AR-NAFAKA Project Aflatoxin Management: 2016–2017 Progress

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International Institute of Tropical Agriculture

Africa RISING - NAFARKA Scaling Project End-of-project phase Review Meeting
Dar es Salaam, Tanzania, 3-4 July 2017
What is Aflatoxin

- Aflatoxin is a poison produced by Aspergillus spp.
- A. flavus and A. parasiticus
- Aspergillus is found in the soil and on dead & decaying organic matter
- Aflatoxin is colourless – can not be seen
- Grain with no visible signs of A. flavus can contain high amounts of aflatoxin
- Laboratory tests only way to determine presence of aflatoxins
Health Impacts of mycotoxins

- Toxicity of mycotoxins can be acute or chronic, and results in:
  - Disorders in the digestive system
  - Compromised gastrointestinal function, interfering with absorption of nutrients
  - Deterioration of liver, renal or kidney function
  - Immune suppression
  - Cancer of the liver and oesophagus
  - Birth defects and neural tube defects
  - Impairment of child growth and development (stunting)
  - Death – exposure to high doses
Deadly food poison linked to 14 deaths in two regions

Tanzania Daily News (Dar es Salaam)

Tanzania: Strange Disease Linked to Aflatoxin Poisoning

Tagged: East Africa • Health • Human Rights • Land and Rural Issues • Tanzania

By Hilta Mhagama

As the number of patients who contracted the mysterious disease that ravaged parts of Chemba and Kondoa districts in
Symptoms

- Tanzania: 2016
  - 65 cases reported
  - 19 fatalities
  - Vomiting
  - Diarrhea
  - Swelling of abdomen
  - Yellowing of eyes
Mycotoxin Awareness is very low

Number of Interviewees

- Bukombe: 81%
- Kongwa: 65%

Districts
Aflatoxin awareness in Tanzania

Aflatoxin awareness level (%)

Districts

- Babati
- Hanang
- Kiteto
- Sumbawanga
- Nkasi
- Ifajara
- Kilosa
- Mbinga
- Songea Rural
- Chamwino
- Nanyumbu
- Masasi
- Iringa Rural
- Urambo
- Nzega
- Kahama
- Bukombe

- Not Aware
- Aware
Interventions

Awareness creation

Aflatoxins and health impacts

Interventions
Sensitization meetings

<table>
<thead>
<tr>
<th>Group</th>
<th>Male</th>
<th>Female</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Government</td>
<td>139</td>
<td>38</td>
<td>177</td>
</tr>
<tr>
<td>Farmers</td>
<td>938</td>
<td>184</td>
<td>1122</td>
</tr>
<tr>
<td>Total</td>
<td>1077</td>
<td>222</td>
<td>1299</td>
</tr>
</tbody>
</table>

Kiteto

Chamwino

Kibaigwa
Farm field day (Kongwa)

<table>
<thead>
<tr>
<th></th>
<th>Male</th>
<th>Female</th>
<th>Total</th>
</tr>
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<tbody>
<tr>
<td></td>
<td>310</td>
<td>258</td>
<td>568</td>
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</table>
Media Familiarization Day

<table>
<thead>
<tr>
<th>Male</th>
<th>Female</th>
<th>Total</th>
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</thead>
<tbody>
<tr>
<td>24</td>
<td>14</td>
<td>38</td>
</tr>
</tbody>
</table>
Aflatoxin management brochure

- Pre-testing

<table>
<thead>
<tr>
<th>Group</th>
<th>Male</th>
<th>Female</th>
<th>Total</th>
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</thead>
<tbody>
<tr>
<td>Government</td>
<td>24</td>
<td>3</td>
<td>27</td>
</tr>
<tr>
<td>Farmers</td>
<td>38</td>
<td>13</td>
<td>51</td>
</tr>
<tr>
<td>Total</td>
<td>62</td>
<td>16</td>
<td>78</td>
</tr>
</tbody>
</table>

- Finalizing brochure (put a photo of brochure here. Take a screen short)
Integrated approach to manage aflatoxins

