

タイ家畜衛生改善計画
第二次エバリュエーション報告書

昭和59年5月

国際協力事業団

タイ家畜衛生改善計画
第二次エバリュエーション報告書

昭和59年5月

国際協力事業団

JICA LIBRARY



1050725[9]

| | |
|--------------------|------|
| 国際協力事業団 | |
| 受入 月日 '84.10. 4 | 122 |
| 登録No. 10766 | 87.9 |
| | ADL |

まえがき

本報告書は昭和59年1月25日から2月3日まで、タイ国に派遣された「タイ家畜衛生改善計画・第二次エバリュエーションチーム」(緒方団長,他2名)の報告をとりまとめたものである。

今回のエバリュエーションチームは、当該プロジェクトの技術協力期間の終了をまえに昨年9月に派遣された第一次エバリュエーションチームの評価調査結果をふまえ、その後国内関係者の間で協議した結果及びタイ政府からのR/D延長要請を受け、口蹄疫ワクチン製造センターについては、さらに2ヶ年間技術協力を延長するよう討議議事録に署名し併せて今後2ヶ年間の協力計画の細部についても協議打合せすることを目的として派遣されたものである。

本報告書が、今後のプロジェクトの業務運営の参考になれば幸いである。

また、緒方団長以下協議・計画打合せ作業の任にあられた団員各位並びに現地において協力いただいた関係者各位に深甚なる謝意を表するものである。

昭和59年5月

国際協力事業団

理事 松山良三

目 次

I 調査団の経緯

| | |
|------------------|---|
| 1. 調査の目的 | 1 |
| 2. 調査団の構成 | 1 |
| 3. 調査団の日程 | 1 |
| 4. 訪問先と面会者 | 2 |

II 業務報告

| | |
|---------------------------------------|----|
| 1. 調査団の業務概況 | 4 |
| 2. タイ家畜衛生改善計画の延長 R/D 及び T. I. P. | 5 |
| 3. 事業計画に関する Summary Report. | 9 |
| 4. 小口無償に関する機材仕様書(案) | 12 |
| 5. インドネシア国口蹄疫防疫対策の地域協力に関するメモ | 19 |

III 資料

| | |
|------------------------------------|----|
| 1. タイ家畜衛生改善計画に係わるタイ国政府の延長要請書 | 21 |
| 2. 新規プロジェクトに関する要請書 | 57 |

I 調査団の経緯

1. 調査の目的

タイ家畜衛生改善計画は昭和52年3月2日よりR/Dによる技術協力を中部タイ・パクチョンの口蹄疫ワクチン製造センターにおける口蹄疫ワクチン製造技術の開発、及び南部タイ・ツンソンの家畜衛生センターにおける地域重要疾病の診断技術、家畜防疫活動を実施してきた。

昭和58年8月6日より今井正夫氏（農林水産省畜産局衛生課薬事室長）を団長とする第一次エバリュエーション調査団が派遣され、昭和59年3月1日に終了予定の本プロジェクトについてタイ国側関係者も交えた調査、及び協議がなされた。タイ政府からのR/D延長要請を受け、調査団報告を踏えて、日本国関係者の協議がなされた結果、

① パクチョンの口蹄疫ワクチン製造センターの協力は更に2年間延長して行なう。

② ツンソンの家畜衛生センターは当初目標が達成されたと見られるので協力を終了する。

方針が出され、これらの事項をタイ国関係者と協議し、①延長R/Dの署名、②同延長期間におけるT.I.P.の作成を目的として派遣された。

また本プロジェクトの関連事項として、③小口無償関連機材の検討、④インドネシア国口蹄疫防疫対策に係わる地域間協力についても協議する目的であった。

2. 調査団の構成

緒方 宗雄 団長（総括兼家畜衛生）JICA国際協力専門員

徳井 忠史 団員（ワクチン製造）農林水産省、家畜衛生試験場、海外伝染病部ウイルス研究室長

栗城俊之助 団員（業務調整）JICA農業開発協力部畜産開発課課長代理

3. 調査団の日程

| （年月日） | （訪問先） | （ 摘 要 ） |
|-----------|-------------------------|---|
| 昭和59年1/25 | | 成田～Bangkok |
| | | 専門家との打合せ |
| 26 | 午前 大使館，JICA事務所 | 表敬及び打合せ |
| | 午後 畜産振興局 | 第一回会議（R/D，T.I.P.について） |
| 27 | 畜産振興局 | 第二回々（インドネシア口蹄疫，小口無償） R/D署名式 |
| 28～29 | Tungsong DLC Bangkok | ：緒方団長ツンソンDLC訪問 ：徳井団員専門家とMeeting（事業計画，機材） |

| | | |
|------|--------------------|---------------------------|
| 30 | F.M.Dセンター | 午前 施設視察 午後 第3回会議(事業計画) |
| 31 | " | 第4回会議(無償機材,新プロジェクトの協議) |
| | (緒方団員,栗城 帰 Bankok) | |
| 2/ 1 | 畜産振興局 | 資料整理,専門家との Meeting |
| | (徳井団員, 帰 Bankok) | |
| 2/ 2 | 畜産振興局 | 第5回会議(小口無償機材) |
| | 大使館 JICA 事務所 | 表敬報告 |
| 2/ 3 | | Bankok ~成田着 |

4. 訪問先と面会者

1) D. L. D.

| | |
|-------------------------|---------------------------------------|
| Dr. Tim Bhannasiri | Director General |
| Dr. Vitoon Khamnurtetch | Deputy Director General |
| Dr. Pinit Suphulai | Deputy Director General |
| Dr. Piya Aranyakanont | Deputy Director General |
| Cr. Viset Prasert | International Coordinator |
| Dr. Smarn Pipitkul | Director of Veterinary Biologics Dep. |
| Dr. Prakal Somithinant | " " Veterinary Service Dep. |
| Dr. Paoy Sarkaputi | " " Artificial Insemination Dep. |
| Dr. Sophom Chareammung | " " Disease Control Dep. |
| Dr. Panudej Suthat N | " " Animal Nutrition Dep. |
| Dr. Sutham Dunya-Upaped | " " Veterinary Research Dep. |
| Dr. Anant chinwala | " " Livestock Breeding Dep. |
| Dr. Yuanta Purksaraj | " " Feed Quality Control Dep. |
| Dr. Suwit Phollap | " " Livestock Extention Dep. |

2) D. T. E. C.

| | |
|------------------|-------------------|
| Mr. Sutin Susilo | Technical officer |
|------------------|-------------------|

3) F. A. O.

| | |
|--------------------|-------------------------------------|
| Dr. Balbin K. Soni | Animal Production & Health officer. |
| Dr. Masao Sasaki | " " " |

- 4) F. M. D. Vaccine Production Center. (Pakchong)
- | | |
|-------------------------|------------------------------|
| Dr. Thinakorn Chandakeo | Director |
| Dr. Ab Kongton | Chief of Research Diagnosis. |
| Dr. Suneejet Kongton | " Vaccine Control |
| Dr. Pichit Makarasan | " Vaccine Production. |
- 5) Diagnostic Laboratory Center (Tung Song)
- Dr. Nimit Traiwanatham, Director
- 6) Ministry of Agriculture and Co-operatives
- Mr. Y. Ohata Agricultural Planning (Japanese Expert)
- 7) その他
- a) 在タイ日本大使館
- | |
|----------|
| 茂田 参事管 |
| 三宅 一等書記管 |
- b) 日本人専門家
- | | |
|------|-------------|
| 岡本哲夫 | 畜産局 Advisur |
| 難波功一 | 口蹄疫センター |
| 津田知幸 | " |
| 角田 清 | 家畜衛生センター |
| 内村益雄 | " |
- c) JICA Bangkok 事務所
- | | |
|------|----|
| 河西 明 | 所長 |
| 菊地文夫 | 所員 |

II 業務報告

1. 調査団の業務概況

調査団はタイ国滞在期間中、畜産振興局や、プロジェクトサイトであるパクチョン、口蹄疫ワクチン製造センター、ツンソン家畜衛生センターを訪問しタイ国政府関係者はもとより、プロジェクトに派遣中の専門家と十分な討議を行った。

延長R / Dについてはタイ側から提出された延長要請書の内容を慎重に検討した上で昭和59年1月27日バンコクの畜産振興局において、日本側の提示した案で緒方宗雄団長とTim Bhanasiri 畜産振興局長との間で署名がなされた。

T.I.Pについては、延長R / D署名と同日作成されたが、詳細な事業計画については、30日パクチョン口蹄疫ワクチン製造センターにおいて、日本人派遣専門家も含めタイ側技術陣との間で協議を行なって緒方団長名による Summary Report を作成して、その内容について、明確にするとともに確認をした。

また、口蹄疫ワクチン製造センターに係わる小口無償供与機材の打ち合せについては、昭和58年12月9日より17日までの期間で本橋常正(財)日本生物科学研究所理事(前タイ家畜衛生改善計画チームリーダー)がタイ側と協議、作成したリストを基に、派遣中の日本人専門家と2日間にわたり検討した上で30日、31日の両日パクチョン口蹄疫ワクチン製造センターのタイ側技術者との間で必要な機材リストと仕様、及び精製濃縮ラインについての意見交換がなされ案が作成された。

調査団のもう一つのT / Rであるインドネシア国口蹄疫防疫対策の地域間協力については、JICAバンコック事務所長とも打ち合せを行なった上で畜産振興局長とその趣旨、内容及び手続きについて話し合いを行ない、覚え書きを作成した。たまたまインドネシアに出張する同局長に託してインドネシア畜産局長へも同覚え書きを送った。

調査団のT / Rではなかったがタイ側から話しが出されている無償を含めた新プロジェクト“National Animal Health and Production Institute”についてもタイ側の意見を聴き計画案の提出を受けた。

調査団は所期の目的を達成し予定どおり59年2月3日帰国したが、最後に30日口蹄疫ワクチン製造センター訪問の折、第三国研修が開催中でそれに出席しているビルマ、インドネシア、スリランカ、マレーシア、フィリピン、ネパールの研修生と懇談の機会がもたれたことを付記しておきたい。

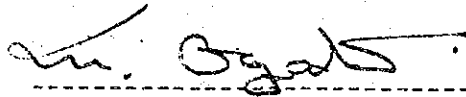
2 タイ家畜衛生改善計画の延長R/D及びT.I.P.

THE RECORD OF DISCUSSIONS ON EXTENSION OF
THE PROJECT OF THE TECHNICAL COOPERATION
PROJECT ON ANIMAL HEALTH IMPROVEMENT PRO-
GRAMME IN THAILAND

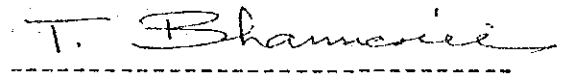
The Japanese Project Formation Team (hereinafter referred to as "the Team") organized by the Japan International Cooperation Agency and headed by Dr. Muneo Ogata visited the Kingdom of Thailand from January 25 to February 3, 1984, had a series of discussions with the authorities concerned of the Kingdom of Thailand concerning the extension of the period of the Technical Cooperation based on the Record of Discussions which was signed on March 2, 1977 (hereinafter referred to as "R/D") and will terminate on March 1, 1984.

As a result of discussions, the Team and the authorities concerned of the Government of Thailand agreed to recommend to their respective Governments that Annex I of the R/D should be amended as attached hereto and that the technical cooperation for the Foot-and-Mouth Disease Vaccine Production Centre and for the Department of Livestock Development (advisory services) should be extended until March 1, 1986, in order to fulfill the anticipated objectives. However the technical cooperation for the Diagnostic Laboratory Centre in Tung Song will be terminated as scheduled.

Bangkok, January 27, 1984



Dr. Muneo Ogata
Head of the Japanese Project
Formation Team
Japan International Cooperation
Agency



Dr. Tim Bhannasiri
Director-General
Department of Livestock
Development

witnessed by



Mr. Apilas Osatananda
Director - General
Department of Technical and
Economic Cooperation

Annex I Master Plan of the Project

Activities under the Project

1. Foot-and-Mouth Disease Vaccine Production Centre

- (1) The practical experiments for improvement of techniques on vaccine quality by means of the mass production method of Foot-and-Mouth Disease Vaccine and training of technical staff at the Centre
- (2) Diagnosis and identification of types of foot-and-mouth disease virus for the whole area of the country in collaboration with the related institutions

2. Department of Livestock Development (Advisory services)

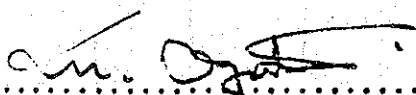
- * Advice on animal health improvement in Thailand including foot-and-mouth disease control programs

TENTATIVE IMPLEMENTATION PROGRAM FOR TECHNICAL
COOPERATION PROJECT ON ANIMAL HEALTH IMPROVEMENT
PROGRAMME IN THAILAND

Within the scope of the Record of Discussions signed on January 27, 1984, the Japanese Project Formation Team and Thai authorities concerned have jointly formulated the Tentative Implementation Program for the smooth implementation of the Japanese Technical Cooperation Project on Animal Health Improvement Programme in Thailand (hereinafter referred to as "the Project") as annexed hereto.

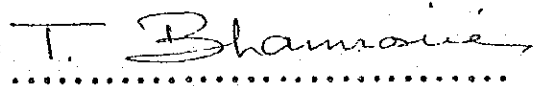
The Tentative Implementation Program is subject to change in the course of the implementation of the Project within the framework of the Record of Discussions, and also subject to the conditions that necessary budget will be allocated for the implementation of the Project.

Bangkok , January 27, 1984



.....

Dr. Munéo Ogata
Head of the Japanese Project Formation
Team
Japan International Cooperation
Agency



.....

Dr. Tim Bhannasiri
Director-General
Department of Livestock
Development

Tentative Schedule of Implementation

| Year | 1984 | 1985 | 1986 |
|--------|-----------------------------|------|------|
| Months | 3 5 7 9 11 1 3 5 7 9 11 1 3 | | |

(Main Activities)

- (1) To maintain and improve the massproduction techniques of foot-and-mouth disease vaccine and to train technicians at the Centre
- (2) To improve the quality of foot-and-mouth disease vaccine
- (3) To improve the safety test and potency test for foot-and-mouth disease vaccine
- (4) To improve the technique for diagnosis of foot-and-mouth disease
- (5) To advise for animal health administration with particular reference to control programme of foot-and-mouth disease

(Dispatch of Expert)
(Long-term Assignment)

(1) Advisor

(2) Vaccine production technique of foot-and-mouth disease

(3) Diagnosis of foot-and-mouth disease

(Dispatch of Expert)
(Short-term Assignment)

(Training of Thai Personnel in Japan)

(Provision of Equipment and Machinery)

Several (man-month)
Number and duration of these experts will be agreed upon during the operation of the Project

Several (man-month)
Number of and duration of Thai Personnel to be trained in Japan will be agreed upon during the Operation of the Project

3 事業計画に係わる Summary Report.

Summary Report of the Discussion for Technical Cooperation on Animal Health Improvement Project (F.M.D. Center)

The Japanese Formation Team of J.I.C.A headed by Dr. Muneo Ogata visited Thailand from January 25 to February 3, 1984.

At Foot and Mouth Disease Vaccine Production Center, the Team member, relevant officials of Thai authorities, Japanese experts assigned to the Project and the counterpart officials (Appendix I) discussed about the Objectives and Detail of Implementation Plan as the main activities to be conducted during the period of extended cooperation schedule which will be ended by March 1th 1986.

The summary of the discussion is as following.

Objectives and Detail of Implementation Plan.

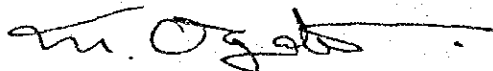
1. Maintain and improvement of the mass production techniques of FMD vaccine and training of technicians.
 - 1) Maintaining the established technology of mass production of the vaccine for stable production.
 - 2) Improvement of technology for mass vaccine production particularly to obtain, a) increased yield of virus antigen, b) higher cell multiplication, c) decreased contamination rate, and d) routine checking and careful operation of equipments and facilities.
 - 3) Training of mechanical engineers for good maintenance of machinery.
2. Quality improvement of FMD vaccine.
 - 1) Selection of seed virus strains suitable for efficient vaccine production.
 - 2) Analysing and dissolving allergic reaction after the vaccination.
 - 3) Establishment of reduced serum content as vaccine component.
 - 4) Purification (refinement) of the vaccine by means of ultra filtration.
 - 5) Increase of immunogenicity by means of virus concentration.

3. Improvement of vaccine control.
 - 1) Introduction and establishment of tissue culture method as *in vitro* safety test which is more sensitive than *in vivo* test.
 - 2) Estimation of 140 S content as evaluation of vaccine potency.
 - 3) Further analysis and improvement of PD_{50} (50% protective dose) in different species of animal and introduction of neutralization test as evaluation of potency.

4. Improvement of FMD diagnosis.
 - 1) Strengthening of the systematic collection of field materials for diagnosis.
 - 2) Investigation and analysis of virus types of regional distribution.
 - 3) Evaluation of the vaccine produced and used with regards to the field viruses.

- 5) Advisory services for animal health administration.
 - 1) Assistance for planning and implementation of FMD control in general.
 - 2) Coordination of activities between DLD and JICA.

