MINISTRY OF INDUSTRY AND TRADE

Using Multi Criteria Decision Analysis to Identify and Prioritize Key Sanitary and Phytosanitary Capacity Building Options and Needs for Malawi

Isaac Briandt Gokah[1]

Bridget Chifundo Kauma[2]

Chipo Kachiwala[3]

Charles Vyawo Chavula[4]

Spencer Henson[5]

Dermot Cassidy[6]

17th July 2012

Contents

This study is made possible by the generous support of the American people through the United States Agency for International Development (USAID). The contents are the responsibility of the authors and do not necessarily reflect the views of USAID or the United States Government.

Acronyms

AHIF	Avian and Human Influenza Facility
ASWAp	Agriculture Sector Wide Approach
AU	African Union
CAADP	Comprehensive African Agriculture Development Programme
CIP	International Potato Centre
COMESA	Common Market for Eastern and Southern Africa
DALH	Department of Animal and Livestock Development
EAC	East African Community
EU	European Union
FAO	Food and Agriculture Organisation
FMD	Foot and Mouth Disease
GAP	good agricultural practices
GMO	Genetically-modified organism
GMP	good manufacturing practices
GVP	good veterinary practices
HACCP	Hazard Analysis and Critical Control Point
HaSSP	Harmonised Seed Security Project
HCC	hepatocellular carcinoma
HTFA	high temperature forced air
IITA	International Institute of Tropical Agriculture
ISO/IEC	International Standards Organization/International Electrotechnical Commission
IPPC	International Plant Protection Convention
ISPM	International Standards For Phytosanitary Measures
LGB	larger grain borer
LoD	limit of detection
LPI	logistics performance index
MBS	Malawi Bureau of Standards
MCDA	multi-criteria decision analysis
MoAFS / MoAIWD	Ministry of Agriculture and Food Security (or Ministry of Agriculture, Irrigation and Water Development)
MoIT	Ministry of Industry and Trade
MRL	maximum residue level
NPPO	National Plant Protection Organization
NTRM	non-tobacco-related materials
OECD	Organization for Economic Co-operation and Development
PCE	Phytosanitary Capacity Evaluation
PVS	Performance, Vision and Strategy

RASFF	Rapid Alert System for Food and Feed
SADC	Southern African Development Community
SME	Small and medium enterprise
SPS	Sanitary and Phytosanitary
STDF	Standards and Trade Development Facility
TAML	Tea Association of Malawi Limited
TBT	Technical Barriers to Trade
UPOV	International Convention for the Protection of New Varieties of Plants
WFP	World Food Programme
WTO	World Trade Organization

Executive summary

As part of efforts to establish more coherent and accountable decisions in the allocation of scarce resources towards competing Sanitary and Phytosanitary (SPS) capacity-building needs the use of multi-criteria decision analysis (MCDA) is advocated as a structured framework for making the costs and benefits of alternative capacity-building investments explicit and for identifying options that offer the greatest return. Because the lack of data can seriously impede such analyses the Standards and Trade Development Facility (STDF) has supported the development of MCDA which enables SPS capacity-building options to be prioritized on the basis of a wide range of decision criteria.

This report has presented the initial results of a priority-setting exercise for SPS capacity-building in Malawi which commenced on Wednesday 8th February 2012. In this case, 16 distinct SPS capacity-building options were eventually identified and prioritized on the basis of a series of decision criteria to which weights are applied, that were derived by further consultation with stakeholders. The end result is a clear ranking of the 16 capacity-building options, which appear relatively robust to changes in the weights attached to the decision criteria and to changes in the decision criteria applied, including analyses where the analytical focus was exclusively on the trade impacts. Of the 16 options in the analysis the following four are consistently ranked as high priority:

- Pesticide controls for tea.
- Compliance with SPS requirements for chilli sauce exports.
- Virus indexing capacity for planting material.
- Aflatoxin controls for groundnuts.

Conversely, certain capacity-building options are consistently ranked as low priority, notably:

- Pesticide residue testing capacity.
- Pesticide controls for maize.
- Animal health controls for day old chicks.

The ranking of aflatoxin controls for maize is highly sensitive to assumptions over trade impacts and is examined in more detail. This prioritization is based not only on the respective costs and predicted trade impacts, but also on the basis of impacts on agricultural productivity, domestic public health, local environmental protection, poverty and vulnerable groups i.e. encompassing many of the United States Agency for International Development (USAID) Feed the Future indicators. Given the robustness of the results, this basic ranking would appear to present a coherent basis on which to start defining a national action plan for SPS capacity-building in Malawi.

It is important to recognize, however, that the results of the analysis presented above represent just the starting point in the use of the priority-setting framework in the context of SPS capacity-building in Malawi. Indeed, the results must be revisited and revised on an ongoing basis in the light of improvements in the availability and/or quality of data, changes in policy priorities that imply shifts in the decision weights and/or the introduction of new decision criteria, and as investments are made in the options included in the analysis above, these can be excluded and the priorities estimated accordingly.

Using Multi Criteria Decision Analysis to Identify and Prioritize Key Sanitary and Phytosanitary Capacity Building Options and Needs for Malawi

1. Introduction

Sanitary and phytosanitary (SPS) measures are applied by governments to control food safety, plant health and animal health risks, and to prevent incursions of exotic pests and diseases. In turn, such measures act to protect human health, promote agricultural productivity and facilitate the international marketability of agricultural and food products.[7] Increasingly, private standards are being applied in parallel as a mechanism for firms to manage food safety risks and to differentiate their products. Whilst the illegitimate use of SPS measures undoubtedly remains a problem, despite the obligations and rights laid down in the World Trade Organization (WTO) Agreement on Sanitary and Phytosanitary Measures, arguably the biggest challenge for developing countries is achieving and maintaining the required compliance capacity, both within the public sector and in exporting firms.[8]

In making efforts to expand their agri-food exports and to reposition themselves towards higher-value markets, developing countries face an often daunting array of SPS capacity-building needs that outstrip available resources, whether from national budgets or donors. Inevitably, hard decisions have to be made to prioritise particular capacity-building needs over others. At the same time, the drive towards greater aid effectiveness requires that beneficiary governments are able to present coherent and sustainable plans for capacity-building. Whilst decisions have to be made between competing needs on an on-going basis, such decisions often lack coherence and transparency, and there are various accusations of inefficiencies in the allocation of resources, whether by developing country governments or by donors.[9]

As part of efforts to establish more coherent and accountable decisions in the allocation of scarce resources towards competing SPS capacity-building needs, various economic analysis techniques have been touted. Approaches such as cost-benefit and cost-effectiveness analysis are seen as providing structured frameworks for making the costs and benefits of alternative capacity-building investments explicit and for identifying options that offer the greatest return.[10] The quantity and/or quality of data in many developing countries, however, can seriously impede such analyses. Further, establishing priorities amongst capacity-building needs is often made on the basis of multiple criteria measured in disparate ways, pointing to the potential use of multi-criteria decision analysis (MCDA).

The Standards and Trade Development Facility (STDF) has supported the development of a framework for the establishment of priorities amongst competing SPS capacity-building needs that might be funded by the government or the private sector in developing countries, and/or donors.[11] Through the use of MCDA, the framework enables capacity-building options to be prioritised on the basis of a wide range of decision criteria (for example value of exports, impacts on small-scale producers, improvements in domestic public health and/or agricultural productivity and consequences for vulnerable groups) that are not necessarily measured or even measurable using the same metrics. At the current time, this framework is being applied in selected countries in order to assess its utility in practice and to lead the development of an easy-to-follow users guide.

One of the initial applications was in Malawi, which is the focus of this report. Despite the fact that various assessments of the SPS situation and capacity-building needs have been undertaken in Malawi, there remains a lack of coherence in the establishment of priorities. Thus, many of the existing assessments, whilst identifying a plethora of weaknesses in capacity, generate a virtual 'shopping list' of needs that evidently outstrip available resources. Further, many of these needs are rather general in their focus, with insufficient attention given to the benefits that will flow from specific investments in SPS capacity relative to the costs involved. Therefore, it is not surprising that Malawi lacks a coherent and prioritised plan for the enhancement of SPS capacity that might guide government, donor and/or private sector investments. The analysis presented below aims to inform the development of such a plan.

This report starts by providing an overview of the agricultural policy environment followed by trade and trade support in SPS sensitive goods and related challenges in Malawi. The priority-setting framework and related methods are then briefly described. The report then proceeds to lay out the SPS capacity-building needs identified in the analysis and that enter the priority-setting exercise. The results of the analysis are then reported, followed by an assessment of the implications for SPS capacity-building in Malawi in the medium term.

2. Overview of Sanitary and Phytosanitary (SPS) situation in Malawi

2.1. Prior reviews of Sanitary and Phytosanitary (SPS) requirements and capacity building in Malawi

There are a number of tools and approaches for assessing the status of SPS capacity, the main ones of which are listed in Table 1. In terms of SPS-specific toolkits, the following have been applied in Malawi:

- The World Organization of Animal Health's (OIE) Performance, Vision and Strategy (PVS) and PVS Gap Analysis for animal health capacity have been applied. It is reported that these have been authorised for public release[12] but are not yet available on the OIE website/database[13]
- The International Plant Protection Convention's (IPPC) Phytosanitary Capacity Evaluation (PCE) of plant health capacity was completed in 2009 by the University of Pretoria[14]
- A National Biosecurity Capacity Assessment was carried out by the Food and Agriculture Organisation (FAO) in 2009, which reviewed food safety, plant and animal health.[15]

Further, national agricultural strategy documents, referred to as Comprehensive African Agriculture Development Programme (CAADP) compacts, are published by African Union (AU) countries. Since enhanced trade in agricultural products is one deliverable of the Regional Economic Communities within the AU, there is typically a significant trade promotion component to national CAADP Compacts. In the case of Malawi, a national CAADP Compact has been developed, known as the Agriculture Sector Wide Approach (ASWAp).

A Trade Policy Review for Malawi has recently been completed by the WTO.[16] The review contains, among other constituents a general overview of SPS requirements and issues focusing on legislative and institutional arrangements. In general, the arrangements as of 2010 are considered by the WTO report as being outdated.

Table 1. Existing reviews of SPS compliance and capacity for Malawi:

Source		Applied?
Enhanced Integrated Framework	Diagnostic Trade Integration Study	Yes
	Trade Policy Review (WTO)	Yes
CAADP Compact	Agriculture Sector Wide Approach	Yes
Integrated Approach to Food Safety, Plant & Animal Health: National Biosecurity Capacity Evaluation		Yes
Performance, Vision and Strategy (PVS) Tool		(Yes)
Pilot of FAO Guidelines to Assess Capacity-Building Needs to Strengthen National Food Control		No
Phytosanitary Capacity Evaluation (PCE) Tool		Yes
Ad hoc and other national case studies		Yes

Key: Yes = Conducted and in public domain; (Yes) = Conducted but not in public domain; No = not aware has been undertaken

Other specialist reviews have examined fruit, groundnuts, dairy, cereals and other value chains of strategic importance for food security and agricultural development, including the development of exports[17181920212223]. In the context of this review, some of the data from these reviews is looked at below in more detail in terms of value chains where there is a record of strong export performance.

2.2. Background and status of Malawi in respect of compliance to the World Trade Organization (WTO) Sanitary and Phytosanitary (SPS) Agreement and reporting obligations

The WTO maintains records of the compliance of Member States with obligations relating the Agreement on Sanitary and Phytosanitary Measures and Agreement on Technical Barriers to Trade. In addition, the Convention on Biological Diversity and the Cartagena Protocol on Biosafety[24] have some bearing on the workings of the SPS Agreement and have led to the additional requirement for a Biosafety National Focal Point in countries that are signatories to these conventions. The status of Malawi's compliance with these requirements is shown in Table 2.

Table 2: Compliance with World Trade Organization (WTO) and related obligations relating to SPS Sanitary and Phytosanitary and Technical Barriers to Trade (TBT) measures, August 2010[2526]

TBT Enquiry Point	Biosafety National Focal Point	SPS National Notification Authority	SPS Enquiry Point	Codex Contact Point	NPPO Contact Point[27]	Official website
Yes	Yes	Yes	Yes	Yes	Yes	No

2.3. Trade in Sanitary and Phytosanitary (SPS) sensitive agri-food products

Table 3 provides an overview of the magnitude and structure of agri-food exports from Malawi over the period 2007 to 2010 with an indication of their "SPS sensitivity'; an assessment of the degree to which they are subject to technical regulations relating to plant health, animal health and/or food safety, and to private standards. Annual agri-food exports averaged around US$870 million over the period 2007 to 2010. Exports were largely dominated by tobacco, which accounted for around two thirds of agri-food exports. Significant amounts of coffee, tea, sugar and cotton accounted for most of the remainder.

Agri-food exports from Malawi that have the highest degree of SPS sensitivity include fish, live animals, meat and other animal products, fruits and vegetables and planting materials (Table 3). It is important to recognise, however, that there are wide differences in the application and enforcement of SPS requirements across markets and segments within markets. Malawi's agri-food trade is directed predominantly to Europe, neighbouring countries (especially the Democratic Republic of Congo) and South Africa with widely varying SPS requirements.

The European Union (EU) Rapid Alert System for Food and Feed (RASFF) lists 11 notifications of non-compliant imports of agri-food products from Malawi over the period from 2005 to the end of May 2012. Of these, 10 relate to levels of aflatoxins in groundnuts, with the one remaining notification concerning the colorant Sudan Yellow in curry. Whilst SPS requirements tend to be strictest in Europe, where in some cases official requirements have been supplemented by private standards, exports to South Africa and to some extent to other Common Market for Eastern and Southern Africa (COMESA) and Southern African Development Community (SADC) countries have also experienced periodic SPS-related problems, such as the lack of pest lists published by the Malawian National Plant Protection Organization (NPPO).[28]

Given the overall composition of Malawi's agri-food exports and experiences to date, SPS requirements do not appear to be a major issue for agri-food exports from Malawi, despite the fact that a number of studies have highlighted the importance of SPS issues and the weakness of associated national capacity.[29] Other competitiveness factors, such as primary producer and processor productivity, continuity/reliability of supply, logistical costs, macroeconomic factors and international commodity price trends have arguably played a more leading role in explaining Malawi's agri-food trade performance to date.

Malawi's performance in more perishable and SPS sensitive agri-food exports, notably animals, fresh vegetables, cut flowers, and animal products are suggestive that supply chain problems, logistics and seasonality remain the predominant constraints, especially in light of the country's landlocked status and poor ranking in the world logistics performance index (LPI). Malawi's major trading partners, particularly in the region, are, in relative terms, not highly concerned about SPS requirements and anecdotal evidence suggests that traders circumvent these relatively easily, such as through informal trade across borders or, in cases where internationally recognised certification is required, by certification/testing through international service providers.[30] [31]

Most of Malawi's imports of agri-food products, mainly wheat and cooking oils with lesser amounts of dairy products and oilseeds, can generally be considered of low to moderate risk from an SPS standpoint. The imports of foods for which there might be greater SPS and especially food safety risks, such as dairy products, are from South Africa where relatively higher standards of SPS controls apply. Indeed, the greatest SPS risks faced domestically undoubtedly relate to within-country production and distribution rather than international trade.

Table 3. Malawian agri-food exports and attendant SPS requirements

Category	Average Annual Export 2007-2010 (US$000)	Proportion of Total SPS Sensitive Exports (%)	Sensitivity[32]			
			Plant Health	Animal Health	Food Safety	Private Standards
01 Live animals	158.03	0.0		XXX		
02 Meat and edible meat offal	0.64	0.0		XXX		
03 Fish, crustaceans, molluscs, aquatic invertebrates, nes	257.22	0.0		XXX		XXX
04 Dairy products, eggs, honey, edible animal product, nes	876.30	0.1		XX	XXX	XXX
05 Products of animal origin, nes	0.28	0.0		X		
06 Live trees, plants, bulbs, roots, cut flowers etc	198.85	0.0	XXX			
07 Edible vegetables and certain roots and tubers	23658.67	2.7	XX			XXX
08 Edible fruit, nuts, peel of citrus fruit, melons	7455.72	0.9	XX			XXX
09 Coffee, tea, mate and spices	68978.63	7.9	X		X	XX
10 Cereals	34018.17	3.9	XX		XX	
11 Milling products, malt, starches, inulin, wheat gluten	3375.82	0.4	X		XX	
12 Oil seed, oleagic fruits, grain, seed, fruit, etc, nes	35661.82	4.1	XX		XX	
13 Lac, gums, resins, vegetable saps and extracts ne	16.86	0.0			XXX	XXX
14 Vegetable plaiting materials, vegetable products, nes	88.48	0.0	X			
15 Animal, vegetable fats and oils, cleavage products, etc	565.44	0.1			XX	
16 Meat, fish and seafood food preparations, nes	6.14	0.0		X	XXX	XXX
17 Sugars and sugar confectionery	64278.40	7.4			X	
18 Cocoa and cocoa preparations	19.35	0.0			X	
19 Cereal, flour, starch, milk preparations and products	1353.37	0.2			X	
20 Vegetable, fruit, nut, etc. food preparations	1335.47	0.2			XX	XX
21 Miscellaneous edible preparations	225.01	0.0			X	
22 Beverages, spirits and vinegar	4621.38	0.5			X	
23 Residues, wastes of food industry, animal fodder	1777.11	0.2	XX	XX		
24 Tobacco and manufactured tobacco substitutes	589341.16	67.4			X	
44 Wood and articles of wood, wood charcoal	11041.25	1.3	X			X
46 Manufactures of plaiting material, basketwork, etc.	45.95	0.0	X			
47 Pulp of wood, fibrous cellulosic material, waste, etc.	88.11	0.0			X	X
48 Paper & paperboard, articles of pulp, paper and board	712.95	0.1			X	
50 Silk	0.00	0.0		X		
51 Wool, animal hair, horsehair yarn and fabric thereof	2.55	0.0		X		
52 Cotton	23847.78	2.7			X	
53 Vegetable textile fibres nes, paper yarn, woven fabric	30.71	0.0				
TOTAL	874037.62					

3. Establishing priorities using a Multi-Criteria Decision-Making Framework

The framework employed here aims to present a more comprehensive analysis of options for SPS capacity-building that can feed into the development of a prioritised action plan for the enhancement of SPS capacity. Thus, its ultimate objective is to *generate a prioritised schedule of options for SPS-related capacity-building in Malawi on the basis of the multiple economic and/or social criteria*. The rationale behind the framework, therefore, is that priorities need to be established on the basis of a range of economic and social considerations that may, at least on the face of it, be difficult to reconcile. In turn, this assumes that the rationale for investments in SPS capacity-building is not compliance with export market SPS requirements *per se*, but the economic and social benefits that might flow from such compliance, whether in terms of enhanced exports, incomes of small-scale producers and/or vulnerable groups, promotion of agricultural productivity and/or domestic public health, etc. The framework provides an approach for different decision criteria to be taken into account, even though they may be measured in quite different ways.

In pursuit of this objective, the framework aims to:

- Identify the current set of SPS-related capacity-building options in the context of existing and/or potential exports of agri-food products. Below this is termed the *choice set*.
- Determine the *decision criteria* that should drive the establishment of priorities between SPS-related capacity-building options and the relative importance (*decision weights*) to be attached to each.
- Prioritize the identified SPS-related capacity-building options on the basis of the defined decision criteria and decision weights.
- Examine the sensitivity of the established priorities to changes in parameters of the framework.

The framework employs a highly structured process that aims to be applied in a wide variety of contexts and to provide various diagrammatic and numerical outputs. The framework and its practical implementation are described in detail in a draft user's guide.[33] Thus, here a relatively brief outline of the seven stages of the framework (Figure 1) is provided, with a particular focus on how they were implemented in Malawi.

Stage 1: Compilation of information dossier

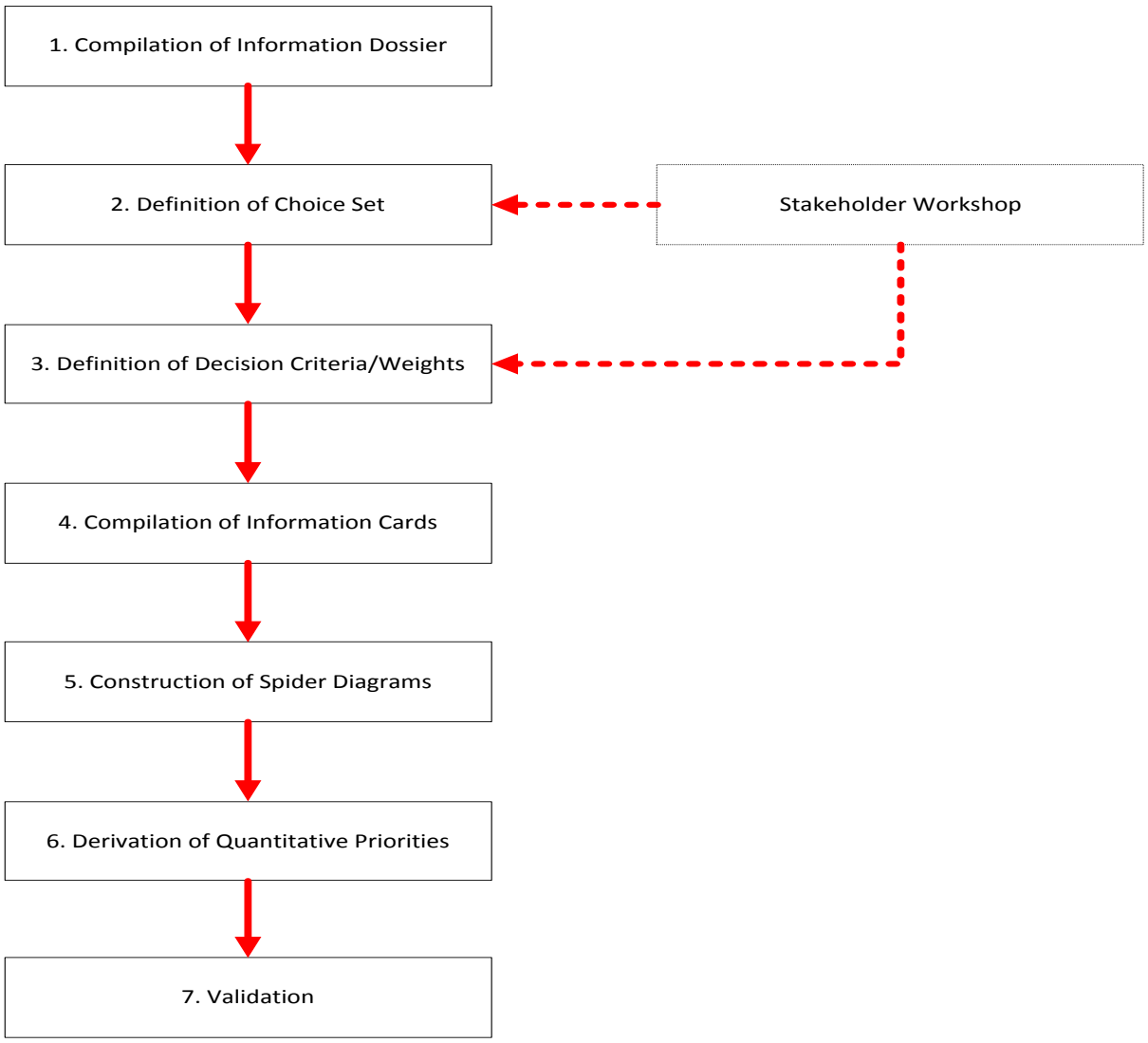
The first stage of the analysis involved the compilation of a comprehensive dossier of existing information on the SPS challenges facing agri-food exports from Malawi and the associated capacity-building needs. In so doing, the aim was to ascertain what work had already been undertaken to identify capacity-building options and the definition of priorities for related investments. The documents/information in the dossier are itemised in Appendix 1.

Stage 2: Definition of choice set

In order to identify the SPS capacity-building options to be considered in the priority-setting framework, a one-day stakeholder workshop was held on Wednesday 8th February 2012. A total of 37 stakeholders (Appendix 2) attended the workshop, drawn from government, private sector and donors. Participants

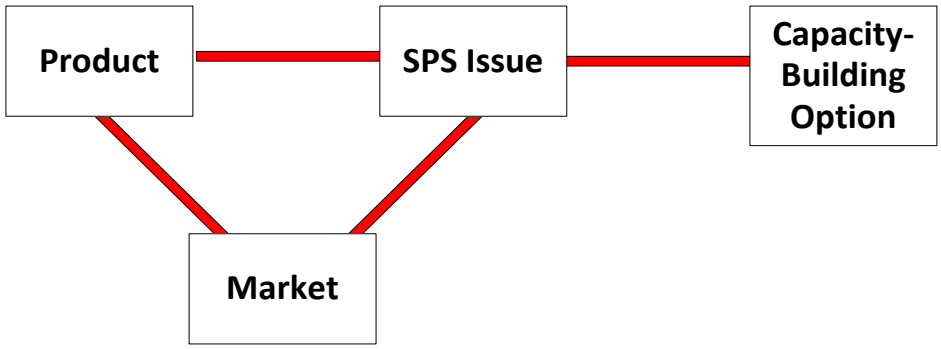
were presented with a series of cards and asked to identify the SPS capacity-building needs of Malawi. Critically, respondents were asked to define a series of mutually-exclusive needs consisting of four key elements (Figure 2). First, the product(s) affected. Second, the specific SPS issue faced by exports of this product(s). Third, the market(s) where these SPS needs were an issue. Fourth, the capacity-building option(s) that would solve the SPS issue being faced. The combination of these four elements defined a distinct capacity-building option. Respondents were free to define as many specific SPS capacity-building needs as they wished.

Figure 1. Stages in multi-factorial prioritisation of SPS capacity building options



The cards of all respondents were collected, shuffled and then reported back to the workshop as a whole through listings on flip charts. The collection of items was then discussed in order to remove any ambiguities and to ensure that each represented a mutually-exclusive capacity-building option. A total of 31 SPS capacity-building options were defined through the above process, of which 16 were excluded because they were judged not to be substantive SPS issues.

Figure 2. Definition of SPS capacity-building options



The excluded capacity building options were as follows:

- **Controls for Larger Grain Borer in maize:** Regional and international exports of maize require treatment to exclude the larger grain borer (LGB) beetle (*Prostephanus truncatus*). This requirement is a usual condition of plant import permits in the region. This issue is already well addressed and the fumigation services and national plant protection inspections to fulfil the necessary additional declaration on the phytosanitary certificate are already in place.
- **Plant pest controls for cut flowers:** Importers of cut flowers into the EU require surveillance by the NPPO of the exporting country of growing areas for pests. Whilst this would be a problem should Malawi try to export cut flowers to Europe, this is not judged to be the critical constraint. Thus, in Malawi there are no direct or easy cold chain logistical connections to European markets and even if the flowers were robust enough to travel indirectly it is unlikely that they could be competitive with production in Kenya (for instance).
- **Controls for weevils in pulses:** Regional and international exports of pulses require treatment to exclude weevils. This requirement is a usual condition of plant import permits in Malawi's export markets. This issue is already well addressed and the fumigation services and national plant protection inspections to fulfil the necessary additional declaration on the phytosanitary certificate are already in place.
- **Animal disease controls for hides and skins:** Exporters of hides and skins to China, Hong Kong and Korea require certification that they originate from areas that are free from animal diseases. The export of partially-processed ('green') hides is essentially a by-product of beef production exported from areas geographically free from Foot and Mouth Disease (FMD) and other quarantine animal diseases. The development of an export industry based on such a product is unlikely to justify the expense of creating a disease-free area. Fully processed ('blue') hides are free from SPS-related issues.
- **Controls for pests and diseases in citrus fruit:** Certain markets require citrus fruit to be inspected and/or treated and certified free from certain pests and diseases, including Citrus Black Spot and fruit flies. However, there is no substantive support for the view that Malawi has significant export potential for citrus fruit because of the intense pest and disease pressure in the country coupled with logistical issues in getting the product to distant markets. No evidence was advanced that citrus is excluded from regional markets for phytosanitary reasons.

