FMD and Livestock Trade

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Livestock systems are a significant global asset with a value of at least USD 1.4 trillion, employing at least 1.3 billion people and directly supporting the livelihoods of 600 million poor small holder farmers in the developing world, where it is one of the fastest growing agricultural sub-sectors. World agriculture has been growing at rates of 2.1 to 2.3 % per annum for the last four decades, with much growth originating in the developing countries (3.4 to 3.8 % per annum). The share of livestock sector in agricultural GDP is around 33% which is quickly increasing, driven by the rapidly increasing demand for livestock, mainly due to urbanization and increasing incomes of developing countries. (Thornton 2010, FAO 2006).

Countries which are free from major diseases tend to protect their domestic agriculture by totally excluding the importation of livestock products from areas affected by specific animal diseases or by making importation conditional upon a series of precautionary measures which can cause great economic impact. The desire to gain access to high-value international markets is indeed the driving force behind many animal disease eradication efforts (FAO 2004).

Foot and Mouth Disease (FMD) is one of the three major diseases apart from Bovine Spongiform Encephalopathy (BSE) and Avian Influenza (AI) which have been a major cause of instability in meat markets and trade (FAO 2006). FMD control has therefore always been an important component of policy decisions made by many countries to boost their economy, especially after globalization, which could bring in valuable foreign exchange.

World Trade Organization (WTO) has designated World Organization for Animal Health (OIE) as the reference organization for dealing with animal health issues

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in international trade. Those countries attempting to harness the potential benefits of livestock trade need to align their animal disease control strategies with the OIE recommendations, which serve as a science-based, universally recognized, rational basis for international trade in animals and animal products. For attaining FMD free status in a country or a region (zone) of a country endemic to the disease, OIE has made two classifications; (a) countries/zones free from FMD with vaccination and, (b) countries/zones free from FMD without vaccination. The OIE has laid down very detailed guidelines for achieving this status. No trade related disputes appears to have been documented in WTO relating to FMD till date. OIE, on the basis of information produced by the member country as a dossier, recognizes the FMD status of the country.

Export of animal products like processed meat, milk, semen, wool, hair, hide and trophies etc made from wild animals is possible from FMD infected countries or zones if processed as per the guidelines stipulated by OIE. However FMD free countries usually do not encourage such imports because of the apprehension that products originating from infected countries may become the sources of infection in their country.

Of all the animal products traded internationally and derived from FMD susceptible animal species, meat is the highest value commodity. Live animals, milk products, germplasm, hides and bones etc. are, in comparison not very significant. Therefore this article focuses on the impact of FMD on international trade of meat.

The exports of animal products are the mainstay of agribusiness for many countries. The combined exports of beef and mutton of Australia and New Zealand put them at top till 2001, until Brazil overtook them. Meat trade expansion is likely to continue, with more being supplied by the developing exporters (FAO 2006).

The top 10 exporters of various animal products from FMD susceptible animals during 2009, which could be ostensibly affected by their FMD status, are listed in Table 1. Most of these countries were FMD free without vaccination, a few having free zones without vaccination. There are also a few countries in the top exporter list that are FMD free with vaccination or have such zones. Most of these countries have retained their FMD free status even in 2011.

Some FMD endemic countries also appear in the list of top exporters for a few animal products by virtue of the exclusivity or abundance of certain species in these regions (eg. Buffloes in India), or a high demand quotient for the product (eg. goat & sheep meat).

There are other countries like Namibia, Botswana, Nicaragua, Paraguay, Iceland etc, where the value of animal produce is the highest among agricultural commodities exported, though these countries are not among the top exporters. All these countries are either FMD free or have free zones, with or without vaccination. Further, the export market of cattle hides in countries like Albania, Bosnia, Brunei and Somalia provides them with the one of highest values in agribusiness (FAOSTAT 2009); all except the latter are FMD free countries without vaccination.

An exception to the rule is probably India, though endemic to FMD, which exports buffalo meat, the value of which is ranked 4th highest among all its agricultural commodity exports (FAOSTAT 2009).

It can be reasonably assumed from the above that freedom from FMD provides a country with a favourable marketing platform for export of animal products from FMD susceptible animals.

