Overview of Multi-Criteria Decision-Making Framework for Establishing SPS Capacity-Building Priorities

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Structure

• Aims of the framework
• Nature of the framework
• Practical implementation of the framework
• Framework outputs
• Implications/issues
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>$3 million</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>5</td>
<td>1</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
8. Sifting of Options
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 linked to trade
• 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
• Not perfect…..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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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

Market

SPS Issue -> Capacity-Building Option
Mango
Pesticide Residues
Fruit Fly
Papaya
EU
US
US
South Africa
Eliciting the choice set

• Approaches:
  – Workshop using Nominal Group Technique
  – Delphi survey

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

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

• Is it an SPS issue?
• Does the option relate to a current/potential and substantive compliance problem?
• Is the option economically viable aside from the SPS constraint?
• Are the sectors concerned and the level of existing/potential exports substantive?
Identified capacity-building options - Belize

- Animal health controls for live cattle exports
- Hygiene controls for beef exports
- Animal health and hygiene controls for chicken exports
- Plant health controls for pitahaya exports
- Food safety controls for papaya exports
- Laboratory testing capacity for pesticide residues and veterinary drug residues
- Laboratory testing capacity for heavy metals
- Plant health controls for citrus pulp exports
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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:
  – Workshop using Nominal group Technique
  – Delphi survey
Possible decision criteria....?

• Cost and difficulty of implementation:
  – Up-front investments
  – On-going costs
  – Difficulty of implementation

• Trade impacts:
  – Growth/avoided losses in value of exports
  – Diversification of exports
  – International reputation
  – Capacity to prevent future problems

• Wider impacts on agri-food sector
  – Agricultural productivity
  – Public health
  – Environmental protection

• Social impacts:
  – Poverty
  – Vulnerable groups - women, small farmers, disadvantaged areas, etc.
  – Employment impacts
# Decision criteria and weights - Belize

<table>
<thead>
<tr>
<th>Criterion</th>
<th>Weight</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Cost and difficulty of implementation</strong></td>
<td></td>
</tr>
<tr>
<td>Up-front investment</td>
<td>10%</td>
</tr>
<tr>
<td>On-going costs</td>
<td>9%</td>
</tr>
<tr>
<td>Difficulty of implementation</td>
<td>9%</td>
</tr>
<tr>
<td><strong>Trade impact</strong></td>
<td></td>
</tr>
<tr>
<td>Change in value of exports</td>
<td>15%</td>
</tr>
<tr>
<td>Trade diversification – new products</td>
<td>8%</td>
</tr>
<tr>
<td>Trade diversification – new markets</td>
<td>9%</td>
</tr>
<tr>
<td><strong>Domestic agri-food impacts</strong></td>
<td></td>
</tr>
<tr>
<td>Agricultural/fisheries productivity</td>
<td>8%</td>
</tr>
<tr>
<td>Domestic public health</td>
<td>8%</td>
</tr>
<tr>
<td>Environmental protection</td>
<td>5%</td>
</tr>
<tr>
<td><strong>Social impacts</strong></td>
<td></td>
</tr>
<tr>
<td>Employment impacts</td>
<td>7%</td>
</tr>
<tr>
<td>Poverty impacts</td>
<td>7%</td>
</tr>
<tr>
<td>Impact on vulnerable groups</td>
<td>5%</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 assumptions, basis of estimate, etc.
  - Indicator of confidence in estimate
- ‘Living’ documents
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 that can be used 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’</td>
</tr>
<tr>
<td></td>
<td></td>
<td>-1 = ‘Small negative impact’</td>
</tr>
<tr>
<td></td>
<td></td>
<td>0 = ‘No impact’</td>
</tr>
<tr>
<td></td>
<td></td>
<td>+1 = ‘Small positive impact’</td>
</tr>
<tr>
<td></td>
<td></td>
<td>+2 = ‘Large positive impact’</td>
</tr>
<tr>
<td>Count</td>
<td>Number</td>
<td>Number of small farmers impacted</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Number of new markets accessed</td>
</tr>
<tr>
<td>Continuous</td>
<td>Absolute value/change</td>
<td>Absolute increase in value of exports</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Percentage increase in costs</td>
</tr>
</tbody>
</table>
# Measurement of decision criteria - Belize

