Food and Agriculture
Organization of the
United Nations

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european commission for the
control of foot-and-mouth disease

GL🌍BAL
Monthly
Report

Foot-and-Mouth
Disease

Foot-and-Mouth Disease Situation | 2019 | November

Foot-and-Mouth Disease Situation
Food and Agriculture Organization of the United Nations
Monthly Report

November 2019

MAIN INFORMATION SOURCES USED:

Databases:
OIE WAHIS World Animal Health Information Database
FAO World Reference Laboratory for FMD (WRLFMD)
FAO Global Animal Disease Information System (EMPRES-i)

Other sources:
FAO/EuFMD supported FMD networks
FAO/EuFMD projects and field officers

The sources for information are referenced by using superscripts.
The key to the superscripts is in references.

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I.   HIGHLIGHTS

Dear Readers,

We would like to take this moment to update you on the changes occurring with our newly agreed Phase V agreement with DG-SANTE of the EC for our program of activities from October 2019 to September 2023, under a framework of co-ordination with EC (DG-SANTE), FAO and OIE EuFMD.

The primary objective of Phase V will be to reduce the threat not only of FMD but of similar transboundary (FAST) diseases, to our 39 member countries; beneficiaries are not only these countries but under the Pillar II and III activities, are also in the European neighbourhood and supported under the Global programme. Given the strong land and other connections to the countries in the European neighbourhood, and because of globally interconnected trade and air travel, the EuFMD member countries recommended to extend the ""3 Pillars"" programme to cover multiple disease threats in the new 4 year programme, and financial support for this has been agreed with DG-SANTE. Depending on the current epidemiological circumstances of each threat, the programme will be flexible and responsive to changes in risk.

The 3 Pillars of the new work programme are:
Pillar I: **improving preparedness** for management of FAST diseases crises by Members and across Europe as a whole**.** Through the interlinked activities of this Pillar, the main beneficiaries will be the EuFMD members who will be supported in increasing their capacities on emergency preparedness, emergency vaccination and disease risk assessment of FAST diseases;
Pillar II focuses on **reduced risk** to Members from the FAST disease in the European neighbourhood especially referring to countries that are not members but who have land borders, or are in the Mediterranean or however have an animal health status that provides an early warning system to the European neighbourhood.
The main activities that this Pillar will be supporting are an enhanced coordination with GF-TADs partners, international agencies and national competent authorities and improved implementation of strategic plans for FAST control at national and regional level. A special focus will be on improved early warning for FAST diseases and capacity development for surveillance and improved control programmes.
Pillar III will be sustaining and **enhancing progress** in the roll out of the GF-TADs Global Strategy for control of FMD, and on increasing the security in the supply of effective FMD vaccines. The activities in support are represented by the effective implementation of the Progressive Control Pathway (PCP-FMD), with better training in support of this, together with the improvement of global laboratory support. A further activity within this Pillar is dedicated to increase of vaccine security to improve the access of FMD endemic countries, particularly in PCP Stage 1 to 3, to quality FMD vaccines in the mid to long-term by developing technical and policy study reports, guidance papers and application tools**.**

As part of the new strategic plan of Phase V, the Global Monthly Report will undergo an improvement in support of risk managers. A new system will be developed for the collection and evaluation of FAST disease information for risk assessment and forecasting, and we will seek your feedback on the new developments in order to best address your needs and interests.

Keith Sumption
Executive Secretary
European Commission for the Control of
Foot-and-Mouth Disease - FAO-Rome

II.   GENERAL OVERVIEW

Pools represent independently circulating and evolving foot-and-mouth disease virus (FMDV) genotypes; within the pools, cycles of emergence and spread occur that usually affect multiple countries in the region. In the absence of specific reports, it should be assumed that the serotypes indicated below are continuously circulating in parts of the pool area and would be detected if sufficient surveillance was in place (Table 1).

Table 1: List of countries representing each virus pool for the period 2014 – 2018 (source EuFMD)

POOL	REGION/COUNTRIES	SEROTYPES
1	**SOUTHEAST ASIA/CENTRAL ASIA/EAST ASIA** Cambodia, China, China (Hong Kong, SAR), Taiwan Province of China, Democratic People's Republic of Korea, Republic of Korea, Lao People's Democratic Republic, Malaysia, Mongolia, Myanmar, Russian Federation, Thailand, Viet Nam	**A, Asia 1 and O**
2	**SOUTH ASIA** Bangladesh, Bhutan, India, Mauritius, Nepal, Sri Lanka	**A, Asia 1 and O**
3	**WEST EURASIA & MIDDLE EAST** Afghanistan, Armenia, Azerbaijan, Bahrain, Georgia, Iran (Islamic Republic of), Iraq, Israel, Jordan, Kazakhstan, Kuwait, Kyrgyzstan, Lebanon, Oman, Pakistan, Palestine, Qatar, Saudi Arabia, Syrian Arab Republic, Tajikistan, Turkey, Turkmenistan, United Arab Emirates, Uzbekistan	**A, Asia 1 and O (SAT 2)***
3	**NORTH AFRICA** Algeria, Egypt, Libya, Morocco, Tunisia	**A, O and SAT 2**
4	**EASTERN AFRICA** Burundi, Comoros, Djibouti, Eritrea, Ethiopia, Kenya, Rwanda, Somalia, Sudan, South Sudan, United Republic of Tanzania, Uganda, Yemen	**O, A, SAT 1, SAT 2 and SAT 3**
5	**WEST/CENTRAL AFRICA** Benin, Burkina Faso, Cameroon, Cabo Verde, Central Afr. Rep., Chad, Democratic Republic of Congo, Congo, Côte d'Ivoire, Equatorial Guinea, Gabon, Gambia, Ghana, Guinea-Bissau, Guinea, Liberia, Mali, Mauritania, Niger, Nigeria, Sao Tome & Principe, Senegal, Sierra Leone, Togo	**O, A, SAT 1 and SAT 2**
6	**SOUTHERN AFRICA** Angola*, Botswana, Malawi, Mozambique, Namibia, South Africa, Zambia*, Zimbabwe	**{O, A}**, SAT 1, SAT 2 and SAT 3**
7	**SOUTH AMERICA** Colombia, Venezuela (Bolivarian Republic of)	**O and A**

*REPORTED ONLY IN OMAN IN 2017

** ONLY IN ANGOLA AND NORTH ZAMBIA AS SPILL-OVER FROM POOL 4

III.   IN THIS REPORT

POOL 1- SOUTHEAST ASIA/CENTRAL ASIA/EAST ASIA

Myanmar [1] – Thirteen outbreaks, some of which already resolved were caused by FMDV serotype O during October and November 2019 in various areas of the country.

POOL 2 - SOUTH ASIA

Bangladesh [2] – FMDV serotype ASIA 1 was detected in cattle samples collected in 2018.

POOL 3 - WEST EURASIA & MIDDLE EAST

Pakistan [3] – FMDV A, Asia 1 and O were the serotypes detected in the 48 outbreaks notified in three different provinces of the country.

POOL 3 – NORTH AFRICA

Libya [2, 4] - FMDV serotype O was detected in a cattle sample collected in May 2019.

POOL 4 - EASTERN AFRICA

Ethiopia [5] - FMDV serotypes A and O were detected during November 2019 in bovine samples analysed by the National Animal Health Diagnostic and Investigation Center (NAHDIC) Ethiopia.

Kenya [6] – FMDV serotypes A and SAT 1 were detected among the nine samples examined during the reporting month by the FMD National Reference Laboratory (NRL), Embakasi, Kenya.

POOL 5 - WEST/CENTRAL AFRICA

Cameroon [2, 7] – FMDV serotype A was detected by the WRLFMD in the cattle samples collected in the country by the Laboratoire National Vétérinaire (LANAVET), Garoua during August and September 2019.

Nigeria [8] – FMDV was detected for the reporting month by the National Veterinary Research Institute (NVRI) Vom, Nigeria.

POOL 6 - SOUTHERN AFRICA

Namibia [2, 9] – FMDV serotype SAT 3 was detected in the cattle samples collected in August 2019.

South Africa [1, 10] – Ten outbreaks due to FMDV serotype SAT 2 were reported during November 2019 as confirmed by the ARC-Onderstepoort Veterinary Institute.

Zambia [2, 9] – FMDV serotype O was detected in the bovine samples collected in 2019.

Zimbabwe [1] – FMDV serotypes SAT 1 and SAT 2 were responsible for outbreaks notified during August, September and October 2019.

POOL 7 - SOUTH AMERICA [1, 11]
No outbreaks are reported for this Pool. FMD in Latin America was last detected in Colombia in October 2018 with outbreaks due to FMDV serotype O, while PANAFTOSA reported historical outbreaks due to serotype A in Venezuela in 2013.

COUNTER

*** 184 MONTHS SINCE THE LAST SEROTYPE C OUTBREAK WAS REPORTED*

IV.   DETAILED POOL ANALYSIS

A.   POOL 1 – *SOUTHEAST ASIA/CENTRAL ASIA/EAST ASIA*

OUTBREAKS

Country	Description
Myanmar [1] – FMDV serotype O	Thirteen outbreaks due to FMDV serotype O of which ten occurred in Sagaing, two in Magwe and one in Shan State were notified between October 1st and 14th 2019. Location of the outbreaks is represented in Map 1.
	The cases were observed in 523 cattle out of the 3699 exposed with an apparent morbidity rate of 14.14%, apparent mortality rate of 0.30% and apparent case fatality rate of 2.10%.
	The Biosecurity Level 2 Diagnostic Laboratory, Shwemyo (National laboratory) confirmed the aetiology on October 10th 2019 using reverse transcription - polymerase chain reaction (RT-PCR).
	The origin of the outbreaks was attributed to illegal movement of animals, contact with infected animals at grazing and watering points and different types of fomites.
	Control measures are being adopted for the containment of the infection including vaccination in response to outbreaks, zoning and surveillance outside the containment and protection zone.

