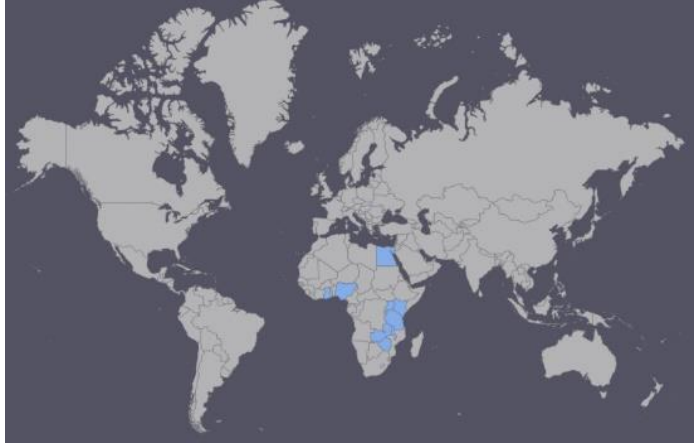
Food and Agriculture Organization
of the United Nations

Tilapia Lake Virus (TiLV) Expert Knowledge Elicitation (EKE) Risk Assessment

Melba B. Reantaso

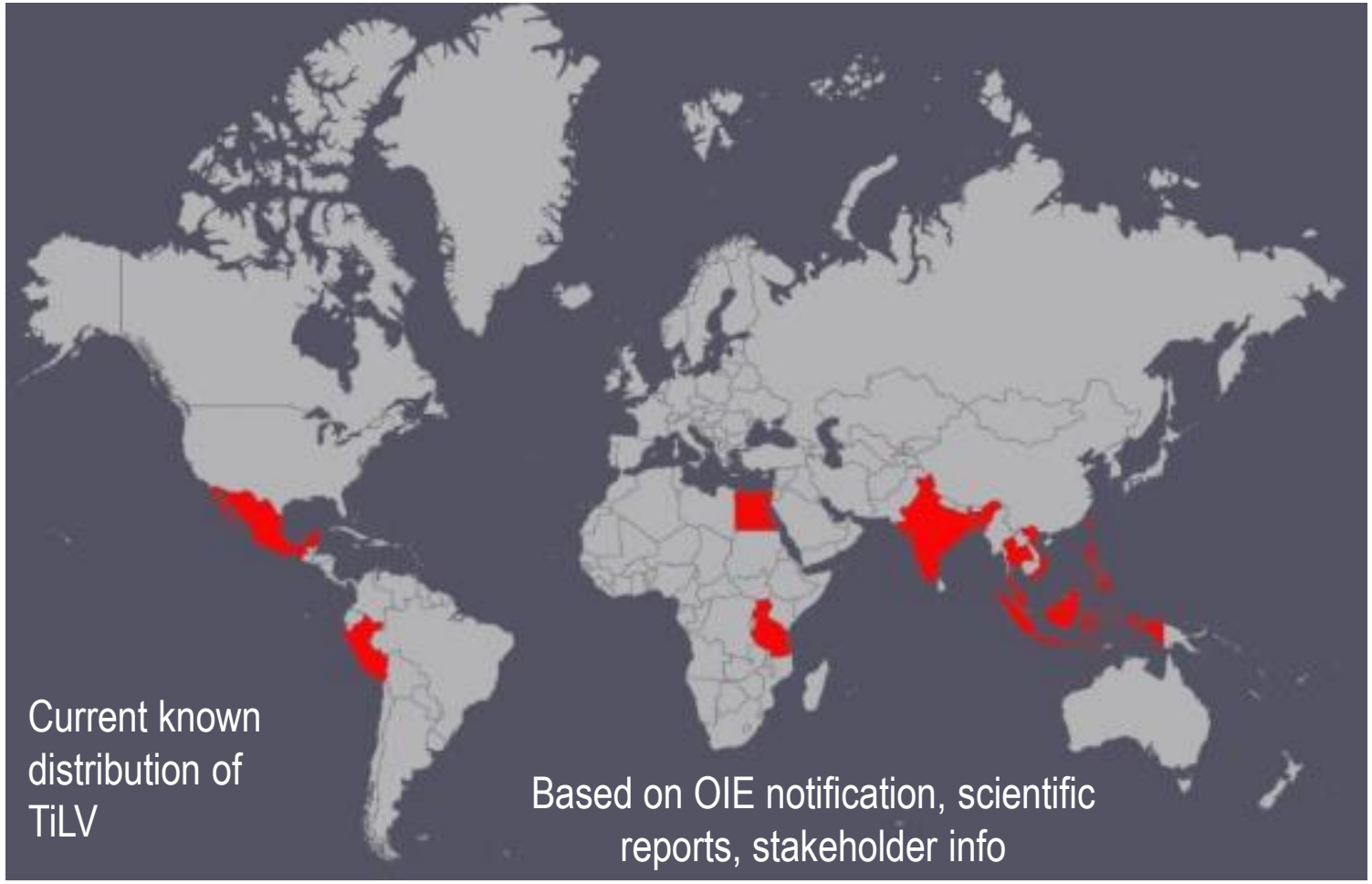
Project Inception Workshop of GCP/RAF/510/MUL:
Enhancing capacity/risk reduction of emerging Tilapia Lake Virus (TiLV) to African tilapia aquaculture
Southern Sun Myfair Hotel, 23-24 October 2018, Nairobi, Kenya