<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 ($)</td>
</tr>
<tr>
<td>On-going costs</td>
<td>Absolute value ($)</td>
</tr>
<tr>
<td>Difficulty of implementation</td>
<td>‘Very easy’ (1) to ‘Very difficult’ (5)</td>
</tr>
<tr>
<td><strong>Trade impact</strong></td>
<td></td>
</tr>
<tr>
<td>Absolute change in value of exports</td>
<td>Absolute value in 2017 ($)</td>
</tr>
<tr>
<td>Trade diversification – new products</td>
<td>‘Large negative’ (-2) to ‘Large positive’ (+2)</td>
</tr>
<tr>
<td>Trade diversification – new markets</td>
<td></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>Employment impacts</td>
<td>‘Large negative’ (-2) to ‘Large positive’ (+2)</td>
</tr>
<tr>
<td>Poverty impacts</td>
<td></td>
</tr>
<tr>
<td>Impact on vulnerable groups</td>
<td></td>
</tr>
</tbody>
</table>
## Capacity-building option profile – animal health controls for live cattle exports

<table>
<thead>
<tr>
<th>Decision Criterion</th>
<th>Value</th>
<th>Details</th>
<th>Confidence</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Cost and difficulty of implementation</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Up-front investment</td>
<td>US$6.12 million</td>
<td>Estimates from EU project proposal...</td>
<td>High</td>
</tr>
<tr>
<td>On-going cost</td>
<td>US$440,000</td>
<td>Estimates from EU Project proposal.</td>
<td>High</td>
</tr>
<tr>
<td>Difficulty of implementation</td>
<td>5</td>
<td>Very difficult. Identification system needs to cover entire cattle population in Belize. Surveillance system needs to be maintained. Needs cooperation of Mexican government.</td>
<td>High</td>
</tr>
<tr>
<td><strong>Trade impact</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Change in absolute value of exports</td>
<td>US$13.6 million</td>
<td>Currently the informal trade with Mexico is estimated at US$500,000 per annum but is estimated to increase to US$14,062,500 per annum once trade is formalised</td>
<td>Medium</td>
</tr>
<tr>
<td>Trade diversification – products</td>
<td>0</td>
<td>Currently, exports occur to Mexico and Guatemala, but all informal</td>
<td>High</td>
</tr>
<tr>
<td>Trade diversification – markets</td>
<td>0</td>
<td>Currently, exports occur to Mexico and Guatemala, but all informal</td>
<td>High</td>
</tr>
<tr>
<td><strong>Domestic agri-food impact</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Agricultural/fisheries productivity</td>
<td>+1</td>
<td>Bovine Tuberculosis and Brucellosis are not known to be major problem in cattle production in Belize. Returns to cattle production likely to increase</td>
<td>Medium</td>
</tr>
<tr>
<td>Domestic public health</td>
<td>0</td>
<td>No impact</td>
<td>High</td>
</tr>
<tr>
<td>Environmental protection</td>
<td>-1</td>
<td>Could lead to deforestation. Likely to be shift to semi-intensive or intensive systems of production.</td>
<td>Medium</td>
</tr>
<tr>
<td><strong>Socio-economic impact</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Impact on employment</td>
<td>0</td>
<td>Negligible. Likely to be increased production, but not very labour intensive</td>
<td>Medium</td>
</tr>
<tr>
<td>Poverty impact</td>
<td>0</td>
<td>Even small cattle producers are not poor.</td>
<td>Medium</td>
</tr>
<tr>
<td>Impact on vulnerable groups/areas</td>
<td>0</td>
<td>Cattle producers predominantly men. North not a marginal area.</td>
<td>Medium</td>
</tr>
</tbody>
</table>
Stages in prioritisation process

- Compilation of Information Dossier
- Definition of Choice Set
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- Derivation of Quantitative priorities
- Validation

Sifting of Options
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
• Aims:
  – Communication
  – Assembly of information for ‘traditional’ decision-making
  – Initial assessment of capacity-building options before formal prioritisation
Decision criteria measures scores: on-going costs ($)

- Animal health controls for live cattle exports
- Hygiene controls for beef exports
- Animal health and hygiene controls for chicken exports
- Plant health controls for pitahaya exports
- Laboratory testing capacity for heavy metals
- Laboratory testing capacity for pesticide and veterinary drug residues
- Food safety controls for papaya exports
- Plant health controls for citrus pulp exports
Decision criteria measures scores: growth in value of exports ($)

- Animal health controls for live cattle exports
- Hygiene controls for beef exports
- Animal health and hygiene controls for chicken exports
- Plant health controls for pitahaya exports
- Food safety controls for papaya exports
- Laboratory testing capacity for heavy metals
- Laboratory testing capacity for pesticide and veterinary drug residues
- Plant health controls for citrus pulp exports
Decision criteria measure scores: domestic agri-food impacts