Pakchong, January 31, 1984



Dr. Muneo Ogata
The Leader of Japanese Formation
Team, J.I.C.A

Appendix. I.

| | |
|-------------------------|--|
| Dr. Muneo Ogata | Leader of Japanese Formation Team. |
| Dr. Tadashi Tokui | Member of Japanese Formation Team. |
| Mr. Shunnosuke Kuriki | - do - |
| Dr. Testuo Okamoto | Japanese expert (Advisor) |
| Dr. Koichi Namba | Japanese expert |
| Dr. Tomoyuki Tsuda | Japanese expert |
| Dr. Ichiro Takatori | Japanese expert |
| Dr. Smarn Pipitgul | Director of Veterinary Biologics, DLD. |
| Dr. Thinakorn Chandakeo | Director of FMD Vaccine Center |
| Dr. Ab Kongton | Chief of Research Diagonosis, FMD Vaccine Center |
| Dr. Suneejet Kongton | Chief of Vaccine Control, FMD Vaccine Center |
| Dr. Pichit Makarasan | Chief of Vaccine Production, FMD Vaccine Center |

4. 口蹄疫ワクチン製造センター小口無償に係る機材仕様(案)

A-1. 細胞培養槽

2,500ℓ (ステンレス製 Sus-316), ジャケット付

保温, 温度調節 0℃ ~ 50℃ (±0.1℃)

PH調節記録 (重曹炭酸ガス方式)

溶存酸素記録

攪拌無段変速 (0 ~ 200 rpm)

プロペラ: マリンタイプ

適用: 丸菱 MPF, UP-2500L

A-2. 細胞遠心機 (細胞採取用)

連続式, 流量 23L/min

速度無段変速, 最大遠心G 1,000G, 5分間

耐腐蝕性 (耐酸, 塩類溶液) 材質

高圧蒸気滅菌可

無菌運転構造, 無菌細胞採取システム付

耐用...総回転数 20億回転

適用: Cellcentrifuge. Dia. 70 Chemap special

A-3. ウィルス遠心機 (ウィルス清澄用)

連続式, 流量 17L/min 流量調節機構付

速度無段変速, 最大遠心G 12,000G以上, 3分間

チャンバー及びローター: 耐腐蝕性 (耐酸, 塩類溶液) 材質

高圧蒸気滅菌可

無菌運転構造 無菌採取システム付

耐用...総回転数 20億回転 総運転時間 2,500時

A-4. 限外濾過装置

1. 濾過速度 1,000L/hr 以上 (1~2%牛血清加ウィルス液)

リザーバー, 自動安全スイッチ, 圧力コントロール付

リザーバー: 200ℓ, ステンレス製1基

ホローファイバークートリッジ, 分子量10万カットオフ, 3セット

H53P-100-20 (アミコン) × 5本

濾過面積， $5\text{m}^2 \times 5$

滅菌可

適用：Amicon DC-1200

2. 濾過速度 100L/hr 以上

リザーバー (30L)，自動安全スイッチ，圧力コントロール付

ホローファイバークートリッジ，分子量 10 万カットオフ 3 セット

H10P-100-20 (アミコン) $\times 9$ 本

濾過面積 $0.88\text{m}^2 \times 3$

滅菌可

適用：Amicon DC-30 EM

A-5. 濾過器セット

Sartopure 825 \times 2

545 \times 1

バルブチーズ，圧力計付

適用：ザルトリウス

A-6. クリーンスチームポイラー

蒸気発生量 900kg/hr

蒸気圧 (運転時) 7kg/hr

蒸気温度 170 °C

電 源 220V 又は 380V

燃 料 軽油

B-1. 遠心機

スイングタイプ

最高回転数 4,200 rpm

最大遠心容量 6,000ml

電 源 220 V

適用：Beckman J-6B

スイングタイプローター 6,000 ml

電気工事、及び配管等については、後日資料を送付の予定である。

Brrief Specification of Equipments for Concentration and
Purification of FMD Vaccine

1) Cell culture fermenter unit

Model : MARUBISHI MPF-UT-2500L

Capacity (working volume) : 2.5 m³ with jacket and insulater

Material : inside stainless steel SUS 316 brff # 300 outside
stamless steel SUS 304

Control and recording system (Bioprocess controller)

| | |
|----------------------|--------------------------|
| Temperature | 0-150 °C |
| pH | 4-10 |
| Air flow | 0-40 NL/min |
| CO ₂ flow | 0-40 NL/min |
| DO | 0-20 ppm |
| ORP | -999- + 999 m V |
| Agitation | 0-250 rpm |
| Pressure | 0-2.0 Kg/cm ² |

Electrical voltage : 220 volts.

2) Continuous centrifuge (for cells)

Model : Cellcentrifuge Dia 700 Chemap Special

Max gravity : At least 1000 G (5 min)

Continuous flow rate at least 23 L/min

Basket : Stamless steel SUS 304 700 mm ϕ

Strictly aseptic operation system by steam blow sterilization
and aseptic harvesting of cells

Durable total revolution : at least 2 X 10⁹ revolution

Electrical voltage 220 volts.

3) Continuous centrifuge (for virus)

Max gravity : at least 12,000 G

Continuous flow rate : at least 17 L/min

Flow rate control system

Basket : anti-corrosion (material)

Aseptic operation system

Durable total revolution : at least 2×10^9 revolution

Durable total operation time : at least 2500 hours

Electrical voltage : 220 volts.

4) Ultrafiltration system (Hollow fiber)

Model : Amicon DC-1200

Total filtration area : at least 25 m^2

Accessory : Safty switch

: Pressure control

: Reserver tank (Stainless steel SUS 316 200L)

: Hollow fiber H53P-100-20 (MW 1×10^5 cut off)

15 pcs

Electrical voltage : 220 volts.

5) Ultrafiltration system

Model : Amicon DC 30 EM

Total filtration area : at least 2.64 m^2

Accessory : Reserver tank (Stainless steel SUS 316 30L)

: Hollow fiber H10P-100-21 (MW 1×10^5 cut off)

10 pcs

Electrical voltage : 220 volts

6) Filtration system

Model : Sartopure type SM 303 system

Housing : type SM 303 03 2 pcs

type SM 303 01 1 pcs

Accessory : Sanitary piping system (as figure)

Prefilter 552 24 (1.1 m²) 10 pcs

Filter 552 07 P (1.1 m²) 10 pcs

Filter 552 07 P (0.55m²) 10 pcs

7) Centrifuge

Model : Beckman J-6B

Swing type rotor system

Max revolution speed 4,200 rpm

Max volume 6,000 ml

Electric voltage : 220 V

8) Clean steam boiler

Continuous steam generating capacity 900 Kg/h

Steam pressure (working) 7 Kg/cm²

Steam temperature 170 °C

Electric voltage : 220 volts

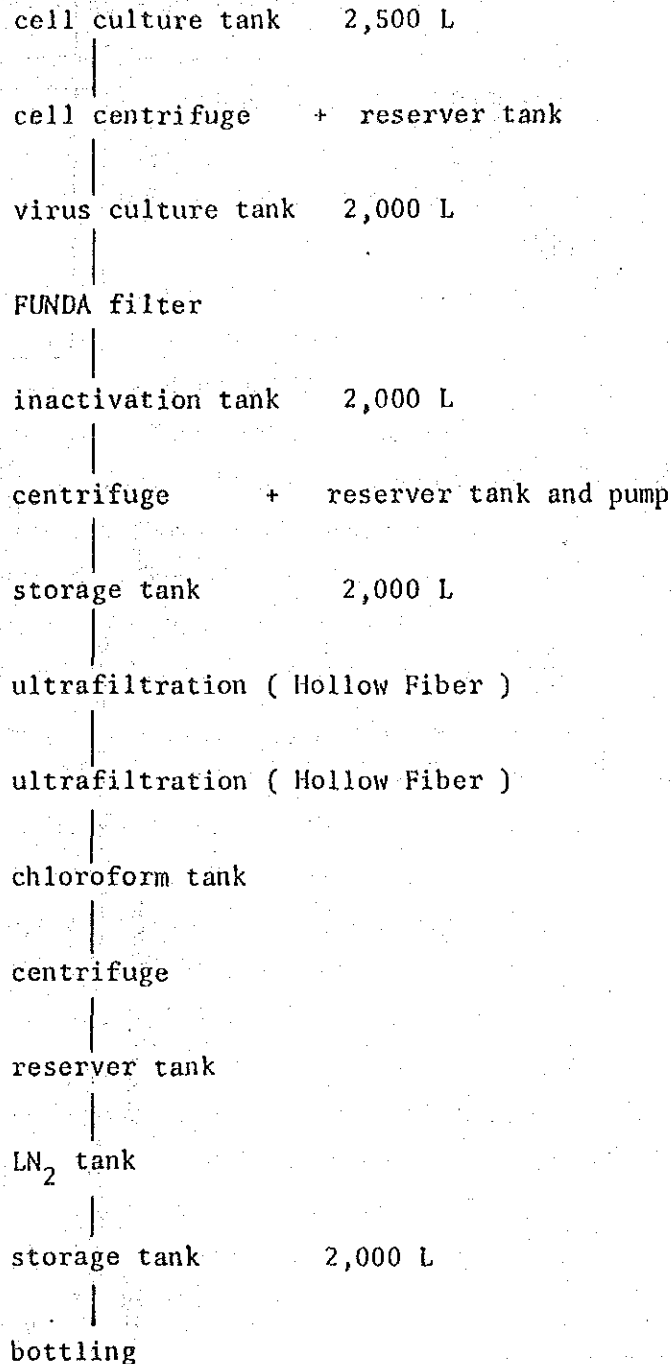
Fuel : diesel - low speed

9) Installation and piping among equipments should be included.

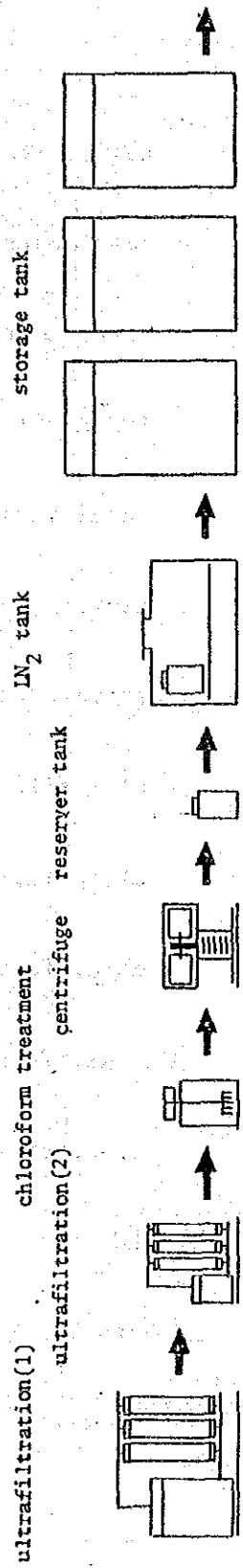
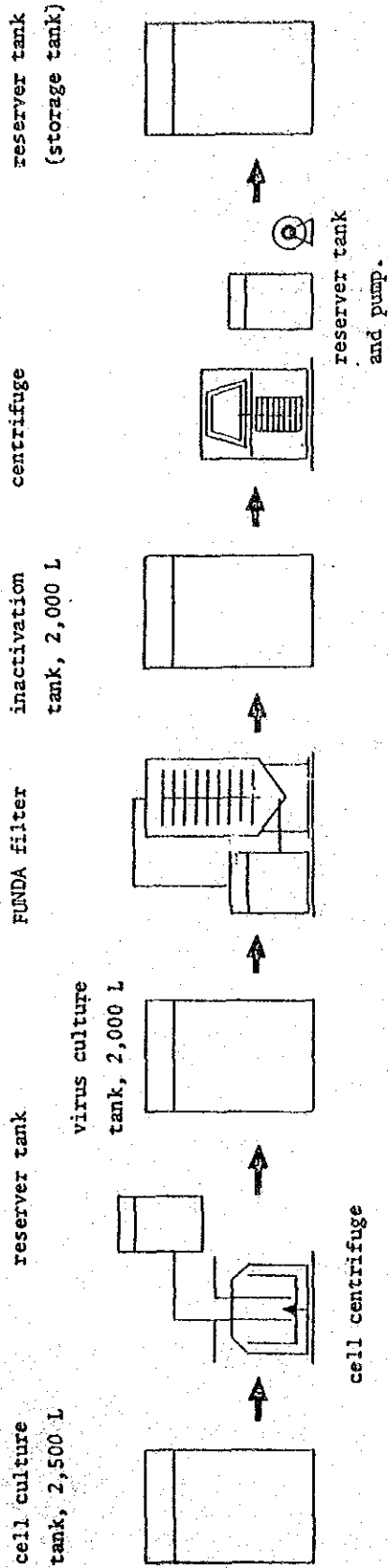
10) Electric wiring, machinery and equipments for electric supply should be included.

2 Feb. 1984

Production process of concentrated and purified FMD vaccine



Production Process of concentrated, purified FMD Vaccine



5. インドネシア国口蹄疫防疫対策の地域協力に係わるメモ

Participation to FMD Control in Indonesia as Regional Cooperation

The Animal Health Authorities of Japan and Thailand have great concern on the recent outbreaks of foot-and-mouth disease in Indonesia which started on July 20, 1983 as a regional menace of this malignant infectious disease of animals.

To cope with this situation, following measures shall be taken as emergency actions.

1. The regional Coordination of FMD Control as FMD regional reference Laboratory at the FMD Vaccine Production Center, Pak Chong, shall be strengthened as proposed by APHCA.
2. Efficacy and usefulness of the Thai produced FMD vaccine against current outbreak of FMD in Indonesia shall be evaluated in due course. For this purpose, necessary investigation programme and arrangement shall be discussed and established by the Thai and Indonesian authorities concerned.
3. Production of FMD vaccine which will meet for current FMD in Indonesia shall be examined in Thailand, as well as in Indonesia.

Regional Collaboration including Japan shall be strengthened on this matter.

4. To assist and coordinate present FMD control activities in Indonesia, two project counterparts mentioned-below shall be sent from the Department of Livestock Development, Thailand to assist regional cooperation by the JICA's fund together with Japanese experts.

Field on FMD diagnosis:

- 1) Technology exchange of laboratory procedures of FMD diagnosis.
- 2) Laboratory tests and examination on the evaluation of different FMD vaccines including Thai produced one.
- 3) Advice and recommendations for the arrangement of FMD vaccine production in Surabaya Institute and systematic diagnostic services.

Field on FMD control and regional coordination

- 1) Coordination and assistance on FMD control programme in force in Indonesia.
- 2) Exchange of technical and administrative know-how on FMD control which have gained in Thailand.
- 3) Cooperation programme of FMD control and prevention between the two countries.
- 4) Advice and recommendation on FMD control to be considered in future programme.

Proposed duration and date of visit:

Three weeks starting from April 1984.

Jan. 27, 1984.

M. OGATA

III 資料

1. タイ家畜衛生改善計画に係わるタイ国政府の延長要請書

Request for a Project Extension

Project title : Animal Health Improvement Project
Phase 4 (Foot-And-Mouth Disease Vaccine
Production Center)

Requesting agency : Division of Veterinary Biologics,
Department of Livestock Development,
Ministry of Agriculture and Cooperatives

Source of assistance : The Government of Japan

1. Proposed period of project extension:

nd
from 2 March 1984
at
to 1 March 1986

2. Detailed description of present project accomplishment and work in progress:

Considerable progress has been obtained on many subjects in the third phase of the project, with full collaborations between Japanese experts and Thai staffs.

1. Progress of vaccine production

The production has increased steadily during the period of third phase of the project. The amounts of vaccine in 2 years of 1981/82 - 1982/83 has reached the target of the project. This successful background is due to the joint effort between Thai and Japanese staffs and stable supply of high quality chemicals.

With the increase of vaccine production, however, the following problems are still remained to be improved.

- (1) Water supply for medium preparation.
- (2) Serum supply for cell culture.
- (3) Bacterial contamination in rolling culture.

2. Amount of vaccine

Since the project has operated, the technology of vaccine production has improved in year by year. It is indicated that the Center has ability to product vaccine in mass production. The process of vaccine distribution, it is to be transferred from the Center after bottling to the cool storage at DLD, Bangkok.

Amount of vaccine shipped from Center by year and by types of vaccine are summerized in the following table. Remarkable and steady increasement of the production from 1981 to 1983 is notable.

| Types of production | 1980/81 | 1981/82 | 1982 Oct./83 Aug. |
|----------------------|-----------|-----------|-------------------|
| Type O cattle | 2,314,150 | 2,248,950 | 3,327,550 |
| Type A cattle | 151,000 | 791,480 | 1,127,650 |
| Type Asia - 1 cattle | 237,250 | 1,169,300 | 1,884,360 |
| Type O pig | 621,840 | 1,169,301 | 1,353,400 |
| Total | 3,324,240 | 5,379,031 | 7,692,960 |

*: Total amounts of vaccine shipped form FMD Center In 1980-1981, it was FMD outbreak in south of Thailand. Most of vaccine has supplied in that area. In the end of 1981, the outbreak has eradicated. It caused shortly surplus of vaccine in the DLD, Since 1982, DLD had established new concrete plan of general vaccination. The above figures in the table indicate the demand of vaccine for vaccination. It means that the amount of vaccine that produced by the Center has upon to the demand of the Division of

Disease Control (DEC) . Remarkable, the correlation between the production plan and vaccine used is achieved.

3. Type of vaccine

Production procedures for type O, A, and Asia-1 cattle vaccine by suspension culture method were established, but, type A vaccine has to be often concentrated to meet Thai standard.

Type O pig vaccine has been produced by rolling culture method. Furthermore, the experimental vaccine for pig with type A and Asia-1 was also produced by this method.

4. Quality of vaccine

1) Basic research on immune duration with both cattle and pig vaccines revealed that SN antibody was increased significantly 3 weeks after vaccinations, but the antibody was dropped 3 months later in vaccinated animals. The result indicated that the potency of vaccines meeting Thai standard is still low. The concentration of vaccine to increase its potency is necessary for improving the FMD control in the field.

2) Recently, immediate type of allergic reaction was observed in 81 cattle and buffalo at Nakornsri Thammarat Province. The cause of the reaction has not been proved. It is continuously testing in both laboratory experiments and field survey. Concerning with this problem, on the other hand, assay of protein contents in vaccine has launched and the result indicated that purification procedure of vaccine in large scale is to be established urgently.

5. In vitro assay for vaccine

In vitro assay for infectivity and antigenicity were already established and further modification of CF test such as quantitative CF test was created.

Estimation of 140 S content in vaccine have been studied by ELISA, RID and CIF techniques.

In vitro safety test of vaccine by tissue culture method was

examined recently and the result indicated that it is much more sensitive than the safty test by animal inoculation method.

6. Potency test with animals

Potency test using cattle has been accomplished by Thai standard method. Various effort to estimate the potency of vaccine in stead of protection test in cattle has been done. Titration of neutralizing antibody levels in vaccinated animals were analysed on its correlation to the protection rate in animals. High correlation coefficient ($r=0,84$, $n=17$) is obtained between SN test instead of cattle protection test,

Guinea pig PD test has also been performed and high correlation has not yet been obtained between cattle protection rate or pig PD and guinea pig PD . Further improvement of this method is to be performed.

Mice for PD - test has just launched for establishing vaccine potency test.

7. Vaccination procedure

Basic research on vaccination procedure was revealed that subcutaneous injection of vaccine into cattle is more effective immunity than Spray injection method used in field vaccination.

Immunization of piglet in 3 weeks of age by pig vaccine has studied and vaccination of the piglets did not interfere their growth rate and also immune response of item is nearly same as those piglets in 6 weeks of age.

The twice vaccination method at 1 week interval between first and second injection has been used to immunize pig in the field. Basic study on the vaccination intervals between first and second injection indicated that in longer intervals such as 3 to 4 weeks intervals elicited the higher immunity than 1 week interval.

8. Supply of small experimental animals for vaccine control

Breeding of small experimental animals has developed. Production of mice is already able to fulfill demand of laboratory. Production of guinea pig is continuously developed in number to fulfill demand of laboratory. Production of feed pellet has improved in technology but there are some problems concerning with the pellet. At present it cause insufficiently support the feed pellet to the animals. It has still needed improvement in future.

