Horizon Scanning for plant pest prioritization

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CABI

Definition of horizon scanning

A systematic examination of potential threats and opportunities within a given context

In this case:

Potential threat = invasive species

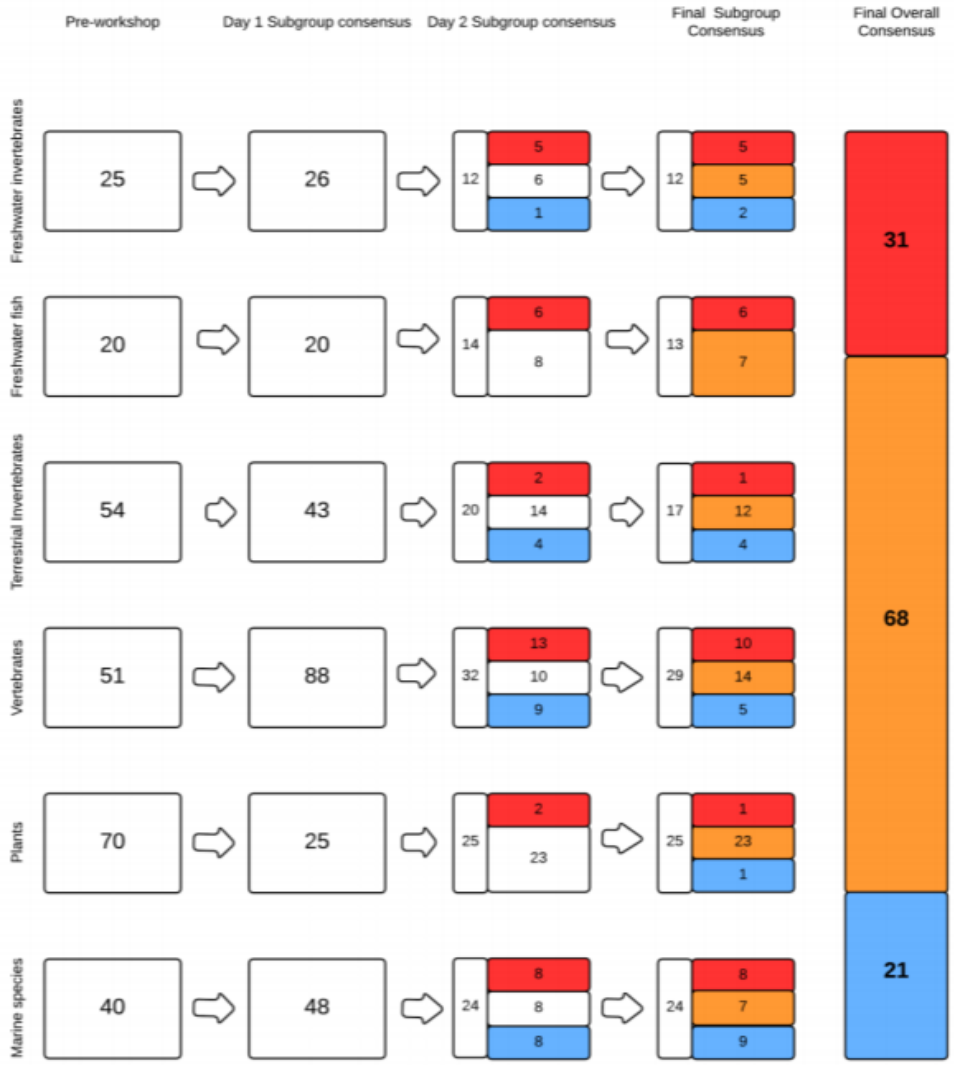
Given context = agriculture, forestry and environment

Horizon scanning can help prioritize species for PRAs and other purposes

Prioritizing invasive species through horizon scanning

Three key elements:

