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FOREWORD

Rinderpest, or cattle plague, is a fatal disease of domestic cattle and buffaloes which can kill over 95 per cent of susceptible animals. It is caused by a moribillivirus. Sheep, goats, pigs and game animal species may also be affected. Clinically, the disease is characterised by fever, discharges from the eyes and nose, dribbling, erosions of mucous membranes, diarrhoea containing blood and mucous, and death. It still remains endemic in Africa and parts of Asia. Rinderpest has devastated the bovine herds in the past until an effective vaccine was developed. It has the potential to be the dreadful animal disease causing massive economic losses to the countries where such infection is endemic.

In this context, the FAO-APHCA and EMPRES organized a Regional Expert Consultation on Rinderpest Control in Kandy, Sri Lanka, during 8-10 February 1999. The objectives of the Consultation were to review the current situation of rinderpest in South Asian and South-east Asian countries, discuss constraints and strategies towards the disease eradication and co-ordinate national rinderpest eradication programmes and regional action plans under the umbrella of the South Asian Rinderpest Eradication Campaign (SAREC).

The discussions of the expert group were based on their understanding that rinderpest eradication programmes in the region have proceeded successfully to the current situation where the disease has been eliminated from South-east Asia, most of the Near East and from most of South Asia except for Pakistan and a contiguous portion of Afghanistan.

This publication, covering the proceedings of the FAO-APHCA-EMPRES Regional Expert Consultation on Rinderpest Control, consists of four parts: -

Part I:	Report of the FAO-APHCA-EMPRES Regional Expert Consultation on Rinderpest Control;
Part II:	Country Reports;
Part III:	Resource Papers; and
Part IV:	Annexes.

The FAO-APHCA and EMPRES are very grateful to all participants and resource persons for their contributions to the Consultation and hope that these proceedings will be found useful by policy makers as well as veterinarians, scientists and field extension workers who are engaged in rinderpest control and eradication activities in the Region.

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Assistant Director General and
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for Asia and the Pacific

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PART I

REPORT OF THE FAO-APHCA-EMPRES REGIONAL EXPERT CONSULTATION ON RINDERPEST CONTROL

INTRODUCTION

1. Background

The FAO-APHCA-EMPRES Regional Expert Consultation on Rinderpest Control was held in conjunction with the 57th Executive Committee Meeting of APHCA at the Institute of Continuing Education, Department of Animal Production and Health in Kandy, Sri Lanka, during 8-10 February 1999.

Experts from the following 8 countries: - Bangladesh, India, Lao PDR, Myanmar, Nepal, Pakistan, Sri Lanka, and Thailand participated in the Consultation. In addition, there were resource persons from FAO Headquarters (EMPRES), OIE and India attended the Consultation. Two FAO/RAP officers, being the main organizers of the Consultation, were also among the participants and 23 observers from Sri Lanka and Thailand. The list of participants/observers, and the adopted agenda are given as Annex "A", and "B", respectively.

The APHCA Executive Committee Meeting and the Consultation were officially inaugurated by three chief guests: - Dr. S.S.E. Ranawana, Director of the Department of Animal Production and Health of Sri Lanka and Chairman of APHCA, Dr. P. Ramanujam, Secretary, Ministry of Livestock Development and Estate Infrastructure, and Dr. G. Bernard, FAO Representative in Sri Lanka. The full text of their statements can be found as Annex "D", "E", and "F", respectively.

Dr. S.S.E. Ranawana, Director of Department of Animal Production and Health, Ministry of Livestock Development and Estate Infrastructure of Sri Lanka, was the Chairman of the Consultation.

All the papers were presented to review the current status of rinderpest and were used as a platform for discussion on the proposed activities towards eradication/planned activities on rinderpest in each country. The full texts of the following country papers are in the Part II: - Bangladesh, India, Lao PDR, Myanmar, Nepal, Pakistan, Sri Lanka and Thailand. The resource papers are accommodated in the Part III.

2. Objectives

The objectives of the Consultation were to review the current situation of rinderpest in South Asian and South-east Asian countries, discuss constraints and strategies towards the disease eradication and co-ordinate national rinderpest eradication programme and regional action plans under the umbrella of the South Asian Rinderpest Campaign (SAREC).

3. Organizers

This Consultation was jointly organized by the Animal Production and Health Commission for Asia and the Pacific (APHCA) of the Food and Agriculture Organization of the United Nations (FAO) and Department of Animal Production and Health, Ministry of Livestock Development and Estate Infrastructure, the Government of Sri Lanka.

4. Consultation Format

The Consultation was divided into the following 4 parts: - Part I - Country report presentations, Part II - Resource paper presentations, Part III – Discussion, and Part IV - Conclusion and Recommendations. The full consultation timetable appears as Annex "C".

At the end of the Consultation, the following conclusion and recommendations were adopted.

CONCLUSION AND RECOMMENDATIONS

The discussions of the expert group were based on their understanding that rinderpest eradication programmes in the region have proceeded successfully to the current situation where the disease has been eliminated from South-east Asia, most of the Near East and from most of South Asia except for Pakistan and a contiguous portion of Afghanistan. As a result the majority of countries has ceased, or are about to cease, vaccination of livestock against rinderpest in order to embark on the OIE Pathway to verified freedom from rinderpest. Therefore, the livestock populations are becoming increasingly more vulnerable to the re-emergence of rinderpest in epidemic form.

1. The countries affirmed their commitment to the complete and verified eradication of rinderpest from Asia by the year 2010. Asian countries should mobilize all available manpower and resources to achieve this target date. All Asian countries and international agencies should undertake a public awareness campaign to raise the profile of the eradication programme and publicize its progress.

2. The continuing endemic persistence of rinderpest in Pakistan is a matter of grave concern for the entire South Asian Association for Regional Co-operation (SAARC) region as well as countries in adjoining regions. Indeed, at this time of extreme vulnerability, the expert consultation considered this situation to constitute an international emergency. Addressing the issue of rinderpest persistence in Pakistan is viewed as the absolute priority animal health issue facing the SAARC countries.

2.1 Safeguarding the significant gains made in South Asia requires immediate implementation of a Pakistan national project for the progressive control of rinderpest leading to its eradication in the shortest possible time. Failure to do so risks generation of a new South Asian rinderpest pandemic which would have devastating consequences for all the countries of the region as well as for the Global Rinderpest Eradication Programme (GREP).

2.2 The Pakistan Government has indicated its commitment to mounting a National Rinderpest Eradication Programme for which it requires assistance. The European Commission and other donors are unanimously requested to support the Pakistan national rinderpest programme to enable its implementation without delay.

2.3 FAO, OIE and APHCA are requested to make representations to the EC stressing their anxiety about the current situation and their support for rapid implementation of a Pakistan national project.

2.4 There is an urgent need to determine the epidemiology of rinderpest maintenance in Pakistan and this is a pre-requisite for eradication strategy development needed for project implementation. Undertaking the required studies should not await eventual project implementation. The international organizations and donors are requested to provide emergency assistance for this. In particular, FAO is requested to support the required activity through an emergency Technical Co-operation Programme (TCP) project.

3. Although throughout most of the regional rinderpest eradication has been achieved there is a disparity between the countries in the stage reached on the path to verified freedom. In order to consolidate the gains, there is a need to sustain the momentum and bring all countries to the required level.

3.1 The need for urgent implementation of a SAREC Support Project, as previously proposed was unanimously endorsed.

3.2 APHCA was requested to inform the SAARC Secretariat of the need as expressed by the consultation and to urge the Secretariat to take the initiative in discussing with the European Commission resuscitation of the project proposal.

3.3 All SAARC countries should endorse the need for the SAREC Support Project and use their influence with the SAARC Secretariat to reopen negotiations.

4. The situation of rinderpest persistence in Afghanistan is also of major concern. Although this might be solved eventually by eradication of rinderpest in Pakistan, this is not certain and specific action is required in that country as well.

4.1 The Consultation recommended that the GREP Secretariat should initiate a dialogue with the appropriate authority of Afghanistan to urge that appropriate action be supported. The international community is urged to support continuation of the UNDP/FAO Afghanistan Livestock Project and to expand its activities in rinderpest control.

5. The excellent progress made by India and Nepal is noted and the countries are urged to continue to progress along the OIE Pathway to verified freedom.

6. Bangladesh is the only country other than Pakistan that is still practising mass rinderpest vaccination. Bangladesh has not had clinical disease since 1958. The neighbouring countries (Myanmar, India, for example) have stopped mass vaccination and are now entering the OIE Pathway. Therefore, it is advised that Bangladesh stops rinderpest vaccination and makes a declaration of provisional freedom from rinderpest disease. Financial and technical support is required to enable this action to support pursuit of the OIE Pathway.

7. Myanmar and Thailand have stopped rinderpest vaccination for more than 5 years and have not had clinical disease for more than 40 years. Their recent serological surveys of about 5,000-6,000 serum samples showed no antibody to rinderpest virus. The Consultation's recommendation is that these two countries might be eligible to submit to OIE for recognition of "freedom from disease". Provided that their sero-surveillance is epidemiologically and statistically sound, the information might be sufficient for Myanmar and Thailand to apply directly for "freedom from infection". The Consultation encouraged them to make their cases.

8. Laos has stopped rinderpest vaccination in 1960 and has had no clinical disease for more than 30 years. The risk of re-infection is minimal (considering the disease status of the surrounding countries). Taken together these indicate that it is appropriate for Laos to apply directly for "freedom from infection" provided that the country has effective veterinary services to recognize the disease quickly. The Laos authorities were recommended to ensure that the EC-funded national project for strengthening of veterinary services provides the support for this action.

9. Sri Lanka has stopped vaccination against rinderpest since 1997 and there has been no clinical evidence of the disease since 1994. It is recommended that Sri Lanka declares "provisional freedom from disease" and continues clinical and serological surveillance towards verification of "freedom from infection".

10. At this vulnerable final stage of the rinderpest eradication programme in Asia, countries must ensure that each has in place a realistic and implementable Rinderpest Emergency Plan including quarantine and movement control of animals across borders. This will ensure that countries are able to detect without delay any incursion of rinderpest and is fully prepared to undertake the urgent actions needed for immediate containment and elimination. To facilitate this, each country should nominate a full-time senior officer as emergency preparedness officer. The nomination should be notified to APHCA, FAO and OIE. These officers or their delegated representatives are requested to present an outline of the disease contingency action plan at the APHCA Session in September 1999.

11. As the eradication of rinderpest is dependent on the successful completion of individual national eradication programmes, donors are urged to extend their funding for this purpose. All countries should ensure that their national programmes are sustained to the end even in the absence of external funding.

12. National authorities should take appropriate steps to register rinderpest virus stocks in their countries and have such stocks stored safely in a place designated for that purpose. Furthermore national authorities should ensure that the handling of live rinderpest virus is limited to facilities specifically licensed for such work, giving due regard to biosafety requirements.

13. APHCA member countries should examine their stocks of samples and submit any archived pathological material or isolated field viruses to the FAO World Reference

Laboratory for Rinderpest for virus characterization. The information gained would be made available to all countries as a preparedness measure in the event of possible future outbreaks.

14. Sample submission and reporting of outbreaks of rinderpest and rinderpest-like diseases is encouraged both at national and regional levels, paying due attention to the need for differential diagnosis of peste des petits ruminants. Technical information of diagnostic conclusions should be submitted to OIE and made available to APHCA to be distributed to other member countries.

15. The Consultation requested FAO to assist attainment of the critical 2000 date for submissions to OIE to join the Pathway by fielding a regional Technical Co-operation Programme project for Bangladesh, Myanmar and India.

16. The Consultation recommended that the support provided to diagnosis and surveillance by FAO and IAEA should continue and be enhanced to facilitate rapid progress.

PART II

COUNTRY REPORTS

RINDERPEST CONTROL IN BANGLADESH

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1. Introduction

Livestock play a very significant role in the economy of rural and small farmers in the Asian region. Nearly one third of the world population of cattle and buffaloes is owned by small farmers and land-less families in the South Asian countries. These animals not only provide food, regular cash income and draught power but also constitute an important source of employment and income generation for the poor and vulnerable groups. But these animals usually succumb to rinderpest outbreaks along with other deadly diseases causing a severe loss to the owners.

Rinderpest (cattle plague) one of the oldest known and established animal disease which caused tremendous losses in cattle population throughout Asia since the 1st Century A.D. It is a contagious highly fatal disease of ruminants (cloven footed animals) particularly of cattle, buffalo and swine characterized by serous ocular and nasal secretion, haemorrahagic erosion and necrosis of the oral mucous membrane, and diarrhoea. The disease may be of acute or mild form depending upon the virulence of the viral strain involved, the innate nature of the various breeds/types of cattle involved and the presence or not of secondary infection with latent pathogens, especially protozoa.

Many of the countries in the world like European countries, America, Japan, Philippines, New Zealand and Australia are now free from this disease. In the western hemisphere the only outbreak of this disease occurred in Brazil in 1921 and it was effectively eradicated by slaughtering the affected animals and strict quarantine measures. Four states of the southern India were affected by this deadly disease in 1981 and this was successfully controlled by strict quarantine and preventive measures. Since this South Asia sub-region is not free from this deadly disease of ruminants, it is therefore, considered as a constant threat to each of these countries of this sub-region in particular, India, Bangladesh, Bhutan, Nepal, Pakistan and Sri Lanka. However, we must not forget that rinderpest is everybody's business in Asia and every country that has the disease; and the country that has no report of rinderpest at present and has the apprehension of getting the outbreak at any time should be concerned of this disease; - said the world famous rinderpest specialist, Dr. Gordon E. Scott.

The persistent existence of rinderpest in the South Asia sub-region has been hampering livestock development not only in the infected territories but also a constant threat to the adjoining rinderpest-free countries. In newly infected regions mortality rate can go up to 90 per cent where-as in enzootic areas they are generally low, although morbidity could be high. Obviously the disease has more serious negative effects on world food supply than any other animal disease. Although there is a trend for decreasing in number of outbreaks reported in recent years, the social and economic effects of the disease are still profound.

2. Status of Rinderpest

Bangladesh is in a very vulnerable position with respect to the spread of animal diseases. The climate is quite conducive to the entrance and spread of the disease. The country has a border area of about 1,680 km with its neighbours - India and Myanmar. There is a continuous inflow of cattle from India throughout the year.

The last outbreak of rinderpest in Bangladesh was in 1958. During this outbreak an estimated 3 million cattle and buffaloes died in Sylhet district. Since then no such large-scale epidemic has occurred in this country. Strict quarantine and preventive measures have succeeded in controlling the disease. Since then routine vaccination programmes are carried out by the Department of Livestock Services (DLS). But it requires much more intensive disease surveillance to make a conclusion that Bangladesh is free of rinderpest. Sometimes field veterinarians complain about an unknown small-scale epidemics in which the animal shows the symptom of diarrhoea, etc. Although there is no major outbreak after 1958 even then Bangladesh has been shown as "doubtful" case in the map of status of rinderpest in South Asia. Perhaps because of its situation, Bangladesh is geographically also in a vulnerable situation, for rinderpest if the status of neighbouring countries is carefully examined.

In 1983, the Indian Government appointed a task force on rinderpest to work-out a plan to control and eradicate the disease. The task force has classified Indian states and territories according to degree of risk, such as high risk, medium risk, low risk and disease-free areas. High risk areas include 8 states (Andhra Pradesh, Bihar, Orissa, Karnataka, Madhya Pradesh, Tamil Nadu, and West Bengal) where almost every year outbreaks are reported. At least one third of these states have direct and indirect border with Bangladesh. Under such circumstance, if animals of Bangladesh are not adequately immunized, Bangladesh may face a severe outbreak of rinderpest in future.

Nepal has suffered rinderpest every ten years or so for many years and the last epidemic in the year 1974-95 took away 20,000 cattle life. Rinderpest has recently been positively diagnosed by the World Reference Laboratory in samples taken from the Landhi Buffalo Colony near Karachi. All the above evidence clearly indicate that rinderpest is still a common problem in South Asian countries. FAO/APHCA has indicated a proposal of Rinderpest Eradication Campaign in South Asian Countries (Bangladesh, Bhutan, India, Nepal, and Pakistan). If the campaign is successfully implemented, this sub-region may get rid of this malady.

3. Status of Immunity in Bangladesh

Irrespective of future rinderpest control and eradication policy, the most important task for Bangladesh is to evaluate the activities performed during the last twenty years. Although vaccination efforts have been continuing since the last epidemics, no appreciable attempt has been made so far to demonstrate the status of immunity of the national herd except a pilot serological survey done by the Bangladesh Livestock Research Institute (BLRI), which reported that only 15 per cent of 600 animals had immune against rinderpest. If this is a true indication of the immune status of the national herd, the possibility of severe outbreak of rinderpest in Bangladesh can not be over ruled.

From 1973 to 1983 as per survey result, a total of 101.2 million doses of G.T.V vaccine have been produced by the Rinderpest Vaccine Section of the Department of Livestock Services (DLS) and 90.1 million doses of the produced vaccine have been distributed for field utilization. If vaccines are properly utilized, it would seem reasonable to estimate that 23 million cattle of Bangladesh have anti-rinderpest protection. This hypothesis, however, needs to be established. The country has very limited facilities for routine diagnosis of rinderpest and for detection of antibody in the serum. Bangladesh Livestock Research Institute has planned to undertake a serological survey in collaboration with the Department of Livestock Services and the World Reference Laboratory, Pirbright, UK.

4. Production of Rinderpest Vaccine

The Rinderpest Vaccine Laboratory, just after partition of Bengal (1947), was started at Comilla and produced Moist Goat Tissue Vaccine. The Laboratory was moved to Dhaka during 1951. An improved method of preparation of Goat Tissue Vaccine was evolved and Moist Vaccine was replaced gradually.

The Freeze Drying Plant was put into operation and Freeze Dried Goat Tissue Vaccine was made available to the field in the year 1958. Freeze Dried Vaccine replaced completely and permanently the Moist Vaccine by the end of 1959. Freeze drying method and extensive experimental works were carried to determine the type of the vaccine suitable for cattle and buffaloes.

In the year 1985 with the assistance of Asian Development Bank Bangladesh started producing rinderpest tissue culture vaccine from bovine kidney. Some samples of rinderpest tissue culture vaccine have been sent to Animal Virus Research Institute, Pirbright, UK to confirm the quality of vaccine in respect of potency and duration of immunity. The result received from there is quite satisfactory. This vaccine successfully being used in the field.

Production of Rinderpest Vaccine (GTV and Tissue Culture).

Year	Production		Total
	G.T.V.	T.C.	
1987-88	2,512,100	1,975,500	4,487,600
1988-89	11,659,300	3,845,200	15,504,700
1989-90	10,637,600	2,284,800	12,922,400
1990-91	5,502,700	3,111,000	8,613,700
1991-92	10,708,800	2,349,100	13,057,900
1992-93	6,253,800	3,934,300	10,188,100
1993-94	8,246,600	6,053,100	14,299,700
1994-95	9,134,500	152,000	9,286,500
1995-96	162,900	4,884,800	5,047,700

5. Control Programme in Bangladesh

Rinderpest is enzootic in Bangladesh and the disease may reappear after certain intervals. Moreover the neighbouring countries have the prevalence of rinderpest. To control the disease vaccination programme is carried out in the following ways:

(a) Border Belt Vaccination Programme

Bangladesh has common borders with India and Myanmar, and there is a continuous influx of animals particularly cattle and buffaloes from India. Vaccination programmes of cattle and buffaloes are carried out regularly within 5 miles radius of the border so that no incidence of rinderpest may occur and immune belt is established.

(b) Routine Vaccination Programme

To prevent the introduction of rinderpest into the susceptible livestock population in the centrally located areas, routine vaccination programmes are conducted regularly throughout the year, especially on both sides of the inter-district high ways. Vaccination of all calves at 3 months of age, and repeated vaccination within a period of 12 months are being practised.

(c) Mass Vaccination

To prevent the loss of cattle and buffaloes intensive mass vaccination campaign is launched for a period of 3 months against rinderpest every year in order to establish herd immunity in general.

(d) Isolation of Sick and Infected Animals

In case of an outbreak all sick and infected animals are immediately isolated, and all possible care and veterinary health/sanitation programme are taken. Slaughtering is the best way to get rid of the risk of infection from sick and infected animals.

Disposal of Carcasses

(a) by burning; and
(b) by deep burial system with lime cover.

Vaccination of In-Contact Healthy Animals

All in contact animals showing normal temperature are vaccinated with rinderpest vaccine. Mass vaccination of all susceptible animals are immediately undertaken in and around the spot of infection.

Movements of Animals

Movements of animals are restricted to prevent spread of the disease by motivating the people through mass-media, radio, television, etc.

6. Proposal for Eradication Campaign of Rinderpest in South Asia

- **Problems and Constraints**

Due to topographical and geographical reasons, control of animal movements both within and between countries are next to impossible. The most likely method of introduction of rinderpest into Bangladesh is through unauthorized import and/or smuggling of animals across the border. This is easily done due to absence of natural barriers with our neighbours. Over and above this, along the border areas especially on the plains, there are common community grazing fields which act as perfect areas for the dissemination of diseases. The free movement of animals into each other territory is impossible to prevent unless an effective barrier is created along the entire border belt. This proposition is neither technically nor financially possible. The existing disease control act was adopted as “Bengal Act VI of 1944” followed by the “Bengal Diseases of Animals Rules, 1945”. This acts describe procedures of reporting, duty of segregate, declaration of infected areas, disinfection of building, prohibition of holding markets and fairs, manner of burial or disposal of carcasses, and power of veterinary officers in case of outbreak. The existing diseases control act unfortunately does not provide any authority to the DLS to regulate importation of animals and their products or compulsory quarantine except in special cases when the Department interferes. However, recently, a draft Animal Disease Act and Quarantine Act covering all these aspects have been prepared and submitted for approval in the parliament.

- **The other constraints which deserve attention are**

1. Time-bound eradication programme;
2. Absence of a satisfactory method of identification of vaccinated animals;
3. Non availability of a safe quality vaccine inducing solid immunity without causing any reaction and life-long immunity;
4. Inadequate quality control on the production, distribution and administration of the vaccine was also responsible for not achieving desired result. Staff handling various activities are not properly trained in this regard;
5. Inadequate legislative support for eradication programme;
6. Unregulated movement of animals is a major constraint. Only those animals which have been vaccinated and have identifiable markings should be allowed to move from one place to another;
7. Lack of proper awareness of the benefits of eradication of rinderpest is another factor and absence of necessary support and co-operation from the farmers. Proper publicity and support of local leaders in implementation of campaign are not always taken into consideration;
8. Absence of national and regional co-ordinating mechanism.