9. Diagnosis

Typing method by CF test and virus isolation method from field samples by cell cultures have been already established.

The antisera against some of field isolates (type O and A) are already prepared and using these antiserum, antigenical differentiation among the field isolates were performed in type O and A by cross CF test. Continuous investigation on antigenically differentiation between seed virus or vaccine and field isolates has to be performed to select the new seed virus for production. Further investigation in type Asia-1 is also to be performed.

The basic experiment of serological diagnosis and epidemiological survey by ELISA technique of virus infections associate (VIA) antigen has been launched.

10. Epidemiology

Epidemiological investigation on subtyping on O and A is revealing the feature of subtype distribution in the field. Further study is to be continued for investigating the effect of vaccine in the field.

11. Building, Facilities, Equipments and Expendable materials for FMD Center.

1. According to the programme stated in the R/D, a total of 133 million Yen equivalent of equipments and materials have been provided from Japan in the past.

fiscal year of 1981 and 1982, and 59 million Yen equivalent ones in the fiscal year of 1983 is expected to offer for the project.

2. Establishment of routine checking and careful operation for equipments and facilities should be continued.
3. The building and facilities have been maintained relatively in good conditions with minor modification.

Additional works, such as some more construction of houses, animal shed, pellet making house, remodeling of electric wiring and laboratorys room and their relating facilities were made by the expenses both of Thai and Japanese sides. It is necessary, furthermore, to consider such arrangement as packing room for vaccine, modification of some equipment, vaccine tanks and so on with advancement of productions.

4. Early preparation of request by the center has been developing, but the flexible and early response by relevant officers for budget allocation are still needed to solve the unexpected problems in production.

Maintenance of facilities and equipments

Efforts has been done to improve the activities for maintenance of facilities and equipments in the center by both Japanese and Thai sides.

Operation, maintenance and minor repairing of facilities and equipments are routinely carried out in well being executed by existing Thai staff of limited career, but the set up for steady maintenance and major repairing of facilities and equipments are not completed yet.

12. Assignment of Japanese experts

1. Project advisor

A long term advisor for smooth implementation of the project has been assigned to DLD on December 1982 and his period will terminate on November 1984.

Reasonably, it should be extended his period into fifteen months, December 1984 to March 1, 1986.

2. According to the R/D of the project, 5 long term experts (52 men/month) and 7 short term experts (11men/month) have been assigned to the Center from December 1981 to September 1983.
 3. Besides the long term experts, short term experts in particular field were useful for smooth implementation of the project, and should be considered in future plan.
13. Thai Counterparts and other Personnels for FMD Center
1. The staffs and other personnels of the project have been strengthened by the efforts of Thai side. At the FMD Center, its employees totaled to 81 persons consisting of 19 officers and 62 workers before the project launched and then increased to 147 in total number consisting of 38 officers and 109 workers.
 2. Facility maintenance is gradually developed and 2 officers were newly employed to strengthen in this field by the efforts of Thai side. But it is still insufficient and further strengthening is necessary.
 3. The operation management, personnel control and reorganization of administration have been improved. But much more cooperation among each section is still needed for the improvement of vaccine production in both quantity and quality through monthly or regular meeting.
 4. The training of Thai counterparts in Japan has been conducted for 5 staffs from December 1981 to September 1983.

14. Budgetary Situation of Thai fiscal budget for FMD Center

1. Operation budget allocated to the Center for the 2 years are as following :

| | 1982 | 1983 |
|------------------------------|------------|------------|
| Salary and personnel expense | 4,566,500 | 5,127,500 |
| Expendable material | 7,661,628 | 4,705,604 |
| Non-expendable material | | |
| Miscellaneous | | |
| Land and Construction | 144,000 | 4,800,000 |
| Total | 12,372,128 | 14,633,104 |

X = revolving fund

XX = (Oct. - June, 1983)

15. Others

1. Model storage facilities for FMD vaccine

According to the requirement of Thai-Government, the FMD vaccine storage facilities for effective distribution, storage and inoculation of FMD vaccine are being constructed at four sites (Nakorn Pathom, Udonthani, Pitsanulok, Songkla). JICA's special fund.

After completion of the facilities, about 1.6 million doses of FMD vaccine are to be kept.

By the effective use of the facilities, smooth consumption of the vaccine will be expected. Two architectural experts are being assigned for the smooth construction of the facilities under the Animal Health Improvement Project.

2. Audio-visual aids

According to the DLD's requirement, Japan International Cooperation Agency has provided the Audio visual aids (3 sets) Cooperation with Japan Veterinary

Medical Association to assist of technical knowhow in the field of veterinary Medical Association, to assist of technical knowhow in the field of veterinary laboratories and extension of knowledge an animal health to the field veterinarians and farmers.

16. Summary

- 1) The vaccine production reached to target of the project quantitatively.
- 2) Various basic experiments for improvement of vaccine quality have just reached the target of fundamental in small scale. Therefore, the further efforts to improve both techniques of potency and safety of vaccine in large scale is to be continuously improved.
- 3) Improvement of the assay for vaccine quality is progress. But, some of material and method are not reliable yet. For establishment of more reliable assay method, in vitro assay techniques of vaccine potency and safety have just started.
- 4) The technique for the isolation of field virus was established. Further studies on comparison of antigenicity between field isolates and vaccine strains has been inadequated progression.
- 5) Epidemiological investigation on subtyping A and O type is revealing the feature of field distribution of variant viruses in each subtype. Further investigation to select the suitable seed virus for production is to be continued.
- 6) Improvement of facility maintenance has been achieved, but English operation manual, spare parts and technology are still needed.

3. Major problems. They are as the following items:-

- 3.1 Potency of FMD vaccine has still lower the international standard.
- 3.2 Bacterial contamination has still occurred in the purification of virus in large scale.
- 3.3 Searching the effective seed virus from local outbreak of FMD is insufficient.
- 3.4 Tank for suspension culture, vaccine storage, and vaccine concentration have not enough yet.
- 3.5 The supply of water(quality) and bovine serum has not been constantly sufficient.
- 3.6 Improvement of special technology for Thai counterparts has not completed yet.
- 3.7 International Training center for countries in Southeast Asia, South Asia and Pacific regions has not ready facilitated yet.

4. Justification for an extension of the project :

It is noted that quality of vaccine is developed. Potency of recent product only meets Thai standard, Improvement of vaccine quality should be studied, through investigations such as selection of vaccine virus strain, cloning virus, adaptation of virus to suspension culture and so on. The basic research has operated since the last phase. There were many factors concerned, some of them have not solved yet, Improvement of vaccine potency should be study through investigations, such as concentration of virus, selection of seed virus and so on. Therefore research on futher improvement of quality to meet international standard has to be launched in the next two years of the project extension.

In case of the mass production of vaccine, bacterial contamination is a good chance to appear in every step of vaccine

processing Improvement of technique and production procedure for purification of virus in large scale should be done urgently to improve vaccine quality.

In order to obtain more effective seed virus for vaccine production and also to watch the appearance of new subtype of virus, collection of field sample should be continuously performed. Epidemiological survey of each outbreak and analysis of the obtained informations is essential to effective performance of vaccination, including evaluation of efficacy of vaccine.

Presently, the achievement of equipment and facility operation are smoothly running but the capacity of productivity is in the limit of 18 million doses. And in accordance with the assignment of the Thai-National Economic-Social Development Board in the next two year plans has conducted the concreateed plans on increasing the capacity of the Foot-and-Mouth Disease vaccine production up to forty million doses, year by year (from 1984-5) to 1985-6 is 32 and 40 million . It is necessary to increase the number of vaccine tanks, facilities concerned and also the training Thai staffs for supporting the large scale production .

According to the center was purposed to be the International Training Center for countries in Southeast Asia and pacific regions. Facilities for training should be improved.

General conclusion, the technical activity on the project has been steadily progressed and achieved already remarkable success by the efforts relevant authorities and officials within a period of R/D.

The proposed cooperation period will be 2 years from

from March 2, 1984 to March 1, 1986 for the achievement of following activities,

1) Improvement of vaccine potency to elicit the long term immune duration.

2) Development of vaccine quality in large scale to reduce the protein content in vaccine.

3) Improvement of more reliable assay techniques in vitro and in vivo for safety, innocuity and potency tests.

4) Performance of further improvement of epidemiological investigation for vaccine production and for FMD control in Thailand.

5. Detailed description of the proposed project extension.

5.1 Project objectives :

1. To improve the existing facilities and procure the additional necessary facilities for the FMD Center.
2. To increase the productivity of Foot and Mouth Disease vaccing up to 40 million doses, (cattle and buffalo = 30 million doses and pig = 10 million doses) in the next two years.
3. To develop, from existing operation center, the completed Institution of Foot and Mouth Disease and the Foot-and-Mouth Disease Vaccine Production Center in Southeast Asia.
4. To establish a Training Center for the technical workers from both Thailand and other countries in fields of diagnosis, vaccine productivity and disease control.
5. To enlarge the Disease-free areas so that the expansion of livestock and meat production can be made.

5.2 Condition expected at completion of extended project.

In the period of project operation (24 months), the capacity of the center will be increased its own productivity to 25 million doses. There will be found bigger amount of Foot and Mouth Disease Vaccine to support animal disease control programme and whenever there is an heavy outbreak of disease, the production of vaccine can be accelerated to meet the requirement for the control purpose.

5.3 Recommended sources of data for project verification.

- Division of Veterinary Biologics, Department of Livestock Development.
- Summary report of evaluation for technical cooperation project on Animal Health Improvement between Japan and Thailand, September 16, 1983.
- Monthly progress reports by Japanese expert leader, Jan. 83 - Dec. 83.

5.4 Project site.

Foot and Mouth disease Vaccine Production Center, Nong Sarhai, Pakchong District, Nakornrajsima Province, Thailand.

5.5 Project work plan and activities.

5.5.1 Detailed work plan.

First year of project operation :

Some activities should implementary continuance from the last phase such as the improvement of potency test technology for international standard, increase amount of vaccine production to the national target, improvement of man power for mass production, improvement of the purification of virus in large scale, searching the effective seed virus, epidemiological concerned and so on. Some activities should urgently implement such as contribution and installation of vaccine tanks, equipment and facilities concerned. It is understanding that all existing activities are carrying out and

additional facilities with modification of modern technology will also implement parallelly.

In second year of project operation, the emphasis is increasing the vaccine production up to 40 million doses which consists of 30 million doses of FMD Type A, O and Asia¹ for cattle and buffaloes and 10 million doses of FMD Type O for swine.

5.5.2 Time schedule of project activities during March 2, 1984 to March 1, 1986.

| <u>Year</u> | <u>Activities</u> |
|---------------------------|---|
| April, 1984 - March, 1985 | <ul style="list-style-type: none">- Continue the existing facilities.- Improve man power.- Recruit additional man power.- Procure some facilities, tanks etc.- Send Thai-counterpart to train in Japan- Improve the vaccine quality up to international standard- Continue the epidemiological field work for FMD- Improve the existing facilities eg. Lab, equipment, etc.- Produce FMD vaccine up to 32 million doses by suspension and rolling culture method- Install equipment, vaccine tanks and facilities. |

| <u>Year</u> | <u>Activities</u> |
|-----------------------------|--|
| April, 1985 - March 1, 1986 | <ul style="list-style-type: none"> - Produce FMD vaccine up to 40 million doses - Send Thai-counterpart to train in Japan. - Continue the unfurnished activities in the first year operation. |

5.6 Manpower/personnel support for the extended project.

Institutional framework :

The Foot and Mouth Disease Vaccine Production Center only has authority to produce the various types of Foot and Mouth Vaccine. All authorities are undertaken by the Division of Veterinary Biologies, Department of Livestock (DLD), Ministry of Agriculture and Cooperatives. The vaccine production target is assigned by the DLD's policy and approved by National Economic and Social Development Board. The vaccine products are regularly supplied to DLD, and then Distributed to every provincial Livestock Offices all over Thailand. The coordination is shown as the following chart.

Ministry of Agriculture and Cooperatives

Department of Livestock Development

- Office of International Department of
Technical and
Economic Coopera-
tion (DTEC)

Office of the Secretary Division of Veterinary Biologics Other Divisions

Foot and Mouth Vaccine Production Center

To produce Foot and Mouth
Disease Vaccine as the annual target

| | |
|--|-----------------------------------|
| Director | - Dr. Thinsorn Chandakeaw |
| Deputy-director | - Dr. Ab Kongtone |
| Administrative section | - Dr. Thinsorn Chandakeaw |
| | - Mrs Aimorn Aranwanone |
| | - Miss Achra Somkraw |
| Vaccine production section | - Dr. Fichit Makasane |
| | - Dr. Payone Sinsuwongwatana |
| | - Dr. Panant Srichareon |
| | - Dr. Nonglakana Cholsin |
| | - Dr. Wachraree |
| | - Dr. Wongchun Chewros |
| | - Mr. Chareomsark Pinratsana |
| Quality Control and Experimental Animal Section | - Dr. Suneechit Kongtone |
| | - Dr. Tarika Pramoonsinsarbp |
| | - Dr. Nopporn Pattanaprasit |
| | - Mr. Chaiyapat Karndee |
| Laboratory Supply section | - Dr. Thinsorn Chandakeaw |
| | - Mr. Tongdee Keontha |
| | - Mr. Chanasongkarn Chaiyarat |
| | - Mr. Somyote Angkar |
| Tongue epithelium and Serum Collection section | - Mr. Niran Supreeyawanachai |
| Research and Diagnosis section | - Dr. Ab Kongtone |
| | - Dr. Wilai Sinchongsubongkole |
| | - Dr. Sanchai Kamolsiripichaiporn |
| | - Dr. Charanee Sastra |
| | - Dr. Suchad Suttirut |
| Mechanic and Constructive section | - Mr. Somsark Baewchaye |

5.6.1 Organization

| Section | Function |
|---|---|
| 1. FMD. Center | To produce the foot and mouth disease vaccine. |
| 2. Vaccine production | To culture the viral cell by Tissue culture and Frankel methods. |
| 3. Quality control | To test the potency, safety, purity etc, of the vaccine before distributing to the field service. |
| 4. Experimental animal | To takecare, breed, control sanitary condition and control disease infection. |
| 5. Laboratory supply | To clean glassware and laboratory instruments, then sterile them for laboratory supplied. |
| 6. Tongue epithelium and serum collection | To collect and look for the cattle tongue with membrane for culturing the viral cells by Frenkel Method. |
| 7. Research and Diagnosis | To look for the advanced technique and apply to center. To find out the problem concerned and solve it. To identify FMD field samples. |
| 8. Administrative | To manage the manpower, facilities/and organize the process within the center. |
| 9. Mechanical and Constructive | To co-ordinate with the Livestock Department and other official concerned. To maintain the machine, electricals, water and other effeciency concerned. |

5.6.2 Number of Thai staff of FMD Vaccine Production Center.

| year | Head and veterinarians | Assistant | Mechanic | Workers | Administratives | total |
|-----------------------------|------------------------|-----------|----------|---------|-----------------|-------|
| 1983-84 (Already available) | 27 | 29 | 6 | 147 | 20 | 209 |
| 1984-85 (to be requested) | 29 | 33 | 7 | 153 | 21 | 243 |

Head and veterinarian : at least D.V.M.

Assistant : at least B.Sc. or Certified Veterinarian

Mechanic : at least certified machanic

Administrative : at least certified clerk

6. Assistance required for project extension.

6.1 Expert:

| Field of Operation/Activity | Total | | 1984-85 | | 1985-86 | |
|---|-------|-----|---------|-----|---------|-----|
| | No. | m/m | No. | m/m | lic. | m/m |
| 1. Project advisor | 2 | 24 | 1 | 12 | 1 | 12 |
| 2. Machinery maintenance | 2 | 12 | 1 | 6 | 1 | 6 |
| 3. Vaccine production culture | 2 | 24 | 1 | 12 | 1 | 12 |
| 4. Quality control | 2 | 24 | 1 | 12 | 1 | 12 |
| 5. Epidemiology | 2 | 24 | 1 | 12 | 1 | 12 |
| 6. Other necessary fields - Exp. animal - Special lab. technics - etc. | 4 | 12 | 2 | 6 | 2 | 6 |
| Total | 14 | 120 | 7 | 60 | 7 | 60 |

6.1.1 Justification for requesting experts.

The Foot and Mouth Disease Vaccine Production Center will be constructed the new expansion building and installed new modern equipments and other facilities concerned. The Japanese experts are necessary to advise and extend the knowledge to the center staff of how to plan, manage and operate the equipment, So the center will be able to carry on alone after the project is terminated. The mastering of the complicated technical equipment and technique will require considerable time. Furthermore, training is needed for project implementation to set up an operational system, administration, organization, management and planning. The project advisor is required.

6.2.2 Job description of each expert required is in the attached papers on pages

Post title : Expert in Machinery maintenance

Duration : Twelve months for two years of the project period, one expert is six months per year

Duty station : Foot and Mouth Disease Vaccine Production center, Nong Srai area, Pakchong District, Nakornrajchsima Province

Duties : To advise and plan the project activities in the field of machinery engineering and other concerned and extend knowledge to Thai counterparts.

Qualification : a. Academic qualification : At least B.S. in engineer
b. Requested experience : At least 10 years experience in machinery engineering

Age limit : Between 40 to 60 years old

Language : Excellent English

Background information : Machinery engineering

Post title : Expert in Quality control

Duration : Twenty-four months for two years of the project period, one expert is twelve months per year.

Duty station : Foot and Mouth Disease Vaccine Production Center, Nong Sarai area, Pakchong District, Nakornrajchsima Province

Duties : To extend the knowledge concerning with the quality control of vaccine products to Thai counterparts.

Qualification : a. Academic qualification : At least D.V.M.
b. Requested experience : Foot and Mouth Disease Vaccine quality control technologist.

Age limit : Between 35 to 60 years old.

Language : Excellent English.

Background information : Foot and Mouth Disease Vaccine Quality Control technologist.

Post title : Expert in Epidemiology.

Duration : Twenty-four months for two years of the project period, one expert is twelve months per year.

Duty station : Foot and Mouth Disease Vaccine Production Center, Nong Sarai area, Pakchong District, Nakornrajhsima Province

Duties : To extend the knowledge concerning with veterinary diagnosis of vaccine products to Thai counterparts.

Qualification : a. Academic qualification : At least D.V.M.
 b. Requested experience : Foot and Mouth Disease Vaccine Diagnosis technologist

Age limit : Between 35 to 60 years old.

Language : Excellent English.