- **Genetically-modified organism (GMO) testing for maize:** Zimbabwe excludes genetically modified maize from its markets. This includes the requirement for testing and certification of maize exports from Malawi as being GM-free. The testing of maize exports as being GM-free is relatively straightforward. However it may require the laboratory and test method to be certified. However, Malawi produces little or no GM crops and testing in certified laboratories is possible in South Africa. Furthermore the concerns of Zimbabwe relate to the potential for un-milled GM maize to be grown and to cross-pollinate local open-pollinated cultivars. The concern appears not to extend to milled maize.
- **Plant pest controls for tobacco:** Malawi is a substantial exporter of tobacco to Europe, Asia and North America. International exports of tobacco require fumigation to exclude storage pests. This requirement is a usual condition of import permits in Malawi's main export markets. This capacity building option is excluded because the issue is already well-addressed and the fumigation services and national plant protection inspections to fulfil the necessary additional declaration on the phytosanitary certificate are already in place.
- **Starch testing for roots and tubers:** Cassava starch production is aimed at the supply of raw material for food manufacturers. It is not clear, however, that such markets require precise tests for starch content. Further, this is not an SPS but rather a quality issue.
- **Coffee packaging:** The packaging of coffee for export requires specialised packaging that conforms to market specifications. This is not an SPS issue.
- **Nutrient content testing for fortified maize meal**: Malawian and regionally-available maize meal is fortified with a range of nutrients as well as being mixed with other foods such as soya meal. The option is associated with the development of the capacity to test fortified maize meal for its nutritional value. This is not an SPS issue.
- **Plant health controls for timber packaging:** The IPPC has formulated guidelines the International Standard for Phytosanitary Measures # 15 (ISPM 15) for the treatment and certification of wooden packaging in order to prevent the spread of plant pests and diseases through international trade. Although some exports have not conformed to these requirements, capacity for the treatment and certification of wooden packaging does exist in Malawi.
- **Hazard Analysis and Critical Control Point (HACCP) requirements for rice exports:** Rice exported from Malawi to the United Kingdom requires HACCP certification as part of the private food safety standards in that country. However, commercial opportunities to export rice from Malawi appear very limited. Further, the requirements to achieve certification would be minimal for a dry good such as rice that is consumed cooked and where pesticide use is minimal.
- **Food safety controls for processed mango:** There is a potential for the development of exports of processed mango to a variety of export markets, some of which have strict food safety requirements, including HACCP. However, HACCP certification can be obtained from international service providers, probably at lower overall cost than developing the internal capacity for certification within Malawi.
- **Capacity for Hazard Analysis and Critical Control Point (HACCP) certification in a variety of sectors**: As with mango, certain food exports require HACCP certification. However, HACCP

certification can be obtained from international service providers, probably at lower overall cost than developing the internal capacity for certification within Malawi.

- **SPS controls for cotton:** Cotton is a priority crop for Malawian agriculture. Exports of this crop might include cotton lint, oilseed cake (for use as animal feed) and cooking oil. Given that cotton has a significant range of pests it would be necessary for Malawi to be able to comply with phytosanitary, food safety and crop chemical residue requirements of the importing countries for these products. This option is excluded, however because: i) cotton lint has no binding phytosanitary issues; ii) oilseed cake is unlikely to have chemical and/or aflatoxin residues and buyers are likely to carry out residue tests if their customers or import regulations require them to; and iii) whilst there can be some food safety problems with cottonseed oil, major pressing companies are well able to deal with these.

The 16 capacity-building options remaining after this initial sifting process are outlined in Table 4. These options proceeded to the priority-setting stage of the analysis.

Table 4. Choice set of SPS capacity-building options

Option Number	Name	Details
1	Post-harvest treatment for mangoes	Mango production for processing and fresh fruit exports is being planned in Malawi. Since it is a requirement of destination markets that mitigation measures are in place for fresh fruit exports, the proposed activity will develop a post-harvest treatment based on high temperature forced air technology (HTFA) to disinfest the fruit of *B. invadens*, and provide the equipment to treat export fruit.
2	Aflatoxin controls for groundnuts	The ability of smallholders to meet aflatoxin standards is limited. In addition the control of aflatoxin by conventional means (e.g. improved post-harvest management) has had limited impact over the years. The intervention aims at providing a systems approach to mycotoxin contamination in groundnuts together with a low cost aflatoxin bio-control remedy to smallholders that will increase the likelihood of meeting EU limits for the contaminant, as well as reducing dietary intake of the domestic population.
3	Aflatoxin controls for maize	The ability of smallholders to meet aflatoxin standards for maize is limited. In addition the control of aflatoxin by conventional means (e.g. improved post-harvest management) has had limited impact over the years. The intervention aims at providing a systems approach to mycotoxin contamination together with a low cost aflatoxin bio-control remedy to smallholders that will increase the likelihood of meeting EU limits for the contaminant, as well as reducing dietary intake of the population as a whole.

Option Number	Name	Details
4	Mycotoxin testing capacity	Groundnuts and future maize exporters cannot get certified tests for mycotoxins in Malawi. Laboratories in the country conduct tests for aflatoxin (not mycotoxin) residues prior to shipping. Tests are conducted in the destination country to ISO/IEC[34] 17025 standard on a consignment basis. Exporters run the risk that domestic testing is inaccurate and/or that aflatoxin levels have increased in transit, leading to rejection of the consignment. This option will establish internationally-credible aflatoxin testing capability in Malawi.
5	Compliance with SPS requirements for honey exports	For honey exports to the EU, the exporting country has to have a residue plan in place which outlines how pesticides and other residues will be controlled and prevented from exceeding certain levels. This option will develop a residue monitoring plan for the Malawian Competent Authority within the Department of Animal and Livestock Health (DALD) of the Ministry of Agriculture and Food Security (MoAFS) in close cooperation with the private sector exporters.
6	Pesticide controls for tobacco	Widespread use of agro-chemicals on tobacco poses potential problems with meeting maximum residue levels (MRLs) in export markets, whilst imposing risks to human health in Malawi, including for people working in tobacco production and post-harvest handling. The accepted control of agro-chemicals is through the implementation of good agricultural practices (GAP) by farmers. This option will develop a programme of GAP training and implementation with large numbers of smallholders in the tobacco sector.
7	Pesticide controls for pulses	Whilst crop chemical requirements and level of usage on pulses are not very high, from a trade perspective it is necessary to demonstrating compliance to importing country agro-chemical MRLs through implementation of GAPs at the production level. Regional trade standards are being developed by the East African Community (EAC)[35], which are likely to use CODEX MRLs as the default agrochemical standard. This option would enable Malawi to demonstrate compliance with these requirements.
8	Pesticide controls for maize	Maize is attacked by a wide range of pests and diseases in Malawi which, in many cases, need to be managed through the use of agrochemicals, including in storage. This poses challenges in meeting exports market MRLs and also poses risks to human health; maize is a key component of the national diet. This option will extend the use of GAPs to maize growers.

Option Number	Name	Details
9	Pesticide controls for tea	While there are relatively few SPS issues in respect of tea, pesticide residues have long been a concern. In 2007, the Tea Association of Malawi Limited (TAML) organised a study of the use of pesticides in Malawi which found evidence of improper pesticide use incompatible with GAPs. This option will redress this issue through promotion of GAPs and natural control methods.
10	Pesticide residue testing capacity [36]	Currently Malawian exporters of agri-food products have pesticide tests conducted outside the country. Establishing this capability in Malawi will negate the need to use external laboratories. This option will establish internationally-credible pesticide residue testing capability in Malawi.
11	Animal health controls for (live ornamental) fish exports	Exporters of live fish need to demonstrate compliance with EU and OIE fish health regulations and requirements, whilst the Malawian Competent Authority needs to be able to make compatible declarations on health certificates. Some of these declarations may require national surveillance of fish and fish diseases. This option will develop the required capacity.
12	Compliance with hygiene requirements for milk and dairy product exports	This option will provide training and support the adoption of pre-requisite programs for HACCP certifications of factories, i.e., GAPs and good veterinary practices (GVPs) along the dairy value chain, including input supply and production. At the levels of producer bulking and processing training and implementation of better quality management will be facilitated. The ultimate aim is compliance with trading partner standards for milk and milk products based on COMESA-CODEX standards.
13	Virus indexing capacity for planting materials	Certain crops are propagated through live vegetative planting material, for example Irish potatoes, sweet potatoes and pineapples. A significant problem with such materials is that pests and diseases can be carried through to succeeding crops. This option focuses on the capacity to produce, test and certify planting material in Malawi.
14	Compliance with SPS requirements for chilli sauce exports	This option aims to facilitate the re-certification of Nali, a manufacturer of chilli sauce, for HACCP. The company lost its original HACCP certification due to contamination of raw material with foreign bodies. The option will introduce enhanced controls of suppliers of raw materials.

Option Number	Name	Details
15	Seed inspection and certification capacity	Worldwide, seed testing is required in order to comply with international standards. These requirements have been codified by a SADC standard; the Harmonized Seed Security Project (HaSSP). Challenges for seed health testing in Malawi include inadequate facilities, lack of experienced analysts, limited knowledge of where to find reference materials when submitting seed health testing methods, and limited research in seed science and seed health testing. This option will develop internationally-recognised seed testing and certification services in Malawi.
16	Animal health controls for day old chick exports	A Malawian producer of day old chicks exports to a number of African countries. Consignments must be accompanied by an original veterinary import permit and animal health certificate with additional declarations issued by the veterinary services of the exporting country. Capacity needs to be built in the DALD of the MoAFS in order to meet trading partner animal health requirements.

Stage 3: Definition of decision criteria and weights

In the second stage of the stakeholder workshop, respondents were asked to define an appropriate set of criteria to drive the priority-setting process and to assign weights to these. First, participants were presented with a series of potential decision criteria organised into four categories as set out in Table 5, and asked which (if any) should be excluded and whether any potentially important criteria were missing. Two additional decision criteria were selected, namely:

- **Difficulty of implementation**: The level of difficulty likely to be faced in implementing the option given current political priorities, economic constraints, need for realignment of administrative priorities within government, need for cooperation between the public and private sectors and/or with governments in trade partners, etc.
- **Trade diversification**: the degree to which the option leads to the diversification of exports whether across products and/or markets. This is a key priority of the Government of Malawi.

To define the decision weights, the workshop participants were each asked to assign 100 points amongst the eight decision criteria. The scores of participants were then collated and an average weighting calculated. This average weighting was reported back to the workshop participants to identify any discrepancies. The final agreed weightings are reported in Table 5.

Stage 4: Construction of information cards

Having identified the choice set of SPS capacity-building options and the decision criteria and weights to be applied in the priority-setting exercise, this information was assembled into a series of information cards. The aim of these cards is not only to ensure consistency in the measurement of each decision

criterion across the capacity-building options, but also to make the priority-setting exercise more transparent and open to scrutiny.

Table 5. Decision criteria and weights for setting priorities of SPS capacity-building options

Objectives	Decision Criteria	Minimum	Mean	Maximum
Costs and Difficulty of implementation	Up-front investment	0	11	30
	On-going costs	0	9	21
	Difficulty of implementation	0	8	19
Trade impacts	Change in absolute value of exports	4	20	45
	Trade diversification	0	11	40
Direct agri-food impacts	Change in agricultural productivity	0	12	20
	Change in domestic public health	0	8	20
	Change in local environmental protection	0	7	20
Social impacts	Poverty impact	0	9	25
	Impact on vulnerable groups	0	6	28

First, the specific nature of each of the SPS capacity-building options was described in some detail on the basis of existing documentation, consultation with stakeholders, etc. Descriptions of each of the 16 capacity-building options are provided in Section 4 below.

The metrics to be employed for each of the 10 decision criteria were then defined, taking account of currently available data and the range of plausible ways in which each of the criteria might be represented. Table 6 sets out the final metrics. Note that the choice of metrics involves a sometimes difficult compromise between the availability and quality of data, and the imperative to employ continuous quantitative measures. However, it is important to recognise that the aim of the framework is not to provide a final and definitive prioritisation of the capacity-building options. Rather, the priorities that are derived should be revisited on an on-going basis and revised as more and/or better data for the decision criteria become available.

Information cards for each of the 16 SPS capacity-building options were then compiled. These are reported in Appendix 4. Each card presents data for the eight decision criteria, measured according to the scales outlined in Table 6. For each criterion, details are provided of how measures for each of the decision criteria were derived. There is also an indicator of the level of confidence in the measure reported. Where there is a lack of underlying data and/or these data are of dubious quality, a low or medium level of confidence is indicated. Conversely, where fairly rigorous and comprehensive prior research is available, a high level of confidence is reported. These confidence measures need to be considered in interpreting the results of the prioritisation exercise, and in considering how the analysis might be refined in the future.

Table 6. Decision criteria measurement

Criterion	Measurement
Cost/Difficulty of implementation	
Up-front investment	Absolute value ($)
Annual on-going costs	% value of exports (2017)
Difficulty of implementation	Very easy (1) Somewhat easy (2) Neither easy nor difficult (3) Somewhat difficult (4) Very difficult (5)
Trade impact	
Absolute change in value of exports	Absolute value (2017)
Trade diversification – products and/or markets	Large negative (-2) Negative (-1) No impact (0) Positive (+1) Large positive (+2)
Domestic agri-food impacts	
Agricultural/fisheries productivity	Large negative (-2) Negative (-1) No impact (0) Positive (+1) Large positive (+2)
Domestic public health	
Environmental protection	
Social impacts	
Poverty impacts	Large negative (-2) Negative (-1) No impact (0) Positive (+1) Large positive (+2)
Impact on vulnerable groups/areas	Large negative (-2) Negative (-1) No impact (0) Positive (+1) Large positive (+2)

Stage 5: Construction of spider diagrams

Through Stages 1 to 4, the inputs to the priority-setting process were collected and then assembled into the series of information cards. The aim of Stage 5 was to present the information in the information cards in a manner that permits easier comparison of the 16 capacity-building options. Thus, spider diagrams were derived that plotted the 16 SPS capacity-building options against each of the 10 decision criteria. Scrutiny of these diagrams identified the decision criteria against which each of the capacity-building options performed relatively well/badly compared to the other capacity-building options in the choice set.

Stage 6: Derivation of quantitative priorities

The formal priority-setting analysis involved the use of outranking through the D-Sight software package. The mechanics of the analysis are described in some detail in the user guide to the framework.[37] The inputs to the model are the data assembled in the information cards. For most of the decision criteria preferences were modelled using a level function since these were measured using categorical scales. However, the up-front investment, on-going cost and criteria were measured continuously and modelled using linear functions.

Three models were estimated using D-sight:

- *Baseline model* using decision weights derived in Stage 3.
- *Equal weights model* in which all of the decision criteria are weighted equally.
- *Costs and trade impact model* in which only the cost and trade impact decision criteria are included in the analysis, all of which are equally weighted.

The baseline model is considered to provide the most reliable set of priorities, in that it uses the full set of information derived through Stages 1 to 4. The two subsequent models were estimated in order to examine the extent to which the derived priorities are sensitive to changes in the decision weights; if the broad ranking of the 16 SPS capacity-building options remains broadly the same under the three scenarios presented by these models, we can be reasonably confident that the results of the framework are robust. The sensitivity of the derived rankings to changes in decision criteria measures for which there are low levels of confidence was also explored, for example by adjusting the expected change in the absolute value of exports from investments in aflatoxin controls for maize where there was some uncertainty as to whether trade would be impacted or not should this option not be pursued.

Stage 7: Validation

The final stage of the priority-setting analysis is on-going. The aim of the validation process is to ensure that the results of the priority-setting framework are broadly in accordance with expectations, or that unexpected rankings can be explained through the pattern of data in the information cards. To facilitate this process, the draft report was disseminated to stakeholders by email with a request for comments. Further, the preliminary results were presented at a stakeholder workshop on 28th June 2012, the participants at which are reported in Appendix 4. Comments were subsequently incorporated into the final report.

4. Sanitary and Phytosanitary (SPS) capacity-building options

This section provides a more detailed description and rationale for each of the 16 SPS capacity-building options considered in the priority-setting analysis.

4.1. Post-harvest treatment for mango exports

In recent years, *Bactrocera invadens* has been detected in Tanzania, Zambia and Mozambique, although there are no records of its presence in Malawi.[38] The principle markets for mangoes from Malawi are South Africa (where the fly has had to be eradicated eight times in recent years) and Europe. These markets will not permit the importation of potentially-infested fruit. This option involves the development of a post-harvest treatment facility based on hot water, HTFA or a similar technology to disinfest the fruit of *B. invadens*. The estimated up-front investment is US$120,000.

As well as the installation of the necessary equipment, the most heat tolerant stage of *B. invadens* on mango would need to be determined[39]. This is achieved by inoculating mango fruit with *B. invadens* eggs at a constant temperature and waiting for the appropriate time to obtain different life stages. Fruit containing *B. invadens* at these different life stages is immersed in water maintained at 45^{o}C or warm air at high humidity and their survival determined after different exposure times to heat treatment. It is assumed that the basic research for determining the exact treatment conditions using either hot water baths or HTFA will be carried out at no additional cost, as part of similar programs in other countries.

4.2. Aflatoxin controls for groundnuts and maize

Mycotoxins have emerged as a major problem impacting exports of groundnuts from Malawi[40], whilst potentially constraining exports of some other commodities, notably maize aflatoxins (and mycotoxins more generally are also a major public health issue in Malawi. Tackling this problem requires a two-pronged approach. First, mycotoxin controls need to be implemented along the value chain, most notably in harvesting and post-harvest handling. Second, facilities are needed to enable the testing of consignments prior to export and also to monitor the impact of the aforementioned controls on the exposure to mycotoxins within the domestic population. This second option is explored in Section 4.3.

Prior efforts to control levels of mycotoxins in groundnuts, maize and other crops in Malawi through improved post-harvest handling have been of limited effectiveness. This option aims to enhance the ability of smallholder to meet export market mycotoxin (and especially aflatoxin) limits through the use of a low-cost bio-control approach. Thus, a systems-based approach using GAPs for the control of *Aspergillus flavus* on maize and groundnuts would be employed, coupled with the development and extension of atoxigenic strain technology to reduce aflatoxin levels. The atoxigenic strains would be developed from local land races similar to those developed by the International Institute of Tropical Agriculture (IITA) in Nigeria. Studies have shown not only a direct reduction in aflatoxin concentration in crops through use of such atoxigenic strains, but also that these strains can displace toxin-producing strains in the soil. The long term effect is a sustained reduction of aflatoxins in affected crops by between 90 and 99 per cent.

Application of the atoxigenic strain will also reduce mycotoxin levels in maize and cassava crops grown in nearby fields, with benefits in terms of reduced local dietary intake. The death rate from liver cancer (hepatocellular carcinoma (HCC)) in Malawi is one of the highest rates in the world.[41] Levels of HCC in countries with a similar climate but good mycotoxin management systems, for example South Africa and Brazil, are much lower. It is estimated that the use of the atoxigenic strain could result in a significant decline in the HCC rate in Malawi. A possibly more significant public health problem in Malawi is oesophageal cancer which is associated with fumonisins that are metabolites of *Fusarium* spp. This issue will also be partly addressed by the use of GAPs in maize production.

4.3. Mycotoxin testing capacity

Currently, exporters cannot obtain certified tests of export consignments of groundnuts or maize for mycotoxin residues inside Malawi. Whilst a number of laboratories can conduct semi-quantitative tests for aflatoxin (although not for mycotoxins more generally) residues prior to shipment, they cannot provide internationally-recognised quantitative results at the consignment level. Thus, exporters run the risk that local test results are inaccurate and/or that aflatoxin levels increase during transit, leading to rejection of the consignment.

Although there are accredited laboratories in the region, particularly in South Africa, there is limited sharing of and access to such resources within and between countries. Thus, this option would fund the establishment of internationally-recognised quantitative testing capacity for mycotoxin residues in Malawi. Credible controls and testing must be in place for exporters to ensure compliance with destination market standards, notably those of the EU. At the current time, consignments are retested in Europe; this cost would be avoided if internationally-recognised testing capacity existed in Malawi. At the same time, there are serious domestic public health considerations relating to the presence of dietary mycotoxins. The establishment of laboratory testing capacity in Malawi is necessary in order to ensure monitoring and assessment of the levels and occurrence of these contaminants in the local diet.

4.4. Compliance with Sanitary and Phytosanitary (SPS) requirements for honey exports

For any product of animal origin to be imported into the European Union, including honey, the exporting country has to have a residue plan in place which outlines how pesticides and other residues will be controlled and prevented from exceeding maximum levels. Malawi is not on the list of EU-approved countries for the importation of honey. Some other countries in the region, for example Uganda and Zambia have obtained such approval.

The initial investment involved in obtaining official EU approval for exports of honey is significant. Maintaining this approval is less costly, but does requires an annual update of the residue analyses. The required expertise and finance required to obtain initial approval is not available at the level of individual producers. Thus, the Competent Authority, perhaps in this case the DALD in MoAFS, would need to take the lead in preparing and submitting the application for Third Country listing.

Major steps involved in achieving approval for the importation of honey into the EU are as follows:

- A sampling schedule for Malawian honey exporters needs to be prepared based on specified maximum exportable quantities. Honey is then sampled during the harvesting season with the

participation/oversight of the Competent Authority and samples sent to an accredited residue testing.

- Samples have to be analysed for residues in an accredited laboratory. As there is no accredited laboratory in Malawi, a facility in South Africa, elsewhere in the African continent or in Europe would need to be used.

- The results of the analyses are included in a draft EU Accreditation Request. Assistance would need to be provided to the MoAFS in submitting the request to the European Commission and in responding to any questions, comments and suggestions that are forthcoming.

Having achieved approval, sampling and testing is undertaken on an annual basis, with the results communicated to the European Commission in order to maintain approval.

4.5. Pesticide controls for tobacco

Tobacco is an intensively-managed crop that is attacked by a wide range of pests and diseases. Inevitably this leads to the widespread use of agro-chemicals, some of which are tightly regulated in export markets for their environmental and/or human health impacts. There can also be significant risks to human health locally, notably for those engaged in the production and/or post-harvest handling of tobacco. The accepted approach to the control of agro-chemicals is through the implementation of GAP's by farmers. In a smallholder dominated sector such as in Malawi, this requires extensive training of producers and support for infrastructural improvements.

4.6. Pesticide controls for pulses

Generally-speaking the pest and disease complex affecting pulses requires minimal use of agrochemicals. Certainly crop chemical requirements are less than for maize (see Section 4.7). Therefore, from a trade perspective the issue here is probably more of demonstrating compliance to importing country agro-chemical MRLs than of implementing GAPs at the production level. Regional trade standards are being developed by the EAC that are likely to be based on CODEX MRLs as the default agrochemical standard. Malawi should have little difficulty in achieving compliance, although demonstrating this may be more difficult.

Production of pulses is smallholder-based and thus highly fragmented such that it is logical to look at compliance at the point of export/import. Countries such as India is likely to insist on testing on a consignment basis at the port of entry, whilst other countries in the region will likely rely on *ad hoc* arrangements between buyers and their end customers. For example, it is unlikely that exports to the COMESA and SADC region would require certified tests for the presence of agrochemicals, but that private sector buyers in South Africa will almost certainly insist on demonstration of compliance through some form of GAP certification.

4.7. Pesticide controls for maize

Maize is attacked by a wide range of pests and diseases and which, in many cases, need to be managed through the use of agrochemicals. A review of current agrochemical recommendations in Zimbabwe,

South Africa and Kenya shows that there are no significant issues relating to potential chemical contamination of maize if agrochemicals are used correctly. The only systemic chemical registered for use on maize in Malawi is carbofuran, which is generally applied at sowing. All other chemicals are either surface acting non systemic or translaminar, and therefore are unlikely to contaminate the crop.

The key issue with agrochemical use in maize production, therefore, is improper chemical and/or crop handling. A particular additional concern is the use of agrochemicals in stored maize. The use of chemical insecticides in the form of sprays, fumigant or dusts against grain pests is common on large-scale farms in Africa. Small-scale farmers are tempted to use such measures due to their quick action. While some agrochemicals are registered for use in stored maize, it is possible that insecticides meant for use in field crops could be used by farmers leading to an increased potential for agro-chemical residues (Nukinene, 2010).[42]

This option, therefore, involves the training of farmers in GAPs for maize production, including pest and disease control and the appropriate use of agrochemicals. Support would also be provided for infrastructural improvements on farms, including post-harvest handling and storage.

4.8. Pesticide controls for tea

Malawi has produced tea on a commercial scale since the 1880s. Currently, large commercial estates account for over 90 per cent of production, with the remainder grown by between 6,500 and 8,000 smallholders. Most of the estates are owned by foreign companies. All tea estates are Members of TAML.[43]

Pesticide residues have long been a concern in the tea sector. In 2007, TAML organised a study of the use of pesticides in Malawian tea production.[44] This identified a number of issues and concerns:

- Few, if any, agricultural chemicals are registered for use on tea in Malawi such that their usage is not possible in any formal GAP system - in particular, the application rates and withholding intervals necessary to comply with EU MRL's are unknown.
- Some chemicals withdrawn from use on tea by the EU are still being used on tea in Malawi.
- Some pests being controlled through the use of pesticides are probably not of economic significance.

A number of tea estates are pesticide free. Many smallholders also do not sue pesticides because of their high price. Further, there is evidence that tea production in Africa is remarkably pest free and that it should be possible to introduce a low agrochemical and integrated pest and disease management program without compromising yield and quality.[45] This is usually achieved by introducing management practices on a commercial scale and then adjusting the regime as time and experience dictate. Some technical assistance from agrochemical experts and research agronomists is necessary, but in general the primary inputs come from farm managers themselves. The one area where high cost technical inputs are required is in registering agrochemicals for sue in tea production, and in particular determining their efficacy, application rates and withholding periods to comply with MRLs.

4.9. Pesticide residue testing capacity

Due to the existence of sub-standard laboratories in terms of hardware and human capacity, Malawi is currently not able to make scientific assessments of compliance to the pesticide MRLs of export markets. Although there are a few accredited laboratories in the region, particularly in South Africa, there is limited sharing of these resources within and between countries. Currently, Malawian exporters of agricultural products have pesticide tests conducted outside the country. The aim of establishing this capability in Malawi is to by-pass this requirement through the establishment of internationally-recognised pesticide residue testing capability in Malawi.

There are advantages and disadvantages of investments in pesticide residue testing capacity in Malawi. Clearly, credible controls must be in place in order for exporters to ensure compliance with destination market MRLs, including those of private buyers. Malawi's principle markets are currently in the region, and in the Middle East where standards are relatively easy to meet. However, in some instances agrochemicals used for export crops in Malawi are not registered in the importing countries or no limits are set, such that regulatory maximum is the limit of detection (LoD). Testing capacity is arguably of more importance in the case of EU markets where far stricter limits and associated testing requirements are applied. However, the main mechanism for the control of pesticide residues as required by EU buyers is the application of certified GAPs (such as GlobalGAP). The implementation of GAPs is generally backed-up by the testing of crops on the basis of risk assessment rather than on a consignment basis. This means that relatively few samples require testing, and which most exporters can obtain through laboratories in the destination market.

