A multi-criteria decision-making framework for setting priorities in SPS capacity-building

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Structure

• Background
• Aims of the framework
• Nature of the framework
• Practical implementation of the framework
• Framework outputs
• Implications/issues
Background

• Many countries face challenges complying with SPS measures in international trade
• SPS capacity-building needs are often substantial
• Challenges establishing priorities in face of resource constraints
• Process of priority-setting often lacks coherence and transparency
• Efforts to develop more rigorous framework for setting priorities
Aims of the framework

• Provide structured approach to establishing priorities between alternative SPS capacity-building options
• Enhance transparency of SPS capacity-building decisions
• Facilitate inputs to priority-setting from diverse stakeholders

• Greater resource efficiency
• Demand-driven capacity-building
• Enhanced trade and social outcomes and impacts
Nature of the framework

• Based on multi-criteria decision analysis (MCDA)
• Sequenced process for compilation, collation and analysis of information on SPS capacity-building needs
• Aims to mimic formal decision-making processes
• Highly flexible
• Decision support tool
# Basic framework structure

<table>
<thead>
<tr>
<th>Criteria</th>
<th>Weights</th>
<th>Options</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>Option 1</td>
</tr>
<tr>
<td><strong>Cost</strong></td>
<td>20%</td>
<td>20%</td>
</tr>
<tr>
<td><strong>Growth in Exports</strong></td>
<td>30%</td>
<td>30%</td>
</tr>
<tr>
<td><strong>Small farmers</strong></td>
<td>30%</td>
<td>No</td>
</tr>
<tr>
<td><strong>Poverty impacts</strong></td>
<td>20%</td>
<td>Minor</td>
</tr>
<tr>
<td><strong>Ranking</strong></td>
<td></td>
<td>5</td>
</tr>
</tbody>
</table>
Stages in prioritisation process

1. Compilation of Information Dossier
2. Definition of Choice Set
3. Definition of Decision Criteria/Weights
4. Compilation of Information Cards
5. Construction of Spider Diagrams
6. Derivation of Quantitative priorities
7. Validation

Stakeholder Workshop/ Delphi Survey
Compilation of information dossier

- Build on and provide opportunity for input from previous capacity assessments
- Ensure priority-setting exercise based on full set of existing and pertinent information
- ‘Level playing field’ across stakeholders
- Enhance transparency
Compilation of information dossier

- Consists of plausible indicators of weaknesses in SPS capacity
- Aims to ‘build a picture’ from spectrum of information available
- Sources:
  - Primary/Secondary
  - Qualitative/Quantitative
  - Rigorous/Superficial
- Important to maintain connections between identified weaknesses and indicators
- Important to use triangulation
## Possible SPS capacity indicators

<table>
<thead>
<tr>
<th>Type</th>
<th>Examples</th>
</tr>
</thead>
<tbody>
<tr>
<td>Capacity-based</td>
<td>Formal capacity evaluations and benchmarking</td>
</tr>
<tr>
<td></td>
<td><em>Ad hoc</em> capacity assessments</td>
</tr>
<tr>
<td>Compliance-based</td>
<td>Inspection reports</td>
</tr>
<tr>
<td></td>
<td>Approved importer lists in export markets</td>
</tr>
<tr>
<td></td>
<td>Pest interception reports</td>
</tr>
<tr>
<td>Trade-based</td>
<td>Border rejections in export markets</td>
</tr>
<tr>
<td></td>
<td>Inventories of SPS requirements in export markets</td>
</tr>
<tr>
<td></td>
<td>Trade flow trends and disruptions</td>
</tr>
<tr>
<td></td>
<td>Official restrictions/actions in export markets</td>
</tr>
<tr>
<td></td>
<td>Reports of trade problems from exporters</td>
</tr>
<tr>
<td></td>
<td>Exporter and/or importer interviews and surveys</td>
</tr>
<tr>
<td></td>
<td><em>Ad hoc</em> problem reports/questionnaires</td>
</tr>
</tbody>
</table>
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Stakeholder Workshop/ Delphi Survey
Definition of choice set

• Identification of SPS capacity-building options to be considered

• Nature of capacity-building options:
  – Mutually-exclusive
  – Linked to specific capacity weaknesses
  – Can assign flow of costs and benefits

• Focus on current and nascent issues

• Focus on existing, latent and potential exports

• Trade-off between comprehensiveness and practicality

• Once have defined choice set need to sift out ‘redundant’ options
Definition of capacity-building options

Product → SPS Issue → Capacity-Building Option

Market
1

Mango

Pesticide Residues

EU

US

Fruit Fly

Papaya

US

South Africa
Eliciting the choice set

• Approaches:
  – Nominal group technique workshop
  – Delphi survey

• Procedure:
  – Private elicitation
  – Feedback
  – Development of consensus

• Guiding principles:
  – Inclusiveness
  – Transparency
  – Practicality
  – Cost/time
‘Sifting’ the choice set

