



## **CAMEROON BIOSECURITY PROJECT**

*Development and Institution of a National Monitoring and Control System (Framework)  
for Living Modified Organisms (LMOs) and Invasive Alien Species (IAS)*

### **TRAINING MANUAL IN COMMODITY AUDIT SYSTEMS FOR COMPLIANCE WITH RISK ASSESSMENT PROCESSES**

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Government of Cameroon via the Ministry of Environment, Protection of Nature and  
Sustainable Development.*

**Under the Supervision of:**

Project Component Three Taskforce (MINESUP)

&

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## LIST OF ACRONYMS AND ABBREVIATIONS

BIRA	Biosecurity Import Risk Analysis
BRM	Biological Risk Management
BXW	Banana Xanthomonas Wilt
CABI	Centre for Agriculture and Bioscience Institute
CAS	Commodity Audit Systems
CBD	Convention on Biological Diversity
CBP	Cameroon Biosecurity Project
Codex	Codex Alimentarius Commission
CPC	Crop Protection Compendium
CPB	Cartagena Protocol on Biosafety
CSM	Case Specific Monitoring
EU	European Union
GEF	Global Environment Facility
GS	General Surveillance
IAS	Invasive Alien Species
IGB	Inspector General of Biosecurity
IPPC	International Plant Protection Convention
LMOs	Living Modified Organisms
MINEPDED	Ministry of the Environment, Nature Protection and Sustainable Development
UNEP	United Nations Environment Programme



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## EXECUTIVE SUMMARY

Cameroon is party to the Convention on Biological Diversity (CBD) which is focused on the conservation of biodiversity, sustainable use of its components and equitable sharing of benefits derived from genetic resources. The Ministry of Environment, Protection of Nature and Sustainable Development (MINEPDED) has been tasked to ensure that Cameroon is in compliance to the international agreement and adhere to relevant national and regional policies and legislation. To fulfil this, MINEPDED has commissioned capacity building and development of frameworks under a Biosecurity Programme entitled 'Development and institution of a National Monitoring and Control System for Living Modified Organisms (LMOs) and Invasive Alien Species (IAS). One of the capacity building initiatives is, the development of a Training Manual on Commodity Audit Systems (CAS) and specifically Biological Risk Management (BRM) of biological risks of Living Modified Organisms (LMOs) and Invasive Alien Species (IAS) from production, during transit and post-harvest considering all points of entry in Cameroon.

The Training Manual on CAS is to be used by national trainers to train operational staff in Cameroon, by drawing special attention to LMOs and IAS based on best practises. The staff responsible for CAS at the operational level hail from diverse disciplinary backgrounds and thus the Training Manual aims to guide the trainers to provide the basic concepts of CAS in relevance to biosecurity.

The manual is structured to provide explanations of key concepts from the international and national premises for biodiversity conservation, agriculture, risk analysis and modern biotechnology and the process of CAS as can benefit Cameroon. This is followed by individual modules to address BRM at site of production (for internally produced commodities), in transit (for imported commodities), post-harvest and at points of entry and exit (to cater for trade across national borders). For each module hands on exercises are used to demonstrate the concepts presented. The participants at the training are expected to share their diverse disciplinary expertise to the CAS to enrich the learning outcomes.



## INTRODUCTION

Cameroon is party to the Convention on Biological Diversity (CBD) which is focused on the conservation of biodiversity, sustainable use of its components, and equitable sharing of benefits derived from genetic resources. The CBD is a general, flexible framework that commits countries that are party to it to develop national mechanisms for the implementation of the principles inscribed in the Convention.

As an international structure the CBD supports national implementation of the principles with the aim to promote continued international co-operation whilst ensuring the biodiversity principles it advocates. The CBD notes that as part of international co-operation, trade is one of the activities with an immediate impact on biodiversity. Thus, as countries implement trade agreements and strive to satisfy the needs of their populations, the CBD obliges parties to manage the effects on biodiversity of trade and consumption within their jurisdiction “regardless of where [those] effects occur” (Article 4(b)).

Cameroon has recognised the challenges in promoting systematic risk-based approaches for the prevention of biological invasions. At importation points, in particular capacity for utilisation of systematic risk-based approaches for inspection and treatment are minimal. To address this the Ministry of Environment, Protection of Nature and Sustainable Development (MINEPDED) is advocating development of a systematic approach in the form of a Training Manual to be the basis of training to aid Cameroon address of this gap.

This Training Manual serves to develop Commodity Audit Systems (CAS) capacity of decision makers in Cameroon providing an overview of the key elements of CAS and specifically Biological Risk Management (BRM) of Living Modified Organisms (LMOs) and Invasive Alien Species (IAS) from production, during transit and post-harvest considering all points of entry in Cameroon.

The Training Manual is an implementation document for a Technical Manual developed by MINEPDED on the same subject matter.

### OBJECTIVES OF THE TRAINING MANUAL

#### **Overall Objective:**

The overall objective of the CBP Component 3 is to strengthen national capacities in order to prevent and/or control the introduction, establishment and spread of Invasive alien species (IAS) and the management of living modified organisms (LMOs) through the implementation of a risk-based decision making process.



The Training Manual thus serves to provide requisite tools and capacity building guidance to assist operational staff at importation points in Cameroon.

### **EXPECTED LEARNING OUTCOMES:**

The Training Manual should serve to deliver the following learning outcomes:

- a) A clear understanding on the role of CAS as part of an integrated, risk-based approach to the management of biological invasions.
- b) Improved knowledge on commodity audit requirements from production areas to post-entry.
- c) Increased awareness and appreciation for the introduction pathways management in Cameroon for all taxa (including LMOs).

### **LIMITATIONS OF THE MANUAL**

The Training manual does not articulate compliance procedures to be followed in a step by step manner for the various situations requiring commodity audit systems in Cameroon. The manual provides examples through exercises to simulate how such procedures are implemented in other countries with relevance to Cameroon. The Manual also does not cover CAS for pharmaceuticals, vaccines or bio-reagents imported for scientific research that are covered by other legislation. The Manual assumes that the training participants hail from backgrounds with expertise and competencies that are of relevance to CAS and therefore does not provide for basic technical concepts.

### **COURSE STRUCTURE**

The course contents are elaborated in the text of the modules and summarized in the accompanying PowerPoint presentations, which should provide a sufficient basis for the training. The modules are designed to be as interactive as possible with exercises, which enhance the sharing of expertise, building teams and ensures a productive learning environment. An indicative course programme is provided in Annex 9.1; it can be adapted as necessary. It is recommended where possible to provide on-site learning at an inspection point to enable hands-on learning.

The suggested delivery time is two to three days for about 25-30 trainees, but this could be extended to four days if site visits and/ or more exercises are planned or when larger groups are to be trained. It is recommended that more exercises would need to be developed as those provided are only examples.

The course is structured in eight core modules, namely:



- Module 1: Background, Basic Concepts and Legal basis for Commodity Audit Systems for LMOs and IAS
- Module 2: An overview of the commodity audit process
- Module 3: Biological risk management measures and audit requirements (production)
- Module 4: Biological risk management measures and audit requirements (post-harvest)
- Module 5: Biological risk management measures and audit requirements (in-transit)
- Module 6: Biological risk management measures and audit requirements (point of entry)
- Module 7: Biological risk management measures and audit requirements (post entry)
- Module 8: Introduction pathways management

A schematic diagram on the course is presented below (Fig 1):

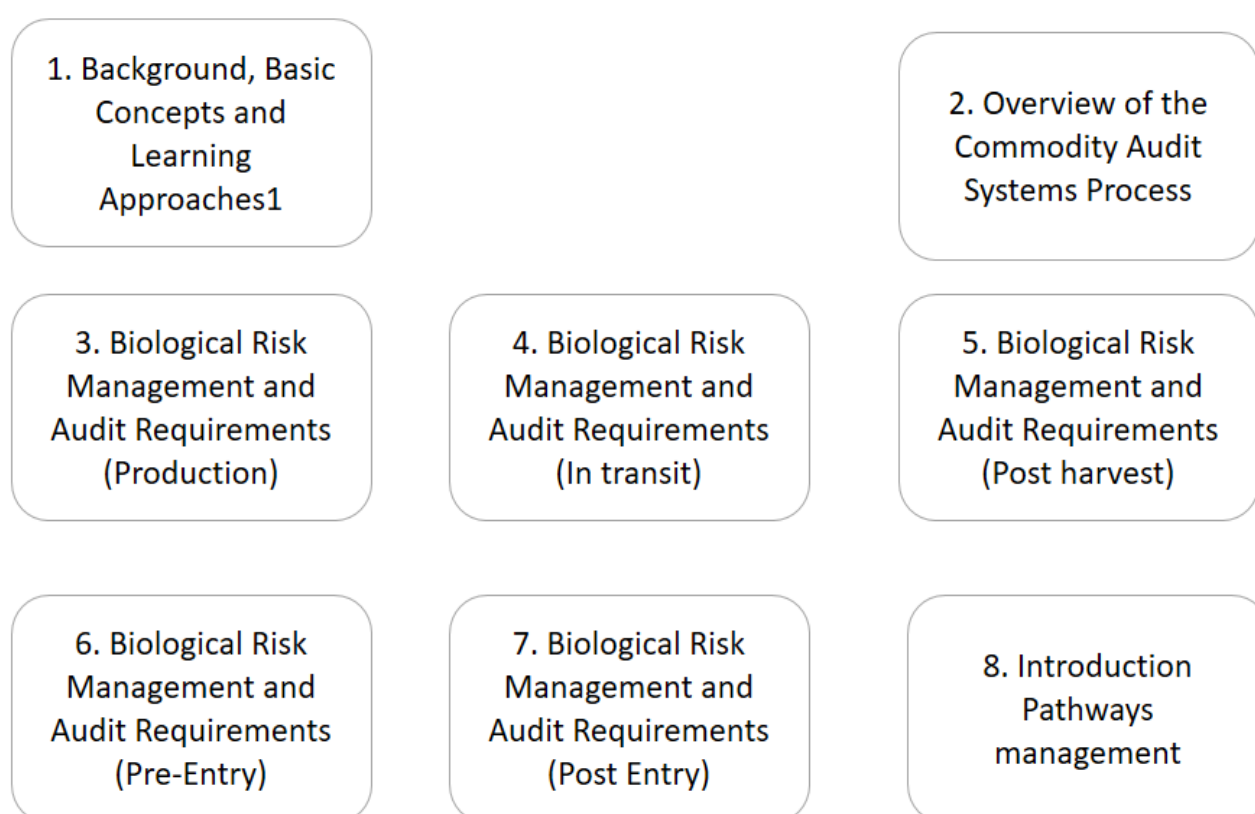


Figure 1 Modules for training on Commodity Audit Systems



## MODE OF DELIVERY

The mode of delivery will depend largely on the background and experience of the trainers, and the participants (level of expertise, experience with different learning approaches, etc.). The course delivery modes will include lectures (Powerpoint Presentations) group and plenary discussions, group exercises and take home readings. It is recommended however that the delivery method includes/considers the following:

- *Knowledge sharing:* Everybody has something to share and nobody knows everything. Therefore the presentation should be as interactive as possible.
- *Context:* As much as possible examples from Cameroon and the region should be used. Notably application to the international arena is also of value.
- *Participation* in the course helps to inform decision makers, but should not be considered absolute, there could be other elements to decision making to be considered in the event of an audit.
- *Time management:* The Course Facilitator(s) should allow for interaction, but should keep in mind that not all matters can be addressed within one course. Thus other avenues for soliciting feedback e.g. web discussion groups, correspondence with the facilitators should be considered.

## RESOURCE REQUIREMENTS FOR RUNNING THE COURSE

The minimum requirements for the delivery of the course include trainers (at least two) and a venue (and other logistics) with the following amenities/ facilities:

- A laptop computer and LCD Projector with pointer
- Flip charts and pens (if no chart holders then non-destructive adhesive material eg sellotape to enable sticking to the wall is an alternative)
- Sticky notes
- Printing and photocopy facilities
- The Technical Manual on CAS;
- Relevant Literature

## PRE-TRAINING EVALUATION

A pre-training evaluation (diagnostic test) is done to establish the level of understanding of the participants and to enable the trainers gauge the depth of content that needs to be delivered. The participants are requested to fill out a pre-training evaluation form or are administered a questionnaire, which serves to provide the trainers with their profiles, level of awareness and knowledge. The questionnaire or test should cover key terminologies and concepts to be covered in the training.



Given optimal conditions the pre-evaluation can be delivered prior to the training, or by mail (e.g. a week before) if possible so that the trainers have ample time to re-adjust their presentations.

If the pre-evaluation test is delivered at the start of the course, the Trainers should have examples and flexibility in rearranging the presentations. A strategy to bring the participants to the same level is to provide them with reading material before the sessions. However, it is recommended that the modules are presented first and the assignments given at the end. Experience suggests this to be a more effective method of retaining the attention of the trainees during the lectures.

A sample of a Pre-training evaluation test is given in Appendix A.1.

### **POST TRAINING ASSESSMENT**

This course can be offered as both a training of trainers (ToT) and a direct training for officers to conduct a CAS. If it is required that the course is a ToT then a post training assessment to gauge the capacity for delivery of the material post training is important. In any case it is desirable that the correction of the pre-test be done at the end of the lectures as a form of revision for the final assessment. Note that the aim is to help the course participants go home enriched with the key messages of CAS. A typical assessment is included as Appendix A.2.

### **THE LAYOUT OF THE TRAINING MANUAL**

The Modules of the Manual are structured to enable potential trainers plan and customize the delivery according to their needs. For each module the purpose, suggested delivery time, expected outcomes, exercises and where available literature for further reading are indicated.



# **MODULE ONE**

## **BACKGROUND, BASIC CONCEPTS AND LEGAL BASIS FOR COMMODITY AUDIT SYSTEM**



**Purpose:** To present the relevant basic concepts of Biosecurity and the rationale for a holistic approach for CAS so that the participants are at a similar level of understanding.

**Suggested Delivery Time:** 90 mins

**Format:** PowerPoint presentation followed by a plenary discussion

**Expected Outcomes:** At the end of the session, participants will be able to:

- Define Biosecurity, Biosafety and Commodity Audit Systems
- Enumerate and briefly describe key national and international agreements/conventions and legislation on biosecurity
- Understand and explain the Risk Analysis Process.

## 1.1 DEFINITION OF KEY TERMS AND CONCEPTS

### 1.1.1 Biosecurity:

Biosecurity has been defined within the context of the Cameroon Biosecurity Project as a strategic and integrated approach that encompasses the policy and regulatory frameworks (including instruments and activities) that analyse and manage risks in the sectors of food safety, animal and plant life, human health, and the associated environment. Biosecurity covers the introduction of plant pests, animal pests and diseases, zoonoses, the introduction and release of genetically modified organisms (GMOs) and their products, and the introduction and management of invasive alien species and genotypes. *Biosecurity is the protection of biodiversity from all biological threats from all pathways into and within the country.*

Biosecurity encompasses the prevention, early detection and rapid response, eradication, control, mitigation and other management activities such as risk analysis for all types of invasive species (pests, diseases, weeds, invasive animals and other organisms), as well as the management and control of living modified organisms (LMOs), of which biosafety risk analysis is the subject of a separate risk analysis manual.

The term Biosecurity should not be confused with **Biosafety** which is defined as all measures taken to prevent Modified Living Organisms (LMOs) from causing harm to humans, livestock and the environment.

*(Note to the Trainer:* At this point participants should be asked to note that there is a difference between the terms biosecurity and biosafety in English and the fact that both terms are translated into French as biosécurité).



### **1.1.2 Living Modified Organisms**

Living modified organisms (LMOs) are any living organisms that possess a new combination of genetic material obtained through the use of modern biotechnology; they are a subset of genetically modified organisms (GMOs). Genetically modified seeds, cuttings and tissue cultures are living parts of plants and therefore considered LMOs (FAO, 2004).

### **1.1.3 Modern biotechnology**

Modern biotechnology is defined as the application of

- a) In vitro nucleic acid techniques, including recombinant deoxyribonucleic acid (DNA) and direct injection of nucleic acid into cells or organelles” or
- b) “Fusion of cells beyond the taxonomic family that overcome natural physiological reproductive or recombination barriers and that are not techniques used in traditional breeding and selection” (CPB).

The Interim Commission on Phytosanitary Measures, which is the governing body of the International Plant Protection Convention (IPPC) has instituted an international treaty, which helps to stop the spread of pests and diseases affecting plants. The Commission on Phytosanitary measures develops standards for implementation of the IPPC. The International Standard on Sanitary and Phytosanitary measures (ISPM) No. 11 outlines guidelines for how countries should address LMOs by conducting risk assessment to determine whether the LMOs should be considered as weeds or other organisms that damage plants and institute risk management procedures.

The IPPC, within its overall scope of preventing the introduction and spread of plant pests covers those LMOs which are considered to be plant pests. Meanwhile, the Cartagena Protocol (CPB) addresses, in general, the safe transfer, handling and use of LMOs, specifically focusing on trans-boundary movement.

### **1.1.4 Invasive Alien Species**

Invasive Alien Species (IAS) as are organisms that occur outside their normal distribution and whose introduction and/or spread threatens biological diversity (GIASI, CBG)

When alien species were introduced, some 10-15% of them were reportedly harmful to the target ecosystems and habitats or species living therein as the alien species grow and spread and sometimes preying on native species of the target area. IAS have been known to be a major direct cause of biodiversity loss, which pose serious hazards to ecosystem services, human health and sustainable development.



IAS also impact on country economies and development. The costs required to manage IAS, to eradicate, reduce their rate of spread is substantial. Invasive alien species that pose high risk on agriculture or the environment can be rejected by importing countries. To access international markets biological /agricultural products need to meet certain quality standards. This requires inspection which adds to the management cost.

### **1.1.5 The Global Biodiversity Strategy and Action Plan**

Strategic documents such as the Global Biodiversity Strategy and Action Plan and its national implementing modality (National Biodiversity Strategy and Action plan (NBSAP) are key elements of a functional Biosecurity risk analysis framework.

The NBSAP II of 2012 for Cameroon informs decision making by the establishing the national biodiversity protection goals and assessment end points. The goals and assessment end-point are further cascaded into sector policy documents for environment, natural resources, health, and agriculture and livestock development.

The NBSAP II of 2012 elaborates the following biodiversity goals for Cameroon:

- i. The country's biodiversity resources constitute the nation's natural heritage with intrinsic values and consequently should be used sustainably to the benefit of its people and improve their livelihoods;
- ii. The traditional knowledge and practices of indigenous and local communities should be respected, preserved, maintained, and used with the prior informed consent of the holders of such knowledge and practice.