4.10. Animal health controls for fish exports

Malawi has a unique range of freshwater fish species, notably from three lakes and the Shire river system. Most fish is consumed locally, and indeed Malawi is a net importer of fish, most of which comes from the region. Exports are dominated by live ornamental fish which though limited in volume have a high unit value.

EU regulations lay down detailed requirements for the importation of live ornamental fish. Council Directive 2006/88//EC requires importers of ornamental aquatic animals to register in the importing country and to notify the relevant authority at least 24 hours in advance of any import. All consignments must be accompanied by an appropriate health certificate stating that the animal is free of specified diseases. However, generally speaking the regulations focus their attention on countries exporting cold water ornamental fish, with the requirements for warm water fish exporters being considerably more relaxed. The main requirement in the case of Malawi, therefore, is that it is a member of the OIE and is able to complete some additional declarations on the health certificate.[4647] This option ensures that Malawi has the capacity to meet this requirement.

4.11. Compliance with hygiene requirements for milk and dairy product exports

Whilst Malawi is a net importer of milk and dairy products, there are significant exports of milk and milk products, predominantly to Zimbabwe and other countries in the region. Food safety controls in milk processing are well-established, with the major facilities implementing HACCP food safety systems.

However, effective food safety controls require multiple interventions/controls along the value chain including at the level of animal feed producers and veterinary product and service providers, and in the bulking and handling of milk prior to processing.[48]

This option involves the development of curricula for training on GAP and GVP, and widespread training amongst input suppliers. At the level of producers and traders, it provides for the training and implementation of quality management in the bulking, storage and transportation of milk. By establishing links to milk processors, compliance with trading partner standards for milk and milk products based on COMESA-CODEX standards will be facilitated.

4.12. Virus indexing capacity for planting materials

Crops such as Irish potatoes, sweet potatoes and pineapples are propagated from live vegetative planting material. The risk here is that pests and diseases can be carried through to succeeding crops. In particular viruses and mycoplasma-like organisms are readily transmissible through vegetative planting material even if they go through a tissue culture phase. This option involves the development of capacity to test and certify live planting material in Malawi. In turn, this will facilitate the indexing of viruses in Irish and sweet potatoes, leading to improvements in productivity and also facilitating exports of indexed planting material.

4.13. Compliance with Sanitary and Phytosanitary (SPS) requirements for chilli sauce exports

The costs of HACCP re-certification are normally a regular business cost. However, in the case of Nali, a manufacturer of chilli sauces, problems have been encountered due to the loss of control of raw materials leading to foreign body contamination of their product. This has negated their HACCP system and prevents re-certification.

This capacity-building option focuses on the implementation of GAP's by suppliers of chillies and other raw materials, particularly smallholders. Since other chilli sauce manufacturers, such as Nando's in South Africa, are sourcing acceptable chillies from Malawi this requirement must be possible to implement. The option would help Nali develop a GAP-compliant supplier base and install the systems necessary for supplier control. The basic assumption is that many of the internal pre-requisite programmes for HACCP certification, such as good manufacturing practices (GMPs) already exist within the factory and that this activity will be focused on the supplier base only.

4.14. Seed inspection and certification capacity

The climate in Malawi is very favourable for seed production given that extended humid rainy conditions generally produce poor quality seed. Many seed crops are suited to smallholder cultivation and only require basic post-harvest conditions. Furthermore, seeds have a high value in relation to weight and transport and other logistical costs tend to be less important. Seed exports are dominated by seed for sowing, which accounted for US$12 million of US$16 million of exports in 2010.[49] The main destination markets are Zimbabwe, Tanzania, Kenya, South Africa, Zambia, Malawi and Turkey.

Seed testing worldwide is generally required to comply with the standards of three international bodies: 1) International Seed Testing Association (ISTA)[50]; 2) Organisation for Economic Cooperation and

Development (OECD)[51]; and 3) International Convention for the Protection of New Varieties of Plants (UPOV).[52] In the case of Southern Africa, the main SPS requirements are specified in the SADC Harmonised Seed Security Project (HaSSP)[53] Challenges for seed health testing in Malawi towards compliance with these standards include inadequate facilities, a lack of experienced analysts, a lack of knowledge where to find reference materials when submitting seed health testing methods, and little research in seed science and seed health testing. This option will develop internationally-recognised seed testing and certification services in Malawi as discussed in more detail in the references quoted above.

4.15. Animal health controls for day old chick exports

A Malawian producer of day old chicks currently exports to a number of African countries. These exports must be accompanied by an original veterinary import permit and animal health certificate with additional declarations issued by the DALH. It is not evident that the capacity to provide the required assurances currently exists in Malawi. For example, requirements cover regular monitoring/blood testing of parent stock flocks by official veterinary services. The lack of standardisation among importing countries in the region with regard to health certificate requirements further hampers compliance.[54]

As can be seen from the conditions listed for South Africa (which has a large ostrich meat export sector to protect) the requirements for health certification of day old chicks are far from trivial.[55] This option focuses on developing capacity within the DALH in the MoAFS to undertake regular monitoring of flocks. This would enable companies that meet the requirements to be certified for export in advance. In turn, this will ensure no delays when these companies apply for health permits. Regular monitoring would also ensure that bird health in Malawi is kept to a high standard, with potential benefits for local consumers of poultry products.[56]

5. Results

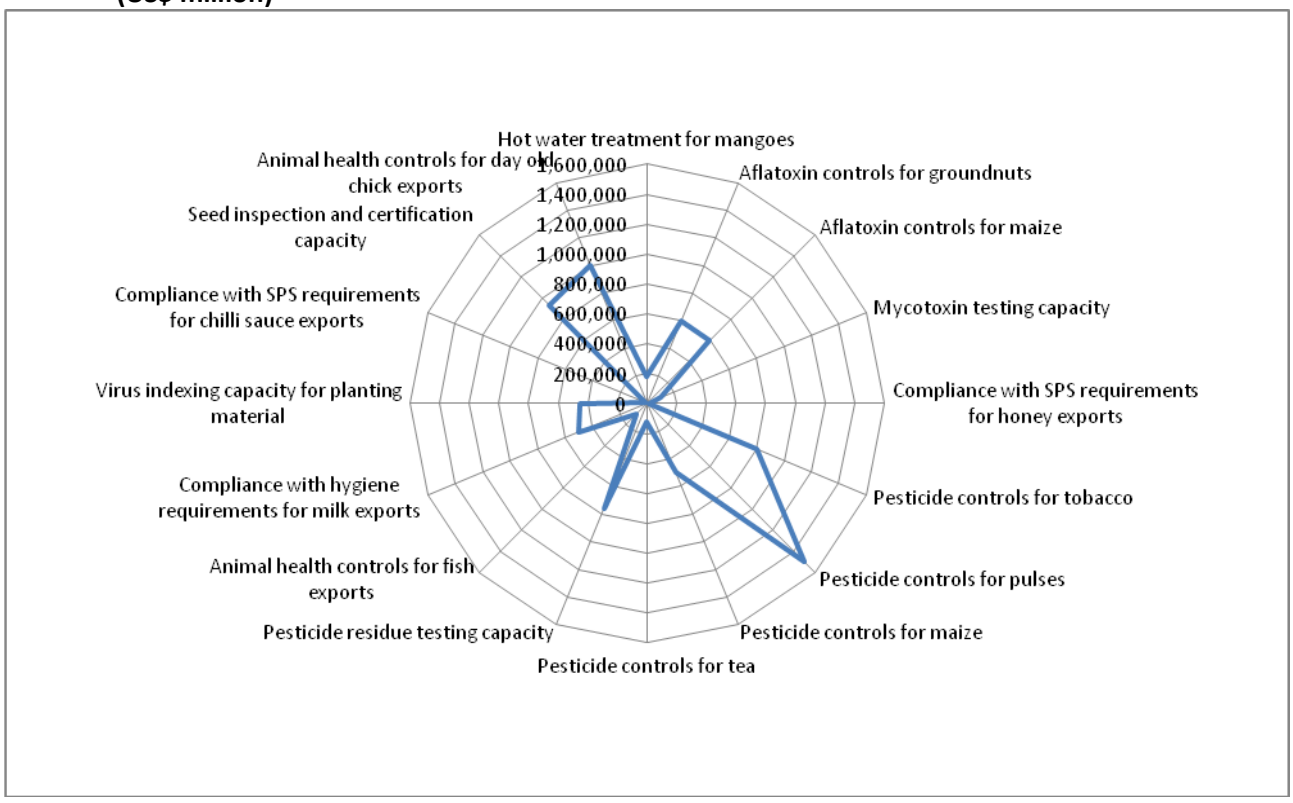
The descriptions presented above, and the results of the stakeholder workshop, suggest all 16 of these options are credible options for SPS capacity-building. However, the associated costs and resulting benefits may differ substantially, such that it is possible to define clear priorities amongst the options on the basis of the defined decision criteria and weights. Below are presented the results of the prioritisation exercise using outranking through the software package D-Sight.

To provide a first scan of the relative strengths and weaknesses of the 16 capacity-building options, spider diagrams were constructed (Figures 3 to 12). Because of the relatively large number of options, a separate diagram is presented for each of the ten decision criteria. Although this depiction only permits comparison of the capacity-building options according to the decision criteria on a one-by-one basis, it does enable the key dimensions along which each of the options performs relatively well/badly to be identified. As such, the spider diagrams are a useful way in which to present information on the SPS capacity-building options to more senior decision-makers.

Figures 3 and 4 present the up-front investment and on-going costs profiles of the 16 SPS capacity-building options. It is immediately obvious that the most expensive capacity-building option in terms of

up-front investment is pesticide controls for pulses (US$1.5 million). Most options require up-front investment of US$100,000 or over, although some have very low costs of around US$10,000, for example compliance with SPS requirements for honey exports and compliance with SPS requirements for chilli sauce exports. The majority of the options have little or no on-going cost. The only exceptions are animal health controls for day old chicks exports (7.5% of the annual value of exports), animal health controls for fish exports (5.4% of the annual value of exports), and compliance with SPS requirements for honey exports (4.6% of the annual value of exports).

Figure 3. Decision criteria measures scores for SPS capacity-building options – up-front investment (US$ million)



Most options are judged to be somewhat difficult to implement. The main exceptions are mycotoxin testing capacity, compliance with SPS requirements for chilli sauce exports, compliance with SPS requirements for honey exports, pesticide controls for tea, and animal health controls for fish exports, which are judged to be easy to implement (Figure 5). These latter options require little in the way of coordination within the Malawian government, between the public and private sectors in Malawi, and/or between the Government of Malawi and other country governments.

Figure 4. Decision criteria measures scores for SPS capacity-building options – on-going costs (%)

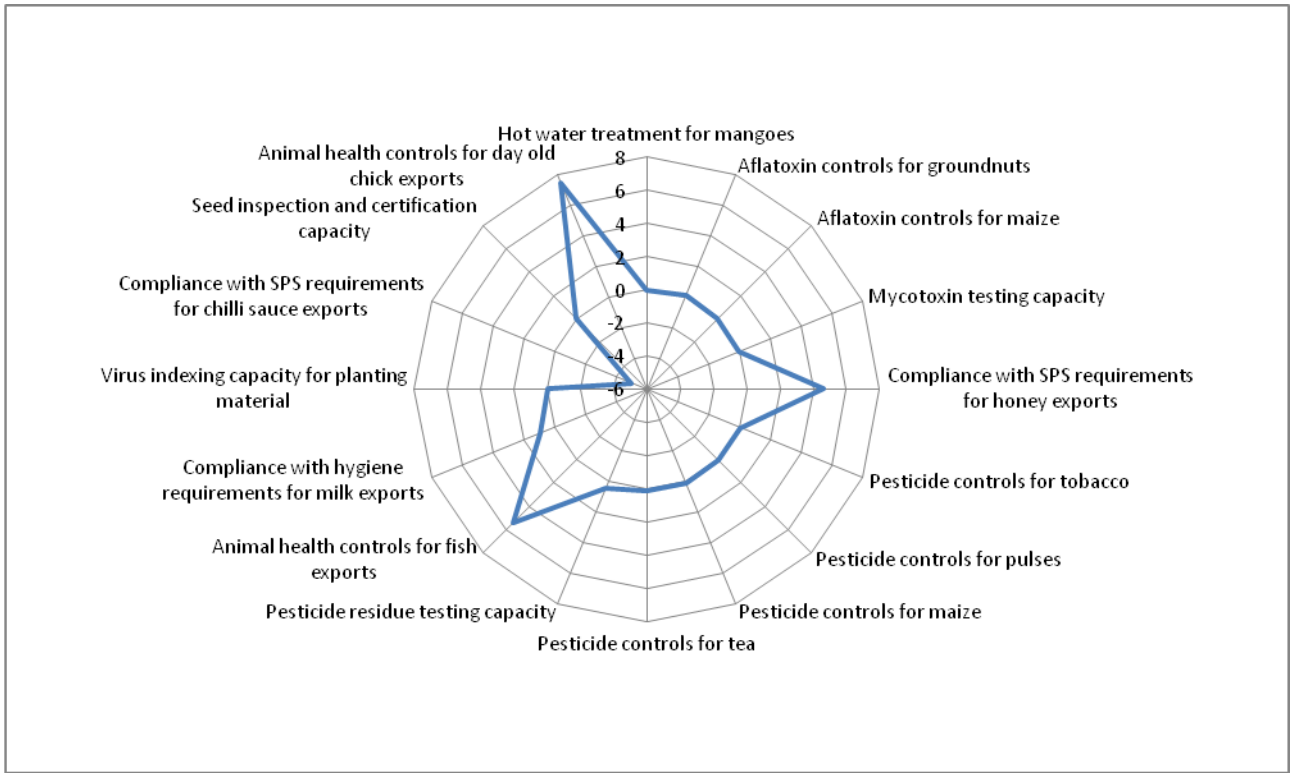
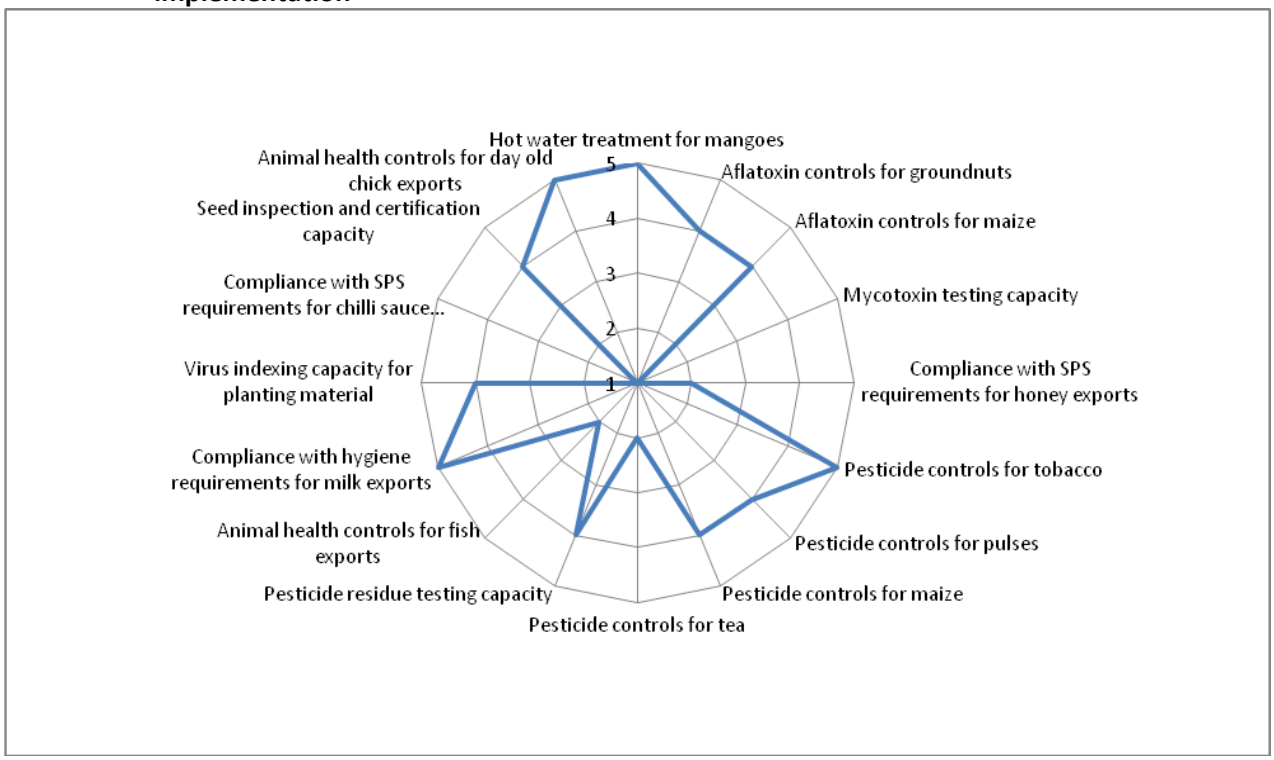


Figure 5. Decision criteria measures scores for SPS capacity-building options - difficulty of implementation



Most of the 16 capacity-building options are predicted to have modest impacts in terms of growth in agri-food exports or avoided losses in exports (Figure 6). The notable exceptions are pesticide controls for tobacco that are considered to avoid losses of exports amounting to US$60 million annually in 2017. The potential impact of aflatoxin controls for groundnuts on the value of exports is also considered to be appreciable, estimated at almost US$11 million annually in 2017. A greater number of the options, however, are likely to have an impact on trade through the diversification of products and/or markets (Figure 7). Indeed, only five of the 16 options are judged not to diversify exports.

Figure 6. Decision criteria measures scores for SPS capacity-building options - change in absolute export (US$ million)

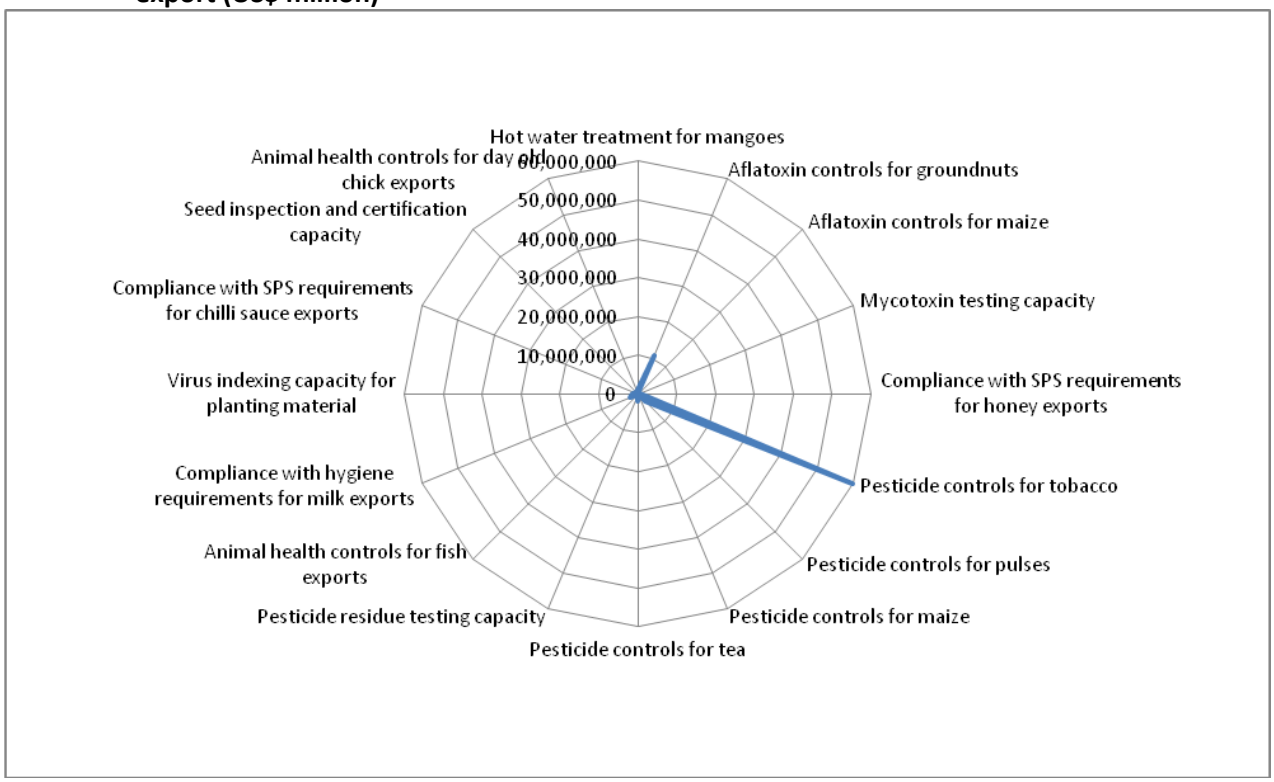


Figure 8 reports the predicted impact of the 16 capacity-building options on the productivity of agriculture and/or fisheries in Malawi, whether through enhanced yields, reduced post-harvest losses and/or increased revenue because of higher prices. Options with a significantly positive impact are animal health controls for day old chick exports and virus indexing capacity for planting material.

Most capacity-building options have little or no impact on domestic public health or on local environmental protection (Figures 9 and 10). Indeed, only four options are predicted to have positive spill-overs to domestic public health, namely aflatoxin controls for amaze, pesticide controls for maize, compliance with hygiene requirements for milk exports, and animal health controls for day old chick exports. None of the options is judged to have negative impacts on domestic public health. Five options are predicated to have positive environmental impacts domestically, namely compliance with SPS requirements for honey exports, pesticide controls for maize and for tea, animal health controls for fish exports, and compliance with SPS requirements for chilli sauce exports.

Figure 7. Decision criteria measures scores for SPS capacity-building options - trade diversification

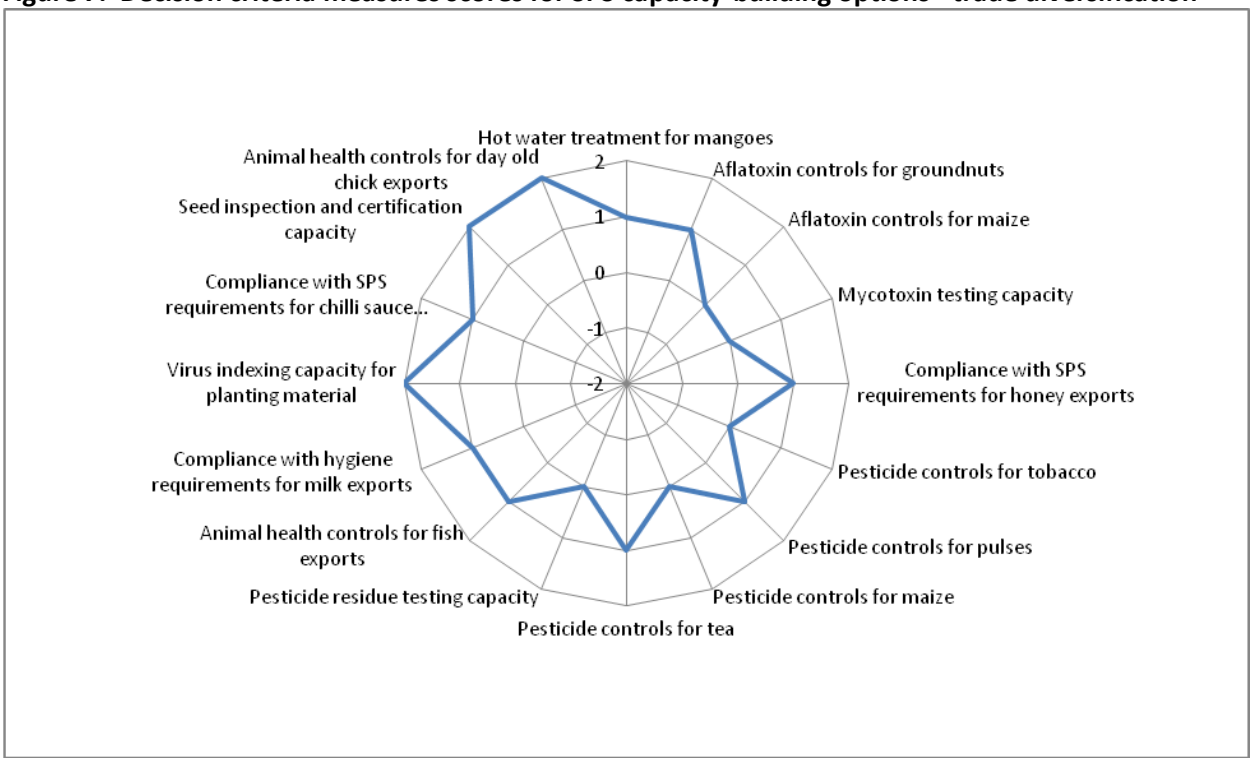


Figure 8. Decision criteria measures scores for SPS capacity-building options - agricultural productivity

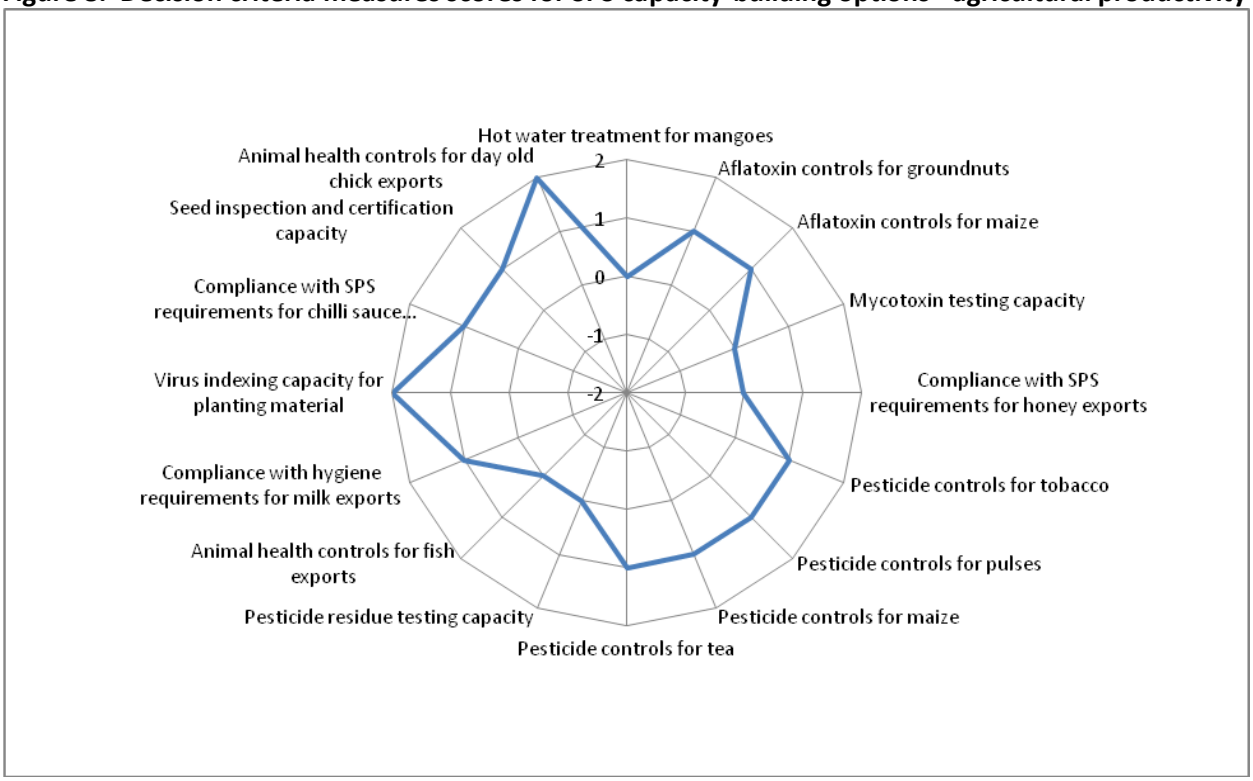


Figure 9. Decision criteria measures scores for SPS capacity-building options -domestic public health

