





# **CAMEROON BIOSECURITY PROJECT**

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

# NATIONAL TRAINING COURSE NOTES ON PEST RISK ANALYSIS (INCLUDING LMO RISK ANALYSIS) – DEFINITIONS, USAGE AND MANAGEMENT APPROACHES FOR CAMEROON

These Course notes have been produced with the support of UNEP/GEF and the Government of Cameroon via the Ministry of Environment, Protection of Nature and Sustainable Development.

#### Under the Supervision of:

Project Component Three Taskforce (MINESUP)

&

The Biosecurity Project Coordination Unit (MINEPDED)









May 2017

# **TABLE OF CONTENTS**

TABLE OF CONTENTS	II
ACRONYMS AND ABBREVIATIONS	vi
LIST OF FIGURES	vii
LIST OF ANNEXES	viii
ACKNOWLEDGEMENTS	ix
SUMMARY	xv
1. INTRODUCTION	1
1.1. Context and Justification	2
1.2. Presentation of the Project and Overall Objective of Project	2
1.3. Rationale of the activity	3
1.4. Overall/specific objective of the activity	4
1.5. Methodology of the activity	4
1.6. Structure of modules	5
1.7. Definition of key terms	6
2. TRAINING MODULES	8
2.1. MODULE 1: PRE-COURSE KNOWLEDGE ASSESSMENT AND INTRODUCTIC PEST/LIVING MODIFIED ORGANISMS	<b>N TO</b>
2.1. MODULE 1: PRE-COURSE KNOWLEDGE ASSESSMENT AND INTRODUCTION PEST/LIVING MODIFIED ORGANISMS	<b>N TO</b> 9
2.1. MODULE 1: PRE-COURSE KNOWLEDGE ASSESSMENT AND INTRODUCTION PEST/LIVING MODIFIED ORGANISMS	<b>N TO</b> 9 10 10
<ul> <li>2.1. MODULE 1: PRE-COURSE KNOWLEDGE ASSESSMENT AND INTRODUCTION</li> <li>PEST/LIVING MODIFIED ORGANISMS</li> <li>2.1.1. Learning outcomes</li> <li>2.1.2. Importance of module to Biosecurity</li> <li>2.1.3. Content of the module</li> </ul>	<b>N TO</b> 9 9 10 10
<ul> <li>2.1. MODULE 1: PRE-COURSE KNOWLEDGE ASSESSMENT AND INTRODUCTION</li> <li>PEST/LIVING MODIFIED ORGANISMS.</li> <li>2.1.1. Learning outcomes</li></ul>	<b>N TO</b> 9 10 10 10 10
<ul> <li>2.1. MODULE 1: PRE-COURSE KNOWLEDGE ASSESSMENT AND INTRODUCTION</li> <li>PEST/LIVING MODIFIED ORGANISMS.</li> <li>2.1.1. Learning outcomes</li></ul>	<b>N TO</b> 9 10 10 10 10
<ul> <li>2.1. MODULE 1: PRE-COURSE KNOWLEDGE ASSESSMENT AND INTRODUCTION PEST/LIVING MODIFIED ORGANISMS.</li> <li>2.1.1. Learning outcomes</li></ul>	<b>N TO</b> 9 10 10 10 10 10 11
<ul> <li>2.1. MODULE 1: PRE-COURSE KNOWLEDGE ASSESSMENT AND INTRODUCTION PEST/LIVING MODIFIED ORGANISMS.</li> <li>2.1.1. Learning outcomes</li></ul>	<b>N TO</b> 9 10 10 10 10 10 11 516
<ul> <li>2.1. MODULE 1: PRE-COURSE KNOWLEDGE ASSESSMENT AND INTRODUCTION PEST/LIVING MODIFIED ORGANISMS.</li> <li>2.1.1. Learning outcomes</li></ul>	<b>N TO</b> 9 10 10 10 10 10 11 516 17
<ul> <li>2.1. MODULE 1: PRE-COURSE KNOWLEDGE ASSESSMENT AND INTRODUCTION PEST/LIVING MODIFIED ORGANISMS.</li> <li>2.1.1. Learning outcomes</li> <li>2.1.2. Importance of module to Biosecurity.</li> <li>2.1.3. Content of the module</li> <li>2.1.3.1. Pre-workshop knowledge assessment.</li> <li>2.1.3.2. Objectives, reflection on participant's expectation and fears.</li> <li>2.1.3.3. Developing a shared understanding of key terms</li> <li>2.1.3.4. Introduction to P/LMO Risk Analysis, National and International Requirements</li> <li>2.1.4. Requirements for delivery of the module.</li> <li>2.2. MODULE 2: INTERNATIONAL FRAMEWORK FOR DECISION-MAKING NATIONAL OBLIGATIONS.</li> </ul>	N TO 9 10 10 10 10 10 10 11 5 11 5 17 AND 19
<ul> <li>2.1. MODULE 1: PRE-COURSE KNOWLEDGE ASSESSMENT AND INTRODUCTION PEST/LIVING MODIFIED ORGANISMS.</li> <li>2.1.1. Learning outcomes</li></ul>	N TO 9 10 10 10 10 10 10 10 11 5 11 5 17 AND 19 20
<ul> <li>2.1. MODULE 1: PRE-COURSE KNOWLEDGE ASSESSMENT AND INTRODUCTION PEST/LIVING MODIFIED ORGANISMS.</li> <li>2.1.1. Learning outcomes</li></ul>	N TO 9 10 10 10 10 10 10 10 10 11 5 11 5 11