And the ensuing assessment endpoints are that:

- a) By 2020, all sources of coastal and marine pollutants should be effectively controlled to reduce pollution and mitigate its impact on the ecosystem;
- b) By 2020 the use of alternative energy should have increased and significantly reduced pressure on fuel wood;
- c) By 2020, at least 50% of grazer populations have developed the capacity to reduce overgrazing;
- d) By 2020 at least 25% of sites degraded by droughts or floods are rehabilitated within the semi-arid ecosystem;
- e) By 2020 wetlands of great significance should be under management plans and at least 10% of degraded fresh water catchment areas and riparian zones restored and protected.



### 1.1.6 Introduction Pathways of IAS and LMOs

IAS and LMOs can be transported into Cameroon via a variety of different pathways either natural and or manmade, several of which are as a result of trade that potentially expose the country to risk of unintended introduction, establishment and spread of undesired organisms. The MINEPED (2013) document on “Current biosecurity profile from trade and other activities in Cameroon’ identifies trade, transport and tourism as the main pathways for species introduction into the country.

Imports to Cameroon include processing products, retail products, agricultural products, consumer products and consumer products with the agricultural products comprising the highest volume (See Table 1). From this core component of imports the MINEPED 2013, report further highlighted three core risk groups, namely, consumables, seeds and propagules. In brief the report categorized group one comprising of fruit and vegetables as having low and short lived risks providing a wide range of insect pests, notably fruit flies and soil borne pests (fungi, bacteria and insects) entry into the country. The second group consists of seeds for planting that provide a pathway for seed borne diseases and pests. The commercial integrity of the seed constitutes a control mechanism for this risk since market forces would reject poor seed sources. Group three which is made up of vegetative propagules such as seed potatoes and live animals presents risks of introduction as sterilization of planting material is somewhat challenging, despite stringent importation phytosanitary requirements.

**Table 1** Quantities of plant material and import purpose for which import permits were granted for Cameroon from 2011, 2012 and Jan-April 2013, in tons, packets (seeds) and quantity (seeds).

Purpose of import	Quantity (tons)	Quantity (packets)	Quantity (seeds)
Processing/sale	3,325,703	27	950
Cultivation	30,215	2,218	4,279,700
Unclassified	20,000	0	0
Consumption	5,173	0	0
Research	0	104	0
<b>Grand Total</b>	<b>3,381,090</b>	<b>2,349</b>	<b>4,280,650</b>

Source: MINEPED 2013



### 1.1.7 Commodity Audit Systems

The audit (assurance of compliance to agreed and accepted standards) of the breadth of an economic activity (covering all the processes and procedures) from the production to consumption of a particular commodity is considered a commodity audit system (CAS). Addressing the breadth of the economic activity allows for the design of policies and procedures to address the concerns and needs of broad categories of stakeholders, defined in terms of geographic location, commodity produced, and technologies since very few areas are similar. Thus a CAS encompasses the complete sequence of operations which, starting from the raw material, or an intermediate product, finishes downstream, after several stages of transformation or increases in value, at one or several final products at the level of the consumer.

Note to the Trainer: The trainer should briefly recall the meanings of the terms commodity and audit as popularly used and then explain their meanings in the context of biological risk management. Audit usually refers to verifying the accounts or goods in an organisation to ensure that they respect pre-set norms and that no mismanagement has occurred. Herein a broader meaning has been adopted. Audit herein is not about verifying financial or property records. It is about finding out whether the norms prescribed for biological risk management are respected. Commodity ordinarily refers to marketable goods. Herein it refers to IAS and LMOs/ GMOs, which may be marketable or not.

### 1.1.8 Other important concepts and terms

In addition to the main concepts, the following definitions of concepts and terms adopted from the CPB glossary of terms enhance understanding of the vocabulary used for biosecurity frameworks:

*“Application”* is the appropriate presentation of the requisite information, as specified in respective regulations, to the National Biosafety Committee, for the authorisation of respective activities involving LMO(s);

*“Applicant”* is any natural or legal person, nominated within a public or private institution or company, submitting the application to the National Biosafety Committee;

*“Authorisation”* is the permission, in writing, of an activity involving LMO(s) by the National Biosafety Committee;

*“Biological diversity”* is the variability among living organisms from all sources including, inter alia, terrestrial, marine and other aquatic ecosystems and the ecological complexes of which this includes diversity within species, between ecosystems”.



*“Biological resources”* are genetic resources, organisms or parts thereof, populations and other biotic components of ecosystems with actual or potential use or value for humanity”.

*“Biotechnology”* is any technological application that uses biological systems, living organisms, or derivatives thereof, to make or modify products or processes for specific uses” (CBD).

*“Biosafety”* is the avoidance of risk to human health and safety and to the conservation of the environment, as a result of the use for research and commerce of infectious or genetically modified organisms”. It engages the policy, regulation, and management to control risks associated with use of modern biotechnologies.

*“Biosafety protocol (Cartagena Protocol on Biosafety (CPB))”* is an internationally agreed protocol set up to protect biological diversity from the potential risks posed by the release of genetically modified organisms. It establishes a procedure for ensuring that countries are provided with the information necessary to make informed decisions before agreeing to the import of such organisms into their country” (FAO glossary)

*“Convention on Biological Diversity (CBD)”* is the international treaty governing the conservation and use of biological resources around the world that has also called for the establishment of rules to govern the international movement of nonindigenous living organisms and genetically modified organisms.

*“Genetic material”* any material of plant, animal, microbial or other origin containing functional units of heredity”.

*“Genetic resources”* genetic material of actual or potential use”.

*“Genetically modified organism GMO”* Any organism that possesses a novel combination of genetic material obtained through the use of modern biotechnology.

*“Habitat”* place or type of site where an organism or population naturally occurs”.

*“Import”* shall mean the intentional trans-boundary movement of LMO(s) and or IAS into the territory of Cameroon, for a purpose to be specified

*“Organism”* is any biological entity, including micro-organisms, cellular or non-cellular, capable of replication or of transferring genetic material, including viruses, viroids, and animal and plant cells in culture;

*“Pathways”* are the means by which IAS and LMOs are transported from one location to another either naturally or manmade.



*“Responsible person at operational level”* this is an individual assigned responsibility to conduct an audit as delegated by an authority.

*“Risk”* is the combination of the magnitude of the consequences of a hazard, if it occurs, and the likelihood that the consequences will occur” (where hazard = potential of an organism so cause harm to human health or the environment). Potential and level of exposure are essential for existence of risk.

*“Spillage”* shall mean any unintentional release of IAS and or LMOs during transport through or into the territory;

*“Transit”* shall mean the intentional trans-boundary movement of LMO(s) and other commodities through the territory of Cameroon, avoiding any intentional release, use, disposal or handling of LMO(s) and IAS within Cameroon.

## **1.2 BACKGROUND**

### **1.2.1 The Convention of Biological Diversity**

The basis for Biosecurity is entrenched in the Convention for Biological diversity (CBD) and international structure which advocates for:

1. Conservation of biodiversity,
2. Sustainable use of its components, and
3. Equitable sharing of benefits derived from genetic resources.

The CBD as an international agreement is general and flexible with obligations that countries party to it should apply at national level.

With regards to Commodity Audit Systems (CAS), the CBD recognizes the role of trade as an underlying cause of the activities that have immediate impacts on biodiversity. It is acknowledged that trade, in turn, is driven at least in part by consumption in importing countries, whereby Parties to the CBD have an obligation to manage the effects on biodiversity of trade and consumption within their jurisdiction “regardless of where [those] effects occur” (Article 4(b)).

The CBD addresses the “positive” as well as the “negative” impacts of trade on biodiversity. The convention encourages control of trade-related threats to biodiversity, but recognises that trade in at least one component of biodiversity – genetic resources – can support conservation



and sustainable development if properly structured and controlled (e.g. in *in situ* and *ex situ* conservation).

The CBD secretariat has developed implementation guidelines for the broad objectives in the form of protocols one being the **Cartagena Protocol on Biosafety**. The CPB aims to ensure the safe handling, transport and use of LMOs resulting from modern biotechnology that may have adverse effects on biological diversity, taking also into account risks to human health and specifically focusing on trans-boundary movements.

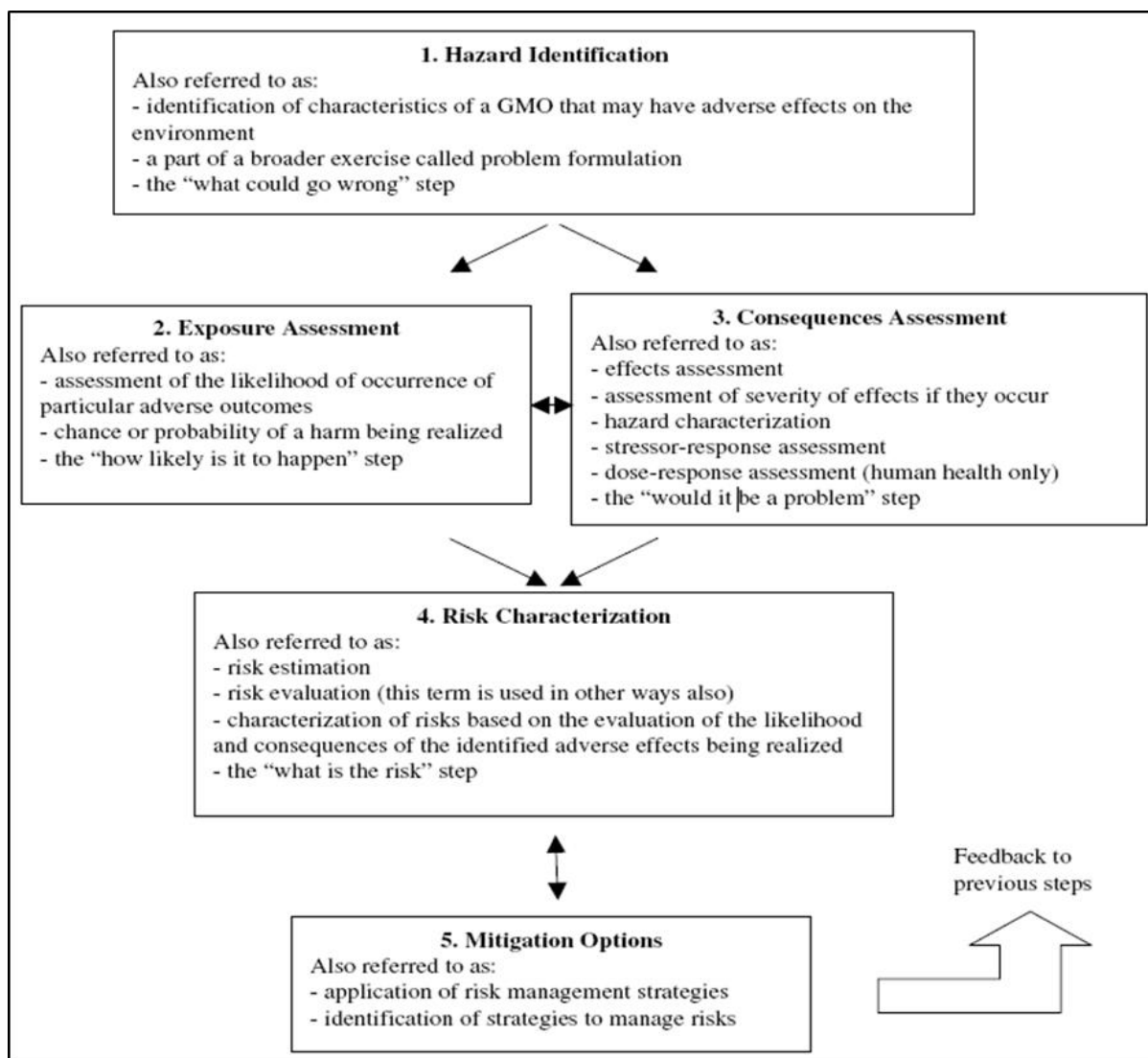
The CPB article 2 in particular provides the scope of the protocol stating the need for countries that are party to it, to take the necessary and appropriate legal, administrative and other measures to implement obligations with respect to development, handling, transport, use, transfer and release without impinging the sovereignty of the country. It also draws caution to countries rights and not to set restriction or take action that is more protective of the conservation and sustainable use of biological diversity. It encourages countries to take into account, as appropriate, available expertise, instruments and work undertaken in international forums with competence in the area of risks to human health.

Risk assessments undertaken pursuant to the CPB are to be carried out in a scientifically sound manner, in accordance with Annex III and taking into account best practice risk assessment techniques. Risk assessment aims to identify and evaluate the potential adverse effects of LMOs on the conservation and sustainable use of biological diversity in the likely potential receiving environment, taking also into account risks to human health. Risk assessment and risk management are used by competent authorities to make informed decisions regarding LMOs

MINEPDED 2017, Revised Manual on Risk Analysis of Living Modified Organisms and other objective decision-making mechanisms in Cameroon outlines best practice approaches and premises for risk assessment and risk management (See Fig 3).

*Note to the Trainer.* The trainer should take some time to explain the information in Fig 3. There are five different aspects or stages of risk assessment and risk management, namely Hazard Identification, Exposure Assessment/ Consequence Assessment, Risk Characterization and Mitigation Options. The trainer should also highlight the fact that alternative nomenclature has developed making an understanding of the literature difficult. Throughout the training the terminology proposed by Hill, which is given in bold in Fig 2-1 will be used. After this explanation the Trainer may entertain a few questions and clarifications from the audience.





**Figure 2:** Outline of the risk assessment process and Variation in terminology used to describe methodological components common to many risk assessment frameworks (Hill, 2005)

### 1.2.2 National Biodiversity Strategy and Action Plan

The National Biodiversity Strategy and Action Plan (NBSAP) of Cameroon is guided by the Aichi Targets which are elaborated in the following five goals:

- i. To address the underlying causes of biodiversity loss by mainstreaming biodiversity across government and society
- ii. To reduce the direct pressures on biodiversity and promote sustainable use
- iii. To improve the status of biodiversity by safeguarding ecosystems, species and genetic diversity
- iv. To enhance the benefits to all from biodiversity and ecosystem services



- v. Enhance implementation through participatory planning, knowledge management and capacity building.

These goals are particularly relevant to the concept of biosecurity and CAS as they aim to ensure that biodiversity is safeguarded even in the necessity of movement for purposes of trade.

For Cameroon the NBSAP of 2012 articulates the following protection goals:

- The country's biodiversity resources constitute the nation's natural heritage with intrinsic values and consequently should be used sustainably to the benefit of its people and improve their livelihoods.
- The traditional knowledge and practices of indigenous and local communities should be respected, preserved, maintained, and used with the prior informed consent of the holders of such knowledge and practice.

Assessment endpoints that benchmark the attainment of the goals for Cameroon are:

- a) By 2020, all sources of coastal and marine pollution should be effectively controlled to reduce pollution and mitigate its impact on the ecosystem.
- b) By 2020 the use of alternative energy should have increased and significantly reduced pressure on fuel wood.
- c) By 2020, at least 50% of grazer populations have developed the capacity to reduce overgrazing
- d) By 2020 at least 25% of sites degraded by droughts or floods are rehabilitated within the semi-arid ecosystem.
- e) By 2020 wetlands of great significance should be under management plans and at least 10% of degraded fresh water catchment areas and riparian zones restored and protected.

### **1.2.3 Biosecurity**

The need for biosecurity measures in Cameroon are drawn from the following challenges:

- The national regulatory and export certification systems are faced with an increase in the volume of food and agricultural products being traded internationally.
- Increased travel creates more pathways to spread pests, diseases and other hazards
- National bodies responsible for enforcing sanitary, phytosanitary and zoosanitary measures are required to better protect human, animal and plant life as well as human health without creating unnecessary technical barriers to trade.



Biosecurity measures thus represent a strategic and integrated approach that encompasses the policy and regulatory frameworks (including instruments and activities) that analyze and manage risks in the sectors of:

- Food safety,
- Animal life and health, and
- Plant life and health
- Associated environmental risks

It broadly encompasses the process and objective of managing biological risks associated with food and agriculture in a holistic manner.

Biosecurity frameworks thus offer:

1. Protection to agricultural production systems, and those dependent on these systems;
2. Protection to human health and consumer confidence in agricultural products;
3. Protect the environment and promote sustainable production

It should be recalled that biosecurity covers the introduction of plant pests, animal pests and diseases, and zoonoses; the introduction and release of genetically modified organisms (GMOs) and their product and the introduction and management of invasive alien species (IAS) and genotypes; the sustainability of agriculture and food production, food safety and the protection of the environment, including biodiversity.