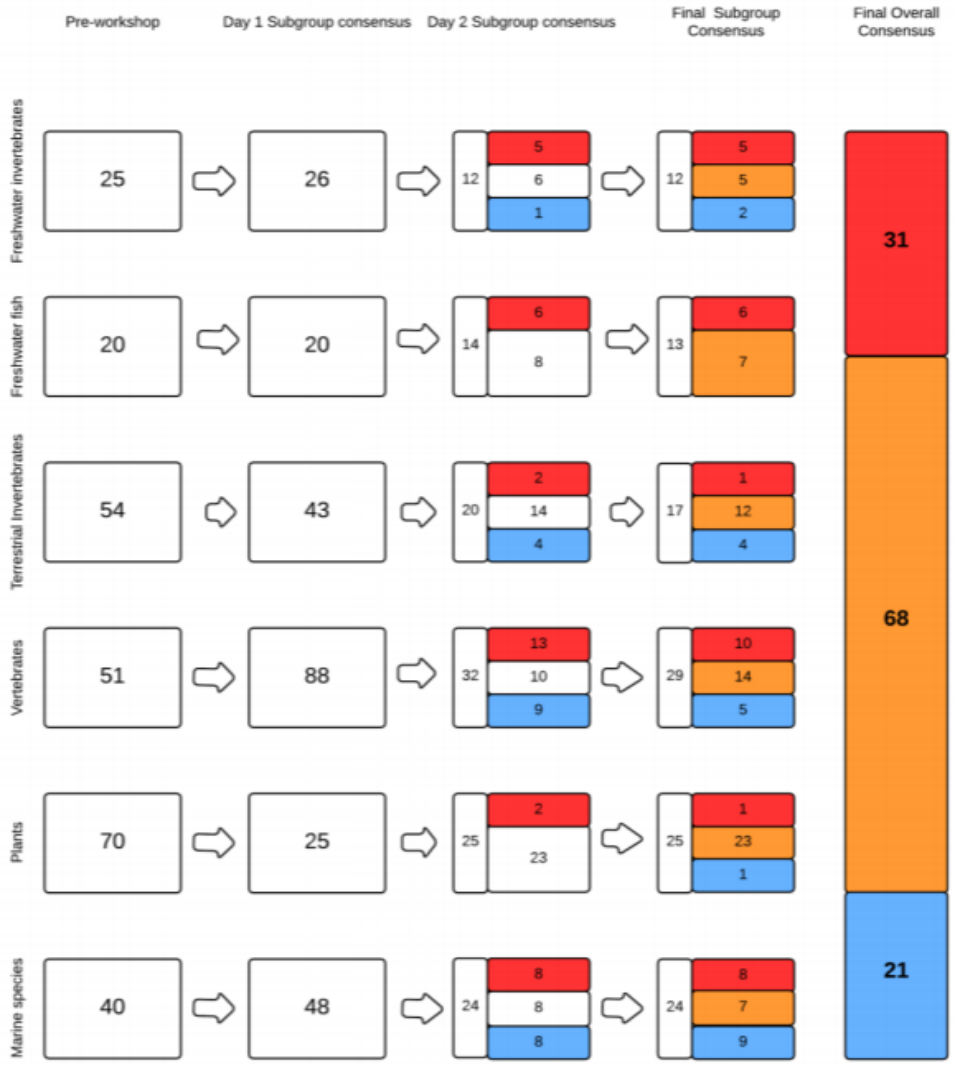
1. Large and broad scanning to start with a workable lists
2. Shortening the lists
3. Consensus



Prioritizing invasive species through horizon scanning

Three key elements:

1. Large and broad scanning to start with a workable lists – Horizon scanning tool
2. Shortening the lists
3. Consensus



- Identifies **potential invasive species threats** to a country, state or province
- Using information from CABI **Compendia datasheets**
- Provides lists of species absent in the **area at risk** that may come from a **source area**, on a particular **plant or part of plant**, through a particular **pathway** …

Uses of the Horizon Scanning Tool

To prioritize species for pest-initiated PRAs

Which potential invasive pests most urgently need PRAs?

To select representative pests in pathway-initiated PRAs

E.g. Which pests are likely to arrive with commodity X from country Y?

Other utilities

E.g. Which pests are already in neighbouring countries and need surveillance or contingency plans?