• Does the option relate to a current/potential and substantive compliance problem?
• Is the option economically viable?
• Are the sectors concerned and the level of existing/potential exports substantive?
• Are there other SPS capacity gaps that also need to be fixed?
Zambia capacity-building options: final selection

- Pest controls on honey exports South Africa
- Aflatoxin testing for groundnuts and maize Regional & EU
- Pest status of bananas Regional
- Pest risk assessment and fresh vegetable exports USA/South Africa
- Pesticide residue testing EU & Regional
- Compliance with Codex standards for milk and dairy products Regional
- Animal health status and beef/maize bran exports Regional
- Pest status for maize and bean seeds Regional
Zambia capacity-building options: excluded

- Antibiotic controls and honey exports International
- Antibiotic testing and crocodile meat International
- Animal disease controls and day-old chicks Regional
- Certification of wooden packaging International
- Bananas and plant pests International
- Plant pest controls and fresh vegetable and cut flower exports EU
- Imports of potentially invasive plants Regional
- Plant health controls and pot plants
- Plant pest controls and banana planting materials Regional
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Definition of choice criteria/weights

• Elements:
  – Criteria to be used to establish priorities amongst members of choice set
  – Weights attached to each decision criterion

• Issues:
  – Attribution
  – Spill-over effects

• Approaches:
  – Nominal group technique workshop
  – Delphi survey
## Potential decision criteria

<table>
<thead>
<tr>
<th>Objective</th>
<th>Decision Criteria</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cost</td>
<td>Up-front investment</td>
</tr>
<tr>
<td></td>
<td>On-going costs</td>
</tr>
<tr>
<td>Trade impact</td>
<td>Change in absolute value of exports/export losses avoided</td>
</tr>
<tr>
<td>Domestic agri-food impact</td>
<td>Impact on agricultural/fisheries productivity</td>
</tr>
<tr>
<td></td>
<td>Impact on public health</td>
</tr>
<tr>
<td></td>
<td>Impact on local environmental protection</td>
</tr>
<tr>
<td>Social impacts</td>
<td>Impact on poverty</td>
</tr>
<tr>
<td></td>
<td>Impact on vulnerable groups</td>
</tr>
</tbody>
</table>
## Mozambique: decision criteria and weights

<table>
<thead>
<tr>
<th>Criterion</th>
<th>Weight</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Cost</strong></td>
<td></td>
</tr>
<tr>
<td>Up-front investment</td>
<td>13%</td>
</tr>
<tr>
<td>On-going costs</td>
<td>10%</td>
</tr>
<tr>
<td><strong>Trade impact</strong></td>
<td></td>
</tr>
<tr>
<td>Change in value of exports</td>
<td>14%</td>
</tr>
<tr>
<td><strong>Domestic agri-food impacts</strong></td>
<td></td>
</tr>
<tr>
<td>Agricultural/fisheries productivity</td>
<td>21%</td>
</tr>
<tr>
<td>Domestic public health</td>
<td>14%</td>
</tr>
<tr>
<td>Environmental protection</td>
<td>10%</td>
</tr>
<tr>
<td><strong>Social impacts</strong></td>
<td></td>
</tr>
<tr>
<td>Poverty impacts</td>
<td>10%</td>
</tr>
<tr>
<td>Impact on vulnerable groups:</td>
<td>8%</td>
</tr>
<tr>
<td>• Women</td>
<td></td>
</tr>
<tr>
<td>• Children</td>
<td></td>
</tr>
<tr>
<td>• Vulnerable areas</td>
<td></td>
</tr>
<tr>
<td>• Smallholders/Artisanal fishers</td>
<td></td>
</tr>
</tbody>
</table>
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Compilation of information cards

- Bring together data on each capacity-building option
- One card for each capacity-building option
- Elements:
  - Brief description of each option
  - Quantitative measure of each decision criterion
  - Note of uncertainties with data
  - References and sources
- ‘Living’ documents
- Provide measures of impact of each capacity-building option compared to a ‘calculation base’
Compilation of information cards

• Information sources:
  – Prior assessments of capacity-building needs
  – Extrapolations from prior assessments or costs estimates for other sectors and/or countries
  – *Ad hoc* or structured consultations and/or surveys of national stakeholders
  – *Ad hoc* or structured consultations and/or surveys of international experts

