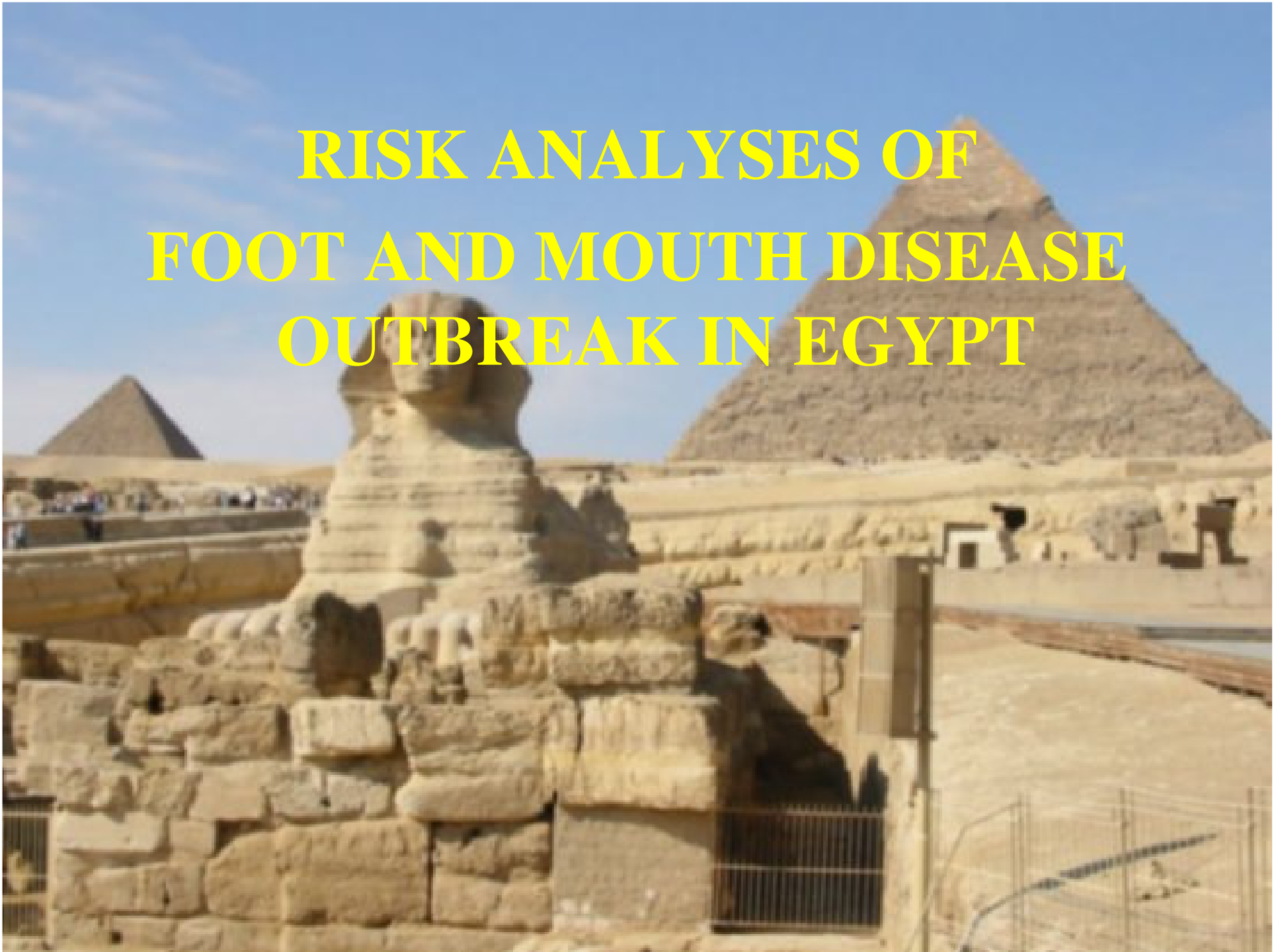


**RISK ANALYSES OF
FOOT AND MOUTH DISEASE
OUTBREAK IN EGYPT**



By

Mohamed Abd El Rahman El Bably

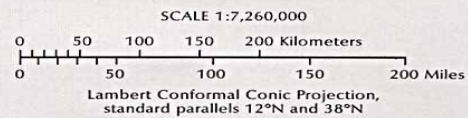
Prof. Animal Hygiene and Epidemiology

Faculty of Veterinary Medicine

Beni-Suef University Egypt

Greetings From Egypt





- International boundary
- National capital
- Governorate capital
- Railroad
- Expressway
- Road
- Track



Scope of work

- Introduction
- Background
- Epidemic situation of FMD in Egypt
- Risk analysis:
 - -Problem identification
 - -Risk assessment (Qualitative)
 - Risk Management (Mitigation)
 - Risk communication

Introduction

- Foot-and-mouth disease (FMD) is perhaps the most contagious animal disease known and therefore one of the most important transboundary animal diseases.
- Economic losses caused by FMD include reduction in production parameters such as decreases in milk production, weight gain, reproductive inefficiencies and death in young ruminants.
- The costs of prevention and control with restrictions in both local and international trade are high, thereby affecting food security and livelihoods along the production and marketing chain.

