



**FEDERATIVE REPUBLIC OF BRAZIL**  
**Ministry of Agriculture, Livestock and Food Supply**  
**Secretariat of Animal and Plant Health and Inspection**

**Eradication of a FMD outbreak in Mato Grosso do Sul, Brazil**

**Animal Health Department**  
**Brasilia, April, 2008**



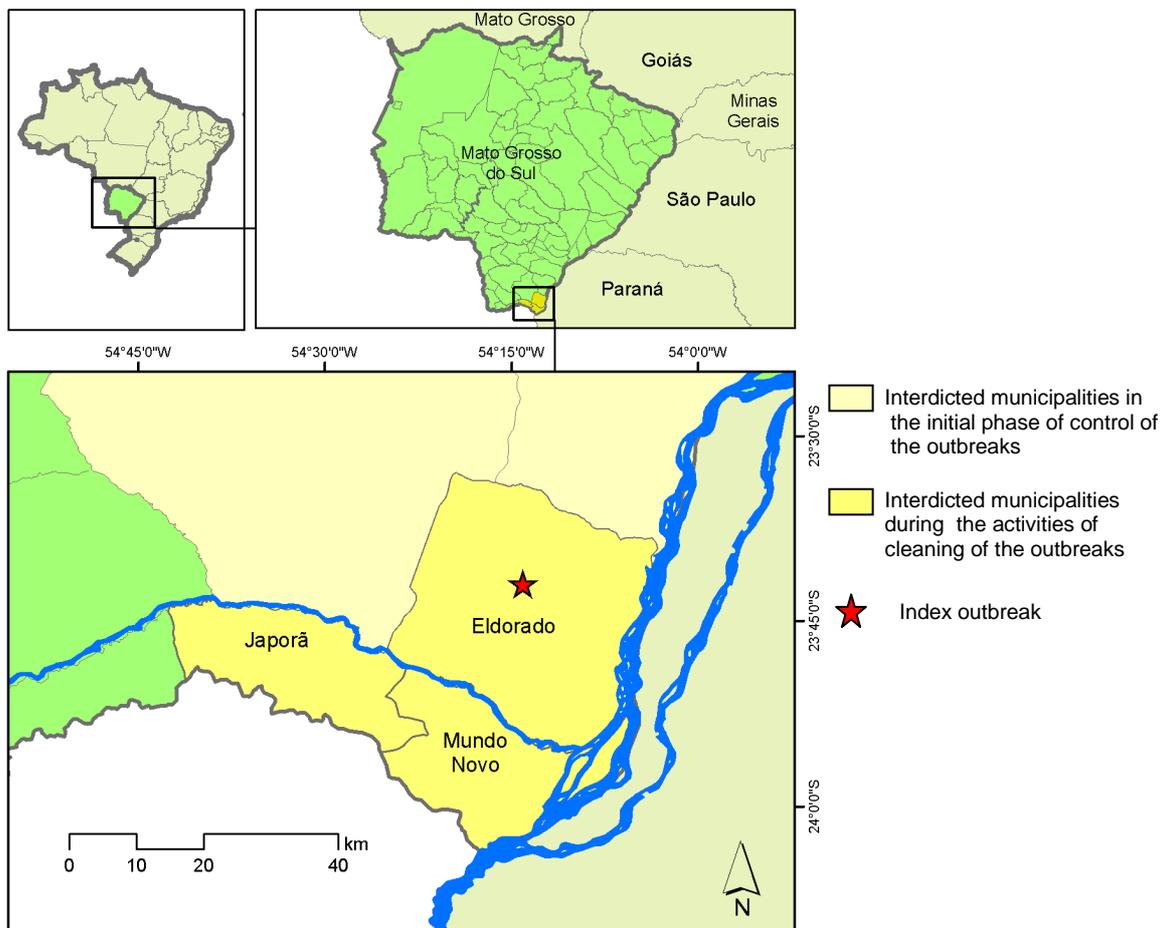
### SUMMARY

In order to enable a chronological overview of the major actions carried out in Mato Grosso do Sul the following information is presented according to the three major phases: Phase 1: confirmation of the outbreak and initial surveillance and inspection actions; Phase 2: eradication of outbreaks; and Phase 3: surveillance and evaluation of virus circulation.