Map 1: location of the FMD outbreaks notified in cattle of different areas of Myanmar between October 1st and 14th 2019.

Source: WAHIS and Google Earth Pro.

Map legend

📍 FMD out break

🔺 Mountainous area

⭐ Town
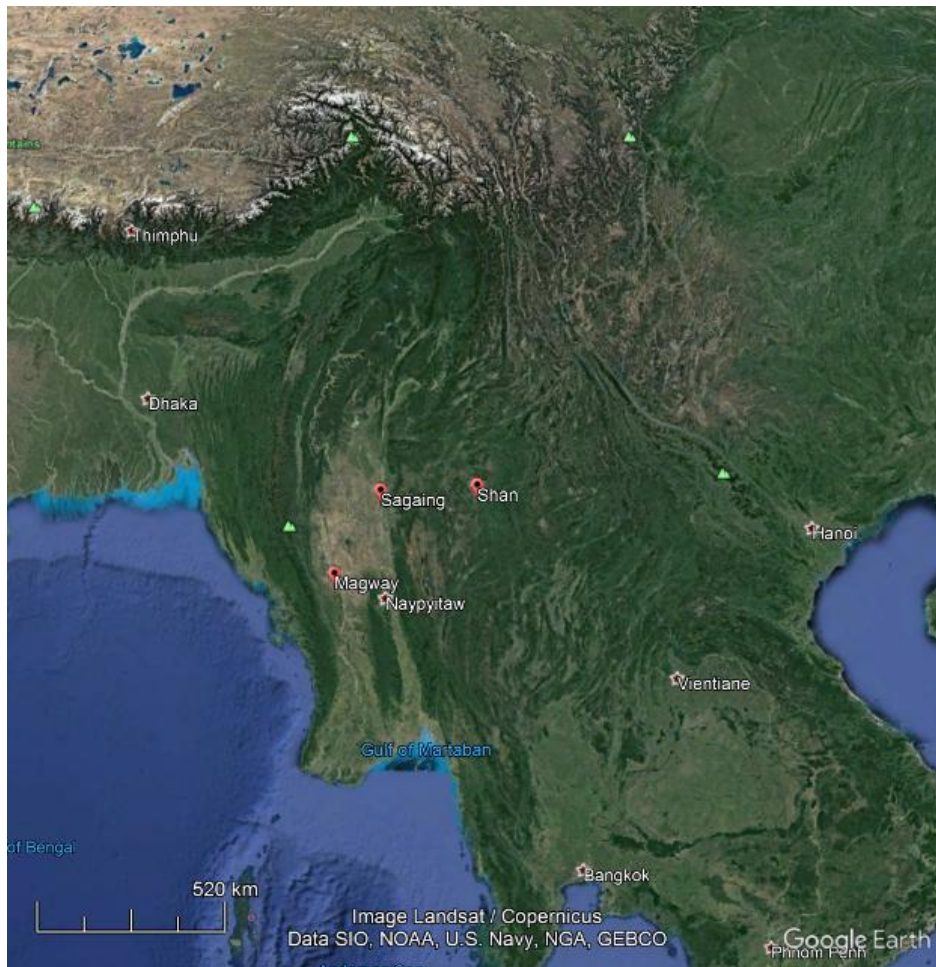
Table 1 and Graph 1: Conjectured circulating FMD viral lineages in Pool 1 (further detail (country-level) in Annex).

Serotype	Viral lineage	Number of countries where strain is believed to circulate in the 13 countries of Pool 1
A	A/ASIA/SEA-97	8
ASIA 1	ASIA1/ unnamed	1
O	O/ME-SA/Ind-2001	8
	O/SEA/Mya-98	6
	O/ME-SA/PanAsia	8
	O/ME-SA/PanAsia2	1
	O/CATHAY	4
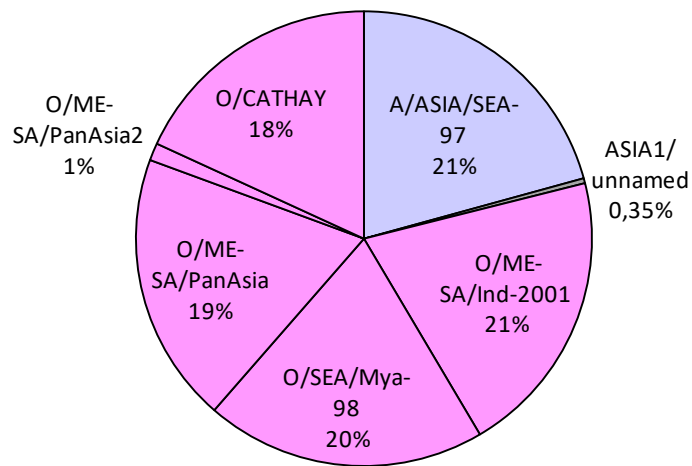
Graph 2: Categorization of the level of uncertainty relative to the prevalence of circulating serotypes/strains defined for each country of Pool 1 (see Annex for explanation).
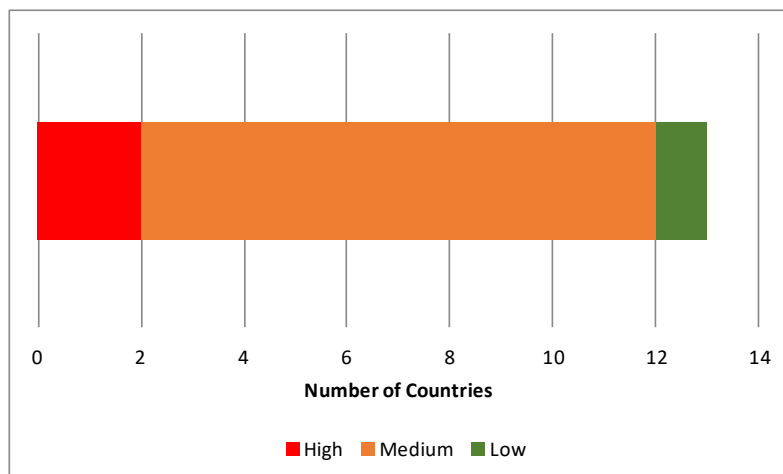
B. POOL 2 – _South Asia_

SURVEILLANCE (Surv.), VACCINATION (Vacc.) AND POST VACCINATION MONITORING (PVM)		
Country	*Activity*	*Description*
[Bangladesh](#) [2]	*Surv.*	Two cattle samples collected in Dhaka during January 2018 were genotyped as Asia 1/ASIA/G-IX. The most closely related virus to these isolates, not pertaining to the country, is NEP/46/2017 with a highest sequence identity (seq id) of 99%. Location of where the samples were collected is represented in Map 2.

Map 2: location of the samples positive for FMDV Asia 1/ASIA/G-IX was collected in Bangladesh.
Source: WRLFMD and Google Earth Pro.

B. POOL 2 – _South Asia_
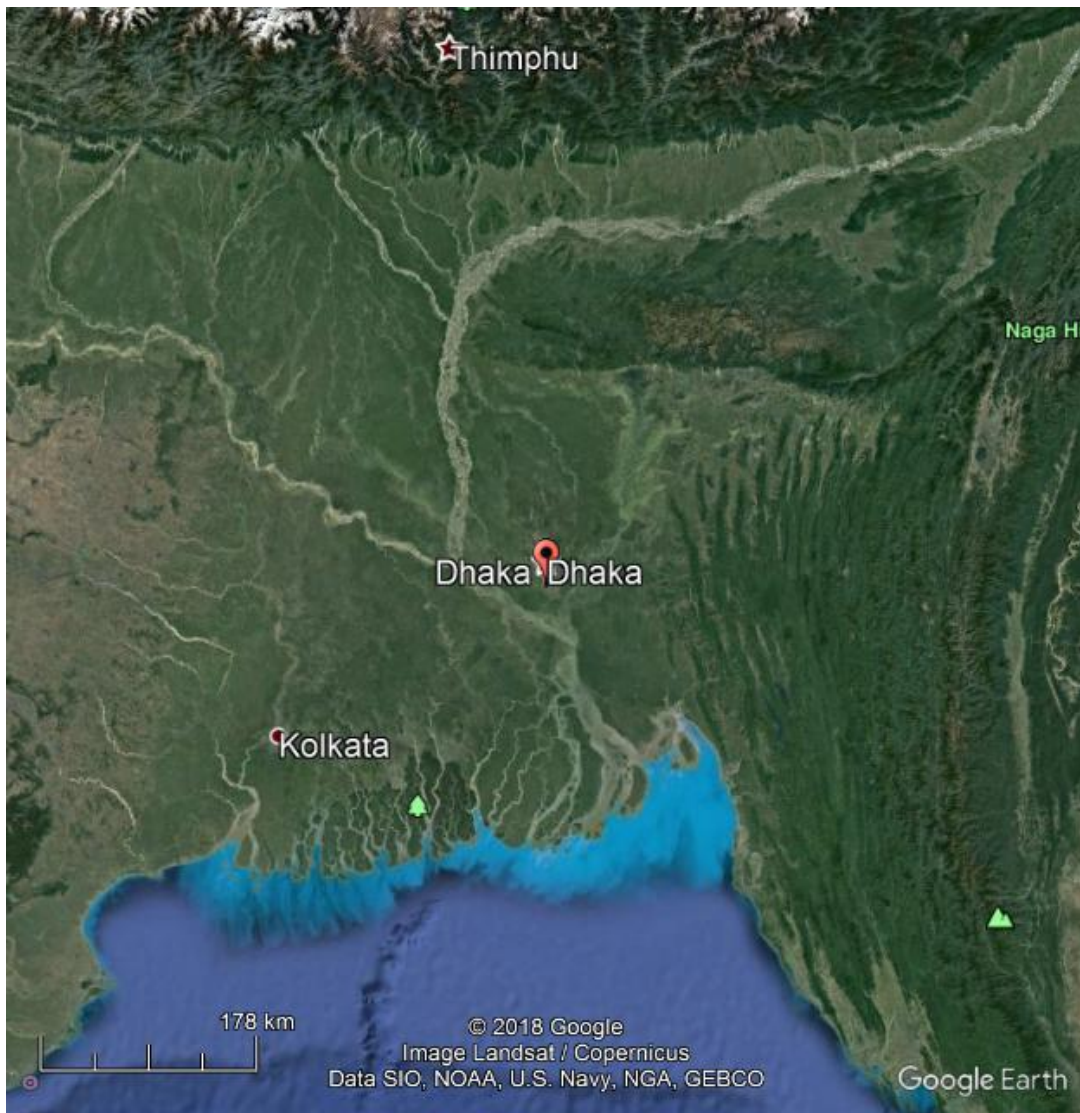
Table 2 and Graph 3: Conjectured circulating FMD viral lineages in Pool 2 (further detail (country-level) in Annex).

