

- 1) Diagnostic services should be practised with the expectation that it must include certain seed for further study.
- 2) More effective and efficient diagnosis should be pursued by using new rapid technology and by standardization of diagnostic process.
- 3) The data collected in diagnostic services should be processed and analyzed the actual outbreaks of disease in the field in order to feed back them to the field services.
- 4) Consultation and discussion on diagnostic cases should be carried out frequently among staff at NAHPI and pathologists of DLC and the Veterinary Pathology Society of Thailand.
- 5) The function as a disease investigation and information center should be organized with DLC, VRD, other division and university in diagnostic services.

6.2.4. Improvement of Supporting Services

Supporting services are divided into four sections chiefly. They are experimental animal unit, maintenance section, information section including library management, and extension and technical transfer services. Those services are usually plain and always hidden the research and diagnostic works. However, they are indispensable to carry out active research.

Various efforts have been made with the advance in services works at NAHPI for the past four years. However, some problems have been brought to every section engaging in supporting services.

A. Experimental Animal Unit:

This unit is necessary to obtain and take care experimental animals using for research and diagnostic works. Although the staff of experimental animal unit have made efforts to keep the facility at good condition. Problems faced to the unit disturb the proper function due to

lacking of man-power and costly maintenance fee. Consequently, management of experimental animals are not sufficient. Production of inbred and crossbred mice has been succeeded already in that condition.

Collaborated research has been proceeded in the animal science under the cooperation with other laboratories. The problems derived from animal experiments have been discussed and solved by the agreement of the Animal House Committee and the Animal User's Committee of NAHPI. However, staff in the animal unit and user's recognition for experimental animals are not enough at NAHPI.

To further study, the following items are recommended ;

- 1) Every staff, especially senior researcher have to be concerned with the problems of animal experimental unit.
- 2) Both of the committees for animal house and user's should be closely related and should discuss enough on efficient running of the animal experiment.
- 3) The incinerator should be repaired to prevent the smoke into experimental animal house.

B. Maintenance of facility and equipment :

Facilities and equipment are indispensable as implement and means for carrying out the research activities. It's property of the maintenance has a great influence on upkeep and improvement in the research level. Therefore, the sophisticated equipment including the electron-microscopes have been provided to NAHPI and almost of all have been kept up at good condition. With regard to the electron-microscopes and some parts of the facilities, however, problems remained to be solved due to the insufficient techniques and number of staff on maintenance. It is desirable that the problems of the maintenance should be improved through a real research activities.

C. Information Services and Library Management :

This section plays an important role to provide the latest

information and references on research tendency to scientific researcher. However, the number of library equipment and staff necessary to offer the services have not been enough at NAHPI as a research institute. Therefore, it is desirable that set-up the specific computer for library to link the database with other libraries. Further Japanese experts guidance or staff training should be provided to this section for comfortable use.

D. Technical Transfer and Extension Services :

Technical transfers have been provided to the researcher and personnel in DLD and other organizations through the conference, seminar and training course at NAHPI. The number of seminar and training course held at NAHPI is getting increase steadily and gradually. Some publication such as abstract on research at NAHPI and proceedings of the seminar have been reported. Those activities have been also brought good stimulation to research and diagnostic works at NAHPI. However, equipment and staff necessary to transfer the technology and knowledge are not enough.

To further study, following items are desirable ;

- 1) The opportunity to transfer the technology and knowledge must be increased gradually with step up the level of research works.
- 2) Researcher should make efforts to write the results obtained from research and diagnostic works in paper.
- 3) Equipment and staff necessary to advance the extension services should be provided.

E. Others

The antigen and antisera necessary to the research and diagnostic services have been prepared in every laboratory. However, any datum of the collection and preservation of them has to be drawn up a list as a library for a common use.

6.3 Activities at Foot and Mouth Disease Vaccine Production Center

In the former Animal Health Improvement Project, basic technology for vaccine production and mass production system of foot-and-mouth disease (FMD) vaccine using suspension culture and rolling bottle culture methods were established by great effort of Thai and Japan. The large amounts of the vaccine more than 10 million doses produced annually had significantly contributed to reduce the incidence of FMD outbreaks in Thailand as shown in the annual statistics prepared by DLD (Appendix 11,12). Based on this achievement, to promote FMD control more efficiently, research on diagnostic method and research on improvement of vaccine quality were focussed at this Project. The research activities in the past five years of Project period were summarized as follows.

6.3.1 Research Progress

1. Research on Diagnostic Method.

- 1) Antigen analysis of FMD virus isolated in Thailand by neutralizing monoclonal antibodies.

In FMD virus, antigenic characteristics of prevalent field virus may change while using same vaccine strain. Therefore, it is necessary to compare the antigenic variation between vaccine strain and field isolates periodically.

Antigenic compatibility between vaccine strains and field isolates of FMD virus was investigated using monoclonal antibody (MAb) to estimate the efficiency of the vaccine strains used in Thailand. MAbs were produced with type O and type Asia-1 vaccine strains and obtained 6 and 9 neutralization positive clones respectively. Field isolates were selected from samples collected in various areas in the country in 1989 and 1990. Compatibility of the antigen was examined by neutralization test with the MAb. In type O, 4 of 13 strains were neutralized by all of the type O MAb, whereas 3 strains were not neutralized by any of them. Type O field

isolates in Thailand seemed to be varied widely in their antigenicity. It may be necessary to examine the antigenicity more precisely. In 10 strains of type Asia-1 field isolates, all of the isolates were neutralized by 3 MABs. Antigenicity in type Asia-1 virus prevalent in the field seemed to be small variation consequence. There may not be a problem about type Asia-1 vaccine strain.

2) Establishment of VIA antibody detection method.

Generally, antibody to virus infection associated (VIA) antigen was detected only in infected animals. Therefore, the test for antibody against VIA antigen may discriminate between antibodies due to infection or vaccination. In this project, anti-VIA-antibody detection method was examined, and was concluded that ELISA is more sensitive than agar gel diffusion test (AGDT) for detecting the antibody in cattle sera. Recently, reactivity of chemically synthetic fragments of RNA polymerase peptides with FMD virus infected and/or convalescent VIA positive sera and hyperimmunized guinea pig sera was examined in FMD center by guest researcher Dr. SAEKI from exotic disease research division of NIAH. After clearance of few points, this system will be used for screening of animals whether convalescent from FMD or immunized with inactivated vaccine.

3) Field virus isolation with highly sensitive cell line.