2.2.3.1. International Frameworks21
2.2.3.2. National Frameworks22
2.2.4. Requirements for delivery of the module24
2.3. MODULE 3: NATIONAL CONTEXT - DEVELOPMENT PLANS AND TRADE PATTERN OF CAMEROON
2.3.1. Learning outcomes
2.3.2. Importance of the module to Biosecurity26
2.3.3. Content of the module26
2.3.4. Requirements for delivery of the module
2.4. MODULE 4: WORLD TRADE ORGANIZATION/SANITARY PHYTOSANITARY MEASURES, INTERNATIONAL PLANT PROTECTION CONVENTION AND OTHER INTERNATIONAL AGREEMENTS
2.4.1. Learning outcomes
2.4.2. Importance of the module to Biosecurity
2.4.3. Content of the module
2.4.4. Requirements for delivery of the module
2.5 MODULE 5. INTERNATIONAL PLANT PROTECTION CONVENTION AND
INTERNATIONAL STANDARDS DEVELOPMENT
INTERNATIONAL STANDARDS DEVELOPMENT.       .36         2.5.1. Learning outcomes       .37         2.5.2. Importance of the module to Biosecurity       .37         2.5.3. Content of the module       .37         2.5.4. Requirements for delivery of the module       .39         2.6. MODULE 6: PEST/LIVING MODIFIED ORGANISM RISK ANALYSIS INTERNATIONAL STANDARDS AND THEIR APPLICATIONS       .40         2.6.1. Learning outcomes       .41
INTERNATIONAL STANDARDS DEVELOPMENT       36         2.5.1. Learning outcomes       37         2.5.2. Importance of the module to Biosecurity       37         2.5.3. Content of the module       37         2.5.4. Requirements for delivery of the module       39         2.6. MODULE 6: PEST/LIVING MODIFIED ORGANISM RISK ANALYSIS INTERNATIONAL STANDARDS AND THEIR APPLICATIONS       40         2.6.1. Learning outcomes       41         2.6.2. Importance of the module to Biosecurity       41
INTERNATIONAL STANDARDS DEVELOPMENT       36         2.5.1. Learning outcomes       37         2.5.2. Importance of the module to Biosecurity       37         2.5.3. Content of the module       37         2.5.4. Requirements for delivery of the module       39         2.6. MODULE 6: PEST/LIVING MODIFIED ORGANISM RISK ANALYSIS INTERNATIONAL         STANDARDS AND THEIR APPLICATIONS       40         2.6.1. Learning outcomes       41         2.6.2. Importance of the module to Biosecurity       41         2.6.3. Content of the module to Biosecurity       41
INTERNATIONAL STANDARDS DEVELOPMENT       36         2.5.1. Learning outcomes       37         2.5.2. Importance of the module to Biosecurity       37         2.5.3. Content of the module       37         2.5.4. Requirements for delivery of the module       39         2.6. MODULE 6: PEST/LIVING MODIFIED ORGANISM RISK ANALYSIS INTERNATIONAL         STANDARDS AND THEIR APPLICATIONS       40         2.6.1. Learning outcomes       41         2.6.2. Importance of the module to Biosecurity       41         2.6.3. Content of the module to Biosecurity       41         2.6.4. Group exercise 1       43
INTERNATIONAL STANDARDS DEVELOPMENT       36         2.5.1. Learning outcomes       37         2.5.2. Importance of the module to Biosecurity       37         2.5.3. Content of the module       37         2.5.4. Requirements for delivery of the module       39         2.6. MODULE 6: PEST/LIVING MODIFIED ORGANISM RISK ANALYSIS INTERNATIONAL         STANDARDS AND THEIR APPLICATIONS       40         2.6.1. Learning outcomes       41         2.6.3. Content of the module to Biosecurity       41         2.6.4. Group exercise 1       43         2.6.5. Requirements for delivery of the module       43
INTERNATIONAL STANDARDS DEVELOPMENT.       36         2.5.1. Learning outcomes       37         2.5.2. Importance of the module to Biosecurity       37         2.5.3. Content of the module       37         2.5.4. Requirements for delivery of the module.       39         2.6. MODULE 6: PEST/LIVING MODIFIED ORGANISM RISK ANALYSIS INTERNATIONAL       39         2.6.1. Learning outcomes       40         2.6.2. Importance of the module to Biosecurity       40         2.6.3. Content of the module to Biosecurity       41         2.6.4. Group exercise 1       41         2.6.5. Requirements for delivery of the module.       41         2.6.5. Requirements for delivery of the module.       43         2.6.7. MODULE 7: INFORMATION NEEDS FOR PEST/LIVING MODIFIED ORGANISM RISK       46
INTERNATIONAL STANDARDS DEVELOPMENT.       36         2.5.1. Learning outcomes       37         2.5.2. Importance of the module to Biosecurity       37         2.5.3. Content of the module       37         2.5.4. Requirements for delivery of the module.       39         2.6. MODULE 6: PEST/LIVING MODIFIED ORGANISM RISK ANALYSIS INTERNATIONAL         STANDARDS AND THEIR APPLICATIONS       40         2.6.1. Learning outcomes       41         2.6.2. Importance of the module to Biosecurity       41         2.6.3. Content of the module to Biosecurity       41         2.6.4. Group exercise 1       41         2.6.5. Requirements for delivery of the module       43         2.6.5. Requirements for delivery of the module       43         2.6.7. MODULE 7: INFORMATION NEEDS FOR PEST/LIVING MODIFIED ORGANISM RISK       46         2.7.1. Learning outcomes       47