Estimates of Ruminant populations for countries in North Africa for 2007

	Unit	cattle	buffaloes	Sheep	Goat	Total
Egypt	Heads	4,9,932,636	1,650.000	1,880,000	1,027,228	9,489,924
Libya	Heads	130,000	-	1,600,000	428,000	2,158,000
Sudan	Heads	41,000,000	-	28,000	23,500,000	92,500,000
Ethiopia	Heads	83.3000.000				

Background

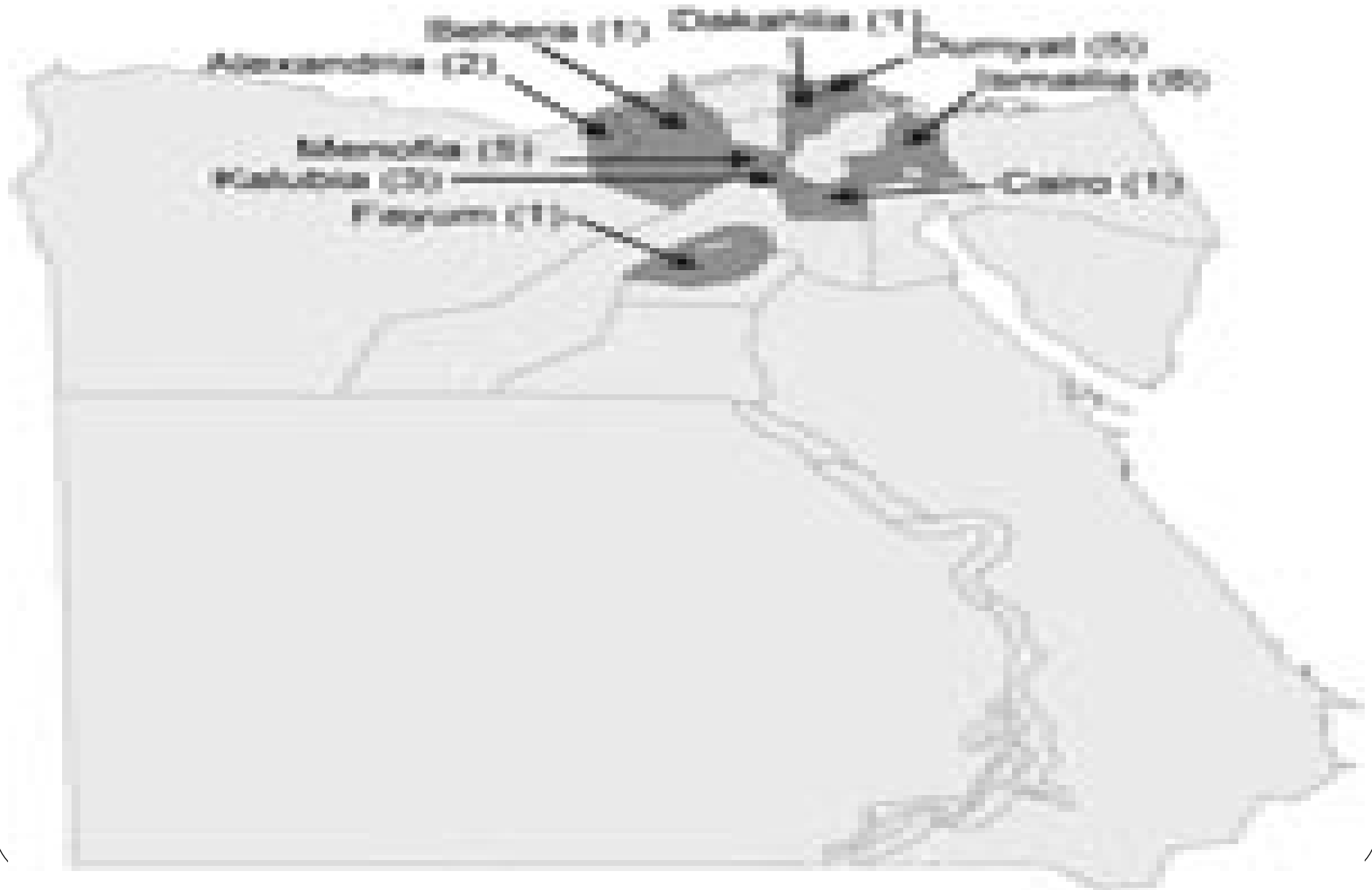
- Foot-and-mouth disease (FMD) is endemic in Egypt with control strategies focusing:
 - ❑ On vaccination of cattle,
 - ❑ Quarantines measures.
- **In June 2000:**
 - An outbreak of FMD reported to OIE: type O,
 - Routine prophylactic vaccination has been conducted with a locally produced serotype O vaccine.

In 2006:

- Clinical cases of FMD were first recognized on January 22, 2006, on a cattle farm in Ismailia, northeastern Egypt .
- Initial testing with antigen ELISA and RT-PCR assays suggested that multiple FMD virus (FMDV) serotypes may have been involved in the outbreak, although only type A was later confirmed.
- **Circumstances** : index case few km from quarantine stations in southern Egypt.
- First infection date unclear ; presume early Jan. cattle apparently from Ethiopia via Djibouti

- Six outbreaks of FMDV caused by serotype (A)in Ismailia and 12 additional outbreaks in 7 other Egyptian governorates: Alexandria (2 outbreaks), Behera (1 outbreak), Cairo (1 outbreak), Dakahlia (1 outbreak), Dumyat (5 outbreaks), Fayum (1 outbreak), and Menofia (1 outbreak).
- By April 6, 2006, 34 outbreaks of disease had been reported that affected >7,500 animals and involved an additional governorate (Kalubia).
- Most (96.7%) of clinical FMD cases involved cattle; 411 cattle (mainly calves) reportedly died.

Figure 1. Locations and number of cases in the initial outbreaks of foot-and-mouth disease, Egypt, 2006.



- Attempts to control the outbreaks were hampered by lack of an appropriate vaccine and concurrent outbreaks of highly pathogenic avian influenza.
- FMD became widespread in Egypt, with the following numbers of animals affected per month: 6,189 (January), 1,858 (February), 3,035 (March), 401 (April), and 297 (May).
- A locally produced bivalent FMDV vaccine, containing both O1 and A / Egypt/2006 isolates, was released in mid-May 2006 for the first time in Egypt. No new cases have been reported since July 2006.