Serotype	Viral lineage	Number of countries where strain is believed to circulate in the 5 countries of Pool 2
A	A/ASIA/G-VII	3
Asia 1	ASIA1/ unnamed	1
O	O/ME-SA/Ind-2001	5
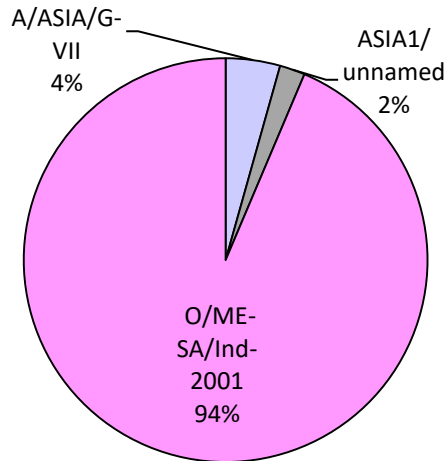
Graph 4: Categorization of the level of uncertainty relative to the prevalence of circulating serotypes/strains defined for each country of Pool 2 (see Annex for explanation).
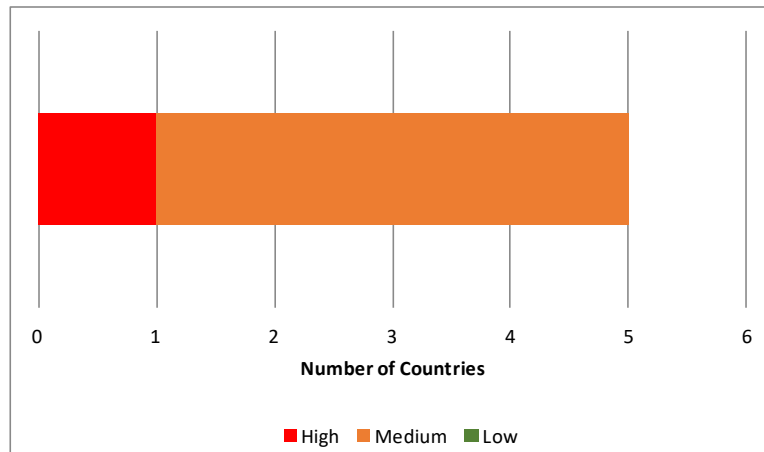
C. POOL 3 – _West Eurasia & Middle East_

SURVEILLANCE (Surv.), VACCINATION (Vacc.) AND POST VACCINATION MONITORING (PVM)		
Country	**Activity**	**Description**
Pakistan [3]	**Surv. & Vacc.**	FMDV serotypes A, Asia 1 and O were responsible for the 48 outbreaks notified during November in three different provinces of the country.
		A summary of the results of the surveillance conducted under the project "The enhancement of FMD control in Pakistan" funded by Government of Japan and executed by FAO is reported in Table 3 and location of outbreaks is reported in Map 0. Ring vaccination was also carried out in the same provinces were the outbreaks were reported and a summary of this activity is reported in Table 4.

Table 3: summary of the outbreaks reported in different provinces of Pakistan during November 2019 Source: "The enhancement of FMD control in Pakistan" - _Dr. Muhammad Afzal_, Project Coordinator.

Province	District	Number Outbreaks	Number of Outbreaks due to the FMDV Serotypes					
			'O'	**'A'**	**'Asia-1'**	**'Mixed'**	**Negative**	**NYT**
Punjab	DG Khan	1	-	-	-	-	-	1
	Layyah	4	-	-	-	-	-	4
	Jhung	1	-	-	-	-	-	1
	Gujranwala	1	-	-	-	-	1	-
	Hafizabad	2	-	-	1	-	-	1
	Multan	4	2	-	-	1	1	-
	Khanewal	1	1	-	-	-	-	-
	Chakwal	1	-	-	1	-	-	-
	Jehlum	1	-	-	-	-	1	-
Sindh	Karachi	25	3	6	3	1(A+O)	12	-
Khyber Pakhtunkhwa	Mardan	3	-	-	-	-	-	3
	Charsadha	2	-	-	-	-	-	2
	Abbottabad	2	-	-	-	-	-	2
Total		**48**	**6**	**6**	**5**	**2**	**15**	**14**

Table 4: summary of the emergency vaccination carried out to contain the above reported outbreaks in different provinces of Pakistan during November 2019 (Source – "The enhancement of FMD control in Pakistan" - _Dr. Muhammad Afzal_, Project Coordinator).

Province	Ring Vaccination (Doses)
Punjab	625
Sindh	1 450
Khyber Pakhtunkhwa	760
Total	**2 835**

Map 3: location of the areas of the FMD outbreaks that were notified in Pakistan during November 2019
Source: "The enhancement of FMD control in Pakistan" - *Dr. Muhammad Afzal*, Project Coordinator, Google Earth Pro.

Table 5 and Graph 5: Conjectured circulating FMD viral lineages in Pool 3 - West Eurasia & Middle East (further detail (country-level) in Annex).

Serotype	Viral lineage	Number of countries where strain is believed to circulate in the 24 countries of Pool 3 - West Eurasia
A	A/ASIA/G-VII	17
	A/ASIA/Iran-05	9
ASIA 1	ASIA1/ASIA/Sindh-08	9
O	O/ME-SA/Ind-2001	8
	O/ME-SA/PanAsia2	22
	O/EA-3	2
SAT2	SAT2	1
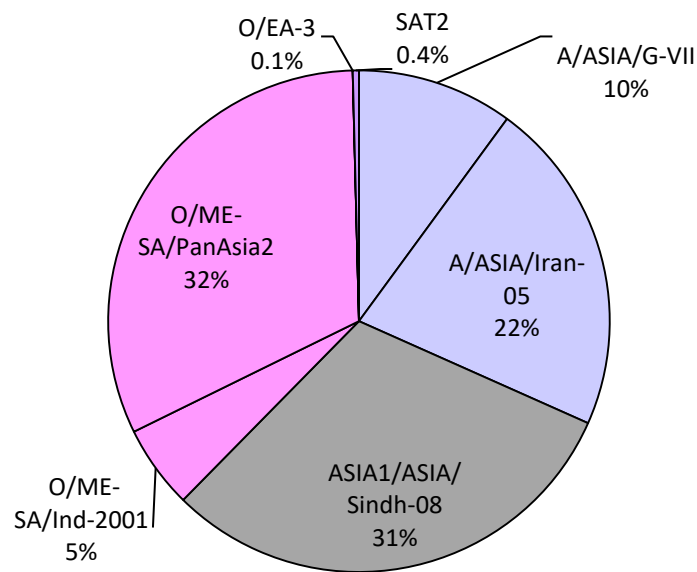
Graph 6: Categorization of the level of uncertainty relative to the prevalence of circulating serotypes/strains defined for each country of Pool 3 – West Eurasia & Middle East (see Annex for explanation).
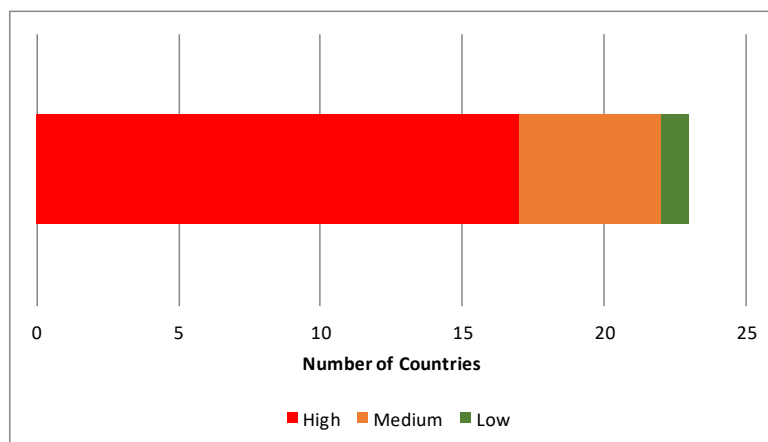
D. POOL 3 – *North Africa*

SURVEILLANCE (Surv.), VACCINATION (Vacc.) AND POST VACCINATION MONITORING (PVM)		
Country	*Activity*	*Description*
Libya [2, 4]	*Surv.*	The Istituto Zooprofilattico Sperimentale della Lombardia e dell'Emilia Romagna "Bruno Ubertini" (IZSLER), Brescia, Italy, (OIE/FMD World Reference Laboratory for FMD) submitted the VP1 sequence of a cattle sample (LIB/Misrata/2019 (IZSLER/19/194010/2) collected at Misrata (Map 4) during May 2019, which the WRLFMD confirmed as that of topotype O/EA-3. The most closely related field virus is represented by ALG/Medea/2019/IZSLER/19/33806/2 with a seq id of 99.8%.

Map 4: location of the area of where the cattle sample typed as O/EA-3 was collected.
Source: WRLFMD, Google Earth Pro.