Among the importing countries, Japan saw a five-fold increase in its meat imports between 1979 and 2001. The other major importers being Russia, Mexico, Hong Kong, Saudi Arabia, South Korea (FAO 2006). A glance at the top 10 countries that import various meats of FMD susceptible animals (Table 2)

shows the major importing countries also to be FMD free. A substantial amount of meat from sheep and goat is imported by countries that are endemic to FMD.

Similarly, most of the top 10 countries exporting live cattle and pig are either FMD free or have free zones, with or without vaccination. However, the same does not hold good for live goat and sheep, which are being exported predominantly from endemic countries (Table 3). The countries importing live cattle and pig also follow a similar trend, majority of which are FMD free or have free zones, with or without vaccination. Here too, most of the countries importing live goat and sheep are endemic to FMD, which may be attributed to their preference of live small ruminant imports over and above its products (Table 4) (ESGPIP 2011).

As on 2011, there are 65 countries that are FMD free without vaccination, one country FMD free with vaccination, 9 countries with FMD free zones without vaccination and 6 countries with FMD free zones with vaccination (OIE 2011).

Impact of recent outbreaks

FMD has caused havoc in the recent past not only in animal husbandry but also had its cascading effect on tertiary industries like tourism, and is definitely the prime target of animal disease control projects. In terms of animal husbandry, animals that are infected with FMD almost never regain the weight they lost and often remain somewhat lame. Majority of milk-producing animals do not return to pre-infection milk production levels and pregnancy rates usually drop (O'Toole 2002).

Europe

The Pan Asia "O" type FMD outbreaks in 2001 were unprecedented in Europe. Undue priority given to trade and, urgency to regain FMD free status forced the EU to adhere to the non-vaccination policy and resort to stamping out. There were some 2030 outbreaks in which 6.5 million animals were slaughtered in

UK, 2.85 million in Netherlands, 63,000 in France, 53,000 in Ireland, toting to about 10 million, even as the new - borns were not counted. The contingency plan that was adopted during the 2001 European outbreak was the 24/48 plan, i.e., slaughtering all animals at infected farms within 24 hours and neighbouring farms (within 3 Km radius) by 48 hours. There was also an unfounded and unsubstantiated fear in the food trade that consumers would not accept products from vaccinated livestock (EU 2002).

The culling of large number of animals in EU caused enormous problems of disposal for which the army had to be called in by many countries. There was also a huge public outcry against this policy, consequent to which greater prominence has been given to the use of emergency vaccination in the event of an outbreak as an adjunct to slaughter in the new EU directive adopted in September 2003. The EU also felt it important that an agreement and understanding is reached to record that meat and milk from vaccinated animals are safe for human consumption (EU 2002).

Tourism industry also suffered serious losses. Centre for Economic and Business Research establishment have stated that losses in UK alone amounts to USD 13 billion -USD 5 billion to the State and 8 billion to the private sector. (Domenech 2011). Some have reported the total costs of FMD in the UK between 1999-2002 at USD 18-25 billion (Thornton 2010). Others have pegged it between USD 11.9–18.4 billion, including USD 4.8 billion in losses to agriculture, the food industry, and the public sector, USD 4.2–4.9 billion in lost tourism, and USD 2.9–3.4 billion in indirect losses (Carpenter 2011).

Africa

After a period of over 20 years with low incidence of FMD outbreaks in the FMD free or controlled regions in certain countries in the African sub-continent, the period between 2002 and 2009 saw a resurgence of FMD. Outbreaks of the disease were recorded in Botswana, Malawi, Mozambique, Namibia, South Africa, Zambia and Zimbabwe. The increased disease spread was not only

threatening exports to the lucrative European Union (EU) markets that some of these countries enjoy but also presented a challenge on the national control strategies including vaccinations that had proven to be effective for many years in the past (Thobokwe 2010).

Botswana estimated a loss of USD 55 million due to the spate of the outbreaks of the FMD during 2011. In the recent past, the country has seen a number of outbreaks of the disease (Neondo 2011).

The beef trade has been an important contributor to the economy of Zimbabwe with an annual average of USD 43 million generated from fresh beef and beef related by-products till 2000. There was a sharp decline of 93% between 2001 and 2002 due to a major outbreak of FMD and subsequent suspension of exports to EU market (Ronny 2008).