Background information : Foot and Mouth Disease Vaccine Diagnosis technologist.

Post title : Expert in other necessary fields :
experimental animal, special laboratory
technics, etc.

Duration : Twelve months for two years of the project
period, one expert is three months, two
experts per year.

Duty station : Foot and Mouth Disease Vaccine Production
Center, Songserai area, Pakchong District,
Nakornrajchsima Province.

Duties : To extend the knowledge concerning with
each special field to Thai counterparts,

Qualification : a. Academic qualification : At least D.V.M.
b. Required experience : At least 10 years
experience in each
special field.

Age limit : Between 35 to 60 years old

Language : Excellent English.

Background information : Specialist in each special field.

6.2 Fellowship

| Field of study/training | Total | | 1982-83 | | 1983-84 | |
|---|-------|-----|---------|-----|---------|-----|
| | No. | m/m | No. | n/m | No. | m/m |
| 1. Observation study | 4 | 4 | 2 | 2 | 2 | 2 |
| 2. Concentration and purification of virus | 2 | 12 | 1 | 6 | 1 | 6 |
| 3. Vaccine processing(training) | 2 | 12 | 1 | 6 | 1 | 6 |
| 4. Quality control (training) | 2 | 12 | 1 | 6 | 1 | 6 |
| 5. Serology method of virus(training) strain defferentiation | 2 | 12 | 1 | 6 | 1 | 6 |
| 6. Machinery maintenance(training) | 2 | 12 | 1 | 6 | 1 | 6 |
| 7. Peptide synthesis | 2 | 12 | 1 | 6 | 1 | 6 |
| 8. Genetic engineering(training) | 2 | 12 | 1 | 6 | 1 | 6 |
| Total | 18 | 86 | 9 | 44 | 9 | 44 |

6.2.1 Justification for requesting fellowships.

Four fellowships for observation study.

In accordance with the technology in worldwide is often developed. The technics of administration, management, and organization of the FMD center would be parallely improved. Taking the further knowledge is still needed. At present, there is no any trained personnel yet because the administrators were changed. Considerably, the observation study is necessary to request for four months in two years of the project period, one person per month, two persons in each year, one is for director of the center, one is for chief of each section and one is for project coordinator.

Two fellowships for purification of virus training.

Purification of virus technology is the most important factor of vaccine production. If the vaccine is contaminated, vaccine would be ineffective immunity. It will lost of livestock economic. Purification of virus technologists require to investigate the advance technical knowhow from the other country. The training is still needed.

Two fellowships for vaccine processing training.

The process of Foot and Mouth Vaccine production is much complicated technology. Particular field of technical knowledge is much essential for each step. Therefore the training is an important factor to improve the efficiency of each technologist. At present, the center has not enough trained personnel yet. Training is still needed.

Two fellowships for quality control of FMD vaccine training.

Before using the vaccine, we usually have to test its standard potency, And after distributed the vaccine to the field practice, we usually have to check and test it again. The testing and checking are needed special technical knowhow. The training is still needed. At present, the center has not enough trained personnel yet.

Two fellowships for serological method of verus strain differentiation training.

The serological activities in the step of the vaccine processing is an important factor. Having advance technical knowledge regarding production of Foot and Mouth Disease Vaccine is necessary for Thai staff. Training is needed. At present, the Foot and Mouth Disease Vaccine Production Center has limited trained personnel. Thereby, it is necessary to request training for one person per year for two years of the project.

Two fellowships for machinery maintenance training.

According to the center is a big factory fulfill with various kind of equipment, complicated chiller system, air compressor system, evaporation system, water treatment system, electrical system, etc. Having advance technical knowhow regarding production of Foot and Mouth Disease Vaccine is necessary for Thai staff. Training is still needed. At present, the center has limited trained personnel. Thereby, it is necessary to request training for one person per year for two years of the project.

Two fellowship for peptide synthesis training.

The principal of Foot and Mouth Disease Vaccine Production

is produced by Foot and Mouth Disease Virus. The advance of virological technology is an important factor of viral vaccine production improvement. Peptide synthesis technique is an important one concerned. Therefore, the training of Thai staff is still needed. At present, the center has trained personnel before. It is necessary to request training for one person per year for two years of the project.

Two fellowships for genetic engineering training.

Genetic engineering technology is an important technique for improving vaccine quality, the development of immunity of virus cells is necessary to research on ever onward. If research work can produce vaccine in high immunity, disease control will be much effective, it will make economic gain. Therefore, it is necessary to request training for two persons in the project period. At present, the center is still lacking of trained personnel.

6.3 Equipment Table is in the next page

6.3.1 Justification for requesting equipment.

In order to level up the mass production of Foot and Mouth Disease Vaccine to 40 million doses. The capacity of the center will be increased. The equipment and facilities concerned are needed as the following :-

Building construction with completed facilities will firstly construct for setting up new equipment such as vaccine storage tanks, cultivation tanks, media preparation tanks, etc. The new building is to be the same design and the same technological facility systems. And the new building has to connect to the present one. Therefore, it will be convenient and safety, if the center is to be imported some spareparts or other concerned for separation. Thereby, it is most necessary to request the assistance from Japan in the project cooperation period.

| Description of equipment item | Amount requested for each item | Unit cost | Total cost | 1984 - 5 | 1985 - 6 |
|---|--------------------------------|------------------|------------------|------------------|----------------|
| | | US\$ | US\$ | US\$ | US\$ |
| 1. Construction of Building with facilities and equipment | 1 | 5,500,000 | 5,500,000 | 5,500,000 | - |
| - Vaccine storage tanks with accessories size at least 2,000 litres. | 3 | 500,000 | 1,500,000 | 1,000,000 | 500,000 |
| - Cultivation tanks with accessories size : at least 2,000 litres. | 2 | 600,000 | 1,200,000 | 1,200,000 | - |
| - Media preparation tanks with accessories, size : at least 2,000 litres. | 2 | 0,000 | 400,000 | 400,000 | - |
| 2. Refrigerated truck (deisel) | 2 | 26,100 | 52,200 | 26,100 | 26,100 |
| 3. Air Bus (deisel) | 1 | 250,000 | 250,000 | 250,000 | - |
| 4. Instrument for isolated diagnostic Lab. detailed is in the list. | | | | | |
| Total | 11 | 7,076,100 | 8,502,200 | 8,376,100 | 526,100 |

Instruments for Isolated Diagnostic Laboratory

Foot and Mouth Disease Vaccine Production Center (FMDVPC)

Pakchong, Nakhon Ratchasima, 30130

Thailand.

| Item | Qun't | Amount (Bahts) |
|-------------------------------------|-------|----------------|
| 1. Air conditioner, split type | 10 | 350,000 |
| 2. Air incinerator | 2 | 250,000 |
| 3. Two-door autoclave 50/70 cm | 1 | 300,000 |
| 4. Laminar flow | 2 | 900,000 |
| 5. Spectrophotometer, digital | 1 | 600,000 |
| 6. Magnetic stirrer, heavy type | 2 | 40,000 |
| 7. Magnetic stirrer, small | 2 | 40,000 |
| 8. Ultraturax | 2 | 200,000 |
| 9. Autoclave, electric, medium size | 2 | 160,000 |
| 10. Autoclave, electric, small size | 1 | 50,000 |
| 11. Tube shaker | 2 | 14,000 |
| 12. Plate shaker | 1 | 30,000 |
| 13. Vacuum pump | 2 | 15,000 |
| 14. Timer | 3 | 1,200 |
| 15. Refrigerator | 2 | 60,000 |
| 16. Freezer | 2 | 100,000 |
| 17. Water bath 37C, large | 2 | 100,000 |
| 18. Water bath 56C, small | 1 | 30,000 |
| 19. Refrigerated centrifuge, | 1 | 100,000 |
| 20. Inverted microscope | 1 | 40,000 |
| 21. Gas, burner | 1 | 4,000 |
| 22. Gas, stove | 1 | 4,000 |
| 23. Microplate washer, automatic | 1 | 200,000 |
| 24. pH meter, digital | 1 | 55,000 |
| 25. Rack for cell culture | 36 | 36,000 |
| 26. Rack for test tube, stainless | 12 | 6,000 |

| Item | Qun' t | Amount (Bahts) |
|--|--------|----------------|
| 27. Incubator, with tube and drum roller | 1 | 200,000 |
| 28. CO incubator | 1 | 120,000 |
| 29. Centrifuge for microplate | 1 | 60,000 |
| 30. Dropper, glass, 0.025 ml | 20 | 100,000 |
| 31. Diluter, 0.025 ml | 60 | 60,000 |
| 32. Filter holder, 25 mm, attachable | 20 | 100,000 |
| 33. Stand and accessory | 2 | 10,000 |
| 34. Minishaker | 3 | 30,000 |
| 35. Balance 160 gm | 1 | 50,000 |
| 36. Vaccuum cleaner | 2 | 20,000 |
| 37. Ice making machine | 1 | 75,000 |
| 38. Electric stabilizer | 2 | 40,000 |
| | Total | 4,550,000 |

Vaccine storage tanks with accessories will be used for keeping the vaccine before bottling up. At present, there are not adequately for the purpose of mass production.

Cultivation tanks with accessories are using for culturing concentration of the virus in the process of vaccine production. It is required at least 2,000 litres, size. Because, it can culture the large amount of viral population in the mass production. At present, there are not adequately tanks for such purpose.

Media preparation with accessories are using for preparing the media that will grow virus in the process of vaccine production. The center need bigger size at least 2,000 litres. Because, it responses to large amount of the viral cultivation.

Refrigerated trucks are using for carrying vaccine from the FMD Vaccine Production Center to keep in the Department of Livestock Development before distribution to other users. This truck with diesel engine is temperated controller. At present, there is not enough. If there are more truck they can use for the purpose of mass production.

Aircondition bus will be used for observation study of a big group of international visitors who participated in the third country training programme on FMD control and out of the programme.

Instrument for isolated diagnostic laboratory are using for FMD virus diagnosis. This lab will be used for training the international Officers in Asian region.

6.4 Other

| Item requested | Total Cost | 1984-5 | 1985-6 | Remark |
|-------------------------------|------------|---------|--------|--------|
| | US\$ | US\$ | US\$ | |
| -Set up purification system | 50,000 | 50,000 | - | |
| -Laboratory material supplies | 20,000 | 10,000 | 10,000 | |
| -Installation of equipment | 50,000 | 50,000 | - | |
| Total | 120,000 | 110,000 | 10,000 | |

6.4.1 Justification for items requested.

In according with the limitation of each fiscal year, necessary parts of purification system, some laboratory material supplies such as chemical, media, special glass ware etc. are necessary to import from Japan. Those are needed to supply to the urgent case of the vaccine processing. They would be presented by the Government of Japan.

Installation of equipment, all equipment must import from Japan, their agencies are not available in Thailand and all technologies originated by Japanese engineers. It is necessary to request the present from the Government of Japan.

Both arrangements are requested to solve this kindrances.

6.4.2 Conclusion the assistance requested.

| Item requested | Sub. Total cost US\$ | 1984-5 US\$ | 1985-6 US\$ |
|--|-------------------------|----------------|----------------|
| 1. Building with facilities equipment and transportation | 9,127,700 | 8,576,100 | 550,600 |
| 2. Material supplies, Installa- tion of equipment and set up purification system | 120,000 | 110,000 | 10,000 |
| Grand Total | 9,249,700 | 8,686,100 | 560,600 |

Note : Total Cost of this project excludes the expense of Fellowships and the experts.

7. Royal-Lhai Government counterpart-contribution will be contributed to the project (in baht)

X 1,000

| Description | Total | | Year | | | Remark |
|-----------------------------|---------------------------------|-----------------|----------------------------------|--------------------------------|--------------------------------|--------|
| | Already available in RTS Budget | to be requested | 1983 - 1984 Already available | 1984 - 1985 to be requested | 1985 - 1986 to be requested | |
| 1. Project personnel | 4.792 | 12.010 | 4.792 | 5.719 | 6.291 | |
| 1.1 Professional staff | | | | | | |
| 1.2 Administrative staff | 3.500 | 200.000 | 3.500 | 120.000 | 80.000 | |
| 2. Land and construction | 15.000 | 30.000 | 15.000 | 15.000 | 15.000 | |
| 3. Expendable materials | 622 | - | 622 | - | - | |
| 4. Non-expendable materials | | | | | | |
| 5. Miscellaneous | | | | | | |
| Total | 23.954 | 242.010 | 23.292 | 140.719 | 101.291 | |

7. Future work

It is confidentially expected that after the project is terminated, fellows will have been trained in Japan and other personnel will have been trained by Japanese experts during in the project operation period in Thailand. They will carry out the activities of vaccine production effectively. And in according with the Thai Government policy, the FMD center is assigned to operate its full production capacity in the target of 40 million doses, the Foot and Mouth Disease Vaccine Production Center will be able to fulfill it's responsibilities, There will be adequated vaccine to support regular animal disease control programmes, and whenever there is an heavy outbreak of the disease, the production of vaccine can be accelerated to meet the new requirement.

Prepared by :

| | |
|---------------|----------------------------|
| Name | Dr. Vises Prasert |
| Position | International Co-ordinator |
| Division of | Veterinary Research |
| Department of | Livestock Development |
| Tel. | 2526941, 2515136-8 ext. 32 |

2. 新規プロジェクトに係わる要請書（非公式）

Request for New Grant Aid Project

Project title : National Animal Health and Production Institute

Requesting Agency : Department of Livestock Development, Ministry of
Agriculture and Cooperatives.

Proposed Source of Assistance : The Government of Japan

Background information and justification of the Project

Since the Department of Livestock Development has operated. The research works have not progress as well as the world wide countries have done. And according to Thailand is a tropical country. Moisture and climatic condition are suitable for the growth of micro-organism, parasites and disease vectors. There were highly frequency of disease outbreak among animals (Livestock, domestic and wild animal). It is very difficult to control or eradicate the infectious diseases that often cause the economic loss. Another present problems that are appearing in the most of population is the animal protein. The population of consumers is increasing rapidly and causes the big demand of consumption but the livestock production is still not enough supply and also the quality of protein concerned is still needed for improvement. Both principal problems have been solved but the solution has still not progress as well. Because the result of research work has not been parallelly done as well as the development of livestock has. Moreover, the imported vaccines for animal disease control are increasing in local market in Thailand annually. They caused a lot of immunity problems

after used. Some were good immunity but some were not. The imported vaccines have not been tested or analyzed before using in the public. Therefore, the establishment of the complex facilities (building, laboratory facilities) for both livestock service and research that called "National Animal Health and Production Institute" is the most necessary to request the grant aids from the Government of Japan.

Purpose : To pool and up grade of the technical standard to the international level.

Goal : To increase the productivity and income of traditional veillage livestock owners in Thailand by means of animal diseases control in high standard of disease diagnosis.

Objectives

1. To set up facilities for the National Animal Health and Production Institute.
2. To improve the livestock service and research activities in various fields.
3. To co-operate the livestock service and research works with other agencies or organizations.
4. To solve the problems in rural areas by means of research works.
5. To contribute the laboratory technique, laboratory material (Antigen, Antisera etc.) and trained personnel to existing regional laboratory diagnostic centers (Central, North, Northeast and South Regions).
6. To research the methodology of vaccine production for the main Lab. "Veterinary Biologics Production Center" Department of Livestock Development.

7. To be a central analysis of feed quality, quality of imported veterinary biologics and local veterinary biological products and data which collected from the three Regional Veterinary Diagnostic Laboratory Centers.
8. To be a central diagnosis of animal diseases and toxicological cases.
9. To be a national information center of livestock data.
10. To be a national training center for both field and laboratory officers and also for the other international training programmes.

Project site : The Institute will be located in the area of Bangken District, Bangkok Province, Thailand.

Operation period : There are three years from 1984 to 1987.

Steps of operation

1. Conduct the feasibility study of the project.
2. Design the project activities.
3. Sign in the exchange note on 1984.
4. Start operating the project on 1984.

Time schedule of project activities:

| <u>Year</u> | <u>Activities</u> |
|-------------|---|
| 1984 - 1985 | Building construction, shipping construction material, some imported materials. |
| 1985 - 1987 | Other facilities construction, shipping equipment and installation. |

The Related Institutions of the Project

Ministry of Agriculture and Cooperatives

Department of Livestock Development

| | |
|---|--------------------------|
| Office of Secretary | National Animal Health |
| Division of Animal Nutrition | and Production Institute |
| Division of Animal Breeding | |
| Division of Artificial Insemination | |
| Division of Livestock Extension | |
| Division of Feed Quality Control | |
| Division of Disease Control | |
| Division of Finance | |
| Division of Veterinary Biologics | |
| Veterinary Biologics Production Centre | |
| Division of Veterinary Service | |
| Division of Personnel | |
| Division of Veterinary Research | |
| -- North Regional Veterinary Diagnostic Laboratory Center | |
| -- Northeast Regional Veterinary Diagnostic Laboratory Center | |
| -- South Regional Veterinary Diagnostic Laboratory Center | |
| Others concerned | |

Related project/activities

This institute will relate to the following projects/activities :-

1. The Animal Health Improvement Project, Under Colombo Plans :
Foot-and-Mouth Disease Vaccine Production Center and South
Regional Veterinary Diagnostic Laboratory Center. They are
operating by Thai-Japan Technical Cooperation.
2. The Establishment of Northeast Regional Veterinary Diagnostic
Laboratory Center where is operating by Thai-German Technical
Cooperation, at Khonkaen Province.
3. North Regional Veterinary Diagnostic Laboratory Center where is
operation by regular Thai budget.
4. Various research activities within or outside of the Department
of Livestock Development, such as joint project research in Buffalo
Development project between universities (Chulalongkorn, Kasetsart)
and the Department of Livestock Development, Improvement of Public
Pasture in Tungkularonghai Project is also operating by Department
of Livestock Development and so on.

Project work plan

In three years of the project period, building construction,
installation of equipment and other facilities concerned will be completed
establishment. Official researchers from the Department of Livestock
Development will start operating the work suddenly. During the project
period, Japanese experts will be transferring technology to Thai counterparts
and/or cooperating in research works.

Financial support

In order to the establishment of National Animal Health and Production Institute where includes of building, equipment and virious facilities, the total request from the Government of Japan approximately is US\$ 25 million includes japanese experts but excludes the land.

Royal Thai-Government oounterpart contribution will contribute the land for the project.

Prepared by:

Name : Dr. Vises Prasert

Position : International Coordinator,
Department of Livestock Development.