#### **Phase 1: confirmation of the outbreak and initial surveillance and inspection actions**

The first FMD outbreak was confirmed on October 8, 2005, in the Municipality of Eldorado, Mato Grosso do Sul. After the disease was confirmed, surveillance and epidemiological investigation actions were intensified and specific legal acts were published in order to ban rural holdings and municipalities, to ban the movement of animals and products that risked spreading FMD, and to set up fixed inspection posts at strategic points, among other inspection actions.

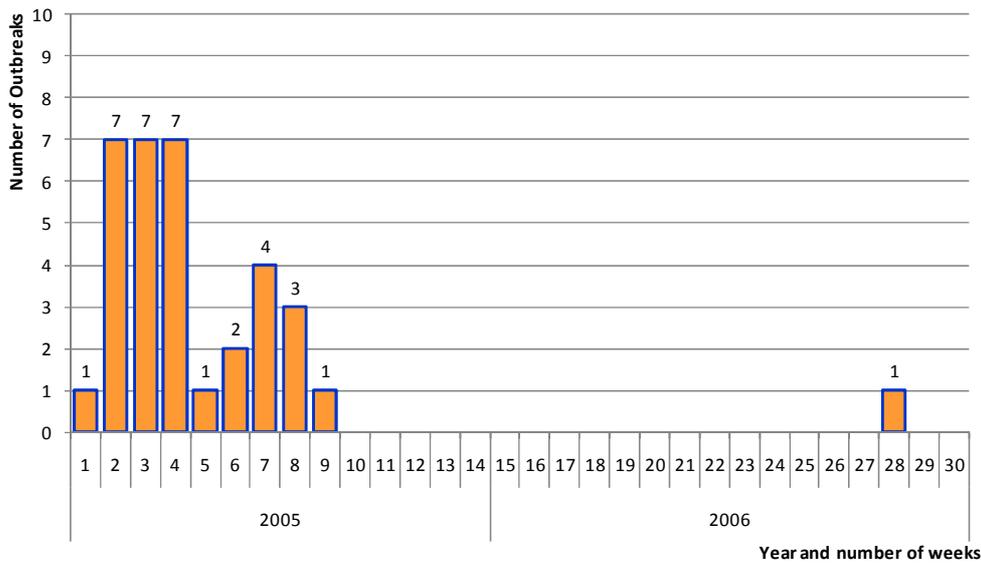
The banned area, for the sake of safety, initially encompassed five municipalities. After epidemiological investigations with clinical inspections of the animals to find signs of FMD, the banned area was gradually reduced, and on January 17, 2006, was restricted to three municipalities: Eldorado, Japorã, and Mundo Novo. See figure below.



The last FMD vaccination stage in Mato Grosso do Sul had been carried out in May 2005, and the following stage was due to occur in November 2005. Given the risk that the disease could be spread by the movements of animals, people and vehicles in carrying out the vaccination stage, and in order to avoid possible interference by vaccination itself in subsequent virus circulation assessment studies, the vaccination stage scheduled for November was suspended throughout the banned area. The vaccination timetable was not altered in the remaining municipalities of Mato Grosso do Sul.

As part of the surveillance activities, animal movements involving the rural holdings in the banned area were analyzed for the 60 days preceding the probable beginning of the outbreak. All rural holdings involved in incoming and outgoing movements to and from the banned region were inspected by the Official Veterinary Service and remained under a ban for at least 15 days. This investigation enabled an epidemiological link to be established with suspected cases in the State of Paraná (see the document on the eradication of FMD outbreak in Paraná). No signs of vesicular disease were observed on the remaining holdings involved.