2.7.3. Content of the module	47
2.7.3.1. Group exercise 2	48
2.7.4. Requirements for delivery of the module	48
2.8. MODULE 8: SIMPLIFIED PEST/LIVING MODIFIED ORGANISM RISK AI METHODOLOGY AND APPLICATION	<b>NALYSIS</b> 49
2.8.1. Learning outcomes	50
2.8.2. Importance of the module to Biosecurity	50
2.8.3. Content of the module	50
2.8.3.1. PRA methodology: Plant diseases caused by microorganisms	50
2.8.3.2. PRA methodology: Plant diseases caused by animals	52
2.8.3.3. LMOs risk analysis methodology	52
2.8.4. Requirements for delivery of the module	53
2.9. MODULE 9: PEST/LIVING MODIFIED ORGANISM RISK ANALYSIS METHON AND APPLICATION OF A CAMEROON EXAMPLE.	<b>DOLOGY</b> 54
2.9.1. Learning outcomes	55
2.9.2. Importance of the module to Biosecurity	55
2.9.3. Content of the module	55
2.9.3.1. Practical exercise in the seed laboratory in MINADER	55
2.9.3.2. Plant Health and Pest Risk Inventory in Cameroon	55
2.9.3.3. Case study: LMO Bt cotton and risk analysis in Cameroon	56
2.9.4. Requirements for delivery of the module	56
2.10. MODULE 10: PRA/GMOS, BIO-CONTROL AGENTS AND NA ADMINISTRATION ARRANGEMENTS	<b>ATIONAL</b> 58
2.10.1. Learning outcomes	59
2.10.2. Importance of the module to Biosecurity	59
2.10.3. Content of the module	59
2.10.3.1. Treatment options for animals (insect, nematodes) as pests	59
2.10.3.2. Treatment options for microorganisms (protists, fungi, bacteria & viruses)	as pests 59
2.10.3.3. Management options for LMOs	59
2.10.4. Requirements for delivery of the module	60
2.11. MODULE 11: NATIONAL NEEDS ANALYSIS TO UNDERTAKE PRA/LM ANALYSIS	<b>10 RISK</b>