FMD infection in part of KwaZulu-Natal province of South Africa in early 2011 caused suspension of all exports of cloven-hoofed animals and their meat from the country. The disease also forced a halt to wool auctions- South Africa being the world's second- largest exporter of the fiber for the textile market. South African farmers earned 1.34 billion rand (USD 193 million) from wool the previous year. The loss due to ban on venison exports due to the FMD outbreak is estimated at around 30 million rand (Latham 2011).

Far East

The recent occurrence of FMD in free countries like Japan and Korean Republic shows the increasing threat posed by FMD as a transboundary disease. (Paton 2010). Japan experienced its first outbreak in 90 years in March 2000. In 2010, both Japan and the Republic of Korea experienced large FMD outbreaks which required extensive programs to control. The 2010–11 Korean outbreak is estimated to have cost the government some 3 trillion won (about USD 2.7 billion) (DAFF 2011). About 3.37 million pigs, cows, goats and

deer were culled. Indirectly, there was also a loss of market for associated supplies to the cattle and swine industries (including feed, bedding, transportation and loss of sales of animal health products) (FAO 2011).

The FMD epidemic that occurred in Taiwan, nearly 70 years after the disease was eradicated from that country in 1930, affected more than 6,000 farms, resulting in the slaughter of approximately 4 million pigs, or 40% of the population at risk. Due to trade ban of pork destined for Japan, the Taiwanese pig industry incurred a loss of USD 1.6 billion (Yang 1999). A further USD 380 million was spent on vaccines and compensation to the farmers for culled animals (Domenech 2011). These losses were in addition to the indirect losses experienced by other allied industries, including the loss of more than 65,000 jobs (Carpenter 2011).

South America

During the October 2005 FMD outbreaks in Brazil, import ban on import of from Brazil was imposed by over 50 countries. The beef exports for that year were reduced to half of the average for the previous five years (Domenech 2011). However, the pork sector was more disadvantaged by the outbreak than the beef sector, which actually experienced the outbreak. This caused a 30% decline even in the domestic market, which was well below the costs of production. Approximately 60 countries imposed import restrictions on pork from Brazil which caused exports to be down by more than 25% in the first half of the year (FAO 2006).

Outbreaks in Argentina during 2000-2001 resulted in losses of USD 439 million in beef exports (Domenech 2011). Outbreaks in early February had a minimal trade impact since the province which lost its status accounted for only 2% of the total Argentine beef exports (FAO 2006).

Likely impact of FMD in other FMD free countries

Studies have been conducted by many FMD free countries to assess the potential loss should FMD strike their countries. The substantial losses estimated drive these countries to continue to work in programmes to achieve or maintain FMD free status. Most of the FMD free countries also carry out FMD simulation exercises to assess, review and update their emergency contingency preparedness in case of an FMD outbreak.

North America

In the USA, which has been free of FMD since 1929, the greatest impact based in the case of an FMD outbreak would be on pork and beef industry amounting to about USD 8 billion (USD 4 billion for each industry). Collaterally affected export markets would likely include: poultry, egg and processed product, soybeans, corn and wheat. Key trading partners would likely close access to U.S. product for some indeterminate amount of time or until the outbreak is resolved. FMD would also have a profound impact on domestic production markets with the price of all commodities plummeting with the surplus of un-exportable product (USDA 2011). If there were an FMD epidemic in the USA (similar to the 2001 U.K. FMD epidemic), then it is estimated that farm income could be reduced by approximately USD 7–21 billion, depending on the change in consumption of red meat and dairy products (Carpenter 2011).

The primary economic impact of a FMD outbreak in Canada would arise possibly due to trade embargo placed on Canadian exports of animals and animal products to countries free of the disease. On simulating two scenarios, a small and large outbreak, over a five year period (1986-90) indicated that even a small outbreak would have serious economic consequences for the livestock sector with farm cash receipts declining by CAD 2 billion, with the largest impact on the pork sector followed by the beef sector (Krystynak 1987).

South America

Uruguay is a good example of a country that gained access to a lucrative market after eradicating FMD. The beef exports increased in volume by more than 100 percent and in value by 52 percent after the OIE declared Uruguay to be officially FMD free without vaccination in 1996. The access to US markets (where prices are double those of the domestic market) alone provides an additional income of USD 20 million annually (Domenech 2011).