This study was performed to select more sensitive cell for assay and the virus isolation from samples. A continuous cell line (FLL-YFT cells) derived from the fetal lamb lung was established for the assay of FMD virus. The FMD virus showed marked cytopathic effect (CPE) and produced clear plaques on the FLL-YFT cell monolayers. On the growth curve experiment of the vaccine strains (type O,A and Asia-1), the progeny virus appeared in culture fluid at 4 hours and one step growth of virus was finished at 8 hours after inoculation. The CPE was initially observed at 4 hours and cell monolayers were completely destroyed and detached from the glass surface at 8 hours after inoculation. The maximum virus

titers were approximately 10^7 - 10^8 TCID₅₀/ml in each serotype. The vaccine strains were titrated using FLL-YFT, BHK-21, calf kidney primary cells (CK) and calf thyroid primary cells (CTH) to compare the susceptibility against FMD viruses. All serotypes showed similar virus titer in each of cell cultures examined. The end point of CPE could be read after 2 days in CTH cells, but 3 days in the other cells. The tongue tissue suspensions from the field outbreaks were titrated on FLL-YFT, BHK-21, CK and CTH cells. The virus titer obtained was the highest on CTH cells. However, some samples could be detected viruses in FLL-YFT cells but not in CTH cells and other cells. The FLL-YFT cells has a higher susceptibility to FMD viruses than BHK-21 cells and approaches the FMD viruses with the convenience of a continuous cell line.

2. Research on Improvement of the Vaccine.

1) Establishment of 140S quantification method by sucrose gradient ultracentrifugation.

This study was performed to quantify the virus particle which is important for vaccine production, such as preservation, quality of FMD vaccine etc.

Sucrose gradient ultracentrifugation method was established for quantification of FMD virus particles. MS-2 phage was used as a sedimentation marker and adenine solution was used as a optical standard. To optimize the assay condition, 1) photometrical properties of sucrose and their gradients, 2) ultracentrifugation conditions were tested. It was confirmed that the fraction of 140S peak in sucrose gradient correspond to FMD particles by immunological, physicochemical and biochemical analyses. Standardization of 140S value was also performed by comparing the theoretical values to the experimental values. A distinct 140S peak was detected from only 1ml of unconcentrated crude virus fluid for less than 4 hours and it was represented that their reproducibility and linearity were sufficiently high(SD= \pm 10.9%, r=0.98,

respectively).

This technique will be a very powerful tool for not only tracing the dynamics of FMD virus particles under processing of vaccine production but also estimating the vaccine potency, and it will remarkably promote the improvement of vaccine production process and quality.

Above research activities were performed steadily by Thai counterparts and Japanese experts, and techniques used in these research were transferred from Japanese experts to counterparts.

6.3.2. Other Activities including Vaccine Production and Diagnostic services.

The FMD Center has two major objects of FMD vaccine production and diagnostic services for the country. The research and investigation conducted at the center have been closely linked with such activities. That is to say, the research/investigation oriented from the needs of vaccine production and diagnosis to be taken at the Center and the achievement derived from such research/investigation return on apply to the practical use of production and diagnosis.

The circumstances for research/investigation at the Center are generally favorable in new of facilities, equipment, man-power as well as funding. Appendix 11 shows the production of FMD vaccine at the Center. It is noted that steady increase in volume and quality have been achieved. On the other hand, case of FMD reported from the field has decreasing trend yearly along with the progress of vaccination campaign(Appendix 12). It has been already 14 years since the facilities of vaccine production were constructed. In spite of great efforts and attention had been given to supporting and maintenance of facilities and equipment, some of them has been reached to renew or out of repair by their lousy quality. Due consideration for renovation of facilities shall be given urgently.

6.4 Overall Effect of Project

The operation of this institute was demanded to cover a wide range (in terms of study fields and study items) from view points of progress of the Project. However, due to the active studies on important study subjects in each fields, steady progress has been made in various aspects in cooperation between Japanese and Thai sides during five years of the Project. The results of these studies have been made public through academic meetings, journals, and others.

Thus, the initial objectives have been mostly attained. When reviewed as a whole, however, progress have not seen in some fields such as bacteriology, immunology, epidemiology, and so on, because of lack of long term experts. From now on, an emphasis should be put on reinforcement of these fields.

In addition, since efforts have been made to train the staff to acquire technical skills, transfer of techniques of basic experimental or test methods, which would be foundation of research, has been mostly accomplished. However, nowadays molecular biological technique is essential or antigenical analysis and diagnosis, or development of vaccine mainly in virological, bacteriological, and immunological fields. Therefore, Technical transfer needs to put emphasis on introduction of new technology in the future.

6.5 Administration of the Project and Legal Arrangement of NAHPI

6.5.1 Administration of the Project

Generally, steady progress has been made in organization and establishment of the institute, which were the initial objectives of this Project.

However, in order that the institute do work as the center of research in Thailand, clear systematization and positioning of study subjects are necessary for the future project.

Furthermore, since the period of the Project is limited, it is really difficult to cover all the study fields or the diseases in present situation. Therefore, research works should be consolidated on selected subjects as focussed on important diseases.

Particularly, the five items DLD designed as most important subjects for livestock development in Thailand; swine fever, paratuberculosis, copper deficiency of cattle, survey of health condition of imported cattle, and foot-and-mouth disease, should be given priority when studies are promoted.

Therefore, in order to accomplish these assignment, cooperation among laboratories and integrated research system is essential.

In research on FMD disease, examination of antigenicity and immunogenicity of prevalent strains by using monoclonal antibody and promotion of effective use of vaccine by using 140S quantification method are essential in future studies.

On the other hand, more stress needs for establishment of planning, drafting and arrangement of studies in order to activate research.

Since diagnostic service is demanded year by year and play a major part of the operation of the institute, measures for efficient administration are desirable. In addition, the findings from diagnosis must be returned to each research field or to administration of animal health services.

For this purpose, organization of disease information network, and data analysis in epidemiological section and feedback of the data to the organization concerned is necessary.

6.5.2 Legal arrangement of NAHPI

It has been pointed out from the early stage of the Project that NAHPI should make itself clear and firm legal background as a national institute. The Team was informed that considerable efforts were given to

this matter by relevant authorities, however, there is no substantial progress made up to the present.

This situation arises a number of hindrance for smooth implementation of the Project as well as the management and operation of the NAHPI itself.

Due consideration shall be given to this matter. It is hoped that substantial progress of legal arrangement of NAHPI shall be achieved prior to the Project extension arrangement.

The evaluation team considers that without having firm legal background of NAHPI, the Project activities can not be sustained properly.

7. Conclusion and Recommendations

7.1 National Animal Health and Production Institute

The Project aims as its final goal, to establish an advanced scientific institution at international level which will conduct research and investigation in the field of animal health for the promotion of livestock industry in Thailand.

For this purpose, National Animal Health and Production Institute (NAHPI) was constructed at Bangkok, Bangkok under the Grant Aid Programme of Japanese Government. The institute was supposed to be one of the national institutions belonging to Department of Livestock Development (DLD), Ministry of Agriculture and Cooperatives of the Royal Thai Government.

Since the institute was officially opened by Her Royal Highness Somdej Phrathep-Ratanarajsuda Siam Boromrajakumari on January 6, 1987, the Project activities have been substantially implemented.

DLD has Veterinary Research Division as one of its technical divisions which has been conducting limited scale of research and investigation particularly on infectious and parasitic diseases of animal

and poultry before and after the commencement of the Project.

All the functions, personnel and other technical resources of this Division have been transferred to the site of NAHPI, and re-arranged or re-organized for the purpose of the Project. The scope of NAHPI works has been expanded and deepened based on this Division.