#### **1.2.4 International Agreements**

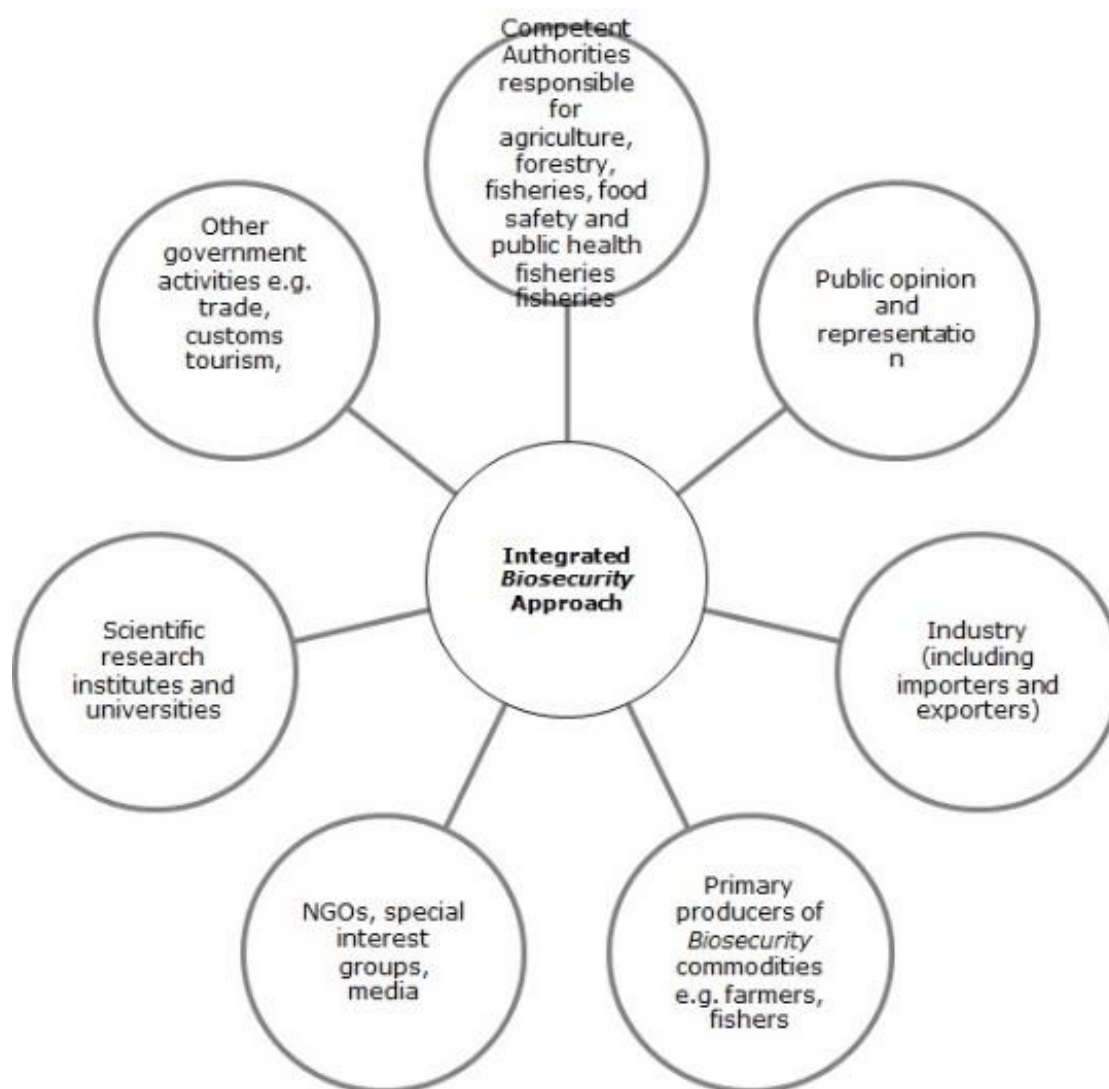
International standard-setting bodies and their parent organizations that are relevant to biosecurity are general sectoral in nature:

- Codex (WHO and FAO) – food safety and human health
- IPPC (FAO) - agriculture
- *Office internationale des epizooties* (OIE) etc. – animal health
- CBD, CBP – biodiversity

Common characteristics of all these instruments are that they use a risk analysis approach, notification procedures and information exchange.

Biosecurity frameworks integrate actors and stakeholders from all the different sectors and layers of society (See Fig 4). However, there is a responsible authority that needs to be designated and this can be the Government Ministry responsible for Environmental matters dependent on government agreement. In Cameroon MINEPDEP is charged with following up the CBG, though it is not specifically charged with implementing biosecurity frame works.

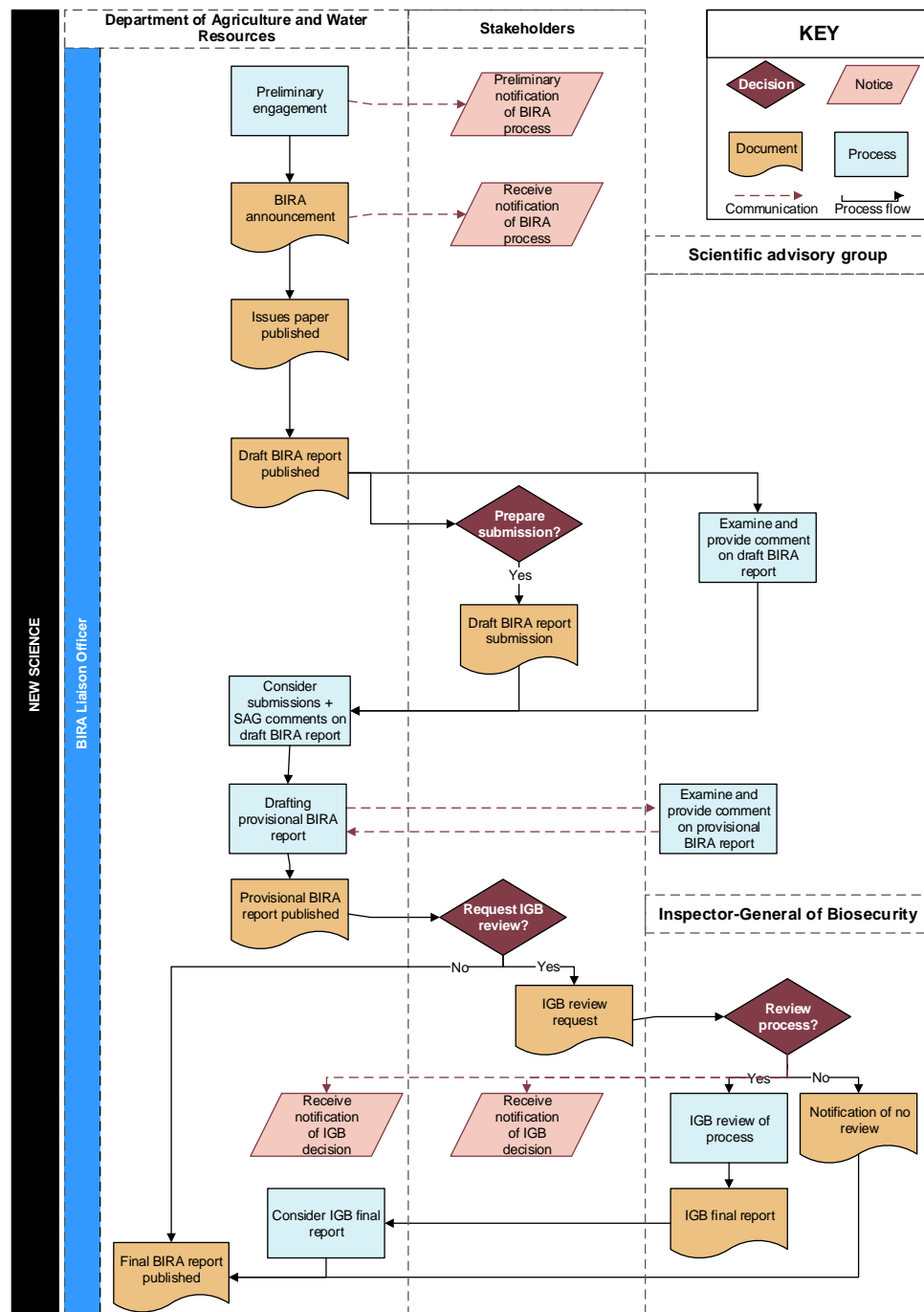




**Figure 3** Stakeholders and actors in an Integrated Biosecurity framework

Australia has developed Biosecurity Import Risk Analysis (BIRA) frameworks that are objective and transparent allowing for stakeholders to inform and solicit information from the responsible government agency or ministry (See Fig 2-3). The assumption is that the importer would fill out and follow the regulations prior to importation. The authority for Biosecurity lies in the office of the Inspector General for Biosecurity (IGB). Notably as an island-state Australia is less subject to unintended importation that occurs with land based countries such as Cameroon.





**Figure 4** Biosecurity import risk analysis framework for Australia

Source: Australia Government Department of Agriculture and water resources

*Note to the Trainer.* At this point the trainer should draw the attention of the trainees to the fact that commodity inspection at the point of entry involves the customs, the Ministries in charge of agriculture, animal industries, but not yet the ministries in charge of the environment. A discussion could be carried out how the Cameroonian system could be modified to include MINEPDED which has been mandated by the Government to oversee the CAS. Next the Trainer should draw the attention of the trainees to the additional reading list given below for those who need more information on any of the topics covered in this Chapter.



### 1.3 RECOMMENDED READING:

- i. MINEPDED (2017). Technical Manual on Commodity Audit Systems for Compliance with Risk Assessment Profiles, submitted to MINEPDED under the UNEP/GEF Cameroon Biosecurity Project: Development and Institution of a National Monitoring and Control System (Framework) for Living Modified Organisms (LMOs) and Invasive Alien Species (IAS). Yaoundé, Cameroon.
- ii. MINEPDED (2013). The Current Biosecurity Profile from Trade and other Activities of Cameroon. Report submitted to MINEPDED under the UNEP/GEF Cameroon Biosecurity Project: Development and Institution of a National Monitoring and Control System (Framework) for Living Modified Organisms (LMOs) and Invasive Alien Species (IAS). Yaoundé, Cameroon.
- iii. The Convention on Biological Diversity (1992) <https://www.cbd.int>
- iv. The Cartagena Protocol on Biosafety (2000) <https://www.cpb.int>
- v. The National Biodiversity Strategy and Action Plan (2012).
- vi. CBD A TOOLKIT to facilitate Parties to achieve Aichi Biodiversity Target 9 on invasive alien species (Prototype).
- vii. Global Invasive Alien Species Information Partnership (GIASI) Partnership Secretariat of the Convention on Biological Diversity
- viii. Hill RA (2005) Conceptualizing risk assessment methodology for genetically modified organisms. Environ. Biosafety Res. 4: 67-70. Available at <http://bch.cbd.int/database/record-v4.shtml?documentid=41660>
- ix. MINEPDED (2017). Revised Manual on Risk Analysis of Living Modified Organisms and other objective decision making mechanisms in Cameroon, submitted to MINEPDED under the UNEP/GEF Cameroon Biosecurity Project: Development and Institution of a National Monitoring and Control System (Framework) for Living Modified Organisms (LMOs) and Invasive Alien Species (IAS). Yaoundé, Cameroon.
- x. CODEX Guidelines - Guideline for the Conduct of Food Safety Assessment of Foods Derived from Recombinant-DNA Plants (CAC/GL 45-2003); The Guideline for the Conduct of Food Safety Assessment of Foods Produced using Recombinant DNA Microorganisms (CAC/GL 46-2003) and the Guideline for the Conduct of Food Safety Assessment of Foods Derived from Recombinant-DNA Animals (CAC/GL 68-2008).
- xi. Department of Agriculture and Water Resources 2016, Biosecurity Import Risk Analysis Guidelines 2016: managing biosecurity risks for imports into Australia, Department of Agriculture and Water Resources, Canberra.



# **MODULE TWO**

## **AN OVERVIEW OF THE COMMODITY AUDIT PROCESS**



**Purpose:** To enable trainees to understand the goals, broad principles and steps in the Commodity Audit Process with particular reference to IAS and LMO management.

**Suggested Delivery Time:** 1hr 30 min it not the

**Format:** PowerPoint Presentations, Plenary discussion

**Expected Outcomes:** At the end of the session, participants will:

- Register a broad overview of the importance of commodity audits
- Be familiar with the status of commodity audits in Cameroon
- Be able to enumerate the key steps in conduct of a CAS

The CAS adopted in Cameroon is based on precaution, and uses the working definition of the Precautionary Principle from UNESCO (2005) to be a strategy to cope with possible risks where scientific understanding is yet incomplete, such as the risks of nano-technology, GMOs, IAS and systemic insecticides.

The working definition precautionary Principle states “When human activities may lead to morally unacceptable harm that is scientifically plausible but uncertain, actions shall be taken to avoid or diminish that harm. Morally unacceptable harm refers to harm to humans or the environment that is:

- Threatening to human life or health, or
- Serious and effectively irreversible, or
- Inequitable to present or future generations, or
- Imposed without adequate consideration of the human rights of those affected.

The judgement of plausibility should be grounded in scientific analysis. Analysis should be ongoing so that chosen actions are subject to review. Uncertainty may apply to, but need not be limited to, causality or the bounds of the possible harm.

Actions are interventions that are undertaken before harm occurs that seek to avoid or diminish the harm. Actions should be chosen that are proportional to the seriousness of the potential harm, with consideration of their positive and negative consequences, and with an assessment of the moral implications of both action and inaction. The choice of action should be the result of a participatory process.”

The CAS process is undertaken as an intervention before harm occurs to avoid or diminish any potential risk. The management interventions are chosen in proportion to the seriousness of the potential harm, with consideration of their positive and negative consequences, and with an assessment of the implications of both action and inaction. The choice of action should be the result of a participatory process involving all the stakeholders.

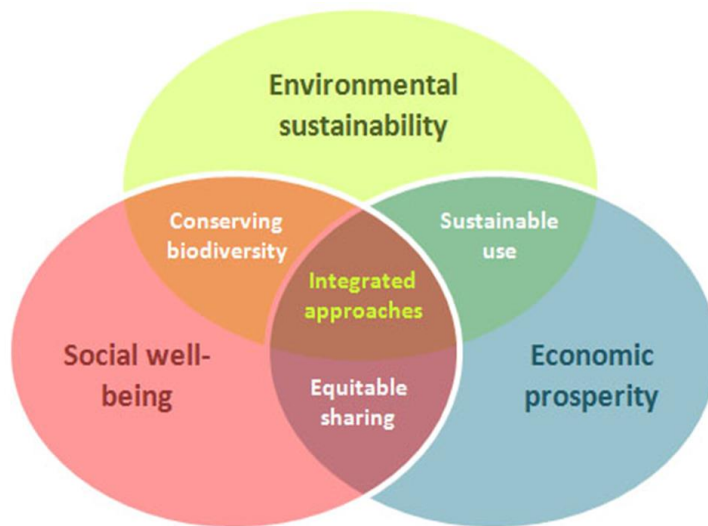


In general, the user of a particular commodity such as IAS, LMOs, or any other natural or biological resource should bear the entire cost of conducting the commodity audit. Thus, for purposes of Biosecurity this implies that an importer or producer of a product will bear the cost of the risk assessment and the management interventions. This is generally implemented through fees and licenses.

For conduct of the CAS it should be noted that no single approach/ methodology is to be considered as exclusive, but the decision on what method(s) to use should depend on available resources, capacity and urgency of the solutions. This notwithstanding the best practices developed by more experienced countries like Australia and New Zealand should be used as bench marks selecting the necessary methods and procedures.

CAS can be conducted in a hierarchical manner whereby the costs and benefits for management consider the impact of the risk on environment, social and or economic sectors. The hierarchical approach utilises a range of tools to identify activities that have a high risk of significant impact. Values (e.g. conservation, resource or community) can be used to identify and/ or describe through an expert process the relevant subsystem for management. The first level builds a conceptual model of the relevant subsystem and identifies the pressures that act on that subsystem. The second level uses mathematical qualitative models to refine the understanding of the system and to reduce the uncertainty around the system structure. The final level uses quantitative and qualitative models to identify specific thresholds, management trigger points and scenarios. Each level reduces the uncertainty in decisions but increase the costs and time taken. The levels are interlinked/ integrated (see Fig 5), the approach the importance of ecosystem models for estimating cumulative risks and provides a frame for understanding how they can be cost-effectively and consistently applied to estimate impacts and improve understanding.

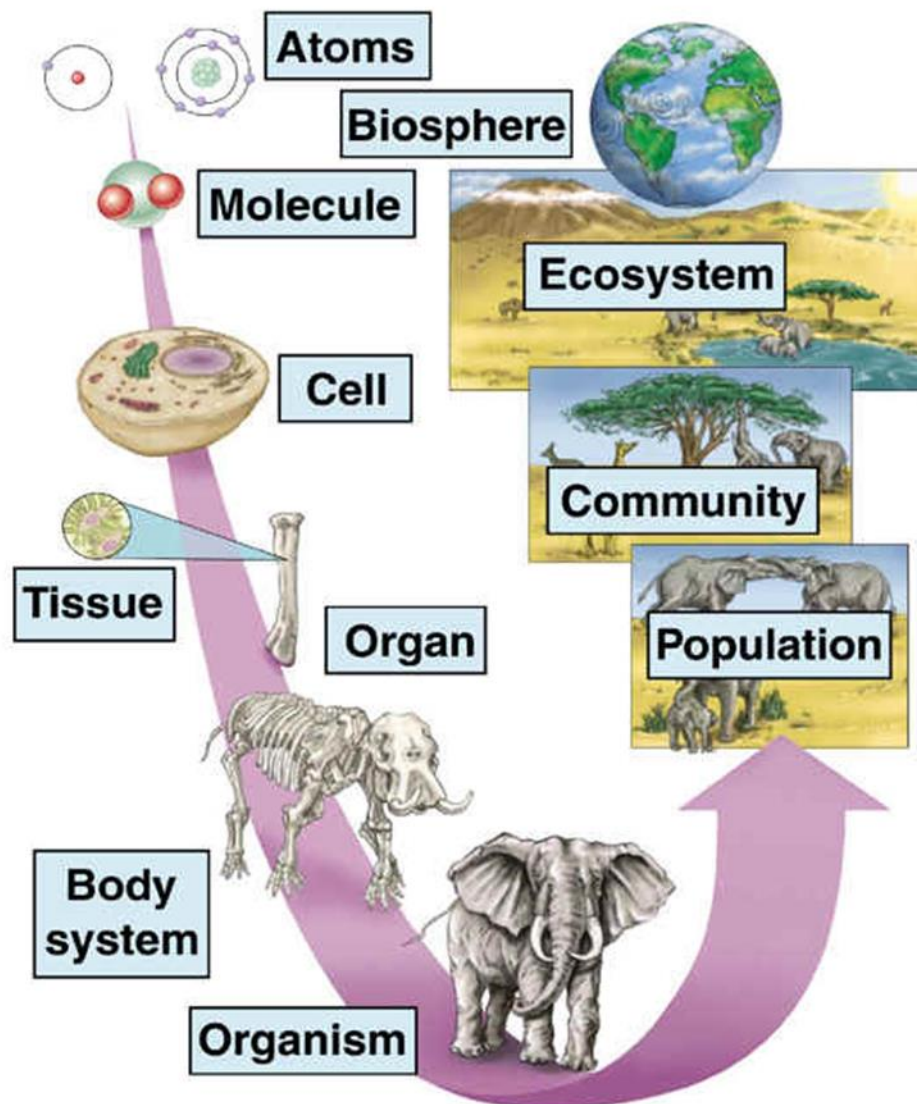




**Figure 5** Interlinked values to address biodiversity conservation.

Alternatively, an ecosystem approach (see Fig 6) can be adopted and here the focus is on the structure, processes, functions and interactions consistent with the definition of “ecosystem” provided in Article 2 of the CBD. The ecosystem approach considers application of appropriate scientific methodologies, and focuses on different levels of biological organization in an integrated manner.





Harcourt, Inc.