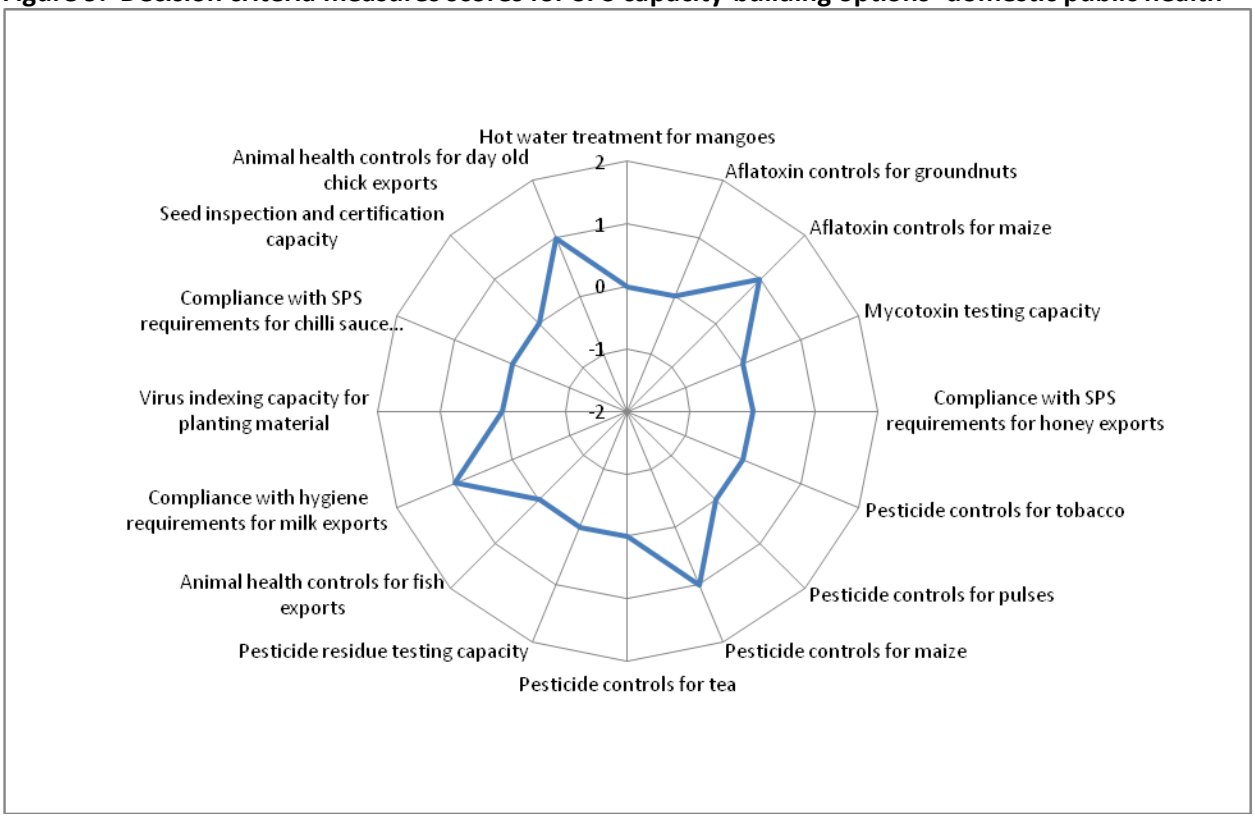
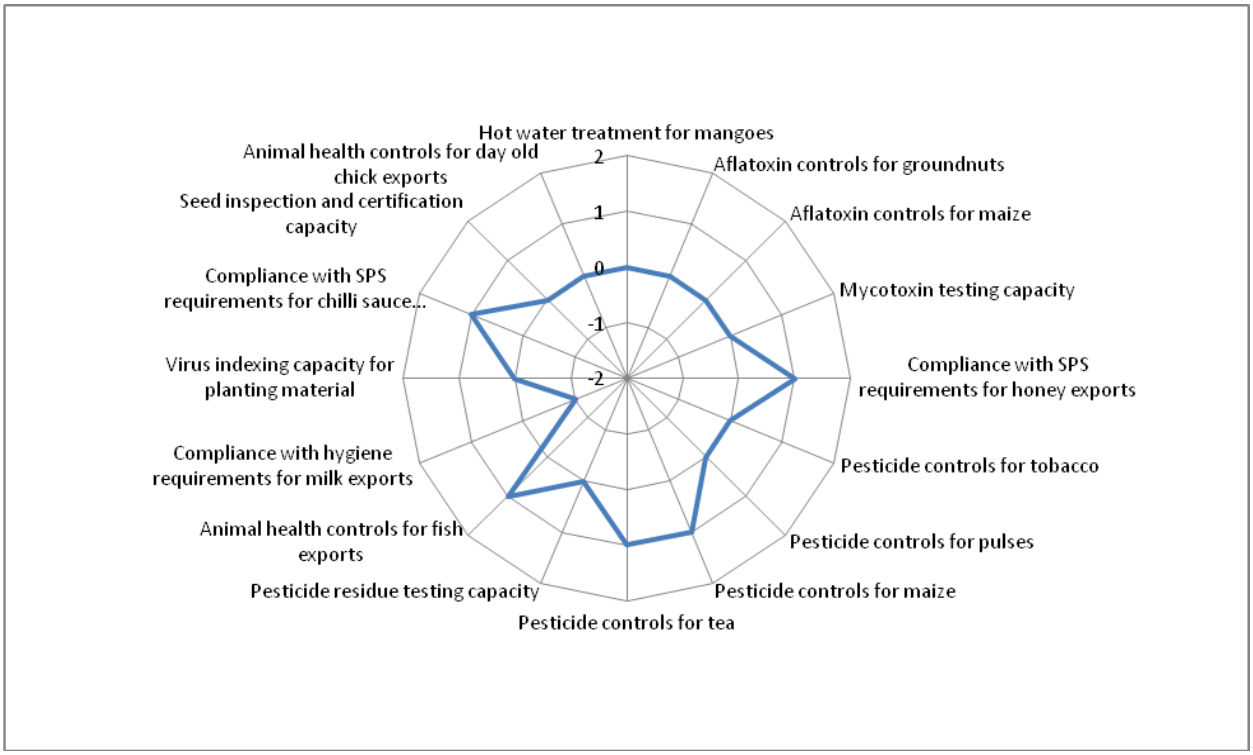
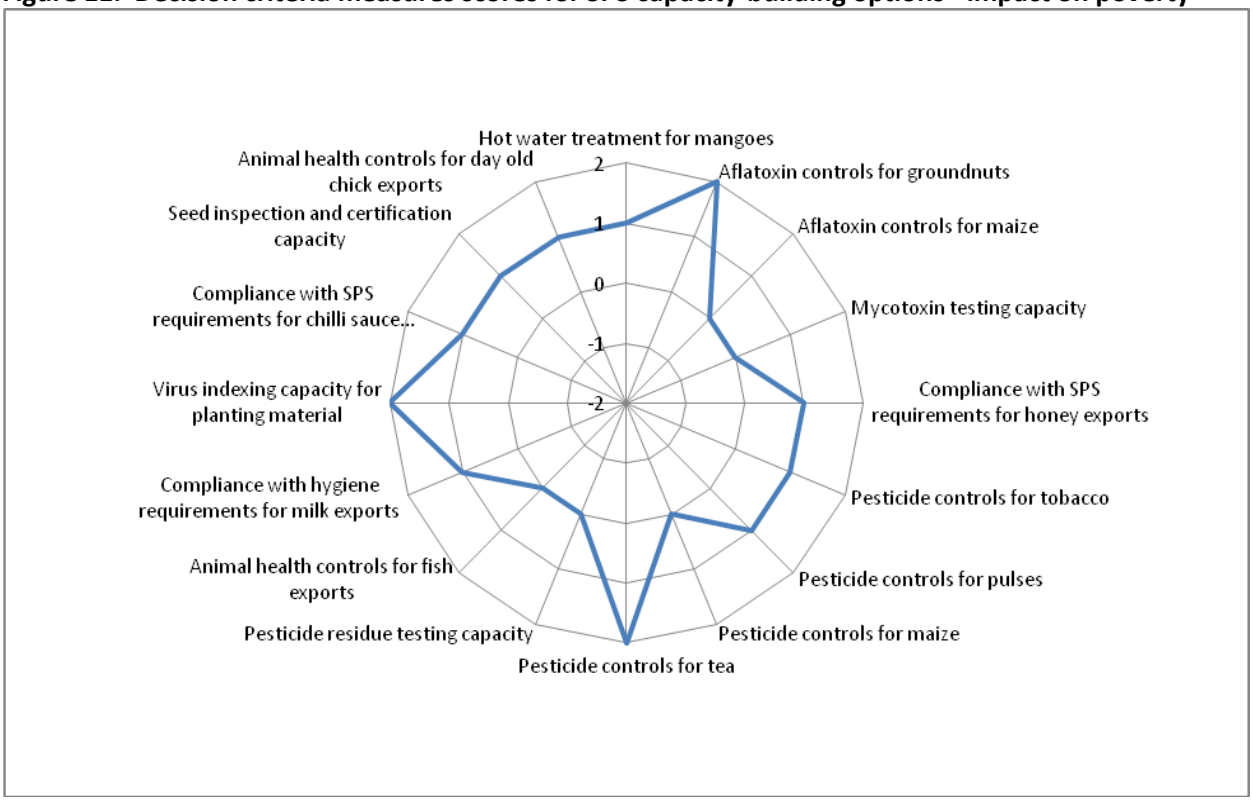


Figure 10. Decision criteria measures scores for SPS capacity-building options - environmental protection



Finally, Figures 11 and 12 report the predicated impacts of the 16 options on poverty and on socially-vulnerability groups including women, children, people in marginal areas, etc. The options are all judged to have positive impacts on poverty except for aflatoxin controls for maize, pesticide controls for maize, mycotoxin testing capacity, pesticide residue testing capacity, and animal health controls for fish exports. The options with the greatest impacts on poverty are aflatoxin controls for groundnuts, pesticide controls for tea, and virus indexing capacity for planting materials. Only one of the capacity-building options, aflatoxin controls for groundnuts, is judged to have significant positive impacts on vulnerable groups.

Figure 11. Decision criteria measures scores for SPS capacity-building options - impact on poverty



It is apparent that none of the SPS capacity-building options dominates across all or even most of the decision criteria, such that it is not immediately apparent how these options should be prioritised. That is where the outranking analysis comes in; it compares each of the capacity-building options on a pairwise basis with respect to each of the ten decision criteria in turn. Each of these comparisons determines whether one option dominates (or is dominated) by another and by how much. The aggregate of all of these comparisons, taking account of the defined decision weights, gives an overall measure of preference, what is termed the 'net flow'. The maximum score an option can have is +1, in which case it dominates all other options for all 10 of the decision criteria. The minimum score an option can have is -1, in which case it is dominated by all other options for every one of the 10 decision criteria. Thus, options with a positive and larger net flow are given a higher priority. Conversely, options with a negative and larger net flow are given a lower priority.

Figure 12. Decision criteria measures scores for SPS capacity-building options - impact on vulnerable groups

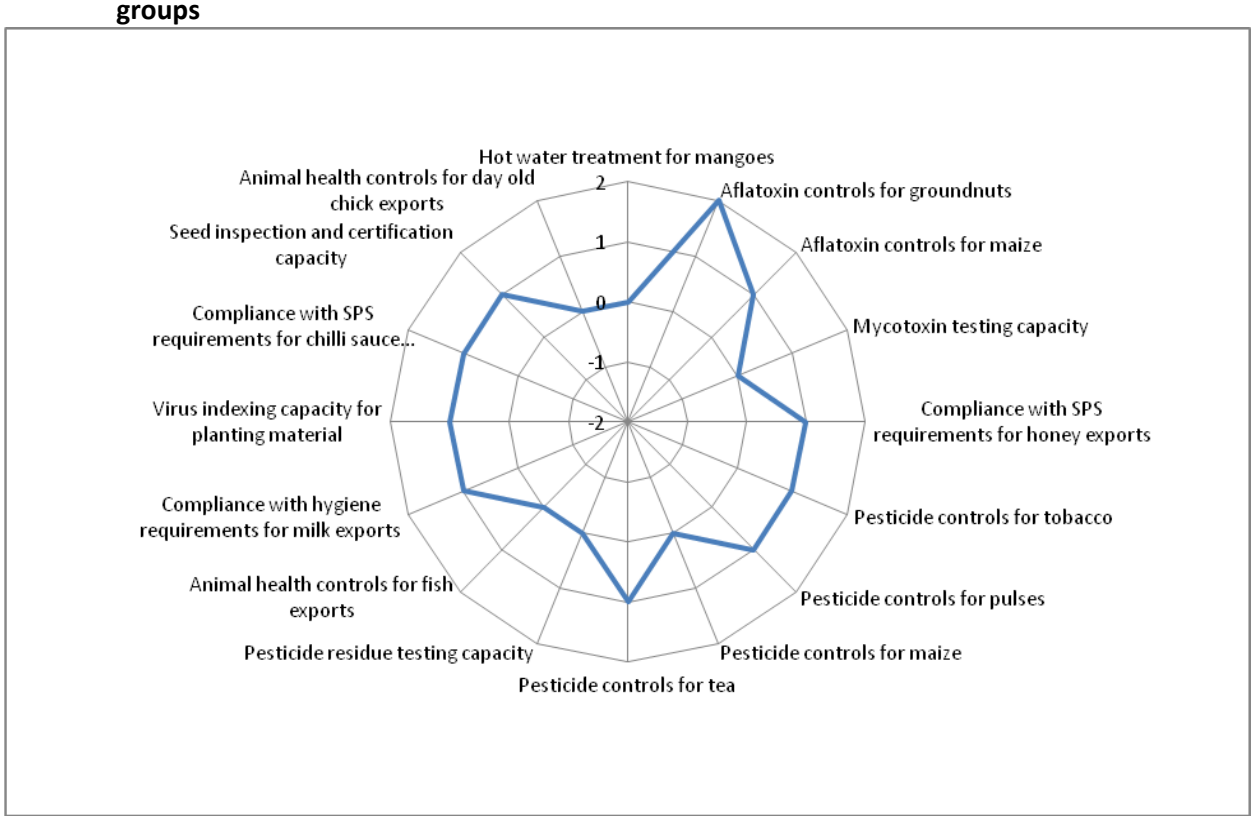
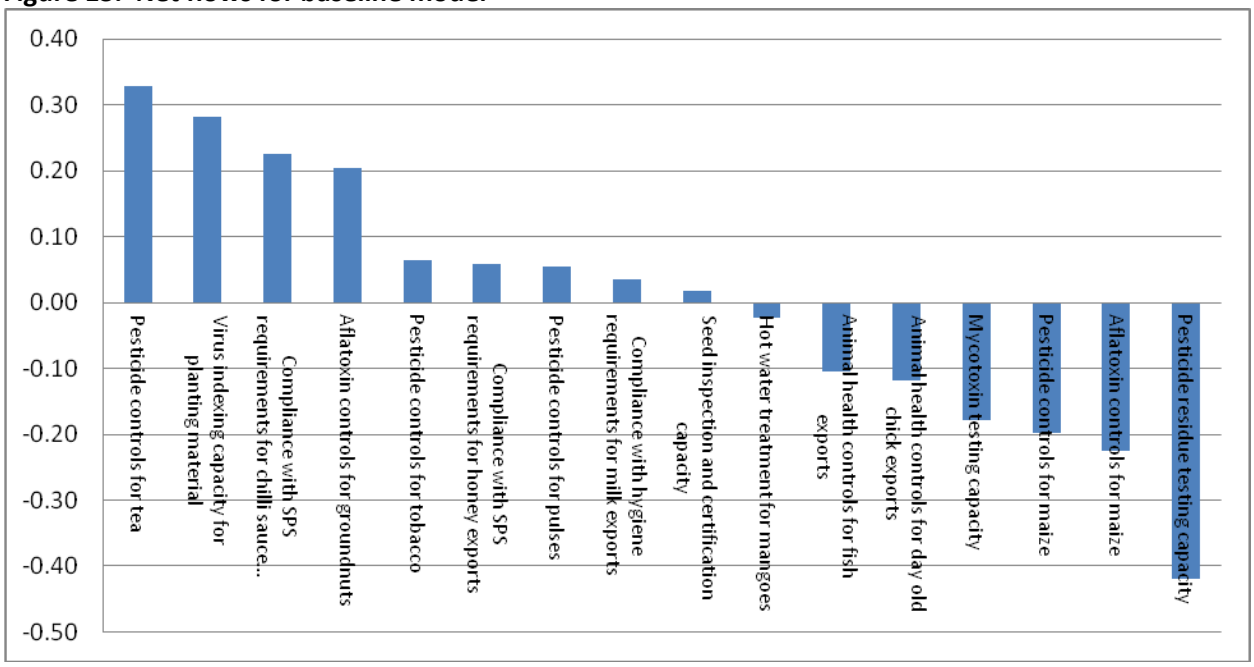


Figure 13 reports the net flows for the 16 SPS capacity-building options for the baseline model; that is the prioritisation derived using the decision weights defined in the stakeholder workshop. The options are prioritised from left to right. Thus, the analysis suggests the top priority options are pesticide controls for tea, virus indexing capacity for planting material, compliance with SPS requirements for chilli sauce exports, and aflatoxin controls for groundnut. Other options with positive net flows are compliance with SPS requirements for honey exports, pesticide controls for tobacco and for pulses, compliance with hygiene requirements for milk exports, and seed inspection and certification capacity. All other options have negative net flows, indicating that they are dominated overall on the basis of the chosen decision criteria and weights.

The prioritisation of the 16 SPS capacity-building options reflects a trade-off or compromise between all ten decision criteria. As discussed above, none of the options dominates all others with respect to every one of the decision criteria; if it did it would have a score of +1 (see above). Thus, in choosing an option that is given a high priority, meaning it generally performs well with respect to the chosen decision criteria, there is still a degree of compromise in terms of under-performance with respect to certain of these criteria, relative to the other capacity-building options being considered.

Figure 13. Net flows for baseline model



It is possible to examine the performance of each of the SPS capacity-building options through their scores for each of the ten decision criteria, as reported in Figures 14 to 29. Not surprisingly, pesticide controls for tea, virus indexing capacity for planting materials, and compliance with SPS requirements for chilli sauce exports have performed very well (i.e. more strongly positive and less negative scores) on almost all the criteria (Figures 22, 26 and 27). Options which perform moderately well across the criteria include aflatoxin controls for groundnuts and compliance with SPS requirements for honey exports. Conversely, pesticide residue testing capacity which is ranked sixteenth in the overall analysis scores negatively on all the criteria (Figure 23).

The foregoing discussions presents the core results of the analysis, and application of the prioritisation framework. Thus, the rankings in Figure 13 are in many ways the key results of the analysis; they represent the recommended priorities between the 16 SPS capacity-building options included in the analysis. It is important to recognise, however, that these results, and the established priorities amongst the capacity-building options, reflect the chosen decision criteria and the respective measures derived for each of the 16 options, and the weights attached to the criteria. This begs the question, how does the ranking of the capacity-building options change if any of these key inputs changes? To answer this question, sensitivity analysis was applied to the baseline model, the results of which are reported in Figures 30 to 32 below.

Figure 14. Decision criteria scores from baseline model – post-harvest treatment for mangoes

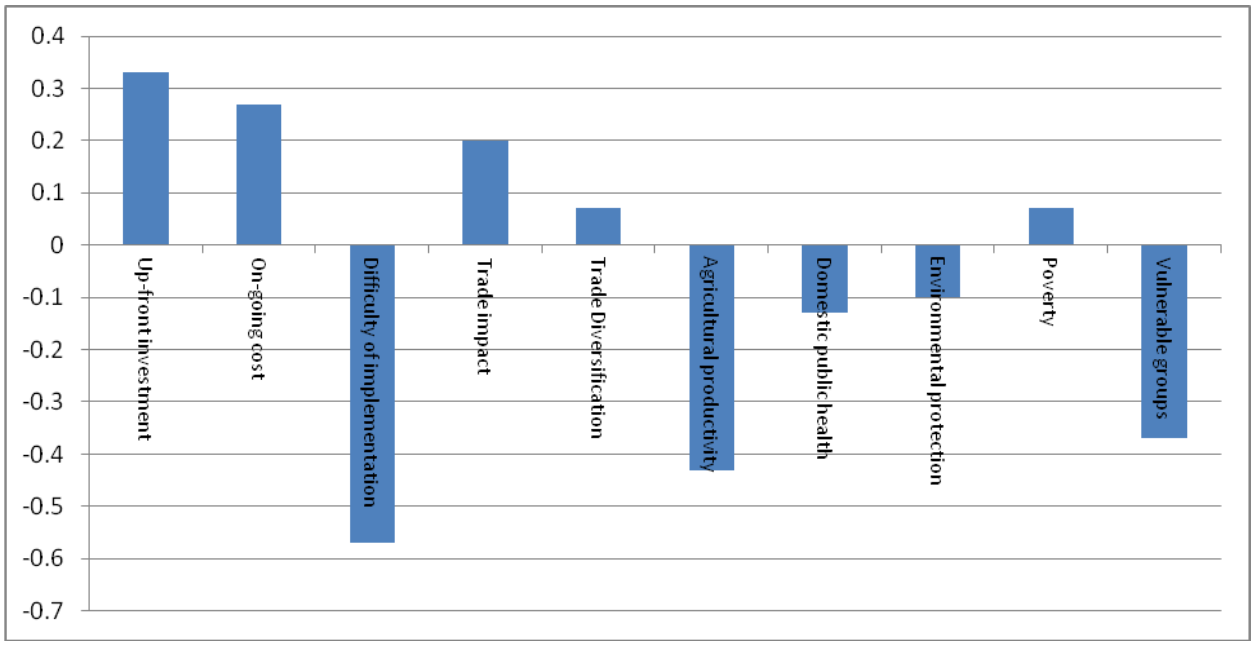


Figure 15. Decision criteria scores from baseline model – aflatoxin controls for groundnuts

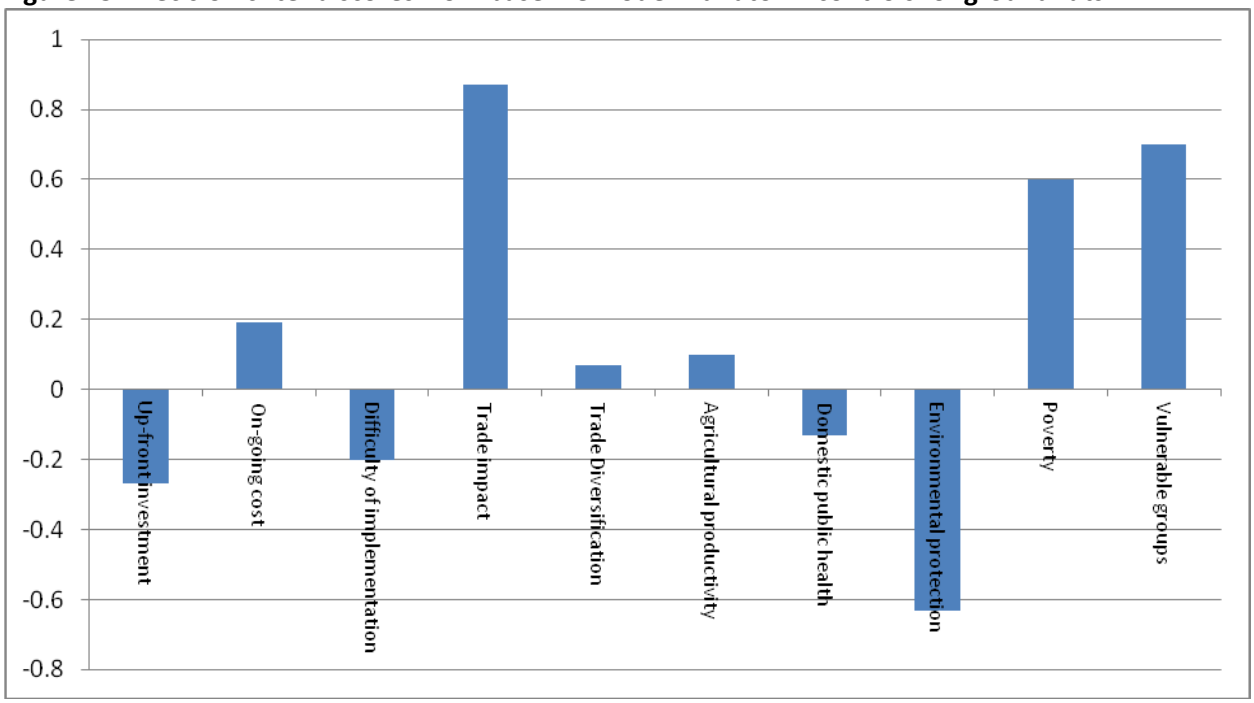


Figure 16. Decision criteria scores from baseline model – aflatoxin controls for maize

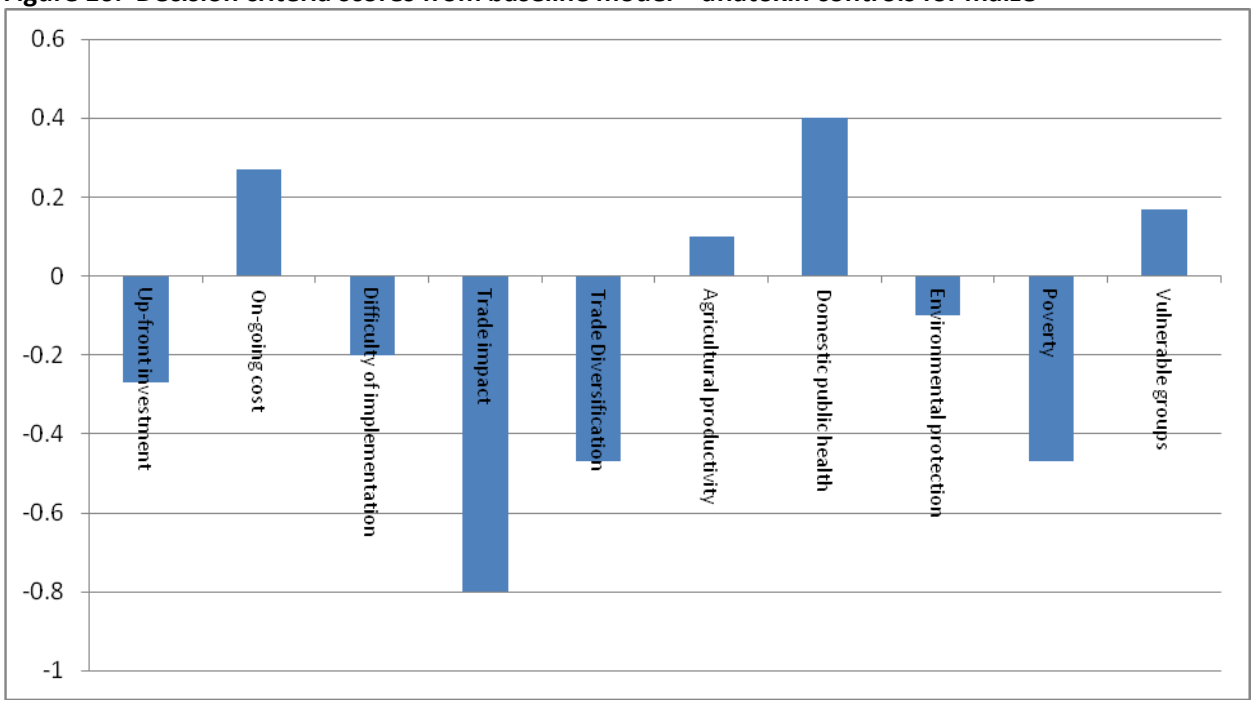


Figure 17. Decision criteria scores from baseline model – mycotoxin testing capacity

