REGIONALISATION AS AN INSTRUMENT FOR PREVENTING THE PROPAGATION OF DISEASES, INCLUDING THOSE OF CAMELIDS

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Summary: Regionalisation is a recent methodology for disease control through the separation of disease free and affected areas on the basis of epidemiological criteria. Traditionally, countries have used the concept of regionalisation in the absence of specific technical criteria, to orient their limited resources by focusing their disease control/eradication programmes on certain regions while leaving the rest of the country out of specific programme actions. Globalisation and the rise in international trade have moved countries to use regionalisation as an instrument to facilitate trade. Countries such as Argentina, Canada, Colombia, Mexico and the United States of America have used regionalisation, backed by risk analysis, to promote international trade.

In 2002, 74% of the countries that replied to a questionnaire apply the methodology of regionalisation as a disease-prevention strategy, with specific legislation in 64% of these countries. However, only 56% of the countries indicate a boost to their foreign trade due to regionalisation, and their dependence on support from the private sector for its implementation.

In South America, foot and mouth disease (FMD) is still the main obstacle to the export of animal products. The establishment in the late 1980s of the Hemispheric Plan for the Eradication of FMD, based on the concept of disease ecosystems, enabled regionalisation of national programmes and the implementation of specific strategies for the control and eradication of FMD. Other diseases covered by regionalised programmes, on the basis of known disease prevalence, include brucellosis, bovine tuberculosis and classical swine fever.

Camelid breeding is restricted to certain regions of the world for climatic reasons, and this facilitates the development of specific disease-control strategies. In the Altiplano zone of Bolivia, Chile, Ecuador, and Peru in South America, where camelids are bred that could be exported, regionalised disease prevention and control strategies are currently being implemented.

1.  INTRODUCTION

Regionalisation, or zoning when it occurs within a given country, is a method implemented by countries to create and maintain areas with a particular health status, in order to enable and promote international trade, in accordance with the recommendations of Chapter 1.3.5 of the OIE International Animal Health Code (the Code). The criteria for the establishment and maintenance of a particular animal health status must be laid down by the national Veterinary Authority and must be based on the specific epidemiology of each disease considered. These criteria may differ in each case with respect to the existence or non-existence of natural barriers, the quality and range of disease containment measures, including the use or non-use of vaccination, the control of animal movements to and from the zone in question, and, especially, the extent of surveillance carried out by the Veterinary Services in the area (11).
The Uruguay Round Final Act of the Multilateral Trade Negotiations of the General Agreement on Tariffs and Trade (GATT) in 1994, the implementation of the Agreement on the Application of Sanitary and Phytosanitary Measures (SPS Agreement) in 1995, and the existence of potential markets for animal products, all served to stimulate investment in the livestock sector in countries with surpluses, and thus expand markets (3).

In the late 1980s in South America, where the main restrictions to the export of animal products are due to foot and mouth disease (FMD), a number of countries established the Hemispheric Plan for the Eradication of FMD (PHEFA), based on the concept of disease ecosystems, defined by the interactions between the agent, host and environment existing in the most typical livestock production units in each region. The ecosystems served as a framework for the regionalisation of national programmes, and the concept made it possible to develop differentiated FMD control and eradication strategies (1, 12).

This regionalised approach to FMD control was put into practice throughout the 1990s and early 2000. Disease occurrence in the sub-continent dropped from 955 outbreaks in 1990 to 55 in 2000; herd infection rates went down from 1.25/10^2 to 0.08/10^2 and morbidity from 6.89/10^5 to 0.41/10^5 over the same period (4, 5).

This paper will present and discuss the impact of regionalisation as a tool for disease control and the promotion of international trade, the progress achieved, the difficulties encountered in the establishment and maintenance of zones and, in particular, its effects on trade in South American camelids.