Telephone : 2526941

2515136-8 ext. 32

Detailed Information

ANIMAL HEALTH

1. INTRODUCTION

A. Characteristics of the Livestock Industry /1

1. Animal health services operate against the following background characteristics of the livestock industry:
2. There are approximately 4.5 million cattle, 5.4 million buffalo, 4.9 million swine, 80 million poultry and relatively few numbers of elephants and horses. The Ministry of the Interior collects census figures through their district and provincial administrations. The Center for Agricultural Statistics receives the same figures but modifies them relative to additional information from a sample of herds. Both figures are compared in Table 1 and show similar tendencies. There appears to have been a stagnation in growth of cattle and buffalo in the last decade, and swine have not increased in numbers but show wide fluctuations between years. The number of ducks showed a spectacular increase in 1981 while chicken numbers declined following a peak in 1979./2
3. There is a dichotomy both in ownership and utilization of livestock. The majority of animals are owned by small traditional farmers, but there is an aggressive and successful commercial ownership and exploitation of swine and poultry. This is a major influence on the distribution of farm livestock in the country. The northeast of Thailand, comprising regions 3 and 4, has 41% and 67% respectively of the national cattle and buffalo herds. The major concentrations of swine are in region 3 (18.5%) and in three provinces of region 7 to the west of Bangkok (25%). Region 7 also has the greatest concentration of ducks (27%) but region 1 to the east of Bangkok has the greatest concentration of other poultry (27%).

/1 Principal reference: Thailand - Program and Policy Priorities for an Agricultural Economy in Transition. Vol. IV, Annex 8. World Bank Report No. 3705a - TH. December 3, 1982.

/2 Poultry figures are issued by the Ministry of the Interior only.

4. The commercial interest in pigs and poultry has made them the most important animals economically. Vertically integrated pig and poultry operations now supply up to 70% of all pork consumed in Thailand and have saturated the market for eggs and chicken meat in the large urban areas. The Northeast has traditionally been the area for breeding buffalo and cattle for draught, with buffalo being the favored animal. Many were sold into the central paddy areas and sent on to Bangkok for slaughter at the end of their working life. Even though the central areas are now largely mechanized, the surplus stock is absorbed by an increased consumption of cattle and buffalo meat in the Bangkok market. A small dairy industry based on crossbred indigenous/exotic animals is largely centered in the upland areas of central Thailand. Only 5% of domestic fresh milk requirements are produced. The country is otherwise heavily dependent on imported milk and milk products (Table 2).

5. In past years, cattle and buffalo for export were assembled in an area free of both foot-and-mouth and rinderpest and called a "disease free zone" (DFZ). This comprised all of region 9 and most of region 8 in the south. Exports have declined because of the increased domestic consumption of cattle and buffalo meat but more importantly because of a foot and mouth disease epidemic which included the DFZ. Currently, because of an improvement in the disease situation, exports to Malaysia have resumed but only of animals originating from the DFZ. However, exports now include swine from a commercial enterprise in the DFZ established as a joint venture between the Singapore and Royal Thai Governments. The most dramatic export development in the last decade has been the agreement to supply frozen chicken meat to Japan. Changes in the value of exports of livestock and livestock products for the years 1976 to 1980 are shown in Table 2.

B. Strategy for Animal Health

6. The Royal Thai Government (RTG) has a two-pronged policy for the development of the livestock industry. The commercial ("growth") sector is encouraged to expand production and increase exports while at the same time its smallholder ("poverty") sector is encouraged to develop from a marginal subsistence status to one producing surpluses for commercial sales. Since control of disease outbreaks is usually costly, the overall animal health strategy for both sectors must be to develop and encourage cost efficient preventive medicine services. Based on an improved surveillance system, however, the strategy for disease prevention will show variations between the two sectors and it can be viewed under three headings: (a) support to the medium-to-large scale commercial sector; (b) expansion of smallholder production; and (c) the relative roles of government and private sectors in providing animal health services.

Support to the Medium- to Large-scale Commercial Sector

7. The objective of government involvement must be to create the appropriate environment for more intensive private sector participation. This can be achieved by giving priority to:

- (a) the provision of a cost-effective structure of national disease surveillance and preventive medicine services so that disease risks to commercial livestock of high productivity can be minimized; and
- (b) the improvement of the disease control aspects of export procedures to achieve international confidence in Thai livestock and livestock products. This includes the establishment and maintenance of cost-effective disease-free zones.

Expansion of Smallholder Production

8. A detailed strategy is required for directly supporting the smallholder through the delivery of appropriate advice and technical inputs to remove disease as a restraint to increased production. The present disease prevention program of the Government focuses almost exclusively on vaccinations. However, the present system is largely ineffective because it is not supported by an adequate investigation service, there is insufficient vaccine coverage, and other important diseases exist for which vaccination is not the preferred method of prevention or control (e.g., husbandry in relation to calf diseases). The required strategy is to provide a package of advice and inputs which includes husbandry, prophylaxis (by vaccines or drugs) and treatment.

9. Achievement of this end will involve:
- (a) improving the planning and evaluation of animal health activities and integrating them into a national policy;
 - (b) increasing the linkage between animal production and animal health services and staff;
 - (c) initiating a wider base of participation in the administration of vaccines;
 - (d) adequate control of animal movements;
 - (e) providing diagnostic and investigation services which are at present lacking for disease surveillance; and
 - (f) raising the operational efficiency of field services, diagnostic and investigation services, and vaccine production.

Relative Roles of the Government and Private Sectors in Animal Health Services

10. The development of animal health in Thailand must reconcile government and private activities to provide an appropriately synergistic environment for the expansion of livestock production. The major area for reconciliation is in vaccine production, quality control, and distribution.

11. Government, already selling some vaccines cheaper than the private sector, needs to improve the quality. Government has the potential to produce and sell, potent and safe vaccines which are competitive with the private sector. The private sector, however, is a potential source of new vaccine technology; it can import vaccines not produced by Government, and through its diverse international connections can respond quickly to emergency requirement for vaccines. There is, therefore, a role for both the government and private sectors.

12. Government's vaccine production strategy should be to make maximum use of the existing production capacity and institute quality control procedures for its products. In parallel there must be an insistence on the quality control of commercial vaccines. A success by Government in the production of cost-effective, quality controlled vaccines will largely determine the future government and private sector shares of the vaccine market. The present distribution of vaccines by commercial livestock producers to their own farms and collaborating farmers includes government-produced swine fever vaccine. Government's strategy should be to make greater use of the commercial system of distribution in reaching the small-holder sector wherever possible.

2. PRIORITY CONSTRAINTS AND THEIR REMEDIES

A. Introduction

13. An efficient animal health service requires that planning and ongoing disease surveillance and evaluation should be carried out in a unit situated in direct contact with policy makers. Implementation and monitoring is usually carried out by the field services provided by and assisted by specialized inputs which can be grouped as: (i) diagnosis, investigation and research, (ii) supply of equipment, vaccines and drugs, (iii) staff education, and (iv) meat inspection services. Against this background the priority restraints to achieving a cost effective animal health service in Thailand and the required remedies are given below for both field services and inputs to them.

B. Improvement of Field Services to the Smallholder

14. A number of problems are important. Firstly, the farmer presently receives a vaccination service against a limited number of diseases, while other important diseases exist for which vaccination is not the preferred method of prevention or control (Examples are husbandry in relation to calf diseases and treatment in relation to trypanosomiasis). Moreover, vaccination programs (the primary activity of provincial and district staff) may not relate to the diseases causing greatest economic loss in their jurisdiction. Contacts between smallholder farmers and staff are therefore tenuous and not consistent enough to engender the mutual confidence required.

C. Inputs to Field Services

15 Detailed problems and suggested remedies are summarized below for investigation services and the production and distribution of veterinary vaccines.

Investigation Services and veterinary vaccines

16 The problems can be summarized as:

- (a) The regional investigation laboratories are too far distant to provide in-service lines of communication for most field staff; provincial clinics, on the other hand, are wrongly focussed and generally poorly equipped for diagnosis;
- (b) The regional investigation laboratories do not have integrated programs and methodologies which would provide a disease surveillance input on a national level.
- (c) the northern investigation laboratory is under-equipped for its responsibilities;
- (d) the central investigation laboratory in Bangkok is badly positioned for diagnostic and investigation functions;
- (e) the type of laboratory service required for intensive poultry and pig production in the commercial sector is only partially available from government facilities; and
- (f) At the Foot and mouth Disease Vaccine Production Center, further items of laboratory equipment are required to consolidate the present level of production.
- (g) There has been inadequate quality control of vaccines produced at the Veterinary Biologics Center. The non-availability of Specific Pathogen Free (SPF) eggs for the production of poultry virus vaccines raises the likelihood of contamination of such vaccines with other disease agents. No security compound exists for the handling of highly infective and virulent viruses used for vaccine production.

17 The remedies can be stated as:

- (a) The regional laboratories require integrated programs which contribute to a national overview of disease problems (e.g. diseases causing infertility, calf diseases, and ticks and tick-borne diseases). In order that such surveillance material can be analyzed, standard sampling techniques and standard diagnostic methodology require to be established. The main activities of these laboratories would, therefore, be "investigative" rather than "diagnostic" - which implies giving laboratory opinions on randomly submitted samples.

- (b) The central investigation laboratory needs to be moved to a place where it is accessible to the livestock industry. If moved to the suburbs of Bangkok at a minimum, then it is able to serve the commercial poultry and pig sector more efficiently than at present.
- (c) The grade of laboratory technician needs to be established in the Department equivalent in training to laboratory technicians already employed by the Ministry of Health which runs a training school.
- (d) to build a separate quality control laboratory which could handle both government and imported vaccines other than foot and mouth vaccines;
- (e) to provide consultancies and training; and

3. PROJECT RATIONALE

18. The Department of Livestock Development has expanded rapidly in the last decade assisted by important investments in animal health from international and bilateral agencies. As a result, the Department possesses an organized field staff and several major units needed for a modern animal health service. However, all components have yet to be adequately integrated into a national policy and some are not operating at a minimal level of efficiency.

19. The central requirements are the identification and quantification of the major disease problems, and the economic evaluation of alternative strategies for disease control. Until these are determined the allocation of resource among the animal health divisions within DLD cannot be properly apportioned, nor can the ultimate cost-effective size of the animal health services be determined.

4. THE PROJECT

A. General Description

20. The project aims to improve the research work concerning with animal health by improving the system of national disease surveillance, and by improving the capability of the DLD to conduct national disease control and eradication programs.

B. Detailed Description

Improvement of Investigation and Research Services

21. Support for the Central Investigation and Research Center. The project will provide basic laboratory equipment not at present available, and replacement for old and worn out equipment. Specialized items of equipment (e.g., electron microscope, atomic absorption spectrophotometer) which were requested have not been included where there appeared to be no economic justification. The siting of the laboratory is discussed under issues.

5. ORGANIZATION AND MANAGEMENT

22. The animal health services components will be one part of an agricultural support services project, with centralized procurement and accounting arrangements. Technical organization and management only are, therefore, described here. No new technical unit will be required as all components relate to existing organizational units within the Department of Livestock Development. The rationale for unifying animal health services and its link with animal production is given in Chart 1 of the main report.

6. ISSUES

Training of Veterinary Assistants

23. The present Veterinary Assistants' ("paravets") training can be argued to be too theoretical and divorced from contact with animals. The required training should enable the Veterinary Assistants to deliver the full range of animal health advice and service to the farmers. Issues to be resolved relate to the need for modifying the present Veterinary Assistants training program to enable it to strengthen the training of vocational school graduates and broadening it to include animal production and the interrelationships between animal health, nutrition and breeding.

Location of Facilities

24. Siting of a new Veterinary Assistants' Training School. Whatever decision is taken on the issue of Veterinary Assistant training, a new site is likely to be required to enable students to be in daily contact with an agricultural environment.

25. Siting of the Central Investigation and Research Laboratory. The present site of the laboratory is unsatisfactory because of the distance from both traditional and commercial farm clients, and lack of facilities for small and large animal experimentation. A new site overcoming these problems is required. The DLW is currently in negotiation with a bilateral aid agency to solve this problem.

26. Siting of a Vaccine Quality Control Laboratory. Estimates were submitted to the mission for a new vaccine quality control laboratory to be sited in proximity to Bangkok. The advantages put forward were:

- (a) decisions on the quality of vaccines produced by the DLW should be in the hands of scientists other than the makers in order to have unprejudiced opinions;
- (b) the laboratory would be better sited to test the quality of imported as well as DLW vaccines;
- (c) the laboratory space at present allocated to quality control at the veterinary biological laboratory center will become cramped when fully operational, even only handling DLW vaccines; and

Table 1

Livestock Census for the Principal Species of Domestic Animals
(^{'000})

| Year | Cattle | | Buffalo | | Swine | | Ducks | | Chickens | |
|------|--------|-------|---------|-------|-------|-------|--------|------|----------|------|
| | A /c | B /d | A /c | B /d | A /c | B /d | A /c | B /d | A /c | B /d |
| 1971 | 4,830 | 4,460 | 5,820 | 5,574 | 5,476 | 3,884 | 7,194 | /b | 61,437 | /b |
| 1972 | 4,365 | 4,485 | 4,930 | 5,361 | 4,573 | 3,982 | 7,281 | | 62,782 | |
| 1973 | 4,358 | 4,093 | 5,546 | 5,546 | 4,214 | 4,510 | 15,525 | | 45,682 | |
| 1974 | 4,204 | 4,150 | 5,743 | 5,642 | 3,532 | 3,846 | 13,647 | | 44,587 | |
| 1975 | 5,433 | 4,142 | 5,516 | 5,597 | 4,550 | 3,548 | 13,661 | | 40,504 | |
| 1976 | 4,144 | 4,322 | 5,248 | 5,895 | 3,043 | 3,404 | 13,420 | | 43,758 | |
| 1977 | 4,127 | 4,314 | 5,099 | 5,827 | 3,536 | 3,275 | 17,684 | | 46,146 | |
| 1978 | 4,990 | 4,437 | 6,021 | 5,959 | 4,247 | 5,324 | 22,405 | | 48,846 | |
| 1979 | 5,918 | 4,276 | 6,012 | 6,028 | 4,159 | 3,396 | 20,619 | | 75,195 | |
| 1980 | 4,563 | 3,938 | 5,909 | 5,651 | 4,014 | 3,021 | 22,505 | | 64,700 | |
| 1981 | 4,335 | /a | 5,427 | /a | 4,926 | /a | 58,882 | | 21,945 | |
| 1982 | 4,491 | /a | 5,388 | /a | 4,927 | /a | /a | | /a | |

/a Not available.

/b Not recorded.

/c Source A. Department of Livestock Development

/d Source B. Agricultural Statistics of Thailand - Crop Year 1980/81.

Table 2

The Value of Principal Exports and Imports of Livestock
and Livestock Products 1976-80 /a
(Baht million)

| | 1976 | 1977 | 1978 | 1979 | 1980 |
|---------------------------|--------------|----------------|----------------|----------------|-----------------|
| <u>Exports</u> | | | | | |
| <u>Live animals</u> | | | | | |
| Cattle | 47.9 | 106.5 | 113.6 | 104.7 | 64.3 |
| Buffalo | 99.3 | 108.7 | 137.8 | 104.1 | 34.5 |
| Pigs | 6.3 | 0.7 | 5.0 | 10.1 | 0.03 |
| Poultry | 10.9 | 8.3 | 17.0 | 11.9 | 42.7 |
| Others | 7.9 | 8.9 | 18.5 | 17.7 | 23.2 |
| <u>Livestock products</u> | | | | | |
| Hides, skins, leather | 177.1 | 231.8 | 295.8 | 478.9 | 260.0 |
| Meat, fresh and prepared | 76.9 | 168.9 | 442.4 | 570.0 | 671.5 |
| Feathers, boned, horns | 149.7 | 239.1 | 207.6 | 299.2 | 292.7 |
| Eggs | 38.9 | 74.7 | 37.2 | 21.6 | 12.0 |
| Milk and cream | 60.8 | 68.2 | 110.0 | 144.7 | 160.8 |
| Miscellaneous | 16.8 | 24.6 | 51.6 | 85.3 | 102.6 |
| <u>Total</u> | <u>692.5</u> | <u>1,040.4</u> | <u>1,436.5</u> | <u>1,848.2</u> | <u>1,664.33</u> |
| <u>Imports</u> | | | | | |
| <u>Live animals</u> | | | | | |
| Cattle | 6.5 | 1.7 | 25.3 | 12.6 | 1.4 |
| Buffalo | 0.2 | 0.3 | 0.5 | 2.2 | 0.5 |
| Pigs | 2.9 | 16.1 | 12.9 | 4.0 | 8.8 |
| Poultry | 25.2 | 30.4 | 52.9 | 76.6 | 91.0 |
| Others | 1.6 | 1.5 | 8.2 | 9.8 | 11.7 |
| Meat, fresh and prepared | 4.5 | 6.0 | 6.6 | 13.7 | 11.9 |
| Animal oil and fats | 55.3 | 89.4 | 98.1 | 107.0 | 105.0 |
| Hides, leather | 2.3 | 6.4 | 24.5 | 62.6 | 118.3 |
| Dairy products | 654.6 | 881.8 | 973.7 | 1,203.0 | 1,314.7 |
| <u>Total</u> | <u>753.1</u> | <u>1,033.6</u> | <u>1,202.7</u> | <u>1,491.6</u> | <u>1,663.3</u> |

/a Consolidated from Agricultural Statistics of Thailand. Information liable to correction in later annual editions.

D. Epidemiology and Economics of Animal
Disease in Thailand

The Spectrum of Disease in Relation to Neighboring Countries

1. Table 1 summarizes the knowledge of the presence or absence of animal disease of known or potential economic importance in Thailand and neighboring countries. Combining information from other sources,^{/1} the following conclusions can be reached.

- (a) Thailand and its western and southern neighbors (Burma and Malaysia) appear to have a better knowledge of the spectrum of disease within their borders than Thailand's eastern neighbors, Laos and Kampuchea.
- (b) Thailand is vulnerable to epidemic disease entering the country from its neighbors. These diseases are:
 - (i) rinderpest. whereas Laos and Kampuchea at one time eradicated rinderpest, the disease has reappeared in Kampuchea.
 - (ii) foot-and-mouth: the subtypes of foot-and-mouth virus present in Kampuchea show variations from those in Thailand. This complicates control by vaccination should infection enter Thailand from the East.
- (c) Some diseases of potential importance are either unrecorded in Thailand following limited search or no information exists. Of these categories, the following are recorded from one or more neighboring countries:
 - (i) malignant catarrh
 - (ii) mucosal disease

^{/1} Personal communications.