The Evaluation Team has examined and reviewed the Project progress for the last five years of operation, and agreed to conclude as follows:

1) The research laboratories of NAHPI composed of respective fields of animal health have already been functioned.

They are equipped with basic to advanced apparatus which will meet practical requirements for conducting modern research and investigation in each field. Procurement of researchers, technicians and other supporting staff is also achieved to some extent in number, and various types of training and seminars have been held for technology improvement of such staff.

2) The supporting units for ensuring smooth and efficient research activities have been strengthened up to acceptable level. Namely,

(1) Experimental animal management

(2) Library services

(3) Information and extension services

(4) Maintenance of facilities and equipment

3) Research and investigation activities related to the Project purposes have been steadily promoted and progressed.

4) Collective research for emerging importance has been intensified.

7.2 Foot-and-Mouth Disease Vaccine Center

The Project includes research cooperation on foot-and-mouth disease (FMD) at FMD Center, Nong Sarai, Pakchong, under the NAHPI Project.

After the completion of technical cooperation project for establishing mass production system of FMD vaccine with great success.

the Center has been producing constantly approximately 10 million doses of vaccines per year which is corresponded 12 to 15 times when compared with pre-project production level and almost 1.5 times to the Project target.

Under the NAHPI Project, research cooperation for improvement and development of diagnostic methods and vaccine quality is focussed on intensification of FMD control in Thailand in cooperation with nationwide vaccine campaign.

Research progress and achievement can be summarized as follows:

All of the techniques established in this Project may contribute for the field survey of the disease and improvement of the vaccine quality. However, monoclonal antibodies should be characterized more precisely, such as binding site of the antibody, and number of field isolates and sampling area should be increased to confirm antigenic variation for the establishment of profiling test.

It is also recognized that the research activities on diagnostic methods should be continued for the completion of the present research target.

In conclusion, the Team agrees to recommend that the Project be extended another two (2) years as the present scheme to complete the Project target set forth in R/D of the Project.

Main activities to be implemented during the proposed extended period are considered as follows:

A. NAHPI

1) To conduct and complete collective research programmes confirmed at the Joint Committee in 1990.

This will contribute directly to solve the major problems of animal health hindering sound development of livestock in Thailand as well as to prove advances of research capability of the Institute.

2) To continue to strengthen supporting activities of following units:

- (1) Experimental animal unit
 - (2) Information and documentation services
 - (3) Extension and technical transfer
- 3) To strengthen efficient diagnostic services.
- 4) To establish legal position of NAHPI as a government institution.

B. FMD Center

To continue to complete research and development of diagnostic methods introducing monoclonal antibody techniques. END

Appendix 1. Summary of National Animal Health & Production Institute Project

Project: Dec. 9, 1986 to Dec. 8, 1991

SUMMARY OF PROJECT	VERIFIABLE INDICATORS	MEANS OF VERIFICATION	IMPORTANT ASSUMPTION
<p>Overall Goal to which the Project contributes: To promote and contribute livestock development in Thailand.</p> <p>Project Purpose: 1. To establish a research institution (NARPI) at international level in the field of animal health and promote advanced research and investigation at NARPI. 2. To promote research and investigation on Foot-and-Mouth disease at FMD CENTER.</p>	<ol style="list-style-type: none"> 1. Incidence and prevalence of animal diseases. 2. Productivities of livestock. 3. Animal population and animal products production (by value). 4. Import & export of animal and animal products. <ol style="list-style-type: none"> 1. Preparation and establishment of laboratory facilities, equipment and others. 2. Provision of personnels such as researchers, lab. assistants, other supporting staffs. 3. Development of lab. technology, experimental animals, reagents, antigens and chemicals. 4. Production of academic documents on research and investigation. 5. Extension and information services. 	<ol style="list-style-type: none"> 1. Kind of diseases, number of incidence, and areas concerned. 2. Loss of animals, production increase, etc 3. Population increase by kinds and areas. 4. Production index and value by year. 5. Number, quantity, and values by year. <p>Evaluate the degree of progress of each items by analysing indicators mentioned in left column qualitatively and quantitatively.</p>	<ol style="list-style-type: none"> 1. The present trend of natinal economic growth is continued and the level of national income is assured not below than present. 2. No malignant animal infectious disease which will affect livestock economy seriously is prevailed. 3. No remarkable changes on livestock conditions such as feeding costs and livestock pollution problems. 4. Adequate livestock promotion policies are implemented. 5. Vaccines, veterinary drugs and others are prepared in quality and quantity.
<p>Results/Outputs: 1. Research and investigation to determine any causes of low productivity and economic losses of animal and poultry at NARPI. 2. Research and investigation to develop countermeasures concerned with above. 3. Establishing supporting activities for effective implementation of research, etc. 4. Research promotion on Foot-and-Mouth disease.</p>	<ol style="list-style-type: none"> 1. Technical and academic reports and articles. 2. Implementation and results of diagnostic services. 3. Reference services and other supporting activities to the Diagnostic Laboratories. 4. Receiving of researchers and technical staffs from outside. 5. Production and utilization of experimental animals 6. Publication, training courses and seminars. 7. Qualification of researchers. 	<ol style="list-style-type: none"> 1. Quality of articles also considered. 2. Analysis of statistics, comparison by years, way of utilization. 3. Number of reference diagnosis and other details for supporting. 4. Number of accepted researchers and technical staffs. 5. Production, management of experimental animals by years. 6. Seminars and training courses held, production and distribution of documents. 7. Acquisition of Ms and/or Ph.D. 	<ol style="list-style-type: none"> 1. Provision of research and technical staffs qualitatively and quantitatively. 2. Establishment of the Laboratory organization and management. 3. Budget for research implementation. 4. Coordination and cooperation between related institutions.
<p>Activities: 1. - Collection and analysis of filed data. - Diagnosis, chemical analysis of field materials. - Establishing fundamental techniques including new technology, and epidemiology. 2. - Development of diagnostic method and biologics. - Analysis of feeds, feed additives and toxic substances. 3. Research promotion on selected topics. 4. - Production and management of exp. animals. - Information services including library. - Extension services and technical transfer. 5. - Study on Foot-and-Mouth disease diagnosis. - Study on FMD vaccine quality improvement.</p>	<p>Input by Japan side: 1. Assignment of long and/or short term experts on virology, bacteriology, pathology, parasitology, biochemistry, Foot-and-Mouth, and experimental animal. 2. Expert(s) of other fields, if necessary. 3. Provision of equipment, books, vehicles, etc. 4. Acceptance of training personnels.</p> <p>Input by Thai side: 1. Provision of counterpart officials. 2. Provision of land, buildings and other related facilities. 3. Supply or replacement of machinery, equipment, instrument, and others. 4. Provision of running expenses for the implementation of the Project.</p>	<p>Checked by related documents, reports, and other statistics.</p> <p>Same as above.</p>	<ol style="list-style-type: none"> 1. Construction of the Laboratory buildings by Japanese Grant Aid Project. 2. No emergency research topics provoked. 3. Stabilizing research and thechnical staffs at the Institute.