2.11.1. Learning outcomes	63
2.11.2. Importance of the module to Biosecurity	63
2.11.3. Content of the module	63
2.11.3.1. Roles and Responsibilities, Requirements, Technical Skills, Soft Skills	63
2.11.3.2. Requirements for P/LMO Risk Analysis: Enabling environment, reporting documents	, 63
2.11.4. Requirements for delivery of the module	64
2.12. MODULE 12: POST-COURSE KNOWLEDGE ASSESSMENT	66
2.12.1. Importance of the module to Biosecurity	67
2.12.2. Content of the module	67
2.12.3. Requirements for delivery of the module	67
3. REFERENCES	68
4. ANNEXES	73

## ACRONYMS AND ABBREVIATIONS

ACRONYM/	FULL NAME
ABBREVIATION	
ANOR	Agency for Norms and Quality in Cameroon
CBD	Convention on Biological Diversity
CBP	Cameroon Biosecurity Project
CPB	Cartagena Protocol on Biosafety
FAO	Food and Agriculture Organization
GISP	Global Invasive Species Programme
IAS	Invasive Alien Species
IMO	International Maritime Organisation
IRAD	Institute of Agricultural Research for Development
IPPC	International Plant Protection Convention
IUCN	International Union for Conservation of Nature
LANAVET	National Veterinary Laboratory
LMOs	Living Modified Organisms
MINADER	Ministry of Agriculture and Rural Development
MINEE	Ministry of Water Resources and Energy
MINEPDED	Ministry of Environment, Protection of Nature and Sustainable
	Development
MINPOSTEL	Ministry of Post and Telecommunications
MINFOF	Ministry of Forestry and Wildlife
MINEPAT	Ministry of Economy, Planning and Regional Development
MINEPIA	Ministry of Livestock, Fisheries and Animal Industries
MINMIDT	Ministry of Mines, Industry and Technological Development
MINRESI	Ministry of ScientificResearch and Innovation
MINESUP	Ministry of Higher Education,
MINSANTE	Ministry of Public Health
MINTOUR	Ministry of Tourism
MINCOMMERCE	Ministry of Commerce
NRSAP	National Biodiversity Strategy and Action Plan
NPPO	National Plant Protection Organization
	U U
OIE	World Organization for Animal Health
OCEAC	Organization of Coordination for the Fight against Endemic
	Diseases in Central Africa
PRA	Pest Risk Analysis
SODEPA	Animal Products Development and Exploitation Corporation
ТоТ	Training of Trainers'
WTO	World Trade Organization

#### LIST OF FIGURES

- Figure 1: Components of the Cameroon Biosecurity Project
- Figure 2: Examples of Plant Pests
- Figure 3: More examples of Plant Pests
- Figure 4: Some invasive alien species that are found in Cameroon
- Figure 5: Some GM crops that are in the world market alongside their non GM counterparts
- Figure 6: An illustration of risk
- Figure 7:.Some touristic attractions in Cameroon
- Figure 8: Keys services involved in border related prevention of pests, IAS and LMOs
- Figure 9: Border control pots in Cameroon
- Figure 10: World Trade Organization member states
- Figure 11: Structure of the World Trade Organization
- Figure 12: Relationship between IPPC and other Plant protection organizations
- Figure 13: Illustration of the stages involved in pest risk analysis
- Figure 14: Risk estimation matrix
- Figure 15: Different ways in which plant diseases are disseminated
- Figure 16: Halo blight of beans caused by *Pseudomonas syringae*
- Figure 17: Life cycle of a nematode in soybeans roots

