Plant invasions and their management in Africa

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Cal-IPC, 28 October 2021
About CABI

Who we are

CABI is an international not-for-profit organization that improves people’s lives by providing information and applying scientific expertise to solve problems in agriculture and the environment.

Our areas of expertise

- Crop health
- Development communication and extension
- Digital development
- Invasive species
- Publishing
- Value chains and trade

Global reach

We have 450+ staff across 26 locations worldwide.

CABI centre
54 countries
1.3 billion people
Growth rate – 2.5%
40% live below the poverty line – 2/3 of the world’s poorest
Most are directly dependent on natural resources
61% are farmers
Some of the worst weeds in Africa!

- *Striga* spp. - Africa
- *Opuntia* spp. - Tropical America
- *Mimosa* spp. – Tropical America
- *Prosopis* spp. – Tropical America
- *Lantana camara* – Tropical America
- *Chromolaena odorata* – Tropical America
- *Tithonia* spp. – Tropical America
- *Pontederia crassipes* – Tropical America
- *Azadirachta indica* – Tropical Asia
- *Acacia* spp. – Australia – sth temperate
- *Leucaena leucocephala* – Tropical America
Chromolaena odorata in NW Tanzania
Chromolaena odorata in eastern Africa

Impacts:

• Reduces livestock carrying capacities from 6 ha./LSU to 15 ha./LSU
• Kills 3000 cattle in the Philippines annually
• Impacts negatively on the breeding biology of the Nile crocodile
• Invasions result in a 95% reduction in species in the Zingiberaceae, main food source of the western lowland gorilla (van der Hoeven, 2007)
### Devil weed in Tanzania

<table>
<thead>
<tr>
<th>Costs and benefits</th>
<th>High density</th>
<th>Low density</th>
<th>$p$ value</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Costs</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Decrease grass</td>
<td>82</td>
<td>54</td>
<td>$\chi^2 = 19.943; p &lt; 0.0001$</td>
</tr>
<tr>
<td>Decrease shrubs</td>
<td>80</td>
<td>51</td>
<td>$\chi^2 = 20.181; p &lt; 0.0001$</td>
</tr>
<tr>
<td>Decrease trees</td>
<td>66</td>
<td>56</td>
<td>$\chi^2 = 2.072; p = 0.150$</td>
</tr>
<tr>
<td>Decrease wildlife</td>
<td>25</td>
<td>21</td>
<td>$\chi^2 = 0.501; p = 0.479$</td>
</tr>
<tr>
<td>Decrease water</td>
<td>67</td>
<td>54</td>
<td>$\chi^2 = 4.051; p = 0.046$</td>
</tr>
<tr>
<td>Decrease movement</td>
<td>94</td>
<td>84</td>
<td>$\chi^2 = 702; p = 0.03$</td>
</tr>
<tr>
<td>Decrease availability of useful plants</td>
<td>39</td>
<td>31</td>
<td>$\chi^2 = 7.839; p = 0.02$</td>
</tr>
<tr>
<td>Negative effects of livestock health</td>
<td>80</td>
<td>63</td>
<td>$\chi^2 = 7.810; p = 0.005$</td>
</tr>
<tr>
<td>Impact livestock (no. lost)</td>
<td>10 ± 12</td>
<td>5 ± 9</td>
<td>$p = 0.002$</td>
</tr>
<tr>
<td>Decrease crop yields</td>
<td>90</td>
<td>74</td>
<td>$\chi^2 = 9.074; p = 0.003$</td>
</tr>
<tr>
<td><strong>Benefits</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Hedge plant</td>
<td>14</td>
<td>14</td>
<td>$\chi^2 = 0.004; p = 0.949$</td>
</tr>
<tr>
<td>Medicinal plant</td>
<td>17</td>
<td>19</td>
<td>$\chi^2 = 0.312; p = 0.577$</td>
</tr>
<tr>
<td>No benefits</td>
<td>75</td>
<td>77</td>
<td>$\chi^2 = 0.336; p = 0.562$</td>
</tr>
</tbody>
</table>
Devil weed in Tanzania

“Chromolaena has killed us because it has killed our crops and our livestock.” Village elders, Serengeti, Tanzania.

“Anyone who would help us to eradicate these weeds, shall be our God on earth.” Elizabeth John Stephen, Kwigutu, Tanzania.

"Agriculture becomes very difficult because of this dangerous plant.” John Wambura Gimanje, RWA, Tanzania.

"I lack a place to graze my livestock. My livestock grows thinner and even die of starvation. Government help us folks" Monica Robert, Nyasirori, Tanzania.