Prepared from the Documents on Implementation Survey, Planning and Consultation Teams.

M. O.

Appendix 2. List of Japanese Experts Assigned to NAHPI and FMD Center

Table 1

EXPERTS	1st Year Dec.1986~	2nd Year Dec.1987~	3rd Year Dec.1988~	4th Year Dec.1989~	5th Year Dec.1990~
Team leader					
Dr. Tamotsu ITO Dec.25,1986 - Dec.31,1987	XXXXXXXXXXXX				
Dr. Chuzou USHIMI Feb.13,1988 - Jul.12,1989		XXXXXXXXXXXX			
Dr. Tetsuo KUMAGAI Jun.19,1988 - Dec.08,1991			XXXXXXXXXXXX	XXXXXXXXXXXX	XXXXXXXXXXXX
Coordinator					
Mr. Hiroshi MATOBA Jan.4,1987 - May.13,1987	XXXXXX				
Mr. Yoshihiro SHIMIZU Oct.6,1987 - Dec.08,1991		XXXXXXXXXXXX	XXXXXXXXXXXX	XXXXXXXXXXXX	XXXXXXXXXXXX
Long-term experts (Virology)					
Dr. Koichi TAKEHARA Jan.20,1987 - Jan.19,1989	XXXXXXXXXXXX	XXXXXXXXXXXX			
Dr. Tomiaki MORIMOTO Jun.19,1989 - Dec.08,1991			XXXXXXXXXXXX	XXXXXXXXXXXX	XXXXXXXXXXXX
(Parasitology)					
Dr. Hiroaki NISHIKAWA Jan.20,1987 - Jan.19,1990	XXXXXXXXXXXX	XXXXXXXXXXXX	XXXXXXXXXXXX		
Dr. Yusuke TADA May.24,1990 - Dec.08,1991				XXXXXXXXXXXX	XXXXXXXXXXXX
(Pathology)					
Dr. Masashi MORIWAKI Jan.20,1987 - Jan.19,1989	XXXXXXXXXXXX	XXXXXXXXXXXX			
Dr. Shigemi SHOYA Nov.14,1989 - Nov.13,1991				XXXXXXXXXXXX	XXXXXXXXXXXX
(Biochemistry)					
Dr. Mistuaki HAYASHI Apr.25,1989 - Oct.24,1991			XXXXXXXXXXXX	XXXXXXXXXXXX	XXXXXXXXXXXX
(FMD)					
Dr. Takaaki SUGIMURA Mar.30,1987 - Mar.29,1988	XXXXXXXXXXXX				
Dr. Junsaku SIRAI Aug.1,1988 - Jul.31,1989		XXXXXXXXXXXX			
Dr. Shigeo YAMAGUCHI Oct.3,1989 - Oct.2,1990				XXXXXXXXXXXX	
Dr. Kenichi SAKAMOTO Nov.20,1990 - Nov.19,1991					XXXXXXXXXXXX
(FMD)					
Dr. Toshihito SUZUKI Jun.4,1987 - Jun.3,1988	XXXXXXXXXXXX				
Dr. Akio FUKUSHO Oct.1,1988 - Dec.25,1989		XXXXXXXXXXXX	XXXXXXXXXXXX		
Dr. Toru INOUE Feb.20,1990 - Feb.19,1991				XXXXXXXXXXXX	
Dr. Mariko ETO Jan.10,1991 - Jan.09,1992					XXXXXXXXXXXX

Table 2

EXPERTS	1st Year Dec.1986~	2nd Year Dec.1987~	3rd Year Dec.1988~	4th Year Dec.1989~	5th Year Dec.1990~
Short-term					
1986 Japanese Fiscal Year					
Dr.Hiroshi Watase (Bacteriology) Jan.20 - Apr.17,1987	XXX				
Dr.Shigeyoshi Nagasawa (Biochemistry) Jan.20 - Mar.31,1987	XXX				
1987 Japanese Fiscal Year					
Dr.Koichi Namba (FMD) Apr.16 - Jul.15,1987	XX				
Dr.Chuzou Ushimi (Virology) Oct.18 - Oct.31,1987		X			
Dr.Kazunori Hashimoto (Bacteriology) Nov.27,1987 - Feb.15,1988		XXX			
Dr.Tomoo Yoshino (Pathology) Nov.27,1987 - Feb.26,1988		XXX			
Dr.Yoshiko Motoi (Biochemistry) Jan.10 - Mar.9,1988		XXX			
Dr.Noriyuki Taira (Parasitology) Mar.24 - Jun.21,1988		XXX			
Dr.Tsunemasa Motohashi (Experimental Animal) Mar.29 - Apr.28,1988		X			
1988 Japanese Fiscal Year					
Dr.Koichi Namba (FMD) May.20 - Aug.19,1988		XXX			
Dr.Tetsuo Morozumi (Bacteriology) Nov.10,1988 - Feb.9,1989			XXX		
Dr.Yoshio Mizuno (Virology) Jan.25 - Apr.11,1989			XXX		
Dr.Michio Nakagawa (Pathology) Mar.20 - Jun.19,1989			XXX		
1989 Japanese Fiscal Year					
Dr.Yasuyuki Nakajima (Pathology) Aug.3 - Oct.29,1989				XXX	
Dr.Tadashi Tokui (FMD) Aug.21 - Nov.21,1989				XXX	
Mr.Teruo Hiruta (Machinery Maintenance) Sep.22,1989 - Mar.21,1990				XXXXXXXX	
Dr.Koichi Namba (FMD) Oct.13 - Nov.8,1989				X	
Dr.Tatsuo Oya (Bacteriology) Nov.8,1989 - Feb.5,1990				XXX	
Dr.Koichi Nakamura (Parasitology) Nov.27,1989 - Feb.26,1990				XXX	
1990 Japanese Fiscal Year					
Dr.Koichi Namba (FMD) Nov.6, - Dec.24,1990					X
Dr.Isao Nonomura (Bacteriology) Nov.6, - Dec.24,1990					X
Dr.Takashi Ogawa (Epidemiology) Nov.20,1990 - Feb.19,1991					XXX

Appendix 3.

Equipments, materials and others provided by JICA budget
(Million yen ; 1986 -1991)

Fiscal year	Equipments & material		Modification and repair of building & others #	Local expense @	Total
	Procured	Carried by experts			
1986	65.5	5.7		2.2	73.4
1987	47.0	8.1	0.5	8.9	64.5
1988	69.3	5.9	2.0	7.4	84.6
1989	70.8	4.2	2.0	6.8	83.8
1990	88.7	2.6	3.3	6.8	101.4
Total	341.3	26.5	7.8	32.1	407.7

#: Storage for flammable reagent(1987), repair of incinerator (1988), Electric breaker(1989), Modification of animal and autopsy room; and publication("ABSTRACTS" 1990)

@: Local expense : Expenses for activities of experts and Thai counterpart such as laboratory materials, small equipments, and so on.

Appendix 4.