#### LIST OF ANNEXES

- Annex 1: An Example of the Activity Plan for the Training Workshop
- Annex 2: Glossary of Key Terms
- Annex 3: Pre- course Evaluation Questionnaire
- Annex 4: Power point presentation slides for Module 1
- Annex 5: Power point presentation slides for Module 2
- Annex 6: Power point presentation slides for Module 3
- Annex 7: Power point presentation slides for Module 4
- Annex 8: Power point presentation slides for Module 5
- Annex 9: Power point presentation slides for Module 6
- Annex 10: Power point presentation slides for Module 7
- Annex 11: Power point presentation slides for Module 8
- Annex 12: Power point presentation slides for Module 9
- Annex 13: Power point presentation slides for Module 10
- Annex 14: Power point presentation slides for Module 11
- Annex 15: Post- course Evaluation Questionnaire

#### ACKNOWLEDGEMENTS

This national training was conducted as part of UNEP/GEF Project number: GFL/3651 titled "Development and Institution of a National Monitoring and Control System (Framework) For Living Modified Organisms (LMOs) and Invasive Alien Species (IAS)", known as The Cameroon Biosecurity Project. The Ministry of Environment, Protection of Nature and Sustainable Development (MINEPDED) is the Project National Executing Agency. This training course notes have been prepared for MINEPDED.

The authors also acknowledge the funding support of the Global Environment Facility (GEF), the technical and supervisory support of the Ministry of Environment, Protection of Nature and Sustainable Development (MINEPDED) and the United Nations Environment Programme UNEP.

The authors appreciate the substantial assistance given in the undertaking of this assignment by the following:

Mr. Rigobert Ntep (Project Coordinator), Mr Declan Ambe (Project Technical and Administrative Assistant), Mr Clouvis Ngong (Project Financial & Administrative Assistant), Dr David Mbah (Project Technical Adviser), the Project Component 3 (Capacity Building) Task Team: Dr Wakata Annie – Component Head MINESUP, Mr Wagnoun Valentin –Component Head MINEPDED, and Task Team members: Mr Alain Njike, Mr. Viban Benard Yuven and Yves Bertin Ebale, as well as those who took part in the national training course.

#### DISCLAIMER

The information contained in this publication was, to the best of the authors' knowledge, correct at the time of publication. Images used have not been independently verified so there is the possibility of error. The opinions expressed in this publication do not necessarily reflect those of UNEP, MINEPDED or the organisations represented in the Component 3 Task Team. UNEP, MINEPDED or the organisations represented in the Component 3 Task Team are not responsible for the information provided in this document. These organisations do not make any warranty of any kind, expressed or implied, including, but not limited to, warranties of accuracy, reliability, completeness, or content of such information in this document.

Under no circumstances shall UNEP, MINEPDED or the organisations represented in the Component 3 Task Team be responsible for any loss, damage or liability or expense incurred or suffered which is claimed to have resulted from the use of or reliance upon the information contained in this document, including, but not limited to, any fault error, mistake, omission or defect. Under no circumstances shall these organisations be liable for any direct, indirect, incidental, special, punitive or consequential damages.

## PREFERRED WAY TO CITE THIS PUBLICATION

MINEPDED (2017). National Training Course Notes on Pest Risk Analysis (including LMO risk analysis) –Definitions, Usage and Management Approaches for Cameroon. Prepared and 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.