• Choice of data:
  – Availability
  – Quality
Data types in information cards

<table>
<thead>
<tr>
<th>Type</th>
<th>Description</th>
<th>Example</th>
</tr>
</thead>
<tbody>
<tr>
<td>Discrete</td>
<td>Yes/No</td>
<td>Impact on the poor, Increases exports</td>
</tr>
<tr>
<td>Ordinal</td>
<td>Scaling</td>
<td>-2 = ‘Large negative impact’, -1 = ‘Small negative impact’, 0 = ‘No impact’, +1 = ‘Small positive impact’, +2 = ‘Large positive impact’</td>
</tr>
<tr>
<td>Count</td>
<td>Number</td>
<td>Number of small farmers impacted, Number of new markets accessed</td>
</tr>
<tr>
<td>Continuous</td>
<td>Absolute value/change</td>
<td>Absolute increase in value of exports, Percentage increase in costs</td>
</tr>
</tbody>
</table>
## Measurement of decision criteria: Mozambique and Zambia

<table>
<thead>
<tr>
<th>Criterion</th>
<th>Measurement</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Cost</strong></td>
<td></td>
</tr>
<tr>
<td>Up-front investment</td>
<td>Absolute value ($)</td>
</tr>
<tr>
<td>On-going costs</td>
<td>% value of exports</td>
</tr>
<tr>
<td><strong>Trade impact</strong></td>
<td></td>
</tr>
<tr>
<td>Absolute change in value of exports</td>
<td>Absolute value (2015)</td>
</tr>
<tr>
<td><strong>Domestic agri-food impacts</strong></td>
<td></td>
</tr>
<tr>
<td>Agricultural/fisheries productivity</td>
<td>Large negative (-2) to Large positive (+2)</td>
</tr>
<tr>
<td>Domestic public health</td>
<td></td>
</tr>
<tr>
<td>Environmental protection</td>
<td></td>
</tr>
<tr>
<td><strong>Social impacts</strong></td>
<td></td>
</tr>
<tr>
<td>Poverty impacts</td>
<td>Large negative (-2) to Large positive (+2)</td>
</tr>
<tr>
<td>Impact on vulnerable groups:</td>
<td></td>
</tr>
<tr>
<td>• Women</td>
<td>Large negative (-2) to Large positive (+2)</td>
</tr>
<tr>
<td>• Children</td>
<td></td>
</tr>
<tr>
<td>• Vulnerable areas</td>
<td></td>
</tr>
<tr>
<td>• Smallholders/Artisanal fishers</td>
<td></td>
</tr>
</tbody>
</table>
## Capacity-building option profiles – Pesticide residue testing in Mozambique

<table>
<thead>
<tr>
<th>Decision Criterion</th>
<th>Value</th>
<th>Details</th>
<th>Confidence</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Cost</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Up-front investment</td>
<td>$300,000</td>
<td>Estimated cost of pesticide laboratory in 2005 is $200,000. Updated to 2010 at 8% gives approximately $300,000.</td>
<td>Medium</td>
</tr>
<tr>
<td>On-going cost</td>
<td>0.1%</td>
<td>Estimated cost of maintaining laboratory accreditation $17,000. Estimated value of exports of bananas and mangoes in 2015 is $15,167,000, on basis of trend over period 2001 to 2010. Thus, on-going costs are around 0.1% of the value of exports. No significant difference in unit costs of test between South Africa and new facility in Mozambique.</td>
<td>Medium</td>
</tr>
<tr>
<td><strong>Trade impacts</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Change in absolute value of exports</td>
<td>$0</td>
<td>Exporters already have samples tested in South Africa. No additional exports created.</td>
<td>High</td>
</tr>
<tr>
<td>New markets</td>
<td>N</td>
<td>No access to new markets – pesticide testing already undertaken using laboratories in South Africa.</td>
<td>High</td>
</tr>
<tr>
<td>Market position</td>
<td>N</td>
<td>No change – pesticide testing already undertaken using laboratories in South Africa.</td>
<td>High</td>
</tr>
<tr>
<td><strong>Domestic agri-food impacts</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Agricultural/fisheries productivity</td>
<td>0</td>
<td>No change – pesticide testing already undertaken using laboratories in South Africa.</td>
<td>High</td>
</tr>
<tr>
<td>Domestic public health</td>
<td>0</td>
<td>No change – pesticide testing already undertaken using laboratories in South Africa.</td>
<td>High</td>
</tr>
<tr>
<td>Environmental protection</td>
<td>0</td>
<td>No change – pesticide testing already undertaken using laboratories in South Africa.</td>
<td>Medium</td>
</tr>
<tr>
<td><strong>Social impacts</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Poverty impact</td>
<td>0</td>
<td>Small number of producers. Mainly medium-sized farms.</td>
<td>High</td>
</tr>
<tr>
<td>Impact on vulnerable groups</td>
<td>0</td>
<td>Little or no involvement of women (0); Little or no impact on children (0); Production largely in less vulnerable areas (0); Little or no involvement of smallholders/artisanal fishers (0).</td>
<td>High</td>
</tr>
</tbody>
</table>
Stages in prioritisation process