- **During February 2012**, a great number of FMD events were reported throughout Egypt despite a nationwide vaccination campaign in January 2012.
- The analysis of the epidemiological situation and laboratory findings suggested exotic FMDV serotypes or strains might be responsible for the pattern of outbreaks.
- Actions were agreed to clarify the situation that resulted in confirmation of SAT2 and other serotypes among recent samples from outbreaks.
- The vaccines currently used in Egypt do not include SAT2.
- The recent FMD infection is thus apparently sweeping through a wholly susceptible ruminant population



- The number of suspected cases is growing at a rate of 5000 per day while the number of deaths is growing at 500 head per day.
- The mortality rate was increased especially among calves and in small farms, since SAT2 is newly introduced to Egypt and there is no herd immunity or previous vaccination effort.
- Losses of older cattle will also be significant. FMD impacts both the cattle and buffalo populations, but the effect is normally more severe on cattle
- The disease has already been detected in 25 of 27 governorates in Egypt.
- Regionally, SAT2 first had an outbreak in Libya in 2009 and February ,2012..





Reports

- Foot-and-mouth disease kills over 9,000 animals, Agriculture Ministry says no human cases (March,27)
- Foot-and-mouth disease traps camels at Sudanese border (March,27)
- Report: Foot-and-mouth disease claims more than 9,000 animals (March,28)
- Govt to continue importing Nile Basin meat despite syndicate fears (March,29)
- Egypt produces first foot-and-mouth vaccine (March,29)

- Report: Over 10,000 animals dead in foot-and-mouth outbreak (March,30)
- Foot-and-mouth disease deaths reach 11,335 livestock (March,31)
- Veterinary directorates report fewer new cases of foot-and-mouth disease (April, 9)
- The Agriculture Ministry's daily report on the foot-and-mouth disease outbreak showed on Tuesday an increase in infections to 74,178 cases, with 15,800 fatal cases, despite confirmation by the ministry that the disease had started to decline due to warmer weather (April, 10)

Problem Identification

- Evaluation of the risk of introducing a new Serotype and topotypes of FMDV (SAT 2) into Egypt through ruminants (importation or smuggling)



Host Range :

- Cloven hoofed animals including: buffalo, cattle, pigs, goats, impala; kudu, sable Camel.
- Sheep act as maintenance hosts, pigs act as amplifiers, and cattle act as indicators.
- As demonstrated in the European outbreak, sheep are often infected and often spread the virus to susceptible animals and the environment without showing obvious clinical signs. (Hughes 2002).

ENVIROMENT FACTORS

Transmission :

- **Direct or indirect contact** (droplets)
- **Animate vectors** (humans, live animals & products etc.)
- **Inanimate vectors** (vehicles, implements)
- **Airborne**, especially temperate zones (up to 60 km overland and 300 km by sea)

ENVIROMENT FACTORS c'tnd

The virus can remain viable on a variety of materials for variable lengths of time, depending on environmental conditions (survival decreases with increasing heat and decreasing humidity) (see [References](#): Bartley 2002):

- Fecal material: Up to 100 days (liquid slurry)
- Hay: Up to 105 days
- Bran: Up to 140 days
- Wool: Less than 21 days, average 18 days
- Snow-covered soil: More than 185 days

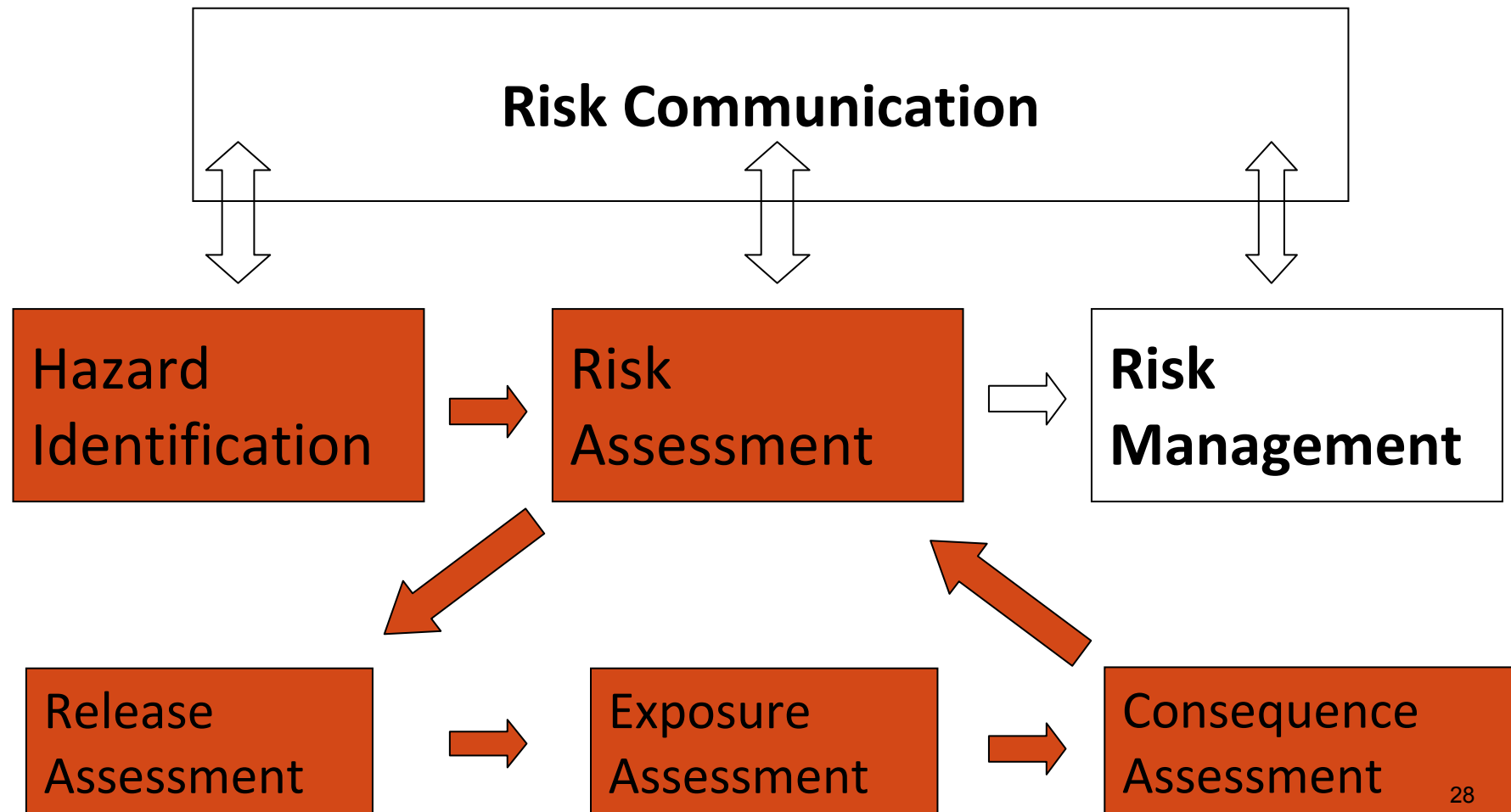
In Egypt :