Global:
China
Brasil



Africa:
Ghana, Nigeria, Zambia, Kenya, Zimbabwe

LAC: Brasil, Honduras, Costa Rica, Guatemala



Objectives

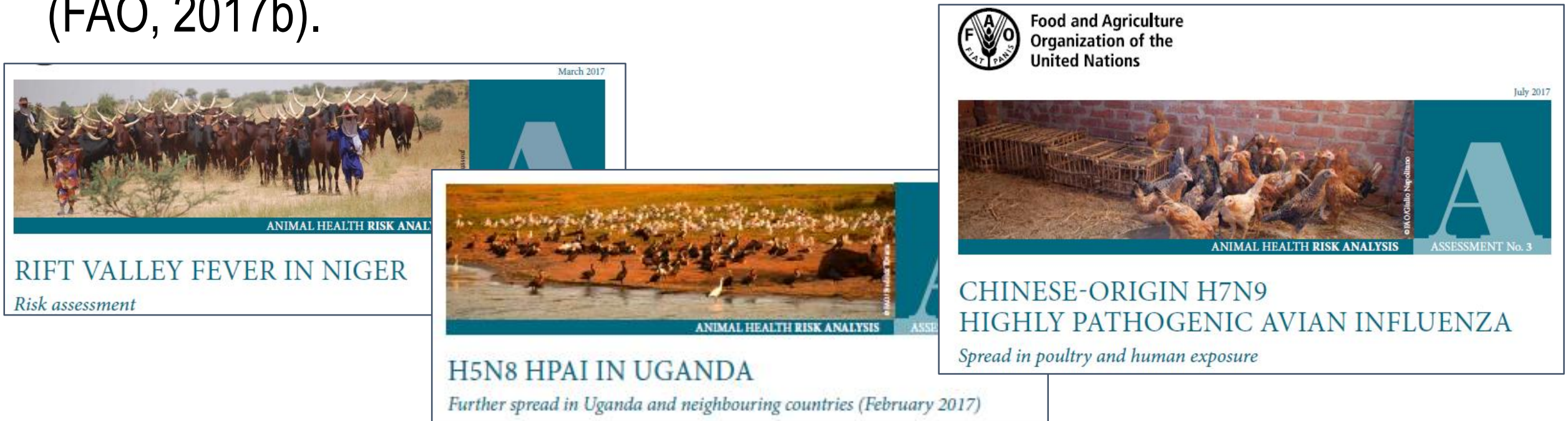
(1) to determine the extent of biosecurity risks associated with the spread of TiLV into TiLV free zones/countries and spread within countries where the disease is already established, and

(2) to identify biosecurity measurers to manage these risks.