7. Strategies for Rinderpest Eradication

A. Strategies for the Countries with No Report of Rinderpest for Last Few Years

i. To vigorise the reporting system;
ii. To enhance the facilities for rapid confirmation of diagnosis of rinderpest;
iii. To undertake combining operations to ensure the freedom from rinderpest;
iv. To introduce a system of incentive awards to the first informer of infection;
v. To establish animal disease emergency control squads to control the infection that might recur;
vi. To develop immune belts up to a depth of 20 km along international land borders; and
vii. To strengthen the international quarantine services in order to prevent entry of infection.

B. Common Strategies for Eradication

i. A programme be prepared for eradication of rinderpest from the countries of the region within a period of five years.
ii. Legislative support be provided for implementing the various facets of rinderpest eradication in those countries where such provision does not exist.
iii. Migratory stock be properly vaccinated to prevent spread of the disease from one area to others.
iv. Vaccinated stock be duly identified by cold branding, ear punch/ear tags or any other method feasible.

v. Tissue Culture Vaccine be used to ensure complete coverage of population which has no side reactions. Those veterinary biological production centers which still manufacture GTV should switch over to the production of TCV.
vi. Rigorous quality control measures be enforced for ensuring minimum standards of quality in manufacture and standardization of the vaccine as per guidelines contained in the WHO Technical Report Series No. 444. For this purpose it would be necessary to provide proper training to the staff engaged in the activities.
vii. The necessary cold chain be maintained from production level to final utilization level of the vaccine. The field vaccinators may be duly trained for re-constitution and administering the vaccine properly.
viii. Proper publicity be widely given about the socio-economic benefits of the programme to seek public co-operation in implementing the programme.
ix. Socio-economic gains of the programme likely to be accrued both directly as well as indirectly be worked out in order to highlight its imperative necessity.
x. Diagnostic services be strengthened for enabling differential diagnosis of rinderpest from rinderpest-like infections and training of field staffs.
xi. Setting up of a National Rinderpest Co-ordination Unit with facilities for monitoring and proper reporting system.

C. Movement of Animals

Movement of animals from the rinderpest infected neighbouring countries constitute the main danger in the spread of the disease. Such movement of live animals and animal products must be restricted.

(a) Importation cattle and buffaloes for breeding and rearing must be controlled under following veterinary health certificates stating:
(b) That the animals were kept in quarantine station of the exporting country for a period of 21 days before their departure;
(c) That the animals were vaccinated with rinderpest vaccine at least 21 days before being exported;
(d) That the certificate should also state precisely the type of vaccine used;
(e) That on the day at embarkation the imported animals must not show any clinical signs of rinderpest;
(f) That the animals must be kept at the quarantine station for 21 days at the port of entry before sending them to final destination.

D. Formation of Commission on Rinderpest

Rinderpest is everybody's business in Asia. A commission on rinderpest with representatives from the member countries of South Asia may be formed without any further loss of time to eradicate the disease. The function of the commission will be to formulate guidelines for the veterinary authorities and their field officers in countries affected by rinderpest which would contribute immediate and sound method of control of the disease under emergency situation.

E. Regional Reference Laboratories

Considering the vast areas of South Asia there should be at least two Regional Reference Laboratories: One for India, Pakistan and Sri Lanka and another for Bangladesh, Myanmar, Nepal and Bhutan which will work for the different diagnosis of rinderpest-like disease. These laboratories will provide advice and assistance for member countries upon request.

F. Proposal for Training Programme

Development of training programme on rinderpest and its eradication programme among the member countries of South Asia based on the concept of TCDC will be very much useful in this respect.

RINDERPEST ERADICATION IN INDIA

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1. Introduction

Rinderpest is one of the oldest animal pests that has engaged global attention for nearly two centuries. Rinderpest is also commonly referred to as cattle plague. It is an acute, febrile and contagious viral disease affecting cattle, buffaloes, sheep, goats and pigs. Rinderpest is believed to have originated in China in pre-Roman times and spread all over the world including Asia, Middle East, Africa and Europe. Both North and South Americas and Australia have never been invaded by the disease with the exception of one incidence each, detected at the animal quarantine stations in Brazil in 1921 and in Australia in 1923. The disease has been eradicated in Europe and most of the other parts of the world. However, the disease is still reported in the equatorial region, in North and East Africa, in Middle East and South Asia.

In India, rinderpest was endemic throughout the country till mid-fifties affecting on an average about 400,000 bovines and killing 50 per cent of them in 8,000 outbreaks per year. The efforts to control rinderpest in India can be traced to the establishment of the Indian Cattle Plague Commission in 1884, the Imperial Bacteriological Laboratory (the forerunner of the present Indian Veterinary Research Institute) in 1889 and the Indian Civil Veterinary Department in 1891. These efforts are indicative of the economic importance attached to this disease. Rinderpest had indeed a crippling effect on the national economy which is agro-based. Next to crop production, animal husbandry is the most important activity in rural India. Almost 73 per cent of the rural households own livestock of one kind or the other. Income from livestock accounts for 30 to 50 per cent of the total farm income. Livestock production in India is characterized by widely distributed small stock holdings, averaging 2-3 bovines except in the case of nomadic herds in Rajasthan and Gujarat. The 70 per cent of the total poultry population is in the unorganized rural sector where a few birds in the backyard form a holding. The livestock wealth in India is indeed very rich in terms of genetic diversity. As per livestock census, India accounts for 15 per cent of the world cattle population, 53 per cent of the buffaloes, 20 per cent of goats and 4 per cent of sheep. Cattle and buffaloes accounted for 63 per net of the total livestock population.

The purpose of this paper is to present detailed account of the efforts made by the Government of India to eradicate the disease starting from 1954, the evolution of

different strategies to tackle ever changing disease scenario both within and outside the national boundaries as well as India's participation in the regional and global rinderpest eradication efforts initiated by FAO.

2. Past Efforts

The control of rinderpest in India was initiated in 1954, as a pilot project, covering 18 districts of Andhra Pradesh, Karnataka, and Maharashtra. A full-fledged mass vaccination campaign was launched in 1956-57, with the objective of covering 80 per cent of cattle and buffalo population in all States and Union Territories except Tamil Nadu, Karnataka, and Kerala which then enjoyed freedom from rinderpest. But by the year 1964, the disease was largely controlled in the Northern, Eastern, Western, Central and North Eastern regions of the country. On the contrary, the disease appeared in a big way in Southern States of Tamil Nadu, Karnataka and Kerala where it continued unabated up to 1974. About 60 to 80 per cent of the bovine population were vaccinated in these areas along with vaccination of the left over and follower animals. Various measures/strategies were adopted in subsequent years for the control of rinderpest, which are as follows:

(1) Development of inter-state and international land frontiers since 1966 along with check-posts, vaccination stations, immune belt and vigilance units;

(2) Establishment of rinderpest surveillance and containment mechanism;

(3) Vaccination of animals on transport, cattle fair markets, etc.; and

(4) Branding of vaccinated animals.

The impact of the vaccination and strategies adopted, brought down the average incidence of rinderpest in the country from level of 1,960 per million bovines to 12 per million bovines during 1975-1980. However, the favourable position of rinderpest was short-lived, which showed increased incidence of 22 per million, during 1980-85 and rose to 43 per million during 1985-90. The National Commission on Agriculture (1976) while reviewing the progress of the National Rinderpest Programme appreciated the progress made so far, but suggested that final thrust to wipe out the disease from limited geographic areas of the country should be undertaken. The task force constituted for rinderpest in 1983 recommended reorientation of the strategies with a time-bound programme (Operation Rinderpest Zero) for eradication of rinderpest within a period of five years.

However, during 1983, FAO initiative identified the need to launch a time-bound co-ordinated programme for eradication of rinderpest in South Asia (SAREC). FAO organized an Expert Consultation on Global Strategy for Control of Eradication of Rinderpest in February 1989. This culminated in the launching of Global Rinderpest Eradication Programme (GREP) to be co-ordinated by FAO, across the globe. FAO's recommendations and after discussion with funding agencies, the Government of India

signed a financial agreement with EEC in October 1989, for implementation of a project entitled "Strengthening of Veterinary Services for Livestock Disease Control in India" (ALA/89/04) taking within its fold all the rinderpest projects in operation in India. The actual implementation started only in May 1992, as part of the 8th Five-Year Plan of the Government of India.

3. The Project Mandate

The main objective of the Project is eradication of rinderpest (RP) and contagious bovine pleuropneumonia (CBPP) from the country by strengthening veterinary services within a period of six years (May 1992 - July 1998). The successful implementation of the Project should be able to provide increased economic and social security through sustainable improved livestock production and productivity.

The above objectives are to be achieved through:

1) Strengthening of selected biological production units for mass production of rinderpest vaccine along with other biological units;
2) Strengthening of diagnostic laboratories for rinderpest in all states;
3) Training of state official in appropriate areas;
4) Research and Development efforts in areas of epidemiology, vaccine production pertaining to rinderpest;
5) Sourcing of consultants as per requirement;
6) Implementing the Project activities with EEC assistance in co-operation with Indian Council for Agricultural Research, National Dairy Development Board, and State Animal Husbandry Departments.

4. Project Component/Implementation

National Project for Rinderpest Eradication (NPRE)

NPRE was initiated as part of the South Asian Rinderpest Eradication Campaign (SAREC) in May 1992 during the 8th Five-Year Plan. It formed the major component of the EEC assisted project ALA/89/04 "Strengthening of Veterinary Services for Livestock Disease Control in India". However, the EEC-assisted project completed its full tenure on 31st July 1998 and EEC has stopped supporting the project financially. The project will be run with funding from domestic resources to complete the stipulations of the OIE Pathway. The major objective of the project is to eradicate rinderpest and CBPP from the country with the strengthening of the veterinary services. The project adopted the OIE Pathway in 1993-94. For exploiting the absence of rinderpest in some parts of the country under the OIE Pathway, the different states were grouped into four zones based on the incidence of rinderpest and geographical contiguity viz: -

Zone 'A': Comprising seven states in the north-eastern part of the country e.g. Assam, Arunachal Pradesh, Meghalaya, Manipur, Mizoram, Nagaland, and Tripura.

Zone 'B': Comprising 14 states in Indo-gangetic plains viz: - Bihar, Goa*, Gujarat, Haryana, Himachal Pradesh, Jammu and Kashmir, Madhya Pradesh, Maharashtra*, Orissa, Punjab, Rajasthan, Sikkim, Uttar Pradesh and West Bengal.

(These states were included in the 'B' zone states with the declaration of provisional freedom from rinderpest in 1996.)*

Zone 'C': Comprising southern peninsular states of Andhra Pradesh, Karantaka, Kerala, Tamil Nadu and Union Territory of Pondicherry.

Zone 'D': Comprising two island territories on eastern and western coasts. These island territories had no incidence of rinderpest.

Zones 'A', 'B' and 'D' were declared provisionally free from rinderpest during 1995-1996 after stoppage of generalized vaccination in 1993-1994. Zone 'C' states were declared provisionally free from rinderpest, effective from 1st March 1998. The last outbreak of rinderpest occurred in the country in September 1995.

These areas were put under extensive clinical surveillance, generalized rinderpest vaccination was stopped, with effective disease reporting system and disease diagnosis facilities.

5. Sero-Monitoring

The project undertook limited sero-monitoring activities targeting vaccinated animal population using imported C-ELISA kit. For undertaking sero-monitoring and surveillance activities of the project, a Central ELISA Training and Data Management Center (ETDMC) has been established at the Institute of Animal Health and Veterinary Biologicals, within the fold of ICAR Project on Animal Disease Monitoring and Surveillance (ADMAS). A total of 32 ELISA Laboratories using the facilities of Disease Investigation Establishment in 25 states in the country have been established by generating ELISA facilities, imparting training and appropriate inputs in terms of equipment, reagents, etc. The Co-ordinator, ETDMC provides consultancy, trouble shooting services and confirmation of results of C-ELISA tests undertaken by State Laboratories.

The sero-monitoring undertaken by the project was limited and results have been provided in Table 1.

6. Disease Surveillance

Animal disease surveillance in India is carried out through the participation of surveillance units manned by veterinarians at block level and para-veterinarians at village level. The incidence of all the OIE list A and B diseases are compiled at each surveillance unit and are reported to district headquarters, which in turn compile the data

and transmits to State Directorate of Veterinary/Animal Husbandry Services of each state. Monthly reports are sent to the Department of Animal Husbandry and Dairying, the Government of India, who compiles a report and further transmits to the OIE Paris.

However, in case of rinderpest, a much faster system of disease reporting mechanism has been evolved. The surveillance against rinderpest is one of the most important components of NPRE. Under the system, the state functionaries are required to report to the Central Project Monitoring Unit (CPMU) every suspected cases of rinderpest in OB-1 format immediately through fax/e-mail/telegram. This is followed by sending OB-2 format to CPMU along with clinical material for confirmation of differential diagnosis at National/International Reference Laboratory. The compiled report is sent to CPMU in OB-3 format. For confirmation of all the suspected cases of rinderpest/morbillivirus, IVRI Mukteswar has been entrusted with the responsibilities and has been designated as "National Morbillivirus Laboratory". Surveillance against rinderpest assumes added importance in view of the adoption of the OIE Pathway for achieving international recognition of free status. The surveillance against rinderpest in India is both clinical and serological. The clinical surveillance essentially consists of village, stock route and institutional searches through which each village in the country is subjected to clinical surveillance to detect rinderpest-like diseases. Each case showing two or more cardinal symptoms of rinderpest is subjected to laboratory examination using AGID and IC-ELISA tests in order to detect morbillivirus infection and differentiation between rinderpest and PPR.

7. Clinical Surveillance

The clinical surveillance has been instituted encompassing all villages of the country. All the State Veterinary Institutions in the country work as vigilance units where veterinarians and para-veterinarians undertake surveillance work in a systematic manner through village stock route and institutional search. The details of the village, stock route and institutional searches undertaken during the last three years have been given in Table 2.

8. Serological Surveillance

The serological surveillance is used to prove that areas declared free from rinderpest stay free. For this purpose, the unvaccinated young stock born after the cessation of vaccination and over one year of age are bled so as to exclude the possibility of maternal antibody in the blood. The serum collection is undertaken according to the sampling frame developed by Nair and James (1996). This sampling frame ensures detection of rinderpest antibodies using C-ELISA test if 1 per cent of the villages in the zone are infected with the confidence level of 95 per cent.

For this purpose, each zone has been considered as a different geographic stratum. In addition, large ruminants (cattle and buffaloes) and small ruminants (sheep and goats) are treated as separate species strata. Random selection of the villages for each state in different zones have been made at ETDMC for the year and the state authorities

undertake the census of animals, selection of eligible animals and collection of sera as per standard operating procedure. The in charge of ELISA Laboratories have been given specialized training on sampling and its operation. This system has been installed across the country for all the states of each zone. The 'C' Zone states will initiate this programme in 2000 as it was declared provisionally free from rinderpest from 1st March 1998.

The information collected by the state units is submitted in consolidated form to the CPMU for compilation. The sera samples and other details are submitted to ETDMC for confirmation of the results, storage of sera and information.

The database is maintained both at ETDMC and CPMU for claiming substantive freedom from rinderpest disease and infection as per the OIE requirement.

The sero-surveillance programme in all the 'A', 'B', and 'D' Zone states will commence from 1999 and 'C' Zone states from March 2000 onwards.

The work carried out under the project, as a run up for full-fledged sero-surveillance, during the past years indicated that sero-positive animals were found to be adults and had previous history of vaccination. This was due to faulty serum collection process. The results of the limited sero-surveillance confirmed the total absence of subtle rinderpest virus activity in Meghalaya, Himachal Pradesh, Nagaland, Assam, Bihar, West Bengal, Manipur, Orissa and Karnataka States. The details of the work carried out are given in Table 3.

9. Maintenance of Immune Zone on India-Pakistan Border

The generalized vaccination operation of livestock in the country has been stopped from 1st January 1998. However, an immune belt of 30 km width along the India-Pakistan border in the States of Gujarat, Rajasthan, Punjab, and Jammu and Kashmir is maintained by saturation vaccination. The maintenance of the immune belt has very little practical significance. With the modification of the criteria for eligibility of provisional freedom, the vaccination of any form with TCRP vaccine is not allowed in susceptible population. However, an exception has been made for India in the last GREP meeting held in September-October 1998. However, the TCRP vaccine is likely to be replaced with PPR vaccine once trial results are made available by World Reference Laboratory, Pirbright to the OIE.

In order to further strengthen the "Cordon Sanitaire" along the India-Pakistan border, the establishment of surveillance units along with sero-surveillance, diagnostic and information network is on the anvil. This will remain operational in all the border districts of four states. A blue print for implementing the programme and tackling the emergency situation is being prepared. The current emphasis on vaccination will be replaced by intense monitoring of animal movement, clinical and sero-surveillance in border districts of these four states. The participation of security forces in this activity will be sought for effective implementation.

10. Strategic Vaccine Reserve

Development of "Vaccine Bank" for use during emergency situation could not be made fully operational due to sudden withdrawal of funds from EEC in July 1998. However, country is maintaining a strategic vaccine reserve of 1.25 million for emergency situation. The vaccine stored is being tested every six months for potency, etc. The strategic reserve will be increased to about 2.5 million doses during 1999-2000. In addition, two commercial firms within the country can be used for emergency supply of vaccines.

11. Emergency Preparedness

The project has taken steps to establish emergency unit in all the State Headquarters. Detailed guidelines have been circulated to all the State Directors regarding the establishment of emergency cell, under the direct control of the head of State Department of Animal Husbandry and Veterinary.

A National Animal Disease Emergency Committee (NADEC) will be established (1999-2000), which will be responsible for the control of emergency situation arising out of any disease including rinderpest. The Project will organize four training programmes in different zones for emergency preparedness along with mock trial.

12. Progress along the OIE Pathways

As per the stipulation of the OIE Pathway, India has been able to satisfy the following:

- India has declared provisional freedom from rinderpest for all the zones from 1st March 1998.
- India has stopped all generalized vaccination against rinderpest in all the zones excepting 30 km width along the India-Pakistan border as buffer zone.
- An effective surveillance system, both clinical and serological, which can detect prevalence of rinderpest infection in any part of the country, has been instituted.
- A total of 32 state laboratories, ETDMC Bangalore and National Morbillivirus Laboratory, IVRI Mukteswar have been established where every suspected material is investigated using validated diagnostic kit.
- India has taken several steps to ensure efficient disease reporting as already elaborated.
- India is maintaining quarantine check-posts and sanitary cordon of 30 km on the international border with Pakistan from where reintroduction of rinderpest is feared. The emergency plan has been worked out.
- Based on above stipulation, India has already submitted revised dossier containing requisite information on the successful completion of three years of clinical surveillance in Zone 'A'. The dossier for 'B' Zone states is under preparation.

- India expects to complete two years of sero-surveillance for declaration of freedom from infection by the year 2002 to complete the OIE Pathway successfully.

13. Future Plan (1999-2000)

The Rinderpest Eradication Programme will continue to follow the OIE Pathway. For this purpose, following milestones have been identified:

1. The clinical surveillance will be intensified in order to achieve the projected targets.
2. Four workshops for sero-surveillance and emergency preparedness to be organized
3. Intensification of sero-surveillance activities with particular emphasis to southern peninsular region and international border.
4. Sero-surveillance as per sampling frame will be initiated for all the zones by March 2000 and completed by 2002.
5. Transfer of PPR vaccine technology, pilot production and limited trial before release of vaccine for the use in the field.
6. Constitution of National Animal Disease and Emergency Committee and development of a blue print for emergency programme.
7. Declaration for substantive freedom from disease for zones and submission of dossier to the OIE followed by freedom from infection by March 2002.
8. Establishment of fully operational vaccine bank of 2.5 million doses of TCRP vaccine in five locations.
9. Strengthening of disease reporting, diagnostic facilities and production of vaccine (other diseases).
10. Fully operational data bank with internet connection.

14. Difficulties and Constraints

Even though the NPRE has done exceedingly well to achieve the provisional freedom from rinderpest disease for the whole country but is having some constraints in implementing the programme as per the OIE Pathway. These are as follows:

1) Sudden withdrawal of funding from EC has affected the momentum of the Project implementation.
2) The availability of validated OIE approved kit/reagents is one of the constraints, which should be looked into by FAO/OIE. Easy availability of reagents has to be ensured.
3) Regional programme can only be successful, if all the countries pursue a national programme for eradication of rinderpest. Co-ordination, exchange of information on the disease situation/activities is one of the pre-requisite of the success of regional programme.
4) The availability of marker vaccine/PPR vaccine for bovines for building up immune belt/sanitary cordon is long over due.

Table 1: Year-Wise Report of Rinderpest Sero-Monitoring.

Year	Cattle		Buffalo		Sheep		Goat		Total States Screened
	Number tested	Number positive	Number tested	Number positive	Number tested	Number positive	Number tested	Number positive	
1994-95	68	37	56	16	44	14	38	1	}
									}
1995-96	1,400	598	801	301	78	32	78	30	}
									}28
1996-97	2,340	841	396	67	57	1	50	15	}
									}
1997-98	1,682	440	391	123	154	19	119	32	}
Total	**5,490**	**1,916**	**1,644**	**507**	**333**	**66**	**285**	**78**	

Table 2: Total Village Searches (Inst. and Stock Route) - 1996-97 to 1998-99.