**Figure 6** The Ecosystem connection through biological taxonomic levels to the environment



## 2.1 STEPS IN THE COMMODITY AUDIT SYSTEM.

There are generally six steps in the CAS, namely:

- i. *Establishing priority areas* (pathways/ points). The auditors familiarize themselves with the requirements and technical aspects of the regulated commodity and or its environs. This step sets the scope of the CAS and determines whether it is ecosystem, region, or site specific as this guide the level of expertise and resources required.
- ii. *Identification of rules and regulations*. The regulations and guidelines for the audit should be understood prior to the inspection. For announced audits, the officer arranges the site visit with the Authorized Party and finds out who will host the inspection at the site (depends on mandates for inspection). Any questions the auditor may have concerning the commodity under audit should be clarified beforehand.
- iii. *Determining process' frequency*. The auditor conducts an examination of the site, facility or regulated activity and takes note of compliance with requirements. Information is recorded in forms but additional notes and or recordings can be taken using equipment such as video camera.
- iv. *Setting Thresholds*. The auditor reviews documents and files, noting compliance to requirements and or existing standards (both national and international depending on what the country has ratified).
- v. *Monitoring*. The auditor interviews the officer(s) responsible for the commodity transport and/ or handling and any other personnel involved and if deemed necessary, people living or conducting activities in close proximity with the site of the regulated activity. The auditor completes the forms, noting any concerns or issues – these can include the following: the facilities and the site; risk pathways for transport; security; documentation; unintended release.
- vi. *Communicating results*. The auditor conducts an exit meeting with the Authorized Party or officer and points out any findings or areas of concern, answers any questions and advises the Authorized Party on follow-up steps and on any upcoming compliance requirements. In the case of significant findings of non-compliance and when immediate action is needed, the auditor reports to Regulatory Authority orally within a period of time as defined by regulations, and or while the auditor is still at the inspection area.



## **2.2 THE ROLES AND RESPONSIBILITIES OF PERSONS INVOLVED IN A CAS.**

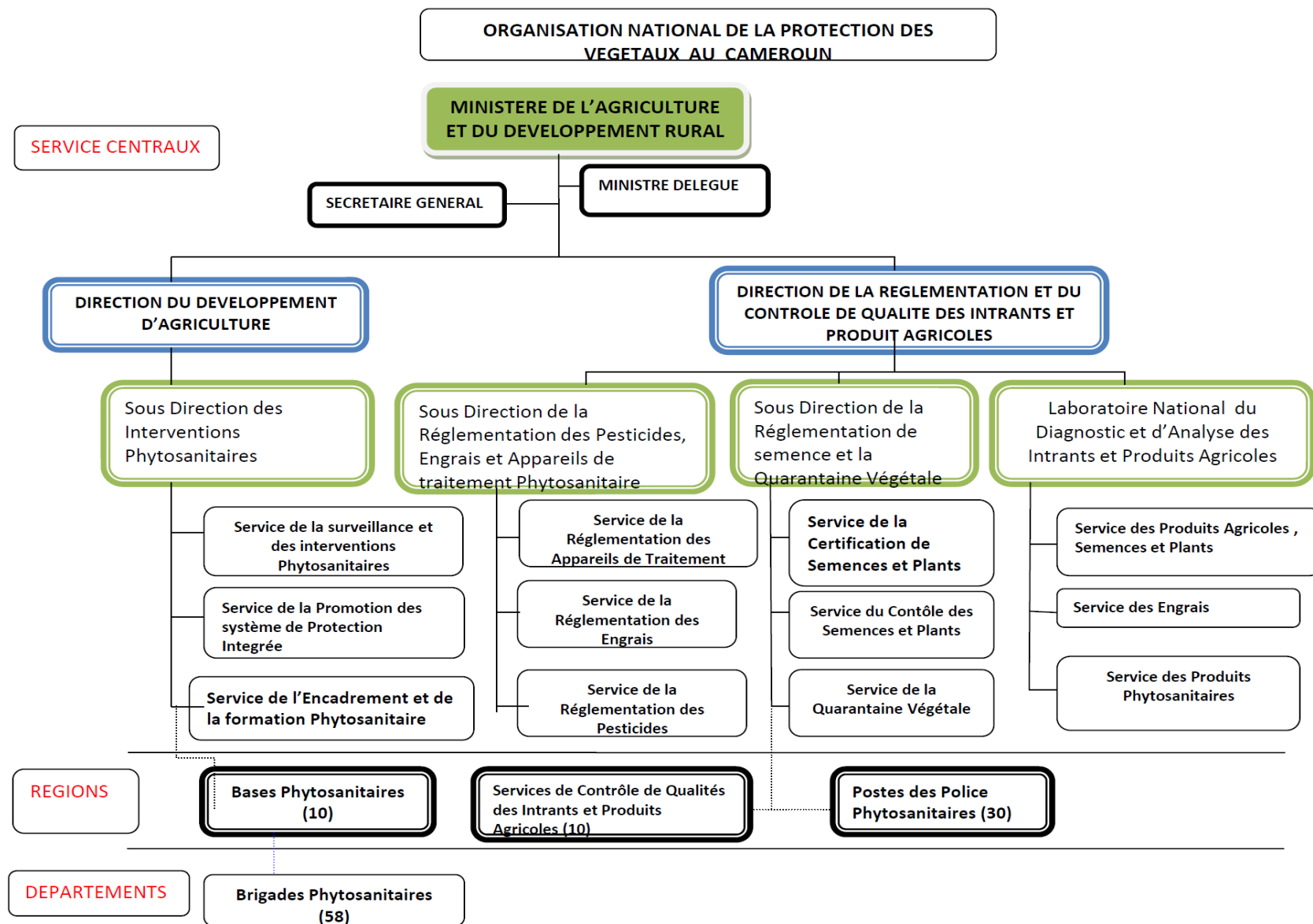
The Commodity Audit is a complex process requiring the competencies of several individuals and administrations or services. These need to be detailed in a document (e.g. a joint ministerial order or decision) with respect to the participants, their reporting mandates, who reports to whom about what issue (as these may vary according to responsibility and expertise). The exercise given below illustrates how this can be done.

For the audit of LMOs and GMOs those responsible at the operational level should be qualified 'sworn-in Inspectors' appointed in accordance with regulations in force, notably those governing the National Biosafety Committee. The national legislation should give Biosecurity Inspectors the right to enter premises without warning to check for compliancy and seize materials/samples if necessary. However, most inspections are undertaken with prior warning to the supervisor of the site and with the full cooperation of the permit holder and site manager.

For IAS, the operational level responsible persons (Inspectors) should include officers responsible for and or with expertise for sanitary and phytosanitary, disease control and customs at the very least. Thus, the ministries concerned i.e. MINADER, MINEPIA, MINSUP, MINSANTE and MINFOF should have either their own staff or use staff of agencies that provide oversight to responsible persons at the operational level charged to implement the CAS. Those responsible at operational level can also be afforded the responsibilities to include LMOs in their capacities dependent on the competence and staffing availability, considering the fact that the CAS procedures for IAS and LMOs do not differ significantly.

Each Ministry will designate Focal Point Service their own structure for lineage with the agency or Government ministry such as MINEPDED for coordinating the CAS. For example, MINADER which plays a key role in the control of agricultural produce has a well-defined and established mechanism as indicated in the organogram below (See Figure 7). This organogram can serve a model for creating a CAS for the management of IAS and LMOs/GMO in Cameroon. MINADER has set up phytosanitary control posts at various locations in the country that serve to protect entry of un-inspected commodities into the country (See Fig 8).

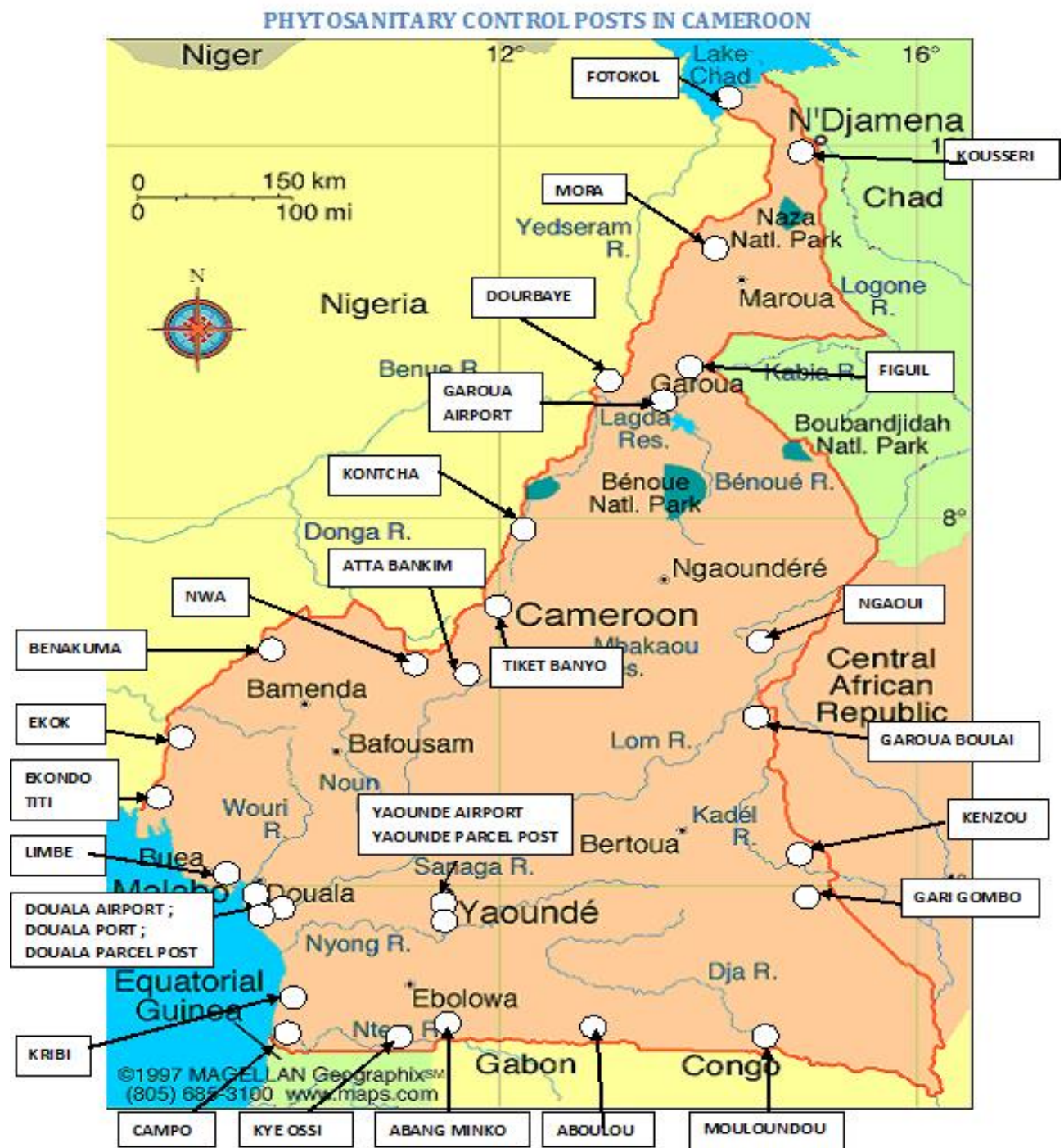




**Figure 7** Organogram for plant protection services in Cameroon. Source: MINADER



In addition to the government departments and agencies civil society and other private sector umbrella organizations provide advocacy for matters on Biosecurity and thus would be part of a CAS.



**Figure 8:** Phytosanitary posts at various entry points to Cameroon. Source MINADER



At the international level agencies such as the World Health Organization (WHO) CODEX, OIE and IPPC, support Cameroon to institute measures of safety particularly for pre-entry by providing guidelines and standards to complement national measures for CAS.

Furthermore, it is important for the participants to appreciate the need for compliance with regional and international agreements particularly those for trade as management measures imposed or instituted can affect non-conservation related agreements.

*Note to the Trainer.* Before concluding the presentation, the Trainer should show the slide summarizing the six steps in the CAS. The trainer should emphasize that some of these steps are already operational in the country, by some technical ministries, that in 2017 a complete CAS system is not yet in place. However, if a national CAS has been set up in the meantime, the new system should replace Fig 5.

The exercise can split such that one group focuses on one site e.g. pre border, post border etc. Alternatively, each group can be asked to attempt completing the entire table. The corrections or responses are given below. They should not be given to the trainees before they have handed in their responses and these have been discussed in plenary.

### Exercise No 01

Participants can be divided into four or five groups and requested to fill out a table with stakeholders that they consider relevant to handling LMOs and IAS in Cameroon at the various points of entry. This serves to demonstrate the variability in responsibility and the broad range of disciplines required to ensure Biosecurity in the country. At the end of the split session which can last for 20—30min, the results are reported in a plenary. The trainers then fill in any gaps and make corrections as necessary.

Pre - border	Border transit including	Post border	Institutional mandate and supporting legislation



**Expected Responses:**

<b>Institution</b>	<b>Institutional Mandates</b>	<b>CAS Focus Area</b>
<b>MINEPDED</b>	Biodiversity and Environment CBD Focal Point; Secretariat for National Biosafety Committee	Production, Post-harvest Transit, Pre-and Post-Entry
<b>MINSANTE</b>	Public Health	Disease control
<b>MINESUP</b>	Higher Education	Research and methodology/ processes for CAS, LMOs and IAS
<b>MINADER</b>	Phytosanitary law of 2003	Production, Post-harvest Transit, Pre-and Post-Entry
<b>MINEPIA</b>	Animal diseases	Compliance standards for pre-and Post-Entry
<b>MINMIDT</b>	Extractive industry	Pre-and Post-Entry
<b>MINFOF</b>	Natural Resources Particularly Forests	Production, Post-harvest and Post entry
<b>MINFI (Customs)</b>	Compliance to pre-and post entry processes	Pre-Entry and Transit
<b>MINRESI</b>	Science, Technology and Innovation Law on Biotechnology	Standards of research, advancement in technology of relevance to IAS and LMOs
<b>ANOR</b>	Quality assurance of commodities transported into the country	Compliance, inspection and certification



## 2.3 RECOMMENDED READING:

- i. MINEPDED (2013). The Current Biosecurity Profile from Trade and other Activities of Cameroon. Report submitted to MINEPDED under the UNEP/GEF Cameroon Biosecurity Project: Development and Institution of a National Monitoring and Control System (Framework) for Living Modified Organisms (LMOs) and Invasive Alien Species (IAS). Yaoundé, Cameroon.
- ii. (MINEPDED (2014). The quantification of the social, cultural, economic, environmental and biological impact of priority invasive species in Cameroon. Report submitted to MINEPDED under the UNEP/GEF Cameroon Biosecurity Project: Development and Institution of a National Monitoring and Control System (Framework) for Living Modified Organisms (LMOs) and Invasive Alien Species (IAS). Yaoundé, Cameroon
- iii. MINEPDED (2015). Report on the formulation of risk management strategies for biological invasion pathways in Cameroon. Consultant Report prepared under the UNEP/GEF Cameroon Biosecurity Project "Development and Institution of a National Monitoring and Control System (Framework) for Living Modified Organisms (LMOs) and Invasive Alien Species (IAS)" as part of the Cameroon Biosecurity Project. Yaoundé, Cameroon.
- iv. MINEPDED. (2015). Report on the Review of Biosecurity Agencies, Guidelines and Procedures. Consultant Report prepared under the UNEP/GEF Cameroon Biosecurity Project "Development and Institution of a National Monitoring and Control System (Framework) for Living Modified Organisms (LMOs) and Invasive Alien Species (IAS)" as part of Cameroon Biosecurity Project.
- v. MINEPDED. (2017). Manual on Commodity Audit Systems for Compliance with Risk Assessment Profiles, submitted to MINEPDED under the UNEP/GEF Cameroon Biosecurity Project: Development and Institution of a National Monitoring and Control System (Framework) for Living Modified Organisms (LMOs) and Invasive Alien Species (IAS). Yaoundé, Cameroon.
- vi. ANSTF (2007). Training and Implementation Guide for Pathway Definition, Risk Analysis and Risk Prioritization Developed jointly by the Aquatic Nuisance Species Task Force (ANSTF) and National Invasive Species Council (NISC) Prevention Committee via the Pathways Work Team



# **MODULE THREE**

## **BIOLOGICAL RISK MANAGEMENT (BRM) MEASURES AND AUDIT REQUIREMENTS (DURING PRODUCTION)**



**Purpose:** To expose the participants on the Commodity Audit Systems Process during production. The trainer will describe the potential sources for biological risks, transmission routes and mechanisms to prevent the introduction of IAS and/or LMOs at production sites. The module will should elaborate mechanisms to minimize spread if there is already introduction.

**Suggested Delivery Time:** 1 – 2hrs (including exercise)

**Format:** PowerPoint Presentations, Exercise, Plenary discussion

**Expected Outcomes:** At the end of the session, participants will:

- Understand how the six principles of BRM are applied at production sites.
- Identify measures for consideration at each CAS step of a production site.

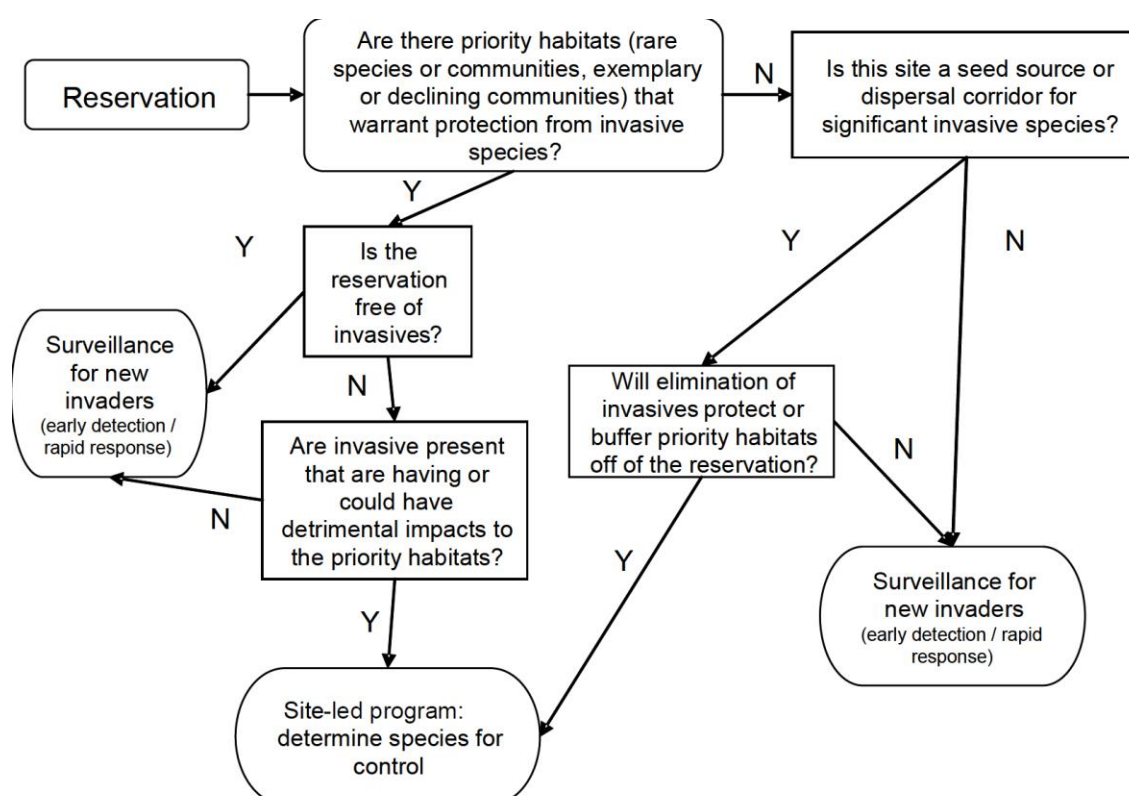
The trainers should use the six-point approach /principles described in Module 2 to present Module 3 and the subsequent modules. The trainer should inform the trainees that these principles will be applied at the remaining sites of the audit. But the emphasis of the measures taken may differ from one site to the other.