- (iii) contagious bovine pleuro-pneumonia
- (iv) scrapie
- (v) contagious caprine pleuro-pneumonia
- (vi) avian tuberculosis
- (vii) Johne's disease

In addition, disease of cattle other than brucellosis and leptospirosis which may have important effects on the calving rate are unrecorded both in Thailand and its neighbors. These include vibriosis, trichomoniasis and infectious bovine rhino-tracheitis.

Prevalence and Incidence Studies

2. The four investigation laboratories of the Department of Livestock Development (DLD) have produced checklists of aetiological agents of disease. Of greater importance are the attempts to quantify disease in the field. Table 5 shows indicative prevalence rates of some animal diseases which are endemic in the country. Incidence studies have been more limited. The distinct seasons and the period of work and nutritional stress on draught animals have important effects on incidence. haemorrhagic septicaemia outbreaks in cattle and buffalo and trypanosis in buffalo in the northeast are both associated with the rainy season.

Diseases as a Restraint to Production and Marketing

3. Reported Morbidity and Mortality. The DLD collects data on six diseases: anthrax, haemorrhagic septicaemia, blackleg, foot-and-mouth, swine fever and swine plague. The reported number of outbreaks, the associated number of sick and recovered animals, and deaths, are recorded in Table 6 - with the exception of swine plague. The existence of the latter as a disease entity is problematical and outbreaks have been reported in only 3 of the last 14 years. In broad terms the figures appear to confirm that anthrax, haemorrhagic septicaemia, blackleg and swine fever are fatal diseases. Foot-and-mouth in cattle and buffalo is primarily a debilitating disease but causes a relatively high mortality in swine. In specific terms the figures are not reliable enough for analysis. When government field staff are instructed to give priority to foot-and-mouth disease, their time becomes fully occupied and other diseases may be under-reported.

4. Effects on Production Indices. Available statistics from official and unofficial sources vary too widely to be analysable in terms of the relative importance of husbandry and disease as restraints to production.

5. Restraints to Genetic Improvement. The commercial livestock sector has introduced the disease control measures into their pig and poultry management systems which enable pure bred exotic stock to survive. The domestic buffalo is well adapted to the requirements of the small farmer and no genetic improvement appears to be required. Genetic improvement of cattle for beef production poses minor or no disease problems as long as Bos indicus breeds are used. However, there are serious disease problems relating to the introduction of Bos taurus breeds as the basis for development of a milk industry.

6. Twenty out of 21 Brown Swiss cattle died following importation in 1961. Heavy mortality in pure-bred exotic dairy cattle was later experienced by the Thai-Danish and Thai-German programs. A private importation of 400 animals from Australia resulted in an almost 100% mortality in 4 years despite attempts to control tick vectors of disease.

7. The major disease challenge has come from three haemoparasitic diseases (anaplasmosis, babesiosis and theileriosis) and foot rot. Trypanosomiasis has been a complication in the north and northeast. At present there is almost no knowledge concerning the distribution, prevalence and incidence of the four haemoparasitic diseases and their vectors.

8. Planning of a dairy industry in Thailand should include an assessment of the nature and size of the challenge from disease and the costing of alternative strategies for disease control or eradication both at the small farm and large commercial farm levels. Precedents exist both on the African and South American continents.

9. Restraints to Marketing. Overseas importers of livestock and livestock products from Thailand are either principally or only concerned with foot-and-mouth disease and rinderpest. Rinderpest was eradicated in 1959 but the country passed through a peak of incidence of foot-and-mouth disease in 1980 which even over-ran the DFZ which had been free of the disease for over 20 years. Exports of live animals showed a marked decline partly for this reason.

10. Contagious bovine pleuropneumonia is recorded both in Burma and Kampuchea but not in Thailand. If discovered in Thailand, the disease would adversely affect both movements of cattle within the country and their export on the hoof. The level of illegal movements of livestock from Burma over the years makes the introduction or even presence of the disease a possibility.

11. The Economic Impact of Animal Disease. At the present time the epidemiological data available are grossly deficient as a basis for making an overall assessment of animal disease as a restraint to production. On current information, and extrapolating from situations in other developing countries, foot-and-mouth disease in cattle, buffalo and pigs, haemorrhagic septicaemia in cattle and buffalo, swine fever (hog cholera) and Newcastle disease in poultry, probably deserve priority attention. However, there is the probability that unspectacular diseases causing infertility or debility will be found to have a greater long term economic importance.

12. The priority for analysis is foot-and-mouth disease. It is also the disease most easily examined because of its visible effects on exports, mortality in pigs and loss of milk in an embryo dairy industry. Its effect on cattle and buffalo in the traditional sector is probably negligible except where draught animals are infected during the ploughing season.

Veterinary Public Health

13. Veterinary public health is that part of disease control activity concerned with disease communicable to man. The benefits are primarily social.

14. The standard of meat inspection in Thailand is low for home consumption but the DLD has sophisticated equipment for the analysis of meat intended for export. Information on the prevalence of meat-borne disease is sparse but Trichinosis is said to be important in the northern hill tribes.

15. Rabies in dogs is endemic in the whole of Thailand and government estimates state that there are at least 300 human fatalities a year.

Table 3

Summary of knowledge of the presence or absence of animal disease of known
or potential economic importance in Thailand and bordering countries.

| Disease | Thailand | Kampuchea | Lao | Burma | Malaysian Peninsular |
|-------------------------------------|----------|-----------|---------|---------|-------------------------|
| Foot and mouth | + | + | + | + | + |
| Virus O | + | 0 | + | + | + |
| Virus A | + | 0 | 0 | + | -(1973) |
| Virus C | - | 0 | 0 | 0 | - |
| Virus Asia 1 | + | 0 | 0 | + | - |
| Virus SAT 1, 2, 3 | - | 0 | 0 | - | - |
| Rinderpest | -(1959) | + | -(1966) | -(1957) | - |
| Malignant catarrh | - | 0 | - | - | + |
| Mucosal disease | - | 0 | - | + | - |
| Bovine rhino-tracheitis | - | 0 | - | ? | - |
| Contagious bovine pleuro-pneumonia | - | + | ? | + | - |
| Fowl pox and avian diphtheria | + | + | + | + | + |
| Rabies | + | + | + | + | + |
| Aujeszky's disease | + | - | + | ? | + |
| Swine fever (cholera) | + | + | + | + | - |
| Swine erysipelas | + | + | + | + | -(1978) |
| Atrophic rhinitis | + | - | - | + | -(1977) |
| Melioidosis | + | 0 | - | + | + |
| Influenza, Parainfluenza | + | - | - | ? | -(1977) |
| Bluetongue | - | 0 | - | 0 | -(1979) |
| Scrapie | - | - | - | + | - |
| Contagious pustular dermatitis | - | - | ? | + | + |
| Foot rot | + | - | - | + | - |
| Contagious caprine pleuro-pneumonia | - | 0 | - | + | - |
| Leptospirosis | + | - | ? | + | + |
| Toxoplasmosis | + | - | ? | 0 | ? |

Legend: + present
 - not recorded
 ? suspected
 0 no information available
 (19__) year of last recorded outbreak

Source: Summarized from the FAO/WHO/OIE Animal Health Yearbook for 1981 using the same sequence of presentation.

Table 4

| Disease | Thailand | Kampuchea | Lao | Burma | Malaysia |
|-------------------------------|----------|-----------|-----|-------|----------|
| Newcastle disease | + | + | + | + | + |
| Velogenic virus | + | 0 | 0 | 0 | + |
| Mesogenic virus | 0 | 0 | 0 | 0 | + |
| Lentogenic virus | 0 | 0 | 0 | 0 | + |
| Fowl plague | - | + | + | + | - |
| Avian infectious bronchitis | + | - | + | ? | + |
| Avian laryngo-tracheitis | + | + | ? | ? | + |
| infectious coryza | + | - | + | + | + |
| Chronic respiratory disease | + | - | + | + | + |
| Avian encephalomyelitis | + | - | ? | - | + |
| Duck virus hepatitis | + | - | 0 | + | 0 |
| Duck plague | + | 0 | 0 | 0 | 0 |
| Narek's disease | + | - | + | + | + |
| Coccidiosis | + | + | + | + | + |
| Anthrax | + | + | + | + | -(1976) |
| Blackleg | + | + | - | + | - |
| haemorrhagic septicaemia | + | + | + | + | + |
| fowl cholera | + | + | + | + | + |
| Salmonellosis | + | + | + | + | + |
| Vibriosis (genital) | 0 | - | - | ? | - |
| Trichomoniasis | 0 | - | - | ? | - |
| Bovine tuberculosis | + | + | + | + | + |
| Avian tuberculosis | ? | 0 | ? | + | - |
| Johne's disease | - | 0 | ? | + | + |
| Brucellosis | + | 0 | ? | + | + |
| Br. abortus | + | 0 | + | + | + |
| Br. melitensis | + | 0 | ? | + | - |
| Br. suis | + | 0 | ? | + | + |
| Mastitis | + | + | + | + | + |
| Avian leucosis | + | - | + | + | + |
| Anaplasmosis | + | 0 | ? | + | + |
| Babesiosis | + | 0 | ? | + | + |
| Theileriosis | + | 0 | + | + | + |
| Trypanosomiasis | + | + | + | + | -(1978) |
| Cysticercosis, bovine | + | + | + | + | - |
| Cysticercosis, swine | + | + | + | + | - |
| Hydatidosis, ovine | - | 0 | 0 | + | - |
| Hydatidosis, bovine | 0 | + | + | + | - |
| Distomatosis (liver fluke) | + | + | + | + | + |

Table 5

Indicative /a prevalence rates of some animal diseases obtained
by the Diagnostic Laboratories from field samples 1981/82

| Laboratory | Disease | Species | No. of samples | No. of positive | % positive |
|---------------------|--|-------------|----------------|-----------------|------------|
| <u>Northeastern</u> | Brucellosis | Buffalo | 696 | 5 | 0.7 |
| | | Cattle | 718 | 49 | 6.8 |
| | | Swine | 360 | 2 | 0.5 |
| | Fascioliasis | Buffalo | 3,493 | 953 | 27.3 |
| | | Cattle | 1,238 | 210 | 17.0 |
| | Trypanosomiasis (<u>T.evansi</u>) | Buffalo | 1,206 | 121 | 10.0 |
| | | Cattle | 180 | 5 | 2.8 |
| | | Horse | 234 | 42 | 17.9 |
| | <u>Southern</u> | Brucellosis | Buffalo | 184 | 0 |
| Cattle | | | 1,606 | 16 | 1.0 |
| Swine | | | 993 | 43 | 4.3 |
| Fascioliasis | | Buffalo | 74 | 6 | 8.1 |
| | | Cattle | 561 | 113 | 20.1 |
| Trypanosomiasis | | Cattle | 1,163 | 0 | 0.0 |
| Theileriosis | | Cattle | 1,163 | 1 | 0.08 |
| | | Cattle | 1,163 | 191 | 16.4 |
| <u>Northern</u> | | Brucellosis | Buffalo | 1,049 | 47 |
| | Cattle | | 1,373 | 174 | 12.7 |
| | Fascioliasis | Buffalo | 821 | 34 | 4.1 |
| | Cattle | 913 | 17 | 1.9 | |

/a Sampling methods are not standardized, nor are the diagnostic methods.

Table 6

The reported number of animal disease outbreaks with the associated numbers of sick and recovered animals, and deaths

| Disease | Year | No. of outbreaks | Cattle | | Buffalo | | Pigs | |
|---------------------------|------|------------------|------------|------------|------------|------------|------------|------------|
| | | | Re-covered | Mor-tality | Re-covered | Mor-tality | Re-covered | Mor-tality |
| Anthrax | 1977 | 6 | - | 18 | - | - | - | - |
| | 1978 | 8 | - | 11 | - | - | - | - |
| | 1979 | 5 | - | 4 | - | 5 | - | - |
| | 1980 | 6 | - | 8 | - | 13 | - | - |
| | 1981 | 10 | - | 16 | - | 10 | - | - |
| | 1982 | 3 | - | 8 | - | 6 | - | - |
| Haemorrhagic Septicaemia | 1977 | 167 | - | 143 | - | 414 | - | - |
| | 1978 | 127 | 3 | 164 | 50 | 477 | - | - |
| | 1979 | 71 | 4 | 30 | - | 191 | - | - |
| | 1980 | 87 | 4 | 42 | - | 212 | - | - |
| | 1981 | 118 | - | 70 | - | 740 | - | - |
| Blackleg | 1977 | 69 | 4 | 62 | 13 | 258 | - | - |
| | 1978 | 1 | - | 9 | - | - | - | - |
| | 1979 | - | - | - | - | - | - | - |
| | 1980 | - | - | - | - | - | - | - |
| | 1981 | - | - | - | - | - | - | - |
| Foot and Mouth | 1977 | 1 | - | 6 | - | - | - | - |
| | 1978 | 123 | 6,814 | 11 | 6,076 | 2 | 8,892 | 539 |
| | 1979 | 207 | 7,872 | 5 | 2,518 | 9 | 1,316 | 71 |
| | 1980 | 302 | 30,179 | 17 | 6,269 | - | 1,708 | 54 |
| | 1981 | 934 | 30,982 | 166 | 57,760 | 12 | 2,576 | 220 |
| | 1982 | 190 | 14,032 | 97 | 7,674 | 22 | 960 | 128 |
| Swine fever (nog cholera) | 1977 | 94 | 8,842 | 11 | 3,793 | 2 | 508 | 20 |
| | 1978 | 31 | - | - | - | - | 16 | 1,130 |
| | 1979 | 37 | - | - | - | - | - | 844 |
| | 1980 | 4 | - | - | - | - | - | 17 |
| | 1981 | 4 | - | - | - | - | - | 46 |
| | 1982 | 1 | - | - | - | - | - | - |
| | 1982 | 3 | - | - | - | - | 238 | 291 |

Source: Records - Department of Livestock Development.

E. Existing DLD Divisions for Animal Health

1. Within the scope of its activities in animal production and health, the DLD is responsible for all aspects of animal health with the exception of municipal veterinary public health services in Bangkok and the inspection of domestic meat supplies throughout the country. The latter is the responsibility of the Ministry of Health.

2. Central Administration. The Director General (DG) has two Deputies, one for production and one for health. The Deputy for Animal Health has responsibility for four technical divisions each with its own Director. The divisions are Disease Control, Veterinary Services, Veterinary Biologics and Veterinary Research. In addition, the Office of the Secretary (which has the status of a Division) contains a planning and evaluation unit for both production and health activities and the Division of Personnel is responsible for the training of Veterinary Assistants.

3. The principal responsibilities and major units within the technical divisions are:

- (a) Disease Control: animal disease prevention and control with emphasis on notifiable diseases. Administers quarantine stations, ports of exit and entry, trichinosis control units and a meat export quality control laboratory.
- (b) Division of Veterinary Service: logistic support to provincial services including clinical and diagnostic services at the provincial level. Administers 30 provincial clinics, whose locations are listed in Table 1.
- (c) Division of Veterinary Biologics: production of vaccines, sera and antigens, and associated applied research including foot-and-mouth typing and sub-typing. Administers a Foot-and-Mouth Vaccine Production Center and a Veterinary Biologics Center under separate Directors but both on the same estate at Pak Chong.
- (d) Division of Veterinary Research: diagnosis and applied research in animal diseases. Administers four laboratories, one in Bangkok and three dispersed regionally for the northeast, north and south.

4. Provincial Administration. There are 73 Provincial Livestock Officer (PLO) supervising 675 District Livestock Officers (DLO). The PLOs are advisors to provincial Governors on livestock matters and are ex-officio members of the provincial administrative boards. Field responsibilities are overwhelmingly disease prevention and control involving vaccination programs. Some DLOs have an assistant.

5. Lines of Command. Between the Provincial Livestock Officers and the central administration are 9 Regional Livestock Officers whose function has recently been changed. Instead of being representatives of the DG, co-ordinating production and health activities, they have now assumed administrative responsibilities bringing them into the line of command and they have each been given a mobile disease control unit for deployment in their regions.

6. There is no direct line of command between the provincial clinic and the regional investigation laboratories.

7. Installations in the field which are administered by the central divisions concerned with animal production are not within the responsibility of the PLOs even though they may take services directly to the farmer.

8. Staff grades, training and numbers. There are two grades of animal health personnel, the graduate veterinarian and the veterinary assistant. There is no establishment for laboratory technicians.

9. Veterinary Facilities exist in the Universities of Chulalongkorn and Kasetsart, both in Bangkok. Both have field stations outside of Bangkok specializing in dairy farming and pig production respectively. Although both facilities teach a clinical bias, Kasetsart has included some epidemiology and economics training into the curriculum and Chulalongkorn is redesigning its curriculum to this end. Approximately 580 graduate as DVM each year.

10. Veterinary Assistants are principally trained at a school forming part of the DLD complex in central Bangkok. The course lasts two years after high school and consists mainly of theoretical training in Bangkok and two months a year training in the field at DLD offices or installations. The student output is 200-250 a year. In 1981-1982 students have been trained for the first time also at Chiang Mai in the north and Khon Kaen in the northeast with an intake of 100 students at each site. At all three locations the training suffers from inadequate accommodation, teachers have to be borrowed part time from other divisions, and there is inadequate contact with both animals and animal production environments.

11. There are current negotiations to enable Veterinary Assistants to enroll for a degree in extension being offered at the new University of Sukothai Thammathiraj in Bangkok. There are no arrangements enabling Veterinary Assistants to enroll at a Veterinary Faculty.

12. In 1981 the establishment of veterinarians was 342 with 58 vacancies, and the establishment for veterinary assistants was 1734 with 353 vacancies. The vacancies for veterinarians are filled in default by veterinary assistants who may be found occupying posts up to provincial level. Graduate veterinarians find alternative employment in the private sector and in commerce.

13. Data Collection, Evaluation and Planning. There is understanding and intention in the Department to place animal health services on an economic basis. An evaluation and planning unit exists in the Office of the Secretary; however, the unit is not strong enough to insist on the type and integrity of data required for economic analysis.

F. Training

Staff training is the responsibility of the Training Section of the Personnel Division. Staff training requirements are stated by the divisions concerned and implemented by the Training Section. Various forms of training have been coordinated or supervised by the Training Section although the major continuing activity has been the Paraveterinarian School run by DLD. The Training Section has one professional training coordinator; a second position for coordination of overseas training and general professional staff development is vacant.

The Institute will be responsible for training Livestock Assistants. Their training will be geared mainly to functions as DLOs or similar. They would however be technically equipped to work as assistants to professional officers in all branches covered by DLD work.

The project will support construction of a training facility at Bang Khen which will be used primarily for the Livestock Officer Course. It will also be used as the venue for most of the staff update/refresher courses.