- This assessment is intended to assist countries in setting risk management policies that address concerns about the potential spread of TiLV. This assessment is a guide only.
- The scope of this assessment is restricted to an estimation of the risks associated with the intra-national or international movement of live fish, or the trade in raw chilled or frozen whole fish or fish products

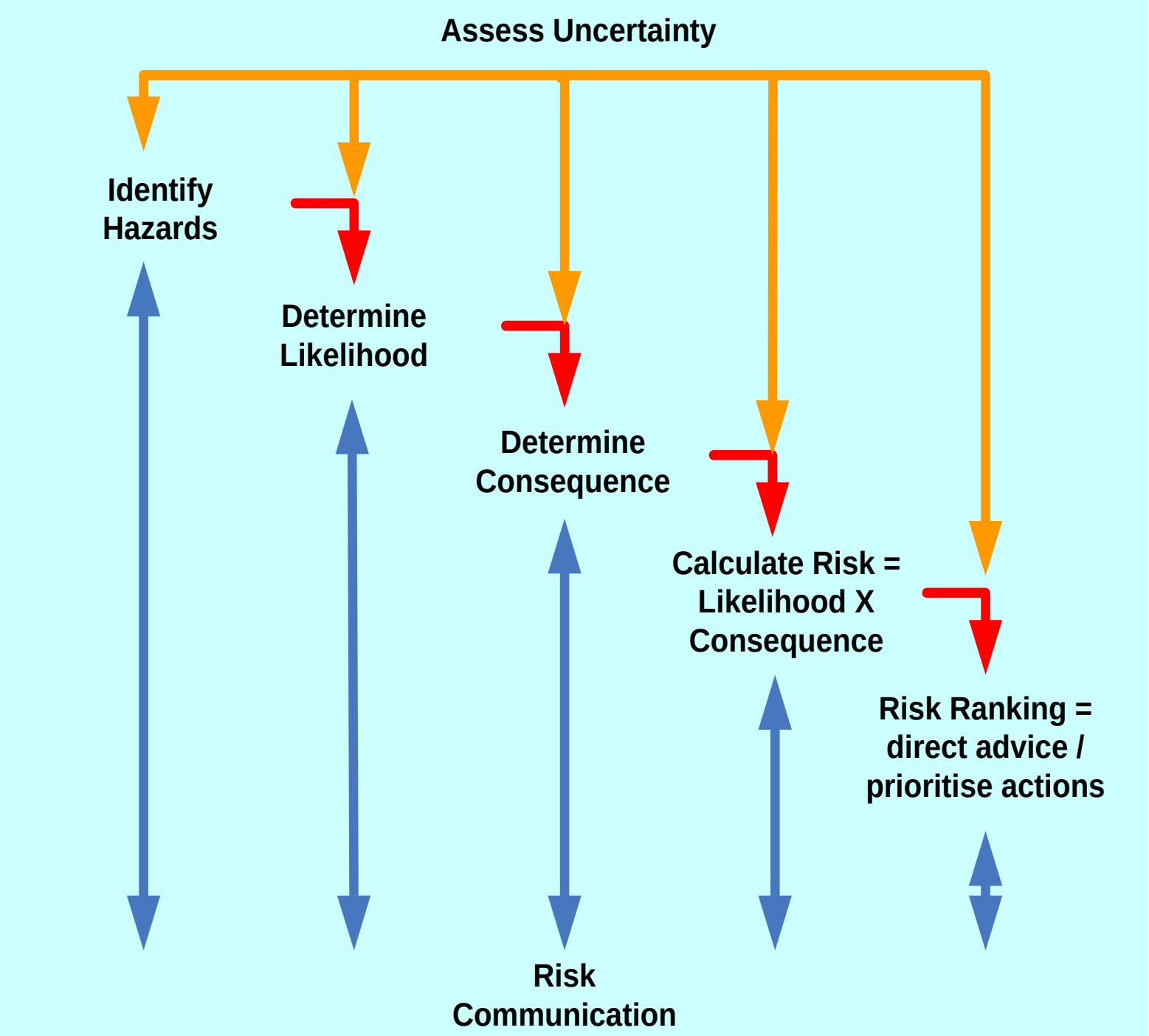
Methodology

- standardised expert knowledge elicitation (EKE) methodology developed by FAO's Global Early Warning System (GLEWS) to improve the capacity to identify, assess and respond to animal health events that could affect livestock, wildlife, food security or food safety (FAO- GLEWS Rapid Risk Assessment Guidelines, in process), and
- draws on previous FAO rapid risk analyses on RVF (FAO, 2017a) and HPAI (FAO, 2017b).



Steps

- Reviewed the risk assessment (RA) done for livestock diseases as reference for developing the RA for TiLV
- Prepared TiLV risk profile based on available information
- Developed the RA questionairres
- Assembled a list of experts and made a call for participation
- Responses were collated and analysed
- Results were reviewed by an FAO team prior to sending back to experts for final assessment



Simplified Risk Analysis Process

They generally incorporate the concepts of:

uncertainty of outcome (of an action or situation)

that leads to a likelihood (probability or chance) of an unwanted event happening, and

a **consequence** or impact (if the unwanted event happens)

risk = likelihood x consequence

TiLV Risk Profile

Pathogen taxonomy	Clinical signs/gross pathology/histopathology
Host range	Diagnostic testing: Molecular methods