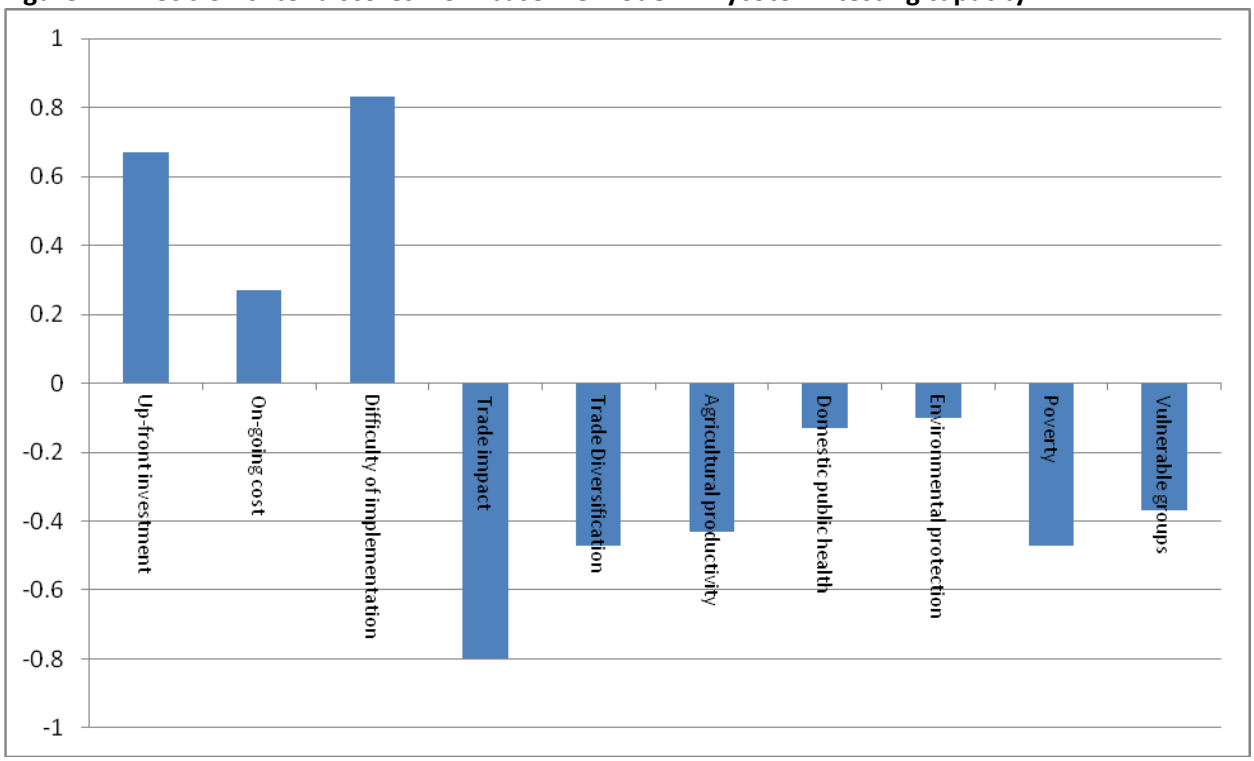


Figure 18. Decision criteria scores from baseline model – compliance with SPS requirements for honey exports

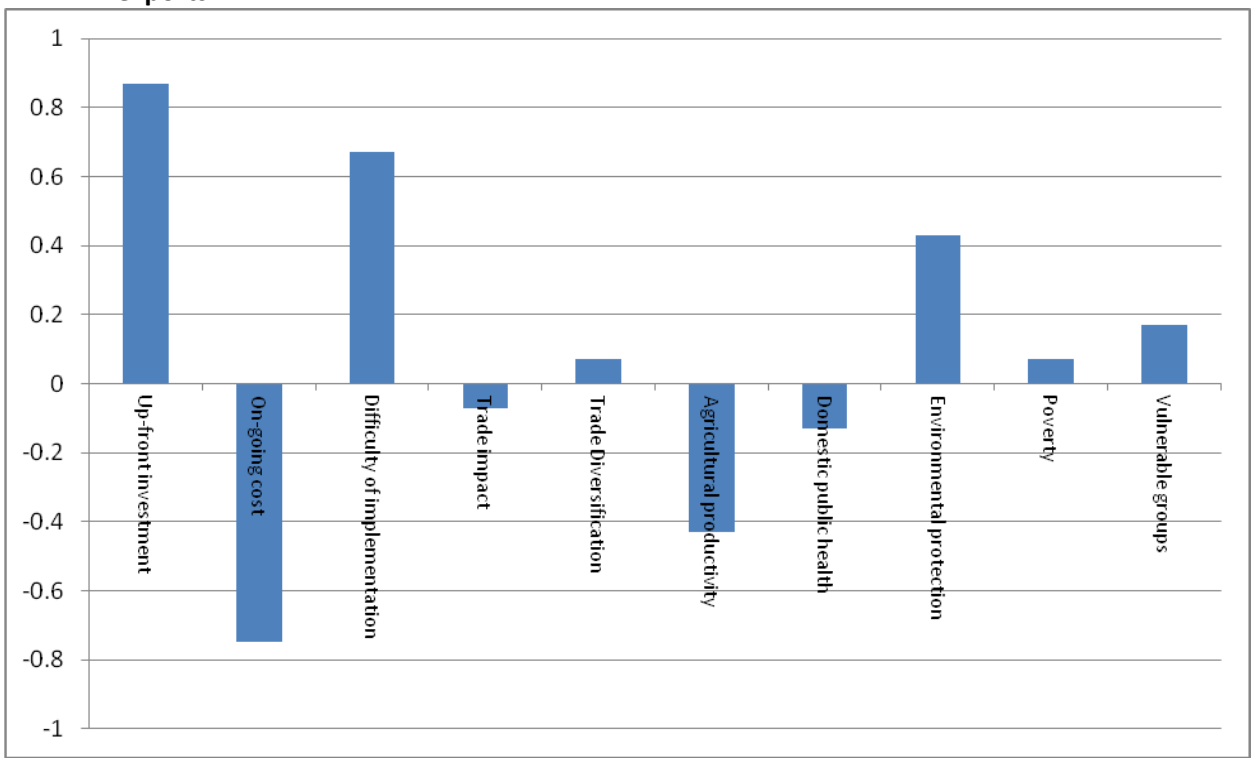


Figure 19. Decision criteria scores from baseline model – pesticide controls for tobacco

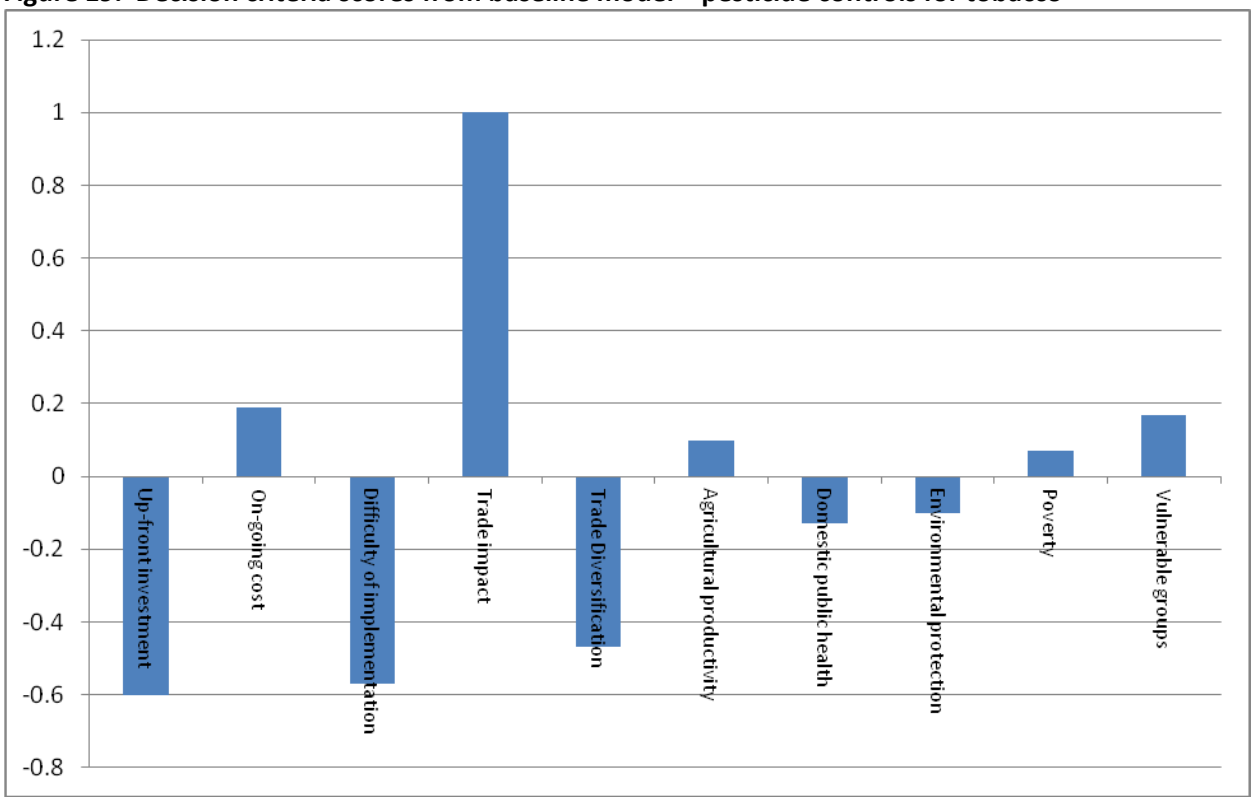


Figure 20. Decision criteria scores from baseline model – pesticide controls for pulses

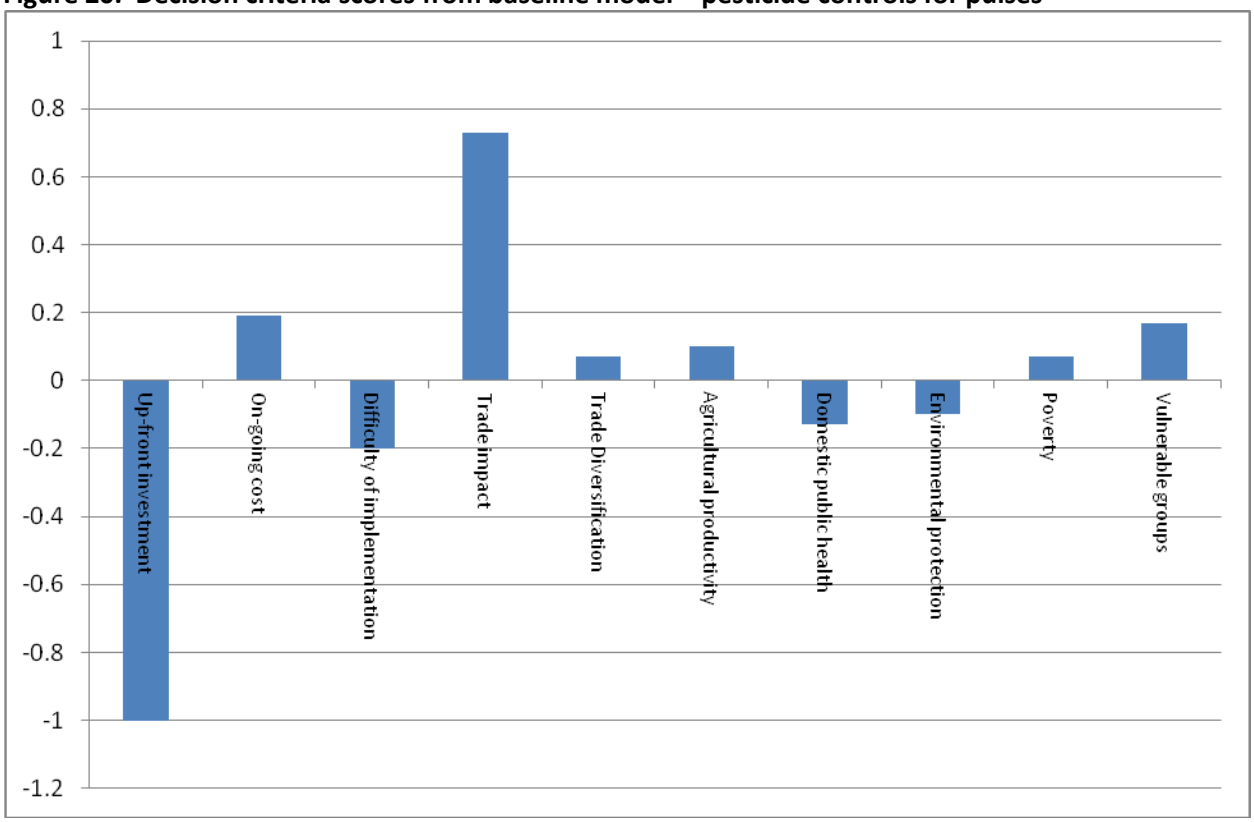


Figure 21. Decision criteria scores from baseline model – pesticide controls for maize

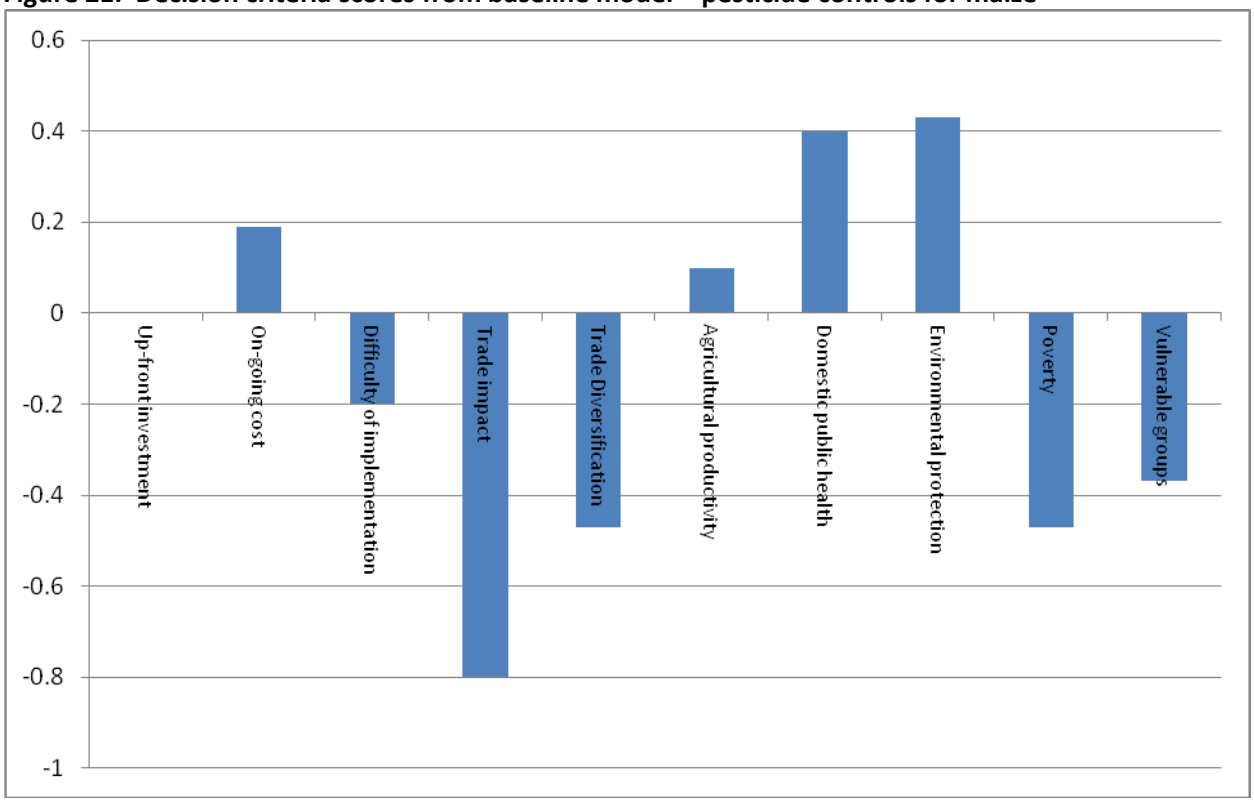


Figure 22. Decision criteria scores from baseline model – pesticide controls for tea

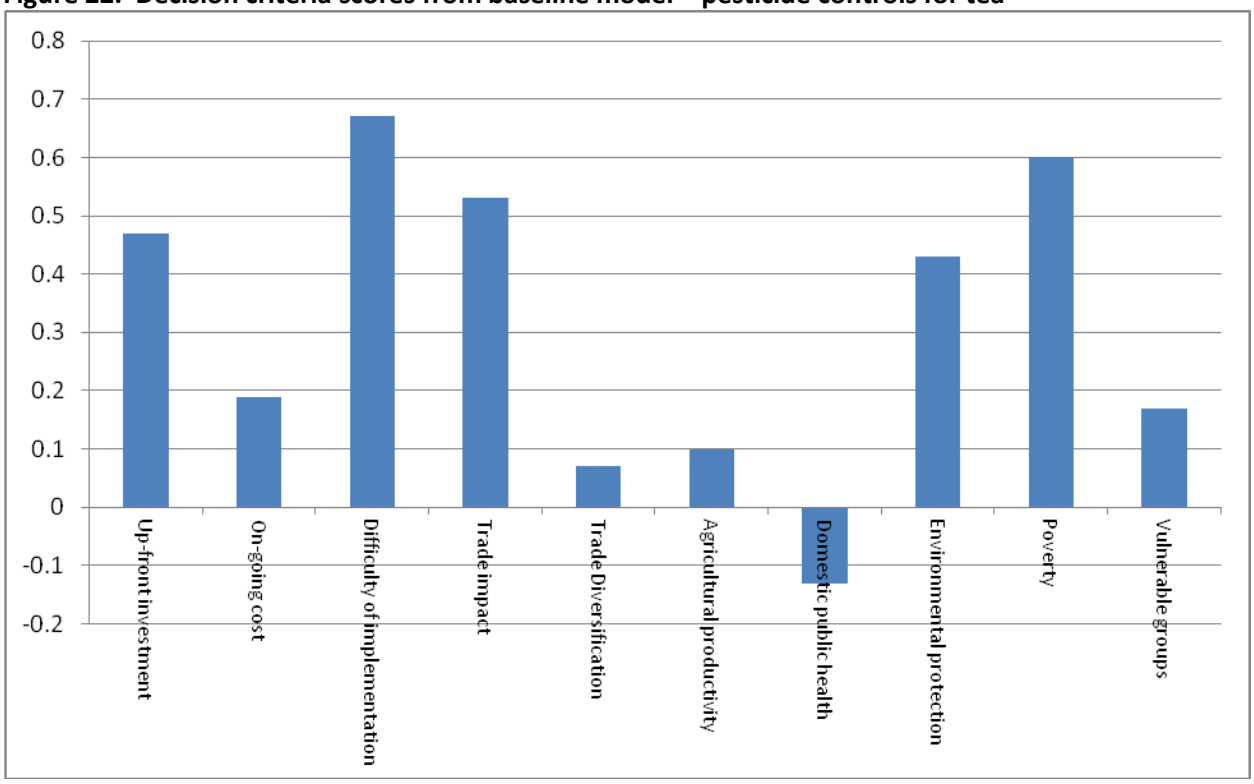


Figure 23. Decision criteria scores from baseline model – pesticide residue testing capacity

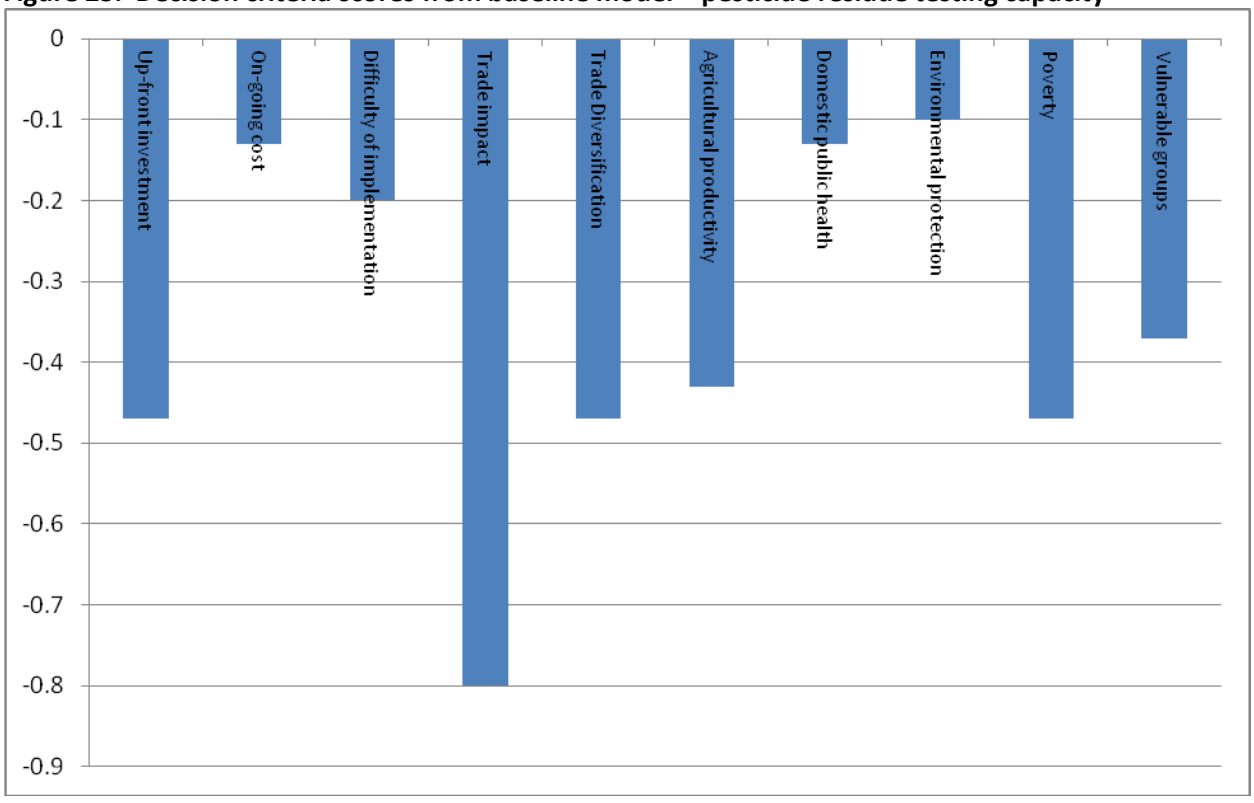


Figure 24. Decision criteria scores from baseline model – animal health controls for fish exports

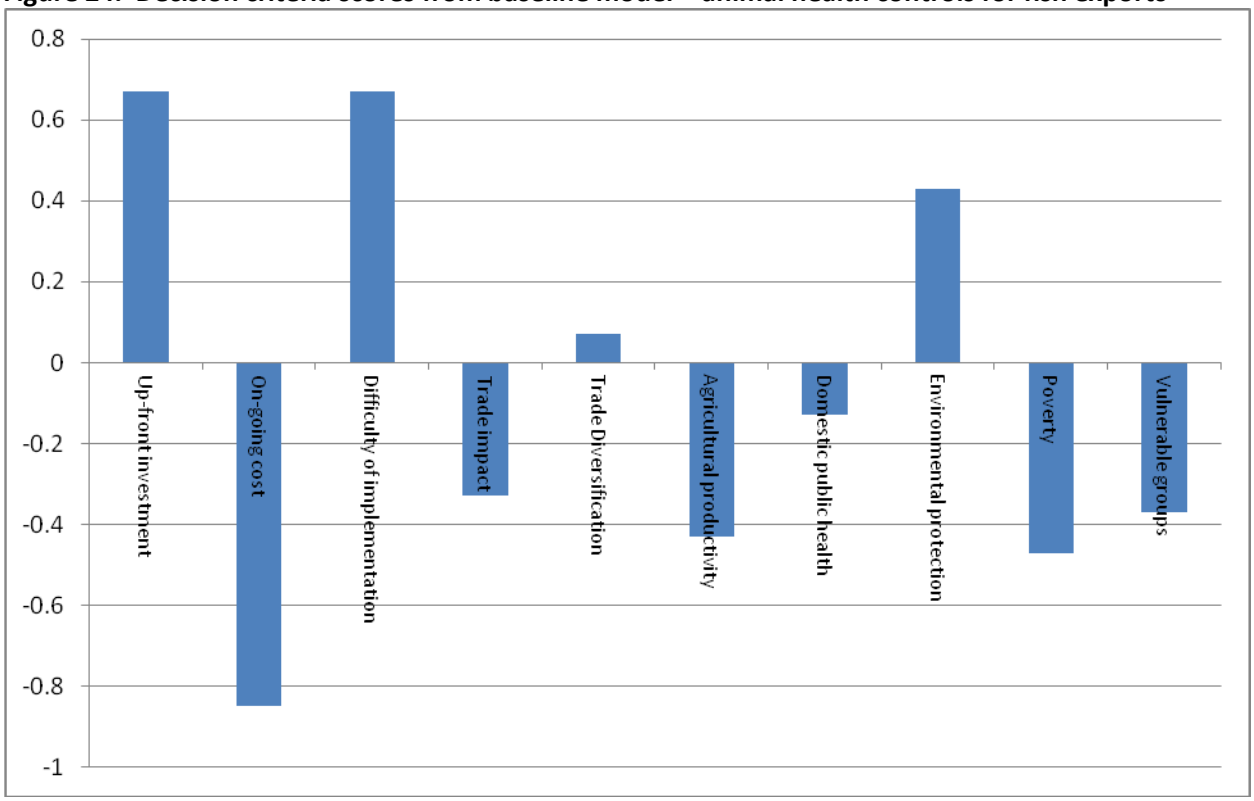


Figure 25. Decision criteria scores from baseline model – compliance with hygiene requirements for milk exports