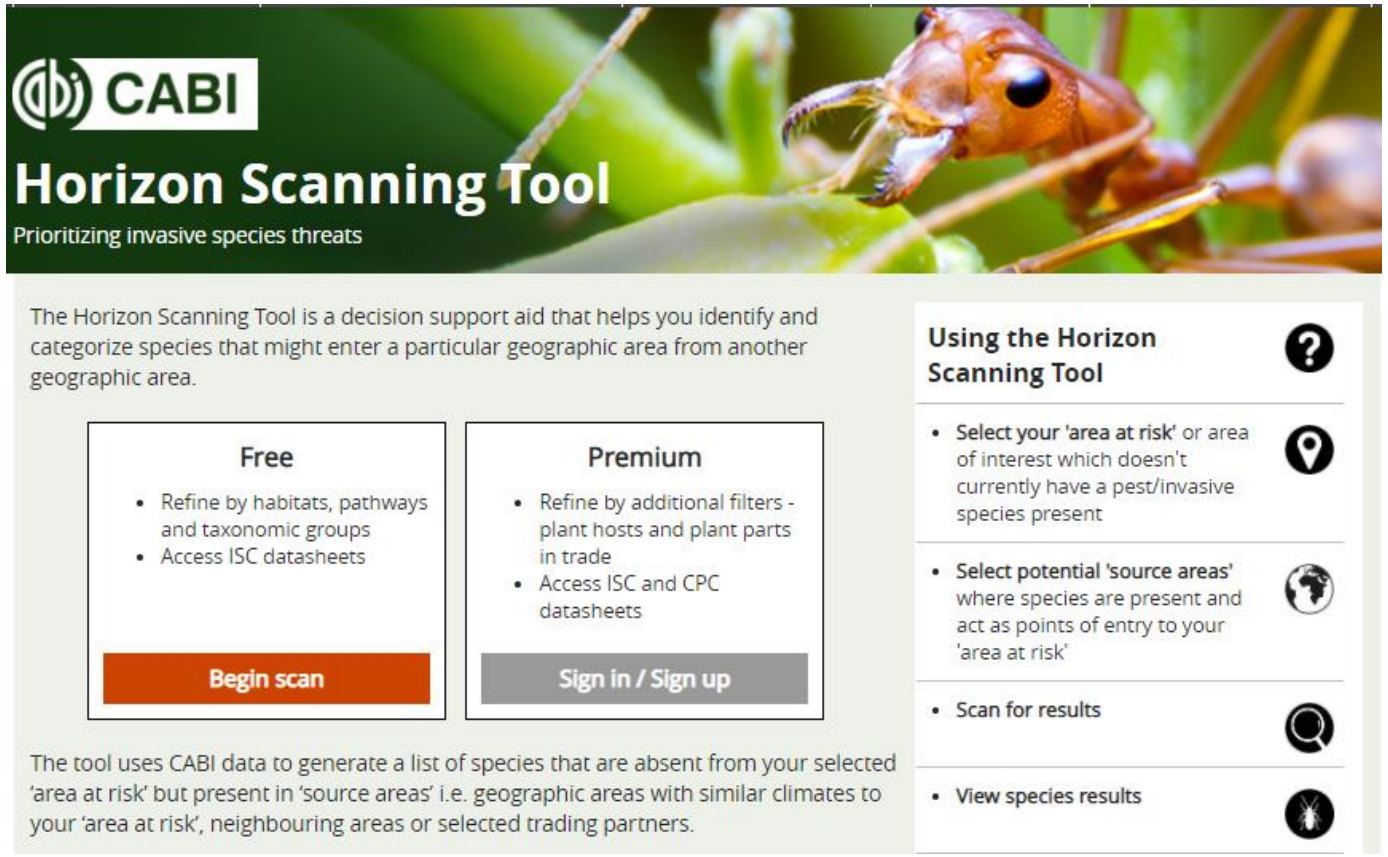
Accessing the Horizon Scanning Tool

www.cabi.org/horizonscanningtool

Or via a link from:

The Compendium page of the New CABI Digital library
https://www.cabidigitallibrary.org/journal/cabicompendium

If you are interested in a demo, let me know



Horizon scanning for potential invasive plant pests in Ghana

Objectives:

- Establish a list of potential invasive alien plant pests (invertebrates and pathogens) that may become harmful to Ghanaian agriculture, forestry or environment.
- Rank these species according to their potential threat and the urgency of carrying out a full pest risk analysis, or taking management measures.