Table 6 and Graph 7: Conjectured circulating FMD viral lineages in Pool 3 - North Africa (further detail (country-level) in Annex).

Serotype	Viral lineage	Number of countries where strain is believed to circulate in the 5 countries of Pool 3 - North Africa
A	A/AFRICA	4
O	O/EA-3	5
SAT 2	SAT 2	2
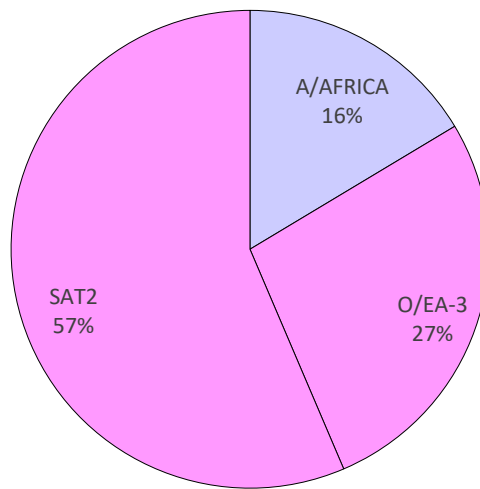
Graph 8: Categorization of the level of uncertainty relative to the prevalence of circulating serotypes/strains defined for each country of Pool 3 – North Africa (see Annex for explanation).
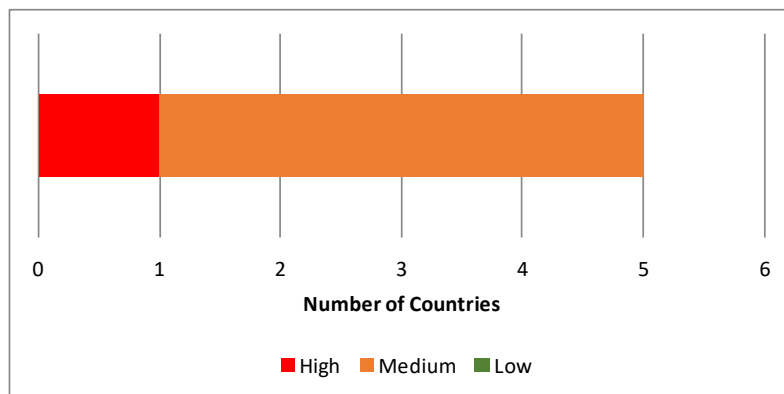
E. POOL 4 – _Eastern Africa_

SURVEILLANCE (Surv.), VACCINATION (Vacc.) AND POST VACCINATION MONITORING (PVM)		
Country	_Activity_	_Description_
Ethiopia [5]	**Surv,**	The NAHDIC used antigen detection ELISA to detect FMDV serotype A in eight cattle samples (swabs and probangs) collected from the Tigray Region and FMDV serotypes A and O in other samples collected from the Finfinne liyu zone, Sebeta during November 2019.

Map 5: location of the area of where the samples positive for FMDV serotypes A and O where collected in Ethiopia
Source: NAHDIC, Google Earth Pro.

| Kenya [6]	Surv.	FMDV serotypes A and SAT 1 were respectively detected in two and three of the nine samples examined during the reporting month by the FMD NRL, Embakasi, Kenya. The laboratory has also sent FMDV positive samples to the WRLFMD for genotyping.

Table 7 and Graph 9: Conjectured circulating FMD viral lineages in Pool 4 (further detail (country-level) in Annex).

Serotype	Viral lineage	Number of countries where strain is believed to circulate in the 13 countries of Pool 4 -East Africa
A	A/AFRICA	11
O	O/EA-2	4
	O/EA-3	9
SAT1	SAT1	10
SAT2	SAT2	6
SAT3	SAT3	5
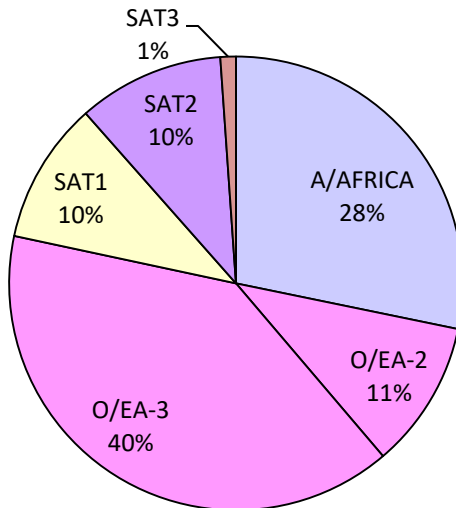
Graph 10: Categorization of the level of uncertainty relative to the prevalence of circulating serotypes/strains defined for each country of Pool 4 (see Annex for explanation).
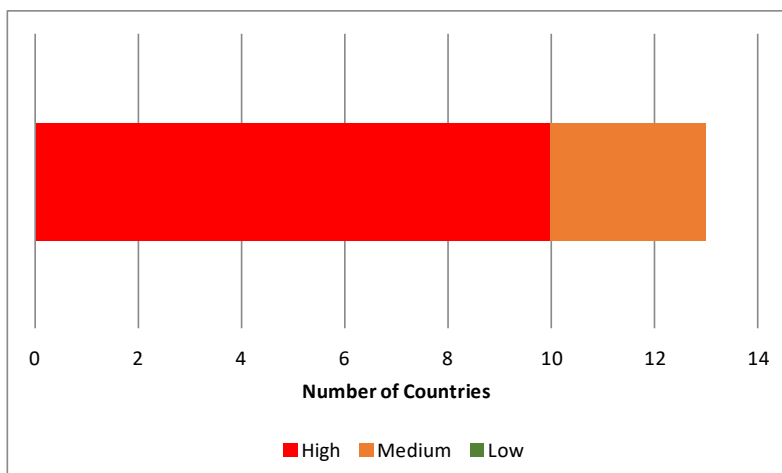
F.   POOL 5 – West / Central Africa

SURVEILLANCE (Surv.), VACCINATION (Vacc.) AND POST VACCINATION MONITORING (PVM)		
Country	*Activity*	*Description*
[Cameroon](#) [2, 7]	**Surv.**	The WRLFMD detected topotype SAT 1/X in the cattle samples collected by LANAVET, Garoua in the country during August and September 2019. The sequences detected are all closely related among them and to other field isolates detected in the recent years in the country. Location of where the samples were collected is represented in Map 6. In addition, 70 serum samples were tested by LANAVET using non-structural protein ELISA and 30 samples reacted positive for FMDV. Another set of 34 NSP ELISA positive samples were reactively positively for serotype A (eight samples) and serotype O (15 samples).

Map 6: location of the area of where the samples positive for topotype SAT 1/X where collected in Cameroon
Source: LANAVET, WRLFMD, Google Earth Pro.

Map legend

📍 FMD outbreak

🔺 Mountainous area

★ Town
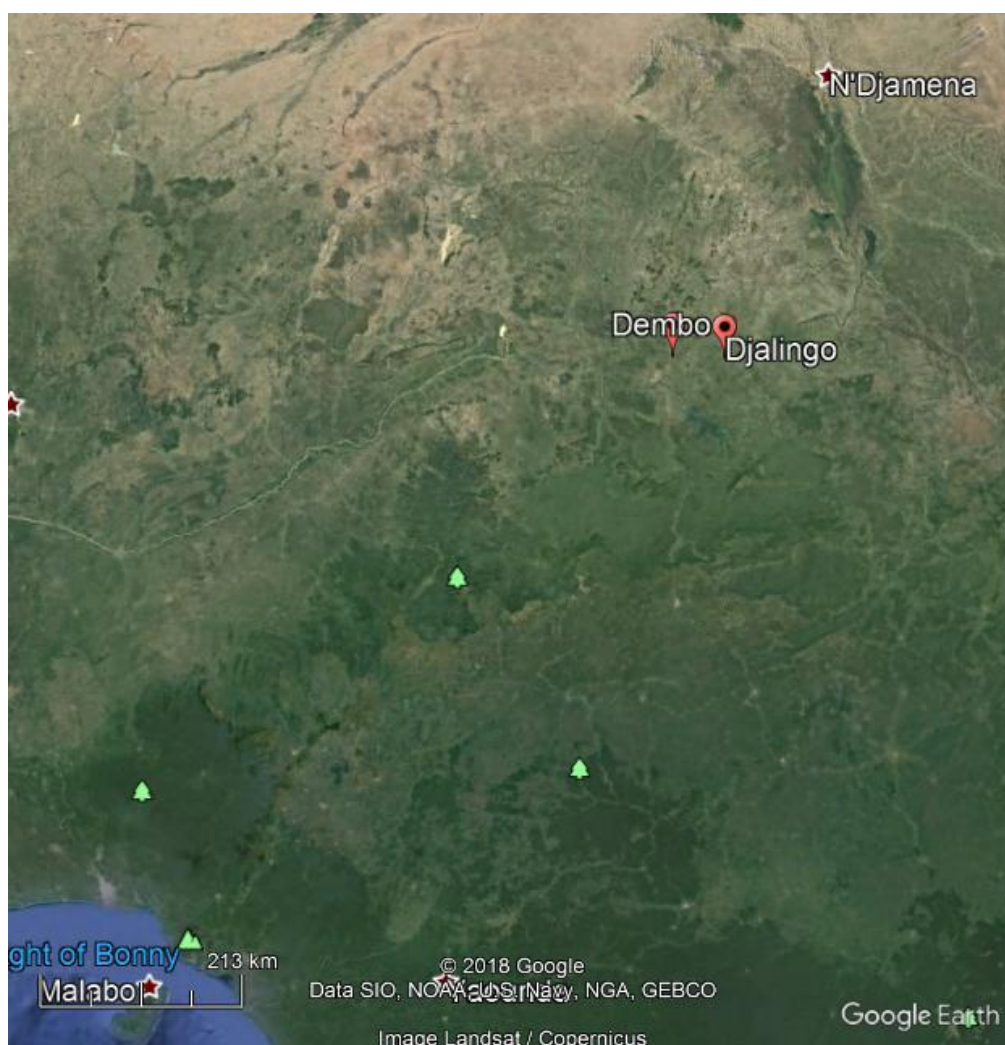
| Nigeria [8] | Surv. | FMDV was detected using RT-PCR by the NVRI, Vom, Nigeria in one of the two samples examined during the reporting month. No other details were provided relative to the species and the area from where they were collected. |

Table 8 and Graph 11: Conjectured circulating FMD viral lineages in Pool 5 (further detail (country-level) in Annex).