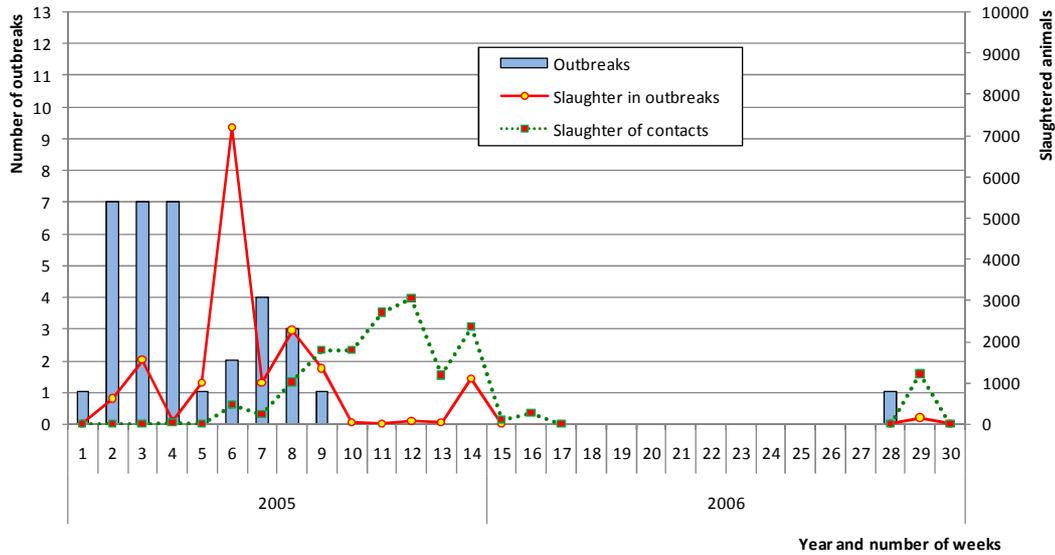
Surveillance actions carried out in the banned area after the index outbreak led to the confirmation of another 32 outbreaks from October 17 to December 12, and of another isolated outbreak on April 12, 2006, which was when the last case was reported, coming to a total of 34 FMD outbreaks, limited to the municipalities of Eldorado, Japorã and Mundo Novo. The graph below shows the distribution of outbreaks, by week of attention by the Official Veterinary Service.



**Phase 2: eradication of the outbreaks**

The clean-up strategy was based upon the elimination of susceptible animals in the outbreaks and in the herds related to these animals by direct or indirect contact, and upon the banning of trade and movement of susceptible animals and hazardous products.

Slaughter and destruction of sick animals and direct and indirect contacts ended on April 21, 2006. The graph below shows the time spent on slaughter and destruction actions for susceptible animals involved in the outbreaks and for the herds related to these animals by geographical proximity or by some other epidemiological condition. Work to eliminate the 33 outbreaks reported in 2005 was completed in 16 weeks; it should be pointed out that this period of the year is characterized by heavy rainfall, which delayed the conclusion. In the single outbreak of April 2006, slaughter and destruction of the susceptible animals was completed within one week.



Timeline of slaughter and destruction of sick animals and direct and indirect contacts, Mato Grosso do Sul, 2005 and 2006

At outbreak sites and on holdings with epidemiological links to them, whether owing to geographical proximity or to animal transportation, 34,330 susceptible animals were eliminated: 33,064 bovines, 637 pigs and 629 small ruminants. Compensation paid to farmers came to US\$ 8,517,480.

After slaughter, all holdings involved were placed under a standstill for at least 30 days. On completion of this stage, sentinel animals were introduced onto the holdings: these were young, unvaccinated bovines that were negative for structural FMD proteins, submitted to LPB-ELISA. They were also tested three times by ELISA 3ABC and EITB over 30 days and were all negative for the test.

The stage following the lifting of the ban on holdings was a sero-epidemiological study, by sampling the remaining herds in the banned municipalities and in the other municipalities of the State. The study thus encompassed two independent subpopulations in Mato Grosso do Sul: the banned area and the non-banned area. Diagnostic techniques to detect antibodies against FMD non-structural proteins were used, as per the diagnostic system recommended by the Pan-American Foot-and-Mouth Disease Center (PANAFTOSA). The study aimed to assess, monitor and compare the reactivity of these subpopulations as an indicator of the effectiveness of the measures to contain and eradicate the outbreaks. The Table below shows information on the study.