*Prioritization* – at production sites it is important to identify which resources are to be protected and this is enabled by knowledge of the LMOs and/ or IAS and its capacity to destroy the valued resource. Prioritization is facilitated further by knowledge and or the existence of effective control methods. This is always an iterative process as new experience/ understanding and technologies/ control methods are developed.

Examples of how a LMOs and/or IAS species can establish and spread abound. One can cite the water hyacinth which has invaded Lake Victoria and is a great challenge to the ecosystem and economy of the counties surrounding the lake. These plants are also threatening the River Wouri Estuary in Douala and their spread to other water bodies should be closely monitored should be provided to enable deeper understanding of the concept. A study coordinated by MINEPDED has identified 146 IAS in Cameroon in 2015. Prioritization would involve tracking those of them that pose immediate danger to the population and the environment like HIV the immune deficiency virus, which is being followed up by the Ministry of Public Health. A flow chart for IAS management in a reserved or protected is shown Figure 7.



*Note to the trainer:* The Trainer should go through the reasoning of the flow chart by reading out each question and pointing out the next step if the answer is Yes (Y) or No (N). The outcomes of this interrogation are either continued surveillance if the response is negative or instituting control of mitigation in case of a positive response. If time permits the Trainer can repeat this exercise with one IAS chosen from the Cameroonian list. GM cotton is currently being cultivated in Cameroon on an experimental basis. It could be used as an example here and in the other steps.



**Figure 9** Determining the extent of IAS management within a small area that is reserved/protected. Y stands for Yes and N stands for No

Depending on the responses derived, either an IAS and or a site specific led management course could be undertaken as categorized in table 2.

**IAS-led control** relies heavily on the detection of new invasions before they become established in a region/country, and may be particularly useful in designed landscapes to prevent new species transported in horticultural material from establishing on properties.

**Site-led control** focuses on controlling populations in specific areas where there is a feature to protect (e.g. rare species, priority community). For Cameroon the NBSAP has defined these areas. Control in this aspect could involve inspecting an IAS across an entire protected area



or management unit, or just within the priority community within a protected area. Most of the IAS control efforts will fall into this category.

**Table 2** Comparison of weed-led and site-led control.

	<b>IAS-led</b>	<b>Site-led</b>
Purpose	Prevent new IAS species from becoming entrenched in natural areas.	Protect threatened species and valuable places.
Scale	Greater than one protected area. Look at entire region or nationwide.	A defined area within a protected or management unit.
Species focus	Species that are newly naturalized in or newly invading the region/state; or with very confined populations	Those necessary to protect the place. Often widespread IAS.
Sites	All infestations within a region, on sites of any quality and ownership	Infestations within the place; plus, buffers and seed sources outside of it.
Success measure	The species is eradicated or contained within the region.	The native species or natural community responds in a desired way (e.g., regeneration).
Other activities	Public awareness Control on sale/spread Surveillance	Public awareness Integrate control with other threat management Survey places with high biodiversity value

*Audit rules* – at this stage the premises/ scope of the audit is to be defined This is based on national and international regulations/ agreements and the valued protection targets identified during prioritization e.g., the preservation of biodiversity, the promotion of good land stewardship to facilitate private and public interest in land preservation and or the preservation of cultural resources, including designed gardens and landscapes, and agricultural productivity. The Inspector(s) is verify on site whether these regulations are followed.



*Frequency* – Depending on the LMO/ IAS species or product the frequency of the CAS is established by the Competent Authority.

*Targets and Thresholds* – The expected/ possible levels of management are to be established and indicators to ensure they are attained defined. Thresholds could be such as use of clean fill<sup>1</sup> for projects is an indicator for prevention of IAS introduction, level of cleanliness of equipment before transporting products could be a threshold for assurance of non-contamination.

*Monitoring and Control* - Prohibit planting or propagation of known or potential invasive species. – See IAS Black and White List for Cameroon; Remove IAS species from designed landscapes to limit spread and monitor new plantings

*Communication* – working with partners is critical for ensuring transparency and objectivity in the process.

**Using an illustration of Livestock to illustrate the concept of BRM at production sites (adapted from Hersom et al, 2014).**

### **3.1 BRM MANAGEMENT ON LIVESTOCK PRODUCTION SITE**

Each livestock owner/manager will have a perception as to the level of risk that their enterprise faces. Risk assessment provides an objective look at the operation to evaluate the various strengths and weaknesses related to a threat or disease entering and spreading across the ranch/farm. The Risk assessment can and should change over time depending on the situation for the ranch/farm. The vulnerability of the animals on a ranch/farm to disease is influenced by a number of factors including: cleanliness, stress, nutrition, and other management factors; these are all aspects that can be managed.

There are three main issues to address in a successful BRM for livestock – isolation, traffic control, and sanitation.

#### **3.1.1 Isolation**

The most important step in disease control is limiting contact, co-mingling, and movement of livestock. For new animals arriving on the farm/ranch, including replacement animals, breeding animals, or animals returning from livestock shows this is particularly important. There is a need to minimize even co-mingling between established groups of livestock on the

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<sup>1</sup> Cleanfills are promoted as low-cost alternatives to landfills for “inert” waste that will have potentially no adverse environmental effect, or only minor effects.



farm/ranch. Thus, separation by age and/or production groups is generally practiced. The isolation of animals can be particularly difficult during natural disasters if there is damage to facilities and or lack of feed resources.

### **3.1.2 Traffic Control**

When considering points where disease agents could enter the ranch/farm, and how they can be spread, control within the operation should be designed to stop or minimize contamination of animals, feed, and equipment. It is important to note that traffic includes more than vehicles; it includes both animals and people. Thus, restricting access to certain places may be necessary. Consideration should be given to visitor's previous stops; both the people and their transportation are potential contaminants. Depending on their origin, visitors' footwear, clothing, and other products may need to be restricted (National requirements for quarantine in this regard may be shared with the participants). Disposable boot covers may be a better option than footbaths to contain contamination from soil and manure. Animal traffic concerns include non-livestock animals such as pets, dogs, cats, horses, wildlife, rodents, and birds.

### **3.1.3 Sanitation**

Sanitation addresses the issue of the disinfection of people, equipment, animals, and material entering the ranch/farm and the maintained cleanliness of people and equipment. Sanitation aims to prevent faecal contaminates from being ingested by livestock. The use of separate equipment for feed handling and manure/dead animal removal is considered optimal. If the same equipment is utilized for manure and feed handling, thorough cleaning and disinfection should be performed. Additionally, loaning of equipment or trailers presents another opportunity for pathogen introduction to the ranch/farm. Cleaning of facilities and equipment between groups of livestock during processing is a good management practice to reduce pathogen transmission.

The CAS would then consist of a procedure to confirm the adequacy of mechanisms instituted to ensure that there is sufficient BRM.



A prototype CAS questionnaire is given in Table 3 below:

**Table 3** Proposed line of questioning during CAS visit

Question	Yes	No
<b>Production Site Owner – to assess presence and function of control measures</b>		
Do you require that all individuals wash hands with soap and warm water before AND after animal contact?		
Do you limit access to your farm?		
Do you have only one gated entrance to the animal areas on your farm to better control and monitor visitors and vehicles?		
Do you keep the gate locked when not in use?		
Do you maintain fences to keep your animals in and others out?		
Do you limit contact between your animals and others that may present a risk of disease?		
Do you keep cats and dogs from roaming between farms?		
Do you minimize visitors and traffic on your farm?		
Have you posted signs at the farm entrance to inform visitors to stay off your farm unless duly authorized?		
Have you posted a visitor biosecurity sign that clearly lists specific measures to follow when on your farm?		
Do you require visitors to follow your farm's biosecurity procedures?		
Do you require visitors to check-in with farm personnel upon their arrival?		
Do require delivery vehicles and personnel to follow your farm biosecurity guidelines regarding parking, driving and animal contact?		
Do you require that all deliveries be left at the perimeter of your farm?		
Are your animal load out and delivery facilities located at the perimeter of your farm?		
Do you take measures to prevent runoff from other operations from entering your operation?		
<b>Employees to assess compliance to standard operating procedures</b>		
Do they use strict biosecurity measures when in contact with livestock at other locations (including their own home)		



Question	Yes	No
While on the farm do they have the requisite protective gear (e.g. boots and coveralls to wear)?		
Are they educated and trained your employees to recognize and report diseases?		
Is there a written Biological Risk Management Plan and that is maintained and are there are regular meetings to educate and update those involved?		
Neighbors (can be farmers and communities) to evaluate potential for establishment and spread		
Is there restricted sharing of equipment or vehicles between farms?		
If equipment is shared, are all the manure and bedding removed and the equipment washed with warm water and soap, rinsed, disinfected and rinsed again before using it with animals on the farm?		
<b>Visitors and Vehicles to assess potential movement of disease vectors</b>		
Are there warning signs telling visitors to only enter the farm with permission?		
Is there a contact provided for visitors to call and make an appointment?		
Is there designated parking away from all animal areas?		
Are only on-farm vehicles used to transport visitors within the area?		
Are all visitors accompanied by someone from the farm at all times?		
Are visitors provided with clean coveralls and disposable or disinfected rubber boots and required that these items be worn all times while in animal areas?		
Are visitors advised to avoid livestock areas and restricted from contacting or handling the animals (unless absolutely necessary)?		
<b>Record Keeping</b>		
Is there an accurate and thorough record of animal movement maintained		
Is each farm location treated as a separate unit?		
Is there a log sheet to record any visitors or vehicles that come onto the farm?		
Are animals individually identified		
Are there health records on every animal?		
Are reviews and updates on vaccination and treatment protocols conducted, how frequent (compare with the requirements)?		
How is monitoring and inspection of animals for signs of illness done?		
Are animals with unusual signs or those unresponsive to treatment, especially those that die suddenly investigated immediately?		
Are equipment cleaned, clothing and boots changed, when handling animals from groups with different health status and or as instructed?		



Question	Yes	No
Are animals that are not going to recover euthanized timely?		
Does the veterinarian necropsy animals that die from unknown causes?		
Are dead animals promptly removed and the carcass disposed of (e.g. render, compost, bury or burn) according to local and state laws?		

Additional questions may consider depending on the focus of the audit. The number of affirmative responses indicates the level of risk, all negative responses require measures for improvement.

### Exercise

The participants can be split into groups to read and discuss the following exercise (20- 35mins and relate their opinions in a plenary).

*Parthenium hysterophorus*, a native plant of tropical and subtropical South and North America, has spread to East Africa, where it is invasive and threatens food security, biodiversity, and human and animal health. The seeds were inadvertently introduced via consignments of imported grains which were imported and distributed by a foreign aid agency as part of a nutrition improvement programme. Its adaptability to a wide range of habitats, drought-tolerance, ability to release toxic chemicals against other plants (allelopathy), rapid growth-rate, and prolific seed production allows the invasive weed to colonize new areas quickly and extensively. It is so pervasive and destructive that Ethiopian farmers call it “Faramsissa,” meaning “sign your land away.”



**Figure 10** *Parthenium*

*Parthenium* reduces the yield of many major crops, such as sorghum and corn. It also taints milk and meat when consumed by livestock, and can cause major skin irritation and respiratory



problems in humans. Because it can release toxic chemicals against other plants, it also replaces natural vegetation, creating a threat to one of the world's richest regions of biodiversity.

In African subsistence farming, *Parthenium* is currently managed by hand-weeding, a task primarily done by women and school-aged children. Any management system that can control *Parthenium* will reduce the workload on both groups, allowing them to engage in more productive activities, and alleviating the dermatitis caused by handling the weed.

Despite its aggressiveness, *Parthenium* is successfully managed in Australia and India using biological control agents, such as insects, pathogens, and competitive smother plant species.

*Parthenium* has invaded South West Cameroon. You are expected to advise the Ministry of Agriculture about the steps which are necessary to prevent such invasions occurring in other parts of the country.

- a) First identify/ suggest the main direct cause(s)/ pathways of the invasion.
- b) Then, identify the underlying economic conditions or motivations which might have prompted people to behave in a way which has led to the invasion taking place.
- c) List the policies and instruments which might have set the particular conditions which have encouraged people to behave in a way which has led to the invasion taking place.
- d) Recommend measures to limit the spread of *Parthenium*.

Discuss this in your working groups for 25 minutes maximum, and be prepared to make a brief 5-minute presentation back in the plenary session which describes the direct and underlying causes of the invasion you are dealing with.

*Note to the Trainer:* The discussion groups should be provided with flip charts on which answers can be written. Each group should designate a Chairperson and a Rapporteur. The Chairperson will coordinate the discussion and the Rapporteur will report at the plenary. The Expected responses for *Parthenium* are given below. These Expected responses should be revealed to the participants only after they have completed and submitted the exercise in plenary

➤ *Expected Feedback from group:*

- i. The pathways for introduction of the seeds/ plantlets should be highlighted whether by air, road and or rail and what the potential vectors (carrying agents would be). A recount of the existing agricultural practices (if known) in the area would inform what would be the most likely route.



- ii. The agricultural practices of the invaded community will inform the discussion on the potential for establishment and spread, i.e. if small holder and mix-cropping the likelihood of spread is greater. An understanding of the biology and soil characteristics of the area and phenology of the other crops will be useful. In the discussion expertise on plant taxonomy, plant chemistry and agronomy is of value.
- iii. Plant protection standards and compliance mechanisms (regulations) will inform the discussion if there potential for introduction, establishment and spread and how this is to be managed and communicated.
- iv. With the given information the group can design management measures if there are no compliance measures to make reference to, or improve the existing with suggestions.



### 3.2 RECOMMENDED READING:

- i. MINEPDED (2015). Black and white lists of priority invasive species and management approaches for Cameroon. Report prepared by John Mauremootoo (John@InspirationalPathways.com) and Augustine Bokwe (v\_cefai2002@yahoo.co.uk) under the supervision of The Project Component 4 Interministerial Task Team (Task team institutions: MINRESI, MINEPDED, MINEPIA, MINADER), as part of the Cameroon Biosecurity Project. MINEPDED, P.O. Box 320, Yaoundé, Cameroon to MINEPDED under the UNEP/GEF Cameroon Biosecurity Project: Development and Institution of a National Monitoring and Control System (Framework) for Living Modified Organisms (LMOs) and Invasive Alien Species (IAS). Yaoundé, Cameroon
- ii. Matt Hersom, Max Irsik, and Todd Thrift. (2014): UF/IFAS Biosecurity and Biological Risk Management for Livestock Enterprises Handbook
- iii. Julie Richberg (2008): Invasive Plant Management: Guidelines for Managers
- iv. The Precautionary Principle (UNESCO COMEST, 2005)



# **MODULE FOUR**

## **BIOLOGICAL RISK MANAGEMENT AND AUDIT REQUIREMENTS (IN-TRANSIT)**



**Purpose:** To expose the participants to the potential sources of biological risk agents, transmission routes and mechanisms to prevent their introduction in transit.

**Suggested Delivery Time:** 1 – 2hrs (including the exercise) – A half day field visit to a port of entry or exit would be of benefit if it can be organized.

**Format:** PowerPoint Presentations, Exercise, Plenary discussion

**Expected Outcomes:** At the end of the session, participants will:

- Understand the principles of BRM at ports of entry and exit as Prevention, Early Detection and Rapid Response, Control and Management and Education and Public Awareness
- Increase awareness for compliance measures for CAS that already exist and identify new gaps for biosecurity risk.

Transit commodities are those that have departed from the dispatch, loading, or shipping point but have not yet arrived at the receipt, offloading, or delivery point. For LMOs, the CPB recommends that Each Party to the Protocol has the obligation to take necessary measures to ensure that LMOs be handled, packaged and transported under conditions of safety, taking into consideration relevant international rules and standards. A CAS for transit commodities in part provides assurance of compliance to the CPB.

As transit goods are not destined for the country/ locality of transit the CAS process is limited to three steps, *i.e. prioritisation, monitoring and evaluation and communication.*

*Prioritization* – All official transit goods are clearly labelled to indicate what is contained. Official points of entry and exit generally have standard operating procedures to cope with spills and/or losses. Access to transit areas should be restricted and the CAS should ensure that adequate protocols for decontamination exist to cope with when spills and losses when they occur. Currently GM Cotton and GM maize seeds are among the most like commodities that can be accidentally released through spillage on transit. Furthermore, undisclosed entry of seeds is among the principal ways in which could compromise surveillance at the point of transit. In some countries like the United States the importation of seeds is forbidden, except they have gone through a stringent vetting. There currently no effective control of the entry of seeds and seedlings into Cameroon although the relevant phytosanitary inspectors do issue certificates for those travelling abroad to take seeds and other plant materials abroad. GMO maize and cotton seeds are particularly indicated and should be prioritized for control at the while in transit and at the port of entry/exit.



## 4.1 MONITORING AND CONTROL

The Management of transit commodities is generally conducted using quarantine and/ or different biosafety levels of containment<sup>2</sup>. Although it is not expected that transit goods will contribute to escape, establishment and spread of LMOs or IAS, it is important to ensure the capacity for containment if the risk arises. A guidance for Biosafety containment based on the level of risk from introduced plants and plant material can be drawn from Traynor et al. (2002) (See Table 4).