Serotype	Viral lineage	Number of countries where strain is believed to circulate in the 24 countries of Pool 5 -West Africa
A	A/AFRICA	13
O	O/EA-3	22
SAT1	SAT1	3
SAT2	SAT2	14

Graph 12: Categorization of the level of uncertainty relative to the prevalence of circulating serotypes/strains defined for each country of Pool 5 (see Annex for explanation).
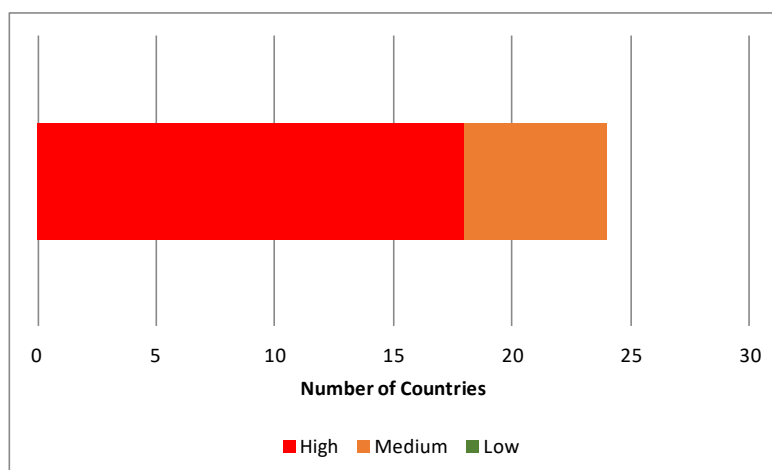
G.   POOL 6 – _Southern Africa_

OUTBREAKS	
Country	_Description_
South Africa [1, 10] –SAT 2	As from November 1st 2019, ten new outbreaks, following those of September 2019, due to FMDV serotype SAT 2, were notified in cattle of three administrative units of the country (Map 7). The diagnosis was confirmed by the ARC-Onderstepoort Veterinary Institute on the same day of notification of the outbreak. The outbreaks are occurring in South Africa's suspended FMD free zone with an apparent morbidity of 0.43% in the 14 334 exposed cattle. General control measures are being applied with vaccination prohibited.

Map 7: location of outbreaks due to FMDV serotype SAT 2 which are occurring since November 1st 2019 in cattle of three administrative units of the country
Source WAHIS: Google Earth Pro.

Zimbabwe [1] – [SAT 1] and [SAT 2]	The country is experiencing outbreaks due to FMDV serotypes SAT 1 and SAT 2.
	FMDV serotype 1 is responsible of 22 outbreaks which occurred between August and October 2019 causing an apparent morbidity of 28.09% in the 32 234 exposed cattle at Chiredzi and Mwenezi (Map 8).
	The outbreaks are due to contact with infected animals, including wild species, at grazing/watering points.
	The infected districts are under strict quarantine with ongoing weekly cattle inspections. Vaccinations are currently being conducted in the infected and neighbouring districts to prevent further spread with the vaccination of 425 000 and 215 000 cattle, respectively in Masvingo and Midlands.
	FMDV serotype SAT 2 is responsible of an outbreak of a series which started in June 2018 with the one previous to this in June 2019. The event which was notified on September 22nd 2019 was immediately confirmed by the Central Veterinary Laboratory on September 24th 2019.
	The outbreak was in Nyamasanga, Shamva, Mashonaland Central (Map 8) causing an apparent morbidity of 1.68% in the 1 368 exposed cattle.
	The cattle contracted the infection due to the movement of illegal animals and contact with infected animals at grazing and watering points.
	Intensive surveillance and implementation of control measures continue to be in force in the affected districts. Veterinary checkpoints supported by the police forces are in place in strategic points in the infected areas and all illegally moved cattle are being destroyed.

Map 8: location of outbreaks due to FMDVs serotypes SAT 1 (yellow icons) and SAT 2 (red icon) occurred in Zimbabwe
Source: WAHIS, Google Earth Pro.

Map legend

🔺 Mountainous area

★ Town

📌 FMD outbreak due to SAT 1

📍 FMD outbreak due to SAT 2

SURVEILLANCE (Surv.), VACCINATION (Vacc.) AND POST VACCINATION MONITORING (PVM)		
Country	Activity	Description
Namibia [2, 9]	Surv.	The VP1 sequences of the FMDVs submitted by the OIE Sub-Saharan Africa Regional Reference laboratory (SSARRL) for FMD (Botswana Vaccine Institute, Gaborone, Botswana) that were detected in two cattle samples collected in August 2019, in Katima-Mulilo, Kabwe North, Zambezi were confirmed by the WRLFMD as belonging to topotype SAT 3/II. The most closely related sequence (seq id of 90.4%) to these field isolates belongs to BOT/P10/2010 isolated in an African Buffalo.

		FMDV serotype SAT 3 is only occasionally isolated in domestic animals and such infections are generally due to contact with wild species.
South Africa [9]	**Surv.**	The Agricultural Research Council, Onderstpoort Veterinary Institute, Transboundary Animal Diseases (OIE Reference Laboratory) detected FMDV serotype SAT 2 in 16 out of the 24 samples analysed in PCR. These samples were collected from suspect animals and during surveillance activities. The laboratory also analysed 9 864 sera in solid-phase competition ELISA for the detection of antibodies against SAT-1, SAT-2 and SAT-3 and 79 sera in non-structural protein ELISA.
[Zambia] [2, 9]	**Surv.**	The VP1 sequences of the FMDVs submitted by the OIE SSARRL for FMD (Botswana Vaccine Institute, Gaborone, Botswana) that were detected in two cattle samples collected in 2019 at were confirmed by the WRLFMD as belonging topotype O/EA-2. The most closely related sequences to these field isolates belong to other isolates circulating in 2019, in the same country. Location of where the isolates where collected is represented on Map 9.

Map 9: location of the area of where the samples positive for topotype O/EA-2 where collected in Zambia
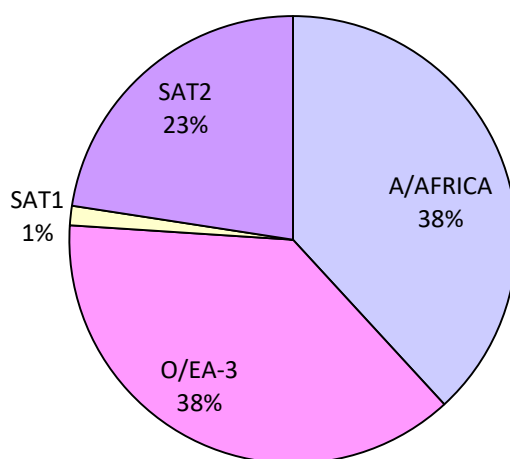Source: SSARRL, WRLFMD, Google Earth Pro.
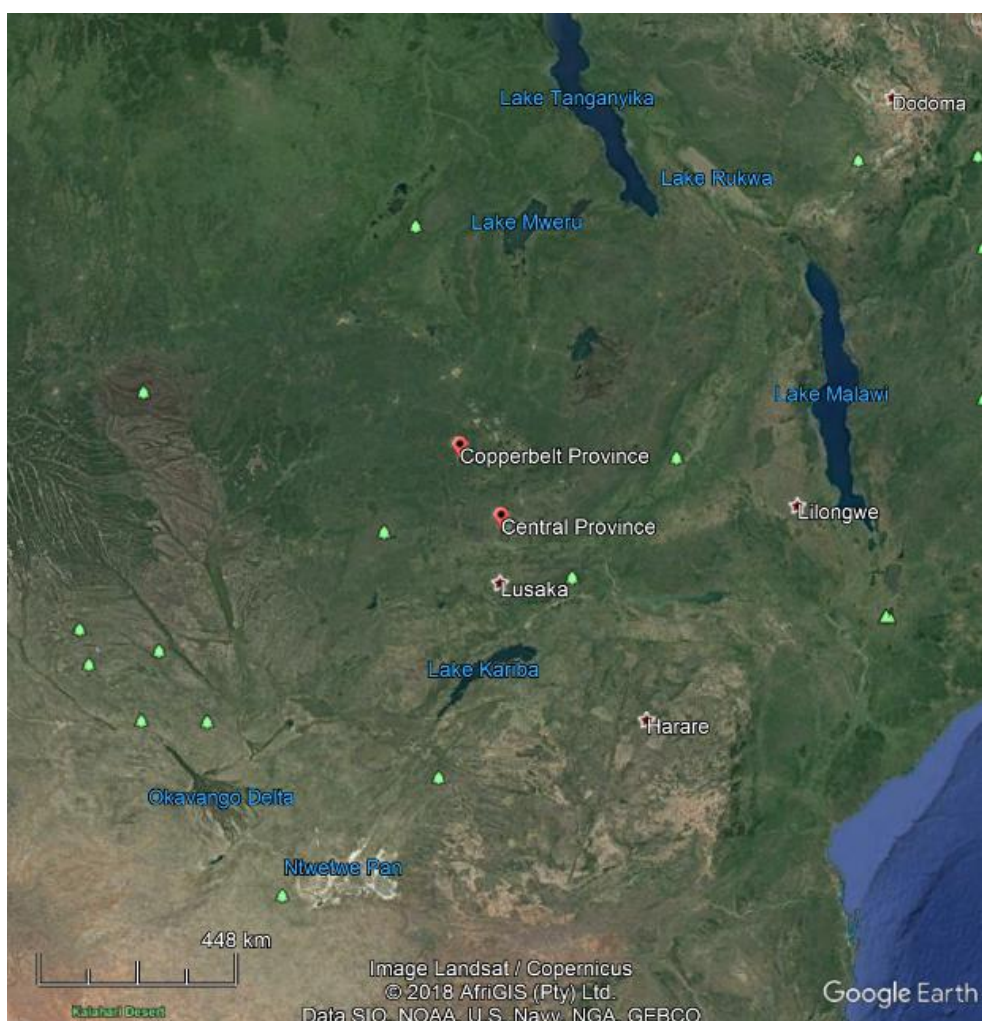
Table 9 and Graph13: Conjectured circulating FMD viral lineages in Pool 6 (further detail (country-level) in Annex).