Subpopulations in Mato Grosso do Sul	Period in which samples were collected	Age of bovines sampled	Number of rural properties	Bovines	
				Number of Samples	Serum-positive
Interdicted Area	March to August/06	6 to 24 months	382	7,458	214 2.87%
Interdicted Area	October/06 to January/07	6 to 12 months	444	7,986	219 2.74%
Non-Interdicted Area	April to July/06	6 to 12 months	483	11,568	26 0.22%
<b>Total</b>			<b>1,309</b>	<b>27,012</b>	<b>459</b>

Two studies were carried out to assess virus circulation in the banned area. The first begun in March in the case of Eldorado and Mundo Novo (where the slaughter and destruction of susceptible animals was completed in 2005) and in May in the case of Japorã (where slaughter ended in April 2006); the study was completed in August 2006. This first study included 382 rural holdings, totaling 7,458 sampled bovines, aged from 6 to 24 months. The second was carried out from October 2006 to January 2007 on 7,986 bovines aged from 6 to 12 months, distributed among 444 holdings. Prevalence rates for seropositive bovines were above 2.7% in both studies, higher than the results obtained in Brazilian studies to assess virus circulation; it should be pointed out that there was an increase of seropositive animals among paired samples. No new cases of vesicular disease were identified during supplementary investigations, nor was it possible to isolate the FMD virus.

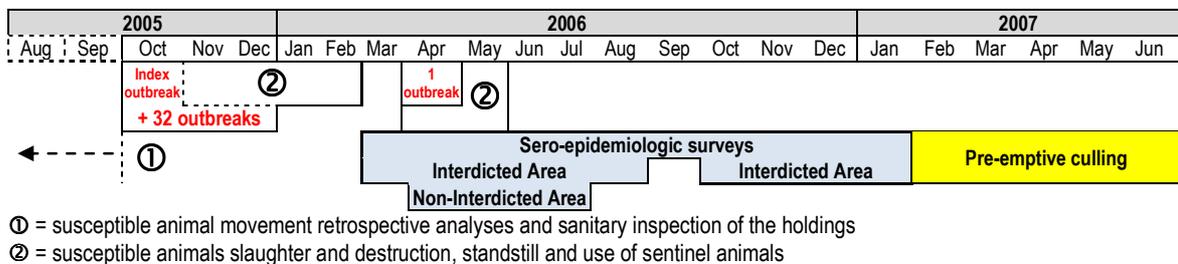
In the subpopulation of the non-banned area, the study involved sampling 11,568 bovines aged from 6 to 12 months distributed among 483 rural holdings. The following criteria were used in order to select the rural holdings: location in municipalities bordering on the banned area; inward movements of bovines from the banned area as of the second half of 2005; location in municipalities on the international border; location in municipalities where there is intense animal traffic and a high incoming/outgoing ratio; and random selection from among the remaining municipalities in the State. The prevalence for seropositive bovines was twelve times less than values observed in the banned area. No signs of vesicular disease were observed during clinical inspections; two oesophageal-pharyngeal fluid samples were taken for all seropositive bovines at intervals of over 15 days. Results were negative for virus investigation laboratory tests.

The results of the serological studies led MAPA to conclude that the zoosanitary measures had been sufficient to prevent the spread of the viral agent outside the three banned municipalities, but that they had not been effective to restrain its circulation among the holdings within the affected municipalities. Then, MAPA reported the results and the sanitary measures taken to OIE, PANAFTOSA, CVP and Brazil's trading partners by means of Technical Note DSA n° 8, of February 7, 2007 and Follow-up Report n° 28, of February 21, 2007.

It should be pointed out that sero-epidemiological studies were also performed from March to August 2006 in Paraná and São Paulo, states which border on Mato Grosso do Sul. The results proved the absence of FMD virus circulation in those states. Information on these studies is available in the report on the outbreaks in Paraná. The results of these studies bolster the conclusion that the zoosanitary measures were sufficient to prevent the spread of the viral agent outside the interdicted area.