# CONTACT DETAILS OF AUTHORS

Dieudonné NWAGA (Pr)	Eneke BECHEM (Pr)
Department of Microbiology,	Department of Botany and Plant Physiology,
Faculty of Science/Biotechnology Centre,	Faculty of Science,
University of Yaoundé I, Cameroon	University of Buea, Cameroon.
Tel: +237. 699.931.871	Tel: 677.358.523
E-mail: dnwaga@yahoo.fr	E-mail: tamenekeso@yahoo.co.uk
(National Consultant)	(National Consultant)

# > Members of the Project Coordination Unit:

# Mr. Rigobert Ntep

Cameroon	Biosecurity	Project	Cameroon	Biosecurity	Project		
Coordinator M	linistry of Env	vironment,	Assistant				
Protection of Nature and Sustainable Development CIDE, Yaoundé, Cameroon Tel: +237 677 30 39 32		Ministry of Environment, Protection of Nature and Sustainable Development Yaoundé, Cameroon					
					Tel: +237 677 02 22 85 / 696 86 66 19		
					Email: rntep@yahoo.fr		Email: declanambe@yahoo.co.uk

Mr. Declan Chongwa Ambe

#### Mr. Clouvis Johnbang

Cameroon Biosecurity Project Financial Assistant Ministry of Environment, Protection of Nature and Sustainable Development Yaoundé, Cameroon Tel: +237 675 95 92 97 / 698 09 94 77 Email: clouvisjohnbang@yahoo.com

## Project Technical Advisers:

# Dr. David MbahDr John MauremootooProject Technical AdviserSupporting Project & ProgrammeCameron Academy of SciencesPlanning, Monitoring and EvaluationTel: 677 839 141Phone/Fax: +44 (0)1934 876565Email: dambah@yahoo.co.ukEmail: John@InspiralPathways.comSkype: johnmaure

Website: www.inspiralpathways.com

# > Members of the Component 3 Taskforce

#### Dr. Annie WAKATA

Head Component 3 MINESUP Tel: +237 674 60 03 31 Email: annie\_beya@yahoo.fr

#### Mr. Valentin Wagnoun

Component 3 Co-Lead MINEPDED Tel: +237 677 86 69 58 Email: valiwa1@yahoo.fr

### Mr. Alain Hervey Njike Tchoukwam

Component 3 Support Staff MINESUP Tel: +237 677170084 Email: ahnjike1@yahoo.fr

#### Dr. Roger Noël Iroume

Component 3 Task Team Member Inspector General MINRESI Yaoundé, Cameroon Tel: +237 677335433 Email: iroumerog@hotmail.fr

#### SUMMARY

Biosecurity is a series of measures to protect against the entry, establishment and spread of Invasive alien species (IAS) including living modified organisms that are deleterious to our human, animal and plant health, environment and our economy. It includes protection of Cameroons borders at the sea ports, airports, other entry points and our practices and habits on properties to reduce risk of disease or infestation. In order to achieve this, there must be the establishment of policy and regulatory framework for effective prevention and control of the introduction, establishment and spread of biological invaders. The implementation of sustainable strategies for the risk-based management of priority pathways and species for invasive alien species and living modified organisms is also important. Useful measures like building of capacity to enable the control of the entry, establishment and spread of invasive alien species and management of living modified organisms are paramount. The raising of awareness of key stakeholder groups on risks, impacts and management of invasive alien species and living modified organisms is necessary.

It is in this light that a training workshop is organized with an objective to train participants from the different stakeholder services that are involved in ensuring biosecurity, on pest/LMO risk analysis – definitions, usage and management approaches for Cameroon. This national training of participants is part of Project Component 3 (Capacity Building) of the Cameroon Biosecurity Project (CBP). This is in recognition of the important role of preventing the introduction of invasive species as the first line of defence as part of a risk-based management system for biological invasions and the role that effective inspection systems play.

This is to be achieved by the production of an appropriate plan of activities and delivery of training which is broken down to modules so as to ease the discussions. The modules include;

(1) Pre-course knowledge assessment and introduction to Pest/Living Modified Organisms, during which relevant information on the level of awareness and knowledge of participants on Pest risk analysis is gathered, and a shared understanding of workshop objectives as well as a definition of key terms is developed.

(2) International framework for decision-making and national obligations in which the different international and national organizations involved in biosecurity related issues are introduced. The roles of the different organizations are highlighted.

(3) National context - development plans and trade pattern of Cameroon, in which the Risk pathways and vectors of Invasive Alien Species, Development plans and trade pattern of Cameroon, is elaborated.