Serotype	Viral lineage	Number of countries where strain is believed to circulate in the 8 countries of Pool 6 - Southern Africa
A	A/AFRICA	2
O	O-EA-2	2
SAT1	SAT1	6
SAT2	SAT2	8
SAT3	SAT3	4
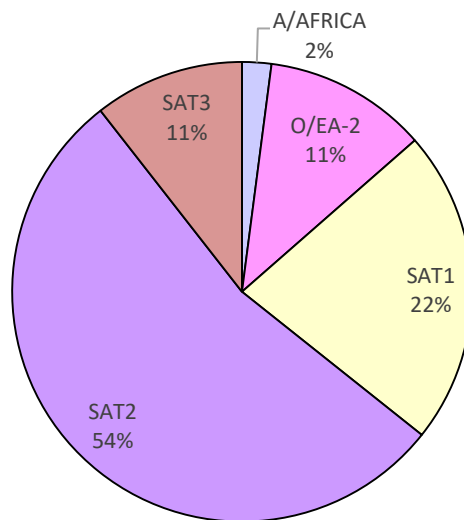
Graph 14: Categorization of the level of uncertainty relative to the prevalence of circulating serotypes/strains defined for each country of Pool 6 (see Annex for explanation).
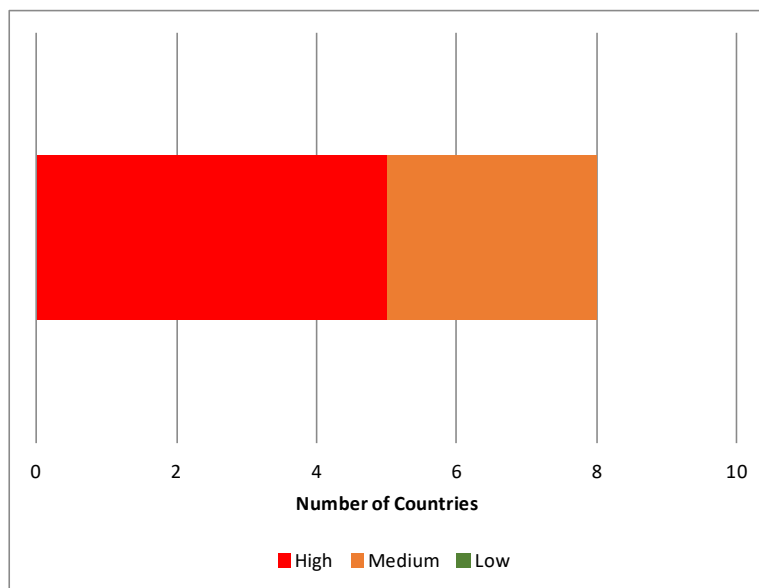
H.   POOL 7 – *South America*

No outbreaks are reported for this Pool during the reporting month.

Table 10 and Graph 15: Conjectured circulating FMD viral lineages in Pool 7 (further detail (country-level) in Annex).

Serotype	Viral lineage	Number of countries where strain is believed to circulate in the 2 countries of Pool 7 -South America
A	A/Euro SA	1
O	O/Euro SA	2
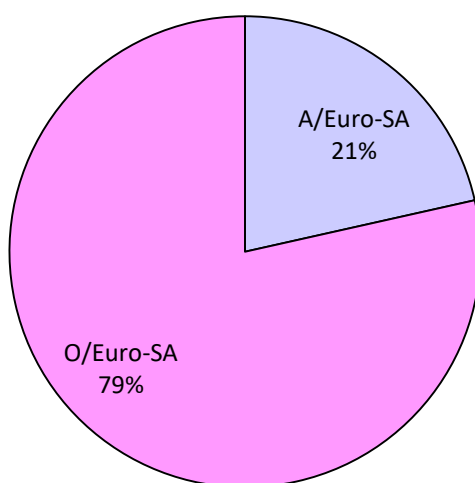
Graph 16: Categorization of the level of uncertainty relative to the prevalence of circulating serotypes/strains defined for each country of Pool 7 (see Annex for explanation).
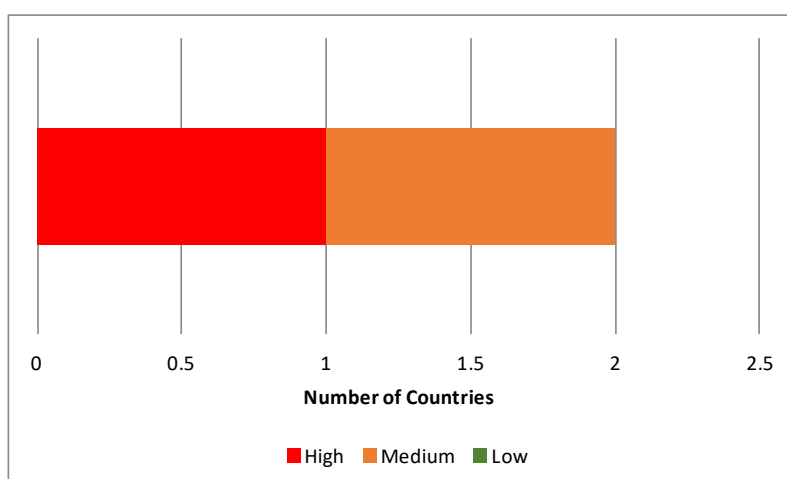
V.   OTHER NEWS

[1]The 3rd WRLFMD Quarterly Report for the period July - September 2019 contains the recommendations of FMDV vaccines to be included in antigen banks for Europe. The discussion of Table 11 is contained within the report.

Table 11: Recommendations from WRLFMD® on FMD virus strains to be included in FMDV antigen banks (for Europe) (Source – WRLFMD).

This report provides recommendations of FMDV vaccines to be included in antigen banks. These outputs are generated with a new tool (called PRAGMATIST) that has been developed in partnership between WRLFMD® and EuFMD. These analyses accommodate the latest epidemiological data collected by the OIE FAO FMD Laboratory Network regarding FMDV lineages that are present in different *source regions* (see Table below), as well as available *in vitro, in vivo* and field data to score the ability of vaccines to protect against these FMDV lineages.

Lineage	West Eurasia	East Asia	North Africa	India and Southern Asia	East Africa	West and Central Africa	Southern Africa	South America
O ME-SA PanAsia-2	35	-	-	-	-	-	-	-
O ME-SA PanAsia	-	10	-	-	-	-	-	-
O SEA Mya-98	-	33	-	-	-	-	-	-
O ME-SA Ind2001	6	20	35	80	-	-	-	-
O EA or O WA	3	-	20	-	45	37	-	-
O EURO-SA	-	-	-	-	-	-	-	74
O CATHAY	-	10.5	-	-	-	-	-	-
A ASIA Sea-97	-	25	-	-	-	-	-	-
A ASIA Iran-05	25.5	-	-	-	-	-	-	-
A ASIA G-VII	17.5	-	-	16	-	-	-	-
A AFRICA	-	-	35	-	24	25	-	-
A EURO-SA	-	-	-	-	-	-	-	26
Asia-1	12.5	1.5	-	4	-	-	-	-
SAT 1	-	-	-	-	10	10	27	-
SAT 2	0.5	-	10	-	20	28	57	-
SAT 3	-	-	-	-	1	-	16	-
C	-	-	-	-	-	-	-	-

Vaccine Antigen Prioritisation: **Europe**
October 2019
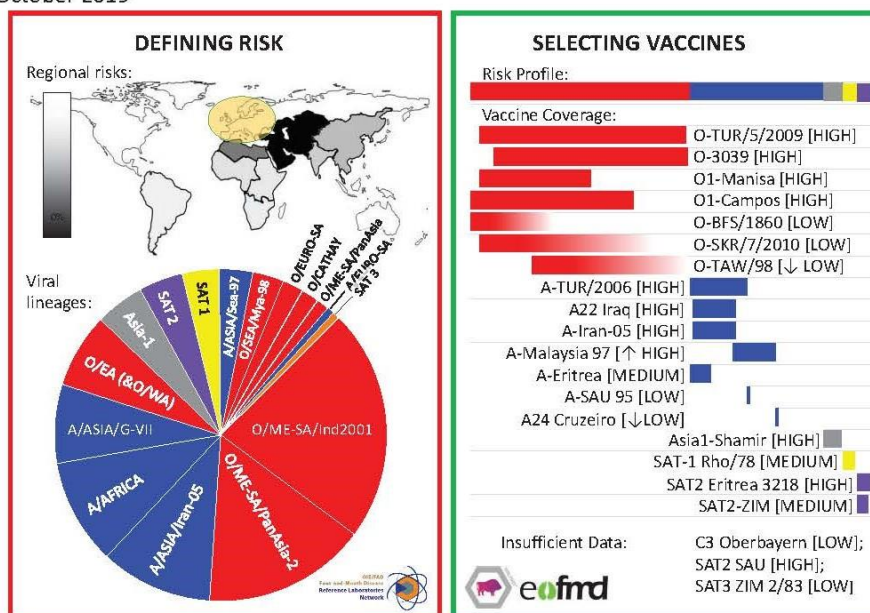
NB: Analyses uses best available data, however there are gaps in surveillance and vaccine coverage data

The table defines the relative distribution of FMDV lineages in each of the eight *source regions*, while the figure highlights the importance of these *source regions* for **Europe** (using data collected at the EU-RL Workshop); please contact WRLFMD EuFMD for assistance to tailor these outputs to other geographical regions. NB: Vaccine-coverage data presented is based on available data and may under-represent the true performance of individual vaccines.