The municipalities of Eldorado, Japorã and Mundo Novo therefore remained under a ban and the Official Veterinary Service intensified its clean-up operations before carrying out a further serological study in the area. These activities included identifying and eliminating potential sources of infection, and were completed on June 21, 2007. Preventive slaughter of 43,565 bovines was carried out in slaughterhouses under veterinary inspection, within the banned area or close to it, with conditional use of the carcasses. The farmers were compensated for the difference between the value of the animals and the price paid to them by the slaughterhouses. Total compensations came to US\$ 7,966,050.

The timeline below synthesizes the main activities concerning Phases 1 and 2.



**Phase 3: surveillance and assessment of virus circulation**

After the FMD outbreaks were confirmed in Mato Grosso do Sul, sanitary surveillance activities were intensified in all States of Brazil.

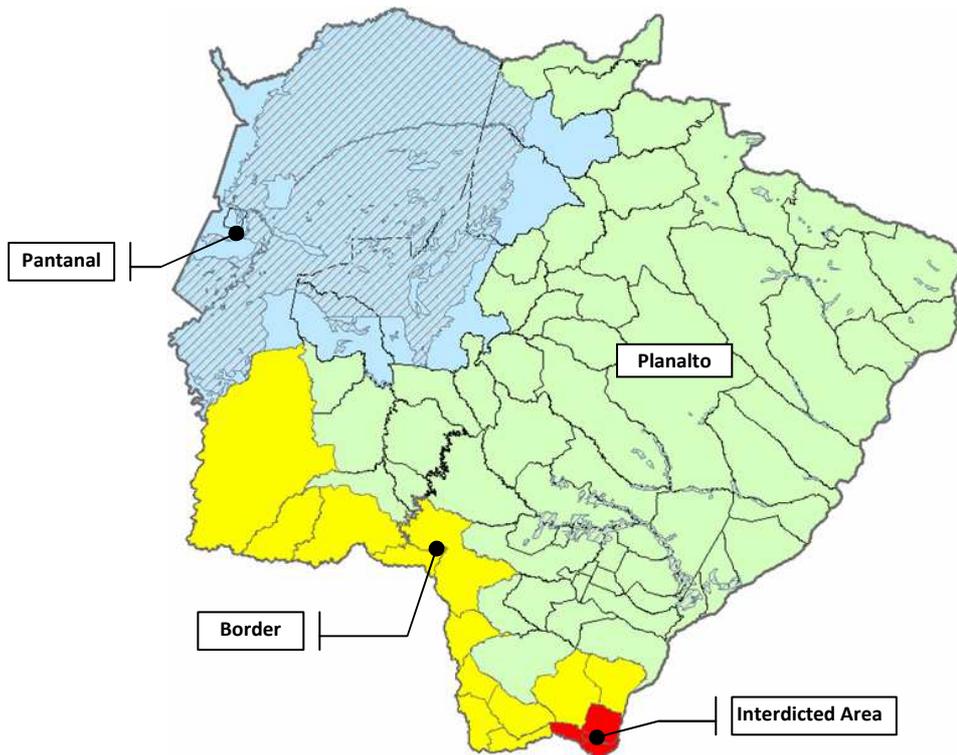
In the borderline between Mato Grosso do Sul and Paraguay, the surveillance system was reinforced in all municipalities, highlighting the implementation of a High Surveillance Zone (HSZ), following recommendations by the OIE Mission that visited the region in December 2006, and in compliance with agreements entered into with the MERCOSUR Permanent Veterinary Committee. This region is comprised by 11 municipalities, from where 29% of the territory represents the HSZ. The sanitary status of the HSZ is similar to that of a buffer zone, with stricter actions such as: individual identification of bovines, buffaloes, and small ruminants; vaccination inspected by the Official Veterinary Service on all livestock holdings; and the registration of the geographical location of all rural holdings with susceptible animals.