Counterparts study in Japan

Name	Duration	Subject	Present Position
1986 Japanese Fiscal Year			
Dr.Rumpa Intraraksa	Mar.22 - Jun.21,1987	Biochemistry	NAHPI:Biochemistry
Dr.Supote Methiyapun	Mar.26 - Sep.25,1987	Patholgy	Chulalongkorn Univ.
1987 Japanese Fiscal Year			
Dr.Ladda Mulika	May.22 - Nov.21,1987	Bacteriology	NAHPI:Bacteriology
Ms.Prapit Klainin	Aug.29,1987 - Feb.26,1988	Biochemistry	NAHPI:Biochemistry
Dr.Nopporn Sarataphan	Jan.10 - Jul.09,1988	Parasitology	NAHPI:Parasitology
Dr.Ladda Trongwongsa	Mar.27 - Sep.24,1988	Pathology	NAHPI:Pathology
Dr.Chengchai Chuntharusmi	Mar.27 - Sep.24,1988	F.M.D	FMD Center
Dr.Wasana Pinyochon	Mar.27 - Oct.14,1988	Virology	NAHPI:Virology
1988 Japanese Fiscal Year			
Dr.Indhira Kramontong	May.29 - Dec.03,1988	Bacteriology	NAHPI:Bacteriology
Dr.Jatuporn Smitanon	Aug.08,1988 - Mar.09,1989	Epidemiology	NAHPI:Epidemiology
Dr.Arinee	Aug.08,1988 - Mar.09,1989	F.M.D.	Khonkaen Univ.
Chatchawanchonteera			
Dr.Sukanyanee Thonasuth	Feb.13,1989 - Feb.10,1990	Parasitology	Retirement
1989 Japanese Fiscal Year			
Dr.Arune Chaisingha	Aug.28,1989 - Mar.04,1990	Virology	NAHPI:Virology
Dr.Monaya Ekgatat	Aug.28,1989 - Aug.23,1990	Immuno-serology	NAHPI: Immuno-serology
Dr.Anong Bintvihok	Aug.28,1989 - Apr.04,1990	Biochemistry	NAHPI:Biochemistry
Dr.Pornpen Pathanasophon	Aug.28,1989 - Apr.04,1990	Bacteriology	NAHPI:Bacteriology
Dr.Somboon Sutherat	Jan.08,1990 - May.07,1990	Pathology	NAHPI:Pathology
Dr.Vitton Khumnirdpetch	Dec.03 - Dec.12,1989	Observation Study	Retirement
Dr.Sophon Muangcharoen	Dec.03 - Dec.12,1989	Observation Study	D.D.G.of DLD

Name	Duration	Subject	Present Position
1990 Japanese Fiscal Year			
Mr.Vinai Uthairavit	Sep.10,1990 - Mar.06,1991	Machinery Maintenance	NAHPI:Maintenance
Dr.Piyanoot Prasitiratana	Sep.24,1990 - Apr.24,1991	Parasitology	NAHPI:Parasitology
Ms.Thanarat Janukit	Oct.28,1990 - Jun.05,1991	F.M.O.	FMD Center
Dr.Sujira Parcharyyanon	Oct.28,1990 - Jun.05,1991	Virology	NAHPI:Virology
Dr.Chit Sirivan	Oct.28,1990 - Jun.05,1991	Epidemiology	NAHPI:Epidemiology
Ms.Malee Teeranusonti.	Oct.28,1990 - Jun.05,1991	Biochemistry	NAHPI:Biochemistry
Dr.Pacharee Thongkamkoon	Oct.28,1990 - Aug.05,1991	Bacteriology	NAHPI:

Appendix 5. Allocation of personnel at NAHPI

Section	1986				1987				1988					
	Veterinarian D.V.R. NAHPI	Scientist D.V.R. NAHPI	Para-Vet D.V.R. NAHPI	Veterinarian D.V.R. NAHPI	Scientist D.V.R. NAHPI	Para-Vet D.V.R. NAHPI	Veterinarian D.V.R. NAHPI	Scientist D.V.R. NAHPI	Veterinarian D.V.R. NAHPI	Scientist D.V.R. NAHPI	Para-Vet D.V.R. NAHPI	Veterinarian D.V.R. NAHPI	Scientist D.V.R. NAHPI	Para-Vet D.V.R. NAHPI
VI	7	-	2	7	2	-	-	7	1	-	2	7	2	-
BA	10	-	-	10	1	-	2	10	1	4	1	10	2	4
PR	8	-	3	8	1	-	1	8	1	3	-	8	1	3
PT	5	-	#1	5	2	-	1	5	2	#1	1	5	2	#1
IM	3	-	-	3	1	-	1	3	1	-	-	3	1	1
BC	2	7	2	3	1	7	1	3	1	2	-	3	1	2
EP	5	-	4	5	-	-	1	5	-	4	1	5	-	4
EX	1	-	-	1	-	-	-	1	-	1	-	1	-	1
IF	1	-	-	1	-	-	-	1	-	-	-	1	-	#5
AD	1	-	#4	1	-	-	-	1	-	#4	1	2	-	#5
Sub-total	43	7	16	44	8	7	7	45	7	21	4	45	7	23

D.V.R.:Division of Veterinary Research Employees NAHPI:Project Employees(Temporary)

* PT:Medical Technician, AD:General affair, IF:Library

Section	1989				1990				1991						
	Veterinarian D.V.R. NAHPI	Scientist D.V.R. NAHPI	Para-Vet D.V.R. NAHPI	Veterinarian D.V.R. NAHPI	Scientist D.V.R. NAHPI	Para-Vet D.V.R. NAHPI	Veterinarian D.V.R. NAHPI	Scientist D.V.R. NAHPI	Veterinarian D.V.R. NAHPI	Scientist D.V.R. NAHPI	Para-Vet D.V.R. NAHPI	Veterinarian D.V.R. NAHPI	Scientist D.V.R. NAHPI	Para-Vet D.V.R. NAHPI	
VI	7	-	2	1	7	-	2	-	8	-	2	3	-	2	
BA	10	1	4	1	10	1	2	4	10	-	4	2	4	-	
PR	7	1	3	-	7	-	-	3	6	-	3	1	3	-	
PT	5	-	#2	1	7	1	2	#2	7	-	#2	2	#2	-	
IH	3	-	1	1	5	-	1	1	6	-	1	1	1	-	
BC	3	1	2	2	3	1	7	4	4	-	2	5	4	2	
EP	5	-	4	1	5	-	-	-	7	-	3	-	-	3	
EX	1	-	1	-	1	-	-	-	1	1	1	-	-	1	
IF	1	-	-	#5	1	-	1	-	1	-	-	1	-	-	
AD	2	-	#5	#1	2	-	1	-	4	#4	#1	1	-	#4	
Sub-total	44	3	24	13	48	3	8	12	54	-	22	10	14	22	
															6

D.V.R.:Division of Veterinary Research Employees NAHPI:Project Employees(Temporary)

* PT: Medical Technician, AD: General affair, IF: Library

Appendix 6.