- **The occurrence of FMD outbreak in Egypt starting in February is frequently related to**
 1. **Climatic changes** (decreasing of ambient temperature below 12 C accompanied by current windy climatic conditions (FMD is windborne))
 2. **Increases animal movements** within and in between different districts and Governorates .
 3. **Shortage of Quarantine measures**
 4. **Ruminant Smuggled through different boundaries**
 5. **Free movement of small ruminant**

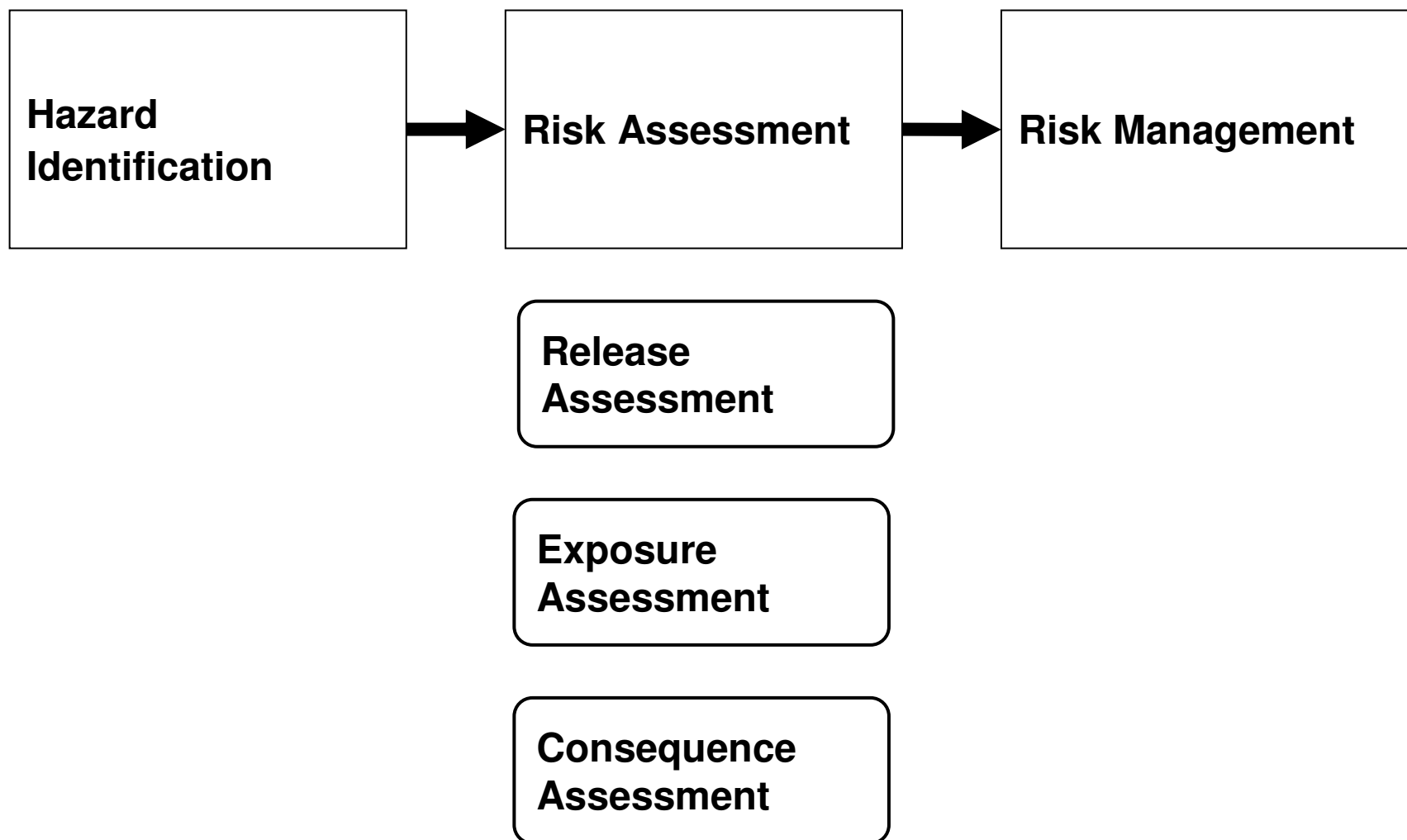
Other risk factors increased risk of spreading of disease throughout Egyptian Governorates.

1. lack of awareness among farmers and small-scale breeders (many are not reporting their infected animals while others are throwing the bodies of the dead animals in the streets and in the small canals)
2. In the Nile Delta animals are raised very close together, " "This crowding makes it impossible to have quarantine".
3. The delayed availability of appropriate vaccines.
4. The current windy climatic conditions hindered the government's efforts to control the outbreak.
5. The temporal breakdown in security in the country will make it difficult to enforce movement controls on cattle.