States/Uts.	Total No. of Villages	1996-97		1997-98		1998-99 (provi.)	
		No. of Villages searched	% of search	No. of Villages searched	% of search	No. of Villages searched	% of search
ZONE 'A' STATES							
Arunachal Pradesh	3,652	1,406	38.5	2,714	74.3	2,138	58.5
Assam	25,503	1,433	5.6	2,671	10.5	0	0.0
Manipur	2,651	2,241	84.5	939	35.4	0	0.0
Meghalaya	5,629	4,947	87.9	3,296	58.6	1,551	27.6
Mizoram	694	261	37.6	1,038	149.6	591	85.2
Nagaland	1,225	249	20.3	13	1.1	3,692	301.4
Sikkim	406	0	0.0	358	88.2	0	0.0
Tripura	873	0	0.0	221	25.3	610	69.9
TOTAL ZONE 'A'	**40,633**	**10,537**	**25.9**	**11,250**	**27.7**	**8,582**	**21.1**
ZONE 'C' STATES							
Andhra Pradesh	28,454	13,551	47.6	32,767	115.2	27,804	97.7
Karnataka	29,507	27,002	91.5	27,737	94.0	23,799	80.7
Kerala	1,048	1,386	132.3	1,359	129.7	686	65.5
Tamil Nadu	26,557	25	0.1	3,777	14.2	0	0.0
TOTAL ZONE 'C'	**85,566**	**41,964**	**49.0**	**65,640**	**76.7**	**52,289**	**61.1**
ZONE 'B' STATES							
Bihar	79,846	227	0.3	17,291	21.7	337	0.4
Delhi	229	0	0.0	0	0.0	0	0.0
Goa	382	423	110.7	244	63.9	264	69.1
Gujarat	18,196	40,731	223.8	41,354	227.3	24,425	134.2
Haryana	6,736	3,187	47.3	3,402	50.5	1,434	21.3
Himachal Pradesh	17,547	5,936	33.8	2,456	14.0	814	4.6
Jammu and Kashmir	6,590	627	9.5	436	6.6	290	4.4
Madhya Pradesh	77,539	56,839	73.3	76,829	99.1	43,782	56.5
Maharashtra	40,412	28,381	70.2	32,754	81.1	5,464	13.5
Orissa	48,970	9,216	18.8	13,656	27.9	33,395	68.2
Punjab	12,342	16,047	130.0	15,484	125.5	0	0.0
Rajasthan	37,889	12,895	34.0	27,462	72.5	17,815	47.0
Uttar Pradesh	112,835	84,111	74.5	81,560	72.3	52,704	46.7
West Bengal	41,770	8,746	20.9	1,858	4.4	3,741	9.0
TOTAL ZONE 'B'	**501,283**	**267,366**	**53.3**	**314,786**	**62.8**	**184,465**	**36.8**
Pondicherry	318	0	0.0	32	10.1	4	1.3
A and N Island	547	0	0.0	0	0.0	0	0.0
TOTAL	**628,347**	**319,867**	**50.9**	**391,708**	**62.3**	**245,340**	**39.0**

Table 3: Year-Wise Report of Rinderpest Sero-Surveillance.

Year	Cattle		Buffalo		Sheep		Goat		Total States Screened
	Number tested	Number positive	Number tested	Number positive	Number tested	Number positive	Number tested	Number positive	
1995-96	964	35*	152	21*	--	--	--	--	}
									}
1996-97	1,328	52*	371	19*	--	--	25	--	}
									}20
1997-98	1,881	59*	581	7*	399	2*	199	9*	}
									}
1998-99	967	--	20	--	548	7**	62	3**	}
Total	**5,140**	**146**	**1,124**	**47***	**947**	**9**	**261**	**12**	

** : The animals were either over age and/or vaccinated.*
*** : Animals were protected against PPR vaccine.*

COUNTRY REPORT OF LAO PDR

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1. Introduction

Lao PDR acknowledges rinderpest as a highly contagious and fatal viral disease against which vaccination controls ceased more than 30 years ago. Since that time no case of the disease has been reported in Laos' territory. Geographically Lao PDR is situated in the Indo-China peninsula and the risk of re-infection is considered minimal in view of the declared disease status of neighbouring countries.

2. Current Situation and Control Measures

Since 1960, effective measures to recognize and control potential disease have operated at grass roots level. There has been no report of the disease within the country for more than 30 years. The observation network comprises province and district level staff and village veterinary workers all of whom have attended short-term training courses on general epidemiology, main infectious diseases and disease surveillance including rinderpest.

3. Future Action Plans

A major priority is to strengthen the epidemiological network of the Animal Health Division. Two main areas will be strengthened namely:

- Field surveillance activities especially in the northern border areas adjacent to Myanmar; and

- Laboratory recognition and diagnostic components.

Training will be upgraded to enable staff to recognize quickly any signs of rinderpest. Additionally laboratory staff and facilities will be upgraded for rinderpest surveillance and diagnosis. These action plans have strong support and commitment from the Government of Lao PDR as well as from the existing international co-operation projects assisted by the European Union (EU) and the Australian Co-operation for International Agricultural Research (ACIAR).

The Government of Lao PDR strongly supports the Rinderpest OIE Pathway as a means to attain disease freedom and benefit trade particularly the milestone dates of control by the year 2003 and eradication by 2008. To that end we will increase and welcome more regional co-operation with neighbouring countries including Thailand, Myanmar, China, Cambodia, and Vietnam as well as information exchange through international organizations namely: - UNDP, FAO, OIE, WHO, APHCA, and ASEAN.

RINDERPEST CONTROL AND ERADICATION IN MYANMAR

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1. Introduction

It was an investigation of rinderpest in the later part of the 19th century in Myanmar that led to the introduction of modern veterinary service and consequently the establishment of Veterinary Department in 1901. Fighting against rinderpest was the preoccupation of the Veterinary Department. For all the troubles borne by the early veterinary staff, Myanmar has been free from rinderpest since the last report of outbreak of the disease in 1956 claiming 29 heads of cattle. After more than four decades of freedom from rinderpest outbreaks, we honestly believe that the time has come for Myanmar to declare the country to be **"provisionally free from rinderpest disease"**. It is this message that the country report is intended to convey to the conference for consideration. Cattle population in Myanmar is more than 12 million (Table 1).

2. Aims and Objectives

Out of three-stage pathway that the OIE has adapted for a country to follow before it can be recognized as being free from rinderpest. Myanmar has accomplished the first step. Vaccination has been stopped since 1994 throughout the country and vigilant surveillance was carried out. Co-operation and assistance of FAO, OIE and IAEA facilitated to reach this stage. We are eager to go on to the second stage that is to declare Myanmar **"free from rinderpest disease"**.

3. Background History

Rinderpest was the most devastating cattle disease in Myanmar as in other parts of Indian sub-continent in the late 19th Century. Mortality amounted to 80 per cent of the total cattle death even in 1925 (Table 2). Hence the establishment of Civil Veterinary Service taking over responsibilities from the Military Veterinary Service.

After the establishment of Civil Veterinary Service, Veterinary Research Laboratory was established to produce vaccines to combat prevailing killing contagious diseases. Field service staff were increased and posted throughout the country. Outbreaks were attended using immune serum first and then goat adapted vaccine was

introduced later by Dr. D. T. Mitchell and Dr. G. Pfaff in 1935. Mass vaccination was carried out but the World War II disrupted the vaccination activities.

After the end of the World War II, vaccination employing goat adapted vaccine was compulsorily enforced and that reduced the incidence of rinderpest conspicuously (Table 2). For control of the spread of animal diseases, "The Contagious Diseases of Animals (Village) Rules 1936" and "The Contagious Diseases of Animals (Town) Rules 1937" were made respectively in 1936 and 1937. These rules were strictly enforced facilitating control of cattle movement and curbing the spread of diseases.

Lapinized vaccine strain of Nakamura was introduced in 1953 and was used along with goat adapted vaccine to the benefit of buffaloes which had a strong reaction to goat adapted vaccine strain.

More veterinary assistants were trained and more vaccine was produced. Vaccination activities were increased resulting in the sharp decrease of disease incidences. Though the last outbreak was recorded in 1956, vaccination was continued to form immune belts especially in border areas with the probability of introduction from outside the country (Table 3-a and 3-b). The programme worked well and cattle population has increased.

4. Summary of Strategies for Eradication Campaign

4.1 Vaccination Programme

Mass vaccination was practiced up to 1961. In the early seventies, vaccination was carried out in scattered areas only concentrating at places with previously records of severe outbreaks and areas bordering India and Laos. It was to help build a barrier zone and to identify probable endemic foci.

Vaccination programme was carried out to meet the well-planned target in project areas. After 1970, only goat adapted vaccine was employed.

4.2 Disease Investigation and Diagnosis

Clinical symptoms of rinderpest were emphatically lectured both in the Institute and Veterinary Training Schools. Old field staff shared their experience with the newly installed assistants and thus the disease surveillance was carried throughout the country by township-wise teams of veterinary staff.

With the assistance of JICA, FAO, OIE, and IAEA; Central Diagnostic Laboratory was made a qualified one to diagnose rinderpest applying the latest equipment and technology. Staff also were trained abroad and these trained staff imparted the knowledge they gained to fellow veterinarians especially from border areas with the possible introduction of rinderpest virus from neighbouring countries.

4.3 Sampling Method

Sero-surveillance was carried out based on random number of susceptible animals. First 300 villages from various Divisions and States of the country were selected. Twenty to thirty susceptible animal serum samples were taken from each village (Table 4).

4.4 Laboratory Diagnosis and Test Result

Diagnosis test was done at Central Diagnostic Laboratory. Preliminary diagnosis was carried out by AGPT (Agar Gel Precipitation Test) followed by CFT (Complement Fixation Test) as a conventional method. For confirmation ELISA technique is applied. All tested sera (6,239 samples) showed no antibody against rinderpest (Table 4).

4.5 Imports and Quarantine

For importation and quarantine of animals "The Animal Health and Development Law" enacted in 1993 specifically deals with the subjects and the articles of the law is strictly observed. In short, care is taken that the imported susceptible animals must be free rinderpest herds and the animals must be quarantined and tested for the presence of antibodies against rinderpest. It must also be observed that the transporting vessel or aircraft should not pass through ports of countries in which rinderpest had occurred.

4.6 Formation of Supervisory Committee

To co-ordinate the eradication campaign, Central and Regional Rinderpest Eradication Supervisory Bodies have been formed systematically in 1994.

In January 1998, Rinderpest Eradication Programme Evaluation Committee was formed to finalize the programme. The Committee is entrusted the duties to analyze, evaluate and prepare draft documents to be submitted to the OIE, SAREC, FAO, and APHCA.

5. Organization of the Department

Livestock Breeding and Veterinary Department is headed by a Director General who is assisted by a Deputy Director General. The Department is roughly divided into Central level and State/Divisional level. In the Central level, there are three divisions namely Planning and Administrative Division, Animal Health and Development Division and Research and Disease Control Division each headed by a Director. The local level that is State/Divisional level is headed by Deputy Director under whom are District officers and Township officers (Figure 1).

The Department has 2,191 staff including 388 officers. There are 1,803 veterinarians. For disease diagnosis there is the Central Diagnostic Laboratory and 3 Regional Laboratories, under the supervision of Research and Disease Control Division. Central Diagnostic Laboratory was strengthened by JICA and IAEA equipment grants and relevant training awarded to the staff by IAEA and FAO.

Deputy Township Veterinary Officers are responsible for recognizing rinderpest outbreaks by clinical symptoms and the reporting system is clearly defined so that prompt action can be taken by the central level to combat disease outbreaks (Figure 2).

6. Participation in Conferences and Seminars on Rinderpest Control

Myanmar has been participating in conferences and seminars on rinderpest control since 1983 as shown below.

Name	Rank and Duty	Date	Seminar Site
Dr. Tha Khin	Director General	27-12-1983 to 31-12-1983	India
Dr. Thein Lu	Deputy Director	23-01-1991 to 25-01-1991	India
Dr. Shwe Htun	Director	01-09-1992 to 05-09-1992	Thailand
Dr. Thet Swe	Assist. Director	04-06-1990 to 05-06-1990	Iran
Dr. Saw Johna Than	Assist. Director	20-02-1993 to 27-02-1993	India
Dr. That Mang	Assist. Director	26-03-1994 to 03-04-1994	Pakistan
Dr. Kyaw Zay Ya	Assist. Director	29-09-1968 to 23-10-1968	India

The co-operation and assistance of 4 experts have been obtained for eradication of rinderpest.

Name	Organization	Year	Activities
Dr. K. Tonkara	IAEA	April 1994	Serological Diagnosis of Rinderpest
Dr. L. Tylor	IAEA	January 1995	Rinderpest Disease Survey and Data Analysis
Dr. K. Tonkara	IAEA	November1995	Serological Diagnosis of Rinderpest
Mr. W. Holland	IAEA	June 1996	Disease Surveillance

By these participations Myanmar has gained the technological information in the combat against rinderpest and the procedural measures to be followed in declaring the achievement of disease eradication.

7. Prevention of Reintroduction of Rinderpest

Myanmar is assumed to be free of endemic foci since the country has been free of rinderpest for four decades. Therefore, reintroduction from neighbouring countries is a threat vigilantly focused on and watched. To prevent this danger the following measures have been taken:

(a) Establishment of disease alert centers;
(b) Creation of disease information network;
(c) Strengthening of diagnosis and research work.

(a) Disease Alert Centers

Twelve Alert Centers have been established along the border. Veterinary staff at the centers are responsible to monitor cattle movement and disease situation in their vacinities. They are given orientation on the recognition and epidemiology of the major diseases and to take prompt action as necessary including routine as well as emergency reporting.

(b) Creation of Disease Information Network

Disease information network within the Department has been created. The head of state/division is required to attend personally any alert reported by the alert center. Cattle movement should be restricted if necessary after consultation with local authorities. Directives from the central organization should be sought and executed.

Private veterinary practitioners are required by the "Veterinary Council Law" to report any contagious disease encountered to the nearest veterinary staff. Stockholders are given talks on rinderpest by veterinary staff.

(c) Diagnosis and Research

For diagnosis, all samples have to be sent to the Central Diagnostic Laboratory where there is facilities. Three Regional Laboratories have to be facilitated to be able to diagnose. Rinderpest research work, especially epidemiology should be increased in the coming years.

7.1 Cattle Movement and Restriction

In Myanmar, cattle movement in general is controlled by local authorities, that is township level and upwards. Cattle market, which is run on weekly basis,

is the main cause of cattle movement with a threat of spreading diseases in the country. Illegal trade of cattle may occur along the national boundaries, the movement being outward and seldom into the country. Cattle movement in the country and importation are dealt specifically with by the "Animal Health and Development Law" enacted in 1993.

7.2 Alert Centers and Check-points

7.2.1 Establishment of Alert Centers

Routine vaccination had been carried on up to 1994 along the border areas to form disease immune belts. To fulfill this objective, 12 disease alert centers in 5 states and 2 divisions had been established. These centers are as follows:

State/Division	Township
Kachin State	Putao
Chin State	Paletwa
Rakhine State	Buthidaung
Shan State	Namhkam, Maingphyat, Lashio
Kayin State	Pharpon, Myawady
Sagaing Division	Homalin, Tamu, Mawlaik
Tanintharyi Division	Tanintharyi

Mass vaccination against rinderpest had been carried out at these centers.

7.2.2 Establishment of Check-points

In accordance with the "Animal Health and Development Law" Check-points and Quarantine Stations have been established at some strategic points manned by qualified veterinary officers:

State/Division	Township
Shan State	Muse, Tacheleik
Kayin State	Myawady
Tanintharyi Division	Kawthaung
Sagaing Division	Tamu
Rakhine State	Maungdaw

7.3 Natural Barriers that Prevent the Disease from Neighbouring Countries

Myanmar is situated in South-east Asia. It is 261,228 square miles in area and topographically divided into central plain and surrounding mountainous regions in the North, West, and East. It has 3,828 miles long land border with Bangladesh, India, China, Laos, and Thailand. Coastal line in the South and the South-west is 1,760 miles long. Masses of rugged mountains made up most of the

border line with few passes that transborder movement of cattle is naturally restricted. The coastal line also is a natural barrier for contact with animals from outside.

Internally, the three principle rivers, the Ayeyarwaddy, the Sittaung, and the Thanlwin run through the plain along with Rakhine Yoma, Bago Yoma mountain ranges and Shan plateau from north to south in parallel forming natural barriers to cattle movements. Nature is in our favour in preventing the incursion of disease into Myanmar.

8. Conclusion

Myanmar has given concerted effort in the fight against rinderpest. Vaccination has been totally stopped since 1994 after 40 years of absence of the disease. Disease surveillance is carried out in accordance with the OIE Pathway with the co-operation of FAO, IAEA, and OIE. Sera samples tested showed no antibodies against rinderpest virus. The central organization as well as field veterinarians are enthusiastically participating in the Rinderpest Eradication Campaign in the country. Law enforcement is properly co-ordinated. So Myanmar is clearly in a position to declare **"provisionally free from rinderpest disease"**.

For declaration of **"free from rinderpest disease"** external verification, as soon as possible is eagerly sought. The tested sera are kept orderly for verification.

It is hoped that FAO, IAEA, OIE, and APHCA will continue to extend their helping hands to Myanmar to attain the status of **"free from infection with rinderpest virus"** in the coming years.

Table 1: Animal Census in 1997-98.

State/Division	Buffalo	Cattle	Sheep and Goat	Pig
Kachin	143,657	222,135	18,276	291,150
Kayah	24,523	66,203	1,988	53,666
Kayin	58,686	249,343	31,884	106,117
Chin	27,359	101,103	39,919	148,092
Sagaing	335,916	1,838,186	591,048	421,846
Tanintharyi	112,571	114,798	16,306	77,807
Bago	229,404	1,131,101	26,866	314,155
Magwe	78,360	1,540,937	409,988	220,062
Mandalay	96,251	1,608,001	555,002	269,005
Mon	60,694	320,537	34,253	88,427
Rakhine	230,372	602,533	99,319	100,038
Yangon	102,325	458,642	42,274	259,081
Shan	515,266	998,764	15,172	429,198
Ayeyawaddy	281,755	1,050,953	46,326	578,861
Total	**2,297,139**	**10,303,236**	**1,628,621**	**3,357,505**

Table 2: Report Rinderpest Outbreak and Death Toll.

Year	No. of Outbreak	No. of Death
1925-26	743	18,758
1926-27	506	39,993
1927-28	660	38,385
1928-29	740	22,061
1929-30	528	6,427
1930-31	708	7,013
1931-32	620	8,889
1932-33	1,255	19,199
1933-34	680	16,517
1934-35	464	21,564
1935-36	521	28,509
1936-37	67	31,072
1937-38	121	11,161
1938-39	27	3,929
1939-40	43	1,673
1940-50	Date not available	-
1951-52	73	2,011
1952-53	18	491
1953-54	16	193
1954-55	7	40
1955-56	No Outbreak Report	-
1956-57	2	29

Table 3-a: Vaccination of Cattle and Buffaloes Against Rinderpest.

Year	Type of Vaccine			Total
	Immune serum	Goat adapted	Lapinized	
1925-26	79,922	-	-	79,922
1926-27	61,869	-	-	61,869
1927-28	96,070	-	-	96,070
1928-29	186,478	-	-	186,478
1929-30	72,038	-	-	72,038
1930-31	78,053	-	-	78,053
1931-32	107,120	-	-	107,120
1932-33	191,704	-	-	191,704
1933-34	103,437	-	-	103,437
1934-35	72,533	-	-	72,533
1935-36	79,866	14,146	-	94,012
1936-37	2,447	364,799	-	367,246
1937-38	25,865	549,564	-	575,429
1938-39	36	419,354	-	419,390
1939-40	63	478,625	-	478,688
1940-50	Data not available			
1951-52	-	350,439	-	350,439
1952-53	-	332,901	-	332,901
1953-54	-	404,483	58,000	462,483
1954-55	-	393,905	83,000	476,905
1955-56	-	360,822	53,750	414,572
1956-57	-	641,880	17,025	658,905
1957-58	-	960,090	31,575	991,665
1958-59	-	1,099,700	35,450	1,135,150
1959-60	-	823,995	15,950	839,945
1960-61	-	877,288	7,900	885,188
1961-62	-	833,094	-	833,094
1962-63	-	381,000	-	381,000

Table 3-b

Year	Type of Vaccine			Total
	Immune serum	Goat adapted	Lapinized	
1963-64	-	40,700	-	40,700
1964-65	-	326,000	-	326,000
1965-66	-	271,000	-	271,000
1966-67	-	282,000	-	282,000
1967-68	-	258,000	-	258,000
1968-69	-	730,000	-	730,000
1969-70	-	1,487,000	-	1,487,000
1970-71	-	1,224,000	-	1,224,000
1971-72	-	967,000	-	967,000
1972-73	-	743,000	-	743,000
1973-74	-	419,000	-	419,000
1974-75	-	1,369,000	-	1,369,000
1975-76	-	749,000	-	749,000
1976-77	-	211,000	-	211,000
1977-78	-	199,000	-	199,000
1978-79	-	210,000	-	210,000
1979-80	-	153,000	-	153,000
1980-81	-	194,000	-	194,000
1981-82	-	139,000	-	139,000
1982-83	-	-	164,000	164,000
1983-84	-	-	247,000	247,000
1984-85	-	-	214,000	214,000
1985-86	-	-	187,000	187,000
1986-87	-	-	178,000	178,000
1987-88	-	-	148,000	148,000
1988-89	-	-	48,000	48,000
1989-90	-	-	45,000	45,000
1990-91	-	-	40,000	40,000
1991-92	-	-	24,000	24,000
1992-93	-	-	30,000	30,000
1993-94	-	-	7,000	7,000
1994-95	-	-	6,000	6,000

Table 4: Serum Samples Tested for Rinderpest Sero-Surveillance.

Division/State	Township	No. of serum tested
Yangon Division	Mingaladon	350
	Insein	240
	Dagon	240
	Shwepyithar	300
	Hlegu	213
	Hmawbi	350
	Kyauktan	77
	Kungyangon	40
	Taikekyi	100
	Total	**1,910**
Bago Division	Bago	200
	Tharrawaddy	40
	Phyu	80
	Pyay	49
	Total	**369**
Mandalay Division	Mandalay/Amarapura	240
	Mandalay	300
	Patheingyi	160
	Kyaukse	60
	Pyinoolwin	60
	Meikhtila	64
	Total	**884**
Sagaing Division	Sagaing	104
	Depaeyine	22
	Yeu	20
	Chaungu	18
	Kalay	120
	Tamu	100
	Monywa	140
	Shwebo	120
	Kankbalu	100
	Kyunhla	100
	Total	**844**
Chin State	Hakha	40
	Total	**40**
Magwe Division	Magwe	96
	Ngape	107
	Natmauk	60
	Min Bu	77
	Total	**340**

Division/State	Township	No. of serum tested
Tanintharyi Division	Daway	100
	Myeik	175
	Total	**275**
Ayeyawaddy Division	Mawlamyaingyun	60
	Yekyi	18
	Total	**108**
Rakhine State	Sittwe	40
	Kyauphyu	40
	Maungtaw	28
	Butheetaung	94
	Total	**202**
Kayin State	Pa-an	45
	Kawkareik	100
	Myawaddy	60
	Total	**205**
Shan State	Taungyi	175
	Mineye	40
	Kengtung	120
	Lashio	100
	Muse	100
	Kunloon	120
	Kutkai	80
	Tachileik	23
	Total	**758**
Mon State	Mawlamyaing	52
	Mudon	50
	Kyeikmayaw	30
	Tambuzayat	75
	Tathon/Bilin	97
	Total	**304**
Grand Total		**6,239**

Figure 1: Organization of the Livestock Breeding and Veterinary Department (L.B.V.D).

