



## Foot-and-mouth disease caused by serotype SAT2 in Egypt and Libya A Regional concern for animal health in North Africa and the Middle East

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### 1. 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 and swine. In addition, affected animals cannot work the land – tilling for instance – or pumping water to irrigate fields, or transport agricultural harvests to market. 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.

The FMD viral distribution at global level can be characterised by seven “virus pools” distributed in Africa, Eurasia and parts of South America; within these pools, FMD virus serotypes continuously circulate and evolve, with new epidemics of each serotype which may result in “jumps” of infection into neighbouring at risk-countries. Egypt and Libya are countries which are at risk of jumps of infection from Virus Pools 3, 4 and 5, from West Eurasia and sub-Saharan Africa. Figure 1 shows the distribution of FMD serotypes reported during 2010–2012 in the region (see page 2).

The confirmation of SAT2 in Libya and Egypt, both endemic countries for types O and A, in February 2012 is an exceptional situation and a serious development in a region with an important livestock sector. Previous SAT2 incursions were limited to Saudi Arabia (2000) and Libya (2003) and were apparently self-limiting, as they did not spread across international borders, possibly due to rapid response. The finding that multiple SAT2 strains are involved adds complexity since it implies that several disease introductions have occurred, of which SAT2 may have been the first detected, but other animal health risks cannot be excluded. For instance, collaborative work between Egyptian authorities with FAO/EuFMD over the past year indicates that endemic FMD viruses affect a high proportion of villages each year, and that losses can be minimized through vaccination. The introduction

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of exotic serotypes to a naive population usually results in severe losses in vulnerable sectors, including high mortalities in young stock.

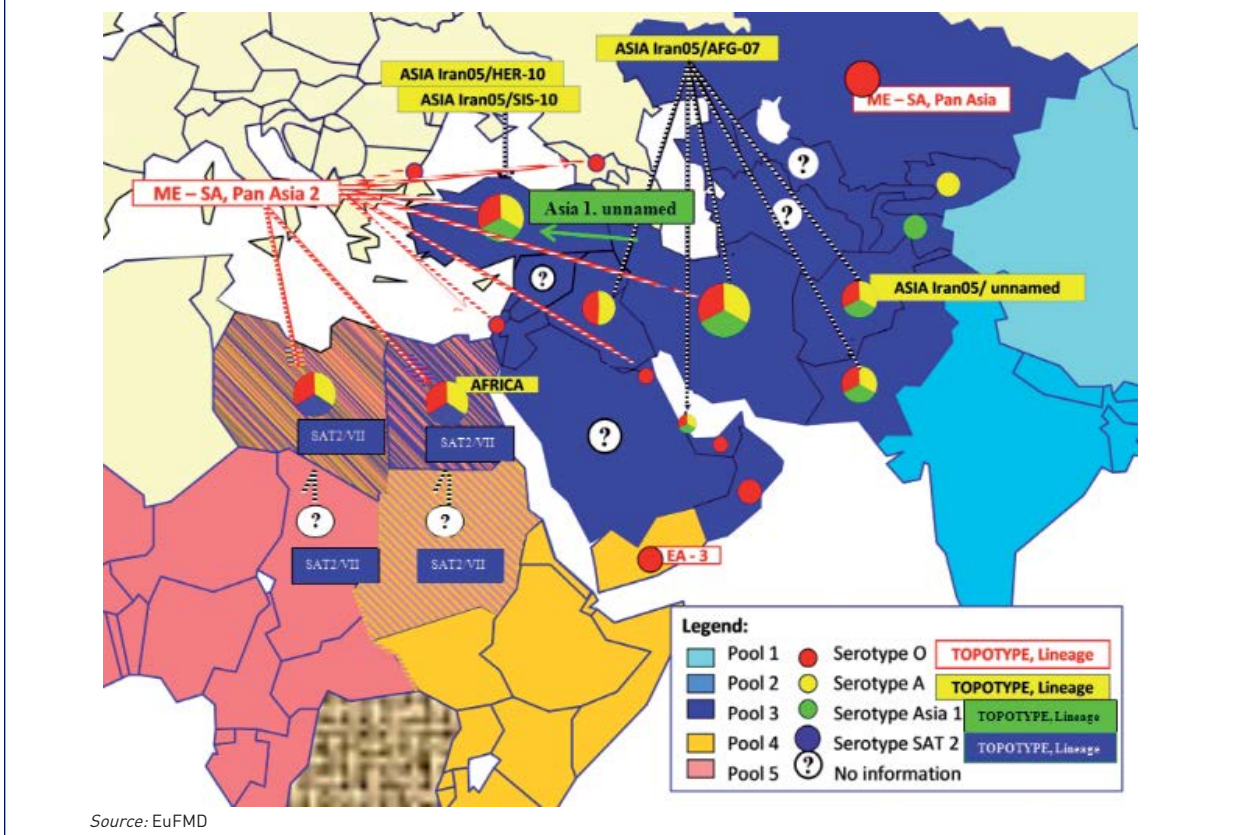
The pool boundaries in Africa are not well defined and there are reasons to suggest Sudan also shares FMD virus strains with Pool 5.