2. REGIONALISATION IN THE WORLD: SURVEY FINDINGS

In order to assess the use of regionalisation in the world, and its impact on disease control and on trade, a questionnaire was drawn up regarding the criteria for the establishment of specific zones/regions and regulations pertaining thereto, the acceptance of special zones by the private sector, the diseases covered by regionalised control measures, and the criteria for evaluating the impact of regionalisation. The questionnaire was sent to the 162 OIE Member Countries, and 115 replies were received (Algeria, Andorra, Argentina, Australia, Austria, Azerbaijan, Bahrain, Barbados, Belarus, Belgium, Bosnia and Herzegovina, Brazil, Bulgaria, Canada, Central African Republic, Chad, Chile, Colombia, Congo (Democratic Republic of), Costa Rica, Côte d’Ivoire, Croatia, Cuba, Cyprus, Czech Republic, Denmark, Dominican Republic, Ecuador, Egypt, El Salvador, Estonia, Ethiopia, Finland, Former Yugoslav Republic of Macedonia, France, Germany, Ghana, Greece, Guatemala, Guyana, Iceland, India, Indonesia, Israel, Italy, Japan, Jordan, Kenya, Kirghizistan, Kuwait, Latvia, Lebanon, Lesotho, Lithuania, Luxembourg, Madagascar, Malawi, Malaysia, Mali, Malta, Mauritius, Mexico, Mongolia, Morocco, Mozambique, Myanmar, Namibia, Netherlands, New Caledonia, New Zealand, Nicaragua, Nigeria, Norway, Oman, Pakistan, Panama, Paraguay, Peru, Poland, Portugal, Qatar, Romania, Russia, Sao Tome and Principe, Senegal, Singapore, Slovakia, Slovenia, Somalia, South Africa, Spain, Sri Lanka, Sudan, Surinam, Swaziland, Sweden, Switzerland, Syria, Taipei China, Tanzania, Thailand, Togo, Trinidad and Tobago, Tunisia, Turkey, Ukraine, United Arab Emirates, United Kingdom, United States of America, Uzbekistan, Vanuatu, Vietnam, Yemen, Zambia, Zimbabwe). An Access XP database was created from the nine questions so that the replies could be cross-referenced in order to draw up a profile on the use of regionalisation as a disease-control instrument, particularly in camelids, and its impact on international trade.

Seventy-four per cent of the countries that replied (62% in Africa, 58% in Asia, 83% in Europe, 86% in North and Central America, 75% in Oceania and 100% in South America) use regionalisation as a means of preventing the spread of diseases, but only in 66% of the countries (48% in Africa, 54% in Asia, 89% in Europe, 43% in North and Central America, 100% in Oceania and 89% in South America) is there specific legislation covering zoning, its geographical limits and specific control measures for the diseases considered. This means that the zones in question cannot all be given international recognition, as the conditions under which the countries have established them do not meet the requirements of Article 1.3.5.2 of the Code. Only 36% of the countries that replied have a disease free zone that has earned international recognition.

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Regarding the impact of zoning on trade and the level of private sector support to the process, the percentage of countries that gave positive replies fell to 56% worldwide (24% in Africa, 21% in Asia, 74% in Europe, 21% in North America, 50% in Oceania and 56% in South America). These figures suggest that the developed countries, with the greatest market opportunities, made more efficient use of regionalisation to promote their trade, and that the majority of countries that replied have not yet recognised the positive economic impact of zoning on trade, which in turn may account for the low level of support from the private sector.

In 74% of the countries that replied, the criteria for delineating the zones were based on the known geographical distribution of the disease, 42% used risk analysis in regionalisation, and 28% combined both types of criteria, indicating a more methodological approach. Sixty-two per cent of the countries that replied used natural boundaries and official transit checkpoints to monitor their zones.

Sixty-three per cent of the countries that replied reported that they have a strategy of different control methods for the diseases covered by regionalised programmes. The methodologies mentioned varied according to the disease, but on the whole were based on national criteria or independent regional approaches, with restrictions on movements of animals or animal products, specific surveillance, or the conditional use of vaccines. In South America, the nine countries that replied, out of a total of eleven, declared that they had a different strategy for the control and eradication of FMD.

With respect to the diseases covered, marked differences between countries and continents were observed. Some countries apply regionalisation to more than one disease. However, FMD was mentioned in 40% of the replies worldwide, and was the leading disease in Africa, Asia and South America. Brucellosis and classical swine fever (29% each) were covered by regionalised programmes in North America and Europe, and bovine tuberculosis (22%) and rabies (20%) were the other two most frequently mentioned diseases.