(4) WTO/SPS, IPPC and other international agreements, in which a detailed understanding of the functioning of the Sanitary and Phytosanitary Agreement of the World trade organization is ensured. Codex Alimentarius and the International Office of Epizootics are also discussed here.

(5) IPPC and international standards development, in which the role of the International Plant Protection Convention is clearly spelt out with particular emphasis on the different International Standards for Phytosanitary Measures (ISPMs), especially those that deal with Pest risk analysis such as ISPM 1, 2, 11, and 21.

(6) P/LMO Risk Analysis international standards and their applications in which an overview of the protocol for pest risk analysis is discussed using specific examples.

(7) Information needs for P/LMO Risk Analysis which discusses the different sources of information that can be useful during a pest risk analysis.

(8) Simplified P/LMO risk analysis methodology and application, in which, the methodology for risk analysis for LMOs/GMOs based on the Cartagena Protocol and Codex Alimentarius are discussed.

(9) P/LMO risk analysis methodology and application of a Cameroon example, during which data collection and sampling techniques are discussed. The case of Bt Cotton in Cameroon is also examined.

(10) PRA/GMOs, bio-control agents and national administration arrangements, where the different management strategies are examined, general and specific treatment of pests and diseases are also discussed.

(11) National needs analysis to undertake PRA/LMO risk analysis in which the roles and responsibilities, the technical and soft skills as well as the enabling environment for pest risk analysis are discussed in the Cameroon context.

(12.) Post-course knowledge assessment in which the relevant information is gathered from the trainees which will enable the evaluation of the effectiveness of the training.

The national training should run for three to five days. The training methodology includes PowerPoint presentations of each of the different modules, question and answer sessions, and laboratory exercises where necessary. There will be about four exercises for small group discussions, to ensure proper transmission of concepts and effective participation by all trainees. A Practical lab-based activity is developed wherein participants will have the opportunity to see, to touch, to practice, to criticize and audit a laboratory on seed analysis. They can also try isolation of fungi from some diseased fruits such as mangoes and tomatoes. The laboratory exercise helps them to understand the procedure that is followed, after the collection of suspected pest infested samples at the various ports of entry of commodities.

The training presentations are developed from desktop reviews of national documents produced under the CBP as well as those developed by international organizations including other documents from leading international agencies such as the Convention on Biological Diversity (CBD), the Global Invasive Species Programme (GISP), the International Maritime Organization (IMO), the International Plant Protection Convention (IPPC), the World Organization for Animal Health (OIE), the Food and Agriculture Organization (FAO), the World Trade Organization (WTO), the International Union for Conservation of Nature (IUCN) etc.

A maximum of thirty participants from stakeholders' institutions should attend the training. The training is done in a participatory approach; the participants are asked to provide examples, data or case study in their domain. Since the level of knowledge of the participants in domains such as agriculture, pest taxonomy, ecology, epidemiology and molecular biology is not the same, a lot is done to simplify the teaching explanations using mostly appropriate figures and pictures from Cameroon and local examples.

By the end of the training, participants are expected to: understand the national and international context within which risk analysis is conducted including relevant institutions and

standards, understand information requirements for risk analysis, understand risk analysis methodologies and their application and have an overview of risk analysis needs and how they can be addressed in Cameroon.

#### Significance of Training to Pest risk analysis

During the training, the knowledge of participants on pest risk analysis is increased. They are able to identify lapses at their various places of work which puts the country's biodiversity at risk. They understand the different national and international conventions that guarantee the carrying out of pest risk analysis. They understand Cameroons obligation towards her trading partners in preventing worldwide spread of pest and diseases. They can estimate the economic consequences of non-compliance. They also understand the necessity and importance of information sharing. They are apt in the procedure for pest risk analysis. They are expected to be able to train their colleagues on pest risk analysis so as to ensure uniformity of procedures and guarantee a concerted effort in pest management.

#### Recommendations

Training should run for five days so that enough time will be allocated for discussions and there will be no rushing over key issues. Many more people should be offered the training so that information on the importance of pest risk analysis is widely disseminated.