General Departmental Training

1. General Departmental Training. Training conducted within DLD itself caters for training of technician level staff. The major activity is the current Paraveterinarian School which will be changed to a Livestock Officer Course. Other departmental training relates to refresher/update courses for staff. These are not considered under technical assistance.

2. Livestock Officer Course. The increase in DLO staff supported by the project necessitates the training of some 400 persons in the general principles of livestock production in addition to refresher/retraining courses for existing staff. The existing course, of two years' duration, was created to produce Disease Control Officers. The demand for this type of trainee is now met, so the course offered will be modified to meet the project objective of serving livestock producers more directly.

3. Refresher/update courses for DLD staff will be used as a means of imparting new knowledge to field staff. In the initial stages of the project, existing DLO staff will attend courses of about one month duration where their new responsibilities and information necessary for their new tasks are presented. Subsequent refresher/update courses will be of one to two weeks duration and will be conducted at the Bang Khen training facility. Each field officer (DLO) will attend a relevant refresher/update course once every two years. Course content will be arranged by subject matter specialists from each technical division and coordinated by the Training Section.

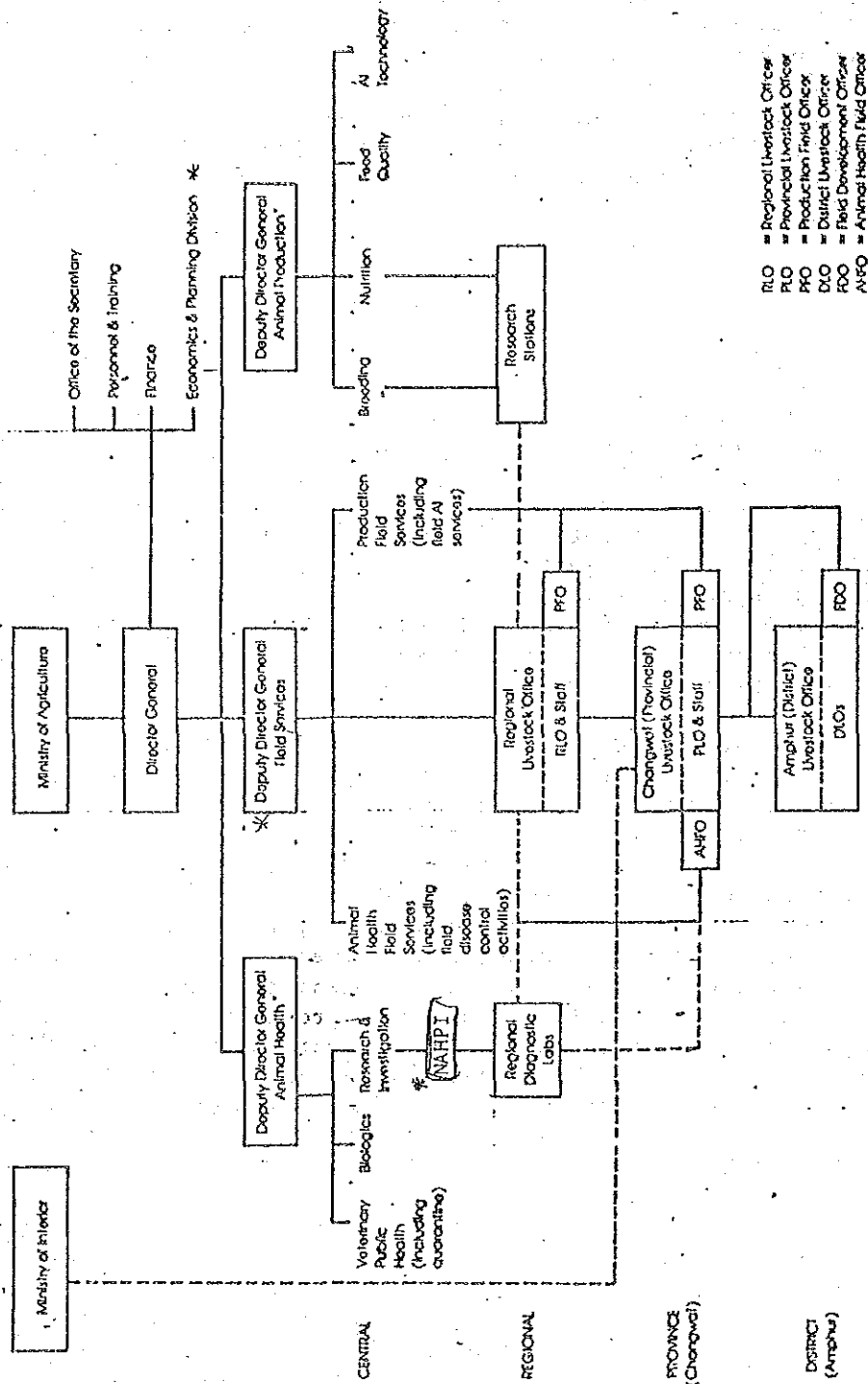
Management Training

1. Management training is possibly the most urgently needed and at the same time the least considered form of training required by DLD. This is a common feature of both technical and government organizations. The need for cost effective management in these circumstances is often overlooked. DLD is an organization of some 8,000 people with an annual budget of about \$30 million. Efficient running of this size of organization requires good management and this is rarely developed simply through experience. DLD requires three forms of management training. Two relate specifically to DLD's major tasks: research and extension. The third covers the development and promotion of general management skills.

2. General Management Training will involve introducing supervisory and management staff to sound management principles and practice. Supervisors and middle managers need to learn how to direct, guide and motivate those working for them. Ultimately DLD is simply a group of people working together. The Department's success must depend entirely on the energetic and intelligent efforts of these people. Management staff can do much to influence these factors. Effective planning, reporting, monitoring, evaluation and control are also essential management tools aimed at improving productivity through better communication and coordination. Management by Objectives is another simple and useful approach to more effective management and output. It lays emphasis on a clear understanding of goals and objectives throughout the organization. The importance of cost control and careful resource utilization also need incorporation in management training programs to help managers contribute towards increased benefits, mainly service oriented, at lower cost.

Chart 1

ORGANIZATION OF DEPARTMENT OF LIVESTOCK DEVELOPMENT



- RLO = Regional Livestock Office
- PLO = Provincial Livestock Office
- PFO = Production Field Office
- DLO = District Livestock Office
- FDO = Field Development Office
- NAHPI = Animal Health Field Office

*An alternative could be to combine these two into one Deputy Director General for Technical Services. A further action in this case would be the appointment of a third Deputy Director General in charge of Administrative Services (i.e., Office of Secretary, Personnel & Training, Finance & ETD).

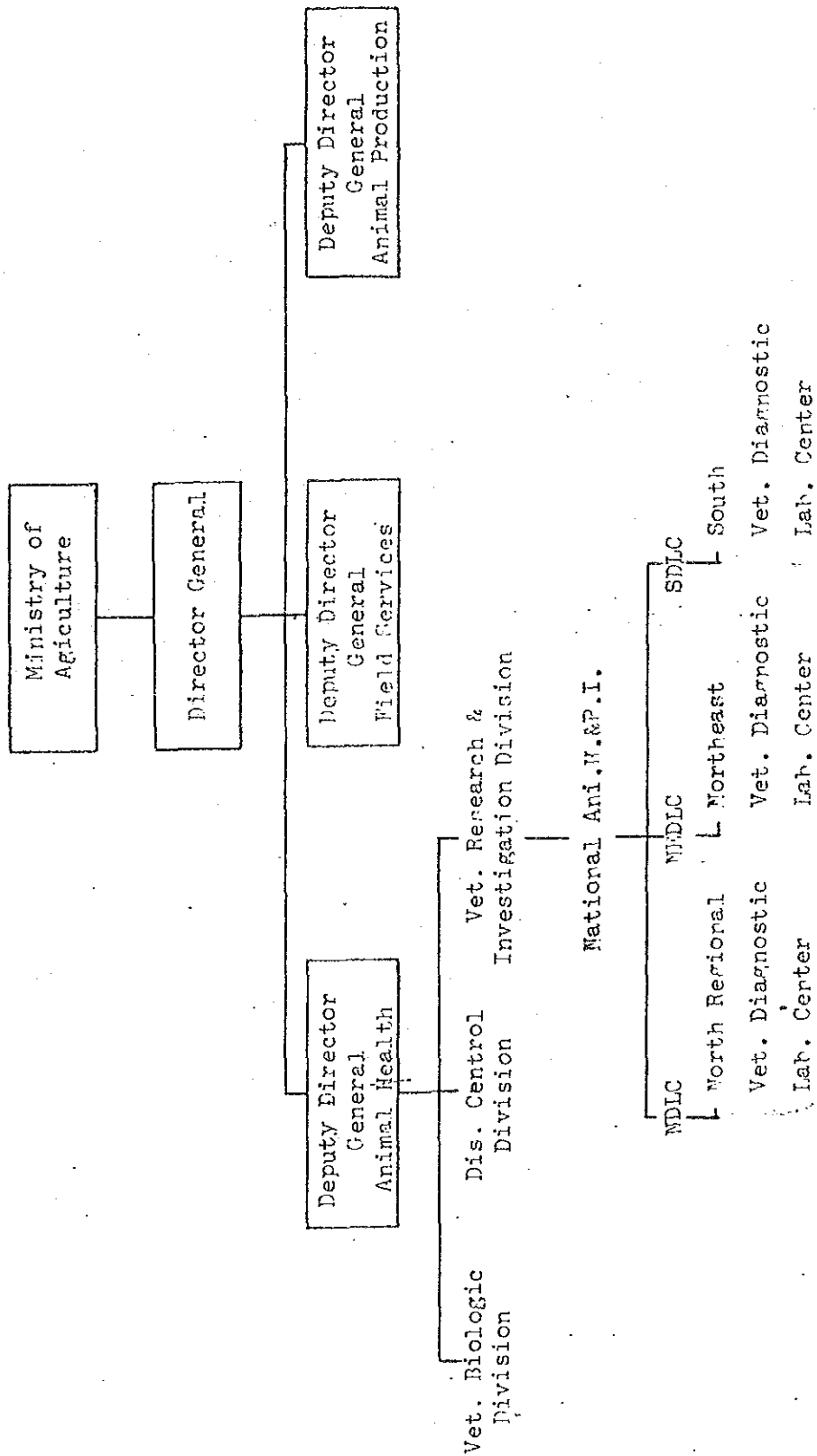


Table 7

THAILANDMOAC AGRICULTURAL SUPPORT SERVICES PROJECTLocation of Veterinary Clinics

| | |
|----------------|------------------|
| Bangkok | Khon Kaen |
| Ayuthaya | Mahasarakarn |
| Lopburi | Kalasin |
| Saraburi | Chiengmai |
| Cha Choeng Sao | Lampang |
| Cholburi | Pitsanuloke |
| Nakornrajseima | Tak |
| Chaiyapoom | Nakornsawan |
| Surin | Uditaradit |
| Ebol | Nakornpathom |
| Yasothon | Petchaburi |
| Udorn | Nakornsritamaraj |
| Loei | Surajtanee |
| Sakonakron | Songkhla |
| Nakornpanom | Patani |

G. Government Disease Control Policies and Activities

Investigation and Research Services

1. Table 8 gives a comparison of the number of samples received and the types of examination carried out at the four diagnostic laboratories during 1981. The laboratory in the northeast has assistance from a West German bilateral aid program and the southern laboratory has assistance from the Japanese. There is no integrated program between the laboratories but they all operate in similar ways. Specimens are received from the field for diagnosis, and from all laboratories teams move into the field to conduct investigations and surveys. Only the central laboratory lists specific research items.

2. Central Diagnostic and Research Laboratory, Bangkok. The laboratory is poorly sited for any purpose. Concentrations of traditional and commercial livestock production are at a distance beyond the urban spread of Bangkok, and there are limited facilities for small animal experimentation and none for large animals. Current research items include:

- (a) studies on swine pseudo-rabies vaccine production;
- (b) studies on infectious laryngotracheitis vaccine production;
- (c) potency testing of a duck plague vaccine;
- (d) study on the normal levels of cholinesterase in swine, cattle and buffalo;
- (e) study of the nitrate content of common grasses in Thailand;
- (f) study of chronic respiratory disease in poultry;
- (g) isolation of Pasteurella multocida from the field, and the study of serotypes, for the inclusion in departmentally produced haemorrhagic septicaemia vaccine;
- (h) a survey of the incidence of swine erysipelas;
- (i) survey for Tritrichomonas foetus in cattle; and
- (j) immunization of calves with infective larvae of Oesophagostomum radiatum.

3. Northern Diagnostic Laboratory, Lampang. The laboratory is strategically situated for surveillance of the borders with Burma and Laos. However, its operation is hampered by a lack of even basic equipment. There is good cooperation with the Provincial Livestock Officer in the province in which the laboratory is situated and two villages a month are selected for a combined visit with Provincial staff. Few samples are received from elsewhere.

4. Northeastern Diagnostic Laboratory, Khon Kaen. There is a well defined work program which attempts to link with all other animal health activities in the northeast. Groups of five villages have been chosen in each of three provinces for routine visits. These are border provinces - one with Laos, one with both Kampuchea and Laos and one with Kampuchea. Another group of five villages has been chosen near to the laboratory for close and continuous surveillance. Importance is given to interpreting the results of laboratory findings to provincial and district livestock officers and to farmers, and initiating control programs at the village level. Emphasis is given to farmer "self-help" programs. Morale of the staff is good and the results of field investigations will become increasingly significant. The major hindrance is a lack of staff housing and several Thai staff return to their families in Bangkok at weekends.

5. Southern Diagnostic Laboratory, Tungsong. The site of the laboratory is central within the DFZ and is an essential component for the level of surveillance that such a zone requires. As in the northeast, there is an attempt to interpret laboratory findings to government livestock officers and farmers. There is a policy of promoting key farms where animal health programs can be demonstrated.

6. Provincial Clinics. There are 35 provincial clinics scattered throughout Thailand. They not only do clinical work with small animals in towns but the staff are available to visit farms if requested. There is a varying amount of equipment available to provide laboratory aid. The work load in the few clinics visited by the mission was low and the equipment poor.

Vaccine Production and Importation

7. Vaccine Production Achieved by the DLD and Production Targets. The number of vaccine doses produced in the fiscal years 1979-1982 and the production targets for the years 1983-1986 are shown in Table 9. Table 10 gives the types and quantities of diagnostic reagents produced. Achievement of all targets will require extra equipment. Most expensively, the 1983 foot-and-mouth disease targets may represent the maximum output of the present facilities for monovalent vaccines. Multivalent vaccines have not yet been produced.

8. Quality Control of Vaccines. There has been inadequate quality control of vaccines produced at the Veterinary Biologicals Laboratory. At present, with more laboratory space having become available, a number of rooms have been allocated for quality control and staff are being trained in the required techniques.

9. Eventually there will be the need for a quality control laboratory divorced from the production facilities in which the quality of imported vaccines may also be checked.

10. Commercial Vaccine. The major imports of vaccine are from France, Taiwan, United Kingdom and the United States of America. The volume of imports and the share of the market between importers could not be determined by the mission. Importations have to be approved by a committee in the Ministry of Health.

11. The potential market for pig and poultry vaccines in Thailand for 1982 at consumer prices, and serving both traditional and commercial sectors, has been estimated at B 222.4 million by one of the principal distributors. The recommended regimes and detailed calculations were made available to the mission. At this volume of business some malpractice can be anticipated, and allegations exist of illegal importations of vaccine and even of importations of inappropriate or dangerous vaccines. No commercial vaccines are manufactured in Thailand.

12. Government policy is to carry out vaccinations free in the traditional sector for foot-and-mouth disease, haemorrhagic septicaemia, blackleg and anthrax, where this is a government requirement. Poultry vaccines are also free if they are being administered as part of a poverty program. Farmers may also buy any vaccine if they so wish, and this is the most normal way of distributing poultry and pig vaccines. The commercial sector appears to hold the government swine fever vaccine in high regard, but has less regard for poultry vaccines.

Table 8

Comparison of the Number of Samples Received and the Types of Examination Carried out at the Four Diagnostic Laboratories of the Department of Livestock Development During 1981

| Section | Type of examination | North-east | North | Central | South |
|--------------|--|------------|-------|---------|-------|
| Bacteriology | Examination prepared of fresh material | 2,349 | 1,305 | 6,465 | 4,109 |
| | Susceptibility to antibiotics | nil | 19 | 3,268 | 56 |
| Virology | Virus identification | 439 | nil | 535 | 187 |
| | Rabies diagnosis | 234 | nil | nil | 439 |
| Serology | Agglutination | 1,135 | 6,396 | 3,579 | 7,072 |
| | Complement fixation | nil | nil | 1,625 | 158 |
| | Haemagglutination | nil | 47 | nil | nil |
| | Mercuricethanol | nil | nil | 1,827 | nil |
| Parasitology | Faecal samples, egg counts | 4,061 | 1,826 | 3,262 | 3,767 |
| | Blood samples, haemoparasites | 567 | 2 | 994 | 2,042 |
| | Ectoparasite identification } | 189 | 1 | 2,465 | nil |
| | Endoparasite identification } | | nil | nil | nil |
| Pathology | Autopsies | 517 | 98 | 934 | 974 |
| | Histopathology | 1,335 | 395 | 6,385 | 5,626 |
| | Clinical pathology | 814 | 322 | nil | 2,000 |
| Biochemistry | Blood examinations | | | | |
| | haemoglobin, cell counts | nil | nil | 197 | nil |
| | magnesium | nil | nil | 53 | nil |
| | phosphorus | nil | nil | 124 | nil |
| | calcium | nil | nil | 62 | nil |
| Toxicology | Nil | nil | nil | nil | nil |

Source: Annual report for 1981, Veterinary Research Division, DLD.