Risk Analysis Components (after OIE Animal Health Code)



The OIE Risk Analysis Framework



Hazard Identification

- Process of identifying all hazards associated with defined situation or activity
 - hazards to be introduced in commodity considered for importation or smuggling
 - hazards resulting from spreading of disease all over the country
- convert into risk question

Does the problem require formal Risk Analysis? IF SO:

Yes.

- Up to 100,000 Egyptian cattle are suspected to have been infected by a new strain of foot and mouth disease that is sweeping the country ,according to Agency France Press
- Based on numbers provided to AFP by Egyptian farm authorities, about one tenth of the suspected infected population has already died

- The outbreak threatens as many as 6.3 million head of cattle and buffalo and 7.5 million sheep and goats in Egypt, the FAO said.
- The calf crop is forecast to decrease by 18 percent to 1,402 thousand head compared to 1,708 thousand head in 2011 due to the spread of the “SAT2” strain of Foot and Mouth Disease (FMDV-SAT2).

- Imports of live cattle and beef are forecast to increase in 2012 to bridge the growing gap between domestic consumption and production.
- The consumption and imports of frozen beef are forecast to increase in MY 2012 due to low meat production and relatively high prices of local beef.
- FAO warned that urgent action is required to control a major outbreak of foot-and-mouth disease and prevent its spread throughout North Africa and the Middle East, which could have serious implications for food security in the region



Summary of SAT outbreaks outside sub-Saharan Africa

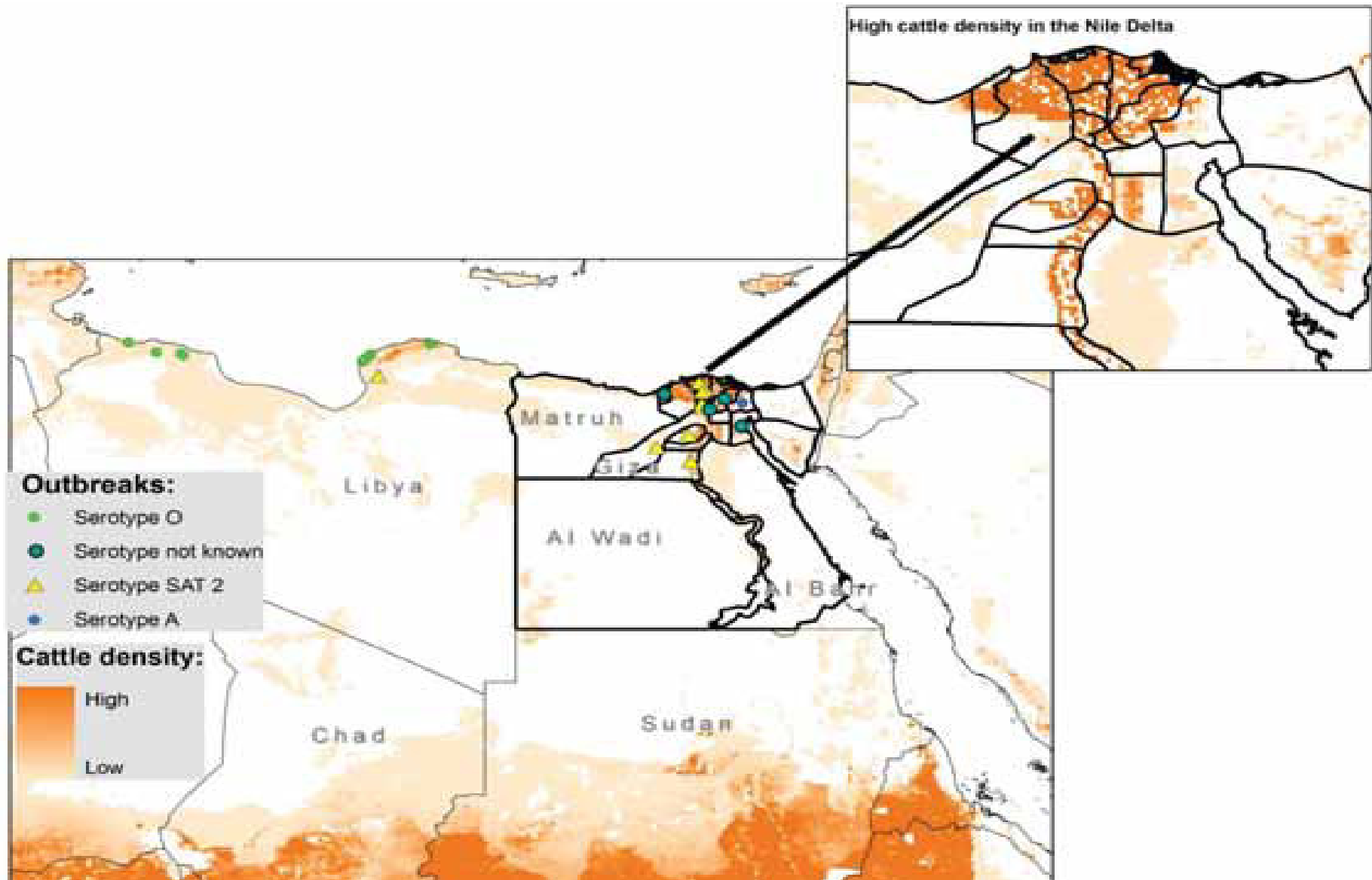
Country	Serotype
Libya	SAT-2 (2003,2009, 2012)
Egypt	SAT-2 (2012)
Saudi Arabia	SAT-2 (2009)
Palestine	SAT-1
Sudan	SAT 2 (frequent)
Ethiopia	SAT 2 (frequent)

Sourced from <http://www.wrlfmd.org/>

Hazard identification

- It is not known how the new strain has entered the country but some sources and government officials suspect that smuggled shipments of infected sheep and cattle from Libya came across the lengthy border.
- With the breakdown in feed and water supplies in Libya during their revolution, Egypt provided a safe harbor for the herds.
- This claim is supported by the results of the UK's Pirbright Reference Lab in March 2012 that confirmed infected cows from Libya with FMDV-SAT2.