Transmission/Agent stability	Geographic distribution
Factors determining disease manifestation	Tilapia aquaculture industry and impact of TiLV

Available scientific literature and other information considered pertinent to an estimation of biosecurity risk and to assist in the conduct of an TiLV risk assessment using an expert knowledge elicitation method

FAO/NFTEC/SYSU Intensive 7-day course on Tilapia Lake Virus, 18-24 June 2018, Guangzhou

http://www.fao.org/fishery/nems/41072/en

http://www.fao.org/fi/static-media/MeetingDocuments/TiLV/Default.html

Species	Country	Reference
Hybrid tilapia (*Oreochromis niloticus* x *O. aureus* hybrids)	Israel Chinese Taipei	Eyngor *et al*., 2014 OIE, 2017c
Nile tilapia (*O. niloticus*)	Egypt	Fathi *et al*., 2017
	Ecuador	Ferguson *et al*., 2014
	Colombia	Tsofack *et al*., 2017
	Thailand	Dong *et al*., 2017a; Surachetpong *et al*., 2017
	Peru	OIE notification 2018
	Philippines	OIE notification 2017
	Indonesia	Isti *et al*. 2018
	India	Behera *et al* 2018
Black tilapia (*Oreochromis* spp) (wild)	Malaysia	OIE notification 2017
Red tilapia *Oreochromis* sp	Thailand	Dong *et al*., 2017a; Surachetpong *et al*., 2017
Wild tilapinies (Sarotherodon galileus, *Tilapia zilli*, *O. aureus*, and *Tristamellasimonis intermedia*	Sea of Galilee, Israel	Eyngor *et al*., 2014

TiLV Risk Profile:
Host range farmed and wild populations

Risk Profile: TiLV distribution:
TiLV OIE notification, scientific publication, stakeholder information

The presence of a disease in any particular country can be a very sensitive issue and easily subject to misinterpretation; caution is recommended; it is always good to have a reference/source