**Table 4** Biosafety Risk Criteria and Recommended level of Biosafety Level Containment

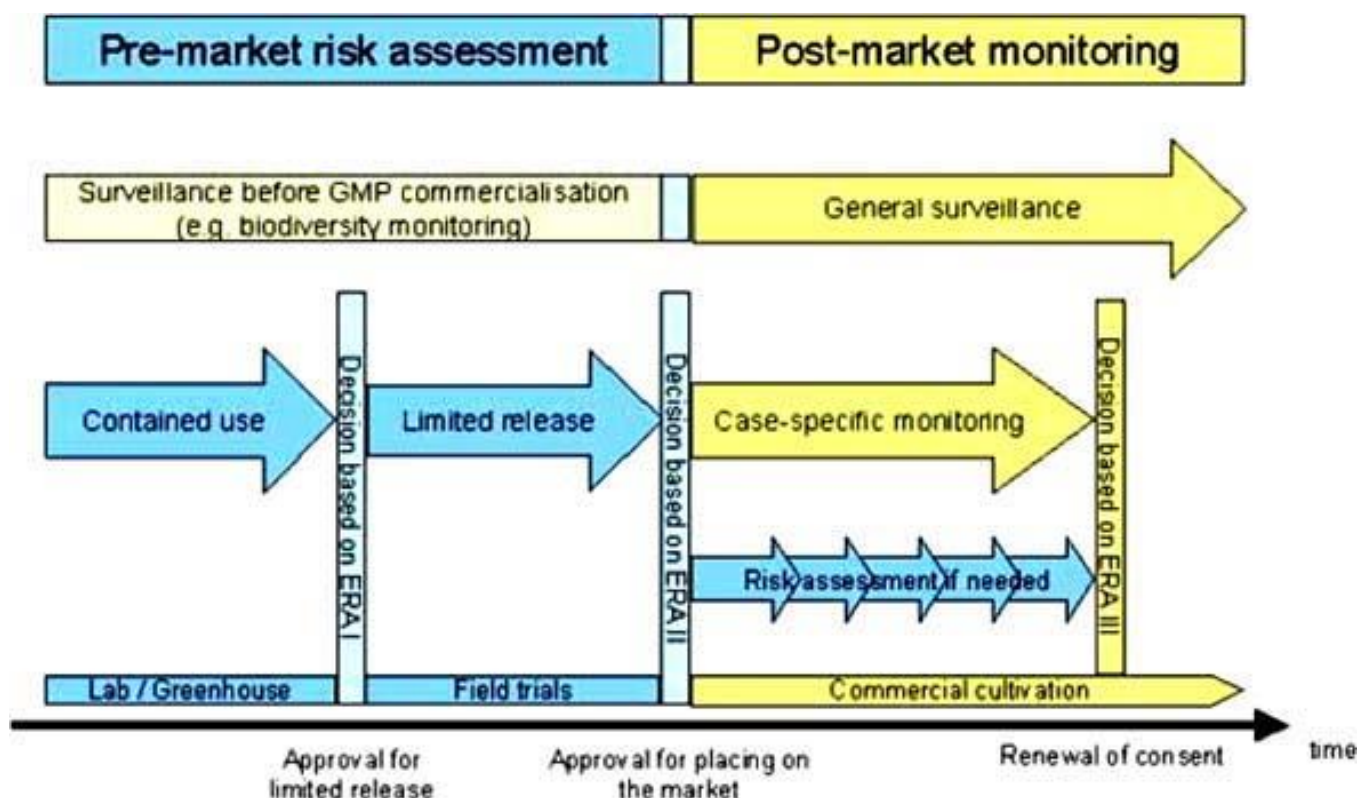
Criteria	Transgenic Plants	Transgenic Microbes		Transgenic Insects/ Animals / Assoc. Microbes
		Exotic	Non - Exotic	
Not a noxious weed or cannot outcross with one	BL - 1			
Not easily disseminated			BL - 1	
Noxious weed or can interbreed with weeds	BL - 1 or BL - 2			
Involves EIA with detriment to environment	BL - 3 or BL - 2			
Contains Vertebrate Toxin	BL - 3	BL - 3	BL - 3	
Detriment to environment		BL3-P-4**	BL2-P or BL1-P +	BL3-P or BL2-P +

A prerequisite for any kind of monitoring are tools to identity or trace GMOs or products derived from GMOs in the environment or food-chain. Detection techniques (such as PCR) are in place in a number of countries to monitor the presence of GMOs in foodstuffs, to enable the enforcement of GM labelling requirements and for the monitoring of effects on the environment. Attempts to standardize analytical methods for tracing GMOs have been initiated e.g. for use in ISO norms. The WHO/FAO Expert Consultation on GM Animals, 2003, identified

<sup>2</sup> Biosafety containment levels 1-4 categorise the risk level of the organism in question, the higher the level the greater the risk. Viruses are contained at level 4 whilst research based transformation (not for release) can be contained at biosafety level 1.



a need for Post Market Surveillance and therefore for product tracing systems in specific cases (See Figure 11).



**Figure 11** Potential Effect of GMOs on human health mediated through environmental impact. Source <http://www.fao.org/docrep/meeting/008/y5871e/y5871e0n.htm>

Case specific monitoring (CSM) focuses on specific risks presented by the LMO which were identified in a pre-market ERA. CSM is generally hypothesis driven and makes use of tests and experiments, so requires availability of standardised protocols/methods (e.g. parallel system without IAS/ LMO). In conduct of a CSM one must define effect sizes and detection limits, and the monitoring can be terminated after defined time (if hypothesis confirmed or rejected). An example of CSM is the assessing for emergence of resistant pests to confirm loss or otherwise of beneficial insects.

General Surveillance (GS) on the other hand is “a general overseeing of the geographical regions where LMOs occur” with no specific adverse effects. It aims to detect events not anticipated in the pre-market ERA with the appreciation that no risk has been identified and thus no risk hypothesis can be tested. GS is not time-limited and makes use of existing monitoring networks but may need additional studies as may identified by the outcome of the monitoring and these in turn may require a specific risk analysis. GS is based on national protection goals (e.g. air, soil, water, biodiversity). GS employs requires expertise to assess unusual effects, it exploits public information and draws from existing monitoring systems.



## 4.2 COMMUNICATION

Communication channels for in-transit CAS is limited to the responsible parties for the commodity and relevant authorities such as Customs and the biosecurity competent authority. The focus of the communication is to ensure that the information is shared broadly between handlers of the commodities and the Cameroon community to facilitate behavioural change. The CAS for Cameroon should adopt and align to the MINEPDED 2015 plan on National Biological Invasions Communications and Awareness-raising for Cameroon. The MINEPDED 2015 report advocates for a targeted approach to ensure that the sharing of information facilitates belief and behavioural changes

It is recommended to ensure the implementation of the International Standard for Phytosanitary Measures (ISPM) 3 under the IPPC, which addresses mainly pests, but also includes biological control agents and other beneficial organisms and thus can provide guidance for in transit commodities.

The presentation of ISPM 3 should be done in relation to practice and regulations in Cameroon is necessary for contextualization of the module. In some sections the MINEPDED 2014 report on Contingency Plan and Emergency Response can be made reference to map out BRM procedures and the MINEPDED 2017 training manual on Pest Risk Analysis.

ISPM 3 highlights the responsibilities of the importing and exporting authorities and the quarantine procedures that would be applicable to commodities in transit. The ISPM advocates for any risks associated with transit goods to be determined, through a risk analysis considering (keeping in mind) the principles of necessity and minimal impact. Thus, depending on the assessed and or predicted risk, phytosanitary measures may include requiring the culturing of suspected agents in quarantine before their release. Culturing for at least one generation can help in ensuring the purity of the culture and freedom from hyper-parasites and pathogens or associated pests, as well as facilitating authoritative identification. This is particularly advisable when biological control agents and other beneficial organisms are collected from the wild.

For LMOs and IAS that are being introduced intentionally for research as an example the ISPM 3 advocates for the NPPO to ascertain information pertaining to the following:

- The nature of the material proposed for importation
- The type of the research to be carried out
- Detailed description of the quarantine facility (could also be a Biosafety facility at the appropriate level, including security and the competency and qualifications of the staff) an emergency plan that will be implemented in the case of an escape from the quarantine (containment) facility.



It is recognized that biological organisms for research and or those that are collected from the field in initial shipments may not be described with regard to their exact taxonomic identity, host range, impact on non-target organisms, distribution, biology, impact in an area of distribution etc. Such information is determined after the organisms are studied in quarantine (containment).

The example of arthropod containment measures demonstrates what needs to be audited in containment. Arthropods, in particular those that are blood sucking such as, mosquitoes, tsetse, black flies, sand flies, biting midges, horse and deer flies), bugs (e.g., kissing bugs and bed bugs), lice, fleas, ticks, and mites are known or believed to be involved in the transmission of pathogens to humans, domestic animals, and wildlife. Thus, it is necessary to gather critical information in a biologically safe and environmentally controlled setting (containment or quarantine) on the behaviour of these arthropods and their life cycle.

Guidelines for Arthropod Containment Levels (ACL) and Biosafety Level (BSL) provide guidance on levels of restriction and handling and the conduct of CAS is to ensure that these are in compliance with the requisite standards.

Table 5 below provides a generic ACL approach for three fates of arthropods upon accidental escape: (1) Inviability: conditions are sufficiently unfavourable to the arthropod that reproduction does not occur. (2) Transient: conditions vary either seasonally or annually such that the arthropod could reproduce upon escape but would be eliminated during a typical climatic year. (3) Establishment: the conditions found in the range of the arthropod are sufficiently similar to those of the laboratory location that the escaped arthropods could reasonably be expected to persist through a typical climatic year.

Active Local VBD Cycling means that transmission of vector-borne diseases of public health importance that are known to be or probably transmitted by the arthropod are cycling in the locale. Indigenous species are those biological species whose current range includes the research location. All others are considered exotic.



**Table 5** Biosafety levels for arthropod containment

Arthropod Containment Level	1		2	3	4
Arthropod distribution, escaped arthropod fate	Exotic inviable or transient	indigenous	Exotic, indigenous and transgenic		
Infection status	Uninfected or infected with non-pathogen		Up to BSL-2	Up to BSL-3	Up to BSL-4
Active VBD cycling	No		Irrelevant		
Practices	ACL-1 standard arthropod handling practices		ACL-1 plus more rigorous disposal, signage, and limited access	ACL-2 with more highly restricted access, training and record-keeping	ACL-3 with high access restriction, extensive training, full isolation
Primary Barriers	Species appropriate containers		Species appropriate containers	Escape-proof arthropod containers, glove boxes	Escape-proof arthropod containers handled in cabinet or suit laboratory
Secondary Barriers			Separated from laboratories, double doors (2), sealed electrical/plumbing openings. Breeding containers and harborages minimized.	BSL-3	BSL-4

Source: The American Committee of Medical Entomology of the American Society of Tropical Medicine and Hygiene – Guidelines for ACL Version 3.1

### Exercise

The report below is from a Warehouse and/ or container in a port inspection report. The inspected warehouse was holding household commodities from the Asian Continent (Ex. Figure 11). The quality ratings 1, 2, 3 are an indication of satisfaction (1), need for improvement (2) or dissatisfaction (3) by the inspecting officer.



Technical Area		Quality Control Point Rating
<b>1. STORAGE SERVICES</b>		
	Unauthorized cartons and packaging used	1
	Improper packing/sealing/markings of cartons	1
	Improper loading/unloading	1
	Disassembled parts not packaged/inventoried	1
	Inventory stickers on finished surfaces	1
	Improper appliance servicing/labelling	1
	Employees on duty not efficient/neat	1
	Services not performed as requested on NTS Service Order or GBL	1
<b>2. ADMINISTRATION</b>		
	Incorrect inventory preparation	1
	No separate weight ticket and certificate/PB and E/WT	1
	Incorrect warehouse receipt preparation	1
	Ineffective locator system*	3
	TOS supporting paperwork needed	1
<b>3. STORAGE METHODS &amp; OPERATION</b>		
	Storage lots not handled in within three business days*	2
	Improper storage, stacks/pallets	2
	Finished surfaces not protected by pads/wrap	2
	Lots and segregated pieces not elevated two inches	2
	Lots stored against exterior walls	1
	Lawnmowers not stored at base level of lot	1
	Improper firearms control	2
	Loose stack storage over 10 feet*	2
	PBO contents not identified on inventory	1
	Improper storage of upholstered pieces*	2
	Improper storage of rugs/pads*	2
	Improper piano/organ storage	1
	Improper storage of mattresses	1
	Segregated items not properly identified	2
	Improper packing of mirrors/glass table tops	1
	Inadequate protection against mould/mildew	2
	Aisles being used to process goods in/out	1
	Previous discrepancies not corrected*	3
<b>4. FIRE PREVENTION AND HOUSEKEEPING</b>		
	Electric/heat/water systems require repair	1
	Evidence of smoking in warehouse*	3
	Unauthorized items stored*	3
	Improper aisle and/or stacking clearance	1
	No fire system inspection*	3
	No fire extinguisher inspection	3
	No extinguishers on warehouse equipment	2
	Trash/debris in storage area	2
	Fire doors inoperable/in need of repair	3
	Fire plan not signed by fire marshal or properly posted	1
	Space heaters/extension cords being used	1
	Fuel not drained from motorized items	3
	Hazards noted within 20 feet of warehouse*	2
	Flammables/combustibles found in warehouse*	2
<b>5. WAREHOUSE PRACTICES</b>		
	Inadequate security*	3



Technical Area		Quality Control Point Rating
	Inadequate loading/unloading area	1
	Structural deficiencies (doors/floors/roof/walls/windows)	3
	Inadequate protection from sun/dust/heat/cold/moisture	2
	Lack of insect/rodent control	2
	Vehicles parked in storage area	3
	Commingled storage with undesirable commodities	2
	Multiple occupancy*	3
	Weight stored in excess of authorized NTS limit*	2
<p>* When those items followed by an asterisk are observed, the inspecting official should consider placing the facility in a non-use or disqualified status immediately. Once placed in a non-use or disqualified status, the facility will not be removed from this status until the deficiencies have been corrected to the satisfaction of the authority.</p>		



**Figure 12** Inspection of commodities in warehouse (first photo) and in container (second photo) Photos from Tanzania

### ❖ Questions:

Consider that a Biosecurity inspector was to use this report to identify potential pathways of spread for an Invasive Species such as the weaver bird.

1. What sections of this report would draw close attention of the inspector? Why?
2. Would the report as presented require the inspector to take further action with regards the managing the potential risk of weaver birds? What would be those actions/ recommendations?

### ➤ Expected Response

The exercise is best discussed in plenary with elaboration of the existing standard operating procedures for warehouse inspection in Cameroon and thus participants with the relevant background can inform their colleagues what is needed. Comparison to other standard operating procedures can be used to inform what is needed. Reference to the Centre for Agricultural and Bioscience International (CABI) and the Global Invasive Species Database (GISD) databases can provide some insight to known IAS.



### 4.3 RECOMMENDED READING:

- i. <https://www.ippc.int> in particular ISPM standard 3
- ii. <https://www.iucngisd.org>
- iii. <https://www.cabi.org>
- iv. MINEPDED, 2014, Report on Contingency Plans with Emergency Response exercises for biological invasions in Cameroon. Report submitted to MINEPDED under the UNEP/GEF Cameroon Biosecurity Project: Development and Institution of a National Monitoring and Control System (Framework) for Living Modified Organisms (LMOs) and Invasive Alien Species (IAS). Yaoundé, Cameroon.
- v. The American Committee of Medical Entomology of the American Society of Tropical Medicine and Hygiene – Guidelines for ACL Version 3.1
- vi. A Workbook for technical training. Biosafety and risk assessment in agricultural biotechnology. 2002. Agricultural Biotechnology Support Programme. Institute of International Agriculture. Michigan State University. PL Traynor, R Frederick and M Koch. [http://www.iaa.msu.edu/absp/biosafety\\_workbook.html](http://www.iaa.msu.edu/absp/biosafety_workbook.html)
- vii. MINEPDED (2015). National Biological Invasions Communications and Awareness-raising Plan for Cameroon. Report prepared by John Mauremootoo (John@InspiralPathways.com) and Dora Shey (sheyilla@yahoo.fr) under the supervision of The Project Component 4 Interministerial Task Team (Task team institutions: MINADER, MINEPDED, MINEPIA, MINRESI), as part of the Cameroon Biosecurity Project. MINEPDED, P.O. Box 320, Yaoundé, Cameroon to MINEPDED under the UNEP/GEF Cameroon Biosecurity Project: Development and Institution of a National Monitoring and Control System (Framework) for Living Modified Organisms (LMOs) and Invasive Alien Species (IAS). Yaoundé, Cameroon.



# **MODULE FIVE**

## **BIOLOGICAL RISK MANAGEMENT MEASURES AND AUDIT REQUIREMENTS (POST HARVEST)**



**Purpose:** To expose the participants to the potential sources for BRM, transmission routes and mechanisms to prevent introduction at production sites post-harvest. The module also will elaborate mechanisms to minimize spread if there is already introduction.

**Suggested Delivery Time:** 1 – 2hrs (including the exercise). Where possible participants can visit an agro-processing plant to examine the audit requirements in particular control of contamination; or visit an LMO confined field trial site. In this case additional time will be needed.

**Format:** PowerPoint Presentations, Exercise, Plenary discussion

**Expected Outcomes:** At the end of the session, participants will:

- Understand the principles of BRM in postharvest situations/ sites including processing, storage and certification.
- Identify measures for consideration at each step of a postharvest CAS.

Biosecurity concerns for postharvest are generally addressed at maintaining control over the site and how it is used in postharvest, ensuring compatibility with guidelines and regulations, to ensure establishment and spread is limited and instituting measures of management. As with the other modules the process of prioritization, setting rules, determining frequency, setting thresholds and targets and communication are followed.

Examples on CAS for postharvest for LMOs are limited and some standards are set by the European Union (EU) for IAS postharvest.

**Prioritisation** – The aim here is to determine the priority/ focus of the CAS in postharvest situations, information on the identity of the IAS/ LMO with its introduced or modified traits (the ‘event’), the intended use and potential exposure routes (due to cultivation or through import and processing) and, the respective receiving environments that were taken into account during the risk analysis are important. After harvest the IAS or GMO product has to be processed, packaged and perhaps stored before it is transported. There is therefore ample opportunity for spillage escape or otherwise accidental release. The CAS should identify in each situation the product that susceptible to be accidentally released and take appropriate measure to prevent this.

**Audit rules** – Subject to standards and requirements related to the objectives that the IAS/ LMO monitoring aims to identify environmental, social and economic changes as early as possible. At this stage identification/ assignment of roles and responsibilities and the frequency of CAS is important. In Cameroon this role is shared by several ministries- MINADER for phytosanitary inspection, MINEPDED for GMOs and LMOS, MINIEPIA for animal products



and fisheries. MINSANTE is in charge of the control of GM medical and pharmaceutical products.