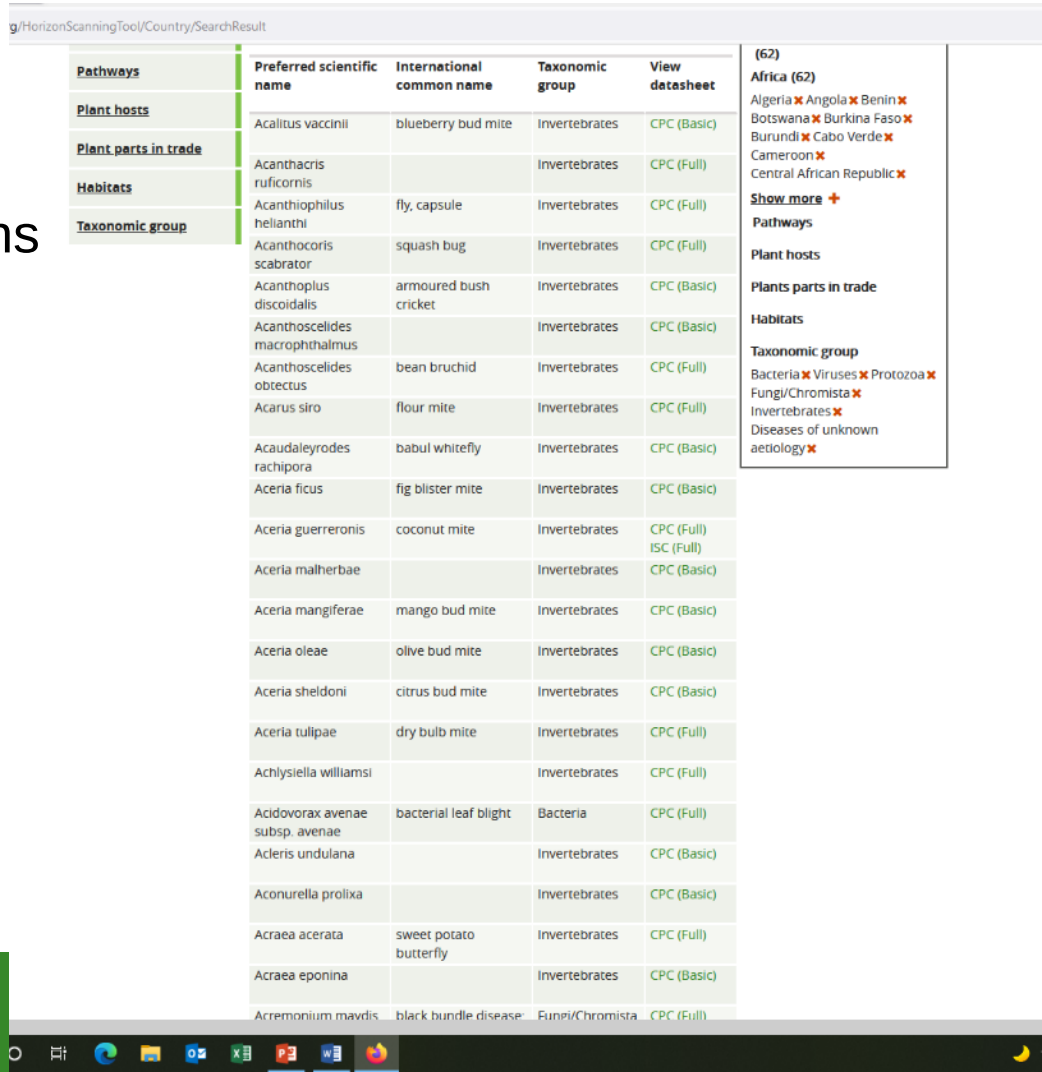
The prioritisation was carried out by a panel of experts from Ghana in research institutions and academia with experience in entomology, bacteriology, mycology, nematology and virology

Step 1. Preliminary horizon scanning

Carried out in a workshop, using the CABI Horizon Scanning Tool

Area at risk: Ghana
Source country: Africa
Filters: Plant pests only, invertebrates and plant pathogens

Result: +1800 species!