VI.   REFERENCES – Superscripts

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18. Central Veterinary Research and Development Laboratory (CVDRL), Afghanistan - Dr. Wahidullah, Head of Laboratory.
19. ACCRA Veterinary Laboratory, Ghana - Dr Joseph Adongo Awuni
20. Laboratoire National d'Elevage et de Recherches Vétérinaires (LNERV) – Miss Mariame Diop

VII.   Annex

The estimates of the relative prevalence of serotypes and strains presented in the Tables below are based on the best data available to us and we are always trying to improve them. The accuracy of these estimates is only as good as the level of surveillance and reporting permits. Readers with relevant data or information are encouraged to contact EuFMD so that it can be included in the report.

In this report, the N. African countries of Morocco, Algeria, Tunisia and Libya considered together as a separate group, as the epidemiological situation is distinct and of interest to risk managers.

Description of methods
How to interpret the estimates of the relative prevalence of serotypes and strains:
If 100 animals that had been infected with FMD virus in the last 12 months were randomly selected from a country or virus pool:
1.   How many animals would be infected with each serotype?
2.   Within each serotype, how many would be infected with each virus strain?

Pool-level estimates and assumptions:
As the data required to calculate the relative prevalence of serotypes and strains are not directly available in most countries, they were estimated in 3 steps as follows:

1.   First, each country in the pool is assigned a weight according to the number of animals infected with FMD each year:

$$weight_{country\ 1} = \frac{(FMD\ incidence * susceptible\ population)_{country1}}{\sum_{country\ 1}^{country\ n}(FMD\ incidence * susceptible\ population)}$$

The expected FMD incidence was based on the paper by Sumption *et al* 2008 as follows: i) Low/Sporadic: 0.029 new infections per 1000 animals/year; ii) Medium: 0.458 new infections per 1000 animals/year; iii) High: 1.759 new infections per 1000 animals/year.

The susceptible livestock population is the sum of sheep, goat, cattle, buffalo and pig populations from FAOStat.

2.   For each country, the relative prevalence (RP) of each FMD serotype and strains within serotype is specified for all countries where FMD is believed to circulate endemically. First, the relative prevalence of each serotype is specified by dividing 100 points according to the serotypes that would be represented if 100 animals infected with FMDV in the previous year were randomly selected from the country. Subsequently, the relative prevalence of each serotype is broken down to reflect the distribution of circulating strains within each serotype.

   - If no information is available for a given country, then the circulating serotypes and strains are inferred from the neighbouring countries.

   - If there is only information about presence of serotypes and/or strains, but no data on the relative prevalence, then it is assumed that the serotypes/strains are circulating in equal prevalence.

   - When available, data from the last 24 months are considered, otherwise the most recent data available are used as well as the current situation in the region.

   - In the absence of reporting, a country is considered infected until it (re)gains recognition of freedom from the OIE

3.   Data from steps 1 and 2 are combined at pool level according to the following formula:

$$relative\ prevalence_{serotype\ or\ strain} = \sum_{country\ 1}^{country\ n} \left(weight_{country} * RP_{serotype\ or\ strain} \right)$$

Similarly to what is described above are the criteria adopted for the categorization of the level of uncertainty relative to the FMD epidemiological situation defined for each country:

High: There has been little or no reporting of laboratory results (serotype and/or molecular characteristics) from this country within the last 24 months. The serotype/strain distribution is based on inferences from the situation in neighbouring countries;

Medium: There is some information available about the circulating serotypes and/or strains, but from a low number of samples and/or not representative of entire country or different sectors and/or not from the past 24 months;

Low: There is reliable information available about the circulating serotypes and/or strains, obtained from analysis of a large number of samples that represent the country's livestock population.

Legend of icons in the following tables

●	>=95%
◕	>=60%
◑	>=30%
◔	>=5%
○	<5%
	no strain circulating

Table 12: Conjectured circulating FMD viral lineages in each country of Pool 1 (current to November 2019).

Country	Last Outbreak Repoted/Serotype#	FMD incidence rate	Presumed serotype distribution within country			Presumed viral lineage distribution within country							Uncertainty on circulating serotypes	Reference
			A	Asia1	O	A/ASIA/SEA-97	ASIA1/ unnamed	O/ME-SA/Ind-2001	O/SEA/Mya-98	O/ME-SA/PanAsia	O/ME-SA/PanAsia2	O/CATHAY		
CAMBODIA	Aug 2018/O, Aug 2016/ A	high	◑		◑	◑				◑			medium	2
CHINA	July 2019/O, May 2017/A	high	◔		●	◔		◔	◔	◔		◔	medium	2
CHINA (HONG KONG, SAR)	May 2019/O	high			●							●	medium	2
KOREA, DEMOCRATIC PEOPLE'S REPUBLIC OF	Dec 2016/O	high	◑		●	◑		●					high	as per REPUBLIC OF KOREA (SOUTH KOREA)
LAO PEOPLE'S DEMOCRATIC REPUBLIC (LAOS)	Dec 2018/A & O	high	◔		●	◔			●	◔			medium	2
MALAYSIA	May 2018/O, August 2016/A	medium			●					●			medium	2
MONGOLIA	Jun 2018/O, Sept 2016/A	medium			●			◑	◑	◑			medium	2
MYANMAR	Nov 2019/O, April 2017/Asia 1, Oct 2015/A	high	◔	◔	●	◔	◔	◑			◑		medium	2 12
REPUBLIC OF KOREA (SOUTH KOREA)	Jan 2019/O, April 2018/A	low/sporadic	◑		●	◑		●					low	2
RUSSIAN FEDERATION	March 2019/O, Oct 2016/Asia 1, Jan 2016/ A	low/sporadic			●			◑	◑	◑			medium	2, 16
TAIWAN PROVINCE OF CHINA	Jun 2015/A	low/sporadic			●							●	high	as per HONG KONG
THAILAND	Jan 2019/A, Dec 2018/O	high	◔		●	◔		◔	◔	◔			medium	2
VIETNAM	Jan 2019/O, November 2017/A and not typed	high	◑		●	◑		◔	◑	◔		◔	medium	2

Table 13: Conjectured circulating FMD viral lineages in each country of Pool 2 (current to November 2019).

Country	Last Outbreak Repoted/Serotype#	FMD incidence rate	Presumed serotype distribution within country			Presumed viral lineage distribution within country			Uncertainty on circulating serotypes	Reference
			A	Asia1	O	A/ASIA/G-VII	ASIA1/ unnamed	O/ME-SA/Ind-2001		
BANGLADESH	Jun 2018/A, ASIA 1 and O	high	◔	◔	◕	◔	◔	◕	high	13
BHUTAN	Jan 2019/O, Dec 2017/A	high	◔		◑	◔		◑	medium	2
INDIA	July 2019/O, Apr 2015/A, ASIA 1	high	○		●	○		●	medium	2
NEPAL	June 2019/O, Mar 2018/Asia 1, April 2017/A	high			●			●	medium	2
SRI LANKA	Dec 2018/O	high			●			●	medium	2

Table 14: Conjectured circulating FMD viral lineages in each country of Pool 3 –West Eurasia (current to November 2019).

Country	Last Outbreak Repoted/Serotype#	FMD incidence rate	Presumed serotype distribution within country			Presumed viral lineage distribution within country								Uncertainty on circulating strains	reference
			A	Asia1	O	sat2	A/ASIA/G-VII	A/ASIA/Iran-05	ASIA1/ASIA/Sindh-08	O/ME-SA/Ind-2001	O/ME-SA/PanAsia2	O/EA-3	SAT2		
AFGHANISTAN	Oct 2019/O & Asia 1, Juy 2019/A	high	◐	◐	◐			◐	◐		◐			medium	17
ARMENIA	Dec 2015/A	low/sporadic	◐		●		◐				●			high	14
AZERBAIJAN	2007/0	low/sporadic	◐	◐	◐		◐	◐	◐		◐			high	as per Iran
BAHRAIN	Mar 2015/O	low/sporadic	●		◐		●			◐	◐			high	as per Saudi Arabia
GEORGIA	2001/ASIA 1	low/sporadic	◐		●		◐				●			high	as per Turkey
IRAN, ISLAMIC REPUBLIC OF	Dec 2018/A, Asia 1& O,	high	◐	◐	◐		◐	◐	◐		◐			medium	2
IRAQ	Dec 2018/O, Dec 2016/A	high	◐	◐	◐		◐	◐	◐		◐			high	as per Iran
ISRAEL	May 2019/O, June2017/A	low/sporadic	◐		●		◐				◐	◐		low	2
JORDAN	Mar 2017/O	low/sporadic	●		◐		●			◐	◐			high	2, as per Saudi
KUWAIT	April 2016/O	high	●		◐		●			◐	◐			high	2, as per Saudi
KYRGYZSTAN	Sep 2014/A, O	low/sporadic	◐	●	◐			◐	●		◐			high	as per Pakistan
LEBANON	2010/not typed	low/sporadic	◐		●		◐				●			high	as per Turkey
OMAN	Dec 2018/O, May 2015/SAT 2	high			◐	◐				◐	◐		◐	high	2
PAKISTAN	Nov 2019/A, Asia 1 & O	high	◐	●	◐			◐	●	◐	◐			medium	2, 3
PALESTINE	Mar 2019/Untyped, Dec 2017/O, Mar 2013/Sat 2	low/sporadic			●							●		medium	2
QATAR	Dec 2018/O, Oct 2017/A	low/sporadic	●		◐		●			◐	◐			high	as per Saudi Arabia
SAUDI ARABIA	Dec 2018/O & Jun 2018/A	high	●		◐		●			◐	◐			high	2
SYRIAN ARAB REPUBLIC (SYRIA)	2002/ A & O	high	◐		●		◐				●			high	as per Turkey
TAJIKISTAN	Nov 2013/ not typed	low/sporadic	◐	●	◐			◐	●		◐			high	as per Pakistan
TURKEY	April 2019/O, Oct 2017/A, May 2015/ Asia 1	high	◐		●		◐				●			medium	2
TURKMENISTAN	Not available	low/sporadic	◐	◐	◐		◐	◐	◐		◐			high	as per Iran
UNITED ARAB EMIRATES	Jan 2018/O	low/sporadic	●		◐		●			◐	◐			high	as per Saudi Arabia
UZBEKISTAN	Not available	low/sporadic	◐	◐	◐		◐	◐	◐		◐			high	as per Iran

Table 15: Conjectured circulating FMD viral lineages in each country of Pool 3 - North Africa (current to November 2019).