- Aggregation
- Aflatoxin testing
- Market linkages
- Policy and advocacy
- Intervention technologies
- Training for pre/postharvest afla management
- Inputs & training to improve productivity
- Farmer groups/ value chain/Finance
- Awareness and sensitizations
Interventions testing

• Aflatoxin bio-control
  • Conducted aflatoxin biocontrol trails
  • Use of Aspergillus flavus strains that do not produce toxins
  • Naturally outcompete the toxic producing strains, reducing their population and hence aflatoxin

• 4 Regions
  • Manyara
  • Dodoma
  • Mtwara
  • Morogoro
Aspergillus flavus life cycle

Atoxigenic strains will reach maize, instead of toxigenic strains = reduced aflatoxin contamination
Competitive exclusion

Non treated Field
High aflatoxin contamination

Treated Field
Little to No aflatoxin contamination

Deadly (3,700 ppb & 2,270 ppb)
533 ppb

Non treated Field

Treated Field

Control  Treated

Above 1,000 ppb
500 to 1,000 ppb
100 to 500 ppb
10 to 100 ppb
0 to 10 ppb

Deadly (3,700 ppb & 2,270 ppb)
533 ppb
Biocontrol with Atoxigenic strains

Non-treated Field

Crop fungal content is the same in treated and untreated fields
Aflatoxin reduced by >80%

Treated Field
## Aflasafe Development

<table>
<thead>
<tr>
<th>S/N</th>
<th>Aflasafe TZ01 (Region-specific)</th>
<th>Aflasafe TZ02 (Tanzania specific)</th>
</tr>
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<tbody>
<tr>
<td></td>
<td>Isolate</td>
<td>Haplotype</td>
</tr>
<tr>
<td>1</td>
<td>TMS199-3</td>
<td>BOWAGA</td>
</tr>
<tr>
<td>2</td>
<td>TGS364-2</td>
<td>BOHIYA</td>
</tr>
<tr>
<td>3</td>
<td>TMH 30-8</td>
<td>BOHOCO</td>
</tr>
<tr>
<td>4</td>
<td>TMH104-9</td>
<td>BOPAJI</td>
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</table>
## Aflasafe efficacy results 2016

<table>
<thead>
<tr>
<th>Region</th>
<th>District</th>
<th>Crop</th>
<th>Treatment</th>
<th>Mean Aflatoxin (ppb)</th>
<th>Reduction (%)</th>
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</thead>
<tbody>
<tr>
<td>Morogoro</td>
<td>Kilosa</td>
<td>Maize</td>
<td>Treated</td>
<td>1.4</td>
<td>51.8</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Control</td>
<td>2.9</td>
<td></td>
</tr>
<tr>
<td>Kilombero</td>
<td>Maize</td>
<td>Treated</td>
<td>0.5</td>
<td>95.6</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Control</td>
<td>11.9</td>
<td></td>
</tr>
<tr>
<td>Manyara</td>
<td>Babati</td>
<td>Maize</td>
<td>Treated</td>
<td>1.9</td>
<td>77.7</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Control</td>
<td>8.5</td>
<td></td>
</tr>
<tr>
<td>Dodoma</td>
<td>Mpwapwa</td>
<td>Groundnut</td>
<td>Treated</td>
<td>145.8</td>
<td>57.3</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Control</td>
<td>341.4</td>
<td></td>
</tr>
<tr>
<td>Kibaigwa Township</td>
<td>Maize</td>
<td>Treated</td>
<td>2.2</td>
<td>75.8</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Control</td>
<td>9.1</td>
<td></td>
</tr>
<tr>
<td>Mtwara</td>
<td>Masasi</td>
<td>Groundnut</td>
<td>Treated</td>
<td>21.9</td>
<td>94.6</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Control</td>
<td>401.0</td>
<td></td>
</tr>
<tr>
<td>Nanyumumbo</td>
<td>Groundnut</td>
<td>Treated</td>
<td>57.4</td>
<td>82.5</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Control</td>
<td>326.8</td>
<td></td>
</tr>
</tbody>
</table>
## Aflasafe Trials - 2017