**Frequency** – The frequency of the CAS considers mechanisms and capacity for identifying and confirming any adverse effects. The European Union (Directive 2002/118/EC) for example set CAS frequencies for LMOs in manner that it serves as an early warning system in order to allow a “more rapid reassessment and implementation of measures to reduce any consequences to the environment”.

**Targets and Thresholds** – Due to the vastness of the risks that may arise in postharvest situations and the complicated nature for addressing these it may not be feasible to ensure comprehensive coverage., Hypotheses for targets and thresholds may be specifically formulated for an individual IAS/ LMO or a certain potential adverse effect or process that may be predicted (e.g. the LMO outcrosses to a certain wild relative). In some cases, the hypotheses may focus on protection goals and targets, especially in case of the monitoring for unanticipated effects. The hypotheses formulated will then guide the audit. Whether the cause-effect relationship formulated in the hypothesis can be verified will be resolved by the statistical evaluation of collected data.

**Monitoring and Control** – Using the mandatory Post Market Environmental Monitoring (Directive 2001/18/EC) EU Monitoring regulations for Genetically Modified Organisms, the concepts of Case Specific Monitoring (CSM) and General Surveillance (GS) can be used to elaborate follow-up strategies. This is based on the Risk Analysis done prior to release (pre-market). The EU recommends confirmation of any assumptions (potential adverse effects made in the European Research Area (ERA) using CSM and identify unanticipated effects using GS. The monitoring is to be done on a case-by-case basis, taking into account the characteristics of the GMOs, its intended use and the range of environmental conditions.

**Communication** – targeted information is important at this stage as credibility of the risk analysis and international obligations for compliance are to be handled carefully. The intention is not to create alarm but to objectively and transparently communicate the need to improve management and/ or assure the population of safety.

## 5.1 AN EXAMPLE OF POST-HARVEST BIOLOGICAL RISK ASSESSMENT

*Parkinsonia. aculeata* (See Fig 6-1) is a major invasive species in Australia, parts of tropical Africa, Hawaii, and other Islands in the Pacific Ocean. It has generally been introduced as an ornamental but has the potential to spread from semi-arid to sub-humid environments. The shrub forms dense thickets, preventing access for humans, native animals and livestock to



waterways. The fruits (seedpods) float, and the plant spreads by dropping pods into water, or pods are washed downstream by seasonal flooding. Without the scarifying received by tumbling in streambeds, the seeds are slow to germinate.



By Stan Shebs, CC BY-SA 3.0,  
<https://commons.wikimedia.org/w/index.php?curid=3852730>



By Hectonichus - Own work, CC BY-SA 3.0,  
<https://commons.wikimedia.org/w/index.php?curid=15896719>

**Figure 13** *Parkinsonia aculeata*

Several control methods are used to reduce the existing population and the spread of *P. aculeata* in Australia.

The defoliating caterpillar, *Eueupithecia cisplatensis* Prout (See Fig 6-2), has been identified as a potential biocontrol agent of *P. aculeata*. Preliminary studies on its biology and host specificity made in Argentina, in the field and in laboratory conditions, strongly indicated fidelity to *P. aculeata*. It was then imported into an Australian quarantine where testing was completed on a broad range of plant species, particularly native Australian caesalpinoids, selected on the basis of phylogeny. Excluding *P. aculeata*, a total of 67 plant species were tested, 40 in Australia and 27 in Argentina.





**Figure 14** *E. cisplatensis* Source CSIRO website (05/11/2017)

*E. cisplatensis* has proven to be entirely host specific to *P. aculeata*. In laboratory tests, full development to adult occurs consistently on *P. aculeata* with a high rate of success (average of 61% in Argentina and 56% in Australia). But no development past the first instar occurred on any test plant species with the exception of was the closely related *Parkinsonia praecox* on which a very low rate of development (3%) was measured. No feeding occurred on any test plant species other than *P. praecox* and hence no damage was observed on non-target species. However, even *P. praecox* was not found to be used by *E. cisplatensis* in the field in the native range.

From the assessment conducted the application to release the geometrid moth *Eueupithecia cisplatensis* for the biological control of *Parkinsonia* (*Parkinsonia aculeata*) was considered subject to standard quarantine conditions associated with the import and release of biological control agents.

### **Exercise: The establishment and spread of a common invasive waterweed growing in pond with LMO.**

Background: A variety of aquatic and semi-aquatic plants have invaded lakes, ponds, rivers, canals and agricultural fields in Cameroon, many becoming noxious weeds. The damage to the environment and the economy is enormous, having a disrupting impact on agriculture, fisheries, production of electricity, transportation, health, means of sustenance, living conditions and social structure (FAO, 2002). There has never been an official survey of these species in order to establish the real extent of their distribution, or the scale of economic problems caused to agricultural and grazing land and water bodies. A developer intends to establish ponds for production of genetically modified fish in one of the ponds already threatened by an invasive weed, the water lettuce.



Task: Given the assumption that the application to establish the ponds has been approved by the Competent National Authority, design a monitoring protocol to ensure that there is minimal spread of the weed to nearby water bodies (300m away) and that there is minimal impact from the genetically modified fish on the environment.

➤ **Expected Response:**

The protocol should be designed to reflect the potential movement of the species, an understanding of the biology of the weed and fictional potential threats and blockages that would limit spread.

## **5.2 RECOMMENDED READING:**

- i. [http://ec.europa.eu/food/dyna/gm\\_register/080714-t45-monitoring\\_plan.pdf](http://ec.europa.eu/food/dyna/gm_register/080714-t45-monitoring_plan.pdf)
- ii. [http://www.biosafety.be/gb/dir.eur.gb/del.rel./2001\\_18/2001\\_18\\_tc.html](http://www.biosafety.be/gb/dir.eur.gb/del.rel./2001_18/2001_18_tc.html)
- iii. SCBD (2000). Cartagena Protocol on Biosafety. ISBN-92807-1924-6
- iv. SCBD (2016). Guidance on Risk Assessment of Living Modified Organisms and Monitoring in the Context of Risk Assessment.
- v. MINEPDED (2014). The designing of a biological invasions monitoring network for Cameroon. Report submitted to MINEPDED under the UNEP/GEF Cameroon Biosecurity Project: Development and Institution of a National Monitoring and Control System (Framework) for Living Modified Organisms (LMOs) and Invasive Alien Species (IAS). Yaoundé, Cameroon.
- vi. ISPM 06 (2016) Guidelines for surveillance



# **MODULES SIX AND SEVEN**

## **BIOLOGICAL RISK MANAGEMENT MEASURES AND AUDIT REQUIREMENTS (POINT OF ENTRY AND POST ENTRY)**



**Purpose:** To expose the participants to the compliance measures of CAS for pre-entry and follow up post entry.

**Suggested Delivery Time:** 1 – 2hrs (including exercise).

**Format:** PowerPoint Presentations, Exercise, Plenary discussion

**Expected Outcomes:** At the end of the session, participants will:

- Understand the need to trace origin and follow up on destination of LMOs and IAS to ensure biosecurity
- Outline the processes for pre-and post-entry and identify areas for improvement.

The concepts of traceability and detection are to be elaborated with respect to LMOs and IAS. The concepts are not new and are commonly used with commodities but for biosecurity purposes there may be a need for additional information on transport forms that should be considered.

Typical pre-and post-entry procedures should be outlined to the participants for Cameroon and where relevant comparison made with a like-minded/ similar economy country. Inspection compliance to IPPC and SPS and other international agreed standards should be illustrated with examples.

The IPPC draft Manual on importation gives some guidance on importation requirements for countries that import commodities the guidelines recommend inspection and give indication of what should be done in a situation of non-compliance.

An example of IAS spread into a country can be drawn from the report by KADETFU, CDI (2013) which reports the impact of the Banana *Xanthomonas* Wilt (BXW) disease. BXW is caused by the bacterium *Xanthomonas campestris* pv. *Musacearum* (See Fig 15) and threatens the livelihoods of millions of farmers in East Africa. It has threatened banana production in the Great Lakes region of Eastern Africa including Burundi, Rwanda, the Democratic Republic of Congo, Uganda, Kenya, and Tanzania (Kalyebala et al., 2007). The disease was first reported about 40 years ago in Ethiopia on Ensete, which is closely related to banana. Outside Ethiopia, BXW was first reported in Uganda in 2001 and has now spread to almost all major banana producing districts of the country. The disease has contributed to decreased household and national food security and income.





**Figure 15** *BXW-Xanthomonas campestris pv Musacearum*

IAS impacts can also affect export, examples are seen with rejected products such as mangoes from East Africa that were infested with *Bactrocera invadens* and *Bactrocera latifrons* (See Figure 16). The two IAS were unintentionally introduced to Tanzania where specimens were trapped only in 2006 but having already spread and damaged significant amounts of crops causing rejection to export to South Africa, Europe and the United States of America.



**Figure 16** Photo 1 *Bactrocera invadens* and Photo 2 *Bactrocera latifrons* Source: Ministry of Agriculture Tanzania



## 6.1 INSPECTION FOR COMPLIANCE

The Competent Authority of importing countries should verify compliance through inspection or audits. Where the Competent Authority has confidence in the verification supplied by the shipping line (or transportation means, air, water or road), it should limit the on-arrival compliance checks.

Where there is no evidence that a checking and cleaning system is in place, and the importing country has reason to believe that risks exist with the containers from a specific country, some means of inspecting imported containers from that country should be established. The risks should be identified by conducting a Pest Risk Analysis and the specific means of inspecting imported containers should be determined by consulting with the Competent Authority of the exporting country and the shipping line. To limit the possible spread of pests, the inspections should be undertaken, and any necessary cleaning carried out, before the container leaves the port area. This may depend on the facilities and requirements of the port involved.

For non-compliance, the importing country may take phytosanitary action as noted in section 5.1.6.1 of ISPM 20 (2004) Guidelines on a phytosanitary import regulatory system. This should follow the requirements of ISPM 13 (2001) Guidelines on the notification of non-compliance and emergency action.

Example of an importing country requirements are drawn from Australia (IRA Handbook 2011).

The authority for handling biosecurity risk is Biosecurity Australia. For import to Australia, a proposal must be submitted in writing. The proposal should provide relevant scientific and other information to the extent available.

After receiving an import proposal, Biosecurity Australia will examine the completeness of the documentation and inform the proposer of any deficiencies.

The scientific information may be provided by the person or body proposing the import (the proposer), the Competent Authority of the exporting country, or may already be available to Biosecurity Australia through scientific literature or other sources.

The required information may include, but is not limited to, distribution records of pests associated with particular plants, or information on the incidence of animal diseases or treatments the goods have undergone. The following information about the proposed import must be provided:

- scientific name (including order, suborder, genus, species, sub-species and variety, where applicable)
- common name(s)



- Country (ies), zone(s), state(s), region(s), province(s), district(s) of origin, where applicable.

In some cases, applicants may be required to supply additional information concerning the good to be imported, such as that listed below, before an import proposal can be considered valid. Additional information that may be required includes production and processing methods.

Proposals to import plants or plant goods may also require more specific information, including:

- Pest and disease information
- Plant pest(s) of interest
- Scientific names of plant pests, including authors
- Classification of plant pests (order, family etc.)
- Export destinations/existing protocols
- Production area in country of origin
- Cultivation methods
- Pest management and general surveillance programs
- Sourcing goods from pest free zones and/or other existing relevant phytosanitary measures
- Harvesting methods and post-harvesting activities
- internal legislative restrictions (pest free areas) or other domestic legislation
- Synonyms commonly used
- Hosts (including variety if relevant)
- Plant parts attacked
- Symptoms/damage
- Distribution (within country)
- Prevalence (common, occasional or rare).

Biosecurity Australia then determine when there is sufficient information to proceed with a risk analysis. If the required information is not available, special surveys and monitoring may be needed. Without all relevant information, it will not be possible for a risk analysis to be considered for Biosecurity Australia's active work program.



### **Exercise: A hypothetical case study**

A Small Café Business in Yaoundé wants to expand to a neighbouring town where the permitting regulations are as indicated below:

- Food must be safe, i.e. it must not be injurious to health or unfit for human consumption.
- Labelling, advertising and presentation of food must not mislead consumers.
- Food businesses must be able to identify their suppliers of ingredients or food-producing animal's as well as their customers/ businesses they have supplied with products, and make available this information on demand.
- Unsafe food must be withdrawn from sale or recalled from consumers if it has already been sold.

Seeking to do a dry run with their product, the Café owners conduct an open air café day in the neighbouring city selling hot beverages and packaged and branded pastries with their label. A day after the open air café was held a local newspaper beyond the city where the open air café was conducted publishes a story on children afflicted with stomach aches from spoiled food and shows the Cafés branded products without indicating that the Café is responsible.

**Assignment:** Develop an information brief refuting or confirming responsibility of the café for the afflicted children elaborating the potential pathways from production to distribution of spread of a potential toxic substance in their product.

Propose recommendations to the food safety regulator on what needs to be done to prevent such an event from happening.

#### ➤ **Expected Response:**

The groups would have to define the production pathway and best practice sanitary mechanisms in existence to ascertain the sanitary conditions and identify loopholes that would allow for a toxic agent to come into contact with the products and be exposed to consumers.



## 6.2 RECOMMENDED READING:

- i. SCBD (2000). Cartagena Protocol on Biosafety. ISBN-92807-1924-6
- ii. SCBD (2016). Guidance on Risk Assessment of Living Modified Organisms and Monitoring in the Context of Risk Assessment.
- iii. MINEPDED (2015). Report on the formulation of risk management strategies for biological invasion pathways in Cameroon. Consultant Report prepared under the UNEP/GEF Cameroon Biosecurity Project "Development and Institution of a National Monitoring and Control System (Framework) for Living Modified Organisms (LMOs) and Invasive Alien Species (IAS)" as part of the Cameroon Biosecurity Project. Yaoundé, Cameroon.
- iv. MINEPDED (2015). Black and white lists of priority invasive species and management approaches for Cameroon. Report prepared by John Mauremootoo (John@InspiralPathways.com) and Augustine Bokwe (v\_cefai2002@yahoo.co.uk) under the supervision of The Project Component 4 Interministerial Task Team (Task team institutions: MINRESI, MINEPDED, MINEPIA, MINADER), as part of the Cameroon Biosecurity Project. MINEPDED, P.O. Box 320, Yaoundé, Cameroon to MINEPDED under the UNEP/GEF Cameroon Biosecurity Project: Development and Institution of a National Monitoring and Control System (Framework) for Living Modified Organisms (LMOs) and Invasive Alien Species (IAS). Yaoundé, Cameroon.
- v. Codex Alimentarius Commission <https://www.fao.org/fao-who-codexalimentarius>
- vi. IPPC (2013) Draft standard on minimizing pest movement by sea containers
- vii. The effects of Banana *Xanthomonas* wilt (BXW) on food security and the people's livelihood: The case of Nshamba and Rubale divisions in Kagera region, Tanzania, KADETFU, CDI, September, 2013



# **MODULE EIGHT**

## **INTRODUCTION PATHWAYS MANAGEMENT**



**Purpose:** To expose the participants to the Introduction pathways management in Cameroon – institutions and capacities. Furthermore to provide indications of International institutions, organisations and networks that can assist Cameroon in the CAS.

**Suggested Delivery Time:** 1 – 2hrs.

**Format:** PowerPoint Presentations, Exercise Plenary discussion

**Expected Outcomes:** At the end of the session, participants will:

- Be informed of the CBD toolkit for IAS
- Be able to describe with examples the international pathway categories and management options

The CBD toolkit on IAS is to be presented to the participants with the six categories of pathways i.e. Release; Escape; Transport-Contaminants; Transport-Stowaway; Corridors; and Unaided (natural dispersals).

The GIASI tool kit explains CBD Article 8h, CBD COP decisions on invasive alien species and outlines existing international regulatory framework related to invasive alien species to assist and support the Parties develop IAS their management policies, their national biosafety action plans (NBSAPs), national invasive species strategies and action plans and make progress in the achievement of Aichi Biodiversity Target 9.

The toolkit consists of three modules, the first outlining the basic concepts of IAS, related terminology, the relevant articles of the Convention on Biological Diversity and decisions of the Conference of Partners related to invasive alien species. The second module is on the international premises for IAS risk assessment and management and the third module is on national contextualisation. These concepts will now be examined briefly

## 7.1 IAS

Invasive species have been recognized globally as a major threat to biodiversity (the collected wealth of the world's species of plants, animals and other organisms) as well as to agriculture and other human interests. It is very difficult to identify 100 invasive species from around the world that really are "worse" than any others. Species and their interactions with ecosystems are very complex. Some species may have invaded only a restricted region, but have a high probability of expanding and causing further great damage (e.g.

*Boiga irregularis*: the brown tree snake). Other species may already be globally widespread, and causing cumulative but less visible damage. Many biological families or genera contain large numbers of invasive species, often with similar impacts. Species were selected for the list according to two criteria: their serious impact on biological diversity and/or human activities, and their illustration of important issues surrounding biological invasion. To ensure the



inclusion of a wide variety of examples, only one species from each genus was selected. Absence from the list does not imply that a species poses a lesser threat (IUCN-IAS Specialist Species Group).

#### Guiding principles for implementation of Article 8h of the CBD:

Article 8(h) of the CBD states that, 'Each contracting Party shall, as far as possible and as appropriate, prevent the introduction of, control or eradicate those alien species which threaten ecosystems, habitats or species'. In 2002 the conference of parties accepted to promote and implement the Guiding Principles as a guidance to implement Article 8h.

The Guiding Principles are not binding, but Parties to the CBD are urged to reflect the Guiding Principles to develop national invasive alien species strategies and action plans as a part of National Biodiversity Strategies and Action Plans (NBSAPs). There are 14 Guiding Principles that articulate as follows:

1. *Precautionary approach* - If an alien species has a suspected risk of causing harm to the ecosystem, habitat or native species, the proof of burden about "the introduction is NOT harmful" falls on those who introduce the alien specie
2. *Three stage hierarchical approach* - Response to IAS based on prevention as the first line of defense, early detection and rapid action when prevention fails, eradication if feasible and, finally, management and containment of established invasions.
3. *Ecosystem approach* - Management of invasive species is not solely based on removal or eradication of invading species but also considers the invaded ecosystem, involves communities and stakeholders and adopts a multi-sectoral approach. The integrated management of land, water and living resources will effectively support the implementation of the CBD and its Strategic Plan for Biodiversity 2011-2020.
4. *State responsibility* - Provision of measures that falls in each responsible authority on environment, agriculture, trade, transport, industry, science, health can reduce risks and impact of IAS, including pests and diseases
5. *Education and public awareness* - Citizens and stakeholders of biodiversity can take effective steps with sound information on IAS, pests and diseases, collectively.
6. *Border control and quarantine measures* - International trade, transport and tourism are pathways of IAS, including pests and diseases. Border controls and quarantine measures for pests and diseases can include IAS in the work of border controls to stop entries of IAS and suspected alien species.
7. *Exchange of information* - Surveillance (monitoring and reporting on invasions) is fundamental mechanism to manage IAS, including pests and diseases. Information on



invasive species with correct taxonomic name and geographic reference is critical importance for prevention.