A medium-term analysis showed that access to "Pacific Rim" markets would generate additional revenue of USD 90 million each year, and yet, before the disease was eradicated, Uruguay had been spending (only) USD 8-9 million to each year on vaccines to combat FMD. In this case, control costs would account for less than 10 percent of the revenue generated by exports alone (News and Broadcast - WB 2011).

Closing down export markets could mean losses of more than USD 350 million for Argentina which is about 20% of Argentina's entire beef exports amounting to more than USD 1.4 billion in 2005 (Wharton University 2006).

Australia & Oceania

Australia has successfully kept FMD out of the country for more than 130 years. FMD would have very serious effects on Australia's livestock industries. The Australian Bureau of Agricultural and Resource Economics and Sciences (ABARES) update (in 2011) of the Productivity Commission report of 2001 estimated that over a ten year period there would be severe direct economic losses to the livestock and meat processing sector from an outbreak of FMD. These losses ranged from AUD 7.1 billion for a small three month outbreak, to AUD 16.0 billion for a large 12 month outbreak (DAFF 2011).

In a limited FMD outbreak scenario simulation involving 50 affected farms for a 2 month period causing an 8% drop in exports of goods and services in New

Zealand, cumulative loss was estimated at around NZD 6 billion after 1 year, and around NZD10 billion after 2 years, with the losses continuing to mount because permanent lowering of potential output (Reserve Bank of New Zealand 2003, Belton 2004). The unemployment was also shown to rise to around 20,000 (New Zealand Government 2011).

Africa

A benefit-cost ratio of vaccination for FMD conducted in an area of South Sudan was 11.5. Losses due to the chronic form of FMD accounted for 28.2% of total FMD losses, indicating that future benefit-cost analyses for FMD control in pastoral and agropastoral areas of Africa need to consider losses caused by chronic disease. (Barasa 2008).

The losses estimated in Zimbabwe due to FMD was in the region of USD 1.6 billion annually if the disease is not controlled (FAO. 2001).

South-east Asia

The annual cost to Taiwanese economy caused by loss of pig meat export due to FMD was estimated at USD 43.2 billion. Costs of FMD control programmes were estimated at USD 16,528 million, and therefore, was economical and urgently needed in Taiwan (JyanSyung 1998) .

If FMD were to be eradicated from Thailand in 2010, the eradication would be economically viable, even without exports, with a predicted benefit-cost ratio of 3.73. With additional exports, the economic justification for control becomes much stronger with a benefit-cost ratio of up to 15:1 being achieved. (Perry 1999).

In Philippines, the benefit-cost ratios for the investment in eradication range from 1.6 for eradication by 2010 (without exports) to 12.0 for eradication by 2005(with exports of 5000 tonnes each of low-value and high-value livestock products annually). This indicated FMD eradication to be an economically

viable investment in the country, with the commercial swine sector capture 84% of the benefits generated (Randolph. 2002, Domenech 2011).

FMD control should also be linked to improvement in livelihoods of livestock dependent communities in the FMD endemic settings. It is expected that this in turn will lead to increasing demand for effective national veterinary services and disease surveillance. Such strategy for progressive control of FMD in the endemic settings would be in a horizon of about 30 years. (Rweyemamu 2008). A long term strategy has to be therefore envisaged while dealing with FMD control.

Market acceptance by trade partners of products of vaccinated animals can also limit the economic consequences of outbreaks of FMD (Backer 2009).

An elucidation of the FMD control strategies adopted in various countries/ zones across the world would give an understanding on the strategies adopted by them to achieve disease free status with or without vaccination.

FMD control strategies

The Food and Agriculture Organization (FAO) of the United Nations, OIE and Pan-American Health Organization (PAHO) have had extensive programmes for FMD surveillance and control. Their focus on disease reporting, disease status evaluation, safety of world trade, diagnosis and research, standardisation of FMD vaccine production, coordinated control of outbreaks and international support of national and regional FMD control programmes have facilitated global trade while minimizing the risk of the introduction of the virus from infected to disease free zones (Blancou 2004).FAO and OIE are working together to develop global FMD eradication programme and have also developed the 'Progressive Control Pathway'(PCP) approach.