<table>
<thead>
<tr>
<th>Region</th>
<th>District</th>
<th>Number of Trails</th>
<th>Observation</th>
</tr>
</thead>
<tbody>
<tr>
<td>Songwe</td>
<td>Mbozi (M)</td>
<td>20</td>
<td>Not Treated</td>
</tr>
<tr>
<td></td>
<td>Mpwapwa (G)</td>
<td>30</td>
<td>4 fields same of 2016 season</td>
</tr>
<tr>
<td></td>
<td>Kongwa (G)</td>
<td>12</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Kongwa (M)</td>
<td>20</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Kiteto (M)</td>
<td>20</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Kondoa (M)</td>
<td>20</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Chemba (M)</td>
<td>20</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Chiamwino (M)</td>
<td>20</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Kibaigwa (M)</td>
<td>20</td>
<td>10 treated in 2017 and 10 from 2016</td>
</tr>
<tr>
<td>Dodoma</td>
<td>Kilosa (M)</td>
<td>30</td>
<td>4 fields same of 2016 season</td>
</tr>
<tr>
<td></td>
<td>Kilombero (M)</td>
<td>30</td>
<td>4 fields same of 2016 season</td>
</tr>
<tr>
<td>Morogoro</td>
<td>Masasi (G)</td>
<td>26</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Nanyumumbo (G)</td>
<td>26</td>
<td></td>
</tr>
<tr>
<td>Total</td>
<td></td>
<td>294</td>
<td></td>
</tr>
</tbody>
</table>
Way Forward

• Aflatoxin sensitization meetings (Iringa rural, Kilolo and Vbomero districts)
• Media training workshop (Dare s Salaam and Morongoro) – July 17-21
• Printing and dissemination of brochure
• Aflatoxin analysis for efficacy trails
• Microbial analysis
• Finalize registration dossier and Aflsafe registration
Challenges

- Registration of Aflasafe – wide scale dissemination not possible if not registered
- Drought – the year started very late, so all activities were delayed.
### Meeting the targets

<table>
<thead>
<tr>
<th>Indicator</th>
<th>Target</th>
<th>Number reached</th>
</tr>
</thead>
<tbody>
<tr>
<td>4.5.2(2) Number of hectares under improved technologies or management practices as a result of USG assistance</td>
<td>200 ha</td>
<td>294</td>
</tr>
<tr>
<td>4.5.2(5) Number of farmers and others who have applied new technologies or management practices as a result of USG assistance</td>
<td>200 plots</td>
<td>294</td>
</tr>
<tr>
<td>4.5.2 (7) Number of individuals who have received USG supported short-term agricultural sector productivity or food security training</td>
<td>15,000</td>
<td>-</td>
</tr>
<tr>
<td>4.5.2 (11) Number of food security private enterprises (for profit), producers organizations, water users associations, women's groups, trade and business associations, and community-based organizations (CBOs) receiving USG assistance</td>
<td>200</td>
<td>2,140 (1,530 male: 613 female)</td>
</tr>
<tr>
<td>4.5.2 (13) Number of rural households benefiting directly from USG interventions</td>
<td>15,000</td>
<td>-</td>
</tr>
</tbody>
</table>
Partnerships

ARI- Naliendale
Mycotoxin steering committee
USDA – ARS
Farmers
DAICOs
Ministry of Agriculture
Africa RISING
NMIST
NAFAKA
Private sector

Financial support –
USAID
USDA-FAS
Bill & Melinda Gates Foundation
Snap shot of activities
Aflasafe production for 2017 season

- 4 tons for Zambia
  - 2 tons Aflasafe ZM01
  - 2 tons Aflasafe ZM02
- 3 tons for Malawi
  - 1.5 tons Aflasafe MW01
  - 1.5 tons Aflasafe MWMZ01
- 4 tons for Mozambique
  - 2.5 tons Aflasafe MZ01
  - 2.5 tons Aflasafe MWMZ01
- 4 tons Aflasafe Tanzania
  - 2 tons Aflasafe TZ01
  - 2 tons Aflasafe TZ02
- Quality control (QC) positive!
Africa Research in Sustainable Intensification for the Next Generation

africa-rising.net