BUDGET IN 1985-1990

Veterinary Research and Animal Health

Details of Expenditures Group	1986		1987		1988		1989		1990	
	D. Vet. Res	NAHPI	D. Vet. Res	NAHPI	D. Vet. Res	NAHPI	D. Vet. Res	NAHPI	D. Vet. Res	NAHPI
Salary and Permanent Employees Payment										
1.1 Salary	6,087,600	-	6,921,600	-	6,651,500	-	7,040,000	-	8,486,800	-
1.2 Permanent Employees Payment	4,746,700	-	5,553,900	-	5,338,400	-	5,681,000	-	6,835,400	-
Temporary Employees Payment	1,340,900	-	1,367,700	-	1,313,100	-	1,359,000	-	1,651,400	-
Remuneration, Expenses and Office Materials	-	-	5,570,700	2,267,100	-	-	-	2,263,700	-	3,040,200
3.1 Remuneration	1,798,200	-	1,202,200	2,300,000	1,242,900	3,171,300	802,000	2,472,400	978,200	2,974,300
3.2 Expenses	91,400	-	83,000	24,000	140,000	36,000	180,000	36,000	180,000	36,000
3.3 Materials	599,700	-	73,100	620,000	170,800	447,400	291,100	647,400	316,100	940,800
Public Utility	1,107,100	-	1,046,100	1,656,000	932,100	1,445,000	331,800	1,789,000	481,800	1,997,500
Endurable Articles, Land and Constructions	128,400	-	108,400	1,500,000	-	1,500,000	-	1,500,000	-	1,895,700
5.1 Endurable Articles	689,100	-	121,800	335,000	-	163,000	-	155,600	722,000	204,800
5.2 Land and Constructions Cost	8,700	-	121,800	183,000	-	3,000	-	120,600	722,000	204,800
Total	8,703,300	7,107,800	8,354,000	9,705,700	7,894,400	5,858,500	7,842,900	6,391,700	10,187,000	8,115,000

BUDGET IN 1990-1991

Veterinary Research and Animal Health

Details of Expenditures Group	1990		1990		1991		1991	
	D. Vet. Res	NAHPI	Total	D. Vet. Res	NAHPI	Total		
	10,187,000	8,115,000	18,302,000	12,217,600	9,682,500	21,900,100		
1. Salary and Permanent Employees Payment	8,486,800	-	8,486,800	9,364,400	-	9,364,400		
2.1 Salary	6,835,400	-	6,835,400	7,549,700	-	7,549,700		
1.2 Permanent Employees Payment	1,651,400	-	1,651,400	1,814,700	-	1,814,700		
2. Temporary Employees Payment	-	3,040,200	3,040,200	-	3,058,200	3,058,200		
3. Remuneration, Expenses and Office Materials	978,200	2,974,300	3,952,500	1,164,200	3,922,100	5,086,300		
3.1 Remuneration	180,300	36,000	216,300	187,600	54,000	241,600		
3.2 Expenses	316,100	940,800	1,256,900	386,000	1,440,800	1,826,800		
3.3 Materials	481,800	1,997,500	2,479,300	590,600	2,427,300	3,017,900		
4. Public Utility	-	1,895,700	1,895,700	-	2,063,700	2,063,700		
5. Endurable Articles, Land and Constructuons	722,000	204,800	926,800	1,689,000	638,800	2,327,500		
5.1 Endurable Articles	722,000	204,800	926,800	1,689,000	309,500	1,998,500		
5.2 Land and Constructuons Cost	-	-	-	-	329,000	329,000		

Appendix 7. STRENGTHENING LABORATORY ACTIVITIES OF NAHPI - Summary -

August 1991

Laboratory Conditions:

Name of Lab.	(1) Equipment	(2) Reagents etc.	(3) Microb st.	(4) Literature	(5) Lab. skill	Total
Virology	A	A	B	C	B	B
Bacteriology	A	B	A	B	B	B
Parasitology	A	B	B	B	B	B
Pathology	A	A	-	C	B	B
Biochemistry	B	B	-	B	B	B
Epidemiology	A	B	B	C	B	B
Immuno-serology	C	C	B	-	B	B
Exp. Animal	B	B	-	-	C	B

Remarks: Classified as A = Good, B = Fair and C = Poor, respectively by the degree of progress.

Appendix 8.

Classification of Research Topics by Each Laboratory of NAHPI

Research Topics of Each Laboratory	1. Determine Low Productivity and Economic Losses				2. Development of Countermeasures		
	(1)	(2)	(3)	(4)	(1)	(2)	(3)
<u>Virology</u>							
1) Diagnosis of major viral diseases	*	*	*		*		*
2) Development, improvement and field apply of vaccines							*
3) Swine abortion and stillbirth	*		*	*	*		
<u>Bacteriology</u>							
1) Improvement of diagnosis	*	*	*		*		*
2) Preparation & improvement of diagnostic reagents				*			*
3) Vaccines for major diseases							*
<u>Parasitology</u>							
1) Control of liver fluke in cattle and buffalos	*	*	*	*	*		
2) Field survey on Toxoplasmosis	*	*	*		*		
3) Prevention of cattle Babesiosis	*		*	*	*		
<u>Pathology</u>							
1) Improvement of pathological diagnosis (immuno-sero. EM)				*	*		
2) Pathogenesis studies			*	*			
<u>Biochemistry</u>							
1) Clinical biochemistry (diagn.)		*	*				
2) Aflatoxin, de-toxinize		*	*				*
3) Influence of heavy metals		*	*				*
4) Residue analysis of pesticides		*	*				*
<u>Epidemiology</u>							
1) Paratuberculosis survey	*	*	*				
2) Serological survey of trypano- somiiasis	*	*	*				
3) Examination of imported cattle	*	*	*	*			
4) Disease surveillance	*	*					
5) Data collection and analysis	*			*			
<u>Immuno-Serology</u>							
1) Development & improvement of serological diagnostic methods			*		*		*

Note: 1. (1) Filed data collection and analysis. (2) Diagnosis, chemical analysis of field materials. (3) Establishing lab techniques. (4) Epidemiology.

2. (1) Development of diagnosis. (2) Development of biologics. (3) Development of analysis for feeds, feed additives, toxic substances.

Appendix 9.