Country	Reference		
	OIE Notification (as emerging disease) (date of start of event/ date of confirmation of event/ date of report)	Scientific report	Stakeholder information
Bangladesh			√ suspicion (2018)
Colombia		√ (2014)	
Ecuador		√ (2014)	
Ghana			√ unexplained mortalities (2017)
India		√ (2018)	
Indonesia		√ (I2018; local report)	
Israel	√ (2011/2014/2017)	√ (2014, 2016, 2017) First observation in 2009	
Peru	√ (2017/2017/2018)		
Malaysia	√ (2017/2017/2017)	√ (2017)	
Mexico	√ (2018/2018/201)		
Philippines	√ (2017/2017/2017)		
Tanzania		√ (2018)	
Taiwan Province of China	√ (2017/2017/2017)		
Thailand	√ (2015/2017/2017)	√ (2016.2017, 2018)	
Uganda		√ (2-18)	
Vietnam			√ suspicion (2017)

Risk questions 1-8: to gain an understanding of the region-specific **likelihood** (probability) of TiLV entry, establishment and spread over the next five years, and the **consequences** (likely impacts) of such spread **(in the absence of any control)**

1. What, in the absence of any controls, is the *likelihood* of TiLV spreading within a country where it is already present?

2. What, in the absence of any controls, is the *likelihood* of TiLV spreading from an infected country to China?

3. What, in the absence of any controls, is the *likelihood* of TiLV spreading within the Asian region?

4. What, in the absence of any controls, is the *likelihood* of TiLV spread from countries of an infected region (e.g. Southeast Asia) to Africa, East Asia, South Asia, North America, South America or Pacific Island Countries and Territories?

5. What would be the *consequences* of TiLV spreading within a country where it is already present?

6. What would be the *consequences* of TiLV spreading from an infected country to China?

7. What would be the *consequences* of TiLV spreading within the Asian region?

8. What would be the *consequences* of TiLV spread from countries of an infected region (e.g. Southeast Asia) to Africa, East Asia, South Asia, North America, South America or Pacific Island Countries and Territories

Risk question 9: to estimate the relative roles of trade in uncooked chilled/frozen whole fish and fish products (such as fish fillets) and the translocation of live fish, in disease spread

Risk questions 10-13: evaluating the effectiveness and feasibility of measures for managing the risk of TiLV spreading internationally or spreading in countries where the virus is already established.

9. Based on the available information, including information that you feel could be drawn from knowledge of ISAV, what proportion of the overall likelihood of TiLV spread (internationally or within a country) is represented by the trade in uncooked chilled/frozen whole fish and fish products (such as fish fillets) as a pathway for disease spread (as compared to translocation of live fish)?

10. Rank from the most to the least *feasible* the measures for reducing the risk of TiLV spread *within an infected country.*

11. Rank from the most to the least *effective* the measures for reducing the risk of TiLV spread *within an infected country.*

12. Rank from the most to the least *feasible* the measures for reducing the risk of the *international* spread of TiLV (national biosecurity controls).

13. Rank from the most to the least *effective* the measures for reducing the risk of the *international* spread of TiLV.

Annex 1 TiLV risk analysis questionnaire

1. **What, in the absence of any controls, is the likelihood of TiLV spreading within a country where it is already present in the absence of any controls?**

LIKELIHOOD ESTIMATION (Extremely unlikely; Very unlikely; Unlikely; As likely as not; Likely; Very likely; or Almost certain)	LEVEL OF UNCERTAINTY (low, medium or high)

2. **What, in the absence of any controls, is the *likelihood* of TiLV spreading from an infected country to China in the absence of any controls?**

LIKELIHOOD ESTIMATION (Extremely unlikely; Very unlikely; Unlikely; As likely as not; Likely; Very likely; or Almost certain)	LEVEL OF UNCERTAINTY (Low, Medium or High)

3. **What, in the absence of any controls, is the *likelihood* of TiLV spreading within the Asian region in the absence of any controls?**

LIKELIHOOD ESTIMATION (Extremely unlikely; Very unlikely; Unlikely; As likely as not; Likely; Very likely; or Almost certain)	LEVEL OF UNCERTAINTY (Low, Medium or High)