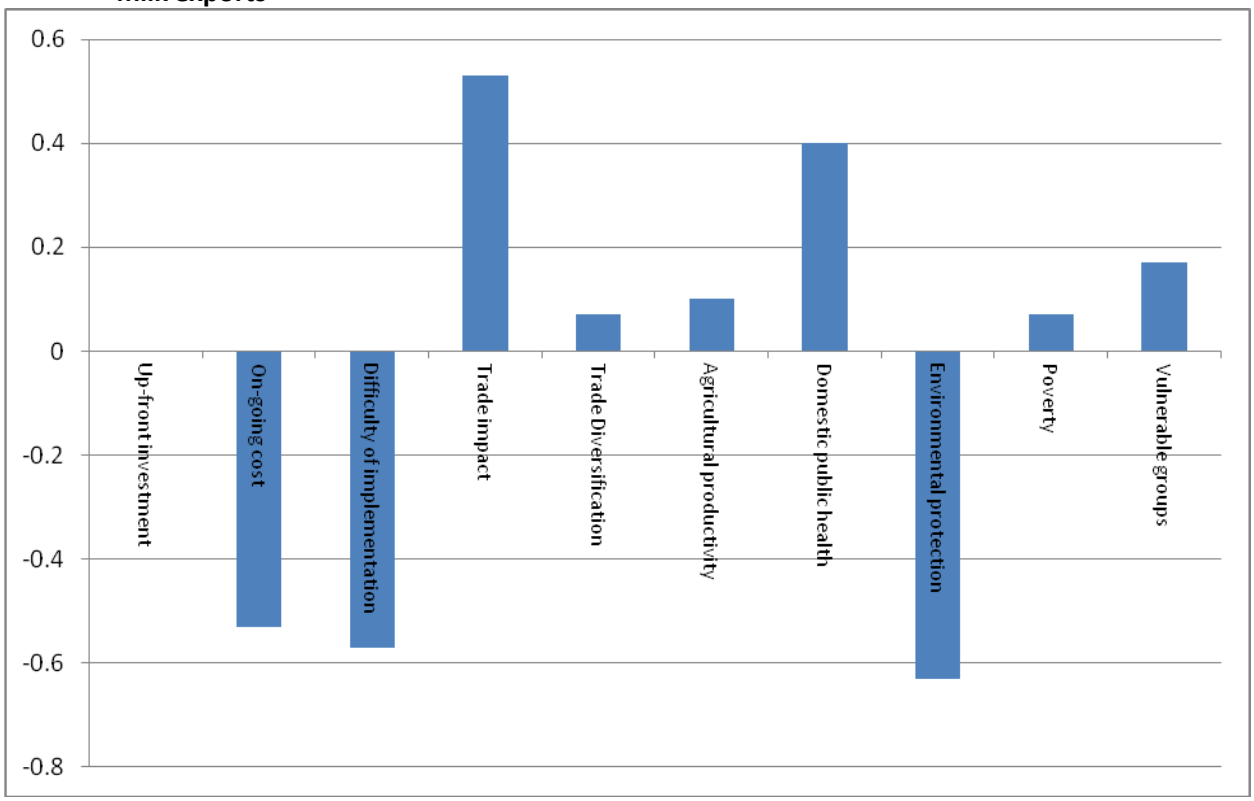


Figure 26. Decision criteria scores from baseline model – virus indexing capacity for planting material

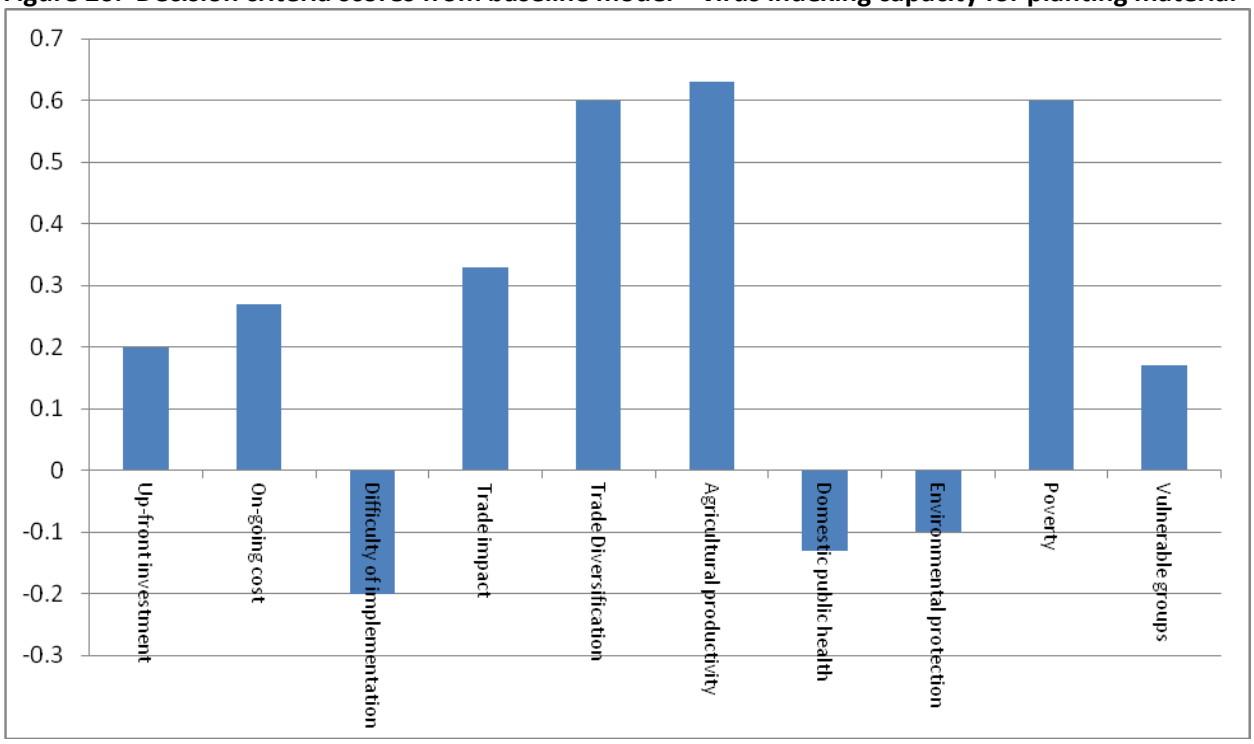


Figure 27. Decision criteria scores from baseline model – compliance with SPS requirements for chilli sauce exports

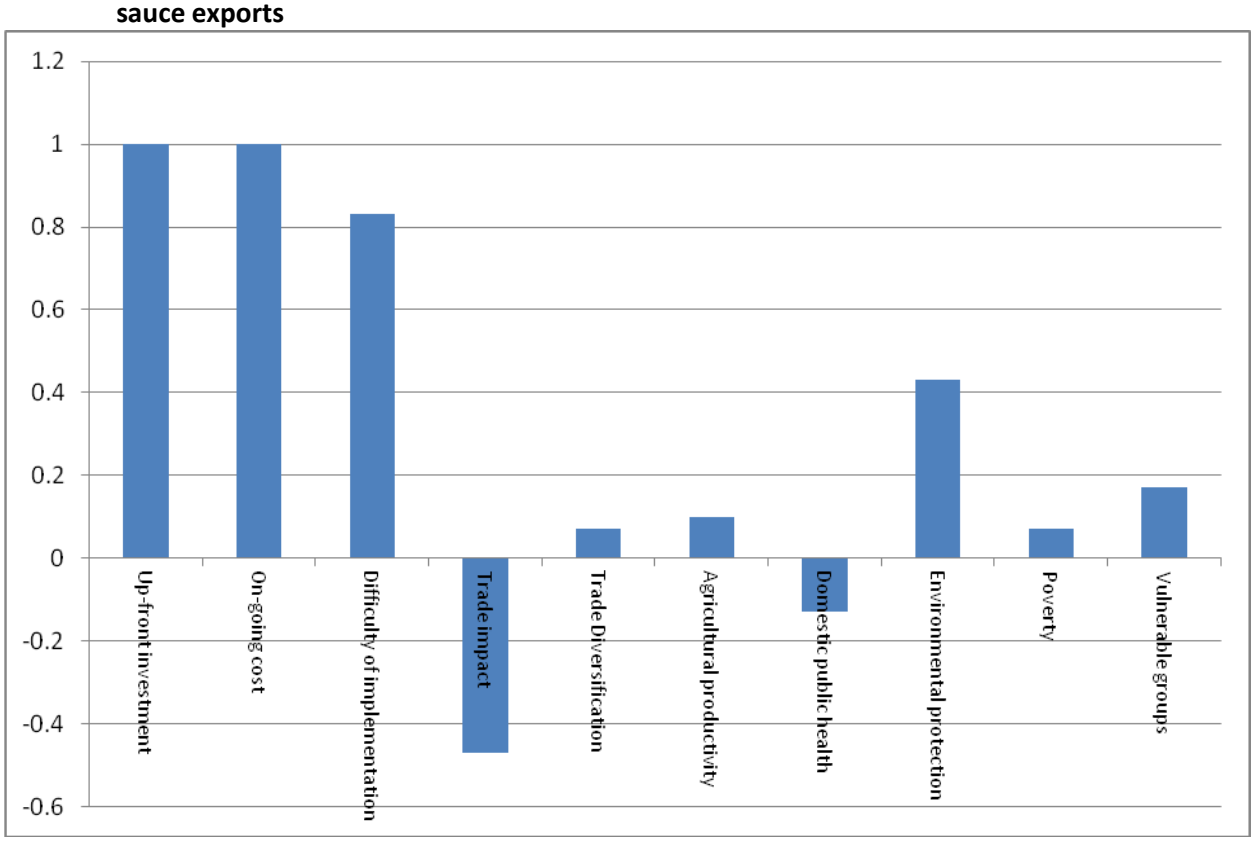


Figure 28. Decision criteria scores from baseline model – seed inspection and certification capacity

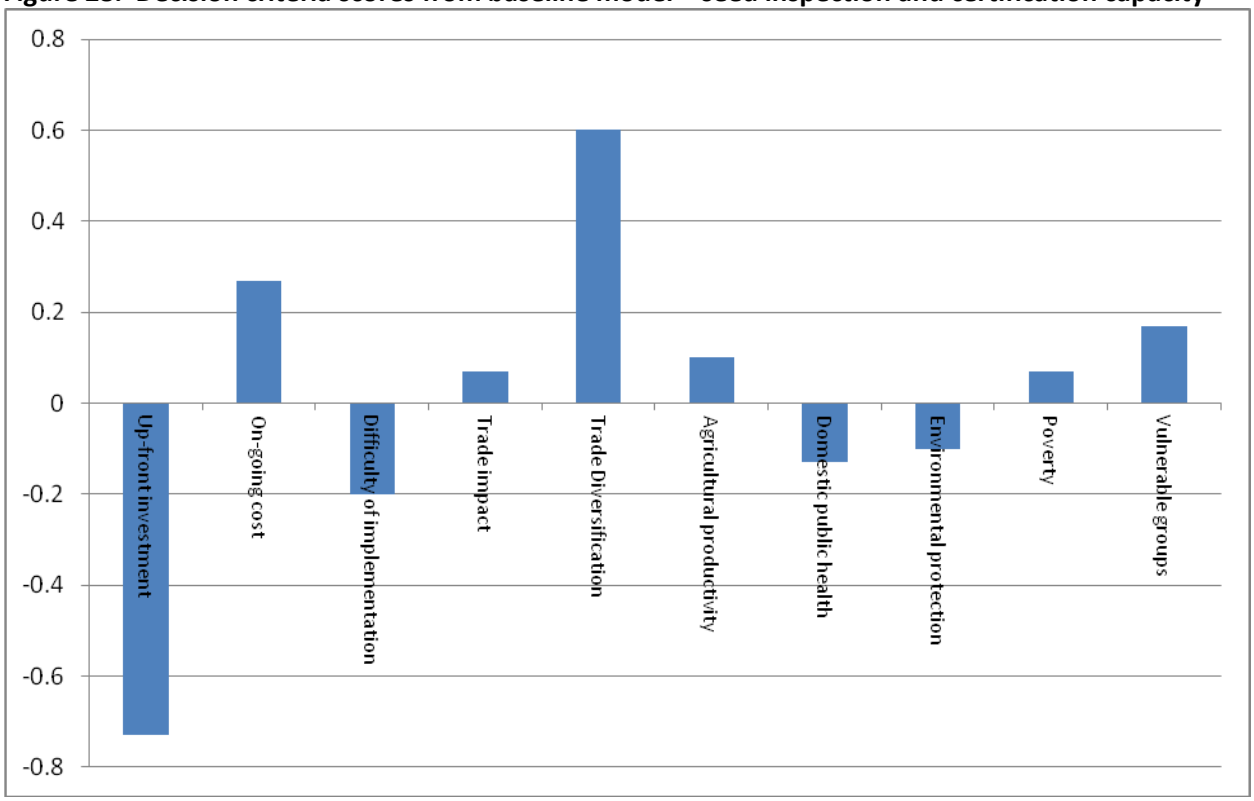
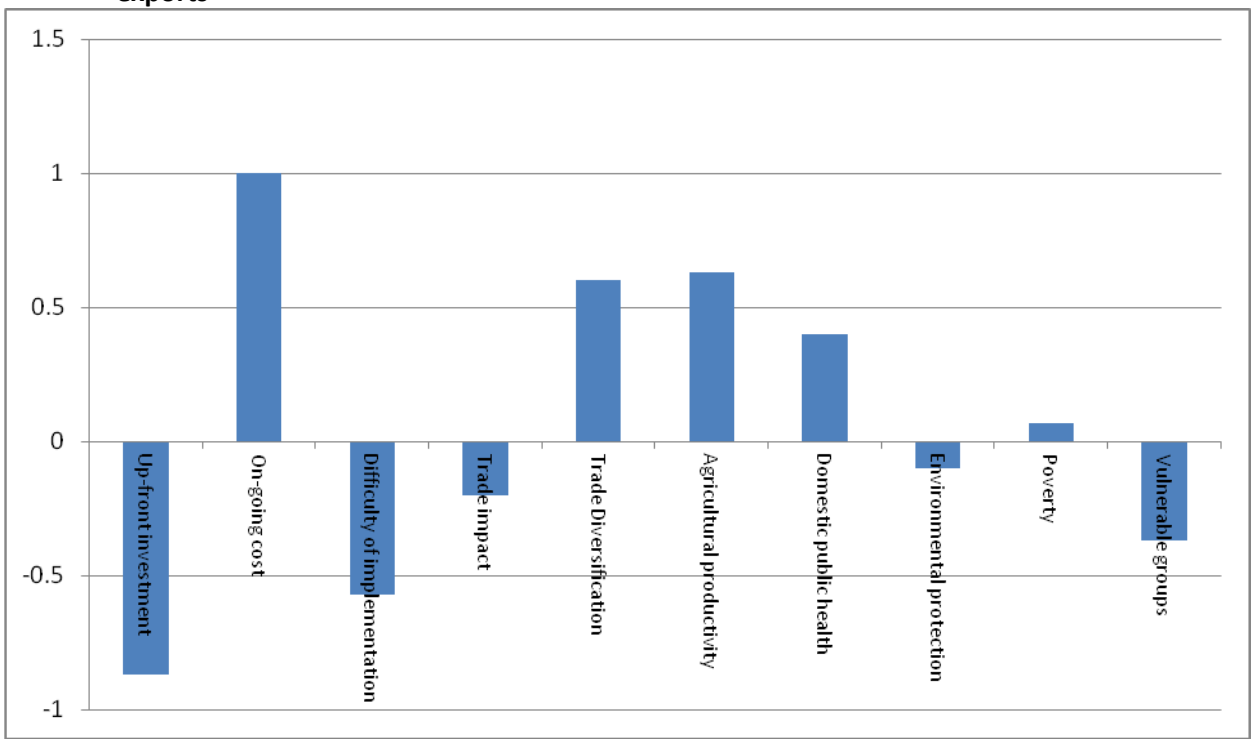
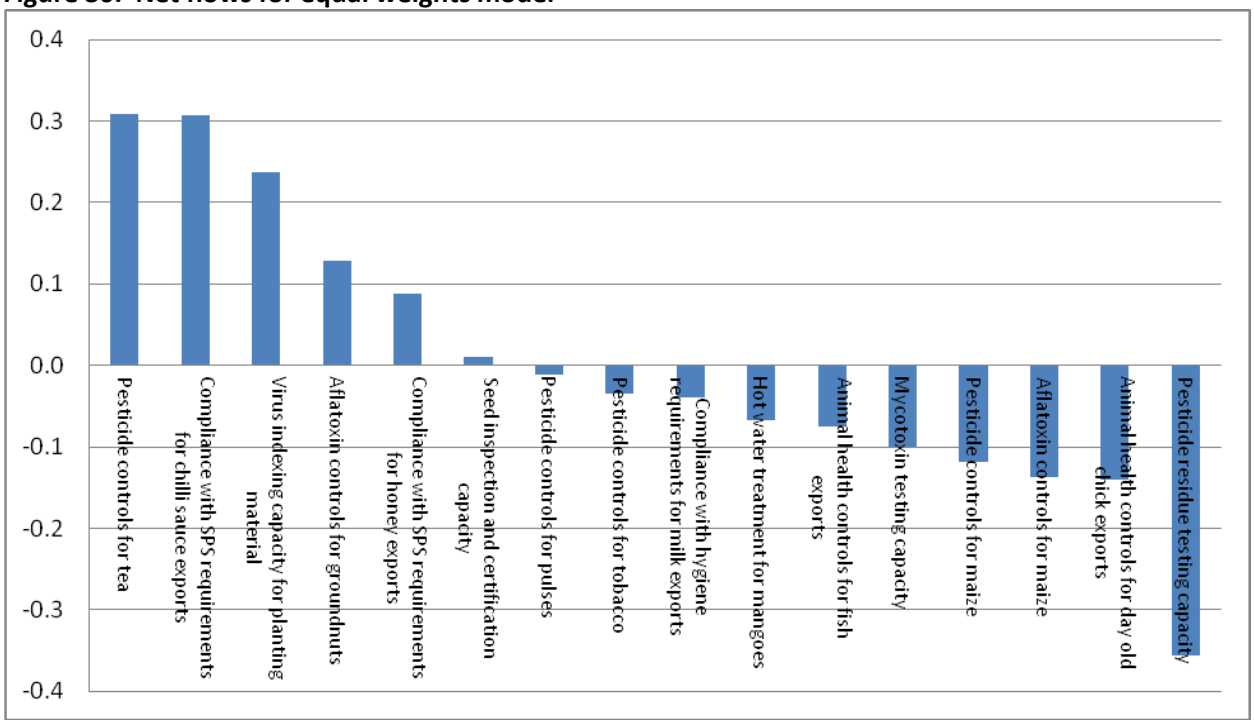


Figure 29. Decision criteria scores from baseline model – animal health controls for day old chick exports



To explore the impact of changing the weights attached to the ten decision criteria, an alternative equal weights model was estimated. This model abandons the weights derived in the stakeholder workshop and assumes all criteria are weighted equally. The results of this model (Figure 30) do not differ appreciably from those of the baseline model, in that the same capacity-building options are ranked as the top five priorities, except that virus indexing capacity for planting materials and compliance with SPS requirements for chilli sauce exports, which ranked second and third respectively in the baseline model, swap positions in the equal weights model. One major difference between the baseline and equal weights models, however, is that some options switch from having positive to having negative net flows. These include pesticide controls for pulses, compliance with hygiene requirements for milk exports, and pesticide controls for tobacco. These results suggest that the derived priorities are relatively robust to changes in the decision weights.

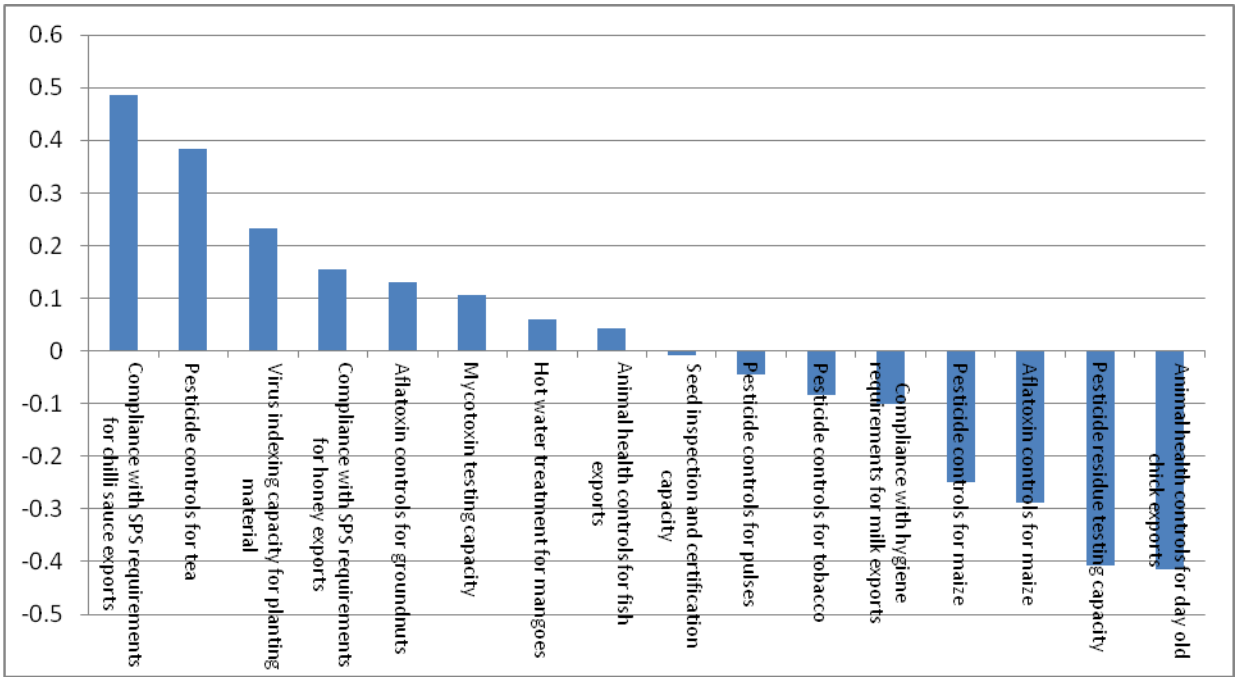
Figure 30. Net flows for equal weights model



To further explore the sensitivity of the prioritisation of SPS capacity-building options to changes in the decision weights, a cost/difficulty of implementation and trade model was estimated; this assumes that the only criteria driving the ranking of options is costs (up-front investment and on-going costs), difficulty of implementation and the impact on trade (absolute change in value of exports and trade diversification). In this model, all five decision criteria are weighted equally. The prioritisation of options presented by this model is somewhat different (Figure 31). Now, compliance with SPS requirements for chilli sauce exports comes first and post-harvest treatment for mangoes is ranked seventh. However, pesticide controls for tea, virus indexing capacity for planting material, and aflatoxin controls in groundnuts remain in the top five. Other options that show positive net flows include compliance with SPS controls for honey exports, mycotoxin testing capacity, and animal health controls for ornamental fish exports. Conversely, seed inspection and certification capacity which had a positive

net flow in most analysis has a negative net flow under the cost/difficult of implementation and trade impact analysis.

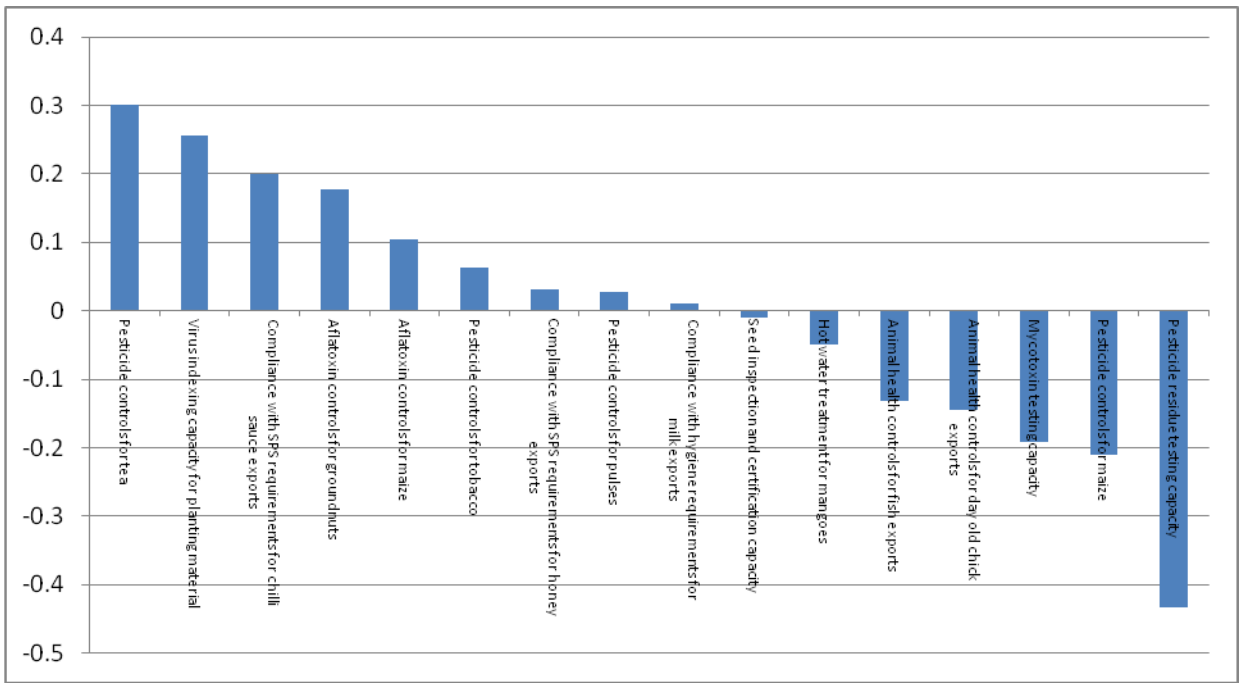
Figure 31. Net flows for cost/difficulty of implementation and trade impact model



Examination of the sensitivity of the prioritisation to changes in measures of the decision criteria is more complex, in that 160 individual measures (10 decision criteria x 16 capacity-building options) enter the analysis and conceivably changes in any one might influence the results. Thus, focus was placed on measures for which there was a low level of confidence and that were considered to be of potential importance to the analysis. In particular two alternative scenarios were run, and are outlined below.

There is considerable uncertainty over the impact of investments in aflatoxin controls for maize on the value of exports. The baseline assessment assumes that the impact on the value of exports is zero. Most trade in maize is through the World Food Programme (WFP) and is tested. If there is a problem with aflatoxins in maize, it is evidently not of a magnitude to impede trade. An alternative plausible assumption, however, is that in seasons with high rainfall, levels of aflatoxins will be greater and exceed the tolerance of export markets and/or buyers. In such cases, a large proportion of exports could be lost. To capture this eventuality, an alternative scenario that investment in aflatoxin controls for maize would prevent losses of up to a half of exports (US$11 million in 2017) is estimated. This has a significant impact on the placement of the option in the overall ranking, which moves from 15th in the baseline model to fifth (Figure 32). Evidently, this is an area where further research and reflection is required.