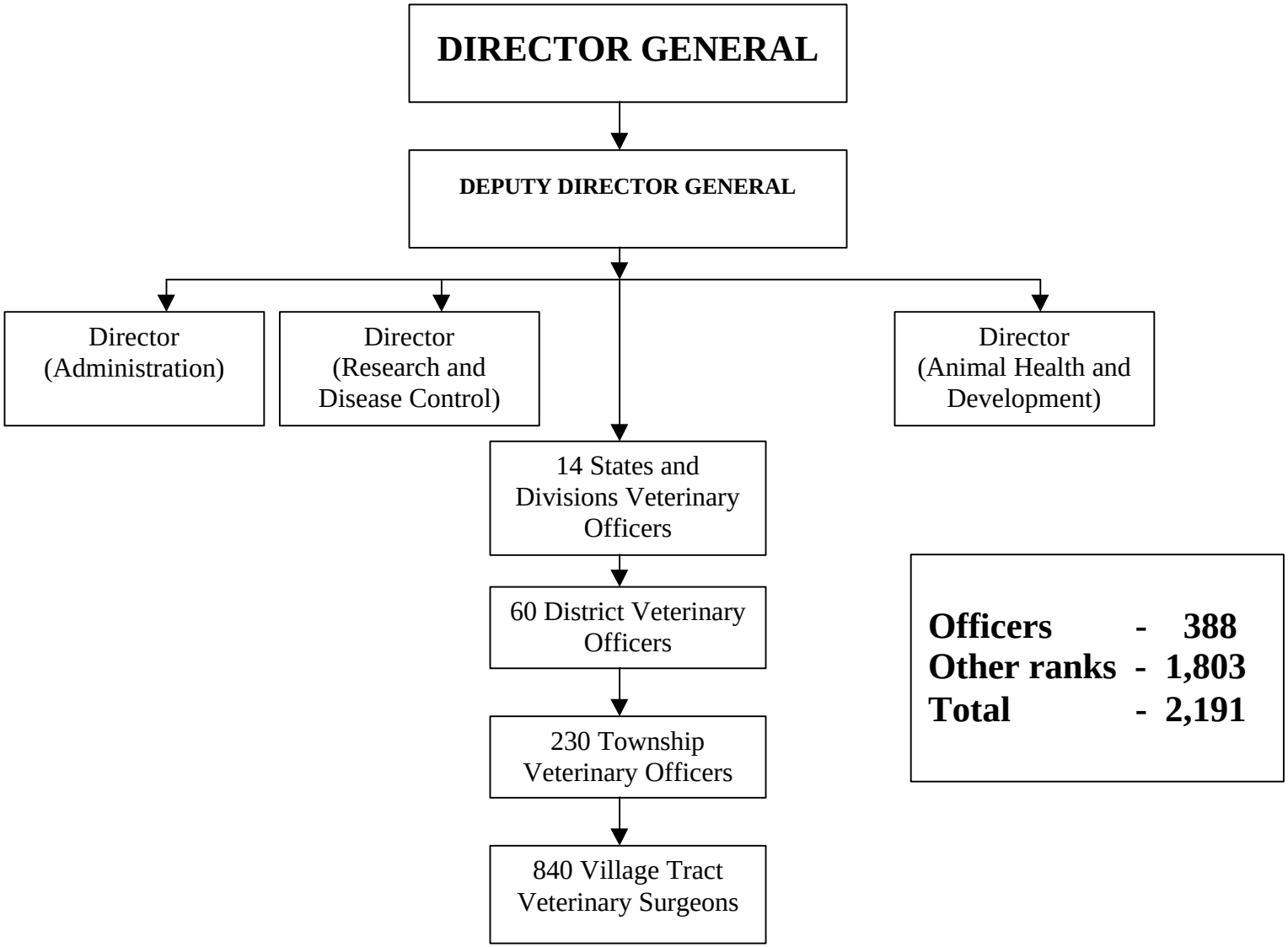
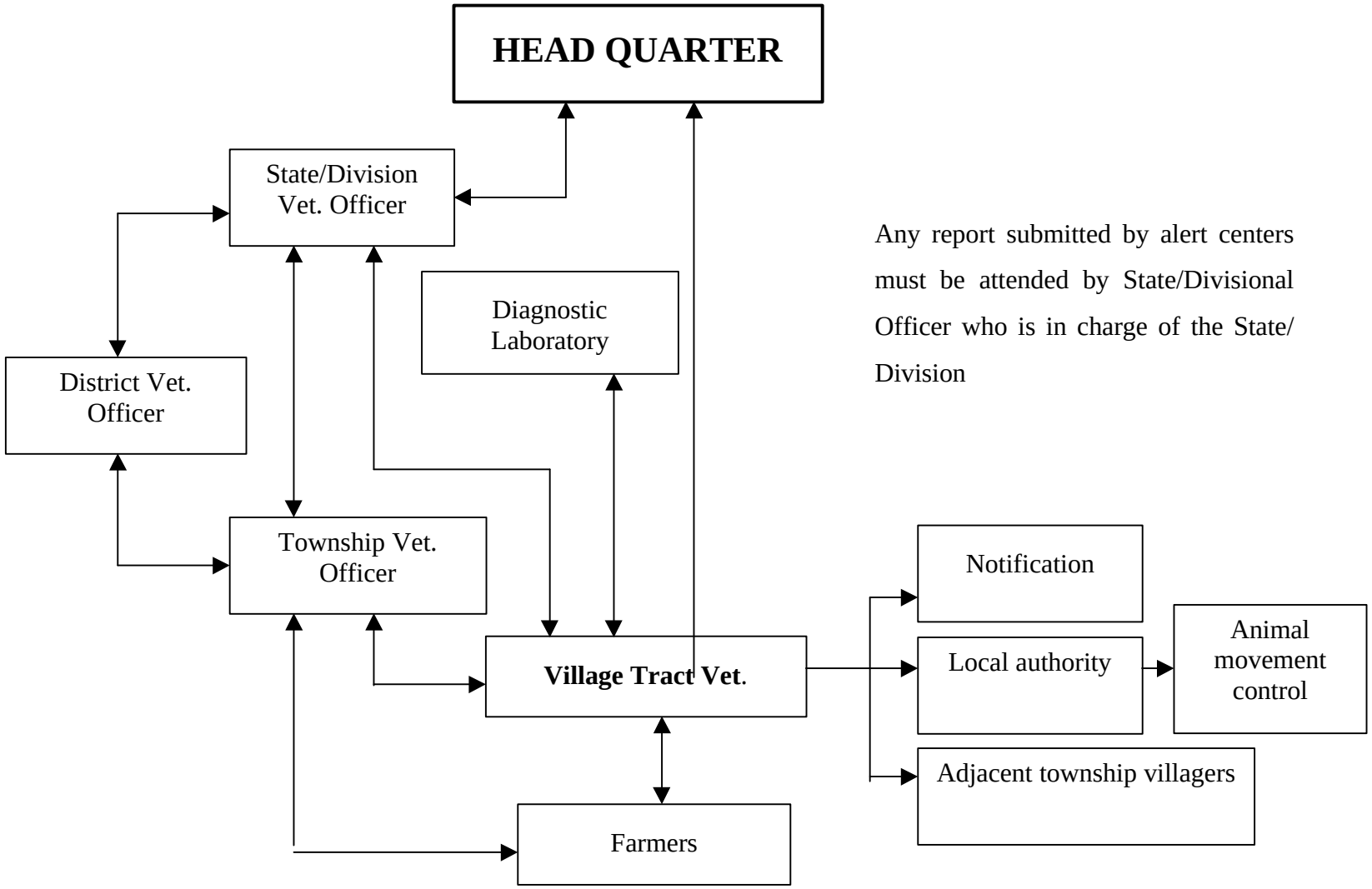


Figure 2: Disease Reporting System.



Any report submitted by alert centers must be attended by State/Divisional Officer who is in charge of the State/ Division

STATUS OF RINDERPEST IN NEPAL

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1. Background

Nepal is an agricultural country where the majority of population (>85 per cent) derives its livelihood from subsistence farming. Livestock are integral component of the subsistence agriculture, and contribute 31 per cent of agricultural GDP (CBS, 1996). Livestock in Nepal provide not only high valued animal protein for human diet, but are also the major source of farm power, both in the hills and the plains, and fertilizer (manure). Manure from livestock is often the only source of soil nutrients applied to the terraces where the grain crops are grown. More importantly, they are the major source of cash income both to the rural and peri-urban farming communities. As a result, increasing livestock production and productivity is one of the major objectives envisaged by His Majesty's Government for improving the living standards of its population through agricultural sector (APP, 1995). It is expected that by 2015, the contribution of livestock sector to agricultural GDP will increase from the current level of 31 to 46 per cent, and the annual growth rate in livestock production will increase from 2.9 to 6.1 per cent (APP, 1995).

Livestock in Nepal are densely populated. In a country with an estimated human population of almost 21 million (in 1997/98) and with cultivated land area of 4.01 million ha, there are more than 7 million cattle, 3.3 million buffaloes, 6 million goats, and nearly one million each of sheep and pigs (Table 1). Thus, the livestock population per unit of arable land is probably amongst the highest in the region. There is a trend of marginal but positive growth for the number of all livestock species, but sheep, over the past decade (Table 1). Though the growth in production is faster than the growth in livestock population (Table 1 and 2), optimum production targets are not yet achieved due mainly to low productivity, in terms of milk and meat, of indigenous livestock.

Table 1: Livestock Population and Its Growth in Nepal.

Species	Population (1997/98)	Annual growth rate (1987/88-97/98)
Cattle	7,048,336	1.1
Buffalo	3,388,660	1.5
Goats	6,080,060	1.7
Sheep	869,142	-0.05
Pigs	758,616	4.7
Poultry	15,992,283	5.8

Table 2: Total Volume of Livestock Products and Their Growth Rate in Nepal.

Product	Total production (1997/98)	Annual growth rate (1987/88-97/98)
Milk (MT)	1,048,040	2.9
Meat (MT)	180,675	3.1
Egg (No.'000)	440,910	5.8

Source: CBS (1988; 1998).

It is estimated that, at present, the deficit in livestock products from the home production is 17 per cent (Karki, in press). Of various causes, limiting production, shortage of animal feed, various diseases and poor genetic potential of the indigenous breeds are the major ones. Among various diseases, foot and mouth disease and fascioliasis are causing heavy economic loss. Historically, however, rinderpest (RP) was also important, due mainly to its epidemic nature with high morbidity and mortality among ruminants exposed to the disease. Currently, as part of Global Rinderpest Eradication Programme (GREP) and South Asian Rinderpest Eradication Campaign (SAREC), Nepal is also implementing a rinderpest eradication programme. This paper reviews the rinderpest situation in Nepal and describes the status of the current programme aimed at eradicating rinderpest from the country.

2. Historical Perspective of Rinderpest in Nepal

Outbreak of rinderpest was first reported in Nepal in Kathmandu valley during 1939. The outbreak of rinderpest during the 1950s was the biggest animal disease problem ever experienced by Nepalese livestock owners. As in many other countries of the world, rinderpest outbreaks were the most important and effective stimulus for the expansion of veterinary services in Nepal. Outbreaks of rinderpest in Nepal were concentrated principally in the southern part, i.e., Terai of the country and other river valleys with road accessibility and with frequent and easy movement of livestock. Nonetheless, the disease was also reported from a few mid-hill districts located in the middle of the country.

It is reported that hundreds of thousands of animals died during various outbreaks of rinderpest in Nepal. Amongst others, outbreaks of rinderpest during 1954-55, 1963-64, 1966-68, 1974-75, and 1985-86 were the major ones in terms of economic losses due to death of animals. The last outbreak of rinderpest in Nepal was recorded in 1989. These outbreaks were controlled principally by ring vaccination. Mass vaccination of animals against rinderpest during the 1980s prevented the reappearance of the disease in Nepal.

The disease has not been reported in the country since 1990. Mass vaccination against rinderpest was discontinued since 1992. Nepal joined the South Asian Rinderpest Eradication Campaign (SAREC) since November 1995, and is now actively implementing rinderpest surveillance programme.

Nepal declared itself provisionally free from rinderpest in August 1996.

3. Current Strategy for Rinderpest Eradication in Nepal

With an objective to declare that the country is free from rinderpest infection by 2001, the eradication programme applying the OIE Pathway is underway. This programme has been funded by the European Union.

3.1 No Vaccination

Nepal has not used rinderpest vaccines since 1992. Despite no vaccination, no clinical cases/outbreaks of rinderpest were detected. As a result, even after the start of rinderpest eradication programme, vaccination has not been introduced. We were able to skip the mass vaccination part of the OIE Pathway, and go straight to a declaration of provisional freedom from disease.

3.2 Clinical and Sero-surveillance

To determine the status of rinderpest infection in Nepal, active clinical and sero-surveillance programmes have been developed and implemented. We have started since 1997/98 an intensive programme of clinical surveillance, with the aim of detecting mild infection of rinderpest that may exist within the country. Because of lack of any clinical disease for the past 7-8 years, it was decided to proceed simultaneously with the sero-surveillance programme.

The surveillance programme is designed to obtain data from clinical examination once a year consecutively for 2 years in the high risk zone and the serological survey from the whole country (high and low risk zone) for two years consecutively. If after sometimes, the sero-surveillance shows no evidence of rinderpest infection in high risk areas, areas where vaccination was last carried out, and areas around wildlife concentrations, we shall re-think about our strategy, and possibly reduce the clinical surveillance component of the programme.

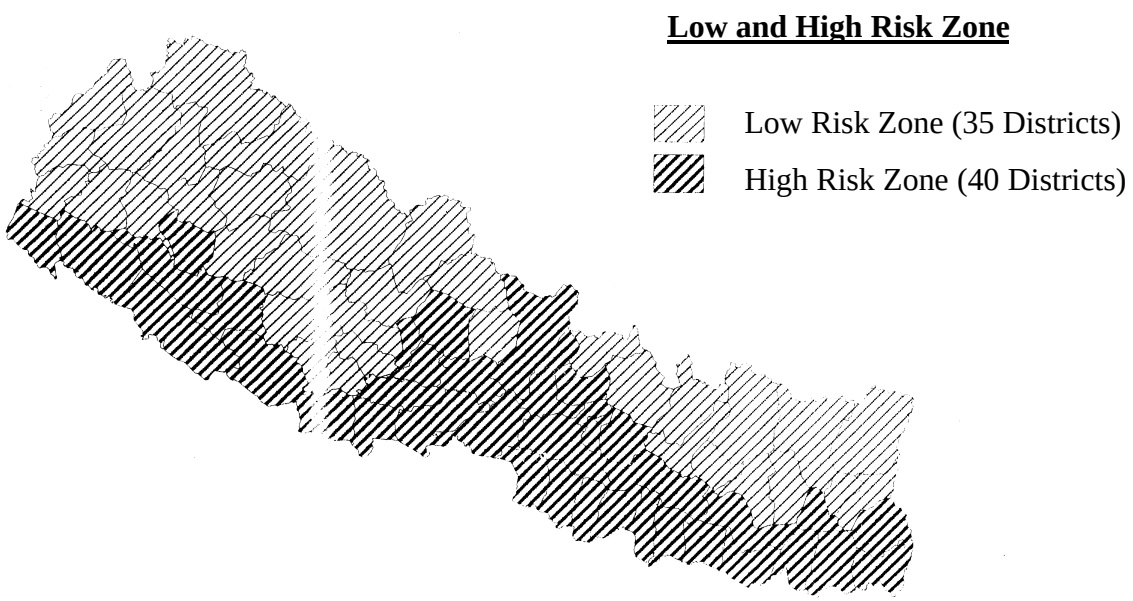
So far, the first year of clinical and sero-surveillance in 40 high risk districts have been completed. Second year of clinical and sero-surveillance in the high risk zone, and the first year of sero-surveillance in the low risk zone is on-going.

The approach adopted for clinical and sero-surveillance programme were based on GREP recommendations and is outlined below.

Epidemiological strata for rinderpest surveillance in Nepal: the OIE recommends that for rinderpest surveillance the number of strata to be made in a country should be based on similar epidemiological condition in each stratum, and the number of strata should be kept to a minimum. For this reason, all past outbreaks of the disease in Nepal were mapped. It was realized that majority of outbreaks were concentrated on the southern Terai close to the Indian borders. Thus, all southern districts of Terai and those districts of the mid-hills with frequent animal movement, with reasonable road transport facilities and animal trading, and with the past history of the disease outbreaks were regarded as the “high risk zone” - area more likely to have hidden pockets of rinderpest. In contrast, high hill and mountain districts together with some mid-hill districts without animal transport facility (no road) and no live animal trade with the high risk zone, which neither had any history of rinderpest

outbreaks in the past nor have risk of introducing animals from Terai, were considered as “low risk zone” for the purpose of rinderpest clinical and sero-surveillance (Figure 1).

Figure 1: Low and High Risk Zones of Nepal for the Purpose of Rinderpest Surveillance.



Identification of epidemiological unit: As per the OIE recommendations, for the purpose of clinical surveillance of rinderpest, an epidemiological unit was considered to be an area with cattle and buffalo population of between 50-1,000 managed under similar management and reared in close contact. In Nepal, both for the purpose of the clinical and sero-surveillance, a ward (smallest political unit) within a village development committee or a municipality would meet these criteria. So a ward, which is generally one or two small villages close by, was considered “an epidemiological unit”.

Sampling intensity and site selection: Sampling intensity, i.e., the number of epidemiological units to be surveyed every year was calculated to detect the disease at a prevalence of 1 per cent with 95 per cent level of confidence. Thus, it was decided to randomly select 300 epidemiological units in each epidemiological stratum. Clinical and sero-surveillance will be repeated every year for a new set of epidemiological units to be surveyed in that year.

For the purpose of sero-surveillance, it was calculated that 14 animals of each species (cattle, buffaloes, sheep and goats) need to be sampled. Including 4 additional serum samples per species as contingency, 18 randomly selected animals of each species are bled for serum from each ward.

3.3 Purposive Sampling

In addition to random sites selected, areas considered to be risky for either introducing the disease or likely to have an undetected foci of infection were closely monitored. Selection of purposive sampling sites was based on the following criteria:

a) Animal trading places;
b) Quarantine check-posts;
c) Milk shadow area with improved animals imported from other countries;
d) Areas of the most recent outbreaks and vaccinations;
e) Areas adjoining wildlife concentrations; and
f) Animals entering into the country from Tibet and India during the festivals and other occasions.

3.4 Team Organization and Supervision of the Surveillance Programme

Clinical and sero-surveillance for rinderpest as outlined above is being implemented through the Department of Livestock Services. A team/teams are formed in each district under the leadership of the District Veterinarian to carry out the work. Team members are trained regularly for the same. The work is co-ordinated in each region by the Regional Director. Field works are closely supervised by a team of expertise from the Center and from the Regional Veterinary Laboratories. Collected sera are transported to the Regional Veterinary Diagnostic Laboratories for storage, from where they are transported to the CVL.

3.5 Rinderpest Diagnostic Capabilities and Serum Testing

The Central and Regional Veterinary Laboratories have been strengthened to carry out rinderpest diagnosis using ELISA and agar gel diffusion tests, respectively. Personnel working at the district veterinary hospitals and livestock service centers/sub-centers have been given refresher training in recognition and field investigation of rinderpest in the field.

Sera received from the field/regional laboratories are catalogued and stored in the Central Veterinary Laboratory where the cold chain is strictly maintained. These sera are regularly tested by competitive ELISA (as recommended by the OIE) to detect the presence of rinderpest antibodies in them. Until now, approximately 10,000 sera collected during the first year of sero-surveillance in the high risk zone have been tested. Laboratory testing is on-going.

3.6 Calendar of Operation

The suggested calendar of operation for rinderpest eradication programme and its status in Nepal is presented in Table 3.

Table 3: Status of Rinderpest Eradication Programme in Nepal and Suggested Calendar of Operation.

Year	Programme	Status/Remarks
1996-1997	1. Declare provisional freedom from rinderpest	1. Declared in August 1996
1997-1998	1. Sero-surveillance and clinical surveillance in high risk zone 2. Purposive sampling in 18 sites	1. Sero-surveillance and clinical surveillance in 300 wards completed 2. Purposive sampling is 18 sites completed 3. A total of 159,901 animals were clinically examined, and 16,699 serum samples collected and stored 4. Testing of 10,000 sera completed
1998-1999	1. Sero-surveillance and clinical surveillance in high risk zone 2. Sero-surveillance in low risk zone 3. Purposive sampling in additional sites 4. Apply for freedom from disease	1. Sero-surveillance and clinical surveillance in high risk zone on-going, approximately 20 per cent wards completed 2. Sero-surveillance in low risk zone ongoing, approximately 10 per cent wards completed 3. Purposive sampling from 10 sites completed
1999-2000	1. Sero-surveillance in high and low risk area, as required	
2000-2001	1. Continue sero-surveillance in both areas, if required 2. Apply for freedom from infection	

4. Other Activities to Achieve and Maintain Sustainable Eradication of Rinderpest

It has been realized that to maintain the disease free status of the country, once it declared freedom from any infectious diseases such as rinderpest, the country has to have effective field veterinary services in place. Proper legislation to control movement of animals when required, effective quarantine, effective field veterinary services, competent laboratory diagnostic services, etc. are amongst few to mention. As a result, efforts are now being directed to strengthen the veterinary services in the country. Salient features of these activities are listed below.

4.1 Legislation

Three bills on Animal Health, Meat Inspection and Slaughterhouse, and Veterinary Council were drafted and tabled in the parliament during the year 1998. All of them have been approved by the parliament and the former one has already been enacted. The remaining two are sent to the Palace for His Majesty's royal seal (signature), and are expected to be gazetted in near future. Enactment of these legislation will empower the Department of Livestock Services to implement effective quarantine and other regulatory activities in relation to animal health.

4.2 Strengthening of Field Veterinary Services

As part of improving the capability of the field veterinary services, field and laboratory capabilities at national, regional and district level have been strengthened. During financial year 1997/98, one central veterinary laboratory, five regional laboratories and 12 district laboratories have been upgraded. Remaining district laboratories are being renovated and diagnostic facilities are being improved. It is planned that all (75) district laboratories should be capable in laboratory diagnosis of parasitic diseases, haematological examination including screening of blood protozoans, and in collection, preservation and dispatch of a variety of samples required for laboratory investigation. Additional facilities for preliminary bacteriology including antibiotic sensitivity testing will be added to 15 district laboratories in one or two years to come.