Tables 1 and 2 summarise the replies regarding the impact and efficacy of regionalisation in the various continents, as regards both control/eradication and international trade.

**Table 1 - Perception of the impact of regionalisation on disease control and trade, OIE Member Countries, 2002**

<table>
<thead>
<tr>
<th></th>
<th>Total</th>
<th>Africa</th>
<th>Asia</th>
<th>Europe</th>
<th>North America*</th>
<th>Oceania**</th>
<th>South America</th>
</tr>
</thead>
<tbody>
<tr>
<td>No reply</td>
<td>28%</td>
<td>43%</td>
<td>25%</td>
<td>20%</td>
<td>22%</td>
<td>–</td>
<td>43%</td>
</tr>
<tr>
<td>Positive impact on disease control</td>
<td>58%</td>
<td>43%</td>
<td>75%</td>
<td>68%</td>
<td>33%</td>
<td>66%</td>
<td>43%</td>
</tr>
<tr>
<td>Positive impact on trade</td>
<td>14%</td>
<td>14%</td>
<td>–</td>
<td>12%</td>
<td>45%</td>
<td>–</td>
<td>14%</td>
</tr>
</tbody>
</table>

* Includes some countries of Central America and the Caribbean.
** Only three replies were received.

Some countries replied that they used more than one methodology to evaluate the impact of regionalisation on disease control. Worldwide, most countries use a single technique, which varies according to the disease (see Table 2).

**Table 2 - Methods for evaluation of the efficacy of regionalisation, OIE Member Countries, 2002**

<table>
<thead>
<tr>
<th></th>
<th>Total</th>
<th>Africa</th>
<th>Asia</th>
<th>Europe</th>
<th>North America*</th>
<th>Oceania**</th>
<th>South America</th>
</tr>
</thead>
<tbody>
<tr>
<td>Seroepidemiology</td>
<td>20%</td>
<td>25%</td>
<td>–</td>
<td>50%</td>
<td>–</td>
<td>–</td>
<td>33%</td>
</tr>
<tr>
<td>Risk analysis</td>
<td>26%</td>
<td>25%</td>
<td>–</td>
<td>25%</td>
<td>50%</td>
<td>–</td>
<td>33%</td>
</tr>
<tr>
<td>More than one method***</td>
<td>54%</td>
<td>50%</td>
<td>100%</td>
<td>25%</td>
<td>50%</td>
<td>100%</td>
<td>33%</td>
</tr>
</tbody>
</table>

* Includes some countries of Central America and the Caribbean.
** Only three replies were received.
*** Depending on the disease, a set of techniques may be used to evaluate the zone (seroepidemiology, risk analysis, vaccinal cover, etc.).
3. IS REGIONALISATION AN EFFECTIVE TOOL FOR DISEASE CONTROL?

On the basis of the replies received, the establishment and maintenance of zones for disease control/eradication is perceived as useful by 58% of the countries. However, the different figures suggest that some countries, particularly in North America, gain more from regionalisation in terms of trade (45%). In countries in South America that are traditional exporters of meat products, only 14% claimed that their exports has been boosted due to regionalisation, although 100% claimed they used zoning.

The PHEFA’s main strategies, in addition to a regionalised approach to FMD control/eradication, include the support of the private sector in the establishment and maintenance of specific zones. The participation and interest shown by the private sector, encouraged by the prospect of new business opportunities, had made it possible to finance and maintain certain control activities in these zones (13). Sixty-five per cent of the countries that replied stated that they had the support of the private sector for their specific zones.

To illustrate the use of regionalisation as an instrument for disease control, we will take the example of South America.

4. REGIONALISATION IN SOUTH AMERICA

The signing of the SPS agreement in 1994, and the OIE’s adoption of the concept of regionalisation/zoning, had a major impact on foreign trade for the South American countries of Argentina, Brazil and Uruguay, traditional exporters of meat products, which established regionalised FMD-eradication programmes, within the framework of the PHEFA. The Hemispheric Plan has regional sub-projects in the Plate River Basin/South Cone, the Andean Region, the Amazon River region, and in non-Amazonic Brazil. The FMD-free region is covered by the Central American, North American and Caribbean sub-projects. In South America, where FMD is endemic, the sub-projects were established on the basis of the specific economic and productive characteristics of the livestock farming systems in those places where the disease is present, which allowed the development of regionalised control strategies (12).