- Animal health controls for live cattle exports
- Hygiene controls for beef exports
- Animal health and hygiene controls for chicken exports
- Plant health controls for citrus pulp exports
- Plant health controls for citrus pulp exports
- Laboratory testing capacity for heavy metals
- Laboratory testing capacity for pesticide and veterinary drug residues
- Food safety controls for papaya exports
- Agricultural/fisheries productivity
- Domestic public health
- Environmental protection
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 → Sifting of Options
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
## Basic framework structure

<table>
<thead>
<tr>
<th>Criteria</th>
<th>Weights</th>
<th>Options</th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>Option1</td>
<td>Option 2</td>
<td>Option 3</td>
<td>Option 4</td>
<td>Option 5</td>
<td></td>
</tr>
<tr>
<td>Cost</td>
<td>20%</td>
<td>$3 million</td>
<td>$500,000</td>
<td>$2 million</td>
<td>$250,000</td>
<td>$3 million</td>
<td></td>
</tr>
<tr>
<td>Growth in Exports</td>
<td>30%</td>
<td>30%</td>
<td>20%</td>
<td>50%</td>
<td>10%</td>
<td>15%</td>
<td></td>
</tr>
<tr>
<td>Small farmers</td>
<td>30%</td>
<td>No</td>
<td>Yes</td>
<td>No</td>
<td>Yes</td>
<td>Yes</td>
<td></td>
</tr>
<tr>
<td>Poverty impacts</td>
<td>20%</td>
<td>Minor</td>
<td>Major</td>
<td>Moderate</td>
<td>Minor</td>
<td>Major</td>
<td></td>
</tr>
<tr>
<td>Ranking</td>
<td></td>
<td>5</td>
<td>1</td>
<td>3</td>
<td>2</td>
<td>4</td>
<td></td>
</tr>
</tbody>
</table>
Belize Prioritisation - Baseline model

- Food safety controls for papaya exports
- Plant health controls for pitahaya exports
- Animal health and hygiene controls for chicken exports
- Laboratory testing capacity for heavy metals
- Hygiene controls for beef exports
- Laboratory testing capacity for pesticide and veterinary drug residues
- Plant health controls for citrus pulp exports
- Animal health controls for live cattle exports
Decision criteria scores – food safety controls for papaya exports

Up-front investment
On-going costs
Difficulty of implementation
Trade impact
Trade diversification - products
Trade diversification - markets
Agricultural/fisheries productivity
Public health
Environmental protection
Employment
Poverty
Vulnerable groups

Scores:
-1.0, -0.8, -0.6, -0.4, -0.2, 0.0, 0.2, 0.4, 0.6, 0.8, 1.0
Decision criteria scores – animal health and hygiene controls for chicken exports
Decision criteria scores – animal health controls for live cattle exports
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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
Belize Prioritisation – Equal weights model

- Food safety controls for papaya exports
- Plant health controls for pitahaya exports
- Animal health and hygiene controls for chicken exports
- Laboratory testing capacity for heavy metals
- Laboratory testing capacity for pesticide and veterinary drug residues
- Hygiene controls for beef exports
- Plant health controls for citrus pulp exports
- Animal health controls for live cattle exports
Belize Prioritisation – Cost/difficulty of implementation and trade only model

-0.25
-0.2
-0.15
-0.1
-0.05
0
0.05
0.1
0.15
0.2

Plant health controls for pitahaya exports
Animal health and hygiene controls for chicken exports
Laboratory testing capacity for heavy metals exports
Food safety controls for papaya exports
Hygiene controls for beef exports
Laboratory testing capacity for pesticide and veterinary drug residues exports
Plant health controls for citrus pulp exports
Animal health controls for live cattle exports
Mozambique baseline model varying trade impact of hygiene controls for bivalves and molluscs

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

Costs:
- US$375,000
- US$20 million
Outputs of the framework

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

• Aim is for the framework to be used on a routine basis:
  – Disagreements over priorities
  – New data
  – New capacity-building needs
  – Capacity-building needs solved
Implications/issues

- Aims to *aid* decision-making and not to be used to *make* decisions
- Has implications for nature of decision-making processes:
  - Structure
  - Transparency
  - Cost
- Confines of the analysis can be adjusted:
  - SPS issues not related to trade
  - Non-SPS issues
- Are complementarities with other assessment frameworks:
  - PVS
  - PCE
Implications/issues

• Need attention and time to collect and synthesise information – avoid ‘rush’ to the software
• Need an inter-disciplinary team:
  – Technical SPS experts
  – Trade expert
  – Applied economist