As mentioned before, the Official Veterinary Service structure was reinforced in municipalities along the border with Paraguay. Of particular note is the presence of a Local Veterinary Unit in each municipality, constantly manned by at least two official veterinarians, in addition to all the basic structure. Movement of susceptible animals originating from the HSZ is subject to specific rules and controls including:

- specific animal movement permits issued by the official veterinary service;
- quarantine performed at origin, with inspection of animals;
- use of sealed trucks;
- definition of specific routes, including compulsory passage through fixed inspection posts; and
- animal quarantine and inspection performed at destination.

To specifically assess virus circulation, a further study - in addition to the sero-epidemiological studies described in Phase 2 - was carried out from April to November 2007 throughout Mato Grosso do Sul, involving 2,046 rural holdings, grouped into 1,150 Primary Sampling Units (PSUs).

For the purposes of this study, the State was divided into four subpopulations, namely: the Banned Area, the “Pantanal” Wetland area, the “Planalto” High Plains area and the Border area, as illustrated below. For each one of these subpopulations a separate sampling was performed, with 95% confidence level, using a minimum expected prevalence for infected herds of 1%, and minimum prevalence of infected bovines in each herd of 10% in PSUs with up to 500 animals, and 5% in PSUs with more than 500 animals.



The studies performed have led to the conclusion, based on the sampling parameters used, as well as on established decision criteria, that there is no FMD virus circulation in the State of Mato Grosso do Sul, particularly since:

- overall assessment of seropositive results concerning animal age and number of FMD vaccinations in sampled animals indicates an epidemiological profile other than what is expected in situations where there is viral circulation;

- the population profile related to I-ELISA 3ABC tests, observed in the four evaluated subpopulations, differed from population profiles obtained in regions with confirmed viral circulation. This profile was in accordance with the methodology proposed by South American researchers, including professionals from PANAFTOSA;
- evaluation of the spatial distribution of holdings belonging to PSUs with seropositive bovines, showed an absence of the grouping (clusters) expected in situations of virus circulation;
- the result of paired sampling indicated an overall reduction of seropositive bovines in all the studied subpopulations; and
- the results of the complementary investigation activities carried out in PSUs with increased numbers of seropositive bovines, indicated an absence of clinical signs compatible with vesicular disease and a reduction of reactivity to lab tests in all investigated herds, after subsequent sample collections. The serological follow-up of sampled animals showed laboratory results incompatible with viral circulation and all laboratory tests for viral investigations performed in OPF samples taken from seropositive bovines presented negative results.

Serological monitoring was carried out in 2006 on rural holdings in the remaining States involved in the present request for restoration of sanitary status that were deemed as being at increased risk for the introduction of the viral agent. Details of this study are given in item 5.2, page 33 of the present document. The study involved clinical inspection and the collection of serological samples in bovines from 6 to 12 months of age, from 329 PSUs. These PSUs comprised 447 rural holdings chosen at random from the database of rural holdings at increased risk for FMD. A total of 11,727 serum samples were taken from bovines ranging from 6 to 12 months of age, with an average number of 36 samples per PSU. The samples were submitted to diagnosis for FMD NSPs (I-ELISA 3ABC/EITB) at a MAPA laboratory. Paired sampling was carried out on rural holdings with at least one seropositive bovine, as prescribed in Appendix 3.8.7 of the Terrestrial Code. All sampled bovines were given long-term individual identification and were clinically inspected by the Official Veterinary Service at least twice. In the interval between samplings, the sampled animals were kept FMD vaccine-free.

After the second sampling a total of 112 seropositive bovines was found (0.9% of the total number), representing a fall of 34% in the total number of positive animals for the first sampling. A fall in the number of seropositive bovines was found in all PSUs where paired sampling was carried out. Two oesophageal-pharyngeal fluid samples were taken for all seropositive bovines, with an interval of at least 15 days, and laboratory results were negative for viral investigations. The animals were clinically inspected at least four times, and no signs of vesicular disease were observed.

The analyses conducted were sufficient to prove the absence of FMD virus circulation in the region. On July, 28, 2008, the State of Mato Grosso do Sul regained the OIE recognition of the FMD free status.



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