Efforts are also being made to increase the coverage of veterinary services within the country. Within the next 10 years, effective veterinary services will be available to more than 35 per cent of Nepalese farmers as compared to the current level of 15 per cent. Provision of revolving fund has been made to technicians and village animal health workers to start/promote basic animal health services in remote areas. Similarly, qualified veterinarians are encouraged to start private clinic to expand the coverage of animal health.

4.3 Improvement in Disease Surveillance Systems

Animal health information systems have been further developed in the Central Epidemiology Unit and each district is provided with a new format for reporting disease situation within the district. Any outbreak of infectious disease has to be reported to the Animal Health Division for further investigation. Comprehensive

disease status is being prepared by the Central and Regional Veterinary Laboratories regularly.

4.4 Quick Response Veterinary Unit

A Quick Response Unit with a mobile laboratory and facilities to tackle outbreak of rinderpest and other diseases has been established as a part of the Central Epidemiology Unit under the Animal Health Division. The unit is equipped with all means of communications (wireless, telephone, fax, and e-mail). All the disease outbreaks in the field are reported to the unit by the quickest available means.

4.5 Control of Animal Movement across National Borders

The open and porous border between India and Nepal, and frequent trading of animals between these two countries even at the farmer's level poses serious problem of controlling and regularizing animal movement system between these two countries. However, attempts have been made to record the movements of the animals through the main entry points and at some routes between hills and Terai. Hence 20 quarantine check-posts have been established at the border between India and Nepal, and 3 check-posts between hills and Terai within the country. These check-posts will be responsible to regularize the animal movement between the two countries and implement the quarantine system within the country.

Although, mixing of Tibetan animals with some high mountain districts of Nepal at some of the high pastures could not be ruled out the frequent animal movement between Tibetan Autonomous Region of the People's Republic of China and Nepal is limited through some identified routes and only during specific period of the year (festival periods). One quarantine check-post has been established between the Nepal-Tibet Border.

To further understand the disease situation between Nepal and the two neighbouring countries, and to develop a system of cross border information exchange on livestock disease situation, a high level delegation is planned to visit both India and Tibet in near future.

4.6 Manpower Development

To strengthen the manpower capability both for field investigation and laboratory investigation, more than two dozens veterinarians are sent overseas for postgraduate training. Special emphasis is given to establish functional laboratories in each district. Several laboratory technicians have been trained in-service, either within the country or from overseas. Laboratory Orientation Training is given to at least one technician from each district laboratory. Similarly, intensive laboratory training is provided to technicians from the Central and Regional Laboratories.

4.7 Quality Vaccine Production and Supply

The biological products division is strengthened for production of quality vaccines. In addition to improve the quality, quantity and range of several livestock

and poultry vaccines, efforts are directed to produce tissue culture PPR vaccine within the country.

4.8 Management of Peste des Petits Ruminants (PPR) in Nepal

PPR has become a problem in the recent years mainly in the Terai region, and in areas where there is frequent movement of animals. Current policy to control the disease is by ring vaccination around the outbreak area by a PPR tissue culture vaccine. However, PPR vaccine is only supplied to the district veterinarians once the disease is confirmed in the laboratory (CVL) by competitive ELISA, and is used strictly only for the sheep and goats.

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CURRENT STATUS OF RINDERPEST IN PAKISTAN

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1. Introduction

Rinderpest is known to have occurred in cattle and buffaloes of Pakistan since the beginning of this century. Two epidemics were recorded in the 1950s when hundreds of thousands of animals died. Since then the disease has smouldered with occasional outbreaks causing substantial losses in all provinces. Rinderpest remains endemic in the Landhi Cattle Colony near Karachi and possibly in other cattle colonies. For some years it was considered that rinderpest did not occur in Pakistan, possibly because of confusion in diagnosis between rinderpest and other diseases such as mucosal disease, bovine viral diarrhoea, and foot and mouth disease. Nevertheless, it is particularly certain that much of what was reported as "rinderpest-like disease" was in fact classical rinderpest. Clinical field diagnosis together with results from the Central Veterinary Laboratory, Sindh since 1991 indicate that rinderpest has occurred sporadically throughout each year in many places in Sindh Province (Table 1).

There is constant circulation of rinderpest virus in Landhi Cattle Colony, fuelled by the continuous introduction of susceptible animals under its rather unusual management system in which animals constantly leave for mating and return at the beginning of the next lactation. There is little doubt that Landhi Cattle Colony is the source of much of the rinderpest infection in Sindh and probably also in other parts of the country. The disease also occurs sporadically in other areas. It is probable that rinderpest is enzootic at very low prevalence over much of the country.

Although severe mortalities were reported in epizootic of rinderpest in earlier decades, large-scale outbreaks have not been reported for sometime in areas where vaccination has been undertaken. This is probably due, partly, to lack of field disease investigations and reporting and partly to a change in the epizootiology of rinderpest in Pakistan following the earlier vaccination of the stock. This may have resulted in partially immune population in which low levels of rinderpest virus could cycle, causing more chronic, low level infection compared to the intermittent but explosive episodes of the past. Recently a major epizootic has been reported from Northern Areas in Gilgit and Hunza Valleys where about 40,000 animals have died between April 1994 to May 1995.

In September, an outbreak of rinderpest in Khost Region was reported by FAO-Afghan Project in Islamabad. FAO Rome responded to the problem with an emergency vaccination campaign. Khost is immediately adjacent to Pakistan and infection was said to have been introduced through the importation of cattle from Sargodha District of Punjab Province of Pakistan. Although rinderpest was confirmed

near Lahore in 1994 it has not been suspected near Sargodha although a severe outbreak of rinderpest-like disease occurred at Shah Jeewna nearby Jhang in 1988.

2. Current Status

The Northern Areas

According to the investigations of Mr. Paul Rossiter, Lead Consultant during November-December 1995 and by Dr. Manzoor Hussain, National Consultant during May 1996, only one small and apparently confined focus of disease at Khaplu has been confirmed. According to the Animal Husbandry Department, Northern Areas sporadic cases are being reported but occasionally on investigation. The disease is haemorrhagic septicaemia. It is believed that virus is circulating in the Northern Areas cattle population. However, epizootics are not recorded because of vaccination and re-vaccination of about over 69 per cent of cattle population by now.

Karachi

The dairy yards of Karachi, especially the Landhi Colony, are endemically infected with rinderpest. Many have close links with farms in the interior of Sindh, Punjab, and Balochistan. In the past outbreaks of rinderpest directly attributed by the affected farmers to movement of animals from Karachi have occurred in Quetta (1986-87) and in Punjab (1988, 1994). It is difficult to assess the amount of direct movement of livestock from Karachi to Afghanistan but some almost certainly does occur with attendant risk. More usually, Karachi animals pass through parts of Balochistan especially Quetta before entry into Afghanistan.

Balochistan

A report from a trader in Bhalwal cattle market stated that his brother had seen rinderpest in Quetta in October 1995. This was later confirmed by the Director, Veterinary Services, Balochistan. The risk of transmission from Quetta to Afghanistan is high. Traders in Bhalwal also reported that Iranian cattle dealers buy cattle and buffaloes in Quetta to sell in Iran.

Punjab

According to the various reports rinderpest has occurred almost annually in Punjab. Nevertheless, there is no convincing evidence that rinderpest in Punjab is maintained independent of introduction from Karachi. There is a possibility that sporadic, localized epidemics of rinderpest frequently occur in Punjab probably as the result of infection from Karachi. However, why they do not spread to become large clearly recognizable pandemics in the largely unvaccinated population of 20 million bovines is difficult to determine.

In conclusion, the dairy colonies of Karachi are endemically infected with rinderpest and any trade with them, transboundary or otherwise, carried a very high risk of transmitting the virus to a new location. The Northern Areas are still definitely infected but the risk of transmission to neighbouring areas other perhaps than Chitral and Azad Jammu and Kashmir is not high. The possibility of transboundary spread of

rinderpest from the other provinces of Pakistan is probably greater than the risk from the Northern Areas. The control of animal movement is rather difficult.

3. Current Status of Rinderpest and National Rinderpest Projects

The Regional Project namely "South Asian Rinderpest Eradication Campaign (SAREC)" to be implemented under the SAARC umbrella has been received and the Government of Pakistan concurrently furnished to SAARC Headquarters, Kathmandu, Nepal. However, its further progress is not known as yet. As regards the National Rinderpest Project, the European Commission Project Formulation Mission has visited Pakistan during January-February 1996 and submitted the Report. They have identified the following project components:

i. Strengthening of field services including mass vaccination;
ii. Development of epidemiological units including disease monitoring and surveillance;
iii. Strengthening of vaccine production, distribution, and diagnostic capabilities; and
iv. Training of veterinarians and para-veterinarians, etc.

On the basis of their Report, a Project has been prepared and is under submission to the Planning and the Finance Ministries for approval of the Government of Pakistan. It is expected that the Project will be launched by July 1999.

Table 1: Rinderpest in Sindh during 1984 – 1994.

Year	Place	No. of outbreaks	No. of animals affected	Mortality (%) ***	Diagnostic source
1984	Landhi	5	410	81.2	PL 480 *
1985	Landhi	4	292	71.2	PL 480
1986	Landhi	5	298	89.2	PL 480
1987	Landhi	5	100	74.0	VRI, Lahore
1988	Landhi Hyderabad	1 1	23 3	52.2 100.0	Field Staff **
1989	Kundi Hyderabad Landhi	1 1 1	37 17 77	45.9 70.6 93.5	Field Staff
1990	Landhi	1	19	68.4	Field Staff
1991	Landhi LES Hyderabad Sanghar	5 3 1 1	692 57 20 11	87.0 71.9 60.0 36.0	VRI, Lahore Tandojam
1992	Landhi Hyderabad Thatta Karachi	4 6 1 2	1,784 73 75 500	94.0 80.2 57.7 70.0	Tandojam
1993	Landhi Nawabshah	8 2	1,417 63	80.3 68.2	Tandojam Pirbright
1994	Landhi	1	101	88.1	Tandojam

** PL 480 = "Epidemiology Project" of Pakistan Agricultural Research Council.*

*** Field staff indicates clinical diagnosis without post-mortem of laboratory examination.*

****"Mortality (%)" is the percentage of sick animals which died or were slaughtered for salvage. It does not represent the proportion of the herd which died from rinderpest.*

The table includes outbreaks which were diagnosed at Tandojam as "rinderpest-related morbillivirus".

RINDERPEST IN SRI LANKA
CURRENT STATUS AND PLAN FOR ERADICATION

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1. Background

Rinderpest was first recorded in Sri Lanka in 1888 and recurred annually thereafter until, following an extensive outbreak in 1926, importation of cattle was prohibited in 1929. This measure together with vaccination resulted in eradication of the disease by 1934. In 1942, however, rinderpest was observed in goats in quarantine. In 1943 with increased military activities in the East, large numbers of goats were brought from India and distributed to garrisons of troops throughout the Island; rinderpest was reintroduced in 1943 through these imports of goats. It was subsequently controlled through the use of a locally made caprinized vaccine together with slaughter and Sri Lanka was once again declared free of rinderpest in 1946. For descriptions of these outbreaks and the early history of the disease, please refer to Mahamooth (1953) and McGaughey (1961). During the following four decades, Sri Lanka was free from the disease apart from a few "false alarms" including an outbreak of diarrhoea among Ayrshire cattle on a large state farm in 1967 in the course of which the animals were vaccinated against rinderpest.

The disease was once again introduced into the Island in 1987 through goats brought into the country by the Indian Peace Keeping Force. It resulted in a major outbreak that spread to all Provinces in the Island in a population with no immunity. The statistics of the outbreak shows that between 1987 and 1994 there were 480 individual reports with a total of 44,170 animals being affected resulting in the deaths of 21,879 cattle and buffaloes. Another 3,403 animals were slaughtered resulting in an overall loss of Rs. 41 million (US$1.2 million). We have now been able to control this outbreak and are working, according to the "OIE Pathway", towards once again declaring the country free of rinderpest.

2. Ecological Zones and Distribution of Animals in Sri Lanka

Sri Lanka is a tropical island with a total land area of 64,000 square km. The country is traditionally divided into three zones based on elevation: - lowland, midland and upland, with separations taken at 330 and 1,000 m above mean sea level (msl). The rainfall is determined by two monsoons that blow seasonally from the south-west and the north-east. The regional distribution of rainfall is determined by this seasonal pattern and the particular configuration of the highlands situated just south of center in the Island on the basis of total rainfall (wet zone, > 2,500 mm; intermediate zone, 2,000-2,500 mm; dry zone < 2,000 mm) and topography, the

country is divided into 9 climatic zones). Agricultural patterns are determined by the natural environment defined by the climate, physiography, and soil types.

The distribution of the ruminant population is shown in Table 1. The systems of raising these animals range from the extensive free grazing management in the dry zone and parts of the intermediate zone to the intensive dairy farms in the hill country. Most of the goats are found in the dry zone where they are reared extensively. It is these free-ranging animals that graze in mixed herds which are always likely to be involved in the spread of diseases such as rinderpest.

Table 1: Population and Distribution of Ruminants According to Climatic Zones.

Climatic Zone	% Buffaloes	% Cattle	% Goats
Low elevations, dry	73	69	65
Low elevations, wet	17	16	17
Mid elevations, wet	6	7	10
High elevations, wet	4	8	7
Total Population (millions)	0.56	1.60	0.54

3. The Current Outbreak

The current outbreak began with a telephone call from the Assistant Director of Animal Health in charge of the Eastern Province on 8th December 1987 in which he reported the occurrence of an unfamiliar disease with high rates of mortality in cattle. Subsequent investigation revealed that the first case had been observed in a village called *Sinna Urani* on 15th October among cattle which were managed under extensive systems of free grazing. Clinical signs and post-mortem lesions suggested rinderpest but as there was little clinical experience with the disease or laboratory expertise to confirm, the disease was only diagnosed later through samples sent abroad. The OIE was notified on the presence of the disease in Sri Lanka together with APHCA who had in 1983 launched an internationally co-ordinated programme for the control of the disease in the region.

In the ensuing years, the disease spread within and outside the Eastern Province and by 1989 and 1990 had been reported from every Province in the Island. Details of its spread are given by Vadivelu (1989) and are indicated in Table 2.

Table 2: Occurrence of Rinderpest in Different Provinces in Sri Lanka.

Year	Province
1987	EP
1988	NP, EP, NCP, CP, WP
1989	NP, EP, NCP, NWP, WP, CP, SAB
1990	NP, EP, NCP, NWP, UVA, CP, SP,SAB
1991	EP, SP
1992	EP, NCP
1993	EP
1994	EP

Note : (EP-Eastern; NP-Northern; NCP-North Central; CP-Central; WP-Western; NWP-North Western; SP-Southern; SAB-Sabaragamuwa; Uva)

Following the imposition of control measures including vaccination and slaughter by 1993, the disease was confined once again to the Eastern Province and the last clinical outbreak was reported in February 1994. The year in which each Province recorded its last outbreak is shown in Table 3. Details of this outbreak have been reported at previous FAO regional consultancy meetings by Siriwardene (1991) and Haniffa (1992).

Table 3: Last Recorded Occurrence of Rinderpest in Each Province.

Year	Province
1989	Western
1990	North Western, Central, Uva, Sabaragamuwa, Northern
1991	Southern
1992	North Central
1994	Eastern

According to the strategy evolved to control the disease, mass vaccinations of animals were only carried out in the Northern and Eastern Provinces where the disease was considered to be endemic. In other areas it was confined to ring vaccinations around the site of an outbreak. Details on the vaccinations carried out are given in Tables 4 and 5.

Table 4: Number of Vaccinations in Each Year Since the Outbreak.

Year	Number of Vaccinations
1987	102,679
1988	637,871
1989	519,380
1990	145,361
1991	20,422
1992	9,971
1993	9,672
1994	nil
1995	97,700
1996	72,000
1997	88,000

Table 5: Year of Last Vaccination in Each Province.

Year	Province
1989	Western
1990	North Western, Central, Uva, Sabaragamuwa
1991	Southern
1992	North Central
1997	Eastern, Northern

Further details on these figures are available in Siriwardene and Kodituwakku.

4. Strategy for Control

Although vaccination was commenced soon after the disease was confirmed in 1987, a strategy for systematic control and eradication was evolved only after the visit of an EU/FAO mission in 1994. Since the distribution of the disease was not uniform, the Island was zoned for purposes of control as described below and shown in the map. Strategies were planned according to the report of the Expert Consultation (1989) commonly referred to as the OIE Pathway.

Infected Zone (IZ): The Northern and Eastern Provinces where the disease was endemic would receive a blanket immunization from 1995 to 1997, together with other measures to bring the disease under control, stop vaccination and carry out intensive surveillance from 1998 to 2000 and declare freedom from infection in 2001.

Intensive Surveillance Zone (ISZ): The areas/Provinces adjacent to the NEP; North Central Province and parts of North Western, Central, Uva and Southern Provinces bordering the NEP; these areas would be under constant surveillance together with slaughter and ring vaccination around outbreaks.

Low Risk Zone (LRZ): Sabaragamuwa, Western and the balance parts of the other Provinces; slaughter and ring vaccinations whenever outbreaks occurred.

The latter two zones would declare provisional freedom from disease in 1995; serological surveillance in 1996; freedom from disease in 1997; and freedom from infection in 2000.

5. Surveillance

Surveillance systems consisted of improving the reporting of diseases resembling rinderpest, of investigation such reports, and serological evaluation for the presence of antibodies. A sero-survey carried out during the period June 1992 to August 1995, when clinical disease was still active, found that the sero-prevalence in bovids was 12.5 per cent in those vaccinated and 3.5 per cent in those that were not (Silva et al., 1998).

Planned sero-surveillance for the purpose of declaring the country free of the disease was commenced in the ISZ and LRZ in April 1997, 5 to 8 years after the last clinical case was reported and the vaccination had been stopped (Table 6), only animals between 6 months and 3 years old were sampled to ensure that they were born after the last clinical case, had not been vaccinated and did not carry maternal antibodies from vaccinated parents. It can be seen from Table 6 that the surveillance plan was generally followed and that no sero-positive cases have been detected so far. At the same time, field reports of disease resembling rinderpest were investigated and found to be negative. Sero-sampling in the IZ, the North East Province has not commenced.

6. Conclusion and Future Plans

A summary of the present status is shown in Table 7. It can be seen that apart from the North East Province; other areas have been free of clinical disease without vaccination for more than 5 years, this fact taken together with the lack of any sero-positive animals indicate that these areas are free of the disease. Although the original intention was to control and declare each zone separately, it is now clear that this would not be acceptable due to the unrestricted movement of animals between zones. The country would have to be considered as a whole for the purpose of making declarations according to the OIE Pathway.

The Northern and Eastern Province (Infected Zone) have had no clinical disease since 1994 and vaccination was stopped in December 1997. We expect, therefore, to declare provisional freedom from rinderpest disease shortly and to recommend surveillance including the North Eastern Province immediately. According to the timetable of the OIE Pathway, we expect to declare freedom from disease at the end of 2000 and freedom from infection by the year 2003.

Table 6: Sero-Surveillance for Rinderpest.

District	Bovines (x 1000)	Sites planned	Sites done	Samples	
Colombo	32	6	6	90	
Gampaha	68	12	12	180	
Kalutara	69	12	12	180	
Kandy	74	13	13	195	
Matale	64	11	12	180	
Nuwara Eliya	55	10	10	150	ND
Galle	39	7	7	106	
Matara	44	8	14	218	
Hambantota	145	25	27	404	
Kurunegala	376	66	69	1,035	
Puttalama	123	22	22	330	
Anuradhapura	240	42	42	628	
Polonnaruwa	104	18	18	270	
Badulla	76	14	14	210	
Moneragala	89	15	15	231	
Ratnapura	51	9	9	165	ND
Kegalle	42	7	11	135	ND
Total	1,691	297	313	4,707	

Age of sampled animals: *6 months to 3 years;*
All found to be negative

ND: *Serum samples not analysed*

Table 7: Current Rinderpest Status in Sri Lanka.

Zone	Province	Last Report	Last Vaccine	Sero-Samples	Date of Sample
LRZ	**Western**	1989	1989	450	Aug-97
	Sabaragamuwa	1990	1990	300	Nov-97
ISZ	**Central**	1990	1990	525	Nov-97
	North Western	1990	1990	1,365	Apr-97
	Uva	1990	1990	441	?
	Southern	1991	1991	728	May-97
	North Central	1992	1992	898	Dec-97
IZ	**Eastern**	1994	1997	ND	ND
	Northern	1990	1997	ND	ND

ND: Not surveyed *IZ: Infected Zone*
ISZ: Intensive Surveillance Zone *LRZ: Low Risk Zone*

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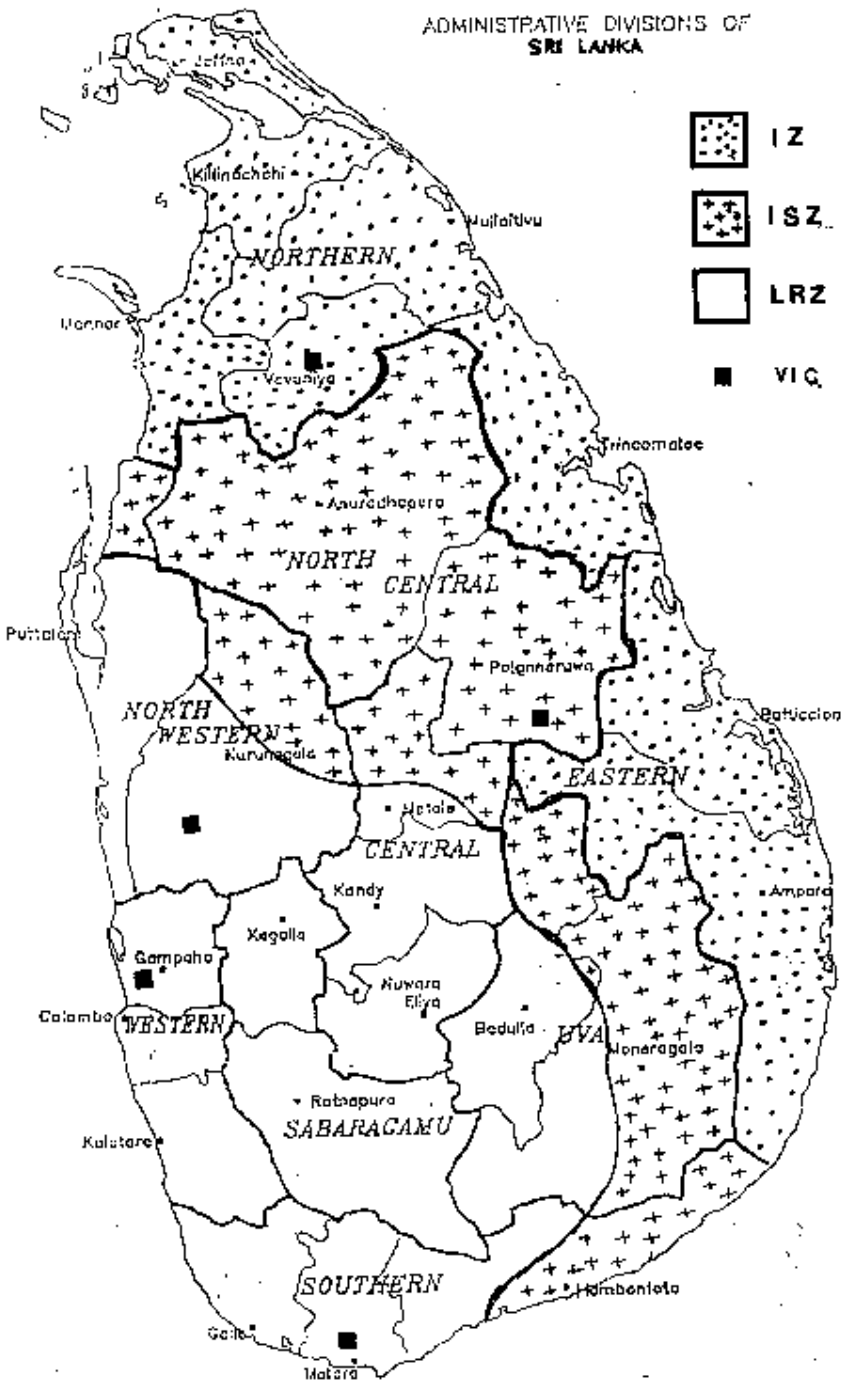
Figure 1: Map of Sri Lanka Showing the Zones for Control of Rinderpest.