4. **What, in the absence of any controls, is the *likelihood* of TiLV spread from countries of an infected region (e.g. Southeast Asia) to the following potentially uninfected regions:**

	LIKELIHOOD ESTIMATION (Extremely unlikely; Very unlikely; Unlikely; As likely as not; Likely; Very likely; or Almost certain)	LEVEL OF UNCERTAINTY (Low, Medium or High)
a. Africa		
b. East Asia		
c. South Asia		
d. North America		
e. South America		
f. Pacific Island Countries and Territories (PICT)		
g. Other countries or region/s where tilapia is present (please state countries or region considered, adding new rows to the table as necessary)?		

For each of the risk questions, the response pertains to likelihood estimation (e.g. extremely unlikely, very unlikely, etc) . and level of uncertainty (e.g. low, medium, high)

Annex 5 TiLV risk assessment summary data

RISK QUESTION		MEAN	STDEV	95% confidence interval	Lower bound	Upper bound
1. What, in the absence of any controls, is the likelihood of TiLV spreading within a country where it is already present?	*Likelihood*	6.2	0.9	0.5	5.7	6.7
	Uncertainty	low-medium				
	impact	3.5	0.9	0.5	3.0	4.0
	likelihood	6.1	0.7	0.3	5.8	6.5
	likely consequences	9.6	1.4	0.7	8.9	10.3
	likely consequences descriptor	major				
	Consequence FINAL SCORE	4.1	0.7	0.3	3.8	4.5
	Overall RISK	10.3	1.3	0.7	9.6	10.9
	RISK description	very high				
2. What, in the absence of any controls, is the likelihood of TiLV spreading from an infected country to China?	*Likelihood*	5.1	1.1	0.6	4.5	5.7
	Uncertainty	medium				
	Impact	3.7	0.7	0.4	3.3	4.0
	Likelihood	5.8	1.4	0.7	5.0	6.5
	likely consequences	9.4	1.7	0.9	8.5	10.4
	likely consequences descriptor	major				
	Consequences FINAL SCORE	4.0	0.8	0.4	3.6	4.4
	Overall RISK	9.2	1.5	0.8	8.4	10.0
	RISK description	high				
3. What, in the absence of any controls, is the likelihood of TiLV spreading within the Asian region?	*Likelihood*	5.8	1.1	0.6	5.2	6.4
	Uncertainty	low-medium				
	Impact	3.5	0.9	0.5	3.0	4.0
	Likelihood	5.9	1.1	0.6	5.4	6.5
	likely consequences	9.4	1.7	0.9	8.5	10.3
	likely consequences descriptor	major				
	Consequences FINAL SCORE	3.9	0.7	0.4	3.5	4.3
	Overall RISK	9.7	1.7	0.9	8.8	10.6
	RISK description	high				

For each of the risk questions, we have a summary data that looks like this

Prohibition of uncooked whole tilapia or tilapia product movement out of infected/buffer zones or from zones of uncertain health status

Prohibition of live tilapia movement out of infected/buffer zones or from zones of uncertain health status

Restrict movement of live tilapia out of infected/buffer zone to only fish from populations tested and certified to be TiLV-free

Restrict movement of uncooked tilapia (whole or product) out of infected/buffer zones to only fish from populations tested and certified to be TiLV-free

Quarantine and post arrival testing of tilapia imported from an infected zone or a zone of unknown health status

Surveillance of establishments with fish imported from free TiLV sources or sources of unknown health status AND implementation of strict biosecurity and emergency response arrangements in these establishments

On-going program of national monitoring and surveillance for TiLV

Immediate TiLV surveillance of all major tilapia breeding facilities and fry/fingerling dissemination centres

Basic biosecurity practices at farm level (e.g. good record keeping, quick action at first signs of abnormal fish behaviour, sick/dead fish disposal, control of fish movement, control of facility access and disinfection of farm vehicles and equipment).

