Handweeding Permanently Deforms Women’s Spines

To weed one hectare a woman walks 10 kilometers in a stooped position.
Hours of In-Crop Handweeding Required for Optimal Yields

(Hours/Hectare)

<table>
<thead>
<tr>
<th>Crop</th>
<th>Hours/Hectare</th>
</tr>
</thead>
<tbody>
<tr>
<td>Groundnuts</td>
<td>378</td>
</tr>
<tr>
<td>Cassava</td>
<td>270</td>
</tr>
<tr>
<td>Maize</td>
<td>276</td>
</tr>
<tr>
<td>Sorghum</td>
<td>150</td>
</tr>
</tbody>
</table>

Akobundu, 1987
## Weed Free Period Required for Optimal Yields

<table>
<thead>
<tr>
<th>Crop</th>
<th>Days After Planting</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cassava</td>
<td>84</td>
</tr>
<tr>
<td>Maize</td>
<td>56</td>
</tr>
<tr>
<td>Rice</td>
<td>42</td>
</tr>
<tr>
<td>Sorghum</td>
<td>35</td>
</tr>
</tbody>
</table>

Akobundu, 1987
<table>
<thead>
<tr>
<th># of Weedings</th>
<th>0</th>
<th>1</th>
<th>2</th>
<th>3</th>
</tr>
</thead>
<tbody>
<tr>
<td>Yield kg/ha</td>
<td>73</td>
<td>249</td>
<td>401</td>
<td>549</td>
</tr>
</tbody>
</table>

Prentice, 1972
Labor “Bottleneck”

- Several different crops are planted in sequence on each farm.
- Weeding of crop planted first is often delayed by need to plant the next crop.
- Weeding of crops is not done at optimal time.
- Farmer practice: partial weeding.
Constraints on Timely Hand-Weeding

- Women can be too tired or sick (malaria)
- Fields can be muddy
- Competing time demands: child care
- Pregnancy
Male Labor for Weeding

- Becoming Scarce
  - Off-Farm Employment
  - Urban Migration
  - AIDS
- Becoming Expensive
In Africa, 69% of farmers’ children between the ages of 5-14 are forced to leave school and are employed in the agricultural sector especially at peak periods of weeding.

In Malawi, one-third of the area planted to maize by smallholders is either left unweeded or weeded after the critical six weeks.

Orr, Mwale & Saiti, 2002
One effect of labor shortage is that more land on the farm is left fallow. The area cultivated is often reduced by 50%.

Bishop-Sambrook, 2003
In Africa, yield losses due to weeds range from 25% to total crop failure. The majority of farmers identify weeding as the major constraint in their farming systems.

Vissoh, et al, 2004
Given the strategic importance of fertilizer to end hunger, the African Union member states resolve to increase the level of fertilizer use by 500% by 2015.

Africa Fertilizer Summit, 2006
Sub-Saharan Africa
Inorganic Fertilizer Use

Farmers Using 5%
Application Rate <50 kg/ha
Recommended Rates 250-350 kg/ha

Dar & Twomlow, 2004
Applying Fertilizer
Benefits of fertilizer use dependent on weed control

- Certain weeds absorb nutrients faster than crops
- Without weed control, increased fertilizer use leads to more weeds
- Farmers reluctant to increase fertilizer use
  - Increased need for hand weeding
  - “Labor bottleneck”
    - Labor not available for applying fertilizers
The Spraying of Chemical Herbicides is an Alternative to Handweeding
Killing Weeds Before Planting
Weeds Killed Before Planting With Herbicides

-60 hours/hectare Handweeding
+2 hours/hectare Herbicide Spray

Gouse, et al, 2006
Residual Power of Chemical Herbicides

- Some chemicals can be sprayed on the soil.
- They stay active in the soil for weeks.
- Germinating weed seeds are killed.
Cotton Experiment: 4 Weeks After Herbicide Spray

-254 hours/hectare Handweeding

+1.5 kg/hectare of Chemical

Lagoke, et al, 1992
Just over 3% of African smallholder farmers are using herbicides in their maize fields.
Lack of knowledge is the most limiting factor in the adoption of herbicide technology. There is a need to train extension workers on herbicide technology, who would in turn train the farmer. If the smallholder farmers are given technical support, they would take advantage of herbicide technology and improve crop production.

Makanganise, et al 1999
Maize Experiment: Kenya

“Chemical weeding was one-third of the cost of two hand-weedings.”

CropLife Foundation/CNFA
Africa Weed Control Project

- Herbicide Treatments-Demonstration Plots
  - 2008-2010, Malawi/Kenya/Tanzania
  - 50 Agrodealer Locations

- CropLife member companies are supplying products, technical and financial support
Typical Agrodealer Shop
Field Day – CLF/CNFA Project

Over 3000 farmers visited the plots
Maize Plot – For Handweeding
Maize Plot – Herbicide Treatment

Yield +26%; -150 Hours of labor/hectare; -50% Lower costs
Field Day Training in Herbicides at Agrodealers
Herbicide Applicator Training at Agrodealer
U.S. Weed Science Volunteers

- Notices were placed in WSSA newsletter for volunteers
- 33 land grant university weed scientists applied
- 4 were supported with federal funds to aid in research and education at demonstration plots
Phil Stahlman, Kansas State University
Volunteer Instructor, Malawi Weed Trials
CLF/CNFA Africa Weed Control Project

- Continue education/outreach campaign
- Expand the demonstration trial program
- Increase number of US weed science volunteers
- Improve African weed science societies and weed science research and education capacity
African Weed Control: Current Practice

- 135 million hectares, 135 million women
- 200 hours/hectare
  - 27 billion hours
  - 20-100% yield loss
What is 100 million hectares?

- 100 million hectares equals total US acreage of maize, wheat, sorghum, soybeans & cotton
Summary: Herbicide Use Impacts; Africa

- 20-50% increase in crop production due to improved weed control
- More fields planted
- Increased fertilization
Improving weed control with herbicides would improve women’s lives

- Less drudgery
- Fewer back problems
- More schooling
- More time for other activities
  - Off-farm employment
  - Planting additional cash crops
Increased Herbicide Use: More Schooling

The small number of farmers who use herbicides send a higher proportion of their children to school.

Overfield, et al, 2001