Step 1. Preliminary horizon scanning

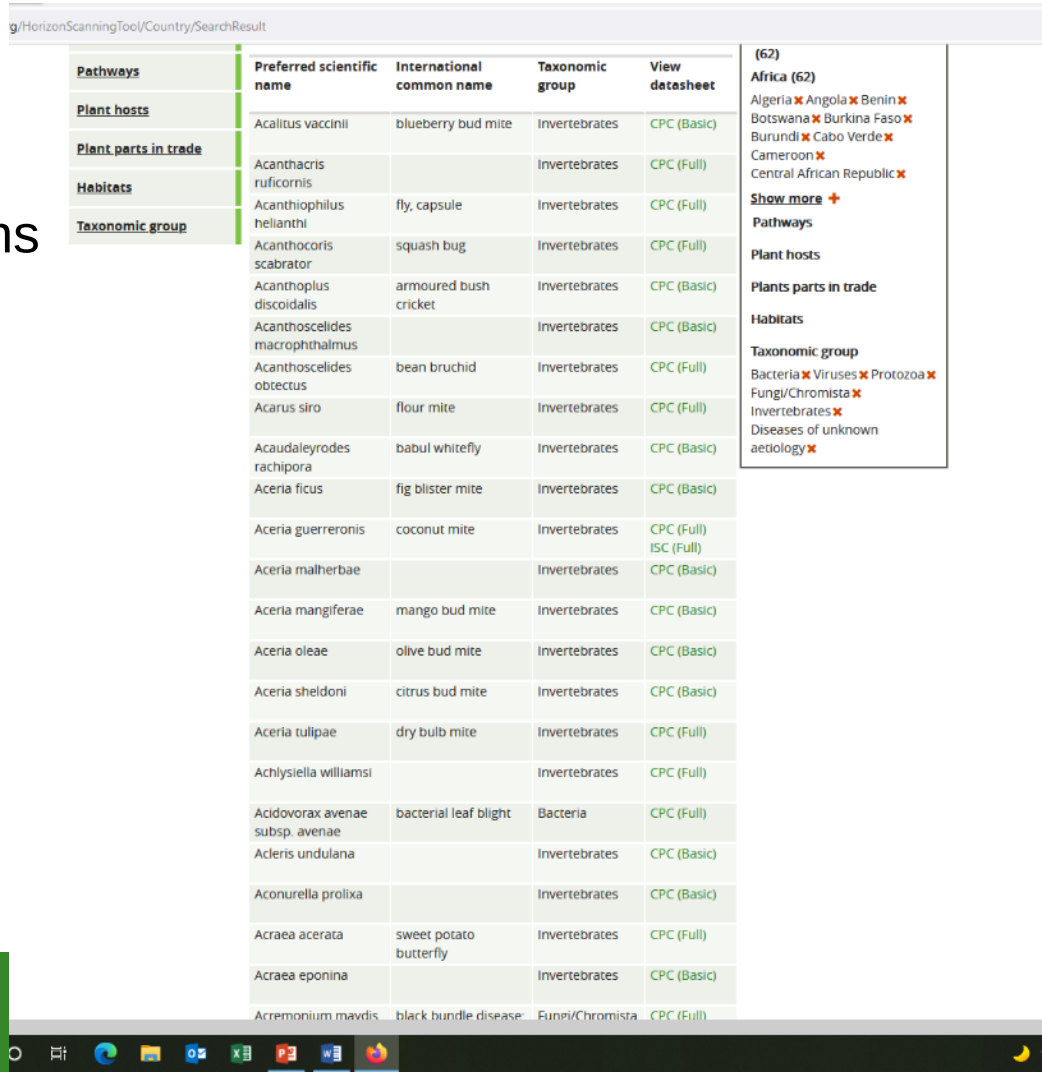
Carried out in a workshop, using the CABI Horizon Scanning Tool

Area at risk: Ghana
Source country: Africa
Filters: Plant pests only, invertebrates and plant pathogens

Result: +1800 species!

Only species with full datasheets and invasive elsewhere were retained

Ca. 270 invasive plant pests already present in Africa but not yet in Ghana were listed



Step 2. First modification of the list

- In workshop
- Removed less important species
- Added species that had not been captured or highly invasive species that are not yet in Africa (partly based on quarantine list of plant pests for Ghana)
- Through expert opinion (consensus)
- Defined a list of pests to be included in the prioritization process
- **Finally 110 arthropods, 60 pathogens and nematodes not yet present in Ghana were selected**