Basic husbandry practices (e.g. appropriate stocking density, maintaining good water quality, good nutrition, culturing same age group, avoiding entry of wild fish or potential vectors in earthen pond system and maintaining good farm records)

14 biosecurity measures

Movement restriction

Surveillance

Basic biosecurity at farm level

Emergency preparedness and response

National emergency disease response system targeting TiLV

Immediate investigation of unexplained mortalities

Immediate notification of unexplained mortalities to Competent Authorities

Immediate notification of unexplained mortalities for early warning to neighbouring farms

Participating independent experts: Women = 6; Men = 8

Name	Knowledge of TiLV/ISAV	Risk assessment experience	Experience in Competent Authority level management of aquatic animal disease risks
Chadag Vishnumurthy Mohan	√		√
Davidovich Nadav	√		√
Dong Ha Thanh	√		
Huchzermeyer David	√	√	
Irde Elena	√	√	
Jansen Mona Dverdal	√		√
Lara Fica Marcela	√	√	√
Misol Jr, Gerald N.	√	√	√
Paclibare Jose **Perera** Ramesh		√ √	√ √
Reantaso Melba	√	√	√
Senapin Saengchan	√		
Surachetpong Win	√	√	
Tang-Nelson Kathy	√		

Results

Risk to food security and liveihood	**TiLV represents a significant risk to most parts of the world, especially those countries where tilapia aquaculture or fisheries is important from a commercial or food security perspective.**

Asia

Africa

Latin America and the Carribean

Results

Risk of TiLV spreading in absence of control	From infected countries to North America or Pacific Island Countries and Territories (PICTs): ***moderate***
	Within a country where it is already present : ***very high***
	From infected countries to China or other countries in the Asian region (including East and South Asia), the African region or the South American region: ***high***
Risk of spread through live fish movement pathway	***high***
Risk of spread through trade in uncooked chilled/frozen whole fish and fish products (such as fish fillets) pathway	***low***

Risk management: of the 14 risk management measures:

- Five ***most effective*** to reduce the risk of TiLV ***spread internationally***
- Five considered generally ***most feasible***
- Five ***most effective*** to reduce the risk of TiLV spread ***within countries***
- Five considered generally ***most feasible***

Movement restriction

Surveillance

Farm level biosecurity and husbandry

Emergency preparedness and response

Results: Five most ***effective*** to reduce the risk of TiLV *spread internationally*

Prohibition of live tilapia imports based on risk assessment.

Importation of live tilapia only from populations tested and certified to be TiLV-free, WITH post-arrival testing of imported live tilapia to verify effectiveness of health controls in source/exporting country.

Quarantine and post arrival testing of imported live tilapia shipments.

Surveillance of establishments with imported fish and implementation of strict biosecurity and emergency response arrangements in these establishments

Immediate TiLV surveillance of all major tilapia breeding facilities and fry/fingerling dissemination centres.

Results: Five considered generally **most feasible**

Immediate notification of unexplained tilapia mortalities to Competent Authorities.

Basic biosecurity practices at farm level (e.g. good record keeping, quick action at first signs of abnormal fish behaviour, sick/dead fish disposal, control of fish movement, control of facility access and disinfection of farm vehicles and equipment).

Immediate investigation of unexplained mortalities.

Basic husbandry practices (e.g. appropriate stocking density, maintaining good water quality, good nutrition, culturing same age group, avoiding entry of wild fish or potential vectors in earthen pond system and maintaining good farm records).

Surveillance of establishments with imported fish and implementation of strict biosecurity and emergency response arrangements in these establishments.

Results: Five most ***effective*** to reduce the risk of TiLV *spread within countries*

Prohibition of live tilapia movement out of infected/buffer zones or from zones of uncertain health status.

Basic biosecurity practices at farm level (e.g. good record keeping, quick action at first signs of abnormal fish behaviour, sick/dead fish disposal, control of fish movement, control of facility access and disinfection of farm vehicles and equipment).