The Sub-regional Project for the Eradication of FMD in the Plate River Basin led to a drastic drop in outbreaks in the late 1990s, the eradication of FMD in Uruguay in 1996, in Argentina in 2000, and the recognition of Southern Brazil (States of Rio Grande do Sul, Santa Catarina and Parana) as FMD free with vaccination in 2000 (5).

To achieve this, Uruguay adopted a programme with homogeneous criteria for the entire country, whereas the national programmes of Argentina and Brazil used zoning to isolate animal production systems with the greatest impact on international trade and subject to specific protective regulations (14, 17).

The year 2000 witnessed the re-emergence of FMD in the region, caused by virus type O, which affected all three countries. In 2001, another outbreak due to virus type A occurred in Argentina and spread to Uruguay and Rio Grande do Sul, Brazil.

During the virus type O outbreak, both Brazil and Uruguay decided to establish an emergency zone in the areas around the outbreaks and to resort to stamping-out without vaccination as an eradication technique. In 2001, during the virus type A outbreak, both countries decided to vaccinate. In Rio Grande do Sul, Brazil, the health authorities decided not to modify the existing zoning system, and the State was isolated, by strict monitoring of the movement of animals and animal products, from the Centre-West livestock region already recognised as FMD free, as well as from the Eastern region, which was in the process of gaining recognition as FMD free with vaccination.

This situation prevailed until the emergency actions and mass vaccination campaigns eliminated the risk for the rest of the country, as attested by successive seroepidemiological samplings (6).

The re-appearance of FMD due to virus types O and A in Argentina, starting in 2000 and lasting throughout 2001, prompted the authorities to revise the National Eradication Programme 2001–2005. The programme is based on the division of the livestock production area into the following regions: Mesopotamica, Cuyo, Northeast, Central, and Patagonia (North A and B and South).
Risk levels resulting from the movement of animals and animal products between regions are covered by specific legislation for each origin/destination. Of particular importance was the strengthening of the protective barrier for the South Patagonia region, where vaccination is not practised, and which remained FMD free throughout the outbreak that extended to nearly the entire country. The Patagonia A region was subject to systematic mass vaccination, while the Patagonia B region, without vaccination, acted as a surveillance zone, with a network of transit checkpoints. Although Argentina was classified as an infected country, the last outbreak having occurred in January 2002, because of zoning the South Patagonia region was internationally recognised as FMD-free without vaccination in May 2002 (10, 17).

In Colombia, the entire Atlantic Coast, which forms a region together with the Lake Maracaibo basin in Venezuela, was subject to a control/eradication programme, and achieved international recognition as an FMD-free zone with vaccination in 2001 (9).

More recently, the Bolivian National Programme submitted a request for recognition of an FMD-free zone with vaccination in the department of de Santa Cruz de la Sierra, near the border with the States of Mato Grosso and Mato Grosso do Sul, Brazil, already recognised as such. The proposal uses the favourable conditions that exist in this border region to establish and implement a protected zone located in a country where FMD is endemic (15).

Paraguay experienced a re-appearance of FMD in Corpus Christi, on the border with the State of Mato Grosso do Sul, Brazil, in September 2002. A national commission was created within the framework of the Plate River Basin Project in order to assess the situation and the risk for Brazil. The authorities decided to regionalise the departments of Chaco and San Pedro, and to establish a special surveillance programme jointly with Brazil. The Paraguayan authorities established a programme of special activities in the departments affected or threatened by the outbreak (2).

5. CAMELID BREEDING AND REGIONALISATION

The breeding of camelids (*Camelus dromedarius* and *C. bactrianus*) is a regionalised activity mainly for reasons of climate, and is concentrated in the arid and semi-arid regions of Africa, especially from the edges of the Sahara and the Sahel to the eastern edge of the continent. It is also practised from the Middle East and the Arabian Peninsula to the countries of the Commonwealth of Independent States, and in the People’s Republic of China and Mongolia, both areas where camelids play an important economic role as providers of meat and milk, and as draught animals. The world camelid population in 2002 was 19,300,000 heads, of which 15,130,000 are in Africa. Somalia, Sudan and Mauritania have 55% of the world camelid population (7).