Figure 32. Net flows for baseline model with adjusted trade impact of aflatoxin controls for maize



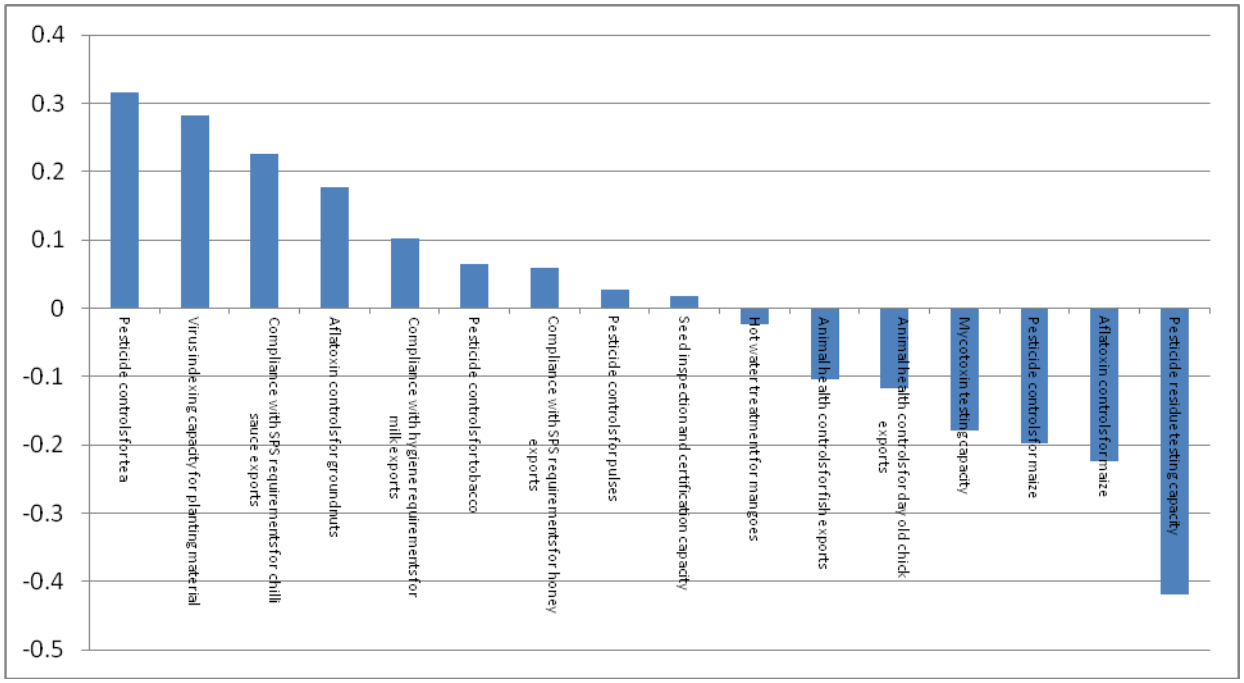
Feedback on the baseline model from dairy processing sector questioned the presumed impact on trade should investments not be made in upgrading hygiene controls in the sector. The baseline model assumed that growth in exports would be facilitated by the enhancement of hygiene controls, estimated at US$2 million annually by 2017 (Table A3.12). An alternative and more pessimistic scenario is that dairy product exports would be curtailed in their entirety should hygiene controls not be upgraded, reflecting the trends towards HACCP-based controls in diary processing within COMESA and SADC. The presumed trade impact in this alternative scenario is US$17.2 million of trade loss averted in 2017. The results are presented in Figure 33. Under this new scenario, compliance with hygiene requirements for milk exports is ranked fifth, compared to ninth in the baseline model. This suggests that the prioritisation of this option is sensitive to the estimated trade effect, and that this is in need of further research in order to ascertain which of these two scenarios (or some other) is most plausible.

6. Conclusions

This report has presented the initial results of a priority-setting exercise for SPS capacity-building in Malawi. The priorities are defined using a new prioritisation framework based on MCDA, which provides a structured and transparent approach to ranking capacity-building options on the basis of predefined and agreed and weighted decision criteria. Thus, the options to be considered are identified through a process of stakeholder consultation that is informed by a review of prior assessments of SPS capacity. In this case, 16 distinct SPS capacity-building options were identified. These options are then prioritised on the basis of a series of 10 decision criteria which weights are applied, that are again derived by consulting stakeholders. These criteria cover the costs and difficulty of implementing the capacity-building options and the pay-off from these investments in terms of impacts on trade, local spill-overs

on agricultural productivity, public health and the environment, and the degree to which they bring about reductions in poverty and impacts on vulnerable groups.

Figure 33. Net flows for baseline model with adjusted trade impact of compliance with hygiene requirements for milk exports



The end result is a clear ranking of the 16 capacity-building options, which appears relatively robust to changes in the weights attached to the decision criteria and to changes in the decision criteria applied, specifically to focus more narrowly on trade impacts. Of the 16 options in the analysis the following four are consistently ranked as high priority:

- Pesticide controls for tea.
- Compliance with SPS requirements for chilli sauce exports.
- Virus indexing capacity for planting material.
- Aflatoxin controls for groundnuts.

Conversely, certain capacity-building options are consistently ranked as low priority, notably:

- Pesticide residue testing capacity.
- Pesticide controls for maize.
- Animal health controls for day old chicks.

Some other capacity-building options are judged to be of high priority, although are more sensitive to changes in the decision criteria and/or weights, for example compliance with SPS requirements for honey exports. Further, the ranking of aflatoxin controls for maize is highly sensitive to assumptions over trade impacts and is certainly in need of closer examination.

Given the robustness of the results, the ranking provided by the MCDA framework provides a coherent basis on which to start defining a national action plan for SPS capacity-building in Malawi. It is important to recognise, however, that the results of the analysis presented above represent just the starting point in the use of the priority-setting framework in the context of SPS capacity-building in Malawi. Indeed, the results should be revisited and revised on an on-going basis in the light of improvements in the availability and/or quality of data, changes in policy priorities that imply shifts in the decision weights and/or the introduction of new decision criteria, etc. Further, if new capacity-building needs arise, these can be added to the analysis. Likewise, as investments are made in the options included in the analysis above, these can be excluded and the priorities re-estimated accordingly. The intention is that the prioritisation framework will become a routine element of SPS capacity-building planning in countries such as Malawi.

It is possible that some stakeholders will be concerned about the priorities presented above. Clearly, the ranking is based on the results of the stakeholder consultation process and the collection and collation of data directed at the compilation of the information sheets. It is almost always possible to improve on this process, for example by encompassing the perspectives of a larger number and wider range of stakeholders, and this should certainly be pursued. It is important to recognise that, however, that the aim of the framework is not to make decisions over investments in SPS capacity-building, but to provide an input into established systems of decision-making. Indeed, the framework aims to facilitate a coherent and transparent debate over priorities between capacity-building options. Thus, if a particular group of stakeholder is unhappy about the priority given to a particular option, they should be invited to present new evidence in the form of revised data to support measures of particular decision criteria in the capacity-building option information cards/profiles and/or to suggest how and why distinct decision criteria or differing decision weights should be employed. Such changes can then be employed and the model re-estimated accordingly.

.

Appendix 1. Contents of Information Dossier

AfDB and OECD (2007). *Malawi.* African Economic Outlook, African Development Bank and the Organization for Economic Co-operation and Development. Available at: http://www.oecd.org/dataoecd/26/36/38562851.pdf

Bilal, S., Rampa, F., and Fautrel, V. , (2010). *Discussion Paper 95: Agricultural Trade Adjustments: Lessons from SADC experiences*. The European Centre for Development Policy Management. Available at: http://www.ecdpm.org/Web_ECDPM/Web/Content/Download.nsf/0/CE47FEE459618192C125773D0029DBA2/$FILE/10-95%20final.pdf

Chemonics International Inc., (2009). *Staple Foods Value Chain Analysis. Country Report - Malawi.* Competitiveness and Trade Expansion Programme and United States Agency for International Development, Washington DC. Available at: http://pdf.usaid.gov/pdf_docs/PNADW639.pdf

Chipeta, C., (2006). *Regional Integration in Southern Africa Volume 3: Deepening Integration in SADC: Can Malawi meet the challenges?* Friedrich Ebert Foundation, Botswana. Available at: http://library.fes.de/pdf-files/bueros/botswana/04923.pdf

Christina, Z. C., (2007). *An Analysis of Malawi's Trade Performance under the African Growth and Opportunity Act.* Integrated Framework Secretariat and Ministry of Industry, Trade and Private Sector Development, Malawi. Available at: http://www.trade.gov.mw/pdf/3%20Chatima%20-%20Malawi's%20trade%20performance%20under%20AGOA_draft.pdf

CYE Consult. (2009). *Value Chain Analysis of Selected Commodities Institutional Development Across the Agri-Food Sector (IDAF) – 9 ACP mai 19.* European Commission, Brussels. Available at: http://www.moafsmw.org/ocean/docs/Agricultural%20Marketing/D%20Value%20chain%20Final%20Report%20Revised%2001.08.09.pdf

Daya, Y., Ranoto, T.R., and Letsoalo, M.A. (2006). *Intra-Africa Agricultural Trade: A South African Perspective.* Department of Agriculture, Pretoria, South Africa. Available at www.nda.agric.za

Department of Agriculture, Forestry and Fisheries. *Groundnut Market Value Chain Profile 2010-2011*. Department of Agriculture, Forestry and Fisheries, Pretoria. Available at: www.daff.gov.za/docs/AMCP/GroundnutMVCP2010-2011.pdf

Department of Agriculture, Forestry and Fisheries. *Groundnut Market Value Chain Profile 2009-2010.* Department of Agriculture, Forestry and Fisheries, Pretoria. Available at: www.nda.agric.za/docs/AMCP/GroundnutMVCP2009-2010.pdf

DESA/CDP Secretariat. WTO Provisions and Preferential Market Access Survey on LDC-specific International Support Measures. Malawi Summary Results. United Nations, Geneva.

FAO (2011). *WTO Report: Activities of the SPS Committee and Other Relevant WTO Activities in 2010*. (CPM 2011/INF/10). Food and Agricultural Organisation, Rome. Available at: www.fao.org

Faulkner, L., Harrington, J., Levy, D. and The, K., (2009). *Commercial Opportunities for Fruit in Malawi.* ICRAF Working Paper no. 86. World Agroforestry Centre, Nairobi, Kenya. Available at: http://www.worldagroforestry.org/downloads/publications/PDFs/WP16120.PDF

Gapasin, D., Cherry, J., Gilbert, J., et. al. (2005). *The Peanut Collaborative Research Support Program (CRSP): 2005 External Evaluation Report*. United States Agency for International Development, Washington DC. Available at: http://www.oecd.org/dataoecd/57/63/36079702.pdf

Gebrehiwet, Y., Ngqangweni, S., and Kirsten, J.F., (2007). *Quantifying the Trade Effect of Sanitary and Phytosanitary Regulations of OECD Countries on South African Food Exports*. Agrekon, Vol. 46, No 1. Available at: http://ageconsearch.umn.edu/bitstream/10127/1/46010023.pdf

Government of Malawi. (2010). *Trade Policy Review: Report by Malawi.* World Trade Organization, Geneva. Available at: http://www.wto.org/english/tratop_e/tpr_e/tp331_e.htm

Government of Malawi. (2009). *Malawi National Nutrition Policy and Strategic Plan (2007-2011)*. Office of the President and Cabinet, Lilongwe. Available at: http://www.moafsmw.org/ocean/docs/Key%20Documents/National%20Nutrition%20Policy%20Strategic%20Plan%20%20Final%2009.pdf

Government of Malawi and the World Bank. 2006. Malawi, Poverty and Vulnerability Assessment. Investing in Our Future. Draft for discussion. June 2006. Available at: http://www.aec.msu.edu/fs2/mgt/caadp/malawi_pva_draft_052606_final_draft.pdf

Griffith, M., (2007). *Much to lose, little to Gain: Assessing EPAs from the perspective of Malawi, A brief for Tearfund partners.* Tearfund. Available at: http://tilz.tearfund.org/webdocs/Website/Campaigning/Policy%20and%20research/Malawi%20report%20Partner%20brief.pdf

Hellin, J., Ndjeunga, J., and Trench, P.C., (2010). *Using qualitative market mapping to explore Aflatoxin contamination along the Maize and Groundnut Value Chains*. International Food Policy Research Institute (IFPRI), Washington DC. Available at http://www.ifpri.org/publication/using-qualitative-market-mapping-explore-aflatoxin-contamination-along-maize-and-groundn

Jayne, T.S., Sitko, N., Ricker-Gilbert, J., and Mangisoni, J., (2010). *Malawi's Maize Marketing System.* Ministry of Agriculture and Food Security, Lilongwe, Malawi. Available at: http://www.aec.msu.edu/fs2/malawi/Malawi_maize_markets_Report_to-DFID-SOAS.pdf

Jensen, M., and Keyser, J.C., *Non-Tariff Measures On Goods Trade in the East African Community: Assessment of Regional Dairy Trade*. World Bank, Washington DC. Available at: http://www.standardsfacility.org/Files/News/EAC_Dairy_Study.pdf

Kandiero, T., (2005). *Malawi in the Multilateral Trading System.* University of Pretoria, South Africa. Cambridge University Press, Cambridge. Available at: http://www.wto.org/english/res_e/booksp_e/casestudies_e/case23_e.htm

Mapemba, L., (2009). *Trade and Industry Performance in Malawi: Opportunities and Policy Challenges.* Trade and Industrial Policy Strategies, Pretoria, South Africa. Available at:

http://www.tips.org.za/publication/trade-and-industry-performance-malawi-opportunities-and-policy-challenges

McGrath, J., and Said, J., (2011). *Malawi Aid for Trade Evaluation Workshop 19 May 2011*. South African Institute of International Affairs and Imani Development, Malawi. Available at: http://ictsd.org/downloads/2011/05/190511-ictsd-malawi-aid-for-trade-evaluation-workshop-presentation-final-1.pdf

Mkandawire, R. W., (2010). *Manufacturing Industries Technology Needs Assessment Report.* Malawi Industrial Research and Technology Development Centre, Blantyre. Available at: http://www.mirtdcmalawi.com/Needs%20Assessment%20Report.pdf

Theyse, M., (2009). *Development of an Effective Phytosanitary Regulatory System Framework for WTO SPS Compliance.* University of Pretoria, South Africa. Available at: http://upetd.up.ac.za/thesis/available/etd-10222009-105307/

Toomey, D.C., Sterns, P.A., and Jumbe, C., (2001). *The Impact of Improved Grades and Standards on the Export Potential of Targeted Commodities in Malawi*. East Lansing, MI: Michigan State University and United States Agency for International Development, PFID-F&V Report No. 2. Available at: http://pdf.usaid.gov/pdf_docs/PNACL842.pdf

UNIDO (2008). *Capacity building for aflatoxin management and control in groundnuts in Malawi*. Standards and Trade Development Facility, WTO, Geneva. Available at: http://www.standardsfacility.org/files/Project_documents/Project_Preparation_Grants/STDF_52_Proposal_Malawi.pdf

World Bank (2004). *Malawi Diagnostic Trade and Integration Study.* World Bank, Washington DC. Available at: http://www.enhancedif.org/EN%20web%20pages/Where%20we%20work/Malawi.htm

World Bank (2004). Malawi Diagnostic Trade and Integration Study Volume 2 - Chapter 1 Regional Trade. World Bank, Washington DC. Available at World Bank (2004). Malawi Diagnostic Trade and Integration Study. World Bank, Washington DC. Available at: http://www.enhancedif.org/EN%20web%20pages/Where%20we%20work/Malawi.htm

WTO (2005). *Update on the Operation of the Standards and Trade Development Facility* (G/SPS/GEN/572). World Trade Organization, Geneva. Available at: http://spsims.wto.org

WTO (2010). *Trade Policy Review: Report by the Secretariat.* (WT/TPR/S/231). World Trade Organization, Geneva. Available at: http://www.wto.org/english/tratop_e/tpr_e/tp331_e.htm

WTO (2003). *SACU-South Africa. Annex 4 South Africa.* (WT/TPR/S/114/ZAF).World Trade Organization, Geneva. Available at: http://www.wto.org/english/tratop_e/tpr_e/tp213_e.htm

USAID. Famine Early Warning Systems Network. *Production & Market Flow Map: Southern Africa Maize*. United States Agency for International Development, Washington DC. Available at: www.fews.net/docs/Publications/sa_fullmap_maize_norm.pdf

Appendix 2. Participants at Stakeholder Workshop, Wednesday 8th February 2012

Name	Organisation	E-mail
Newby Kumwembe	Ministry of Industry and Trade (MoIT)	
Doug Arbuckle	USAID	
Christina Chatima	Ministry of Industry and Trade	chatimachristina@yahoo.com
Clement Phangaphanga	Ministry of Industry and Trade	clementphangaphanga@yahoo.co.uk
Mr Wilfred Lipita	Ministry of Agriculture, Irrigation and Water Development (MoAIWD) - ASWAp Secretariat	wglipita@hotmail.com
Flora Gondwe	Grain Traders and Processors Association	flora.gondwe@yahoo.com
Mr D. Kachingwe	MoAIWD - SADC Desk	kachingwedk@yahoo.co.uk
Chifundo Santhe		tlchidzanja@gmail.com
Albright Mchema	MCCCI	amchema@mccci.org
Phiko Kavinya	MoAIWD	pkavinya2000@yahoo.co.uk
Charles Chivundu	University of Malawi (Bunda College)	chivundu@bunda.unima.mw
Roman Malumelo	DCAFS	malumeloroman@yahoo.co.uk
Milika Kalyati	European Union	milika.kalyati@eeas.europa.eu
Vincent Langdon-Morris	USAID	vlangdon-morris@usaid.gov
Richard Kettlewell	Afri-Nut	rgwk@aol.com
Anne Conroy	Irish Aid	aconroy@africa-online.net
Mr Fred Sikwese	Malawi Bureau of Standards	fsikwese@mbsmw.org
Kingsley Masamba	University of Malawi (Bunda College)	kmasamba@yahoo.com
Will Abel	Ministry of Industry and Trade	william.abel@gmail.com
Joshua Varela	Malawi Mangoes	joshua@malawimangoes.com
Joseph Maruwo	NASFAM	Dcchibonga@nasfam.org
Daniel Chilima	Agricultural Exchange Commission	dchilima@aceafrica.org
Butusyo Mwaibasa	Rab Processors Ltd	cm@rabmw.com
Mr Misheck Soko	Bvumbwe Research Centre	misheck_soko@yahoo.com
Patrick Chikungwa	Dept of Animal Health	pchikungwa@yahoo.com
Mr Michael Makina,	MoAIWD	mkmakina@yahoo.co.uk
Barter Chunga	Lilongwe Dairy	sasif.karim@lldairy.co.zw
Anne Kumwenda	MoAIWD	aonekumwenda@yahoo.co.uk
Limbikani Matumba,	Limbikani Matumba	alimbikani@gmail.com
Bridget Kauma	Ministry of Industry and Trade	bchalira@yahoo.com
Solomon Gebeyehu	USAID	solomon.gebeyehu@gmail.com
Isaac B. Gokah	Ministry of Industry and Trade	yesubaike@gmail.com
Patrick Liphava	Ministry of Industry and Trade	patliphava@yahoo.co.uk
Chipo Kachiwala	Ministry of Industry and Trade	chiphunile@yahoo.com
Vyawo Charles Chavula	Ministry of Industry and Trade	vyawocharles@gmail.com

Appendix 3. Participants at Stakeholder Workshop, Friday 29th June 2012

Name	Organisation	E-mail
Christina Chatima	Ministry of Industry and Trade	chatimachristina@yahoo.com
John Edgar	USAID	jedgar@usaid.gov
Dermot Casidy	USAID, SPS Coordinator	dermot.cassidy@gmail.com
Mr. Fred Sikwese	Malawi Bureau of Standards	fsikwese@mbsmw.org
Roman Malumelo	DCAFS, Coordinator	malumeloroman@yahoo.co.uk
Milika Kalyati	European Union	milika.kalyati@eeas.europa.eu
David Kamangira	Research Headquarters	davidkamangira@yahoo.com
Elisa D. L. Mazuma	DARS, Chitedze Research Station	elisamazuma@gmail.com
Albright Mchema	MCCCI	amchema@mccci.org
Mr. Misheck Soko	Bvumbwe Research Centre	misheck_soko@yahoo.com
McDonald Kachitsa	Lilongwe Dairy	
Aubrey Chinsey	NASFAM	achinsey@nasfam.org
Manikandan Lakshmanan	Mulli Brothers	manikandan.lakshmanan@mullibrothers.com
Cinzia Tecce	UNDP	cinzia.tecce@undp.org
Matthew Raboin	USAID	mraboin@usaid.gov
Pierre le Roux	African Novel Resources	arbor@mweb.co.za
Vincent Langdon-Morris	USAID	vlangdon-morris@usaid.gov
Vyawo Charles Chavula	Ministry of Industry and Trade	vyawocharles@gmail.com
Bridget Kauma	Ministry of Industry and Trade	bchalira@yahoo.com
Will Abel	Ministry of Industry and Trade	william.abel@gmail.com
Henry Mandere	Ministry of Industry and Trade	mandereh@yahoo.co.uk
Charity Musonzo	Ministry of Industry and Trade	charitylonje@yahoo.com
Isaac B. Gokah	Ministry of Industry and Trade	yesubaike@gmail.com

Appendix 4. Capacity-Building Option Information cards

Table A3.1. Hot water treatment for mango exports

Decision Criterion	Value	Details	Confidence
Cost			
Up-front investment	US$180,000	Cost of high temperature forced air equipment ($120,000); Cost of research ($60,000)	High
On-going cost	0%	Estimated additional cost of $0.32/kg. However, offset by increase in price, such that overall cost is around zero.	Medium
Ease of implementation	5	Business interest in exports. Requires public sector research involvement. Needs cooperation of South African government	High
Trade impacts			
Change in absolute value of exports	US$1.0 million	Malawi is an early season producer and so could be a potential market in South Africa, although likely to be quite small.	Medium
Trade diversification	+1	Able to export fresh mangoes into South Africa	High
Domestic agri-food impacts			
Agricultural/fisheries productivity	+1	Some additional returns to mango producers and more commercialised production	Medium
Domestic public health	0	No impact	High
Environmental protection	0	No impact	High
Social impacts			
Poverty impact	+1	Mango for export is not a crop that lends itself well to smallholder production. Limited employment on larger commercial farms and pack-houses.	High
Impact on vulnerable groups	0	Most production by men and little impact on children. Mainly a smallholder crop in Malawi, although production for export is not that amenable to small farmers.	Medium

Table A3.2. Aflatoxin controls for groundnuts

Decision Criterion	Value	Details	Confidence
Cost			
Up-front investment	US$600,000	Estimated cost of scoping study for 4 mycotoxins in diet, land race typing of *Aspergillus flavus* to geographical indicators, and three year field trial with multiple strain atoxigenic strain *Aspergillus flavus.*	Medium
On-going cost	0.1%	Limited additional production costs estimated conservatively at 0.1 per cent of the value of exports.	Medium
Ease of implementation	+4	Somewhat difficult. Larger smallholder farmers involved and fragmented value chain. Difficult to get smallholders to implement GAPs given that they mostly decide the crops they grow in any season on the basis of price.	High
Trade impacts			
Change in absolute value of exports	US$10.8 million	Exports in 2011 were 21,000 tonnes. Limited additional exports could be achieved as a result of the implementation of aflatoxin controls that are over and above growth in exports that would be achieved anyway. These are estimated conservatively at 40,000 tonnes per annum. Assuming no appreciable changes in prices over time these exports are valued at the unit price in 2011 (US$0.27 per kilogram).	Medium
Trade diversification	+1	Enhanced exports to the EU will be facilitated.	High
Domestic agri-food impacts			
Agricultural/fisheries productivity	+1	The implementation of GAP and enhanced returns will stimulate more commercial production.	High
Domestic public health	0	No impact. Groundnuts are heavily consumed in Malawi especially by poor households. Smallholders are likely to sell aflatoxin-free nuts to exporters and to consume the infected ones themselves and/or sell them on local markets. At the same time, a more effective aflatoxin control and management system could reduce overall levels of aflatoxins in the crop.	Medium
Environmental protection	-1	Expansion in production could cause reduction in biodiversity	High

Social impacts			
Poverty impact	+2	Groundnut production is dominated by smallholder farmers. Significant employment in grading and packing. Increased production will have positive impacts on their income.	High
Impact on vulnerable groups	+2	Most production by smallholders, including women. Significant numbers of women employed in grading and packing.	High

Table A3.3. Aflatoxin controls for maize

Decision Criterion	Value	Details	Confidence
Cost			
Up-front investment	US$600,000	Estimated cost of scoping study for 4 mycotoxins in diet, land race typing of *Aspergillus flavus* to geographical indicators, and 3 year field trial with multiple strain atoxigenic strain *Aspergillus flavus.*	Medium
On-going cost	0%	Limited additional production costs estimated conservatively at 0.1 per cent of the value of exports.	Medium
Ease of implementation	+4	Somewhat difficult because of the number of people involved in the value chain. Maize basically is a subsistence crop	Medium
Trade impacts			
Change in absolute value of exports	US$0	Minimal impact. There are moves to set mycotoxins standards in the SADC/EAC/COMESA region and the implementation of these controls will act to preserve existing regional trade. However, much of the current trade is through the WFP and is already tested.	Medium
Trade diversification	0	Most maize production is for domestic consumption. Any trade is within the region and this is not expected to change.	High
Domestic agri-food impacts			
Agricultural/fisheries productivity	+1	Implementation of GAP likely to lead to enhanced productivity.	High
Domestic public health	+1	Aflatoxin contamination reduces immunity. Therefore, more effective aflatoxin control and management for this staple crop is likely to reduce health problems such as HIV/AIDS.	Medium
Environmental protection	0	No impact	High
Social impacts			
Poverty impact	0	No impact	High
Impact on vulnerable groups	+1	Will have some positive impact on individuals with HIV/AIDS	Medium

Table A3.4. Mycotoxin testing capacity

Decision Criterion	Value	Details	Confidence
Cost			
Up-front investment	US$100,000	Estimated cost of testing equipment and training of personnel.	High
On-going cost	$0	Costs of maintaining laboratory accreditation $10,000/year. Annual maintenance costs $5,000. Costs of retesting in EU avoided. On balance, will be little or no additional on-going costs.	High
Ease of implementation	+1	Very easy. Only requires Malawi to upgrade laboratory facilities and implement testing services.	High
Trade impacts			
Change in absolute value of exports	US$0	Samples already tested in non-accredited laboratory in Malawi and then retested in EU, or tested in accredited laboratory in the region. Thus, no additional exports created.	High
Trade diversification	0	No impact on market access.	High
Domestic agri-food impacts			
Agricultural/fisheries productivity	0	Samples already tested in non-accredited laboratory in Malawi and then retested in EU, or tested in accredited laboratory in the region. No change.	High
Domestic public health	0	Samples already tested in non-accredited laboratory in Malawi and then retested in EU, or tested in accredited laboratory in the region. No change.	High
Environmental protection	0	Samples already tested in non-accredited laboratory in Malawi and then retested in EU, or tested in accredited laboratory in the region. No change.	High
Social impacts			
Poverty impact	0	No change in exports, so no impact	High
Impact on vulnerable groups	0	No change in exports, so no impact	High

Table A3.5. Compliance with SPS requirements for honey exports

Decision Criterion	Value	Details	Confidence
Cost			
Up-front investment	US$16,620	Legislative changes, design of monitoring programme, completion of initial surveillance, and collection and analysis of samples. Training of local personnel in maintaining and operating the monitoring programme. Cost estimates based on costs encountered for same investments by SNV in Ethiopia.	High
On-going cost	4.6%	Costs of collecting and analysing samples as part of the monitoring programme and transmitting the results to the European Commission for approval estimated at US$30,400.	High
Ease of implementation	2	Changes to legislation and standards will be needed, requiring coordinated action across government and with the private sector.	Medium
Trade impacts			
Change in absolute value of exports	US$750,000	The main market in Europe would be for processing grade honey Zambia has annual exports of 500 tonnes, and this is taken as a realistic estimate of what Malawi might achieve by 2017.	Medium
Trade diversification	+1	Will enable access to limited new markets – Malawian honey is mainly used in processing and so limited potential for consumer/higher-value markets.	Medium
Domestic agri-food impacts			
Agricultural/fisheries productivity	0	Small scale of exports that is predicted suggests minimal impact on agricultural productivity	Medium
Domestic public health	0	No impact.	High
Environmental protection	+1	Could promote the preservation of biodiversity, although scale limited.	High