Step 3. Definition of a scoring system

- In the workshop, we defined a scoring system, structured as a “mini pest risk analysis”:
- Final score = Likelihood of entry x likelihood of establishment x (magnitude of socio-economic impact + magnitude of environmental impact)
- The system also asked information on the likely pathway of arrival and confidence levels (for information)

Step 3. Definition of a scoring system

Likelihood of entry (1-5)

Likelihood of establishment (1-5)

Potential socio-economic impact (1-5)

Potential environmental impact (1-5)

Step 3. Definition of a scoring system

Likelihood of entry (1-5)

Likelihood of establishment (1-5)

1. Ghana climatically unsuitable or host plants not present
2. Only few areas in Ghana climatically suitable; or host plants rare
3. Large areas in Ghana climatically suitable and host plant rare; or only few areas in Ghana climatically suitable but host plants at least moderately abundant
4. Large areas in Ghana climatically suitable and host plants moderately abundant
5. Large areas in Ghana climatically suitable and host plants very abundant

Potential socio-economic impact (1-5)

Potential environmental impact (1-5)

Step 3. Definition of a scoring system

Likelihood of entry (1-5)

Likelihood of establishment (1-5)

Potential socio-economic impact (1-5)

1. The species does not attack plants that are cultivated or utilised
2. The species damages plants that are only occasionally cultivated or utilised
3. The species damages plants that are regularly cultivated or utilised but without threatening the cultivation, utilisation or trade of this crop
4. The species has the potential to threaten, at least locally, the cultivation of a plant that is regularly cultivated or utilised; or to regularly attack a crop that is key for the Ghanaian economy without threatening this latter.
5. The species has the potential to threaten, at least locally, a crop that is key for the Ghanaian economy

Potential environmental impact (1-5)

Step 4. Scoring of species

- Started in workshop but mostly done remotely and independently by at least 3 assessors per species

Species	assessor	Taxonomic group	Native distribution (s	Already present in Af	Present in Nieghbour	Likelihood (1-5) of er	Confidence in likeliho	Likely pathway of arr	Confidence in likely p	Likelihood (1-5) of es	Confidence in likeliho	Magnitude (1-5) of sc	Confidence in magni	magnitude (1-5) of e	Confidence in magni	Overall score (A*B*(	Confidence in Overal
Bactrocera zonata		Insect	AT	Y	?	3	H	UN; CO	M	5	H	4	H	3	H	105	H
Drosophila suzuki		Insect	As	Y	N	3	M	CO; ST	M	3	M	3	M	2	L	45	M
Orseolia oryzivora		Insect	Afr	Y	Y	4	H	CO	H	4	M	3	M	2	L	80	M
Pieris brassicae		Insect	EU	Y	? N	3	M	UN	L	4	H	4	H	2	L	72	M
Mahasena corbetti		Insect	AT	N	N	2	H	CO	H	4	L	3	M	2	L	40	L

Step 5. Consensus building

- In a new workshop, across experts to harmonize scores and define the proritization list
- At the end, a final risk score was obtained for all assessed species by calculating the median score for all four questions and the final score
- This score was validated by the group through consensus.
- Species were then ranked according to their potential threat for Ghana
- Action to be taken for the highest ranked species were discussed e.g. PRAs, Surveillance programmes, surveys to assess if already in Ghana, EWRR programmes, Contingency plans, Collaborative research, etc.

Final results - scores

Arthropods	score
Maconellicoccus hirsutus	160
Aleurothrixus floccosus	150
Liriomyza trifolii	150
Thrips palmi	150
Aonidiella orientalis	140
Unaspis citri	125
Spodoptera eridania	120
Bemisia tabaci (MEAM1)	120
Brevipalpus phoenicis	120
Callosobruchus chinensis	120
Dialeurodes citri	120
Diaphorina citri	120
Dysmicoccus neobrevipes	120
Icerya purchasi	120
Liriomyza huidobrensis	120
Liriomyza sativae	120
Scirtothrips dorsalis	120
Trioza erytreae	120
Aonidiella citrina (Coquillett)	120
Rhynchophorus ferrugineus	112