The European Union

Annual prophylactic vaccinations were very successful in totally eliminating outbreaks in Europe by 1990. Banning of importation of bone in beef from non-FMD free states in 1978 assisted these FMD control policies. Post 1991, there was a dramatic change in policy of the European Union (EU) by adoption of a non-vaccination policy (EEC Directive 2002). The advent of single EU market in 1993, FMD free member EU countries opposing importation of vaccinated animals, and potential for international trade, most importantly with north and Central America, Australia etc were also contributing factors to adopt this policy.

Apart from the control strategy employed within the country, the following curbs on imports were also a significant part in controlling the entry of the disease into the EU:

1. Full traceability - labeling on the country of origin.
2. No imports of FMD susceptible animals from developing countries having FMD free status with vaccination.
3. Meat from countries, which have this status, must be deboned and matured.
4. The importation from non-EU, FMD free countries (without vaccination) subject to certification of non-vaccinated status, quarantine and testing for freedom from serum antibody and pharyngeal FMDV.

Small outbreaks did occur in countries like Bulgaria, Italy, Greece, Albania, Macedonia etc, but were eradicated without recourse to vaccinations, especially by stamping out. The financial benefits to EU of FMD free status far outweighed the costs incurred in stamping out.

South America

Massive vaccination programmes were initiated in 1950s to control FMD in South America but were poorly executed and hence eradication was not possible. Argentina and other countries changed to a better vaccine in 1990 as a result of which FMD was eradicated within 4 years from Argentina. The massive vaccination programme, along with outbreak and animal movement control, helped eradicate FMD in sizeable areas in the 1990s (Saraiva 2004). They maintained vaccination for another 5 years without outbreaks and were FMD free without vaccination for several years until reintroduced in 2001.Mass-vaccination and movement restrictions were adopted as an effective strategy to control FMD outbreaks but the time taken to end large, national epidemics took more than a year (Perez 2004).

A classical example of control of FMD by emergency vaccination averred by anti-slaughter protagonists in EU was that of Uruguay, wherein 10 million vaccinations accompanied by movement restrictions, eradicated the disease in 15 weeks during the 2001 outbreak. Only 7000 animals were slaughtered (EU 2002).

Regionalization has been a very effective instrument to limit market losses to countries that experienced FMD outbreaks. This has proved to be the case for Brazil and Argentina, where the potential market impacts of FMD outbreaks could have been extremely severe in the absence of importer recognition of in-country zones (FAO 2006).

Southern Africa

In South Africa, Botswana, Namibia and Zimbabwe the use of fences to separate cattle from free-ranging buffalo has been the historic linchpin in controlling the disease. The fences are regularly maintained and supervised. However, this had deleterious effects on wildlife in that their migration routes were blocked, particularly in Botswana and Zimbabwe (Thomson 1995).

Preventive inspection of cattle is done in FMD free areas. Protection zones are created generally contiguous to buffalo dominant areas and vaccination is practiced twice a year in these areas. There are also certain areas where control is impossible due to presence of free-ranging buffaloes but here too vaccination is carried out regularly. These countries are also exporters of meat; hence the FMD free zone or country status is a lucrative proposition to the farmers. However, in Zimbabwe, it was observed that the higher-income segments of the population capture the majority of benefits, with lower-income households enjoying only a third of the income gains (Randolph 2005).

There is now a strong political desire to control animal diseases in countries like Tanzania as part of national poverty alleviation strategy. It is also being realized that dividing the country in zones according to their epidemiological status will allow improving the control of FMD and delimiting potential FMD free areas (Picado 2011). Uncontrolled livestock movements, the presence of large populations of wildlife in regular contacts with livestock, and the general lack of enthusiasm for FMD control among the key stakeholders, are some of the factors favouring the persistence of FMD in Tanzania. (Kivaria 2003).

India

The animal health bulletins of GoI have reported details of FMD since 1943. Systematic efforts to understand and control FMD started through AICRP on FMD in 1971 which was coordinated by a central lab (Mukteswar), 7 regional laboratories and 10 field epidemiological units.