RINDERPEST ERADICATION IN THAILAND

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1. Introduction

Rinderpest is a highly fatal disease which caused a considerable loss of livestock animals in Thailand in the past. The disease was first recognized in Thailand in 1926. The last known incidence of the disease was reported in 1956 and there has been no clinical evidence of the disease since.

2. Current Disease Situation

Rinderpest is a notifiable disease as required by law, the Animal Epidemic Act 1931, in Thailand. But there has been no report of the disease from anywhere in the country for more than forty years.

Thailand has recently stopped mass vaccination campaign against rinderpest. A preliminary serological survey of rinderpest was conducted (1997-1998) by using competitive ELISA technique that was jointly developed by the Institute for Animal Health, Pirbright, United Kingdom and others. Approximately 5,000 cattle serum samples were collected randomly from animals nation-wide, especially those in the border areas. Of those serum samples, no single sero-positive sample was evidenced.

The Department of Livestock Development, Ministry of Agriculture and Co-operatives has decided to follow the OIE guidelines described as the "OIE Pathway" in order to obtain official recognition by the OIE that Thailand is free of rinderpest and its causative virus.

3. Future Action Plan

Thailand is going to apply for a declaration of provisional freedom of rinderpest in 1999 as the initial step in gaining international acceptance as a rinderpest-free country. A national task force will be formed to operate an active surveillance system with statistically and epidemiologically sound and laboratory-based diagnosis and monitoring towards obtaining a final OIE declaration of freedom from infection of rinderpest in Thailand.

A systematic sero-surveillance will be carried out from 1999 to 2002 to confirm the absence of rinderpest in livestock population in Thailand. Emphasis will be put on animals in border areas adjacent to Myanmar, Laos, and Cambodia. The Disease Control Division and nine Regional Livestock Offices are jointly responsible for strict quarantine and examination of animals at border check-posts, report of animal movement, disease monitoring, serum sample collection, and record keeping. A sampling framework will be developed based on a random collection system for identifying the sampling points.

The Immuno-serology Section of the National Institute of Animal Health is identified for the laboratory testing. The current serological technique employed is competitive ELISA, which has the advantage of using a mouse monoclonal antibody specific to the causative virus and an anti-mouse serum to eliminate the necessity of using a variety of different anti-species sera otherwise required. In recent years techniques have been developed to detect the nucleic acid rather than the proteins of virus. The more sensitive technique of reverse transcription-polymerase chain reaction (RT-PCR) amplification not only has the increased sensitivity, but also has the advantage that the amplified products of DNA fragments can be sequenced and determined the relationship of the virus of interest and other viruses. The epidemiological study and differentiation of rinderpest and rinderpest-like disease; - PPR for instance, can be greatly facilitated by the technique.

By the year 2002, Thailand will file an application to the OIE to be declared as “freedom from rinderpest”. Thailand has committed to the programme for the complete eradication of rinderpest (freedom from infection) by the year 2003 or 2004.

We feel strongly that the ultimate success of our programme for eradication of rinderpest depends on a greater and more intense regional co-operation. Similar actions taken by neighbouring countries will ensure a swift success in eradication of the disease from this region.

Figure 1: Expected Targets of Thailand According to the OIE Pathway.

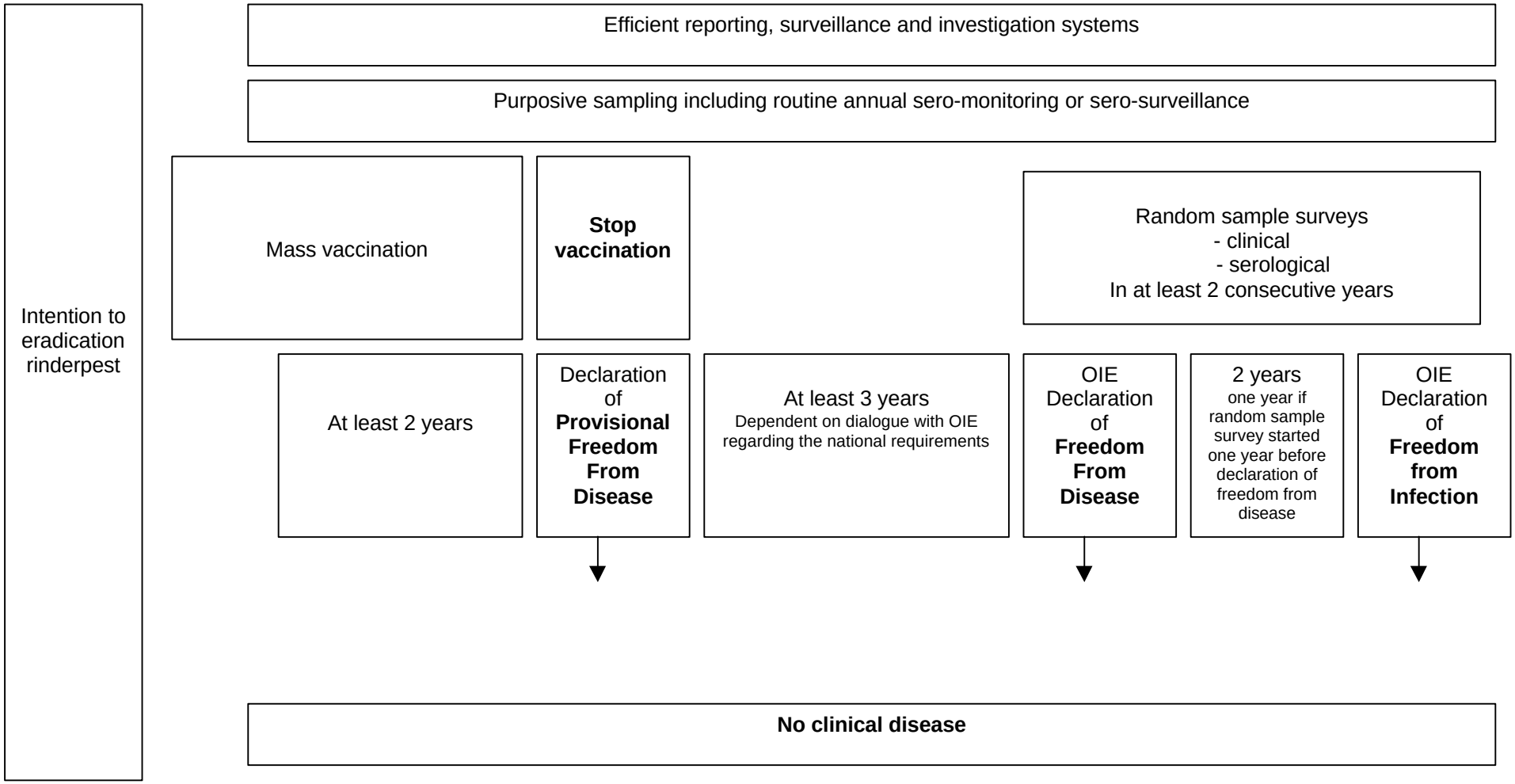

Figure 2: Map of Thailand Showing Its Boundaries and "Administrative" Regions.

PART III

RESOURCE PAPERS

THE GLOBAL RINDERPEST ERADICATION PROGRAMME

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THE GLOBAL RINDERPEST ERADICATION PROGRAMME

SO NEAR BUT SO FAR

2010

If the Global Rinderpest Eradication Programme (GREP) is successful, the Year 2010 is the year by which rinderpest will have been eradicated from the world and proven to have been eradicated.

UN Declaration of Human Rights

UNITED NATIONS
UNIVERSAL DECLARATION OF HUMAN RIGHTS

Article 25.1

Everyone has the right to a standard of living adequate for the health and well-being of himself and of his family, including food, clothing, housing and medical care and necessary social services, and the right to security in the event of unemployment, sickness, disability, widowhood, old age or other lack of livelihood in circumstances beyond his control.

Livestock are of great importance in food security and rural livelihoods.

The DECLARATION ON WORLD FOOD SECURITY Plan of Action developed at the World Food Summit in Rome in 1996 recognized this and included the following objective:

Objective 3.1

Governments, in partnership with all actors of civil society, and with the support of international institutions, will as appropriate seek to ensure effective prevention and progressive control of plant and animal diseases, including especially those which are of transboundary nature, such as *rinderpest* ….

Global Rinderpest Eradication Programme

WHY ?

The great pandemics

as recent as the 1980s

CATTLE PLAGUE

The great rinderpest pandemics in Asia and Africa last occurred in the 1980s but there is no cause for complacency. Cattle plague could return to many of the areas of the world which have been cleared. As long as one country remains infected to act as a source of virus, the risk will remain.

Global Rinderpest Eradication Programme

GREP

not

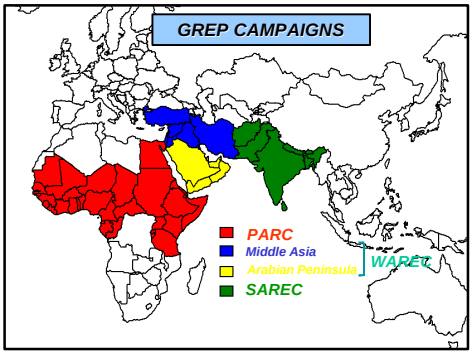
GREC

Coordination not execution

PARTNERSHIPS

GREP is just that - a programme - not a centrally run campaign. An Expert Consultation Meeting in Rome in 1992 advised against attempting to eradicate rinderpest by the global campaign approach. Instead it recommended that FAO should undertake co-ordination of national and regional campaigns in partnership with them and donors.

Global Rinderpest Eradication Programme
Regional Rinderpest Eradication Campaigns



Three regional campaigns were envisaged:

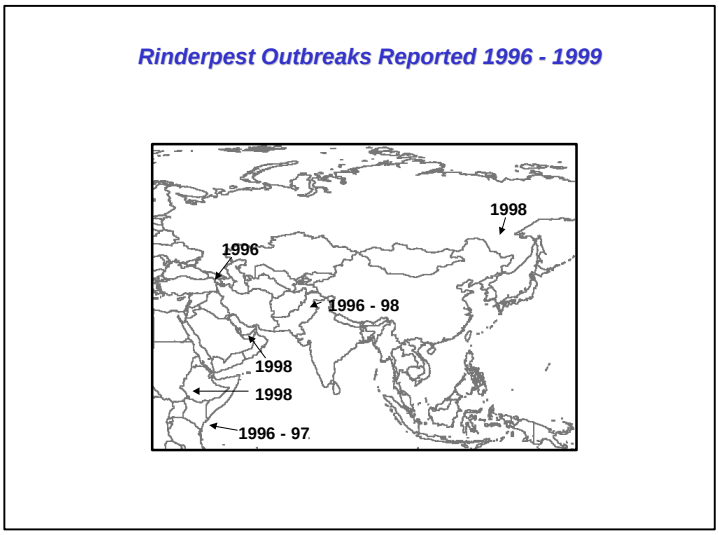
The Pan-African Rinderpest Eradication Campaign - PARC
This has been executed since 1986 by the Organization of African Unity Inter-African Bureau of Animal Resources, financed by the European Union.

The West Asian Rinderpest Eradication Campaign - WAREC
WAREC, executed by FAO with UNDP funding, commenced in 1989, based in Baghdad. It terminated in 1994. This area would now better be divided into a Middle

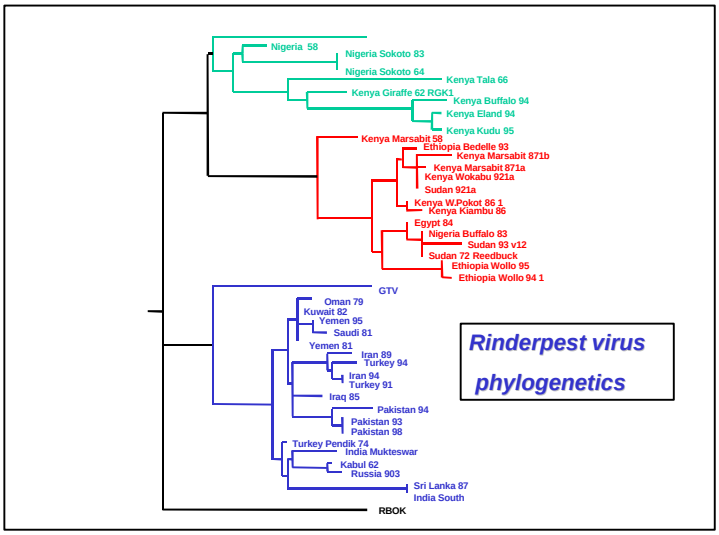
Asian Campaign and an Arabian Peninsula Campaign as relates better to rinderpest epidemiology and current disease status.

The South Asian Rinderpest Eradication Campaign - SAREC

SAREC has never been fully implemented as intended although EU-funded national projects in several countries have contributed significantly to progress.

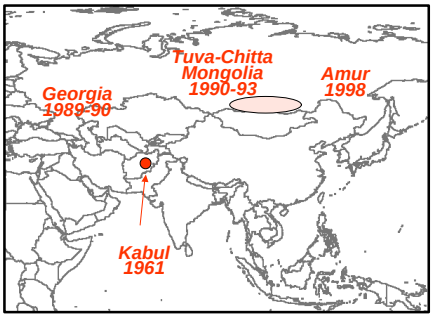


The small numbers of rinderpest incidences reported reflects more the deficits in disease reporting than the true incidence of disease. However, it is clear that the disease now occurs only in fairly restricted areas.

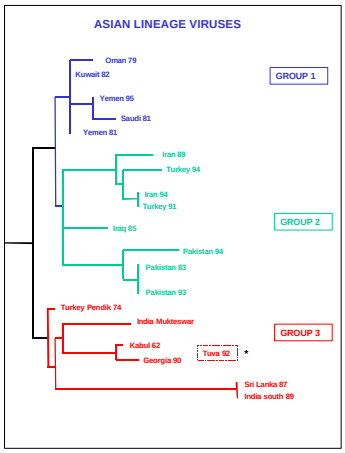


Genetic characterization of rinderpest viruses is a powerful tool to aid the global management of rinderpest eradication. Molecular epidemiology carried out by the FAO World Reference Laboratory for Rinderpest (Institute for Animal Health, Pirbright Laboratory, UK) can help to determine the source of viruses causing outbreaks but only if a sufficient number of viruses are available for fingerprinting. Unfortunately, countries do not use this free service sufficiently. ***All countries are urged to submit any virus material they may have stored from outbreaks (no matter how old) to the WRL to help in this work. In the case of future outbreaks, this should be one of the first actions taken.***

The Russian Enigma



Outbreaks of rinderpest experienced in Georgia (1989-90), Tuva and Chitta with contiguous areas of Mongolia (1990-93) and Amur (1998) are puzzling. The origins remain a mystery. The viruses from all three areas are closely related genetically to each other and also to an old virus isolated from Afghanistan in 1961. The significance of this is unclear partly because so few viruses are available from Asia for study. The possibility of a persisting focus in far eastern regions of the Russian Federation, Mongolia or China needs to be ruled out.



The Russian and Afghanistan viruses fall into one subgroup of Asian lineage of rinderpest virus which also contains isolates from South Asia and Turkey. With larger numbers of viruses to compare it would be possible to draw conclusions about the relationships between endemic foci and outbreaks.

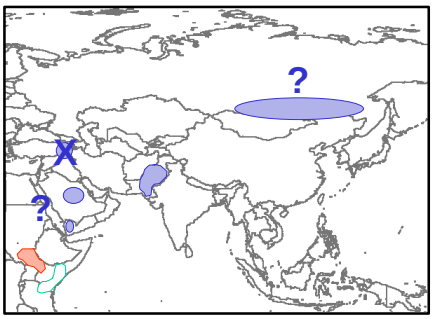
The Last Remaining Foci of Rinderpest

Focus - Virus lineage/sublineage			Prime focus	Involved countries
1	*Asia*	Asia lineage subgroup 1	Yemen Saudi Arabia [1]	
2		Asia lineage subgroup 2a	Turkey [1]	Iraq
3		Asia lineage subgroup 2b	Pakistan	Afghanistan
4		Asia lineage subgroup 3	Asiatic Russia [1]	Mongolia, China
5	*Africa*	African lineage 1	southern Sudan	Uganda, Kenya, Ethiopia
6	*Africa*	African lineage 2	southern Somalia	Kenya, Ethiopia, Tanzania

[1] Uncertain status - rinderpest status requires clarification

Only six areas of the world are currently actually or possibly infected with rinderpest. Two of these are in Africa and relate to two distinct African lineages of rinderpest virus. The other four Asian areas concern the Asian lineage of rinderpest virus.

Rinderpest in 1999



The map shows the areas of the world which are at risk from the persisting endemic foci. These are in Sudan, Somalia and Pakistan. There is growing confidence that the Turkey/north Iraq focus has now been eliminated and the Russian events are under investigation. The other areas of uncertainty are in the Arabian Peninsula and need to be clarified.

Known Active Foci of Rinderpest

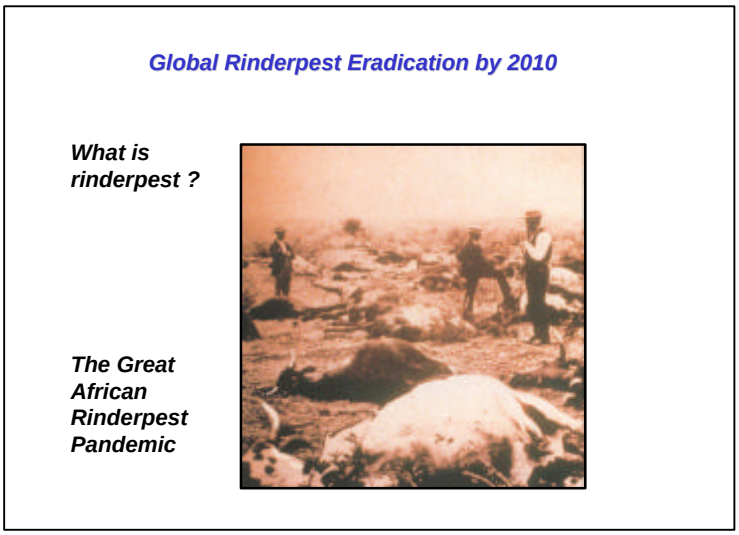
- **Pakistan extending into Afghanistan**
- **Southern Sudan extending into northern Uganda, north-western Kenya and south-western Ethiopia**
- **Southern Somalia extending into north-eastern Kenya**

The three major areas of endemic rinderpest persistence left in the world.

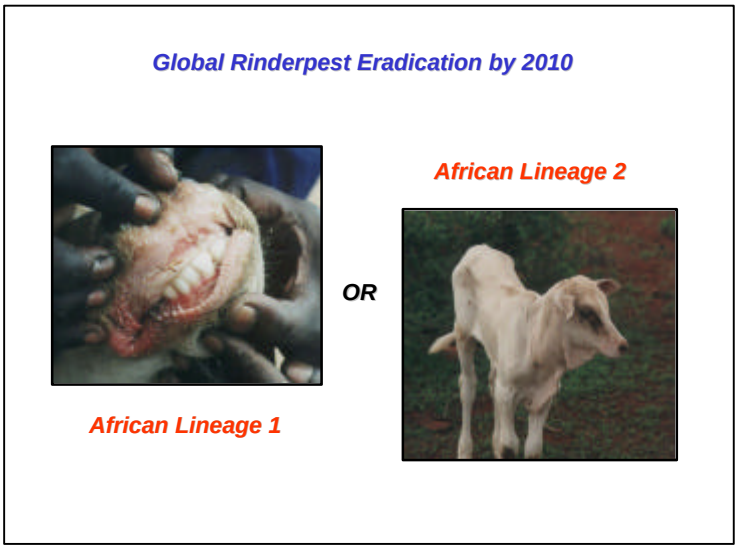
Areas of Rinderpest Uncertainty

- **Eastern Turkey extending into northern Iraq**
- **Yemen and Saudi Arabia**
- **Far Eastern Russia extending into Mongolia and north-eastern China**

The areas which need to be investigated to determine their status with certainty. At least one (Turkey and north Iraq) may now have been eliminated.



Cattle plague was formerly most dramatic as illustrated here by the Great African Rinderpest Pandemic at the end of the last century. Devastating pandemics have occurred as recently as the 1980s in both Africa and Asia. Cattle plague is characterized by both high morbidity and mortality rates. The last occurrence of true cattle plague occurred in 1994 when rinderpest invaded the northern areas of Pakistan killing at least 50,000 yaks, cattle and buffaloes before being brought under control.