Compilation of Information Dossier

Definition of Choice Set

Definition of Decision Criteria/Weights

Compilation of Information Cards

Construction of Spider Diagrams

Derivation of Quantitative priorities

Validation

Stakeholder Workshop/ Delphi Survey
Compilation of spider charts

- Facilitate comparison of capacity-building options across single decision criteria
- Can be used to compare capacity-building options across multiple criteria:
  - Scaling issues
- Aims:
  - Communication
  - Assembly of information for ‘traditional’ decision-making
  - First assessment of capacity-building options before formal prioritisation
Mozambique decision criteria measures: up-front investment

- Pesticide residue testing
- Mycotoxin testing of groundnuts
- Mycotoxin controls for groundnuts and maize
- HACCP controls for cashews
- Biological control of B. invadens
- Maintaining pest-free status for bananas
- Hygiene controls for crustaceans
- Post-harvest treatment for mangoes
- Hygiene controls for bivalves and molluscs
- Determining pest status of bananas

Controls for Black Spot in citrus

Specialised controls for Black Spot in citrus
Mozambique decision criteria measures: up-front investment

- Pesticide residue testing
- Mycotoxin testing of groundnuts
- Mycotoxin controls for groundnuts and maize
- HACCP controls for cashews
- Biological control of B. invadens
- Controls for Black Spot in citrus
- Maintain pest-free status for bananas
- Hygiene controls for crustaceans
- Hygiene controls for bivalves and molluscs
- Post-harvest treatment for mangoes
- Determine pest status of bananas
Mozambique decision criteria measures: domestic agri-food impacts

- Pesticide residue testing
- Mycotoxin testing of groundnuts
- Mycotoxin controls for groundnuts and maize
- HACCP controls for cashews
- Hygiene controls for crustaceans
- Biological control of B. invadens
- Hygiene controls for bivalves and molluscs
- Controls for Black Spot in citrus
- Determine pest status of bananas
- Maintain pest-free status for bananas
- Post-harvest treatment for mangoes

Color codes:
- Green: Agricultural/fisheries productivity
- Blue: Domestic public health
- Red: Environmental protection
Stages in prioritisation process

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Stakeholder Workshop/ Delphi Survey
Nature of prioritisation process

• Outranking approach
• Inputs:
  – Decision criteria measures
  – Decision weights
  – Preference functions
• Options compared in pair-wise fashion
• Calculates:
  – Positive flow
  – Negative flow
• Ranking on basis of net flow
Mozambique baseline model

- Determine pest status for bananas
- Maintain pest-free status for bananas
- Biological control of B. invadens
- Mycotoxin controls for groundnuts & maize
- Post-harvest treatment for mangoes
- Hygiene controls for crustaceans
- Black-Spot controls for citruses
- Mycotoxin testing
- HACCP-based controls for cashews
- Mycotoxin testing for bivalves & molluscs
- Pesticide residue testing
Mozambique decision criteria scores: pests status of bananas
Mozambique decision criteria scores: hygiene controls for bivavles/molluscs

- Up-front investment
- Ongoing costs
- Change in absolute value of exports
- Change in agricultural/fisheries productivity
- Change in domestic public health
- Change in local environmental protection
- Poverty impact
- Impact on vulnerable groups
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Validation process

• Aims to assess robustness and acceptability of derived priorities

• Sensitivity analysis:
  – Decision weights
  – Decision criteria
  – Decision criteria measures

• Stakeholder consultation:
  – Dissemination
  – Workshop
Mozambique equal weights model

- Biological control
- Mycotoxin controls for groundnuts and maize
- Determine pest status for bananas
- Maintain pest-free status for bananas
- Hygiene controls for crustaceans
- Post-harvest treatment for mangoes
- Black spot controls for citrus
- Mycotoxin testing
- Hygiene controls for bivalves & molluscs
- HACCP controls for cashews
- Pesticide residue testing
Mozambique costs and trade impact model

- Maintain pest-free status for bananas
- Determine pest status for bananas
- Hygiene controls for crustaceans
- HACCP controls for cashews
- Black spot controls for citrus
- Post-harvest treatment for mangoes
- Mycotoxin testing
- Biological control
- Mycotoxin controls for groundnuts and maize
- Pesticide residue testing
- Hygiene controls for bivalves & molluscs
Mozambique baseline model varying trade impact of hygiene controls for bivalves/molluscs
Outputs of the framework

• Key outputs:
  – Choice set
  – Information cards
  – Spider diagrams
  – Formal prioritisation
  – Prioritisation model

• Not the end point....

• .....ideas is to use the framework on a routine basis:
  – Disagreements over priorities
  – New data
  – New capacity-building needs
  – Capacity-building needs solved
Implications/issues

- Aims to aid decision-making...
- ...not to make decisions
- Nature of decision-making processes:
  - Structure
  - Transparency
  - Cost
- Constraints:
  - Resources
  - Expertise
  - Buy-in at senior administrative and political levels