It is estimated that around 5,000 outbreaks occur annually in India affecting nearly three lakh animals. The disease is therefore one of the major causes of huge economic losses in India, especially due to decreased milk production, reduction of draught power and breeding capabilities. The annual losses due to the disease in the country is estimated at around Rs.140-Rs.200 billion (Longjam 2011, TheDairySite 2009, PTI 2008, B Singh 2013)

NCA recommended taking up FMD control programme in 1976 encompassing vaccine production, typing & strict quarantine (especially to prevent SAT strains).

A vaccine plant was also established in IVRI in1972 with the capacity to produce 1 million doses per annum. Some small scale manufacturers also entered the fray between 1970-77.

NDDB in 1983 facilitated the establishment of a vaccine production at Hyderabad with the capacity of 25 million doses annually. NDDB also initiated a FMD Pilot scheme in Nilgiris during 1982 which was later extended to adjoining 23 districts in Tamil Nadu, Kerala and Karnataka in a phased manner (Srinivasan 2003). Government of India (GoI) is coordinating a FMD Control Programme (FMDCP) that presently covers 221 districts, covering entire southern peninsular India and some other important milk producing States like Haryana, Punjab and Gujarat. The main focus of FMDCP is mass vaccination of cattle and buffalo, which is performed twice a year.

NDDB also developed a sustainable model for FMD control in one State of the country between 2004-09 by facilitating mass vaccination of all susceptible animals on chargeable basis, strengthening of the State border check posts, providing adequate laboratory infrastructure and proper disease reporting mechanism, which by and large was successful in controlling the disease and also in creating a corpus that would help in continuance of the programme. However, transmission either by direct contact or by aerosols from infected to healthy animals due to the unrestricted movements of animals among different ivestock markets are still remains the major sources of infection of FMD in India (Verma 2010, Bhattacharya 2005).

When cows are impossible to eliminate due to religious reasons, like in India, or due to the extreme poverty, like in some African countries, the strategy to fight FMD that needs to be adopted may be based on mass vaccinations, timely diagnosis of outbreaks and control, especially by ring vaccination. This saves

considerable number of livestock and, most importantly, reduces epizootic threat. Such policy decisions should be included in the binding law (Lis 2009) and effectively implemented. Towards these ends, the GoI plans to initiate a National Animal Disease Reporting System (NADRS), which would enable real time disease reporting by all stake holders using SMS or internet. This would also provide a veritable source of information of disease occurrence to international agencies like OIE on a regular basis and also act an action trigger for emergency measures like ring vaccination.

The Prevention and Control of Infectious and Contagious Diseases Act, 2009 and its Rules, 2010 would provide the necessary teeth by empowering the government machinery to enforce compulsory vaccination, disease reporting, movement control and quarantine of animals among other things, which provide the buttress for efficient implementation of any disease control programme in our country.

Indian perspective

The agricultural sector in India contributes over 20% to the GDP. The sector is dominated by small farms. The livestock sector contributes around 6.8% to GDP and employs 8% of the labour force. The contribution of the livestock sub-sector to agricultural GDP has increased impressively in the last 20 years, from less than 15% in the late 70s to over 33% in 2002. Meat Production increased about 3 % between 1990 and 2000, with poultry and milk production growing at 11.8 and 4.2 % respectively, and all other meats at below 2% (FAO 2005). In addition, cultural and religious factors have also stood in the way of wider diffusion of consumption of meat in general in India (FAO 2006).

India is member of the WTO since January 1, 1995. Over the years, it has also committed itself to a series of free and preferential trade agreements with various south-east Asian countries. (FAO 2005).

Though meat products from FMD susceptible animals processed in ways as stipulated by OIE ensures the destruction of FMD virus, which would suffice to meet the export requirement of meat products from an endemic country (Table 3), many developing countries have forged ahead in FMD control, the main fillip being the premium value tag for the meat produced in FMD free countries/zones.

India is the largest exporter of buffalo meat in the world and has been exporting meat since 1969. It presently exports buffalo meat to around 64 countries. No country has recorded an outbreak as a consequence of import of meat from India. India's exports of animal products especially buffalo, sheep and goat meat have increased dramatically especially in the last few years. The demand for bovine meat in international market has sparked a sudden increase in the meat exports from India. The main markets for Indian bovine meat are Malaysia, Philippines, Mauritius, and Gulf countries. There are 27 export oriented abattoirs in the country which are established on guidelines given by APEDA. (APEDA 2011). The market expansion possibilities are tremendous if in the FMD free zones are developed.