Today in Africa the African lineage 1 virus continues to be generally highly pathogenic as illustrated here by the mouth lesions seen in the south of Sudan in 1998. However, the African Lineage-2 virus has been very difficult to detect. Rinderpest was limited to calves in north-eastern Kenya in 1996; they were infected but showed few obvious signs of disease, as illustrated here.

It must be stressed that this mild nature of rinderpest is not limited only to African Lineage-2 virus. Some strains of African Lineage-1 have been similarly mild and there is convincing evidence that this occurs also with Asian Lineage virus. It is probably a universal phenomenon.

Global Rinderpest Eradication by 2010

Is it possible ?

YES !

YES !

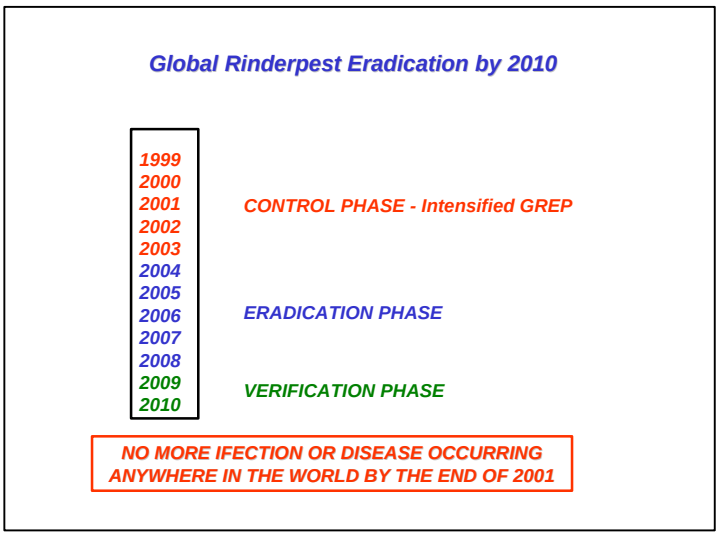
YES !

But there is no time to waste

The date set to achieve total ***verified*** eradication of rinderpest from the world is 2010. This implies at least 10 years to achieve this.

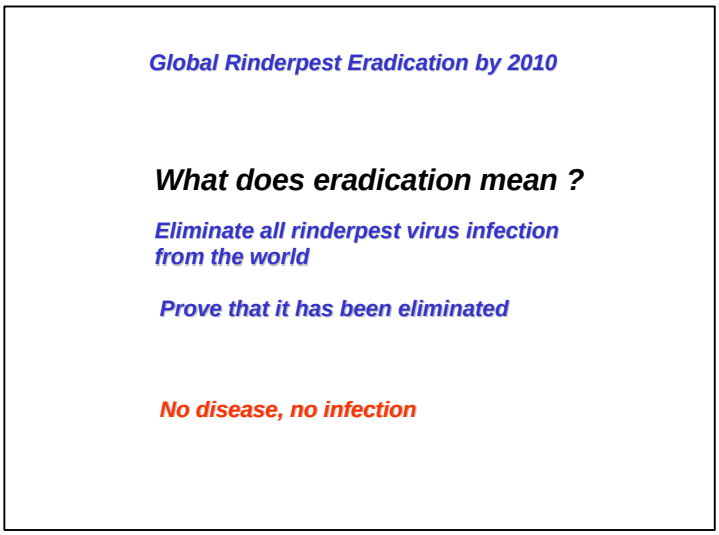
THE INTENSIFIED GLOBAL RINDERPEST ERADICATION PROGRAMME

Dr. Peter Roeder
Animal Health Officer (EMPRES)
FAO Headquarters, Rome, Italy



However, two years are needed for the final stages of global freedom verification and removing rinderpest viruses from laboratories for destruction or safe storage. All countries must therefore have completed the OIE Pathway by 2008. The Pathway requires 5 years on average; therefore, the last countries must have embarked on the Pathway by 2003. To start on the Pathway countries must have been free from rinderpest disease for 2 years. To achieve this requires that there is no more rinderpest infection occurring after ***2001***.

Thus, there is little time left.



It is not sufficient for countries to believe that they are free from rinderpest because they no longer experience clinical rinderpest. Countries need to prove that both disease and infection have been eliminated.

Global Rinderpest Eradication by 2010

Initial stages - CONTROL

- **Repeated mass immunisation campaigns**

  Reduces incidence and even eradicates from some areas

  Not successful in many endemic areas

Mass immunization through annual vaccination campaigns is a most useful procedure when a rinderpest-affected country starts on control progressing to the path to eradication. It can certainly reduce markedly the incidence of disease and in some countries has been able to eradicate it. However, experience has shown that mass immunization campaigns have not been able to eliminate rinderpest from many areas of endemic persistence. Mass immunization therefore should be viewed as a temporary phase.

Intensified Global Rinderpest Eradication Programme

FOCUSSED ACTION FOR ERADICATION

- ***SEEK***
- ***CONTAIN***
- ***ELIMINATE***

Achieving eradication rapidly from the last remaining foci requires an Intensified GREP which relies on a more dynamic approach to finding areas of virus activity within the persisting foci of infection, stopping them from spreading and then eliminating them by a process of ***immuno-sterilization.*** This relies on active disease surveillance and focussed intensive vaccination.

The South Asia Complex *Freedom to be proven **

India, Pakistan, Afghanistan, Nepal, Bhutan and Bangladesh

- **Bangladesh infected in 1957 to 1958 - evidence of the disease for perhaps as long as 30 years.** *Now free **
- **Bhutan severe rinderpest epidemics were recorded in 1948 and again in 1968/69 persisting until 1971.** *Now free **
- **Nepal records first invasion in 1939; clear during the 1940s; 1950s to the 1980s repeated introductions from India; severe epidemics at intervals of approximately 10 years. Now probably free.** *Now free **
- **Sri Lanka eradicated 1940s; free until 1987 - introduced from India. Died out 1994.** *Now free **
- **India endemic until 1995.** *Now free **

There is growing confidence that most of the countries of South Asia are now free from rinderpest but this needs to be proven.

South-East Asia

Freedom to be proven

Thailand: Severe losses in 1926 persisting into the 1930s. Introduced in 1945 from Burma, persisting until 1946, and again in 1948. Introduced from Cambodia in 1951 and 1957. Eradicated in 1959. *Now free*

Malaysia *Now free*

Indonesia *Now free*

Vietnam: In common with rest of Indo-China rinderpest was a severe problem in the post-war period and was thought to have been eliminated by the late 1950s. However, the disease appeared to have lingered on the Vietnam/Cambodia border possibly until 1970. *Now free*

The countries of South-East Asia also appear to be free from rinderpest but, again, this remains to be proven.

South-East Asia

Freedom to be proven

Cambodia: Obviously present until at least 1957. *Now free*

Laos: No information available. *Now free*

Myanmar: An upsurge of infection in the 1930s was followed by unchecked spread between 1935 and 1945. Control implemented in 1940s and 1950s. Eradicated in 1957. *Now free*

Philippines: Probably first introduced at end of last century with buffaloes from Indo-China and persisted until eliminated in 1948. Reintroduced with buffaloes from India in 1955 and spread locally in Luzon until controlled. *Now free*

Indonesia: *Now free*

Pakistan and Afghanistan

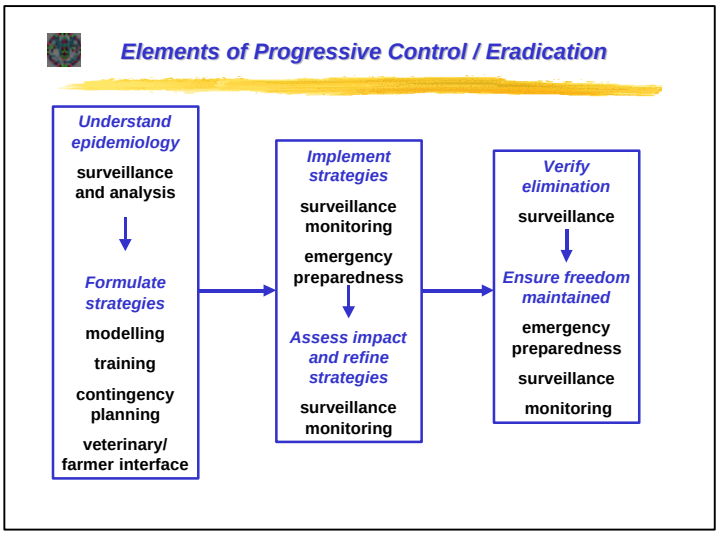
- ***Pakistan***: major epidemics from 1947 to 1951 and again from 1959 to 1962 with subsequent endemicity
- 1994 - a virgin-soil epidemic in the Northern Areas which persisted until 1996
- Rinderpest outbreaks occur regularly in central Pakistan, possibly linked to trade in buffaloes from Sindh Province where dairy colonies maintain rinderpest infection

Epidemiology unclear *Infected*

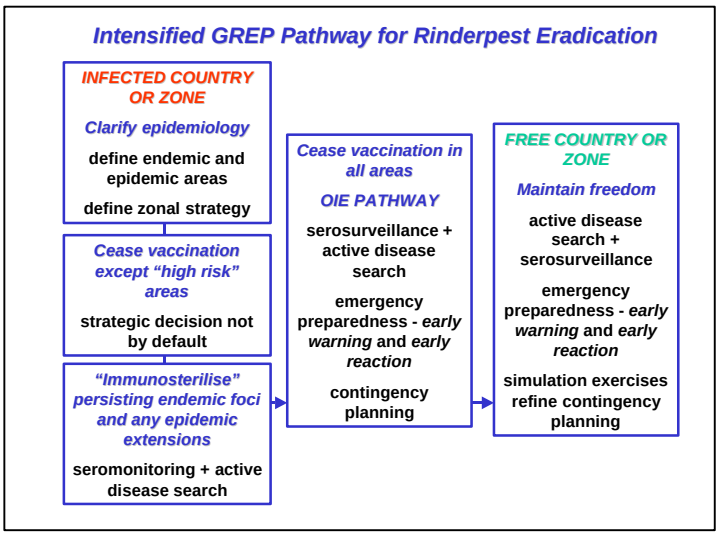
- ***Afghanistan*** has suffered repeated outbreaks of rinderpest from Pakistan – 1969, 1974 ... 1995 ...

Epidemiology unclear *Infected*

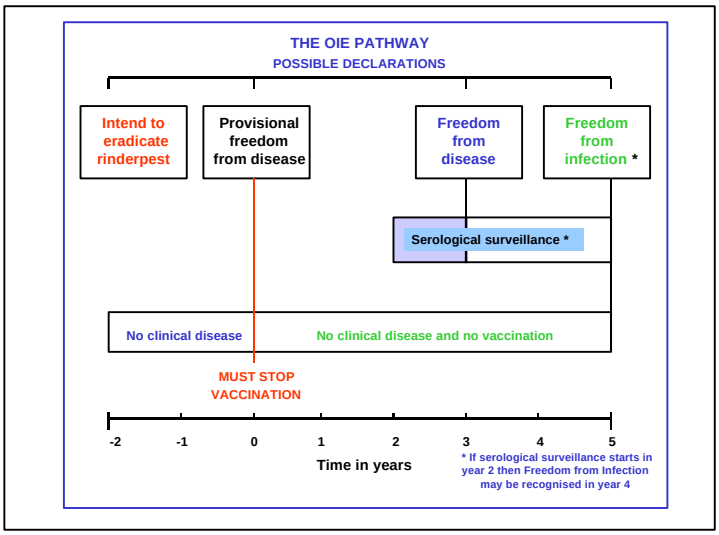
Pakistan, however, remains infected and Afghanistan, if not actually infected at present, is at high risk of introduction. The epidemiological situation in Pakistan remains to be defined.



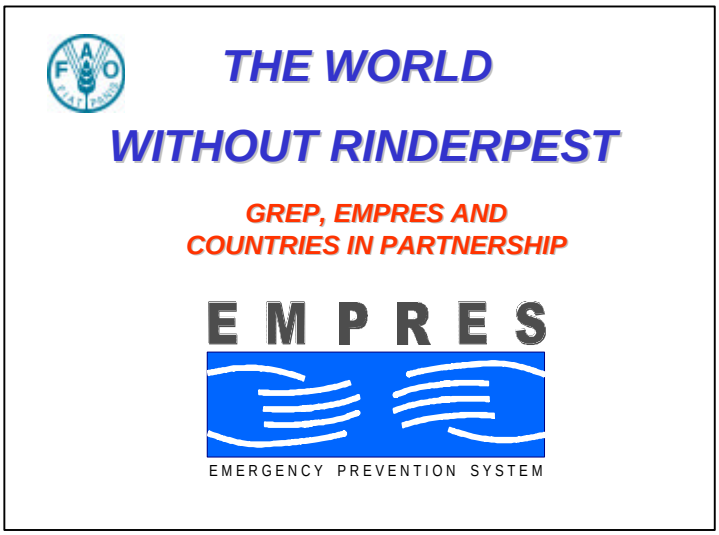
This flow chart describes the major elements of a generic epidemiologically-based approach to the progressive control and elimination of the major transboundary animal diseases.



Applying this to rinderpest is illustrated here - the Intensified GREP Pathway to eliminating rinderpest rapidly - an intensive epidemiologically- based approach rather than institutionalized mass vaccination.



The OIE Pathway is the guiding mechanism for GREP in achieving global verified freedom from rinderpest.



Learning lessons from GREP experiences in the last 10 years can help to rapidly achieve the goal of ***The World Without Rinderpest*** by the Year 2010, This calls for a renewed global commitment by all partners – countries, donors and the FAO/GREP Secretariat.

STRATEGIES FOR RINDERPEST SURVEILLANCE IN INDIA

Dr. Malleshappa Rajasekhar
Project Co-ordinator
Rinderpest ELISA Training Laboratory
Animal Disease Monitoring and Surveillance (ADMAS) Project, Bangalore, India

1. Historical

Rinderpest probably arose in Mangolia and got introduced into India through the north-eastern region around mid 18th century. In 1871, the cattle plague commission headed by Hallen made an in-depth study of the disease and detailed description of the farmers evidence before him on the outbreaks of the disease in N-W frontier province (now Afghanistan), Punjab and Uttar Pradesh were recorded. Interestingly, his report cites outbreaks in sheep in Meerut in 1866 and in goats in Etawa districts in 1867 in northern India.

The menace of rinderpest led to the establishment of Civil Veterinary Departments and the Imperial (now, Indian) Veterinary Research Institute at Mukteshwar in India. Elsewhere in Europe, it was instrumental for the establishment of the Office International des Epizooties (OIE) and the first veterinary college in Lyon, France.

As a killer murrain, rinderpest had few rivals in India. Khera (1980) estimated that the mean deaths in the period 1923-24 to 1938-39 were 164,526 ± 13,895 against a mean bovine population of 149,294,000 ± 87,000. Mortality rates per 100,000 animals ranged from 65.6 to 189.7 with a mean figure of 110 ± 10. Then the only control measure feasible was the serum-virus simultaneous method, which had its own limitations. With the discovery of caprinized vaccine by Edwards (1927), a programme of effective control was envisaged, but financial constraints and lack of veterinary manpower and resources stood in the way of it's implementation. The disease continued to be dreadful and took heavy toll of livestock despite limited vaccination with goat virus vaccine.

2. Mass Rinderpest Vaccination Campaign

In 1954, the Government of India launched a national rinderpest mass vaccination campaign - the National Rinderpest Eradication Programme - and the results were spectacular. The reported number of outbreaks declined dramatically from 8,156 in 1956-57 to 960 in 1960-61, the price being approximately 20 million annual vaccinations. The mass vaccinations had continued year after year but soon it was realized that a much higher vaccination cover was necessary to maintain the status quo.

The subsequent introduction of a tissue culture rinderpest vaccine in the 1960s further strengthened the efforts of this eradication campaign. As a result of all these sustained national mass vaccination activities over a period of 42 years, the annual mortality was brought down from almost two hundred thousand to few hundreds per year. It was then generally agreed that the scheme of eternal mass vaccinations for rinderpest eradication is a drain on the country's exchequer and veterinary manpower. A close examination of the epidemiological data lead to the inescapable conclusion that the incidence of rinderpest in India has perhaps reached irreducible limits and was ripe for its ultimate eradication. However, the prolonged national vaccination campaign was not so focused and fine-tuned. It did not address the field-based operational problems of cold chain, mobility, quality of vaccines, extension education, post vaccinated sero-monitoring, diagnostic laboratory infrastructure and beyond all, lacked a time frame for final eradication.

3. Initial Approach to OIE Pathway for Rinderpest Eradication

- "Provisional Freedom from Rinderpest Disease"

With this reasonably very low and stable rinderpest situation in the country, the Government of India, in January 1990, launched the present National Project on Rinderpest Eradication (NPRE) with the support of the European Union (EU) to bring down the incidence of rinderpest to "zero level" as an attainable goal before the end of this century.

The launching of NPRE, which formed a component of the board project namely - "Strengthening of Veterinary Services in India for Disease Control" - with an outlay of Rs. 4,050 million of which Rs. 3,410 million was provided by the Government of India and the remaining Rs. 640 million by the EU, was timely, holistic and pragmatic.

NPRE was conceived as a multiple approach and result oriented national programme. It has several components including mass immunization, strengthening of tissue culture vaccine production and diagnostic facilities, vaccine quality control, sero-monitoring and sero-surveillance, mass communication and holding of training workshops. In addition, supportive research programmes on vaccine improvement and quality control, epidemiology of rinderpest in small ruminants and development of diagnostic tests.

The successful implementation of NPRE jointly by the EU and the Government of India is a classical case study of a massive field programme of sorts and has set a good example for a co-ordinated effort for the rinderpest eradication from South Asia. It has imbibed aspects of the OIE perceptions of rinderpest eradication, all round focused and committed approaches by the central and state agencies, co-ordination and monitoring of field operations, vaccine quality control, cold chain establishment, mobility of field staff, and beyond all, the political and administrative support. These were primarily responsible for achieving the present status of "provisional freedom from rinderpest disease".

Presently, clinical rinderpest is not seen for the past three years. Practically all clinical cases of "rinderpest-like disease" in small ruminants, so far, have been

confirmed as peste des petits ruminants (PPR) by immuno-capture ELISA. Tissue samples from more than 150 outbreaks in sheep and goats from different parts of the country in the past three years have proved to be PPR by laboratory confirmation. This is further substantiated by serum examination results of a large number of in contact and recovered animals following these outbreaks by competitive and selective rinderpest and PPR ELISA. This study has reconfirmed that the outbreaks were indeed due to PPR and there was no serological evidence of rinderpest virus activity in these sera by rinderpest C-ELISA. Also, there were no outbreaks in bovines suggestive of rinderpest in the past three years. Large-scale TCRP vaccine production and vaccinations have been stopped to pave way for rinderpest surveillance programme, - the final component of the OIE Pathway.

It is a matter of great pride to the veterinary profession, the Government of India and the EU that their goal to achieve "zero" rinderpest is accomplished four years well before the turn of the century.

4. Final Approach to "Freedom from Rinderpest Infection"

Having achieved "provisional freedom from disease", obviously takes us to the next and most crucial phase of the OIE Pathway, - the declaration of "freedom from rinderpest infection". This forms the ultimate game plan for the final thrust on the elimination of the rinderpest virus from the susceptible population.

The epizootiology of rinderpest in India has been an intrigue and the ease of incursion of the virus from bovines to sheep and goats and vice-versa, and possibly pigs, is well documented in the early 1970s. The agrarian nature, the huge large and small ruminant population, free-intermixing, migration and poor zoo sanitary conditions help in the free inter-species transfer of infectious agents; and the rinderpest virus is no exception. This view is amply substantiated if the results of our recent serological survey on the prevalence of PPR antibodies in bovines are any indication. Around 15 per cent of the rinderpest antibody-free bovine serum samples contained PPR antibodies and this situation could be much higher if the ratio of small to large ruminants is more as seen in certain parts of the country. This almost amounts to building up of low to moderate levels "borrowed" resistance of the bovine population in the absence of rinderpest vaccination in the country. In addition, with massive PPR outbreaks in most parts of the country in the past 5 years, it appears certain that PPR virus is innocuously blocking the likely incursion of rinderpest virus into small ruminants being immunologically hostile.

On several occasions in the past 15 years, more than 30 per cent of the sheep and goats have consistently shown the presence of PPR virus antibodies which is an important epidemiological contribution of their positive role in restricting the spill-over of rinderpest virus should it occur in future. In reality, we may even consider broadly that about 50 per cent of the small ruminant population being "immunologically refractory" to the incursion of rinderpest virus from bovines. Perhaps all these ground realities associated with these two diseases may explain the momentary absence of rinderpest in the country.

5. Rinderpest Surveillance Programme

For the past few centuries, India had been the homeland for rinderpest and to expect it to walk out of the country may be a difficult proposition to the virus now. At the same time, to organize an effective surveillance system to detect foci of subtle rinderpest virus activity in a vast country like India with its huge and varied rinderpest susceptible ruminant and pig population, unrestricted movement/migration is an Herculean task. There are certainly areas of strength and weakness that deserve a close introspection in our effort to achieve the ultimate declaration of "freedom from rinderpest infection".

The following is a brief description of the strategies, approaches and evaluation of the "rinderpest surveillance programme" to be initiated soon. It has basically three major components:

5.1 Clinical surveillance
5.2 Serological surveillance
5.3 International border surveillance

5.1 Clinical Surveillance

Each state veterinary regulatory authority has a state level rinderpest officer totally responsible for all the rinderpest-related activities. This is a grass -root-based activity aimed at searching for all the indications of disease entities that resemble rinderpest. This is a mandatory for all the veterinary institutions in the country to participate in the NPRE activity and submit regular reports to the state rinderpest officer who liaises between the state veterinary regulatory authority and the NPRE Headquarters in New Delhi. This activity is already institutionalized with appropriate pro-forma and the schedule of reporting operational. NPRE Headquarters is keeping a very close watch on this crucial programme. There is a great deal of commitment for this activity at all levels. It has three components:

a) Village Searches

A village with several herds/flocks of susceptible livestock population is the basic epidemiological unit for rinderpest surveillance activity. There are 634,000 villages in the country with an average of 750 heads of livestock population. As a specific rinderpest surveillance activity, all the villages within the administrative jurisdiction of the rural veterinary hospital are regularly visited by the trained para-veterinary staff to enquire on the occurrence of any disease resembling rinderpest. The para-vet records details of his visits endorsed by the signatures of the prominent persons of the village as proof of this surveillance activity. He submits combined report to the scrutiny of higher officials.

b) Institutional Searches

India has a well spread out network of rural veterinary institutions within a radius of about 10-15 km. The trained para-veterinarian and professional veterinarians provide the basic livestock health care through first aid centers, hospitals and polyclinics. They have been under strict instructions to look up for animals with high

fever, ocular/nasal discharges, diarrhoea and to rule out rinderpest. They have facilities for collection and dispatch of clinical specimens for laboratory confirmation. The hospital records are verified by the visiting senior officers. They also have the additional responsibility of carrying out village searches.

c) Stock Route Searches

Livestock movement for trade and migration in search of grazing are apart of the husbandry activity. In certain areas of the country these activities are intense and result in the free mixing of infected and healthy animals. The veterinary institutions located along the trade/migration routes conduct regular searches for any rinderpest-like disease and along the trade/migration routes. The details are routinely sent to higher authorities.