National emergency disease response system targeting TiLV.

Immediate notification of unexplained mortalities to Competent Authorities.

Immediate TiLV surveillance of all major tilapia breeding facilities and fry/fingerling dissemination centres.

Results: Five considered generally **most feasible**

Immediate notification of unexplained mortalities to Competent Authorities.

Basic biosecurity practices at farm level (e.g. good record keeping, quick action at first signs of abnormal fish behaviour, sick/dead fish disposal, control of fish movement, control of facility access and disinfection of farm vehicles and equipment).

Immediate investigation of unexplained mortalities.

Immediate notification of unexplained mortalities for early warning to neighbouring farms.

Basic husbandry practices (e.g. appropriate stocking density, maintaining good water quality, good nutrition, culturing same age group, avoiding entry of wild fish or potential vectors in earthen pond system and maintaining good farm records).

Key messages

- The expert elicitation based qualitative risk assessment identified that TiLV represents a significant risk to most parts of the world, especially those countries where tilapia aquaculture or fisheries is important from a commercial or food security perspective.
- Risks to PICTs and North America were generally considered less than those to Asia, Africa and South America, both as a function of lower likelihood of entry, establishment and spread, and associated consequences.
- The bulk of the TiLV risk is due to the translocation of live fish (for aquaculture, direct human consumption or ornamental/aquarium fish keeping purposes).
- The role of trade in uncooked chilled/frozen whole fish and fish products (such as fish fillets) as a pathway for disease spread compared to was considered by the panel to be comparatively small.

Key messages

- Importantly, this assessment did not take into consideration country specific circumstances.
- It is recommended therefore that all countries that have significant tilapia populations, be they farmed or wild, undertake their own risk assessments.
- Attention needs to be paid especially to country specific risks in terms of international trade activity in live tilapia and fresh frozen products.
- To support risk assessment, it is also recommended that these countries undertake TiLV surveillance to verify disease freedom or extent of spread.
- Feasibility of effective implementation depends largely on the capacity and capability of individual countries, including with respect to the legal basis of any controls, laboratory diagnostic services and financial resources to implement measures on ground.

Key messages

- National level risk management measures targeting international trade must also be based on risk analysis (consistent with OIE standards) and be commensurate with the level of risk reduction needed to meet the country's appropriate level of protection (ALOP).
- The outcomes of this risk assessment present a basis for prioritising action on TiLV, including risk assessment and national competent authority and industry sector level measures to manage TiLV risks, be they for TiLV free or already affected countries.
- Countries considering implementing risk management measures should therefore consider all options and decide on the suite of measures that best suits local circumstances, noting that no single measure alone is likely to bring a meaningful level of risk reduction.
- A need for gap analysis and doubling national and international efforts in building in aquatic animal health biosecurity capacity.

Key Messages

- Contingent on the outcomes of country specific risk assessments supported by suitably qualified panels of experts, at-risk countries could move quickly to adopt a suite of measures taken from those recommended by the FAO, NACA, OIE, WorldFish, scientific reports, producers and academe and by the expert panel who conducted this assessment, as appropriate to each country's capabilities and capacities.
- The risk questionnaire could also be readily adapted to a country specific questionnaire and the method overall can be applied to facilitate early interventions.
- To the best of our knowledge, the method used in this assessment is the first time that an expert knowledge elicitation-based rapid risk assessment approach has been used to assess aquatic animal disease risks.
- Notwithstanding its inherent limitations, the method represents a ready means by which countries could rapidly assess risks and identify priority management measures.

Food and Agriculture Organization
of the United Nations

Thank you for your attention

Melba.Reantaso@fao.org

Project Inception Workshop of GCP/RAF/510/MUL:
Enhancing capacity/risk reduction of emerging Tilapia Lake Virus (TiLV) to African tilapia aquaculture
Southern Sun Myfair Hotel, 23-24 October 2018, Nairobi, Kenya