A traceability system is also a critical ingredient to track diseases like FMD and is also a requirement of the importing country. Such systems also act as a proxy for quality assurance. The use of a single central database reduced considerably the cost of implementation and minimized response time for impact analysis (Matete 2010) . NDDB has developed a software with Infosys called Information Network for Animal Productivity and Health (INAPH) which is being used at various locations in the country. The software also includes traceability of the animal amongst various other modules namely Animal Health, Reproduction, Progeny Testing, Nutrition and in addition, feed, milk and pathology laboratory modules. The database thus maintained can be used to estimate the incidences of various diseases in different parts of the country. This rich repository of information would also help policy makers to identify the

appropriate disease control strategies required in different regions of the country not only for FMD control but also for other diseases.

For a country like India, a FMD control programme, more than striving to develop free zones to meet the demands of the importing nations, can also seek to reduce the negative impact of the disease upon production systems especially that of milk production which is likely to be most severely affected in the event of an outbreak (Mathew 2008), rather than for trade purposes alone. This would be a more plausible reason for taking up FMD control programme in our country, which also embodies the progressive approach that seeks to provide interim benefits to the farmers, thereby increasing the importance of effective veterinary services delivery and disease surveillance, along the pathway to the final objective of FMD eradication.

Table 1: Top 10 countries exporting fresh meat from FMD susceptible animals in 2009

No	Country	FMD Status (2009)	FMD Status (2011)	Beef	Beef & Veal (deboned)	Sheep	Goat	Pig	Buffalo
1	France	FC-NV	FC-NV	1			2	7	
2	Germany	FC-NV	FC-NV	2	8	10		3	
3	Netherlands	FC-NV	FC-NV	3	4	7	10	6	
4	Poland	FC-NV	FC-NV	4				10	
5	Belarus	FC-NV	FC-NV	5					
6	Belgium	FC-NV	FC-NV	6		5		4	
7	USA	FC-NV	FC-NV	7	3			1	
8	Spain	FC-NV	FC-NV	8		8	8	5	
9	Colombia	FZ-NV	FZ-NV	9					
10	Ireland	FC-NV	FC-NV	10	6	4			
11	Australia	FC-NV	FC-NV		1	2	1		
12	Denmark	FC-NV	FC-NV					2	
13	Austria	FC-NV	FC-NV					8	
14	Brazil	FZ-NV/V	FZ-NV/V		2				
15	Argentina	FZ-NV	FZ-NV		5				
16	New Zealand	FC-NV			7	1	7		
17	Uruguay	FC-V	FC-NV		9	9			
18	Canada	FC-NV	FC-NV		10			9	
19	UK	FC-NV	FC-NV			3			
20	Greece	FC-NV	FC-NV				9		
21	India	EC	EC			6	4		1
22	China	EC	EC				3		
23	Ethiopia	EC	EC				5		
24	Pakistan	EC	EC				6		

Source: (a) (FAOSTAT 2009) (b) (OIE 2009) (c) (OIE 2011) FC-NV-Free Country without vaccination; FZ-NV – Free Zone without vaccination. FZ-NV/V- Free Zone with and without vaccination. EC- Endemic Country. The number denotes the rank of the country based on value of exports.

Table 2: Top 10 countries importing fresh meat of FMD susceptible animals in 2009

No	Country	FMD Status (2009)	Beef	Beef & Veal (deboned)	Sheep	Goat	Pig	Buff
1	Italy	FC-NV	1	5	8	3	5	
2	Russia	EC	2	3			1	
3	Netherlands	FC-NV	3	7				
4	France	FC-NV	4	6	1			
5	Greece	FC-NV	5				8	
6	Germany	FC-NV	6	4	5		2	
7	Venezuela	EC	7					
8	South Korea	FC-NV	8					
9	UK	FC-NV	9	8	2		10	
10	Portugal	FC-NV	10					
11	USA	FC-NV		1	3	1	3	
12	Japan	FC-NV		2	10			
13	Mexico	FC-NV		9			7	
14	Spain	FC-NV		10				
15	Poland	FC-NV					4	
16	Romania	FC-NV					9	
17	Belgium	FC-NV			4			
18	Saudi Arabia	EC			7	8		
19	UAE	EC			9	2		
20	Qatar	EC				4		
21	Oman	EC				5		
22	Hong Kong	EC				7	6	
23	Bahrain	EC				9		
24	Trinidad	EC				10		
25	Georgia	EC						1
26	Kyrgyzstan	EC						2
27	Guinea	EC						3
28	China	EC			6	6		