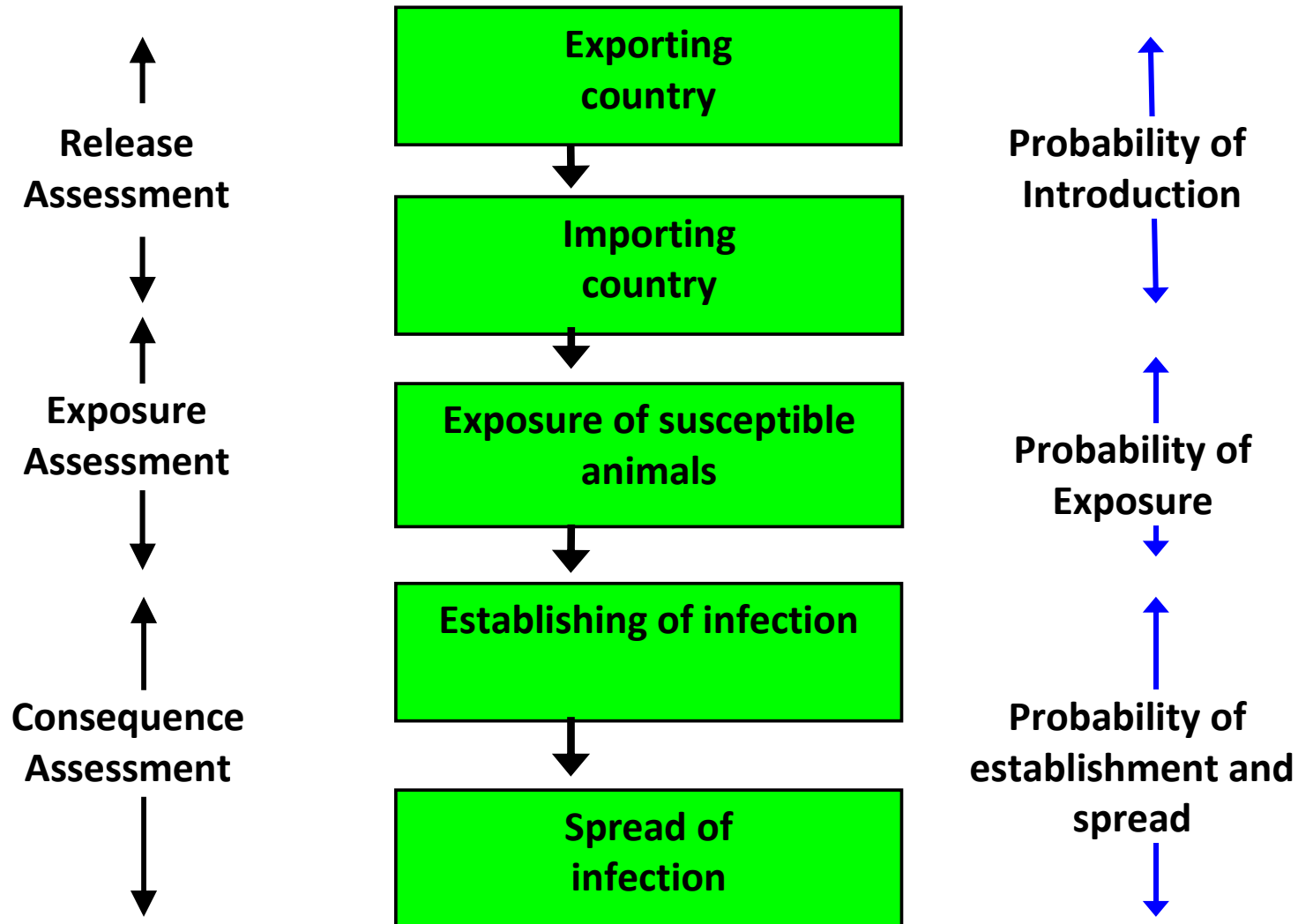
Figure 4. Location of FMD outbreaks in Libya and Egypt during 2012 superimposed over the province-level