### 2. FMD SITUATION IN EGYPT AND LIBYA

The current situation concerns the confirmation of foot-and-mouth disease (FMD) serotype SAT2 outbreaks in both Libya and Egypt between February and March 2012. In addition to this, endemic serotypes A and O continue to circulate in both countries. This represents for Egypt the first report of outbreaks related to this serotype, while for Libya a re-introduction of serotype SAT2 nine years since it was last reported in 2003. This is particularly critical given the large ruminant populations at risk in a region where SAT2 vaccination is not consistently used, and SAT1 entry to the Near-East in the 1960s, which resulted in spread over large areas and required international assistance for its containment to prevent spread to Europe and Asia.

Libya officially confirmed outbreaks due to FMD serotype SAT2 to the OIE on 27 February 2012 in association with newly introduced feedlot cattle in Benghazi, Eastern Province. The results of genotyping of this current FMD strain indicate that the serotype is similar to that from a previous FMD outbreak in Sudan in 2007 and SAT2 viruses identified in Nigeria in 2007. In addition to SAT2, serotype O was also confirmed from samples collected in January 2012. FAOSTAT estimated the susceptible population at risk in Libya at approximately 2.1 million heads including cattle and small ruminants. See Table 1 for estimated animal populations in Northern Africa for 2007.

**Figure 1.** Distribution of FMD virus serotypes reported in Africa, Gulf and Middle Eastern countries during 2010 – 2012, illustrating how FMD virus genotypes detected in Libya and Egypt in this period arose from West Eurasia (Pool 3) and Eastern Africa (Pool 4).



**Table 1.** Estimates of Ruminant populations for countries in North Africa for 2007

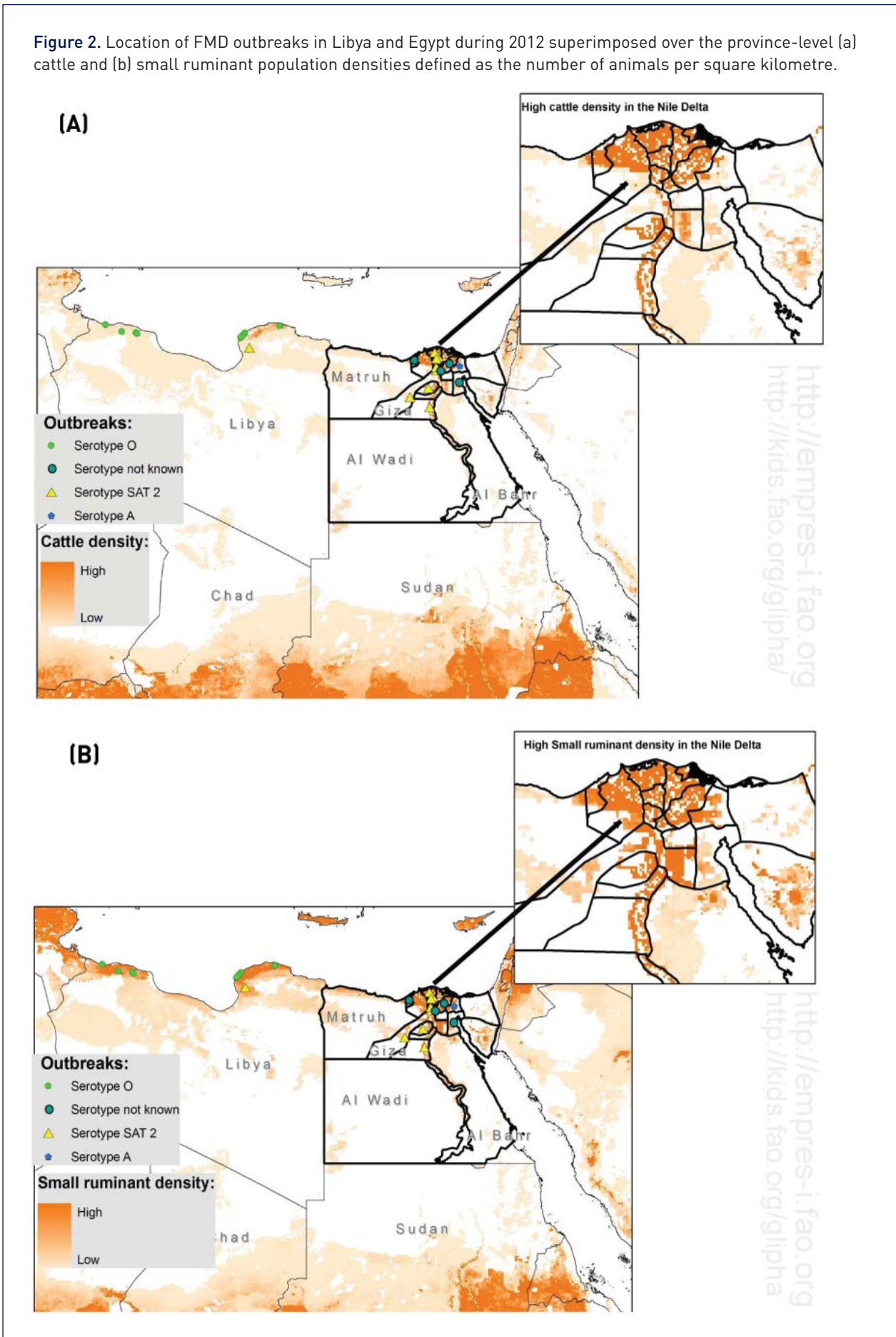
Country	Unit	Cattle	Buffalos	Sheep	Goats	Total
Egypt	Heads	4,932,696	1,650,000	1,880,000	1,027,228	9,489,924
Tunisia	Heads	710,130	-	267,000	500,000	1,477,130
Libya	Heads	130,000	-	1,600,000	428,000	2,158,000
Algeria	Heads	1,633,810	-	6,000,000	2,200,000	9,833,810
Morocco	Heads	2,781,100	-	750,000	1,150,000	4,681,100
Sudan	Heads	41,000,000	-	28,000,000	23,500,000	92,500,000
Western Sahara	Heads	-	-	-	81,000	81,000
<b>Total</b>		<b>51,187,736</b>	<b>1,650,000</b>	<b>38,497,000</b>	<b>28,886,228</b>	<b>120,220,964</b>

Source: FAO GLIPHA

The FMD serotype SAT 2 outbreaks in Egypt were officially reported to the OIE on 14 March 2012. Thirteen outbreaks were reported in eight (8) out of 27 governorates concentrated mainly in the Delta area and very few along the Nile in the southern parts of the country. Affected species include cattle and buffalo, and young buffaloes appear to be the category of animals more severely affected. Mortalities in young stock may be high as a result of lack of maternal immunity. Livestock census data in Egypt estimate 6.3 million heads of buffalo and cattle in addition to 7.5 million heads of small ruminants (sheep and goats) are at risk.

Genotyping of the current FMD virus strains is ongoing to identify the extent of diversity in SAT2 and other FMD viruses present in the outbreaks. In addition to this new serotype of FMD virus, two different FMD viruses, one serotype A and a serotype O, have recently been detected from samples collected in 2011-12 from animal populations in Egypt. The two serotype A viruses are very closely related to a West Eurasia strain which was first identified in Iran in 2005 and an East African strain previously reported in Sudan. Figure 3 shows the location of FMD outbreaks during 2012 overlaid on the cattle and small ruminant population densities defined as animal

Figure 2. Location of FMD outbreaks in Libya and Egypt during 2012 superimposed over the province-level (a) cattle and (b) small ruminant population densities defined as the number of animals per square kilometre.



numbers per square kilometre. Given the presence of areas with low animal densities between the affected and neighbouring countries, spread of the SAT2 could be contained if proper control measures are implemented in time.

### **3. FMD RISK MANAGEMENT ISSUES**

In Libya, the Government response involves vaccination campaigns against serotype A and O, movement controls and closing of livestock markets. In Egypt, markets have been closed and efforts made to impose movement controls, and in response to an FAO mission, to improve actions to reduce spread to unaffected areas, and within infected areas, intensifying communications with stakeholders to raise awareness of actions that can reduce the risks of FMD. The current bi-valent vaccine (A Egy 2009, O Sharquia) in use in Egypt does not include SAT2 and therefore does not provide protection against the serotype SAT2; the level of cross-protection against the current serotype A strains in the country is also likely to be low and is being investigated through submission of samples to FAO's World Reference Laboratory for FMD, Pirbright, United Kingdom. Most countries in the MENA region routinely vaccinate against FMD, although Morocco and Mauritania do not. Algeria routinely implements annual bovine vaccination against types O and A viruses but not against SAT2; and Tunisia implements an annual bivalent ovine (O and SAT2) and trivalent bovine (A, O, and SAT2) vaccination campaign since the SAT2 incursion in Libya in 2003. Countries east of Egypt do not routinely vaccinate against SAT2 although in Saudi Arabia this is often included in programmes on commercial dairy farms.

Countries in North Africa and the Middle East are thus at risk and most do not have contingency plans and associated funding for immediate procurement of vaccines; international actions include the identification of stocks and suitability for use in emergency response, particularly to reduce risk of spread to western Libya and countries east of Egypt. Israel has implemented a buffer zone of SAT2 vaccination on high risk borders in response to the confirmation of SAT2, but additional resources may be needed for the region. FAO has responded by contacting vaccine suppliers and funding partners able to provide support for the production and distribution of the vaccines to Egypt and potentially to other countries in the region (North Africa or Middle East) needing to protect their livestock. The genetic difference between the FMD SAT2 isolates from Egypt and Libya indicates that more than one lineage of SAT2 is circulating with the implication that there were multiple introductions, and thus there may yet be other variants (or serotypes) present.

### **4. LIVESTOCK MOVEMENT PATTERNS IN THE REGION AND IMPLICATIONS FOR FURTHER SPREAD**

Animal movement through formal trade is very intensive between countries in Sub-Saharan countries (Ethiopia,

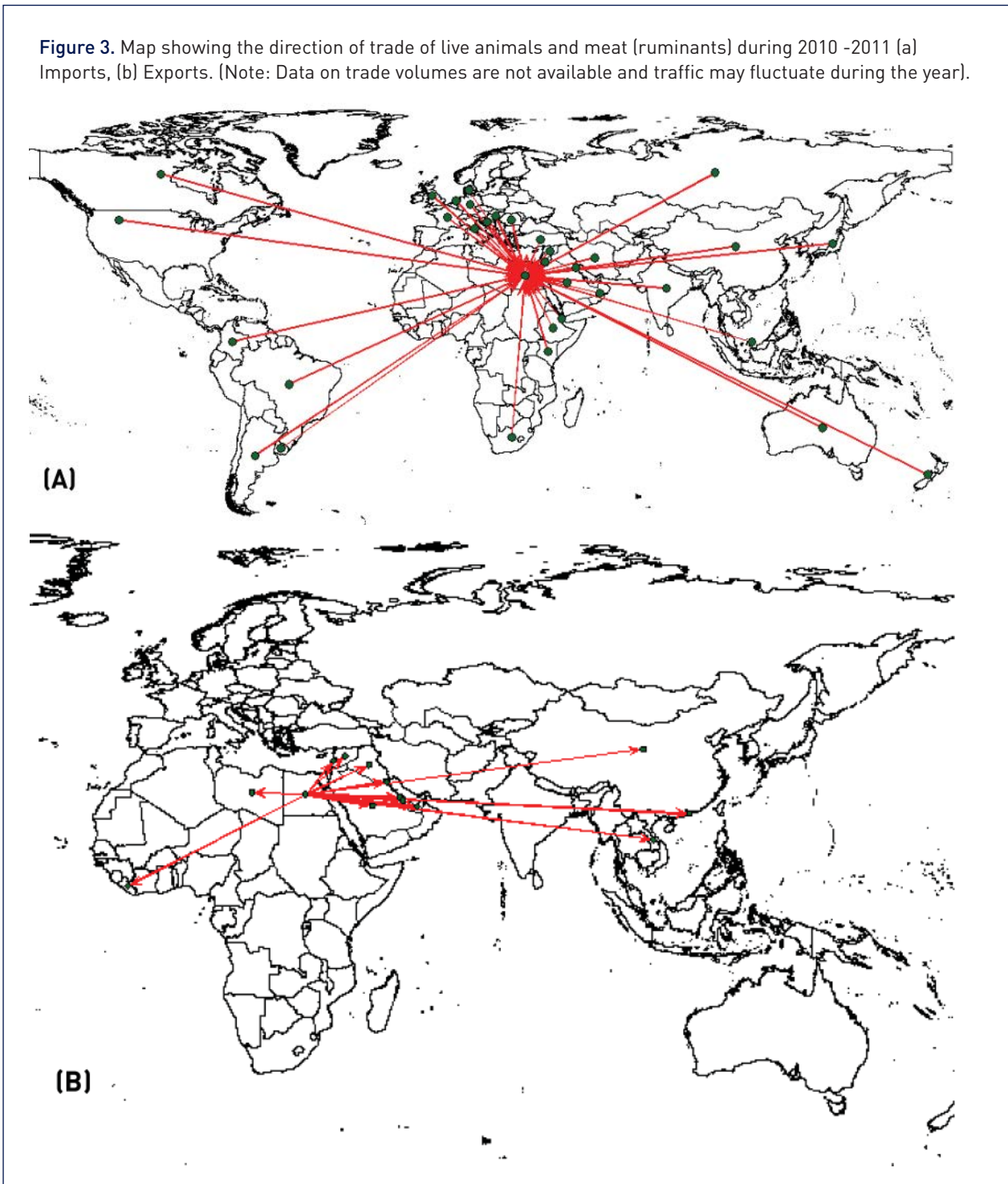
Sudan, and Djibouti) and Northern Africa (Egypt and Libya). Most countries in the MENA region are livestock importers, with live animal imports via the Mediterranean from Europe or the Americas or other parts of the Middle East, or across the Arabian Sea and Gulf from eastern Africa and Asia/Australasia. Intra-regional trade in large and small ruminants is limited except for exports in the past from Syria towards Saudi Arabia and the Gulf states. For six countries including Algeria, Tunisia, Egypt, Libya, Sudan and Morocco, FAOSTAT data show in 2009, 175,034 heads of live animals (including cattle, small ruminants and buffaloes) valued at USD \$167,191,000 were imported. The estimated exports for the same year for countries in the region was 1,536,899 heads with a value of USD \$254,854,000. Control of animal importation across the borders of Libya and Egypt appears to have dramatically changed since the civil unrest of 2011, but this flow is likely to be inward; commercial livestock flows across the Egypt-Libya borders in 2011 and 2012 are unclear. The risk of eastward spread will depend not only on control at land borders with Israel but also on the risk of "jumps across the sea" of infection through various routes including movements of people, fomites or returning ships that carried livestock to ports from infected countries. According to official reports, most of the current FMD SAT2 outbreaks reported in Egypt are concentrated in the Nile Delta, an area where most intensive livestock farms are located. Animal movements within the country are generally from a south to north direction, with animals coming from Sudan and Ethiopia mainly during the months of March and April. There is also movement of animals from the quarantine station in Ain Sokhna in Suez Governorate to other areas of the country. These include animals imported from countries in the Horn of Africa and quarantined in Suez. In Egypt, during the epidemic of type A which occurred between January and March 2006, index cases occurred close to quarantine stations where animals from Ethiopia were held.

In addition to animal movements through quarantine stations, animals are also moved within the country in association with the nomadic Bedouins, mostly within one governorate. There is limited or no animal movement from Egypt to other countries in the region.

The role of Gazelle spp in transboundary movement of FMD is probably unlikely as only limited populations exist in the western desert and borders with the neighbouring countries to the east. Gazelle spp in the Middle East are known to be sensitive to FMD and mortalities have been recorded in Israel and Oman with type O. Infection in wildlife is probably self-limiting and close contact with nomadic pastoralists' animals is likely to be a source for these species.

Egypt and Libya have had several introductions of FMD virus types over the past 10 years. In Libya, these occurred in 2003 (SAT2), in 2009 (type A Iran 05 BAR08) and 2010 (serotype O ANT-10), with the latter two following the regional pandemics in West Eurasia

**Figure 3.** Map showing the direction of trade of live animals and meat (ruminants) during 2010 -2011 (a) Imports, (b) Exports. (Note: Data on trade volumes are not available and traffic may fluctuate during the year).



of the same lineages;and, in Egypt in 2012 (SAT2), the 2006 incursion of an African serotype A from north-east Africa (FMD Virus Pool 4) with continued circulation, and the introductions of A Iran 05 BAR08 and serotype O ANT-10 which are likely to have entered at the time of the regional epidemics but which were not detected until 2012. The 2006 incursion was devastating, and following the initial epidemic, this strain continued to circulate even after local vaccines were used, at least until 2011. The emergence and rapid spread of FMD virus in West Eurasia (Virus Pool 3) has been well documented by the FAO/EuFMD and is one of the rationales behind the West

Eurasia Regional Roadmap for FMD control involving 14 countries, from Pakistan through Turkey, thereby decreasing the risk to Europe, the Middle East and North Africa. The finding that West Eurasian epidemics may extend as far as Libya (on at least 2 recent occasions) indicates that east to west epidemics are a high risk although often mitigated by partial immunity through vaccination against A and O.

In the case of a current Asia-1 epidemic in West Eurasia that has reached western Turkey, and of SAT1 and SAT2 or exotic African type A viruses, existing

control programmes do not cover the risks and more severe epidemics can be expected in the near future. For this reason, FAO/EuFMD, working with the FAO-WRL in Pirbright, places a high emphasis on improving early detection of new threats through support to FMD epidemiological surveillance networks in West Eurasia, Eastern Africa and West/Central Africa but faces the considerable hurdles of rapid disease spread in these regions coupled with limited sampling and local capacity to detect and characterise FMD virus samples, or respond quickly to changing events by providing vaccines that provide adequate immunity to new strains of FMD circulating. Building national capacity is central to establishing long-term Regional Roadmaps for FMD control in these endemic regions, such as the Roadmap for West Eurasia (1) and for Eastern Africa which was drafted at an international meeting of FAO, OIE and AU-IBAR in Nairobi in March 2012.

Factors which influence animal movements in the MENA region include differentials on price of animals, their products, and the movement of people as they flee political or civil unrest, and religious celebrations such as Eid-al-Fitr, amongst others. In 2012, the Eid will be celebrated at the end of August, which implies an increased risk of virus dispersal across the region via increased movements of animals, particularly lambs, during the months of May through July, unless concerted prevention and control actions are implemented.

## 5. DISCUSSION

The livestock population in North Africa and the Middle East is highly susceptible to SAT2, and effective vaccines are only used in some countries in the region. The routine implementation of vaccination programmes have been severely affected by civil unrest and changes in government leadership. It is expected that serotype SAT2 will spread widely and may affect a high proportion of livestock until limited by natural immunity or imposition of effective biosecurity measures and vaccination programmes. Continued circulation within the population is likely on the basis of recent experience of circulation after the 2006 incursion of type A. In a previous SAT1 incursion in the 1960s, almost all of the Middle East was affected with geographical extension into Greece, necessitating international actions coordinated by FAO/EuFMD.

The rapid spread of SAT2 and other exotic FMDV in Libya and Egypt demonstrates the need to have robust surveillance systems to detect and respond effectively to exotic infections in an endemic FMD country, and necessitates the importance of virological intelligence-gathering to pick up related FMDV from epidemics in the Sahelian countries to the immediate south of the Sahara or in eastern regions.

FAO continues to promote regional approaches for long-term FMD control based on risk management in endemic settings, through Regional Roadmaps using

the Joint FAO/OIE Progressive Control Pathway (PCP) at national level as a tool to develop and implement sustainable FMD control (FAO/EuFMD 2011a). The first component of this national/regional approach is to put in place sufficient monitoring of virus circulation so that new epidemic threats are identified, the second to implement actions to reduce the impact on key production sectors in each country. Addressing virus circulation is challenging and requires institutional commitment and a comprehensive set of measures, including the capacity to respond rapidly and effectively to incursions. Control at regional level, and eventually global level, will therefore be built progressively, with each country contributing through national actions; the current events illustrate the importance of maintaining safeguards to these national investments.

The Global FMD Control Strategy under development by FAO and OIE will face the challenge of ensuring that a comprehensive set of regional initiatives is put in place that addresses both the growing demand for participation in international trade in livestock and livestock products and for protection from highly damaging animal diseases.

## 6. FAO RECOMMENDATIONS

Control and prevention measures for FMD, like other transboundary animal diseases, include surveillance, animal movement control, vaccination, quarantine, humane culling and just compensation. FMD endemic countries in North Africa and the Middle East need to intensively monitor the pattern of FMD and thoroughly investigate outbreaks to ensure that exotic serotypes are detected from among the endemic serotypes, through syndromic surveillance for patterns such as mortalities in young stock or among well vaccinated animals, and through adequate and rapid strain typing of FMD at OIE or FAO Reference Centres.

Countries at risk need to:

- review and revise animal disease good emergency practices and contingency plans including compensation; (see FAO manual, 2002)
- enhance surveillance and raise awareness amongst stakeholders about the disease and clinical signs in animals to ensure early detection;
- implement or increase inspection of susceptible animals at gathering places such as live animal markets, in particular during high animal movement periods such as before Eid celebrations.
- For countries where vaccination against FMD is being used regularly, they should ensure routine monitoring of the quality of the vaccination campaigns being conducted and prompt identification of circulating virus strains to ensure appropriate vaccines are selected for use.

- Ensure timely submission of positive samples to international reference laboratories (such as WRL Pirbright) for virus characterization

In both affected and at-risk countries with wildlife populations, wildlife authorities should investigate unusual morbidity or mortality in antelopes or other wild species even if the classical signs of FMD are absent since sudden death may be a feature, and carry out further epidemiological investigations.

FAO encourages countries to report FMD outbreaks and offers assistance to countries in the shipment of samples for transboundary animal diseases (TADs) diagnostic testing to an OIE or FAO reference centers. Contact [empres-shipping-service@fao.org](mailto:empres-shipping-service@fao.org) for information prior to sample shipment and note that sending samples out of a country requires export permit from the Chief Veterinary's Office of the country and one import permit from the receiving country.

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## RECOMMENDED CITATION

**FAO.** 2012. Foot-and-Mouth disease caused by serotype SAT2 in Egypt and Libya: a regional concern for animal health in North Africa and the Middle East . *EMPRES WATCH*, Vol. 25, March 2012. Rome.