Pathogens and nematodes	score
Xanthomonas oryzae pv. oryzae	150
Armillaria heimii	150
Thanatephorus cucumeris	150
Meloidogyne enterolobii	150
Meloidogyne mayaguensis	150
Maize dwarf mosaic virus	140
Maize lethal necrosis disease	140
Clavibacter michiganensis subsp. michiganensis	125
Xanthomonas oryzae pv. oryzicola	125
Tomato spotted wilt virus	125
Banana bunchy top virus	120
Cassava brown streak Virus	120
Ralstonia solanacearum Race 2	105
Maize chlorotic mottle virus	105
Cocoa Yellow Mosaic	105
Meloidogyne hapla	100
Xanthomonas campestris pv. musacearum	90
Maize stripe virus	90
Meloidogyne ethiopica	90

Final results – actions (arthropods)

Species	Score	Suggested actions
Maconellicoccus hirsutus	160	Surveys for its potential presence in Ghana
Aleurothrixus floccosus	150	Surveys for its potential presence in Ghana
Liriomyza trifolii	150	Since only Liriomyza sp. is reported in Ghana, sample Liriomyza spp. in the country for molecular analyses and morphological ID to assess which species is present
Thrips palmi	150	Since only Thips sp. Is reported in Ghana, sample Thrips spp. and related genera for molecular analyses and morphological ID to assess which ones are present in Ghana
Aonidiella orientalis	140	Conduct a full PRA
Unaspis citri	125	Surveys for its potential presence in Ghana and conduct a full PRA
Spodoptera eridania	120	Surveys with pheromone traps and sampling
Bemisia tabaci (MEAM1)	120	Sample B. tabaci in Ghana for molecular analyses to assess which sibling species is present
Brevipalpus phoenicis	120	Conduct a full PRA
Callosobruchus chinensis	120	Surveys to check if the species is not in Ghana. Because the other one is abundant
Dialeurodes citri	120	Conduct a full PRA
Diaphorina citri	120	Conduct a full PRA
Dysmicoccus neobrevipes	120	A paper suggests that it may present in Uganda (only record in Africa), but the information is notz clear. Ask the authors or specialists in Uganda
Icerya purchasi	120	Check with Togo is the presence reported in Togo is confirmed. If yes, make surveys in Ghana
Liriomyza huidobrensis	120	Since only Liriomyza sp. is reported in Ghana, sample Liriomyza spp. in the country for molecular analyses and morphological ID to assess which species is present
Liriomyza sativae	120	Since only Liriomyza sp. is reported in Ghana, sample Liriomyza spp. in the country for molecular analyses and morphological ID to assess which species is present
Scirtothrips dorsalis	120	Since only Thips sp. Is reported in Ghana, sample Thrips spp. and related genera for molecular analyses and morphological ID to assess which ones are present in Ghana

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RESEARCH ARTICLE

A peer-reviewed open-access journal
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Advancing research on alien species and biological invasions

Horizon scanning for prioritising invasive alien species with potential to threaten agriculture and biodiversity in Ghana

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ORIGINAL PAPER

Prioritization of invasive alien species with the potential to threaten agriculture and biodiversity in Kenya through horizon scanning

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Abstract Invasive alien species (IAS) rank among the most significant drivers of species extinction and ecosystem degradation resulting in significant impacts on socio-economic development. The recent exponential spread of IAS in most of Africa is attributed to poor border biosecurity due to porous borders that have failed to prevent initial introductions. In addition, countries lack adequate information about potential invasions and have limited capacity to reduce the risk of invasions. Horizon scanning is an approach that prioritises the risks of potential IAS through rapid assessments. A group of 28 subject matter experts used an adapted methodology to assess 1700 potential IAS on a 5-point scale for the likelihood of entry and establishment, potential socio-economic impact, and impact on biodiversity. The individual scores were combined to rank the species

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KNOWLEDGE FOR LIFE
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Further actions : surveys for presence in Ghana

- Surveys for presence in Ghana: thrips, leaf miners and white flies (4 pest species found in Ghana)
- Surveillance programmes (Diaphorina citri was found)
- Several **PRAs** have been conducted
- Building of a **Risk Register** that is regularly reviewed

Climate change considerations in horizon scanning?

Possible – but not yet implemented in our approach

- Horizon scanning implied a fast assessment of many species – Including climate change scenarios would seriously slow down the process
- The species list is meant to go to a risk register that is regularly updated.
- Quantitative horizon scanning methods using climatic modelling to identify species with the potential to become plant pests are presently being developed (e.g. in a new Euphresco project)

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