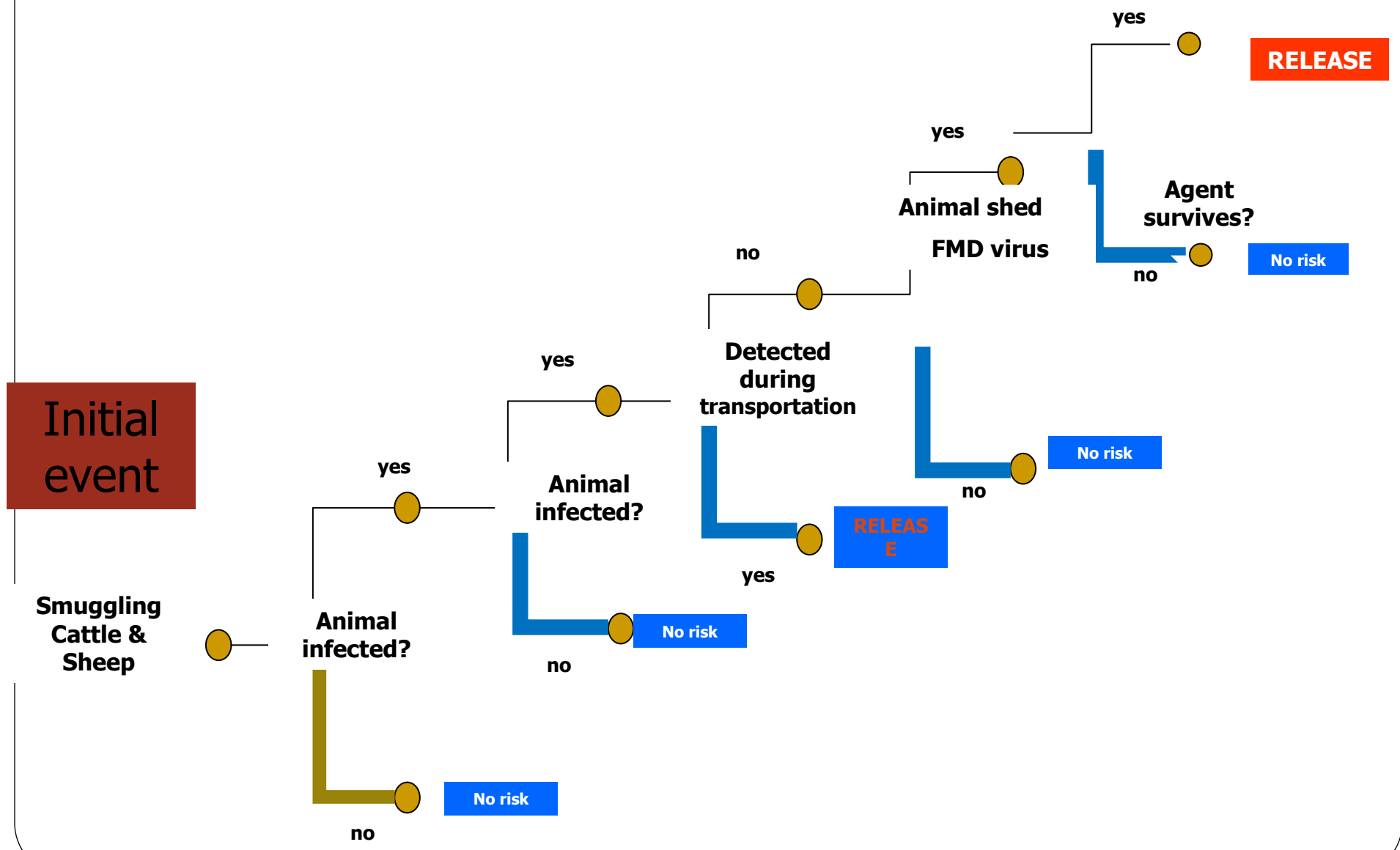
Risk Assessment

- Process of defining risk (s) associated with hazard
 - evaluation of likelihood, of biological and economic consequences of entry, establishment, or spread of pathogenic agent within population
- May be qualitative or quantitative
 - qualitative assessment more common due to lack of data
- It consists of several stages
 - Release, Exposure and Consequence Assessment
- multidisciplinary team approach

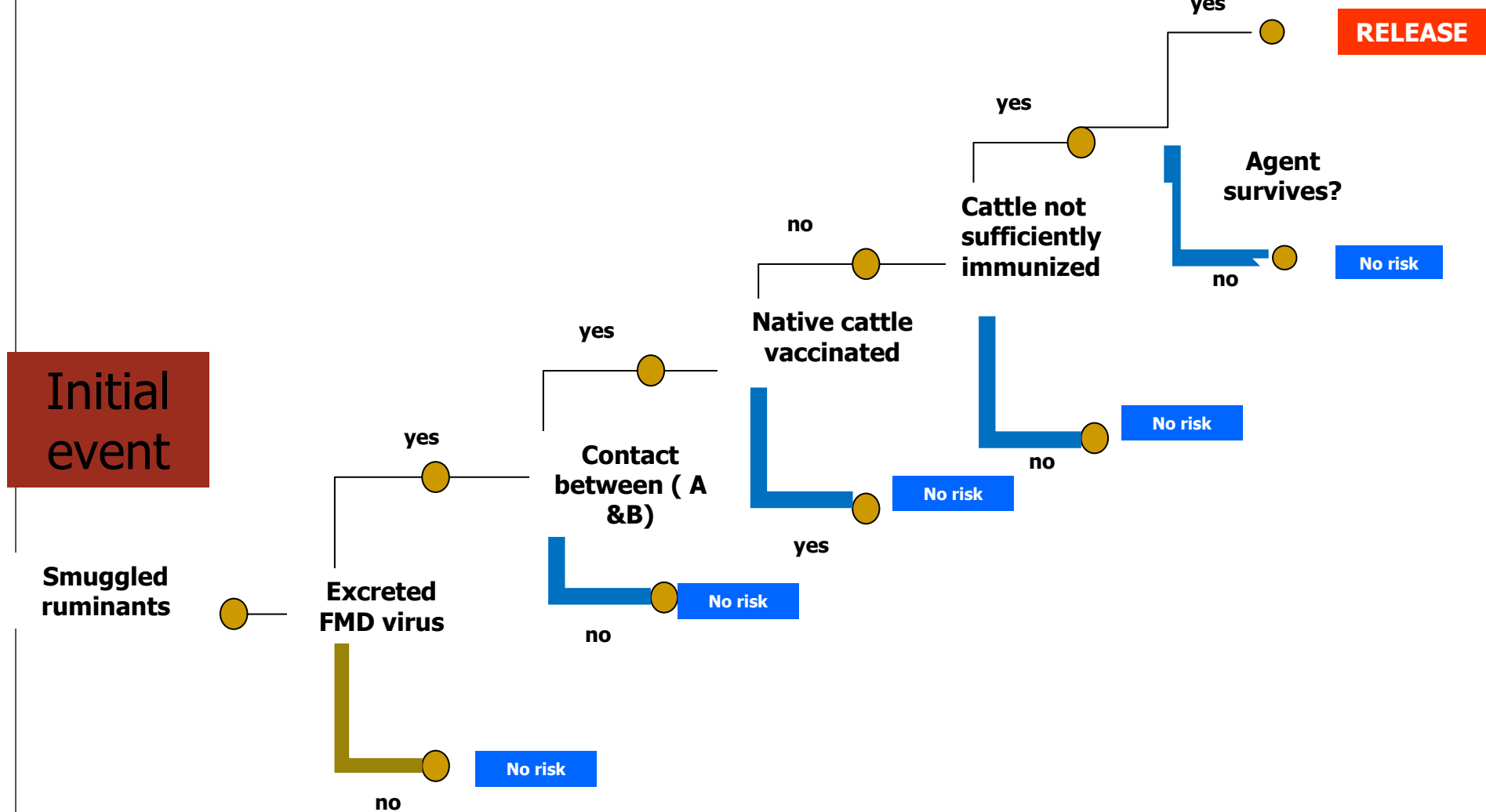
Components of Risk Assessment in Import Risk Analyses