Country	Last Outbreak Repoted/Serotype#	FMD incidence rate	Presumed serotype distribution within country			Presumed viral lineage distribution within country			Uncertainty on circulating serotypes	Reference
			A	O	SAT 2	A/AFRICA	O/EA-3	SAT 2		
ALGERIA	Mar 2019/O, Nov 2016/A, Jun 2016/Sat 2	medium	◑	◕		◑	◕		medium	2
EGYPT	Nov 2018/Sat 2, Feb 2018/A April 2017/O	high	◔	◔	◕	◔	◔	◕	medium	2
LIBYA	June 2019/O	high	◔	◔	◕	◔	◔	◕	high	15, as per egypt
MOROCCO	July 2019/O	low/sporadic		●			●		medium	2
TUNISIA	Feb 2019/O, April 2017/A	low/sporadic	◔	◕		◑	◕		medium	2

Table 16: Conjectured circulating FMD viral lineages in each country of Pool 4 (current to November 2019).

Country	Last Outbreak Repoted/Serotype#	FMD incidence rate	Presumed serotype distribution within country					Presumed viral lineage distribution within country						Uncertainty on circulating serotypes	Reference
			A	O	sat1	sat2	sat3	A/AFRICA	O/EA-2	O/EA-3	SAT1	SAT2	SAT3		
BURUNDI	Dec 2017 / not available	high	◐	◔	◔	◔		◐		◔	◔	◔		high	as per Tanzania
COMOROS	March 2019/O	high		●					●					high	no data
DJIBOUTI	Not available	high	◔	◕	◔		○	◔		◕	◔		○	high	as per Ethiopia
ERITREA	Oct 2018/not reported	high	◔	◕	◔		○	◔		◕	◔		○	high	as per Ethiopia
ETHIOPIA	Nov 2019/ O & A &SAT 2, Feb 2018/SAT 1	high	◔	◕	◔		○	◔		◕	◔		○	medium	2, 5
KENYA	Nov 2019/A & SAT 1, Oct 2019/O & SAT 2	high	◔	◕	◔	◔		◔	◕		◔	◔		medium	2, 6
RWANDA	Oct 2018/ A, O , SAT 1 & Sat 2	high	◔	◕	◔	◔		◔	◕		◔	◔		high	as per Kenya
SOMALIA	June 2018/not reported	high	◔	◕	◔		○	◔		◕	◔		○	high	as per Ethiopia
SOUTH SUDAN	June 2017/O & SAT 2, Mar 2018/A Dec 2018/ not sampled	high		●						●				high	2
SUDAN	Dec 2018/ not sampled, May 2017/O	high	◐	◔		◔		◐		◔		◔		medium	2
TANZANIA, UNITED REPUBLIC OF	Dec2018/O, Nov2018/ A & SAT 2, Sep 2018/SAT 1	high	◐	◔	◔	◔		◐		◔	◔	◔		high	2
UGANDA	Feb 2019/A & O, July 2017/SAT1, Jan 2015/SAT 3, July 2015/ SAT 2	high	◐	◐	◔	◔		◐	◐		◔	◔		high	2, as per Kenya
YEMEN	Dec 2016/not sampled	high	◔	◐	◔		○	◔		◕	◔		○	high	as per Ethiopia

Table 17: Conjectured circulating FMD viral lineages in each country of Pool 5 (current to November 2019).

Country	Last Outbreak Repoted/Serotype#	FMD incidence rate	Presumed serotype distribution within country				Presumed viral lineage distribution within country				Uncertainty on circulating serotypes	Reference
			A	O	sat1	sat2	A/AFRICA	O/EA-3	SAT1	SAT2		
BENIN	Dec 2017/O, SAT 1 &SAT 2, Apr 2017/A	high	◕	◕	◕	◕	◕	◕	◕	◕	high	1
BURKINA FASO	Dec 2018/not sampled, Aug2018/O	high	◑	◑		◑	◑	◑		◑	medium	1, as per Mali
CAMEROON	Sep 2019/ A, Nov 2014/O, SAT 2, May 2014/SAT 1	high	◑	◑	◕	◕	◑	◑	◕	◕	high	2, 7
CAPE VERDE	Not available	low/sporadic		●				●			high	as per Senegal
CENTRAL AFRICAN REPUBLIC	Not available	high	◑	◑		◕	◑	◑		◕	high	as per Nigeria
CHAD	Dec 2018/Not sampled	high	◑	◑		◕	◑	◑		◕	high	as per Nigeria
CONGO	Not available	high	◑	◑		◕	◑	◑		◕	high	as per Nigeria
CONGO, DEMOCRATIC REPUBLIC OF	Jun 2018/A, O & Sat 1	high	◑	◑	◑		◑	◑	◑		high	1
COTE D'IVOIRE	Jun 2018/O	high		●				●			high	1, as per Guinea
EQUATORIAL GUINEA	Jun 2015/Disease suspected	high	◑	◑		◕	◑	◑		◕	high	as per Nigeria
GABON	Not available	high	◑	◑		◕	◑	◑		◕	high	as per Nigeria
GAMBIA	Dec 2018/O	high		●				●			medium	1
GHANA	Dec 2018/SAT 2, Sep 2018/ O	high		◑		◑		◑		◑	high	1,2, 18
GUINEA	Dec 2018/O	high		●				●			medium	1
GUINEA-BISSAU	April 2019/O	high		●				●			high	as per Guinea
LIBERIA	Not available	high		●				●			high	as per Guinea
MALI	Oct 2018/O, Jun 2018/A & SAT	high	◑	◑		◑	◑	◑		◑	high	1
MAURITANIA	Aug 2018/O, Dec 2014/SAT 2	high				●				●	medium	1, 2
NIGER	Dec 2015/O	high	◑	◑		◕	◑	◑		◕	high	as per Nigeria
NIGERIA	Nov 2019/untyped, June 2019/A, Sep 2018/O &Sat 2, Sept 2016/ SAT 1	high	◑	◑		◕	◑	◑		◕	high	1, 2 , 8
SAO TOME AND PRINCIPE	Not available	0									high	no data available
SENEGAL	Nov 2018/A, O & Sat 2, Jun 2018/ Sat 1	high		●				●			medium	2, 19
SIERRA LEONE	Aug 2018/O	high		●				●			medium	as per Senegal
TOGO	Dec 2017/ not sampled, Dec 2016/ O & Sat 1	high	◑	◑		◕	◑	◑		◕	high	1, as per Nigeria

Table 18: Conjectured circulating FMD viral lineages in each country of Pool 6 (current to November 2019).

Country	Last Outbreak Repoted/Serotype#	FMD incidence rate	Presumed serotype distribution within country					Presumed viral lineage distribution within country					Uncertainty on circulating serotypes	Reference
			A	O	SAT1	SAT2	SAT3	A/AFRICA	O/EA-2	SAT1	SAT2	SAT3		
ANGOLA	April 2016/SAT 2	high		◐	◔	○	◔		◐	◔	○	◔	high	as per Zambia
BOTSWANA	June 2018/SAT 2, Aug 2015/SAT 1	medium				●					●		medium	2
MALAWI	Apr 2019/A, SAT 2, June 2016/SAT 1	medium	◔		◔	◔		◔		◔	◔		high	2
MOZAMBIQUE	May 2019/ Typing pending, Oct 2017/SAT 2, May 2015/ SAT 1	high				●	○				◐	○	high	2
NAMIBIA	Aug 2019/SAT 3, Aug 2019/typing pending, Sep 2017/SAT 2, May 2015/SAT 1	medium			◐	◐	○			◐	◐	○	high	2
SOUTH AFRICA	Nov 2019/SAT 2, Oct 2017/SAT 1, Dec 2015/SAT 3	medium			○	◕				○	◕		high	2, 10
ZAMBIA	Aug 2019/O, Apr 2019/SAT 2, Feb 2019/ A, May 2017/SAT 3, Jan 2013/SAT 1	medium	○	◐	○	○	◔	○	◐	○	○	◔	medium	2
ZIMBABWE	Jun 2019/SAT 2, Sep 2019/SAT2 Jun 2013/SAT 3	high			◐	◐				◐	◐		medium	1, 2

Table 19: Conjectured circulating FMD viral lineages in each country of Pool 7 (current to November 2019).

Country	Last Outbreak Repoted/Serotype#	FMD incidence rate	Presumed serotype distribution within country		Presumed viral lineage distribution within country		Uncertainty on circulating serotypes	Reference
			A	O	A/Euro SA	O/Euro-SA		
VENEZUELA	Oct 2018/O	medium	◑	◑	◑	◑	high	1, 11
COLUMBIA	2011/O, 2013/A	medium		●		●	medium	1

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