Scientific Papers Presented to Academic Journals and Meetings
by the Staffs of VRD, NAHPI and FMD Center

Fields	Total	Years								
		1983	1984	1985	1986	1987	1988	1989	1990	1991
Pathology	16	1	1	-	-	2	3	6	1	2
Virology	25	1	3	6	1	1	1	4	4	3
Bacteriology	25	-	4	4	-	3	4	6	3	1
Parasitology	85	5	9	12	8	15	11	13	10	2
Biochemistry and Toxicology	16	-	-	-	3	2	2	1	6	2
T O T A L	167	7	17	22	12	24	21	30	24	10
FMD Center	7	2	1	1	2	1
Grand Total	174	7	17	22	12	26	22	31	26	11

Note: 1. Prepared from "Abstracts" of NAHPI in 1991 and Report from FMD Center

2. Most of the papers were presented to the Meetings of:

- Annual Livestock Conference of DLD
- Annual Veterinary Conference, Thai Veterinary Medical Association
- Annual Conference, Kasetsart University
- Congress of Federation of Asian Veterinary Associations
- Symposium on Ruminant Reproduction and parasitology
- Annual Wildlife Conference

and scientific journals of ;

- J. Thai Vet. Med. Assoc.
- Thai J. Vet. Med.
- Jpn J. Vet. Sci.
- kasetsart Veterinarians and kasetsart J.
- Cattle and Buffalo Bulletin
- J. Thai Vet. Pract.
- J. Trop. Med. Parasit.
- Thai J. Toxicology

3. Year 1991 includes the papers submitted for publishing.

Appendix 10

The number of the Specimens
examined for diagnostic services

MONTH : OCT 1990 - JUN 1991

DATE REPORT : 30 JULY 1991

	CATTLE	BUFFALO	PIG	GOAT	SHEEP	DUCK	CHICK	*OTHERS	TOTAL
1. NUMBER OF OWNER (CASE)	505	5	174	16	11	16	129	57	913
2. TOTAL ANIMAL EXAMINED	12949	114	1195	108	98	39	966	463	15932
3. TOTAL SPECIMENS	14143	154	1232	186	105	41	1041	497	17399
3.1 LIVE ANIMAL	1	0	109	4	2	12	326	37	491
3.2 CARCASS	2	0	121	0	4	27	210	28	392
3.3 ORGANS	30	2	46	2	1	0	16	4	101
3.4 SERUM	10655	112	730	101	31	0	300	126	12055
3.5 WHOLE BLOOD	196	40	83	26	20	0	0	49	414
3.6 BLOOD SMEAR	2041	0	10	2	24	0	0	34	2111
3.7 FECES	839	0	57	36	20	0	7	152	1111
3.8 MILK	23	0	0	0	0	0	0	0	23
3.9 OTHER SPECIMENS	356	0	76	15	3	2	182	67	701

MONTH : OCT 1989 - SEP 1990

	CATTLE	BUFFALO	PIG	GOAT	SHEEP	DUCK	CHICK	*OTHERS	TOTAL
1. NUMBER OF OWNER (CASE)	324	8	289	6	9	26	205	152	1019
2. TOTAL ANIMAL EXAMINED	6300	36	3815	16	36	107	2458	753	13521
3. TOTAL SPECIMENS	8587	37	4175	20	41	143	2789	810	16602
3.1 LIVE ANIMAL	49	0	96	2	3	48	428	97	723
3.2 CARCASS	1	0	89	2	1	34	301	30	458
3.3 ORGANS	29	14	37	2	0	3	44	29	158
3.4 SERUM	5741	23	2738	0	0	0	1016	295	9813
3.5 WHOLE BLOOD	613	0	74	0	1	20	335	45	1088
3.6 BLOOD SMEAR	980	0	3	2	13	0	6	8	1012
3.7 FECES	590	0	687	12	19	0	166	94	1568
3.8 MILK	72	0	4	0	0	0	0	0	76
3.9 OTHER SPECIMENS	512	0	447	0	4	38	493	212	1706

* OTHERS = DOG, CAT, ELEPHANT, HORSE, PARTRIDGE AND OTHER ANIMALS

MONTH : OCT 1988 - SEP 1989

	CATTLE	BUFFALO	PIG	GOAT	SHEEP	DUCK	CHICK	*OTHERS	TOTAL
1. NUMBER OF OWNER (CASE)	409	24	325	5	22	67	198	158	1208
2. TOTAL ANIMAL EXAMINED	9399	194	3569	12	472	445	2442	706	17239
3. TOTAL SPECIMENS	11518	346	3879	18	658	714	2736	845	20714
3.1 LIVE ANIMAL	2	0	122	0	5	86	348	19	582
3.2 CARCASS	4	0	114	0	0	108	218	78	522
3.3 ORGANS	61	14	175	3	5	23	73	43	397
3.4 SERUM	7752	167	2183	8	319	90	1013	113	11645
3.5 WHOLE BLOOD	683	33	137	0	12	0	290	165	1320
3.6 BLOOD SMEAR	1478	61	233	0	81	15	0	29	1897
3.7 FECES	1223	52	589	5	235	1	543	248	2896
3.8 MILK	66	0	0	0	0	0	0	0	66
3.9 OTHER SPECIMENS	249	19	326	2	1	391	251	150	1389

MONTH : JANUARY- SEPTEMBER 1988

	CATTLE	BUFFALO	PIG	GOAT	SHEEP	DUCK	CHICK	*OTHERS	TOTAL
1. NUMBER OF OWNER (CASE)	319	20	342	0	24	31	117	191	1044
2. TOTAL ANIMAL EXAMINED	5296	176	2851	0	167	71	635	969	10165
3. TOTAL SPECIMENS	5847	202	3033	0	258	70	468	1159	11037
3.1 LIVE ANIMAL	1	0	141	0	1	17	164	9	333
3.2 CARCASS	7	1	81	0	6	41	88	38	262
3.3 ORGANS	78	2	152	0	10	9	34	83	368
3.4 SERUM	4471	80	1899	0	136	0	129	252	6967
3.5 WHOLE BLOOD	130	0	45	0	23	0	0	83	281
3.6 BLOOD SMEAR	340	35	74	0	11	0	0	22	482
3.7 FECES	613	84	454	0	68	0	14	538	1771
3.8 MILK	18	0	0	0	0	0	0	0	18
3.9 OTHER SPECIMENS	189	0	187	0	3	3	39	134	555

Appendix 11.

PRODUCTION AND DISTRIBUTION OF FMD (CATTLE) VACCINE IN THAILAND (1987-1991)

Year	Vaccine Production				Vaccine Distribution			
	O	A	Asia-1	Total	O	A	Asia-1	Total
1987	6,478,250	594,250	20,000	7,092,500	5,716,250	574,250	--	6,290,500
1988	7,010,750	447,500	--	7,458,250	7,582,500	442,500	20,000	8,045,000
1989	7,027,750	493,000	714,000	8,234,750	7,503,250	508,000	690,300	8,701,550
1990	5,565,850	711,500	361,500	6,638,850	5,184,150	310,000	148,700	5,642,850
1991	226,600	--	220,500	446,500	495,650	210,000	336,500	1,042,150