Source: (a) (FAOSTAT 2009) (b) (OIE 2009) FC-NV-Free Country without vaccination; FZ-NV – Free Zone without vaccination. FZ-NV/V- Free Zone with and without vaccination. EC- Endemic Country. The number denotes the rank of the country based on value of imports.

Table 3 : Top 10 countries exporting live FMD susceptible animals in 2009

No	Country	FMD Status (2009)	FMD Status (2011)	Cattle	Sheep	Goat	Pig
1	France	FC-NV	FC-NV	1	5		7
2	Canada	FC-NV	FC-NV	2			3
3	Mexico	FC-NV	FC-NV	3			
4	Australia	FC-NV	FC-NV	4	1		
5	Poland	FC-NV	FC-NV	5			
6	Germany	FC-NV	FC-NV	6			4
7	Brazil	FZ-NV/V	FZ-NV/V	7			
8	Thailand	EC		8			8
9	Netherlands	FC-NV	FC-NV	9			1
10	Belgium	FC-NV	FC-NV	10			9
11	Syria	EC	EC		2	8	
12	Romania	FC-NV	FC-NV		3		
13	Sudan	EC	EC		4		
14	Hungary	FC-NV	FC-NV		6		
15	Spain	FC-NV	FC-NV		7		5
16	Saudi Arabia	EC	EC		8		
17	Somalia	EC	EC		9	2	
18	Mauritania	EC	EC		10	9	
19	Iran	EC	EC			1	
20	India	EC	EC			3	
21	Burkina Faso	EC	EC			7	
22	Chad	EC	EC			10	
23	Oman	EC	EC			4	
24	Niger	EC	EC			5	
25	Namibia	FZ-NV	FZ-NV			6	
26	Denmark	FC-NV	FC-NV				2
27	China	EC	EC				6
28	Lithuania	FC-NV	FC-NV				10

Source: (a) (FAOSTAT 2009) (b) (OIE 2009) (c) (OIE 2011) FC-NV-Free Country without vaccination; FZ-NV – Free Zone without vaccination. FZ-NV/V- Free Zone with and without vaccination. EC- Endemic Country. The number denotes the rank of the country based on quantity exported.

Table 4: Top 10 countries importing live FMD susceptible animals in 2009

No	Country	FMD Status (2009)	Cattle	Buff	Sheep	Goat	Pig
1	USA	FC-NV	1				2
2	Italy	FC-NV	2		2		10
3	Netherlands	FC-NV	3				7
4	Indonesia	EC	4				
5	Spain	FC-NV	5				
6	Nigeria	EC	6			4	
7	Venezuela	EC	7				
8	Lebanon	EC	8		7		
9	Belgium	FC-NV	9				
10	Saudi Arabia	EC	10		1	2	
11	UAE	EC				1	
12	Oman	EC			8	3	
13	Yemen	EC			5	5	
14	Nepal	EC		2		6	
15	Senegal	EC				7	
16	South Africa	FZ-NV				8	
17	Ghana	EC				9	
18	Qatar	EC			10	10	
19	Germany	FC-NV					1
20	Poland	FC-NV					3
21	Hong Kong						4
22	Belgium	FC-NV					5
23	Russia	EC					6
25	Portugal	FC-NV					8
26	Romania	FC-NV					9
27	Kuwait	EC			3		
28	Bahrain	EC			4		
29	France	FC-NV			6		
30	Greece	FC-NV			9		
31	Thailand	EC		1			

Source: (a) (FAOSTAT 2009) (b) (OIE 2009) FC-NV-Free Country without vaccination; FZ-NV – Free Zone without vaccination. FZ-NV/V- Free Zone with and without vaccination. EC- Endemic Country. The number denotes the rank of the country based on quantity imported.

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