8. *Cooperation including capacity building* - Cooperation with neighbouring countries where are sharing transport pathways reduce opportunities of introduction and spread of invasive alien species. Shared efforts can fill the gap of capacity if neighbouring country has the needed expertise or build capacity in mutual interests.
9. *Intentional introduction* - Intentional introduction of the known invasive species in a recipient/importing country could be intercepted by the national authority. Suspected alien species could be subjected to appropriate risk analysis process prior to importation/introduction (N.B: the burden of proof is with the proposer of the introduction or be assigned as appropriate by the recipient State)
10. *Unintentional introduction* - Common pathways of unintentional introduction include: escape from confined condition; transport-stowaway (e.g. ballast water, bio-fouling, and hitch-hikers); transport-contamination (e.g. wood packaging, contaminated timber, soil or media). Appropriate pathway management measures need to be in place
11. *Mitigation of impacts* - Once the establishment of an invasive alien species has been detected, States, individually and cooperatively, should take appropriate steps such as eradication, containment and control, to mitigate adverse effects.
12. *Eradication* - The best opportunity for eradicating IAS is in the early stages of invasion, when populations are small and localized; hence, early detection systems focused on high-risk entry points can be critically useful while post-eradication monitoring may be necessary.
13. *Containment* - When eradication is not feasible, limiting the spread (containment) of invasive alien species is an appropriate strategy in cases where the range of the organisms or of the population is small enough. Regular monitoring is essential and it needs to be linked with rapid response to eradicate in any new area of infestation.
14. *Control* - When complete eradication nor containment is possible, reducing the damage caused, as well as reducing the number of the invasive alien species would be an option

The CBD encourages that to facilitate implementation of the Guiding Principles, and when developing, revising and implementing national biodiversity strategies and action plans, that national policies, legislation and institutions are reviewed in light of the Guiding Principles to identify gaps, inconsistencies and conflicts, and, as appropriate, adjust or develop policies, legislation and institutions.



## 7.2 MANAGEMENT OF INTRODUCTION PATHWAYS:

Aichi target 9 stipulates that by 2020, the Parties are expected to achieve the target with following actions:

- Identify and prioritise IAS and pathways;
- Prioritize species that are to be controlled or eradicated;
- Measures are in place to manage pathways to prevent their introduction and establishment

For Cameroon the black and white list identifies and prioritises the IAS to be controlled (MINEPDED 2015).

Experts have identified six different pathways: Release; Escape; Transport-Contaminants; Transport-Stowaway; Corridors; and Unaided (natural dispersals) that would facilitate the introduction of IAS (See Fig 8-1).

Regulation of the deliberate **release** pathway often places responsibility on the *applicant* for release of an alien species who, in order to secure a permit for such release, must demonstrate that the risk of invasiveness is minimized.

ISPM 3 facilitates the safe export, shipment, import and release of biological control agents and other beneficial organisms by providing guidelines for all public and private bodies involved, particularly through the development of national legislation where it does not exist. The standard describes the need for cooperation between importing and exporting countries so that:

- Benefits to be derived from using biological control agents or other beneficial organisms are achieved with minimal adverse effects;
- Practices which ensure efficient and safe use while minimizing environmental risks due to improper handling or use are promoted.

The standard outlines guidelines to:

- encourage responsible trade practices
- assist countries to design regulations to address the safe handling, assessment and use of biological control agents and other beneficial organisms
- provide risk management recommendations for the safe export, shipment, import and release of biological control agents and other beneficial organisms
- promote the safe use of biological control agents and other beneficial organisms



Regulation of the **escape** from confinement pathway often places responsibility on the *importer* of an alien species who must demonstrate that the risk of escape is minimized or that the consequences of escape are not important (i.e., the species is not invasive). Management of the escape pathway also often requires cooperation of the industry (e.g., pet shops) and the general public (e.g., pet owners). ISPM21 provides guidelines for reducing risks associated with plant imports (horticulture/agriculture), and ISPM 25 addresses risks of escapes from the consignment on transit. For animals the FAO Technical guidelines for responsible fisheries (No 1- 13 including supplements) give guidance on risk assessment and management of exotic organisms associated with aquaculture activities.

Regulation of the **contaminant** pathway is very closely tied to international trade, and international standards play an important role in balancing the need for control with the need to avoid undue trade disruption. The *importing* country may use border controls and quarantine procedures. The *exporter* will often take measures to demonstrate that sanitary and phytosanitary standards are respected. Guidelines that provide countries with information on how to handle contaminant pathways include:

- Contaminated bait - FAO Tech Guidelines 13
- Contaminant on animals - OIE Animal Health Codes
- Contaminant on plants/timber/nursery materials - ISPM 36 and other ISPMs for regulated non-quarantine pests
- Seed contaminant - the OECD schemes for the varietal certification of seeds
- ISPM 10 guides on prevention of contamination in the products for exporting materials

The carrier plays a major role on managing the **stowaway** pathway to reduce the risks from transport vectors. The Guiding Principle No.11 indicates that common pathways leading to unintentional introductions need to be identified and appropriate provisions to minimize such introductions should be in place. Sectoral activities, such as fisheries, agriculture, forestry, horticulture, shipping (including the discharge of ballast waters), ground and air transportation, construction projects, landscaping, aquaculture including ornamental aquaculture, tourism, the pet industry and game-farming, are often pathways for unintentional introductions.

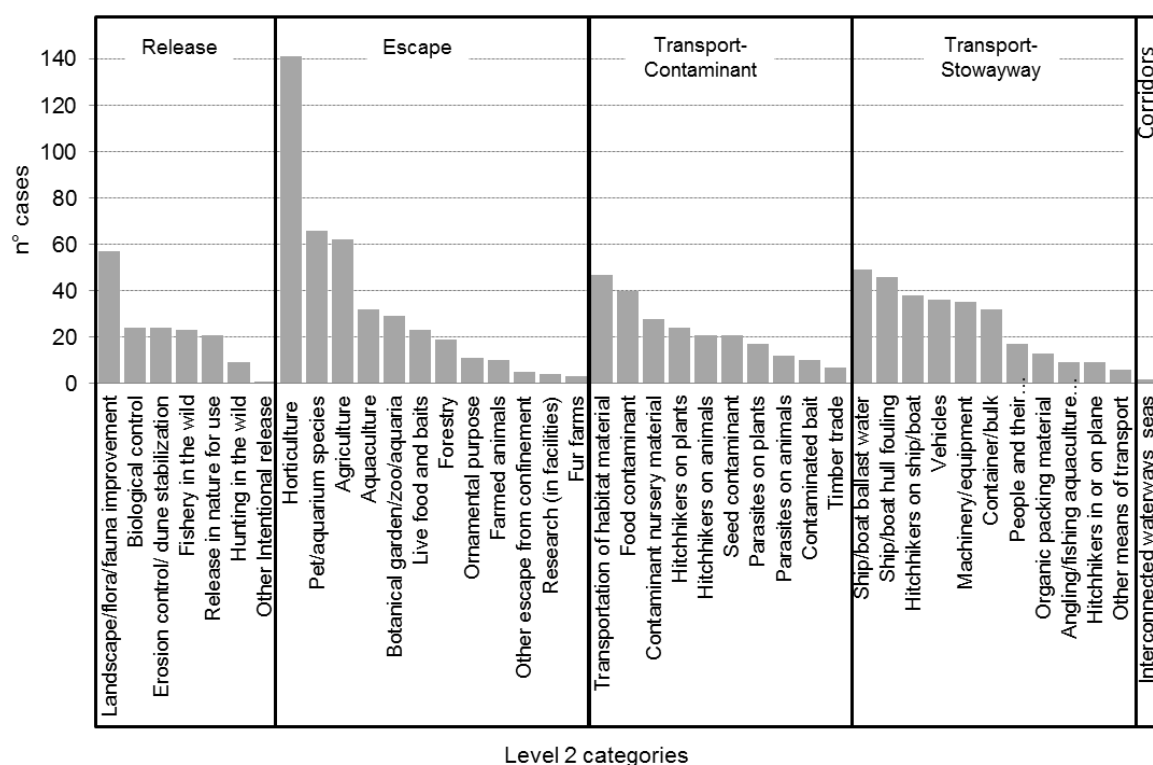
Environmental impact assessment of such activities should address the risk of unintentional introduction of invasive alien species. Wherever appropriate, a risk analysis of the unintentional introduction of invasive alien species should be conducted for these pathways.

A number of tools are available to manage or minimize the risks associated with ship/boat ballast water and ship/boat hull fouling such as the IMO Guidelines on: ballast water and bio-fouling and the ISPM 15 on Organic packaging materials.



For the, **corridors** and **natural spread from a neighbouring region**, monitoring for early detection and rapid response to evidence of species occurrence and spread are important.

ISPM 30 provides guidance on surveillance and measures to maintain low prevalence levels of targeted species such as the fruit fly, which can be considered as a hint to manage natural spread of other small organisms, as appropriate. Close collaboration with national plant protection organization (contact point for the IPPC) is a good practice.



**Figure 17** Common pathways were categorized by experts in six groups: Release; Escape; Transport-Contaminants; Transport-Stowaway; Corridors; and Unaided (natural dispersals) [source: UNEP/CBD/SBSTTA/18/9/Add.10]

The CAS for this would be dependent on the pathway to provide assurance on the adequacy of the risk analysis done for the pathway (See MINEPDED 2017 on Pathway, Species and Products Risk Analysis) and assess for compliance on risk management measures conducted.



### **Exercise:**

#### Background

The precise native range of *Helicoverpa armigera* (common names: cotton bollworm, corn earworm, Old world bollworm) is unknown, but as a migrant species, it is likely to have been able to naturally colonize a wide range of suitable habitats in Africa, Asia and Southern Europe.

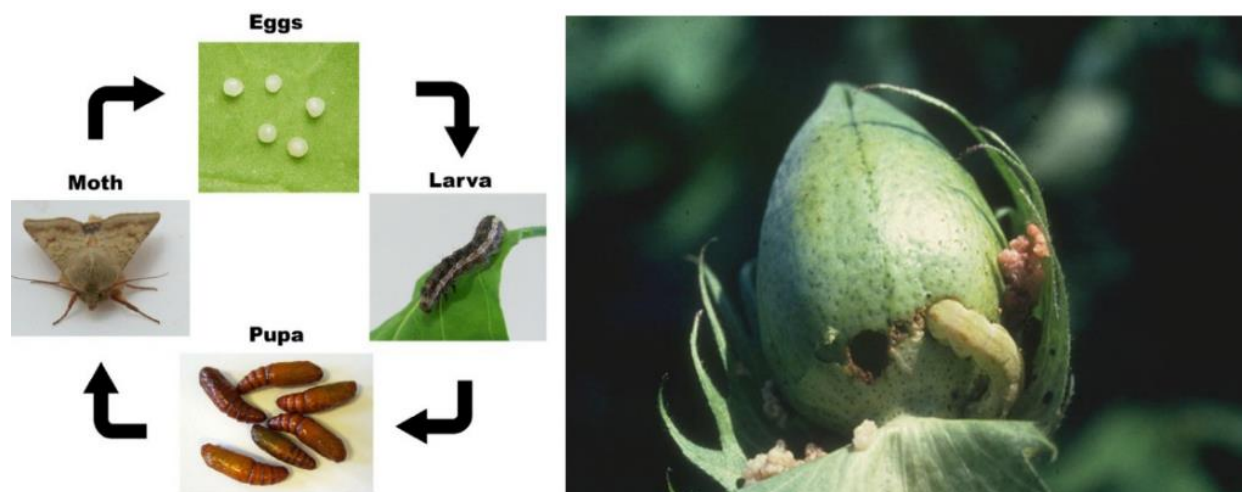
*H. armigera* is a moth that as a caterpillar feeds on a wide range of important cultivated crops such as tomato, pepper, pigeon pea, chickpea, sorghum, lettuce, okra and many other plants. It is very widely distributed in many cropping systems in Cameroon where it is best known as a pest of cotton.

#### ❖ Questions

What are the potential pathways for spread of *H. armigera* and how could this be avoided from one region in Cameroon to another? Who would be responsible?

#### ➤ **Expected Response:**

The moth can fly long ranges, it can be carried by the wind, its eggs can be transported with the harvest from one location to the other. Insecticides can be used to spray the insects, but this may be expensive and environmentally unacceptable.



**Figure 18** The life cycle of *H. armigera* and the larvae on a cotton ball. (Source Stevens et al)



### 7.3 RECOMMENDED READING:

- i. MINEPDED (2017). Trainers' Manual in Inspection Systems and Methods Including Treatments. Report prepared by Phumzile Zanele Dlamini (phumiedlam@gmail.com) and Mary Fosi Mbantenkhu (Maryfosi@yahoo.com) under the supervision of the Project Component 3 Inter-ministerial Task Team (Task team institutions: MINADER, MINEPDED, MINEPIA, MINRESI), as part of the Cameroon Biosecurity Project. MINEPDED, P.O. Box 320, Yaoundé, Cameroon to MINEPDED under the UNEP/GEF Cameroon Biosecurity Project: Development and Institution of a National Monitoring and Control System (Framework) for Living Modified Organisms (LMOs) and Invasive Alien Species (IAS). Yaoundé, Cameroon.
- ii. MINEPDED (2017). Manual on Risk Analysis Products/ Pathways and Species, submitted to MINEPDED under the UNEP/GEF Cameroon Biosecurity Project: Development and Institution of a National Monitoring and Control System (Framework) for Living Modified Organisms (LMOs) and Invasive Alien Species (IAS)
- iii. ATOOLKIT to facilitate Parties to achieve Aichi Biodiversity Target 9 on invasive alien species  
(Prototype) GIASI Partnership Secretariat of the Convention on Biological Diversity.
- iv. MINEPDED (2015). Black and white lists of priority invasive species and management approaches for Cameroon. Report prepared by John Mauremootoo (John@InspiralPathways.com) and Augustine Bokwe (v\_cefai2002@yahoo.co.uk) under the supervision of The Project Component 4 Interministerial Task Team (Task team institutions: MINRESI, MINEPDED, MINEPIA, MINADER), as part of the Cameroon Biosecurity Project. MINEPDED, P.O. Box 320, Yaoundé, Cameroon to MINEPDED under the UNEP/GEF Cameroon Biosecurity Project: Development and Institution of a National Monitoring and Control System (Framework) for Living Modified Organisms (LMOs) and Invasive Alien Species (IAS). Yaoundé, Cameroon.
- v. International Standards for Phytosanitary Measures No. 1 to 24 (2005 edition)
- vi. FAO Technical guidelines for responsible fisheries (No 1- 13 including supplements)
- vii. Biotechnological Approaches for the Control of Insect Pests in Crop Plants Jackie Stevens, Kerry Dunse, Jennifer Fox, Shelley Evans and Marilyn Anderson (Research Gate) <http://dx.doi.org/10.5772/46233>



# APPENDICES

## A.1 Pre-course Assessment

1. What do you understand of the concept Commodity Systems Audit?

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2. Have participated in/ observed/ read about Commodity Systems Audits?

a) Yes

b) No

Number of Responses

Yes	No

If you answered yes, can you elaborate?

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.....

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.....

.....

3. To what extent do you expect this training will make a difference and or add responsibilities to your current job?

1

2

3

4

5

No

Tremendous

Difference

Difference

1	2	3	4	5
		5	5	9

Comments:

- .....
- .....
- .....
- .....
- .....



4. What are the three important **things [or topics]** that you expect to learn during this training?

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5. What kind of material and or exercises do you anticipate as being necessary to ensure learning is effective for the course?

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6. Are you aware of the Cartagena Protocol?

Yes	No

7. Do you know what an invasive alien species is? Can you give an example from Cameroon?

Yes	No



## A.2 Course Evaluation

1. Please complete the following by checking the column of your choice.

PLEASE RATE THE QUALITY OF THE FOLLOWING	POOR	FAIR	GOOD	VERY GOOD	EXCELLENT
Overall Content of Course					
PowerPoint Slides					
Presentation of Material by Trainers					
Participant / Group Activities					
Facilitation of Activities by Trainers					

2. Think about what you *already knew* and what you *learned during* this training about Commodity Audit Systems. Then evaluate your knowledge in each of the following topic areas **Before** and **After** this training.

1 = No knowledge or skills

3 = Some knowledge or skills

5 = A lot of knowledge or skills

3.1.3.1.1.1 BEFORE TRAINING					SELF-ASSESSMENT OF YOUR KNOWLEDGE AND SKILLS RELATED TO:	AFTER TRAINING				
1	2	3	4		Background, Basic Concepts and Legal aspects of Biosecurity	1	2	3	4	5
1	2	3	4	5	Module 1: Overview of the Commodity Audit Process	1	2	3	4	5
1	2	3	4	5	Module 2: Biological Risk Management Measures and Audit Requirements (Production)	1	2	3	4	5
1	2	3	4	5	Module 3: Biological Risk Management Measures and Audit Requirements (Post Harvest)	1	2	3	4	5
1	2	3	4	5	3.1.3.1.1.1.1.1.1 Module 4: Biological Risk Management Measures and Audit Requirements (In transit)	1	2	3	4	5
1	2	3	4	5	Module 5: Biological Risk Management Measures and Audit Requirements (Point of entry)	1	2	3	4	5
1	2	3	4	5	Module 6: Biological Risk Management Measures and Audit Requirements (Post entry)	1	2	3	4	5
1	2	3	4	5	Module 7: Introduction Pathways Management	1	2	3	4	5



3. To what extent do **you** feel prepared to conduct a training for officers conducting commodity systems audits?

1	2	3
Not At All	Somewhat	Well
Prepared	Prepared	Prepared

If you do NOT feel prepared, please explain briefly why not.

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4. To what extent do you feel prepared to develop and conduct exercises as part of training on commodity systems audits?

1	2	3
Not At All	Somewhat	Well
Prepared	Prepared	Prepared

If you do NOT feel prepared, please explain briefly why not.

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