In eleven countries of Africa and Asia, the most common camelid pathologies are parasitic (gastro-intestinal helminthiasis, ectoparasitosis), bacterial (anthrax, brucellosis and tuberculosis) and viral (camelpox, contagious ecthyma, Rift Valley fever and rabies) according to a survey performed by Fassi-Fehri in 1987 (7). The prevalence of these pathologies is intimately linked to the relationship between these species and the environment. The low concentration but high mobility of herds is an obstacle to regionalised control programmes. However, in some regions of Chad, Morocco and Sudan, with a high prevalence of internal parasites due to nematodes and cestodes, control programmes have been established. This is also the case with chemico prophylaxis against trypanosomosis.

6. REGIONALISATION AND CAMELID DISEASE CONTROL IN SOUTH AMERICA

Camelid breeding in South America is concentrated in the plateaus and high mountains of the Central Andes, over 2,500 metres in altitude, located mainly in Argentina, Bolivia, Chile, Ecuador and Peru. The most common species are llamas (*Lama glama*), alpacas (*Lama pacos*), guanacos (*Lama guanicoe*) and vicunas (*Vicugna vicugna*). The camelid population has risen over recent years, and now numbers 6.2 million, of which 70% live in Peru (8).

In the case of Bolivia and Peru, geography, climatic conditions and species distribution create a *de facto* regionalisation in which the camelid species live in virtual isolation due to aridity and traditional breeding methods. In these regions, other species, such as cattle, are infrequent; sheep are the species that most often co-exist with South American camelids. Thus, camelid pathologies are isolated in these ecosystems, and control is easy. Trade with FMD-free countries is possible through trade protocols with established control measures, and the use of risk analysis to identify areas and populations with the lowest risk.
As in Africa and Asia, ecto- and endo-parasites are the principal camelid pathologies, and are covered by regionalised control programmes. In Peru, the Servicio Nacional de Sanidad Agraria – SENASA – carries out regionalised control of mange in camels and sheep, using demonstrative units located mainly in the southern part of the country. The project began in 1999, and is scheduled to conclude in 2004. In populations treated for mange, the average prevalence dropped to 1.85%, compared with 19.02% in populations not covered by the programme. The same organisational structure will be used for a project to control enterotoxaemia (*Clostridium* Spp.) and sarcosporidiosis (*Sarcocystis* spp.), both important pathologies for camelids in the region.

In Peru and Bolivia, centres were set up for the export of camelids to FMD-free countries based on export protocols. These protocols require, in addition to a compulsory declaration that the countries are free from rinderpest, haemorrhagic disease of deer, contagious bovine pleuropneumonia and Rift Valley fever, that animals for export be tested for FMD (they must be non-vaccinated), tuberculosis, brucellosis, enzootic bovine leukosis, infectious bovine rhinotracheitis/infectious pustular vulvovaginitis, bovine viral diarrhoea, bluetongue, vesicular stomatitis and surra (*Trypanosoma evansi*). The protocol was developed on the basis of the regionalisation of these species in the Andean altiplano (16).

### 7. CONCLUSION

Zoning as a disease-control instrument, and its impact on the creation and strengthening of markets for livestock products, is generally perceived as positive by countries. However, in many countries, the system of regionalisation chosen is based on known boundaries of disease occurrence, without any specific support legislation. Few countries have developed and implemented methodologies to characterise more precisely the risks, zone boundaries and the cost-effectiveness of regionalisation for disease control and eradication. An analysis of the replies to the questionnaire suggests that there is a need to disseminate more broadly the concept of regionalisation, to encourage participation by the private sector in the maintenance of specific zones, and to adopt specific legislation. Specific legislation would lead to enhanced disease control, and conceivably to international recognition of these zones, with positive benefits for trade between countries with different animal health status.

### BIBLIOGRAPHY


Regionalisation as an instrument for preventing the propagation of diseases, including those of camelids