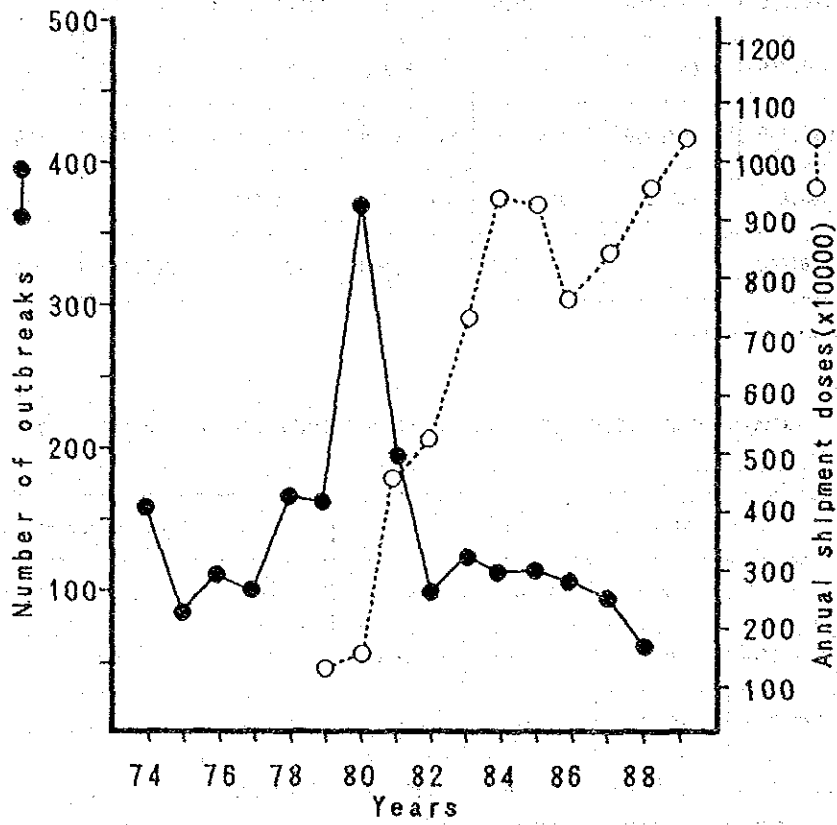
* 9 months production

PRODUCTION AND DISTRIBUTION OF FMD (PIG) VACCINE IN THAILAND (1987-1991)

Year	Vaccine Production				Vaccine Distribution			
	O	A	Asia-1	Total	O	A	Asia-1	Total
1987	951,000	172,000	165,000	1,288,000	931,000	152,000	--	1,065,000
1988	1,927,750	153,750	--	2,081,500	1,513,050	173,750	165,000	1,851,800
1989	1,691,000	370,500	107,000	2,168,500	2,105,700	346,500	5,000	2,457,200
1990	2,980,950	216,500	--	3,197,450	2,681,050	134,000	102,000	2,815,050
1991	100,500	--	1,120,800	1,221,300	376,000	--	1,005,800	1,381,800

* 9 months production

Appendix 12.



FMD outbreaks and annual shipment doses of FMD vaccine in Thailand
from
(Annual statistics of animal hygiene Thailand)

SUMMARY OF PROJECT	VERIFIABLE INDICATORS	MEANS OF VERIFICATION	IMPORTANT ASSUMPTION
<p>Overall Goal to which the Project contributes: To promote and contribute livestock development in Thailand.</p>	<ol style="list-style-type: none"> 1. Incidence and prevalence of animal diseases. 2. Productivities of livestock. 3. Animal population and animal products production (by value). 4. Import & export of animal and animal products. 	<ol style="list-style-type: none"> 1. Kind of diseases, number of incidence, and areas concerned. 2. Loss of animals, production increase, etc 3. Population increase by kinds and areas. Production index and value by year. 4. Number, quantity, and values by year. 	<ol style="list-style-type: none"> 1. The present trend of natinal economic growth is continued and the level of national income is assured not below than present. 2. No malignant animal infectious disease which will affect livestock economy seriously is prevailed.
<p>Project Purpose:</p> <ol style="list-style-type: none"> 1. To establish a research institution (NAHPI) at international level in the field of animal health and promote advanced research and investigation at NAHPI. 2. To promote research and investigation on Foot-and-Mouth disease at FMD CENTER. 	<ol style="list-style-type: none"> 1. Preparation and establishment of laboratory facilities, equipment and others. 2. Provision of personnels such as researchers, lab. assistants, other supporting staffs. 3. Development of lab. technology, experimental animals, reagents, antigens and chemicals. 4. Production of academic documents on research and investigation. 5. Extension and information services. 	<p>Evaluate the degree of progress of each items by analysing indicators mentioned in left column qualitatively and quantitatively.</p>	<ol style="list-style-type: none"> 1. No remarkable changes on livestock conditions such as feeding costs and livestock pollution problems. 2. Adequate livestock promotion policies are implemented. 3. Vaccines, veterinary drugs and others are prepared in quality and quantity.
<p>Results/Outputs:</p> <ol style="list-style-type: none"> 1. Research and investigation to determine any causes of low productivity and economic losses of animal and poultry at NAHPI. 2. Research and investigation to develop countermeasures concerned with above. 3. Establishing supporting activities for effective implementation of research, etc. 4. Research promotion on Foot-and-Mouth disease. 	<ol style="list-style-type: none"> 1. Technical and academic reports and articles. 2. Implementation and results of diagnostic services. 3. Reference services and other supporting activities to the Diagnostic Laboratories. 4. Management of experimental animals. 5. Publication, training courses and seminars. 6. Qualification of researchers. 	<ol style="list-style-type: none"> 1. Quality of articles also considered, by years, way of utilization. 2. Analysis of statistics, comparison other details for supporting. 3. Number of reference diagnosis and other details for supporting. 4. Number of experimental animals used by years. 5. Seminars and training courses held, production and distribution of documents 6. Acquisition of Ms and PhD. 	<ol style="list-style-type: none"> 1. Provision of research and technical staffs qualitatively and quantitatively. 2. Establishment of the Laboratory organization and management. 3. Budget for research implementation. 4. Coordination and cooperation between related institutions.
<p>Activities:</p> <ol style="list-style-type: none"> 1. Research promotion on selected topics at NAHPI. <ol style="list-style-type: none"> a. Swine fever control, b. Diagnosis of Jhons diseases, c. Health investigation of imported cattle, d. Copper deficiency in cattle. 2. Strengthening following activities for NAHPI. <ol style="list-style-type: none"> a. Maximum use of epidemiological data. b. Efficient arrangement & management of experimental animals. c. Improvement of information & documentation services. d. Arrangement of technical transfer. 3. Development of FMD diagnosis introducing mono clonal antibody technique. 	<p>Input by Japan side:</p> <ol style="list-style-type: none"> 1. Assignment of long and/or short term experts on virology, bacteriology, pathology, parasitology, biochemistry, Foot-and-Mouth, and experimental animal. 2. Expert(s) of other fields, if necessary. 3. Provision of equipment, books, vehicles, etc. 4. Acceptance of training personnels. <p>Input by Thai side:</p> <ol style="list-style-type: none"> 1. Provision of counterpart officials. 2. Provision of land, buildings and other related facilities. 3. Supply or replacement of machinery, equipment instrument, and others. 4. Provision of running expenses for implementation of the Project. 	<p>Checked by related documents, reports, and other statistics.</p> <p>Same as above.</p>	<ol style="list-style-type: none"> 1. Efficient use of laboratory facilities of the NAHPI. 2. No emergency research topics provoked. 3. Stabilizing research and thechnical staffs at the Institute.

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