“Cows produce very little milk these days and weigh as much as a goat.” Chichi Marwa, Kyankoma, Tanzania.
Current and potential distribution of *Chromolaena odorata* in eastern Africa
Parthenium hysterophorus in Kenya
Current distribution of *Parthenium hysterophorus* in eastern Africa

**Impacts:**

- 90% of farmers now consider parthenium to be the most serious weed of croplands and pasture in Ethiopia (Tamado and Millberg, 2000).
- Can reduce pasture production by as much as 90% (Jayachandra, 1971).
- Taints the meat and milk of livestock.
- Causes dermatitis and respiratory problems.
Parthenium has an impact on crop production

Sorghum grain yields (kg/ha) in Ethiopia

<table>
<thead>
<tr>
<th></th>
<th>2001</th>
<th>2002</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Weeded</td>
<td>Unweeded</td>
</tr>
<tr>
<td>Babile</td>
<td>2,082 (387)</td>
<td>349 (54)</td>
</tr>
<tr>
<td>Dire Dawa</td>
<td>1,433 (98)</td>
<td>217 (81)</td>
</tr>
</tbody>
</table>

82 – 95% reduction in yield

(Tamado and Milberg, 2004)
Prosopis juliflora in Ethiopia
Current distribution of *Prospis juliflora* in eastern Africa

**Impacts:**

- In Ethiopia, *P. juliflora* has reduced understorey basal cover for perennial grasses from 68% to 2%, and has reduced the number of grass species from seven to two (Kebede and Coppock, 2015).
- Reduces bird diversity and abundance.
- Has a negative impact on underground water resources.
For survival mosquitoes need:
A blood meal;
Standing water;
Resting sites;
Sugar for energy (nectar, etc.)

Over 400,000 people die from malaria each year – most in Africa
Potential distribution of *P. juliflora* in Africa

Could the management of invasive *Prosopis* spp. reduce the incidence of malaria?
What will happen to natural grazing lands if we don’t manage invasive plants?

71% of natural grazing could be lost in South Africa (van Wilgen et al., 2008)
What will happen if we don’t weed?

Under unweeded conditions, crop losses have been measured for:

- Maize: 55-90%
- Common bean: 50%
- Sorghum: 40-80%
- Cowpea: 40-60%
- Rice: 50-100%
- Cotton: 80%
- Wheat: 50-80%
- Groundnut: 80%
- Cassava: 90%

This said, everyone does some weeding yet crop losses are still high

(various authors from Gianessi, 2009)
Invasive alien plants are eroding the natural resource base on which millions of people in Africa directly depend. Although the continent, with the exception of SA, has relatively few IAPs, those that are present are widespread and extremely damaging.
So what is being done to manage the problem in countries outside of South Africa?

NOT NEARLY ENOUGH!!
Most IAP interventions in Africa (outside of SA) are ad hoc, localized, donor-funded, not sustained, etc.

In order to address this CABI has, together with partners, tried to address some of these barriers:

- Lack of policy or implementation thereof;
- Little awareness;
- Limited capacity;
- Insufficient resources;
- No countrywide interventions;
- No available herbicides;
- Little support for biological control;
- Conflict species;
- Etc.
Strengthening policy and legislation

Establishment of Coordinating Unit;
Development of NISSAP;
NBSAP modified to include IAPs;
Cost-recovery mechanisms for IAP management.
Information and awareness
Websites; posters, documentaries, radio jingles, etc.
Capacity building

Training strategy developed and promoted;
Equipment and material support to quarantine departments etc.;
Conference attendance;
Curriculum development;
Support for students.
IAP prevention and management

Risk analysis procedures developed;
Early detection and rapid response mechanisms developed;
Presence and impact of IAS recorded;
Integrated management at pilot sites.
Development of field guides which include information on impacts and management
## Biological control of pests in Africa

<table>
<thead>
<tr>
<th>Control Method</th>
<th># Target Species</th>
<th># Agents Released</th>
<th># Agents Established</th>
<th>Target Species at Least Partially Controlled</th>
<th>#</th>
<th>%</th>
</tr>
</thead>
<tbody>
<tr>
<td>Weed biological control</td>
<td>66</td>
<td>143</td>
<td>103</td>
<td></td>
<td>49</td>
<td>74.2</td>
</tr>
<tr>
<td>Arthropod biological control using insects</td>
<td>119</td>
<td>404</td>
<td>124</td>
<td></td>
<td>91</td>
<td>76.5</td>
</tr>
<tr>
<td>Arthropod biological control using pathogens</td>
<td>12</td>
<td>8</td>
<td>5</td>
<td></td>
<td>4</td>
<td>33.3</td>
</tr>
<tr>
<td>Arthropod biological control using mites</td>
<td>2</td>
<td>15</td>
<td>4</td>
<td></td>
<td>1</td>
<td>50</td>
</tr>
<tr>
<td>Snail biological control</td>
<td>2</td>
<td>4</td>
<td>3</td>
<td></td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>206</strong></td>
<td><strong>574</strong></td>
<td><strong>239</strong></td>
<td></td>
<td><strong>145</strong></td>
<td></td>
</tr>
</tbody>
</table>
Number of countries in Africa (excl. SA), Asia and the Pacific and the number of weeds each country has targeted for CBC
The number of countries in Africa (excl. SA), Asia and the Pacific and the number of years since weed CBC agents were intentionally released.
CBC – *Dactylopius opuntiae* on *Opuntia stricta* in Kenya
The biggest impediment to IAP management is the perception that it is only a biodiversity issue, when in fact it is one of the biggest threats to livelihoods on the planet.

We know how to manage IAPS, what we don’t know is how to ‘manage’ people to manage IAPS.
CABI is an international intergovernmental organisation, and we gratefully acknowledge the core financial support from our member countries (and lead agencies) including: