





Risk of foot-and-mouth disease SAT2 introduction and spread in countries in the Near East and West Eurasia









## Acknowledgements

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# Countries who completed questionnaire and FAO regional and sub-regional offices







# Background

- Increase in FMD outbreaks noted in December 2022 in Iraq and Jordan
- Samples from Iraq tested in Türkiye
  - SAT2 serotype reported in early Feb 2023 in both Iraq and Jordan
    - Topotype XIV, most closely related to a strain detected in Ethiopia in 2022
  - Subsequent reports in other countries













- SAT2 of high concern because animals lack immunity and vaccines used in region not effective for this serotype
- FAO issued an alert on 10<sup>th</sup> February to raise awareness
- Series of 3 webinars held in March 2023 for countries in the region
  - 1. Update on SAT2
  - 2. FMD laboratory diagnostics
  - 3. SAT2 risk management and vaccination strategies
- Series of coordination meetings held (with EuFMD/FAO)
- Emergency mission to Iraq in June 2024 on request of the Iraqi authorities





#### FAO ALERTS COUNTRIES IN THE MIDDLE EAST AND WEST EURASIA TO ENHANCE PREPAREDNESS FOR FOOT-AND-MOUTH DISEASE

10 February 2023







#### **Risk Assessment Methodology**

- Risk of further spread?
  - Qualitative risk assessment performed
    - risk = likelihood + consequences
- Qualitative versus Quantitative?
  - Qualitative is appropriate for faster analysis, lack of reliable data

Steps followed:

- 1. Define the risk questions and scope
- 2. Identify and draw the relevant risk pathways
- 3. Collect data for the analysis
  - Questionnaire to vet services
  - ✓ Literature
  - ✓ Databases (eg FAO STAT)
- 4. Conduct assessment and model economic impact using 5 scenarios Available at: https://



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Available at: https://openknowledge.fao.org/server/api/core/bitstreams/5c38e3c7-5eef-4c03-8b99-2151ed9ccafe/content







# Methodology

# **Risk Questions:**

- What is the likelihood of FMD-susceptible livestock in unaffected countries being exposed to FMD serotype SAT2 due to its introduction from affected countries\* via the specified pathways?
  - \*Affected countries at the time of the analysis: Bahrain, Iraq, Jordan, Oman and Türkiye
- 2. What is the **potential impact** of FMD-susceptible livestock being exposed to FMD serotype SAT2:
  - in unaffected countries?
  - in countries already affected?









# Methodology

# Scope

- *Likelihood analysis*: Countries/territories with contiguous land border with affected countries
- Impact analysis: also included affected countries





*Note*: Small ruminant (A) and large ruminant (B) density layers adjusted according to Food and Agriculture Organization Corporate Statistical Database (FAOSTAT) 2015 (Gridded Livestock of the World [GLW] 4).

*Source:* **United Nations Geospatial**. 2020. Map of the World. In: *United Nations*. New York. [Cited 21 September 2023]. <u>https://www.un.org/geospatial/file/3420/download?token=TUP4yDmF</u>. Modified with GLW 4 data and Emergency Prevention System Global Animal Disease Information System (EMPRES-i) data, 2022–2023. 21 countries included in the analysis:

Spread West from Türkiye (FMD-free countries):	<ul> <li>Bulgaria, Cyprus, Greece</li> </ul>
Spread East from Türkiye	<ul> <li>Armenia, Azerbaijan, Georgia, the Islamic Republic of Iran*, Syrian Arab Republic*</li> </ul>
Spread from Iraq	<ul> <li>Kuwait, Saudi Arabia*</li> </ul>
Spread from Jordan:	<ul> <li>Israel, Lebanon, the West Bank in Palestine</li> </ul>
Spread from Oman	<ul> <li>Yemen, United Arab Emirates *</li> </ul>
Spread from Bahrain:	• Qatar

\* Country borders more than one affected country







# Methodology

# **Risk Pathways:**

- 6 pathways investigated
- Based on epidemiology of FMD and previous identified routes of transboundary spread

What is the likelihood of FMD-susceptible livestock in unaffected countries being exposed to FMD serotype SAT2 due to its introduction from affected countries via the following pathways:

Livestock movement (include informal and common grazing)	Legal and informal trade in animal products
Wildlife movement	Movement of people
Trade in fodder	Movement of vehicles







# Methodology

# Matrix showing country connections

Data from questionnaires (red) and FAO-STAT (black)

- A = live animals;
- C = common grazing;
- D = dairy products;
- F = fodder;
- M = meat products.

			То																			
	Country	Armenia	Azerbaijan	Bahrain	Bulgaria	Cyprus	Georgia	Greece	Iran (Islamic	Iraq	Israel	Jordan	Kuwait	Lebanon	Oman	Qatar	Saudi Arabia	Syrian Arab	Türkiye	United Arab	West Bank	Yemen
	Armenia	•					A, M, D					М	A, M, F	А, М		A, M				A, M, D		
	Azerbaijan		-				A, C, <mark>M, D</mark> , F						F			F			F	<mark>M, D</mark> , F		
	Bahrain			-								D	M, D, F	D, F	M, D		M, D		D	A, M, D, F		D
	Bulgaria		A, D	D, F		M, D	A, M, D, F	A, M, D, F		F	D	D, F	D, F	D, F	D	M, D, F	D, F		A, D, F	A, M, D, F		
	Cyprus		D	D	M, D	-	м	M, D			D	M, D	D	A, M	M, D	A, D	D		M, D	A, M, D		
E	Georgia	D	A*, M, D	А, М					D	F	м	F	A, M	A, F	A	А, М	A, F		F	A, M, D, F		
£	Greece	A, M, D, F		M, D	A*, M, D, F	A, M, D, F	M, D	-			D	D	M, D	A, D, F	м	M, D	D		M, D, F	M, D, F		
	Iran (Islamic Republic of)	M, D	D	M, D			A, D		-			F	A, M, D, F	D	A, M, D, F	A, F			M, D, F	A*, M, D, F		
	Iraq			м			A		с	-		F						A*, C	M, D	A, M, D, F		
	Israel					D		м			•	F	A						D	D	A, M, D, F	
	Jordan		м	А, М, D									M, D	M, D	M, D	M, D	A, M, D, F	D		A*, M, D, F	D	M, D, F







Methodology

# **Risk Pathways:**

- Major steps in each risk pathway were defined and described
- Entry and exposure on continuum
- Based on questionnaire, literature and FAO STAT
- For each country and pathway, overall likelihood assessed and assigned to one of four levels (negligible, low, moderate, high)
- Because of conditional nature of pathway, overall likelihood cannot be greater than least likely step
- Level of uncertainty also assessed (low, moderate high)









# **Results:** Likelihood of spread

- **15/21 (71%) countries/territories** completed the questionnaire
- Informal movements of livestock and common grazing are most likely pathway for SAT2 spread
  - High: 3 countries/territories
  - Moderate: 3 countries/territories
  - Effective mode of transmission
  - Absence of sanitary measures
  - Peaks in seasonal risk (eg Eid al-Adha (qurban))
  - High level of uncertainty







**Results: Likelihood of spread** 

- Animal products less likely compared to animal movements:
  - More steps required to complete pathway
  - Although the countries are highly connected by trade, **exposure usually involves pigs** consuming product, and there is little pig production in the region



**Animal Product Risk Pathway** 







# **Results**

# Likelihood of spread

- Other pathways are possible in some cases, but less likely:
  - Less effective transmission routes (indirect, via fomites)
  - Involve many more steps the more steps are involved the less likely the event will occur
- Several data gaps, therefore high uncertainty in the analysis

#### Likelihood estimates per country/territory and risk pathway addressed

Country/		Live anim	als	POAO	Wildlife	Fodder	People	Vehicles	
Territory					(boar)				
	Officia I trade	Informa I trade	Common grazing	Official trade		Official trade			
Armenia	Ν	Ν	Ν	Ν	L	Ν	Ν	Ν	
Azerbaijan	L	М	Ν	L	L-N	Ν	Ν	L	
Bahrain	L	NA	NA	Ν	Ν	Ν	NA	L	
Bulgaria	Ν	L	Ν	Ν	L-N	L-N	L	L	
Cyprus	Ν	Ν	Ν	Ν	Ν	Ν	Ν	Ν	
Georgia	Ν	Ν	М	L	L	Ν	L	L	
Greece	Ν	Ν	Ν	Ν	L-N	Ν	L	Ν	
Iran (the Islamic Republic of)	L	NA	н	Ν	L	Ν	NA	L	
Iraq									
Israel	Ν	Ν	Ν	L	L	Ν	N	Ν	
Jordan									
Kuwait	Ν	Ν	Ν	Ν	Ν	L-N	N	L	
Lebanon	Ν	Ν	Ν	L	L-N	L-N	N	L	
Oman									
Qatar	L	NA	NA	Ν	Ν	L-N	NA	L	
Saudi Arabia	L	NA	NA	N	Ν	L-N	NA	L	
Syrian Arab Republic	N	н	Ν	L	L	Ν	L	L	
Türkiye									
UAE	L	М	Ν	Ν	Ν	L-N	L	L	
West Bank	Ν	Ν	Ν	L	L	Ν	L	Ν	
Yemen	Ν	Ν	н	N	N	L-N	Ν	L	

*H* = high, *M* = Moderate; *L* = Low; *N* = Negligible; *NA* = Not assessed. Blue cells: high uncertainty. Green cells: moderate uncertainty. The red font indicates that countries did not respond to the questionnaire survey.





#### **Consequences of SAT2 incursion**

#### Impacts of animal diseases

**Objective:** Assessing likelihood of further spread of SAT2 in the region via key risk pathways, and the potential consequences





Source: Rushton, 2009





### **Consequences of SAT2 incursion**

# Impacts & data used in this analysis



- Livestock production data from FAOSTAT 2016-2021 for 21 countries used
- Magnitude of impacts from the literature



Median and standard deviation of cattle raw milk produced in 2016-2021 in millions of tons per year





### **Consequences of SAT2 incursion**

# **Scenarios and simulations**

Analysis conducted under **five main** scenarios representing different potential spread direction patterns from the known affected countries

- 1. No further spread; known affected countries only: Jordan, Iraq, Oman, Türkiye
- 2. Westward spread to FMD-free countries
- 3. Eastward spread to countries neighbouring Anatolia
- 4. Spread to countries neighbouring Iraq
- 5. Widespread in all 21 countries: worst-case scenario.

A Monte Carlo simulation used for each scenario to explore the impact of the potential variabilities of input parameters







\$4,500

\$4,000

### **Consequences of SAT2 incursion**



Simulated median and standard deviation of the production losses (USD Millions)

- Estimated costs varied from USD 3.6 6.5 billion
- Production losses are 95% of total costs
- 4 countries with highest level of production represent ~80% of losses
- Additional impacts related to food and nutrition security





### **Consequences of SAT2 incursion**

Challenges, limitations and broader application

- **Simplified cost calculations:** The method considers only mortality and general impacts on production, leaving out many direct and indirect factors that are not fully captured.
- Market impact analysis needed: Ideally, analysis should cover impacts on supply (production), demand (consumption), and prices. In this case, only the supply side was considered.
- **Data limitations:** Detailed, country- or region-specific economic and epidemiological data are crucial. While country-specific production data (FAOSTAT) was used, generic epidemiological assumptions (e.g., prevalence) were applied.



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Food and Agriculture Organization of the United Nations



**Consequences of SAT2 incursion** 

Challenges, limitations and broader

- **Epidemiological-economic models:** Ideally, epi-econ simulation models should be used for more accurate insights, but there's a lack of necessary data in many endemic regions.
- Monte Carlo simulation: This approach provided a range of possible impacts but relies heavily on the availability of valid data and assumptions.
- **Consideration of prevention/control costs:** Future models should include the costs (and benefits) of prevention and control measures, especially indirect costs.
- Adaptability of the model: While this model provides a solid foundation for FMD, it can be expanded and adapted for other Transboundary Animal Diseases (TADs).





**Conclusions and recommendations** 

- An outbreak of FMD SAT2 would have a substantial negative impact in all countries considered in this risk assessment, though to a varying extent in terms of the level of impact and sector most affected
- The likelihood of exposure, infection and spread can vary over time or change seasonally Eid al-Adha, winter/early spring
- As resources are always limited, prevention should be risk-based and targeted to specific areas, holdings and the highest risk pathways





#### **Conclusions and recommendations**

- Ensuring that only healthy animals (known to be FMD-free) are moved is crucial to mitigate the risk of FMD spreading within and between countries
- Trade between countries could be made safer by facilitating compliance with the official trade regulations, which in turn would help ensure that sanitary measures are applied.
- Raising awareness about FMD prevention is also crucial, as this will enable stakeholders to better protect their livestock and livelihoods.

Transaction in a livestock market – how can they be sure the cattle are healthy?







### **Conclusions and recommendations**

All countries should have an emergency response plan for FMD that details how to manage a sudden increase in cases, such as would be expected with the introduction of a novel serotype such as SAT2.

The response plan needs to be:

- realistic for the country
- supported with adequate resources for implementation when needed,
- should be tested through regular and realistic simulation exercises.

Note: Subsequent introduction of SAT2 topotype V in Algeria (December 2023)



Good emergency management practice: The essentials

A guide to preparing for animal health emergencies Third edition







#### Available at: https://openknowledge. fao.org/server/api/core/ bitstreams/6af6fb17-3f8c-4909-8256a06fbda162bf/content

Available at:

https://web.archive.org/web/20

210610105243/http://www.fao.

org/3/cb3833en/cb3833en.pdf

FAO ALERTS COUNTRIES IN THE MEDITERRANEAN REGION TO ENHANCE PREPAREDNESS FOR FOOT-AND-MOUTH DISEASE

16 February 2024





### **Conclusions and recommendations**

- Implement an early warning system based on reports of increased mortalities (particularly young stock) and observations at slaughterhouses or panic sales, using information from farmers, traders, paraveterinary workers, inspectors and relevant social media sites.
- Support and improve the performance and infrastructure of veterinary services
- Adopt public-private partnership approaches when appropriate
  - Analysis of which groups are impacted and which benefit to determine how to fund control measures



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**Conclusions and recommendations** 

Qualitative risk assessment useful framework to guide prevention and response activities

- Adapt WOAH framework for safe trade
- Challenge to do a truly rapid assessment
- Define the risk question is a key step
  - Risk (probability & impact) of future incursions of exotic serotypes from different regions would be another interesting question
- Need feedback from risk managers to know how to make the results most relevant



Communication with Authorities and stakeholders throughout underpins the process







# GFRA RESEARCH WEBINAR SERIES

# **Recording available:**

https://insights.crdfglobal.org/gfrawebinar







World Organisation for Animal Health

# FMD Roadmap for the Middle East (2025-2028) 28 April 2025

#### **Regional Advisory Group Middle East FMD Roadmap**

CVOs/Delegate:

Ahmed Saif Alamri (Chair), Bakar Alturief, Abdulhai Mohammad Yousuf Epi leader: Bassel Al Bazzal

Lab leader: Asma Abdi Mohammed

#### **GF-TADs FMD Working Group**

Melissa McLaws, Muhammad Javed Arshed, Nick Lyons (FAO) Min-Kyung Park, Bolortuya Purevsuren, Caesar Lubaba (WOAH) Fabrizio Rosso (EuFMD)



Food and Agricul Organization of t United Nations

World Organisation for Animal Health

Countries		Validated Stages															Expected Stages (not validated)			
	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028			
Bahrain	1	2	2	2*	2*	2*	2*	2*	2*	2	2	2	2	2	2	3	3			
Egypt	1	1	2*	2*	2*	2	2	2	2	2	2	2	2	2	3	3	3			
Iraq	2	2	2*	2*	2*	2*	2*	2*	2*	2*	2*	2*	2*	2*	-	-	-			
Jordan	1	1	2*	2*	2*	2*	2*	2*	2*	2*	2	2	2	2	2	2	2			
Kuwait	2	2	3	3*	3*	3*	3*	3*	3*	3*	3*	3*	3*	2	3	3	3			
Lebanon	1	1	2*	2*	2*	2*	2*	2*	2*	2*	2*	2*	2*	2*	-	-	-			
Libya	UnK	UnK	UnK	UnK	UnK	UnK	UnK	UnK	UnK	1*	1*	1*	1*	1*	-	-	-			
Oman	2	2	2*	UnK	UnK	UnK	UnK	UnK	UnK	2*	2*	2*	2*	2*	-	-	-			
Palestine	UnK	UnK	1	1	1	1	1	1	1	2	2	2	2	2	2	2	2			
Qatar	2	2	3*	3*	UnK	UnK	UnK	UnK	UnK	3*	3*	3*	3*	3*	-	-	-			
Saudi Arabia	1	1	2*	2*	2*	2*	2*	2*	2*	2*	2*	2	2	2	2	3	3			
Syria	2	2	2*	2*	2*	2*	2*	2*	2*	UnK	UnK	UnK	UnK	1*	-	-	-			
UAE	1	1	2	2*	2*	2*	2*	2*	2*	2*	2*	2*	2*	2*	-	-	-			
Yemen	1	1	1*	UnK	UnK	UnK	UnK	UnK	UnK	0	UnK	-	-	-	-	-	-			

#### 6th Middle East FMD Roadmap meeting



- Please send information about planned progression to 2028 to complete the Roadmap
- Provisional stages are till June 2025 (2 months)
  - At end June 2025, countries that have not submitted the relevant plan will revert to the previous stage
- To move to next stage plan should be submitted and accepted by the RAG
- Countries are encouraged to submit RAP/RBSP/OCP within next 2 months to the GFTADs FMD Working Group at <u>fao-fmd@fao.org</u> and <u>woah-</u> <u>fmd@woah.org</u>
  - □ Stage 0 to 1:
  - □ Stage 1 to 2:
  - □ Stage 2 to 3:

Risk Assessment Plan (RAP) Risk-Based Strategic Plan (RBSP) Official Control Programme (OCP)



# Thank you for your attention