Also there are designated "check-posts" exclusively established for rinderpest surveillance activity along inter-state borders and inspection of the animals entering/leaving the state are examined and quarantined if necessary.

5.2 Serological Surveillance

This is the backbone of rinderpest surveillance aimed to detect any subtle virus activity in the population. It is specially designed to provide almost fool proof evidence for the presence or absence of the virus activity in the selected population that is free from rinderpest antibodies. NPRE has established its exclusive national rinderpest ELISA Training and Data Management Center (ETDMC) with an attached serum bank facility for rinderpest sero-monitoring and sero-surveillance programmes. It is one of the best laboratory facility in the country and also derives its strength from the ICAR project on Animal Disease Monitoring and Surveillance (ADMAS), which has the expertise conducting population surveys, production of ELISA diagnostics, national livestock and disease-related databases for developing disease forecasting models and training facilities.

The ETDMC provides training in the use of rinderpest ELISA for rinderpest sero-monitoring and sero-surveillance and manages the national network of 32 state level rinderpest ELISA laboratories for NPRE. So far, it has strained more than 200 state level veterinary scientists in the use of rinderpest C-ELISA kits. It has been associated with Dr. Andrew James of Reading University, UK in developing the national registry of villages and the statistical sampling frames for rinderpest sero-surveillance. The intricate details and the working modalities have been assessed and trail runs of sero-surveillance in the north-eastern states (Zone A) have been carried out.

a) Concept of Sampling Frame for Rinderpest Sero-surveillance

For the purpose of rinderpest eradication under the OIE Pathway, India has been divided into four epidemiological zones.

- **Zone A states:**
  Arunachal Pradesh, Assam, Manipur, Meghalaya, Mizoram, Nagaland, and Tripura.

- **Zone B states:**

Bihar, Goa, Gujarat, Haryana, Himachal Pradesh, Jammu and Kashmir, Madhya Pradesh, Maharashtra, Orissa, Punjab, Rajasthan, Sikkim, Uttar Pradesh, and West Bengal.

- **Zone C states:**

Andhra Pradesh, Karnataka , Kerala, and Tamil Nadu.

- **Zone D Islands:**

Andaman and Nicobar and Lakshadweep.

Zones A, B and D were provisionally declared free of rinderpest during 1995-96 after stoppage of mass vaccination in 1993-94. In Zone C, the last case of clinical rinderpest was noticed during September 1995 and was provisionally declared free of rinderpest with effect from 1st March 1998.

Along the international border with Pakistan. The Zone B states have been carrying out annual vaccination to create a 30 km-wide barrier zone. This policy will have to be continued until the disease is eradicated from Pakistan. The international border vaccination with Bangladesh and Nepal are not carried out by India, as the rinderpest did not exist in these countries.

Rinderpest has never been recorded in Zone D islands. Therefore, this zone is eligible to be declared free from rinderpest infection subject to other conditions being met.

b) National Village Registry

The distribution of livestock population is village-oriented, each village is treated as a herd/epidemiological unit. To facilitate the random selection of villages in the respective zones a comprehensive list of 634,000 villages for the entire country is compiled, to identify each village with the coded serial numbers to locate the state, and district to which it belongs.

c) Two-Stage Stratification of Sub-Population

Two-stage random sampling is designed to draw samples of villages in each zone and for collection of samples of susceptible eligible animals in the selected villages.

Sampling frame is designed with the purpose of detecting wild rinderpest virus activity with the 95 per cent probability of detection if present in 1 per cent of villages in each zone and at 5 per cent of animals through antibody demonstration at village level. To achieve this goal, on the basis of sampling theory and logistics of practical feasibility of serum collection, 60 sera from each of the 383 villages per zone were considered for sero-surveillance ("Epidem" software used). Accordingly, the total number of serum samples to be collected for the entire country are 3 zones x 383 villages x 30 animals x 2 species (large and small ruminants) = 68,940.

Villages were randomly selected state-wise in each zone giving due weight age of the total number of villages in the zone. The dot density map of India with the selected villages in each district and zones is presented.

Livestock census in each of the selected village is carried out to identify all the eligible animals and 30 each of small and large ruminants were then selected randomly for sero-surveillance.

d) Constraints and Suggested Modifications in the Present Sampling Frame

- The unequal size of the A, B and C Zones; - the allocation of the villages at state level in A and C Zones is at a higher level when compared to B zone.
- Consequently, some of the smaller states are not represented. This dilutes the spirit of participation and involvement.
- The large high risk border areas adjacent to the international border with Pakistan do not get due recognition and there is a need for creating separate strata.
- The original C Zone allocation of state of Maharashtra and Goa are better retained in the C Zone to reduce the selection pressure on B Zone.
- The relocation of state of Orissa from B to C Zone will be better in view of its sea bound location and similarities with C Zone.

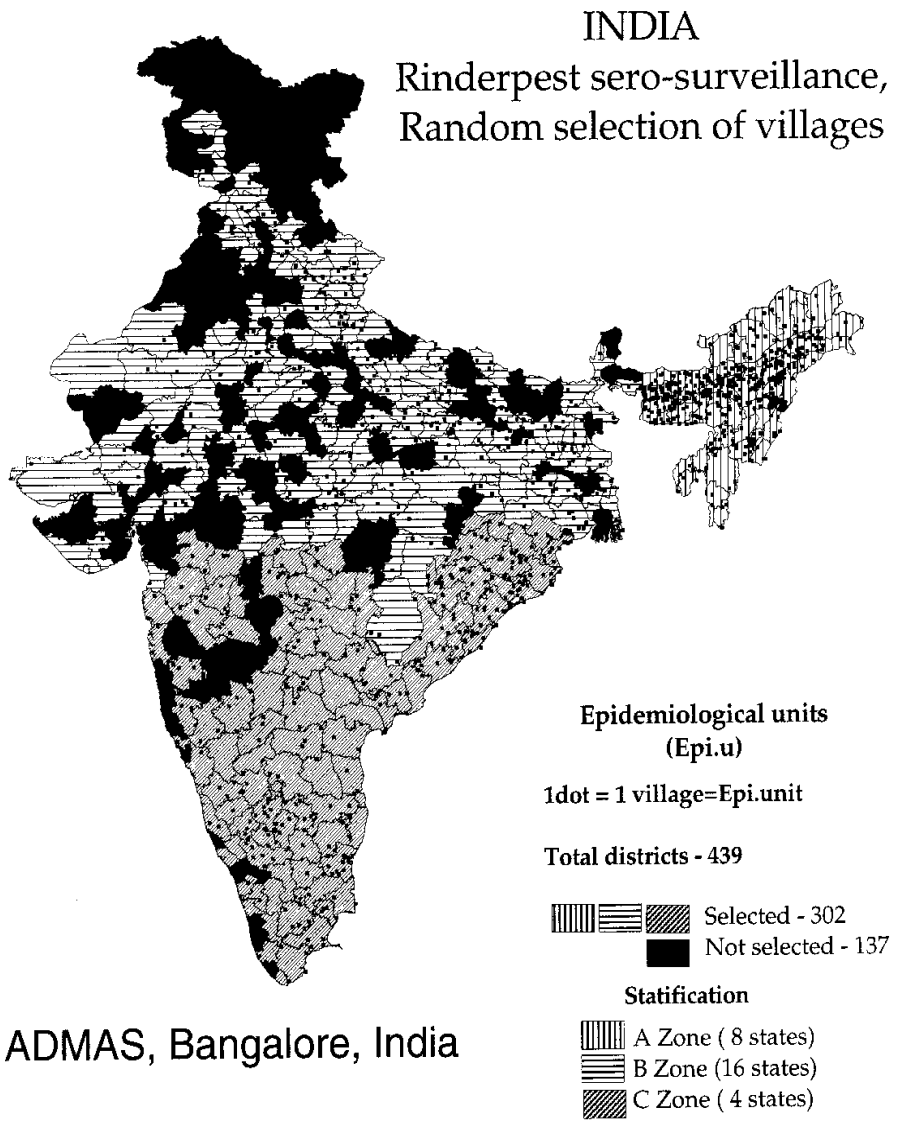
5.3 International Border Surveillance

Rinderpest has been endemic in the Indian sub-continent in addition to Middle Eastern countries in the Arabian Gulf. The contiguity of the landmass and uninterrupted livestock movement make these countries vulnerable for cross border infection. It is gratifying that India and Bangladesh took a common stand some years ago not to vaccinate livestock on either side of the international borders and this has helped both countries to remain free from this disease. Nepal and Bhutan have been free while the rinderpest situation in Pakistan and Afghanistan is of great concern to India and immediate steps need to be initiated as a part of the planned global rinderpest eradication.

The long and porous international border stretching over few thousand miles between Pakistan and India is a major concern as on two occasions in the recent past few hundred cattle strayed into India. These animals were impounded by the Indian border security forces and their sera were rushed to ETDMC, Bangalore to rule out rinderpest. A special surveillance programme needs to be developed for the bordering Indian states to keep vigilance from cross-border reintroduction of rinderpest. International disease obligations have to be given due importance by all the SAARC and the APHCA member countries in their larger regional interests.

In conclusion, India has been making sustained progress for the effective implementation of the proposed sero-surveillance programme. It has put the necessary operational framework in position and has been carrying field trails to ensure success of the programme.

Figure 1: Rinderpest Sero-Surveillance Zoning.



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PART IV

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AGENDA

1. GREP and present global status of rinderpest - progress made in other regions (includes Afghanistan problem)

2. Technology for diagnosis, surveillance and vaccination (includes molecular epidemiology)

3. Regional review with country reports:

    - Bangladesh - progress to verified freedom and emergency preparedness
    - India - progress to verified freedom and emergency preparedness
    - Laos - progress to verified freedom
    - Myanmar - progress to verified freedom
    - Nepal - progress to verified freedom and emergency preparedness
    - Pakistan - intended strategy for eradication (national project plus EC support), surveillance and epidemiology
    - Sri Lanka - surveillance, progress to verified freedom
    - Thailand - progress to verified freedom
    - SAREC - status of national projects and regional support project

4. Epidemiologically based strategy for rinderpest eradication and its application to Pakistan (Discussion: feasibility of implementation in Pakistan)

5. Following the OIE Pathway

6. Constraints to progress and means of resolution

7. Conclusion and Recommendations

TIME-TABLE

Monday, 8th February 1999

09:00 - 09:45	Opening Ceremony
09:45 - 10:00	Tea break
10:00 - 12:30	57th Executive Committee Meeting (for APHCA Ex-Com. Members)
12:30 - 13:30	Lunch break
13:30 - 16:30	Rinderpest Consultation – Country Reports Tea break
16:30 - 17:00	Transboundary Animal Disease Control *(by Peter Roeder)*

Tuesday, 9th February 1999

08:30 - 09:30	The Intensified GREP *(by Peter Roeder)*
09:30 - 10:00	Discussion – How to resolve the remaining infected areas
10:00 - 10:15	Tea break
10:15 - 10:45	Implications of the OIE Pathway *(by Mark Rweyemamu)*
10:45 - 11:30	Strategies for Rinderpest Surveillance in India *(by Malleshappa Rajasekhar)*
11:30 - 12:30	Discussion – How to secure commitment to the OIE Pathway and other issues arising from the morning – Regional Co-operation – past, present and trends *(by Denis Hoffmann)*
12:30 - 13:30	Lunch break

13:30 - 16:00	Working Groups a) India, Nepal, Pakistan *(Roeder, Ozawa, Sinha/Mukhopadhyay)* b) Bangladesh, Laos, Myanmar, Sri Lanka, Thailand *(Hoffmann, Rweyemamu, Rajasekhar)*

Wednesday, 10th February 1999

09:00 - 10:00	Working Groups
10:00 - 10:15	Tea break
10:15 - 12:30	Plenary session – Reports from groups – Conclusion and recommendations (Closing ceremony)
12:30	Lunch break

OPENING ADDRESS

Dr. S.S.E. Ranawana
Chairman of APHCA and
Director, Department of Animal Production and Health

The Chief Guest today, Dr. G. Bernard, FAO Representative in Sri Lanka, Dr. P. Ramanujam, Secretary, Ministry of Livestock Development and Estate Infrastructure, Representatives of the countries on the Executive Committee of APHCA, past members of the Executive Committee from Sri Lanka, Delegates to the Expert Consultancy on Rinderpest, FAO/OIE delegates, observers and distinguished invitees, I take great pleasure in welcoming you to the opening ceremony on this occasion of the 57th Executive Committee Meeting of APHCA and the Regional Expert Consultation on Rinderpest Control. I wish to particularly welcome our foreign guests to Sri Lanka and to Kandy.

We are meeting today and during the next two days with two objectives; one is for the 57th Executive Committee Meeting of APHCA and the second is to hold an Expert Consultation with countries in the region to review the situation with regard to the disease Rinderpest.

As most of you know, the APHCA was established as a regional commission by adoption at the 60th Session of the FAO Council and became operational in December, 1975. The Commission meets once a year and elects an Executive Committee which is expected to give guidance and assistance during that year in the implementation of the work programme approved by the Commission at its annual session. Sri Lanka was elected as the Chairman at the 22nd Session held in June, 1998 and together with India as the Vice-Chairman, and Laos, Myanmar and Thailand as members, form the Executive Committee.

The Commission was created in order to have a common forum for developing strategies to tackle the most pressing problems of livestock agriculture in the region. Thirteen countries, including Sri Lanka signed the original documents of acceptance. Among the general objectives of developing livestock agriculture and raising the living standards and nutrition of smallholder farmers in the region, was the important specific objective of doing so based on collective self-reliance and mutual assistance within the region.

The control of rinderpest in the region, a scourge over the centuries in our countries, is a good example of what could be achieved through such co-operation. Much more remains to be done and I would urge the members to make use of this Commission to a greater extent than has happened in the past. The Commission identified a programme of work for this year which will be reviewed today at the Executive Committee Meeting. Chief among these is the establishment of an electronic network, which makes use of current technology to improve

communications between our countries. We expect that this network will be placed and in use by the end of the year. Improved communication between members and the ready access to information, these new technologies will give a sound platform for future co-operation in many more areas than at present.

I would be failing in my duty if I do not mention the services rendered by past Directors of the Department of Animal Production and Health who are present here today. They have all served as Executive Committee members and some have pioneered the formation of the Commission.

I wish to devote the rest of my talk to present some information on Sri Lanka. This is for two reasons. Your stay in the country will be short and secondly, the island has, in the recent past, received much bad publicity in the media. Sri Lanka is widely acknowledged as one of the most beautiful tropical islands and has often been described, with justification, as the "Pearl of the Indian Ocean". It has contributed a word to the English language, serendipity, derived from the ancient Arab name for Sri Lanka; as you know, it means unexpected fortune and no doubt represented a haven for old seafarers.

It has a long history, which has been, uniquely, recorded in a chronicle known as the Mahavamsa. This history has taken the form of repeated invasions from the neigbouring countries to the North and the East followed by 500 years of colonization from the West. This continuous influx has resulted in a rich ethnic mix and the existence of a unique culture within the island due to blending of these different influences. Sri Lanka is also known for its friendly and hospitable people and for a good overall quality of life.

Finally, Ladies and Gentlemen, I welcome to Kandy, the hill capital and the home of the last king of Sri Lanka. It is beautifully located, nestled between green hills and at an altitude which makes the climate mild throughout the year. It is made special by the presence of the foremost Buddhist place of worship in the world, the Temple of the Tooth, and by a unique culture associated with it.

I welcome you once again, and wish you a most pleasant stay.

INAUGURAL ADDRESS

Dr. P. Ramanujam
Secretary
Ministry of Livestock Development and Estate Infrastructure, Sri Lanka

Dr. G. Bernard, FAO Representative in Sri Lanka
Dr. S.S.E. Ranawana, Chairman of APHCA
Dr. Denis Hoffman, Secretary of APHCA and FAO Regional Officer
Distinguished guests
Ladies and Gentlemen,

Today, we are inaugurating two extremely important programmes.

Firstly, the 57th Executive Committee Meeting of the Animal Production and Health Commission for Asia and the Pacific which will commence shortly. I am aware that APHCA has been formed about three decades ago mainly to work towards the common objective of improving animal production and health aspects in countries of the region. APHCA, having such broad objectives, was free to formulate and implement programmes covering any area in the field of animal production and health. I am also aware that APHCA has been extremely active in the region, specially during the first few years after its inception. Considerable progress and achievements have been in the field of regional manpower development and dissemination of information. The Executive Committee that is elected once a year is responsible for implementation of the APHCA programmes. I am happy to note that the first Executive Secretary of APHCA was a Sri Lankan. Sri Lanka's representation in APHCA has also been a very active throughout the past decades.

However, during the past few years, I noticed that there has been a gradual slowing down of APHCA programmes. Asian Livestock, the APHCA publication that conveyed regional news does not reach me now. There are few training programmes and exchange of regional experts and programmes for bilateral co-operation. In this regard, I understand that Sri Lanka has moved a resolution at an APHCA annual general meeting about three years ago, requesting that programmes of APHCA should be evaluated in order to develop short and long term thrust areas for the future. This way it will be possible for APHCA to be an effective organization once again in the future. I hope that some action has been taken on this matter and programmes of mutual importance identified and implemented by APHCA. Further, there is also a need to look at emerging groups within the region. ASEAN has been a very active group and is contributing in a big way to the region. Similarly, SAARC, our own regional group is now emerging as another strong force. In the light of the emergence of EURO as a common currency, sub-regional groups like SAARC and ASEAN will certainly have a very strong and a prominent role to play in the future. The Executive Committee can explore ways and means of working with such groups.

I am sure that the Executive Committee will consider these observations and attempt to make APHCA a useful force in the region.

The other programme to be inaugurated today is the Regional Expert Consultation on Rinderpest Control. Rinderpest, as you all know, is one of the List A diseases of cattle as identified by the OIE. There is regional and global concern towards eradicating this disease. We in Sri Lanka, were able to eradicate rinderpest within a short time when the disease was introduced in 1926 and again in 1942. At that time with the limited technology, manpower, communication and other resources, Sri Lanka was able to eradicate this disease within a short time. Today we have much improved and super technology, communication systems and highly trained manpower. Unlike our ancestors, who used crude vaccines, today's veterinarians have extremely potent vaccines against rinderpest. Thermostable vaccines which are available now is a boon to countries in the region. It is also possible to perform sero-surveillance of livestock to identify disease status. Such a sophisticated technology is available in most countries, including Sri Lanka. Also today, we are inaugurating an expert consultation on the subject. Thus with all these new activities and resources, we should be able to do much better than what our ancestors did. Based on new technological approaches, the OIE has advised on certain steps to declare countries free from rinderpest. I am aware that India, Nepal, Bangladesh, etc., are well ahead in this programme. Sri Lanka will follow the steps shortly.

Before I conclude, I must convey that I am happy to see both these programmes are hosted by Sri Lanka. I would like to extend my welcome to all participants and very specially to the foreign participants. I trust that you will make use of your stay in Sri Lanka, not only to confer on technical matters, but also to enjoy what Sri Lanka can offer in hospitality, scenic beauty, traditions and culture.

My best wishes are also with you for both the discussions to be continued and concluded in a most successful and meaningful way.

WELCOMING ADDRESS

Dr. G. Bernard
FAO Representative in Sri Lanka

Dr. P. Ramanujam, Secretary, Ministry of Livestock Development
and Estate Infrastructure,
Dr. Sivali Ranawana, Chairman of APHCA,
Distinguished Executive Committee Members of APHCA,
My dear FAO colleagues,
Ladies and Gentlemen

I am grateful to the Chief Guest for presiding over the opening ceremony of the 57th Executive Committee Meeting of the Animal Production and Health Commission for Asia and the Pacific and the Regional Expert Consultation on Rinderpest Control which will be held here continuously from 8 to 10 February 1999.

May I extend to you all, a warm and sincere welcome on behalf of Dr. Jacques Diouf, Director-General of FAO, Dr. Prem Nath, Assistant Director General and Regional Representative for Asia and the Pacific, and on my own behalf.

APHCA, since its inception in December 1975, has been actively involving in livestock development activities in Asia and the Pacific Region. APHCA has been very successful in promoting "collective self-reliance and mutual assistance" between its 14 members of which 13 are developing countries. In the past, the primary mechanisms used to implement this co-operative strategy have been periodic meetings of veterinary officers and animal scientists from the member countries, joint sponsorship of training and workshops, and collaboration among individual scientists in research projects.

I understand that APHCA is now focusing on the issue of how best the Commission can serve its members in the forthcoming 21st Century. One of the important tasks is that the Commission moves into electronic communication. APHCA homepage is now on the world-wide-web and anyone can get into it, communicates, and accesses to various useful and informative links. This certainly allows member countries to communicate more efficiently.

For the Regional Expert Consultation on Rinderpest Control, I would like to quote a small part of the speech of Mr. Govind R. Patwardhan, Chairman of APHCA (1997-98). He stated at the Opening of the 22nd APHCA Session held in Bangkok that "…while the Global Rinderpest Eradication Programme has made much progress, its success in this Region, which is dominated by variety of problems, needs close collaboration of individual country…". From this afternoon onwards, the floor will be opened to you all during your three days' session to discuss and bring out concrete conclusion and recommendations.

Now, before I conclude, I would like to express my sincere appreciation to all the APHCA Executive Members, experts and observers for your kind participation in the 57th APHCA Executive Committee Meeting and in the Regional Expert Consultation on Rinderpest Control. I wish you all successful sessions and a pleasant stay in Kandy.

Again, I sincerely thank our Chief Guest for his presence here despite his busy schedules. Thanks to the Government of Sri Lanka, all concerned officials and my FAO colleagues who have beautifully organized and will further handle the sessions.

Thank you.