Social impacts			
Poverty impact	+1	Honey production by small farmers, although scale of exports predicted to be limited	Medium
Impact on vulnerable groups	+1	Large role of women and small-scale producers, although scale of exports predicted to be limited.	High

Table A3.6.Pesticide controls for Tobacco

Decision Criterion	Value	Details	Confidence
Cost			
Up-front investment	US$800,000	Procurement and installation of kite for pesticide residue testing and non-tobacco-related materials (NTRM) sorting and removal.	Medium
On-going cost	0.1%	Costs of testing, on-going training, etc.	Medium
Ease of implementation	5	Installation of kits for testing and removal of NTRM is difficult since there is a large number of producers and numerous buyers. The most appropriate place to install the kits is not always clear unless there is funding for each grower to be provided with one, which is unlikely.	Medium
Trade impacts			
Change in absolute value of exports	US$60 million	There will be a general improvement in quality of the exported tobacco and a decline in export market rejections. At the same time, production levels are restricted. It is estimated that exports could increase by 10% by 2017.	Medium
Trade diversification	0	Little or no impact. Malawian tobacco is blended because of quality issues.	Medium
Domestic agri-food impacts			
Agricultural/fisheries productivity	+1	Increased exports and lower levels of rejections should enhance farm prices and/or sales	Medium
Domestic public health	0	No impact	High
Environmental protection	0	Little or no impact	Medium
Social impacts			
Poverty impact	+1	Increased income of small-scale tobacco producers	Medium
Impact on vulnerable groups	+1	Tobacco producers are often small, but less poor than smallholders as a whole. Production mainly by men.	Medium

Table A3.7.Pesticide controls for pulses

Decision Criterion	Value	Details	Confidence
Cost			
Up-front investment	US$1.5 million	This will involve the widespread training of farmers in GAP and good handling practices by those engaged in storage, as well as the development and use of a network of commercial grain storage facilities. Figures are based on a similar project in Rwanda.	High
On-going cost	0.1%	Limited cost of maintaining awareness.	Medium
Ease of implementation	4	Dispersed and loosely organised grower base which will be difficult to coordinate and train, and with uncertain outcomes.	Medium
Trade impacts			
Change in absolute value of exports	US$2.7 million	The value of exports would be increased as a result of better quality and lower rejections. It is assumed that this will result in value addition of 10%.better export quality will be achieved and hence facilitate trade	High
Trade diversification	+1	There will be more a degree of trade diversification, mainly away from tobacco.	Medium
Domestic agri-food impacts			
Agricultural/fisheries productivity	+1	Agricultural productivity will increase	High
Domestic public health	0	Little or no impact unless controls are also applied to production for domestic consumption.	Medium
Environmental protection	0	No anticipated environmental impact	Medium
Social impacts			
Poverty impact	+1	Some positive effect on farmer income due to less wastage and better prices.	High
Impact on vulnerable groups	+1	Some impact on smallholders engaged in production of pulses. Little or no impact on other groups unless same practices are applied to production for domestic consumption.	Medium

Table A3.8.Pesticide controls for maize

Decision Criterion	Value	Details	Confidence
Cost			
Up-front investment	US$500,000	This cost will cater for procurement of equipment, training farmers, extension staff, research staff and other stakeholders involved in the production and post-handling of maize, and other associated supplies for analysis of pesticide residues as part of a surveillance programme.	Medium
On-going cost	0.1%	Limited cost of maintaining awareness.	Medium
Ease of implementation	4	Dispersed and loosely organised grower base which will be difficult to coordinate and train, and with uncertain outcomes.	High
Trade impacts			
Change in absolute value of exports	US$0	Little or no impact as not an appreciable impediment to regional trade.	High
Trade diversification	0	Little or no impact as not an appreciable impediment to regional trade.	Medium
Domestic agri-food impacts			
Agricultural/fisheries productivity	+1	It is expected that agricultural/fisheries productivity will increase, albeit marginally	Low
Domestic public health	+1	Domestic public health is expected to improve because consumers will not be subjected to improper use of agro-chemicals	Medium
Environmental protection	+1	Positive effects on the environment due to more careful use of pesticides	Medium
Social impacts			
Poverty impact	0	Little or no impact – gains in agricultural productivity limited.	Medium
Impact on vulnerable groups:	0	Little or no impact.	High

Table A3.9.Pesticide controls for tea

Decision Criterion	Value	Details	Confidence
Cost			
Up-front investment	$120,000	Cost includes the development of IPM guidelines for smallholders, training of procurement staff and implementing correct traceability systems for smallholders.	High
On-going cost	0.1%	Continuing implementation will be the responsibility of the procurement departments of the processors. Minimal cost.	Medium
Ease of implementation	2	There is a lot of information on tea GAPs in the private sector. The systems for procurement traceability are simple and easily taught	
Trade impacts			
Change in absolute value of exports	US$2.0 million	Estimate assumes that smallholders will attain a 25% increase in price by 2017 but no increase in yield. Smallholders account for 10% of total exports.	High
Trade diversification	+1	Some benefits, for example organic and Fair Trade production will become easier	High
Domestic agri-food impacts			
Agricultural/fisheries productivity	+1	No increase in yield but some increase in prices.	High
Domestic public health	0	Since pesticides are rarely used by smallholders this will be minimal.	Medium,
Environmental protection	1	Small impact, principally due to awareness raising	Medium
Social impacts			
Poverty impact	+2	If income assumption holds, this could have a significant poverty impact	High
Impact on vulnerable groups	+1	There will be improved wellbeing of women. The area that will benefit is a poor rural part of Malawi	

Table A3.10. Pesticide residue testing capacity

Decision Criterion	Value	Details	Confidence
Cost			
Up-front investment	$760,000	Cost estimates assume use of GC-MS for analysis of pesticides residues ($620,000) and long term training of two officers ($140,000). One set of this equipment has already been donated but the intention is to establish another laboratory in Lilongwe.	Medium
On-going cost	0.5%	Assumes 10% of exports need testing using the Malawi Bureau of Standards (MBS) pesticide residue testing service. Further, 20% depreciation and maintenance charges on laboratory equipment. US$600 per day for consumables, staff costs and overhead.	Medium
Ease of implementation	4	Difficult to implement. Requires support and budget appropriation by government. Volume of samples in medium term likely to be very limited.	Medium
Trade impacts			
Change in absolute value of exports	0	No trade impact – consignments already test and so impact is simply to alter costs of testing.	low
Trade diversification	0	No Impact. Testing already undertaken.	low
Domestic agri-food impacts			
Agricultural/fisheries productivity	0	No impact.	Medium
Domestic public health	0	No impact.	Medium
Environmental protection	0	No impact	Medium
Social impacts			
Poverty impact	0	No impact.	Medium
Impact on vulnerable groups	0	No impact.	Low

Table A3.11. Animal health controls for ornamental fish exports

Decision Criterion	Value	Details	Confidence
Cost			
Up-front investment	US$100,000	Equipment, personnel training and other costs of national surveillance programme for aquatic animal diseases.	High
On-going cost	5.4%	On-going costs of the surveillance programme, assumed at US$20,000 including staff time, sample collection costs, testing and documentation.	High
Ease of implementation	+2	Requires the full cooperation of private sector ornamental fish exporters.	High
Trade impacts			
Change in absolute value of exports	US$125,000	Potentially there could be an increase in exports.. However the sector appears to be in long-term decline. Historically, exports peaked at US$1.5 million and are currently at US$250,000. Optimistically, with a vigorous conservation policy (assisted by exporters) backed up by a national disease surveillance programme, exports might increase 50% from current levels by 2017	High
Trade diversification	+1	Maintain exports of fresh fish into EU. Exports to COMESA and SADC will not really require this intervention	Medium
Domestic agri-food impacts			
Agricultural/fisheries productivity	0	Minimal trade – little or no impact.	High
Domestic public health	0	No impact.	Medium
Environmental protection	+1	Some investment in conservation and aquatic animal health surveillance. Ornamental fish exporters have a vested interest in conservation.	Medium
Social impacts			
Poverty impact	0	No impact	Medium
Impact on vulnerable groups	0	Little or no impact	Medium

Table A3.12. Compliance with hygiene requirements for milk exports

Decision Criterion	Value	Details	Confidence
Cost			
Up-front investment	US$500,000	Many of the required activities are underway with donor funding. These include the development of a policy document and strategic plan for the dairy sector, training of small holder farmers, implementation of best practices for milk collection and conservation, adoption of improved animal feed practices, installation and upgrading of milk storage facilities, upgrading of milk processing facilities and practices, international certification, etc. The cost estimate here, therefore, represents the additional investment required over and above existing upgrading efforts.	High
On-going cost	1%	These costs include the maintenance of traceability and due diligence systems estimated at 1% of the value of exports.	High
Ease of implementation	5	Difficult due to the prevalence of an under-developed milk supply chain.	Medium
Trade impacts			
Change in absolute value of exports	US$2.0 million or alternatively US$ 19 million	Will significantly increase the value of exports due to an increased export base. An alternative scenario envisages that milk and milk product exports could rise to US$ 18-19 million annually by 2017	Medium
Trade diversification	+1	it will bring about trade diversification by facilitating access to markets in the COMESA Region and the EU	High
Domestic agri-food impacts			
Agricultural/fisheries productivity	+1	Milk production will increase as a result of better livestock management, improved prices for milk, etc.	High
Domestic public health	+1	Will enhance local access to better quality milk.	Medium
Environmental protection	-1	Increase in number of dairy cattle might result in overgrazing	Medium

Social impacts			
Poverty impact	+1	Small increase in sales opportunities and prices for smallholder dairy producers.	Medium
Impact on vulnerable groups	+1	Access of women and children to better quality milk. Increase in smallholder income, including those operated by women.	Medium

Table A3.13.Virus indexing capacity for planting materials

Decision Criterion	Value	Details	Confidence
Cost			
Up-front investment	US$450,000	Acquisition of Test reagents and equipments (PCR machines and associated accessories and ELISA kit) and human capacity building.	High
On-going cost	0%	Estimated additional cost of $0.41/kg for certified planting material (equivalent to US$1,000 per hectare). However, this will be more than offset by the added value of the increased yield. Overall impact is zero.	Medium
Ease of implementation	4	The private sector is interested, although there is generally little knowledge of the importance of virus-free vegetative planting material since most produce is for home consumption and no specialist seed production system is in place, except the initiative by the International Potato Centre CIP. All certified virus-free vegetative planting material comes from South Africa including banana plantlets. The Government of Malawi would be interested because of other potential synergies that could flow from this facility	High
Trade impacts			
Change in absolute value of exports	US$1.2 million	Neighbouring countries do not have such facilities and therefore would likely look to Malawi for seed. The current price of uncertified potato seed is $0.67/kg in Mozambique. Additional cost of indexed seed is US$0.41/Kg.	High
Trade diversification	+2	Neighbouring countries would opt to import seed from Malawi, especially those closer to Malawi than South Africa. These would include Tanzania, Zambia, Zimbabwe and Mozambique. Other crops that are vegetatively propagated will also benefit from the facility, for example bananas, sweet potato and sugarcane.	High
Domestic agri-food impacts			
Agricultural/fisheries productivity	+2	Based on data from Zimbabwe the impact on productivity is likely to be high	Medium
Domestic public health	0	No impact.	High
Environmental protection	0	No impact.	High

Social impacts			
Poverty impact	+2	Likely impact is significant increase in productivity of sweet and Irish potatoes that are widely produced by smallholders.	High
Impact on vulnerable groups	+1	Increased productivity of smallholders, including those operated by women.	High

Table A3.14. Compliance with SPS requirements for chilli sauce exports

Decision Criterion	Value	Details	Confidence
Cost			
Up-front investment	US$10,000	This includes the cost of developing a procurement system including full traceability. The exporter has an established HACCP system, although the certification of this has elapsed. There are existing suppliers of quality chillies that export to demanding markets in terms of food safety requirements. Thus, the main cost is associated with linking these to the chilli processor.	Medium
On-going cost	-5%	It is likely that, if growers implement GAPs, yields will increase and unit costs of production with increase.	Medium
Ease of implementation	1	Not difficult if the exporter has retained the main elements of their HACCP system.	High
Trade impacts			
Change in absolute value of exports	US$60,000	Equates to peak exports for chilli sauce from Malawi in 2002. The chilli sauce market is very competitive with a significant number of African products in major export markets.	Medium
Trade diversification	+1	Exporter could diversify its product range once their HACCP status is reinstated, although volume of exports projected is minimal.	High
Domestic agri-food impacts			
Agricultural/fisheries productivity	+1	Opportunities are presented by GAPs to intensify production.	Medium
Domestic public health	0	No impact.	High
Environmental protection	+1	Some impact through developing GAPs with suppliers	Medium
Social impacts			
Poverty impact	+1	Increased marketing opportunities for small-scale growers of chillies, but volumes of product limited.	Medium
Impact on vulnerable groups	+1	Benefits to smallholders, a significant number of which are women. Production is some more marginal areas.	Medium

Table A3.15. Seed inspection and certification capacity

Decision Criterion	Value	Details	Confidence
Cost			
Up-front investment	US$930,800	Establishment of a National Seed Authority ($150,000 for Study tours, consultative meetings and review of seed legislation); upgrading of four laboratories (US$58,823), purchase of laboratory equipment (US$282,000); training of seed analysts and inspectors (US$150,000); affiliation of Seed Services Unit to OECD (US$40,000); and purchase of vehicles (US$250,000).	High
On-going cost	0%	On-going costs of maintaining the certification system, assumed to be 2% of the value of exports.	Medium
Ease of implementation	4	Somewhat difficult. Requires the cooperation and approval of OECD even though the existing labs already certified	Medium
Trade impacts			
Change in absolute value of exports	US$850,000	Malawi is a net importer of seed; mainly vegetable and maize seed. A National Seed Authority is essential to the establishment of a domestic seed industry and there are opportunities for exports. Since seed is high value in relation to weight and is relatively non-perishable it would make sense that local entrepreneurs would benefit from a seed certification service. This estimate represents around 50% of Malawi's net annual seed imports over the past 10 years. The assumption here is that this option will work towards import substitution as well as assisting the small export sector.	Medium
Trade diversification	+2	Currently, seed inspection and certification involve mainly cereals, legumes and tubers seeds. A seed certification service should see certification for other seeds that could be exported.	Low
Domestic agri-food impacts			
Agricultural/fisheries productivity	+1	Improved certified seeds will enhance productivity.	High
Domestic public health	0	No impact.	High
Environmental protection	0	No impact.	High

Social impacts			
Poverty impact	+1	Expansion in capacity to inspect and certified seeds might see the seed sector expand, including smallholder producers and small and medium enterprise's (SME's) engaged in exports.	Medium
Impact on vulnerable groups	+1	Little impact, although SME's are involved in certified seed multiplication and sales. Seed production can be pro-poor and smallholder based	Medium

Table A3.16. Animal health controls for day old chick exports

Decision Criterion	Value	Details	Confidence
Cost			
Up-front investment	US$1 million	This estimate is derived from a recent investment in Malawian veterinary services aimed at improving surveillance and detection of avian diseases as reported by the Avian and Human Influenza Facility (AHIF).	High
On-going cost	7.5%	Based on an estimate of costs in similar countries.	Medium
Ease of implementation	+5	Very difficult based on the comments in the report by the Avian and Human Influenza Facility (AHIF).	High
Trade impacts			
Change in absolute value of exports	US$650,700	Value of increased trade is based on doubled growth rate of exports between 2012 and 2017 as compared with actual performance between 2002 and 2011.	Medium
Trade diversification	+2	Able to export to new markets within the region where there is significant demand.	High
Domestic agri-food impacts			
Agricultural/fisheries productivity	+2	Agricultural productivity is expected to be increased with the provision of good quality, disease-free birds	High
Domestic public health	+1	Domestic public health will be protected to a small extent through surveillance and control of some zoonotic diseases	Medium
Environmental protection	0	No or slight impact	Medium
Social impacts			
Poverty impact	+1	Increased productivity of poultry keepers, many of which are smallholders	Medium
Impact on vulnerable groups	0	. Some impacts foreseen but not across the board and small in scale.	Medium

Endnotes

[1] Ministry of Industry and Trade, Government of Malawi.

[2] Ministry of Industry and Trade, Government of Malawi.

[3] Ministry of Industry and Trade, Government of Malawi.

[4] Ministry of Industry and Trade, Government of Malawi.

[5] Research Fellow, Institute for Development Studies, United Kingdom and Professor, Department of Food, Agricultural and Resource Economics, University of Guelph, Canada.

[6] USAID SPS Coordinator for Southern Africa (contractor).

[7] Henson, S.J., and Humphrey, J., (2010). Understanding the Complexities of Private Standards in Global Agri-Food Chains as They Impact Developing Countries. Journal of Development Studies, 46 (9), 1628-1646.

[8] World Bank (2005). Food Safety and Agricultural Health Standards: Challenges and Opportunities for Developing Country Exports, Report 31207, Poverty Reduction and Economic Management Trade Unit. World Bank, Washington DC.

[9] Henson, S.J., and Masakure, O., (2009). Guidelines on the Use of Economic Analysis to Inform SPS-related Decision-Making. Standards and Trade Development Facility, Geneva.

[10] Henson, S.J., and Masakure, O., (2009).

[11] Henson, S.J., and Masakure, O., (2009).

Henson, S.J., and Masakure, O., (2011). Establishing Priorities for SPS Capacity Building: A Guide to Multi-Criteria Decision-Making. Standards and Trade Development Facility, Geneva.

[12]Bourzat, D., (2010). OIE -PVS Tool / PVS Gap, Analysis, State of play, PowerPoint presentation BTSF training - Gaborone 9 – 12 March 2010.

[13]http://www.oie.int/support-to-oie-members/pvs-pathway/, Website accessed 18th November 2011.

[14]Theyse, M., (2009). Development of an Effective Phytosanitary Regulatory Information Management System Framework for WTO SPS Compliance, M.SC thesis, University of Pretoria.

[15]FAO (2009). The Republic of Malawi, Implementing an Integrated Approach to Food Safety, Plant and Animal Health (Biosecurity) Country Situation Report The Republic of Malawi, CASE STUDY 3, Capacity Building Needs Assessment Series, FAO, Rome.

[16] World Trade Organization (2010). Trade Policy Review, Report by Malawi, Trade Policy Review Body, WT/TPR/G/231, 5 May 2010.

[17] Faulkner L., Harrington J., Levy D., The K., (2009). Commercial Opportunities for Fruit in Malawi. ICRAF Working Paper no. 86. Nairobi, Kenya: World Agroforestry Centre.

[18] Cassidy, D., Maurer, J., Yazman, J., (2011). Review of the Malawi Dairy Sector, Recommendations for Future USAID Investment under The Feed the Future Initiative, Review Team Report, USAID Bureau for Food Security, Washington DC.

[19] R W Mkandawire, R. W., (2010). Manufacturing Industries Technology Needs Assessment Report, Malawi Industrial Research and Technology Development Centre.

[20] CYE Consult (2009). Final Report; Value Chain Analysis of Selected Commodities, institutional Development across the Agri-Food Sector. (IDAF) – 9 ACP MAI 19, Request for services n°2008/159774/1

[21] Anonymous (2002). Volume 2, Chapter 1, Regional Trade, MALAWI, Diagnostic Trade Integration Study. DTIS.

[22] Anonymous (2007). Malawi, African Economic Outlook, AfDB/OECD 2007

[23] Griffith, M., (2007). Much to lose, little to gain: Assessing EPAs from the perspective of Malawi. © Tearfund 2007

[24] The Convention on Biological Diversity was finalized in Nairobi in May 1992 and the Cartagena Protocol was finalized and adopted in January 2000.

[25] http://spsims.wto.org/ Website accessed July 28th 2010.

[26] Data on the WTO SPS Agreement notification, focal and contact points for SADC member countries as held in the WTO Database in August 2010 are reproduced in Appendix 3.

[27] National Plant Protection Organization.

[28] Theyse (2009) *op cit.*

[29] WTO (2010) *op cit.*

[30] Captured or referred to in several documents as for example FEWSNET, http://www.fews.net/docs/Publications/Malawi_OL_2011_10.pdf, Website accessed 18 November 2011.

[31] For example the proposed EAC commodity standards for mycotoxins are, in some instances, five times greater than equivalent EU standards.

[32] Key of level of difficulty of SPS compliance;

X = relatively easy.
XX = somewhat difficult.
XXX = very difficult requiring significant resources and interactions between several actors.
Box not filled = not relevant/required.

[33] Henson and Masakure (2011).

[34] International Standards Organization/International Electrotechnical Commission.

[35] SADC, COMESA and the EAC have developed a close working relationship which has taken the form of a Tripartite Agreement. The agreement has a specific SPS Annex which commits the three trade bodies to develop common trading standards and both COMESA and SADC are involved in the EAC commodity standards.

[36] The testing capacity exists at the MBS but it is not yet accredited

[37] Henson and Masakure (2011).

[38] De Meyer, M., (2012). Invasive Fruit Fly Pests in Africa http://www.africamuseum.be/fruitfly/AfroAsia.htm. website accessed 01 April, 2012.

[39] Sharp J., L., Ouye M., T., Ingle S., J., and Hart W., (1989). Hot Water Quarantine Treatment for Mangoes from Mexico Infested with Mexican Fruit Fly and West Indian Fruit Fly (Diptera: Tephritidae). *Journal of Economic Entomology*, 82, 1657–1662.

Sharp J., L., Ouye M., T., Ingle S. J., Hart W. G., Enkerlin W. R., Celedonio H., Toledo J., Stevens L., Quintero E., Reyes J., and Schwarz A., (1989). Hot-Water Quarantine Treatment for Mangoes from the State of Chiapas, Mexico, Infested with Mediterranean Fruit Fly and *Anastrepha serpentine* (Wiedemann) (Diptera: Tephritidae). *Journal of Economic Entomology*, 82, 1663–1666.

Armstrong J., W., Silva S., T. and Shishido V. M., (1995). Quarantine Cold Treatment for Hawaiian Carambola Fruit Infested with Mediterranean Fruit Fly, Melon Fly or Oriental Fruit Fly (Diptera: Tephritidae) Eggs and Larvae. *Journal of Economic Entomology,* 88, 683–687.

[40]Exports of groundnuts from Malawi, predominantly to the EU, increased appreciably over the period 2002 to 2011. Further, there is considered to be significant potential for foreign investment in this sector that could contribute to future export growth. The sector, however, has been troubled with problems due to excess levels of aflatoxins. The European Union (EU) Rapid Alert System for Food and Feed (RASFF) Portal lists 11 Notifications for Malawian imports between 2005 and 2008. Of these one relates to the presence of the colorant Sudan Yellow in curry and the ten remaining notifications all concern excessive aflatoxin levels detected in Malawian groundnuts. At the same time, there are concerns about the local public health impacts of high levels of mycotoxins groundnuts and other locally-consumed foods such as maize and cassava flour.

[41]Jemal, A., Bray, F., Center, M, M., Ferlay, J., Ward, E., Forman, D., (2011). Global Cancer Statistics, CA Cancer J Clin, 61:69–90.

[42]Nukenine, E.N., (2010). Stored product protection in Africa: Past, present and future, DOI: 10.5073/jka.2010.425.177. 10th International Working Conference on Stored Product Protection, Julius-Kühn-Archiv, 425, 26-41

[43]Various sources. For example see MALAWI CARER The Malawi Centre for Advice, Research and Education on Rights, MALAWI TEA RESEARCH PROJECT. Commissioned by Center for research on Multinational Corporations (SOMO), http://somo.nl/publications-en/Publication_3098/ Website accessed 31 March 2012.

[44]Vermeulen, J. B., (2007). Report on maximum residue limits (MRLs) and pesticide use in tea in Malawi an Zimbabwe, Mimeo, available at www.trfca.net/newsletters/mls.pdf Website accessed 31 March 2012

[45]Vermeulen (2007) *op cit*.

[46]Posted extract of review by Rudolf W. Hoffmann :Institute for Zoology, Fish Biology and Fish Diseases, Veterinary Faculty of the Ludwig Maximilians University Munich, Reefs.org Discussion Forums, http://www.reefs.org/forums/topic131122.html website accessed 31 March 2012

[47]http://www.marine.ie/home/services/operational/fishhealth/Importing_Ornamentals.htm, website accessed 31 March 2012.

[48]Cassidy, D., Maurer, J., Yasman, J. (2011). *op cit*.

[49]Most of the remainder consisted of flours and meal from oilseeds.

[50]Founded in 1924 during the 4th International Seed Testing Congress held in Cambridge, United Kingdom. Currently its membership consists of 201 member laboratories, 52 personal members and 42 associate members, from 79 countries around the world (December 2010). 120 of the ISTA Member Laboratories are accredited by ISTA and entitled to issue ISTA International Seed Analysis Certificates. Source; ISTA Website http://seedtest.org/en/about-ista-_content---1--1011.html, website accessed 1 April 2012.

[51]The OECD is the main reference for the certification and standardization of certain agricultural commodities and inputs. The work of the Organization in this area involves both Member and non-Member economies about 60 governments have established voluntary international rules in respect of varietal seed identification, to provide passports for international trade. Source: http://www.oecd.org/about/0,3347,en_2649_33905_1_1_1_1_1,00.html, website accessed 1st April 2012.

[52] UPOV is an international convention aimed at protecting plant breeders rights. Its mission Statement is; to provide and promote an effective system of plant variety protection, with the aim of encouraging the development of new varieties of plants, for the benefit of society.

[53]This involved the national IPPC members in the region and was implemented by the Food, Agriculture and Natural Resources Policy Analysis Network of the Southern African Development Community (FANRPAN).

[54]As an example, for South Africa the following is a summary of the requirements for imports of day old chicks:

- The eggs from which the day old chicks were hatched originate from a poultry farm free from signs of infectious and contagious disease.
- A specified freedom or limited presence from/of Newcastle Disease, Fowl Cholera, Avian Influenza Marek's disease, infectious Laryngotracheitis, *Salmonella pullorum*, *Salmonella gallinarum Salmonella enteritidis* Vibrio hepatitis, *Mycoplasma gallisepticum* and *Mycoplasma synoviae* and free from clinical signs of Infectious Bronchitis infectious Bursal Disease, clinical and pathological evidence of avian lymphoid leucosis, are, and have been free from Egg Drop Syndrome (Virus EDS &76).
- Specified testing by serology tests (including the ELISA test) and routine bacterial culture vaccinated against avian encephalomyelitis OR reacted positively to the serological test ;
- An avian leucosis monitoring schedule as implemented in the sourcing flocks must be submitted to this office (veterinary regulator for South Africa) for evaluation prior to the permit being issued.

A certificate certifying that the eggs were kept isolated in a hatchery and the chicks to be exported were also kept in isolation ; separate from other chickens and poultry and that they were in good health and viable immediately prior to export.

[55]Huq, W., (2010). Avian and Human Influenza Facility (AHIF) Report, Undated but from internal references was finalized on or about March 31, 2010, http://siteresources.worldbank.org/INTTOPAVIFLU/Resources, Website accessed 05 April, 2012.

[56]Veterinary import requirements for day old chicks [into South Africa] http://www.nda.agric.za/docs/Vetweb/I_vhc_birds_day_old_chicks.htm.