Possible pathway of release of FMD virus outside Libya



Possible pathway of transmission of FMD virus from smuggled ruminants to egyptian cattle & subsequent spread in Egypt



C) Consequence Assessment

Consequences – description

- **Negligible** : the costs and losses associated with the economic factors are insignificant (unimportant).
- **Very low** : the costs and losses associated with the economic factors are minor (not serious).
- **Low** : the costs and losses associated with the economic factors are low (less serious).
- **Moderate** : the costs and losses associated with the economic factors are intermediate (between extremes in seriousness).

- **High** - the costs and losses associated with the economic factors are severe (intensely harmful).
- **Extreme** - the costs and losses associated with the economic factors are catastrophic (disastrous).

Consequence Assessment

1. Direct losses:

- **Animal health impact (morbidity, mortality and production losses)**

2. **Indirect consequences**

- Surveillance (monitoring, surveillance, surveys, laboratory testing, traceback), control/eradication (quarantine, slaughter, carcass destruction, cleaning, disinfection, treatment, vaccination) and compensation costs
2. Trade impact (losses in domestic marketability including animal movement restrictions)

Consequence Assessment

Direct consequences

Animal health impact (morbidity, mortality and production losses)

- ❖ All cloven-hooved domestic and wild animals including cattle (dairy and beef), pigs, sheep, goats,
- ❖ Expect high infection rates (up to 100%) but low death rates (2% - 5%) among affected farms, death rates are higher in young animals (5-50%) e.g. calves
- ❖ Affected animals show visible signs of pain and suffering: fever, with sore raw mouths, tongues and feet, also visible lameness, nasal and oral discharge, decreased appetite and decreased production, some pregnant animals abort
- ❖ Surviving animals start to improve in 5-7 days, requiring up to 6 months to recover
- ❖ FMD is extremely contagious

Consequence Assessment

Direct consequences

Animal health impact (morbidity, mortality and production losses)

- - if not aggressively controlled, FMD would be expected to spread rapidly, involving several farms within days of the initial outbreak
- - FMD spread occurs via infected carrier animals, aerosols, wind, milk, meat, animal products, contaminated feed, clothing, equipment and vehicles
- - the spread of FMD is facilitated by a number of factors:
 - its short incubation (1-21 days, but usually 3-8 days),
 - viral excretion for 1-10 days before symptoms appear
 - massive quantities of virus are excreted
 - multiple methods of spread
 - potential extended survival of the virus in the environment

Consequence Assessment

Indirect consequences

Surveillance (monitoring, surveillance, surveys, laboratory testing, traceback), control/eradication (quarantine, slaughter, carcass destruction, cleaning, disinfection, treatment, vaccination) and compensation costs

- very aggressive actions are required to regain confidence of international trade and to minimize the duration of impact
- control efforts must contain and stop virus production
- full mobilization of FAD emergency response with full trace-back, trace-out quarantine, movement restrictions, herd depopulation, carcass disposal, premises cleaning and disinfection
- Costs of movement control per outbreak control area
- Quarantine, slaughter, carcass disposal, clean-up and disinfection of infected premises

Consequence Assessment

Indirect consequences

Trade impact (losses in domestic marketability including animal movement restrictions and losses in foreign marketability)

- domestic and export sales would drop in the dairy, beef, swine, and goat industries
- prices of feed-grains and other spin-off industries might also be negatively affected
- expect most export markets to close to live animals and most animal products from cattle, swine, sheep, and goat industries
- the proportion of each industry affected is dependent on the number and distribution of farms/establishments infected with FMDV,
- expect at least entire counties, likely entire provinces and potentially the entire country to experience trade restrictions
- the duration of impacts are dependent on the success and speed of animal and product movement controls

Conclusion:

- The consequences associated with the introduction of foot and mouth disease into Egypt through smuggled ruminants **during the period from February till April 2012** are high.

Conclusion of the qualitative assessment

- The probability that FMD virus will be introduced in Egypt by smuggling of ruminants during the period from February till April 2012 is **High**.

Mitigation measures

Prevention

- Surveillance (Screening tests)
- cattle vaccination
- Animal movement controls
- Quarantine

Biosecurity measures

Health maintenance promotion

- Isolation
- Good veterinary practice

Immediate Actions

1. Communication to private stakeholders (farmers and livestock keepers)
1. Vaccination
2. Biosecurity measures
3. Active surveillance plan
4. Movement restrictions
5. Animal markets
6. Communication to decision makers

Risk Management Options by sensitivity rank

1st - Probability of an animal infected not being detected (P2)

Mitigation options

- Improve diagnostic capacity
- Use serial or parallel testing
- Follow up the animals for further observation

Risk Management Options by sensitivity rank cont 'd

2nd: Probability of exposed herd being infecte (P3)

Mitigation options

1. Vaccinations, Quarantines / disease free zones
2. Improved market infrastructures
3. Good animal management practices
4. Sanitary measures on farm / regions
5. Reporting and Records – *Risk Communication*
6. Policy and laws

Risk communication

Communication to decision makers

- GOVS should be regarded as the most reliable and knowledgeable source of information on animal
- disease and disease control. This requires procedures within its organization on who, what, when and how information is shared with decision makers.

Many thanks for your time

Acknowledgment

Mohamed Abd El Rahman El Bably