Table 9

The Number of Vaccine Doses Produced by the Department of
Livestock Development for the Years 1979-1982 and Production
Targets for the Years 1983-1986 /a/b (millions)

| Vaccine | Production | | | | Production Targets | | | |
|--|---------------|---------------|---------------|---------------|--------------------|--------------|--------------|--------------|
| | 1979 | 1980 | 1981 | 1982 | 1983 | 1984 | 1985 | 1986 |
| Foot and mouth (cattle and buffalo) | 1.1 | 1.2 | 3.4 | 4.1 | 15.0 | 20.0 | 25.0 | 30.0 |
| Foot and mouth (swine) | 0.3 | 0.3 | 1.2 | 1.2 | 3.0 | 5.0 | 7.0 | 10.0 |
| Haemorrhagic septicaemia | 4.3 | 4.6 | 4.6 | 4.6 | 7.0 | 8.0 | 9.0 | 10.0 |
| Anthrax | .2 | .2 | .2 | .3 | 0.6 | 0.8 | 1.0 | 1.0 |
| Blackleg | .05 | .09 | .08 | .06 | 0.2 | 0.3 | 0.4 | 0.5 |
| Brucellosis | .03 | .1 | .1 | .02 | 0.6 | 0.8 | 1.0 | 1.0 |
| Rinderpest | 0.2 | 0.4 | .04 | .3 | 0.6 | 0.6 | 0.6 | 0.6 |
| Swine fever (Hog Cholera) | 1.0 | 1.2 | 1.5 | 1.4 | 3.0 | 4.0 | 6.0 | 6.0 |
| Newcastle | 88.4 | 117.6 | 100.1 | 92.0 | 140.0 | 160.0 | 180.0 | 200.0 |
| Fowl pox | 3.1 | 8.3 | 8.9 | 7.7 | 14.0 | 16.0 | 18.0 | 20.0 |
| Infectious bronchitis | 6.5 | 12.7 | 9.6 | 8.6 | 14.0 | 16.0 | 18.0 | 20.0 |
| Fowl cholera | 5.3 | 7.9 | 6.1 | 9.0 | 8.0 | 10.0 | 12.0 | 15.0 |
| Duck plague | 28.4 | 21.9 | 22.8 | 32.0 | 32.0 | 36.0 | 40.0 | 50.0 |
| Total doses | <u>138.88</u> | <u>176.49</u> | <u>158.62</u> | <u>161.28</u> | <u>238.0</u> | <u>277.5</u> | <u>318.0</u> | <u>364.1</u> |

/a Calculated for fiscal years ending 30 September.

/b The table excludes rabies vaccine. Departmental records state that .003 and .012 million doses were produced in 1980 and 1981, but no figures are available for 1982 and no production targets are issued.

Table 10

Types and Volume of Diagnostic Reagents Produced by the Department
for Livestock Development for the Years 1979-1982 (ml.) /a

| | 1979 | 1980 | 1981 | 1982 |
|-------------------|--------|--------|--------|-------|
| Pullorum antigen | 7,620 | 5,390 | 6,000 | 6,800 |
| Bruceella antigen | | | | |
| - plate | 26,000 | 13,140 | 21,420 | 2,500 |
| - tube | 5,060 | 8,340 | 10,240 | 7,000 |

/a Calculated for fiscal years ending 30 September.

H. Private Sector Activities in Animal Health

1. A basic requirement for the commercial pig and poultry sector is to protect its heavy investment in installations and imported livestock, from losses from disease. They therefore require vaccination regimes, using quality controlled vaccines, to be included routinely in management practices. They also require rapid diagnosis when any loss of production occurs from disease. The DLD is not organized to give a complete service to this level of enterprise and the private sector has had to take the initiative. The following activities are involved:

- (a) sending veterinarians and others overseas for specific training;
- (b) establishing veterinary surveillance routines;
- (c) the establishment of at least four private diagnostic laboratories equipped principally for serological diagnoses;
- (d) the importation of a range of vaccines which are either not produced by the DLD or are alternatives when DLD vaccines are thought to be suspect; and
- (e) distributing vaccines efficiently and quickly to all their enterprises and clients in a timely fashion.

2. Potential Contributions to Animal Health Services. The commercial sector has had in recent years a spectacular impact on the livestock industry including the animal health inputs required for modern, intensive, pig and poultry enterprises. There is also a potential for future partnership with government in the development of animal health services. These are most importantly:

- (a) assistance in the introduction of new vaccine production technology: most importantly this implies genetically engineered foot and mouth vaccines, or alternatively vaccines derived from peptide synthesis
- (b) extending the commercial system of vaccine distribution to their installations and clients to include all farmers whether in traditional or commercial sectors;

- (c) assistance in diagnostic technology, particularly in those diagnostic techniques concerned with foot and mouth virus typing and subtyping;
- (d) importation of vaccines which are uneconomical for government to manufacture;
- (e) using their international resources to respond to emergency requirements for vaccines, drugs or reagents.

Activities

Existing Activities

Administrative Section

- Financial Subsection
- Experimental Animal Subsection
- Personnel Subsection
- General Service Subsection

Parasitology Section

Diagnosis and Research are mixed

Immuno-serological Section

Diagnosis and Research are mixed

Epidemiology Section

Survey and Sample collection are mixed

NAHPI'S Activities

Administrative Section

- Financial Subsection
- Personnel Subsection
- General Service Subsection
- Planning Subsection
- Procurement Subsection
- Coordinating Subsection
- Health Subsection

Parasitology Section

- Ectoparasitology Subsection
- Helminthology Subsection
- Protozoology Subsection
- Radio-Isotope for parasitological Research Subsection

Immuno-Serological Section

- Serological-bacteriology Subsection
- Serological virology Subsection
- Serological-biologics research Subsection

Epidemiology Section

- Survey collect sample Subsection
- Data collection analysis Subsection
- Disease surveillance Subsection

Existing Activities

Toxicology Section

Diagnosis and Research are mixed

Virology Section

- Cattle Buffalo Subsection
- Swine Subsection
- Avian Subsection

Bacteriology/Mycology Section

Diagnosis and Research are mixed

Pathology Section

All activities are mixed

NAHPI'S Activities

Toxicology Section

- Pesticide Subsection
- Biochemistry Subsection
- Mycotoxin Subsection
- Plant poisoning Subsection
- Feed poisoning Subsection

Virology Section

- Cattle Buffalo Subsection
- Sheep Goat Subsection
- Swine Subsection
- Avian Subsection
- Horse Subsection
- Virological Biologics Research Subsection

Bacteriology Section

- Zoonoses Bacteria Subsection
- Enteric Bacteria Subsection
- Infectious Bacteria Subsection
- Bacteriological biologics research Subsection

Pathology Section

- Clinical Pathology Subsection
- Histopathology Subsection
- Post-mortem Subsection
- Tissue Processing Subsection

Mycology Section

- Avian Subsection
- Livestock Subsection
- Mycological Antigen research Subsection

Existing Activities

NAHPI'S Activities

Experimental Animal Section

- Small Animal Subsection
- Large Animal Subsection
- Feed Production Subsection

Lab. supplies Section

- Media Preparation Subsection
- Glass Ware Preparation Subsection
- Tissue culture Preparation Subsection

General equipment Section

- Electromicroscope Subsection
- Computer Subsection
- F.A. technique Subsection
- Fliza technique Subsection
- Photographic Subsection

Vet. Biol. Assay Sect.

- Imported Biologics, Potency Test
- Local Biologics

Feed Quality Control

- Feed mixed analysis
- Additive analysis
- Legislative analysis

Maintenant Section

- Lab. equipment Subsection
- Electrical and Water supply Subsection
- Transportation Subsection

Training Section

- Para-veterinary school Subsection
- Training Administrative Subsection
- Field Staff Training Subsection

Existing Activities

NAHPI'S Activities

Library Section

- Administrative Subsection
- Journal subsection
- Text book Subsection
- Library computer Subsection
- Miscellaneous Subsection

Table 11

J. Annual Finance

| Year | Baht | |
|---------|-------------|------------|
| | DLD | VRD |
| 1983-4 | 675,027,400 | 20,796,800 |
| 1982-3 | 615,503,200 | 20,709,900 |
| 1981-2 | 497,532,900 | 16,651,300 |
| 1980-1 | 438,558,400 | 15,155,700 |
| 1979-80 | 357,612,500 | 11,575,300 |

Note :

DLD = Department of Livestock Development

VRD = Veterinary Research Division

Animal Nutrition Improvement

INTRODUCTION

1. Nutrition is a key constraint to livestock development in Thailand. Disease control allows larger numbers of animals to survive and would therefore create an even greater need for higher production of feed. Coupled to this is the need to increase feed quality in order to permit successful genetic upgrading of livestock. Knowledge of means of improving the nutrition of different domestic livestock species varies according to production systems. Intensive monogastric industries rely on commercially prepared feedmixes while smallholder monogastric industries rely on by-products and other wastes. Large ruminants are predominantly (more than 90%) raised by smallholders with limited feed resources on their land but who often have access to other areas of land. Nutritional improvement is therefore of importance to the smallholder base for all domestic animal species while regulation of feedmix quality is of importance to the remainder of the monogastric industries.

2. Animal nutrition improvement and regulation are currently separated within DLD into the Division of Animal Nutrition (DAN) and the Feed Quality Control Division (FQCD). This separation of activities was introduced to accommodate the need to control feedmixes produced by large commercial companies to supply the monogastric industries. Formulation of a separate FQCD allowed the creation of a separate laboratory complex and sampling system not relevant to the DAN. However, limited space in the central DLD location, limited numbers of trained staff and, to some extent, professional isolation from the rest of the DLD have restricted implementation of the full responsibilities of DLD for feed quality control through the FQCD. Feed quality control is discussed in later. Similarly, animal nutrition research has not proceeded as effectively as it would otherwise have if the DAN had had access to a better equipped laboratory and an associated controlled research program. Within DLD, the discipline of animal nutrition is seen as one in which shared laboratory and technician facilities should have an interactive benefit. In the long-term the two divisions will merge, initially to share a common laboratory facility to be constructed as part of the project, and later completely under one direction.

Feed Quality Control

Introduction

1. Pigs and poultry are raised under both backyard and intensive systems. The latter production system is serviced by the technically advanced feed industry in Thailand and service to that section of the industry is best provided through regulation of feedmix quality. Other pig and poultry producers also utilize feedmixes and concentrates to varying extents in varying manners. The other ingredients mixed into such rations by farmers are usually locally produced or available products.
2. Support for the farmers mixing rations themselves is required in the form of research into the most appropriate means of utilizing locally available products. Such research should be centralized in order to benefit from the better facilities and more highly trained staff that can be provided through one center. In contrast to cattle and buffalo research, regional evaluations are not required because such variations are more controlled in pig and poultry production systems.
3. Nutritional improvement research for all livestock requires high-quality laboratory support. Planning of research programs provides laboratory management with projected throughput requirements which are essential to efficient laboratory operation. The specialist staff and equipment required for a suitable animal nutrition laboratory should be utilized in the most efficient manner by centralizing all related laboratory activities.

The Existing Situation

4. The large monogastric feedmix industry in Thailand produces all mixed feeds and concentrates required by the industry. These feedmix companies are located mainly around fishing areas reflecting their origins as a means of salvaging waste fish. With the growth in production of feedmixes based on fish, maize, cassava, soybean and other locally produced raw materials, export of feedmixes developed rapidly. However RTG policy changes to stimulate utilization of these products in-country reversed this situation and feedmixes are now mainly consumed in Thailand; partly in vertically integrated industries from feedmills to producers, and partly in private commercial farms. The efficient operation of this sector of the industry precludes DLD involvement beyond a regulatory function.

(a) Monogastric Industries

5. Pig production in Thailand can be divided into three systems, viz.: (a) intensive vertically integrated company owned, (b) commercial semi-intensive privately owned, and (c) smallholder production. Table¹² presents a breakdown of pig ownership per household for the four regions of Thailand. If a herd size of less than five is considered to be the smallholder group and herd sizes of less than 100 head are commercial semi-intensive, it appears that the majority of pigs (58%) are raised under a small size commercial system. Previous emphasis on smallholder production has been associated with the higher proportion (79%) of producers in an effort to assist the largest group of poorer producers.

6. Poultry production in Thailand has mainly concerned chickens, although ducks have assumed increasing importance in recent years. It is estimated that poultry are raised by more than 70% of households in Thailand under a scavenging, free-range system of management. These birds are kept for both egg and meat production. Broiler production in Thailand is intensive and vertically integrated through both raising of broilers by feedmix companies and contract raising of broilers (42 days) under a self-contained credit system. Output of the broiler industry totals some six million birds per week which supplies more than 50% of chicken meat sold through major markets. Up to two million birds per week are exported because they are in excess of local demand. Egg production is less controlled by large companies and is based on intensive and semi-intensive production systems for all major cities. Smallholder chicken ownership probably accounts for egg and chicken meat consumption of the 70% of households owning poultry. However, as consumption levels of animal products are lower in these areas than in cities, it is estimated that around 32% of chicken meat ^{/1} can be attributed to the smallholder production base. In the case of egg production, the production from smallholders may be only 20% because a higher proportion of eggs in cities are produced on commercial farms. Duck production in Thailand is based on feeding of agricultural and other by-products in conjunction with commercial feedmixes.

7. Pig and chicken meat and eggs are thus produced predominantly (between 68% and 80%) under systems that are based on the feeding of feedmixes or concentrates. In terms of the proportion of animals that could be fed from feedmix produced in Thailand if no other feed stuffs were used (refer to Table¹³), this would reduce these estimates in the cases of egg production and pig raising. However, feedmix and concentrates are fed as partial rations of pigs and poultry by medium scale producers who have

^{/1} Assuming that 50% of chicken meat in cities is from smallholder production, that 30% of population is in cities and that chicken meat consumption outside cities is 25% of that in cities.

access to supplementary feed resources. In terms of relative economic impact of feed analysis in the monogastric industries, checking of feedmill produce will most likely benefit a larger production base than checking of the diverse and uncontrollable dietary components used in the smallholder production system.

(b) Feedmix Production

8. A total of 32 registered feedmix companies produced a total of some 1.17 million tons of complete feedmix and 0.4 million tons of concentrate in 1982. In addition, fishmeal was produced by 84 registered companies and soybean/peanut meal by 25 registered companies. These raw materials are utilized in feedmixes to a certain extent and, when used outside the feedmix industry may be utilized under conditions where the full value of the concentrates and the raw material is not realized.

9. The number of registered companies from 1980 to 1982 and their output is presented in Table 14. Production volume of feedmills far exceeds that of fishmeal companies and, as it has a potentially greater influence on the monogastric industries, requires regulation by DLD to a greater degree. The names of the principal feedmill companies (representing about 75% of the industry's production) and their production capacities are presented in Table 15. A list of all registered companies and their location is presented in Table 16. Production capacity of around 2.5 million tons per year exists in Thailand in the 32 registered companies and, as this is 1.7 times current production, it is unlikely that the number of feedmills will rise greatly in the near future.

Regulation of the Industry and the Present Role of the Feed Quality Control Division

10. The Animal Food Quality Act (BE 2525) amended the previous regulations concerning animal feed. The Act provides for registration of companies processing animal feedstuffs and details the procedure for imposition of penalties. An Animal Food Quality Committee /1 is required to be formed under the Act which will provide resolutions within the Act of relevance to quality control in the industry for implementation by DLD. Regulation of the industry is conducted within DLD predominantly by analysis and samples of the Feed Quality Control Division. Prosecutions under the Act have not been made to date. Implementation of the Act is hampered by the investment of some

/1 Comprised of the Under-Secretary of State for Agriculture and Cooperatives (Chairman), Director-General of DLD (Vice Chairman), and qualified committee members appointed by the Minister to not more than twelve persons, four of whom are appointed from agriculturalists, and the Director of Animal Food Quality Division, DLD as committee member and Secretary.

authority in the Food and Drug Administration in the Ministry of Public Health, which is responsible for both humans and animals.

11. The preproject arrangement for animal feed analysis is based on the staffing and equipping of the Feed Quality Control Division (FQCD) to sample and analyze feedmixes and other animal feedstuffs regularly. A total of 54 government officials are presently involved in this regulatory support service. The FQCD at present is only responsible for analysis of some 600 samples per year; however, the FQCD also perceives a responsibility to analyze samples on demand as a service to smallholders and other parts of the industry.

12. A staffing table for the FQCD in 1982 is presented as Table 17. The Division is divided into five sections, the largest of which (30 government officers) is the Field Inspection Section. The second largest section is the Laboratory with 12 staff. Present deficiencies in meeting targets are associated with limited space in the laboratory and an apparent lack of manpower for both sampling work and laboratory analyses. At present, there are a total of 13 full time inspectors to cover the 32 registered feedmills and, theoretically, 109 registered meal plants. Under the present system of DLD sampling, this is an inadequate number and an additional 17 positions have been approved but are not yet funded. A total of 30 inspectors will be sufficient with a revised sampling program (para. 16).

13. A breakdown of staff in the Laboratory Section is presented in Table 18. Of the 12 nominal positions, only 6 have been funded to date although it is expected that this will increase to 11 in 1983. Such a staffing level will increase the capacity of the Section to meet the requirements of the FQCD. Equipment in the laboratory is modern and further purchases cannot be made until the space constraint is removed. Work output for past years and targets for 1983 and 1984 are presented in Table 19 which indicates a large projected rise to meet responsibilities.

Project Description and Inputs (FQCD)

14. The project will increase the efficiency of sampling and analysis to serve the largest section of the monogastric meat producing industries utilizing feed and requiring regulation under the Act. The main beneficiaries of this improvement will be the purchasers of commercial feedmixes. These are medium-scale producers who are not contract growers associated

with large commercial companies. The project will provide additional staff training and assistance in formulating proposals to the Animal Feed Quality Control Committee.

15. Sampling of feedmixes will be conducted on the basis of requiring feedmills to submit samples of each batch of feed produced. Samples will be forwarded to the FQCD with details of the formula and market name. Inspectors of the FQCD will conduct regular spot checks of all feedmills and mixes being prepared at the time of visiting. The projected number of samples is of the order of 300 /1 per month; analysis of feedmix samples will be conducted as a priority before other feed component analyses.

16. Sampling of raw materials will be conducted on a more limited spot check basis./2 The large number of producers (109) and the limited output (around 0.4 million tons) reduce the economic benefit of detailed sampling of raw materials. Under the project spot checks and sample submission totalling less than 220 samples per month will be used for analysis. Rigid enforcement of the sampling system for feedmills will place the onus for care in selection of raw materials for feedmixes on the feedmill companies rather than DLD.

17. Sampling farmer feeds should be discouraged, since this is not a regulatory function. Responsibility for submission of suspect feed from farms will be vested in the extension arm of DLD. In cases of suspicion of poor feed quality, DLD staff will be involved and will contact the appropriate subject matter specialists to determine if feed is the likely problem. This is essential to the efficiency of laboratory operations and represents an efficient utilization of technical manpower in the field and the laboratory. Subject matter specialists will advise on the probable causes of farm problems and whether feed samples need analysis.

18. Analysis of feedmix samples will be improved by increasing analytical capacity and quality. Creation of a combined nutrition and quality control laboratory will allow installation of sensitive equipment in appropriate housing for use in both nutrition research and feed quality control. A new laboratory will be constructed at Bang Khen on land already owned by DLD.

/1 Thirty-two feedmills times an average of 25 different batches per month.

/2 Raw materials include: fishmeal, soymeal, peanut meal, rice bran and maize.

Table 12

Pig Ownership by Household in Thailand /a
('000 households)

| Region | Herd size (head) | | | | |
|-----------------------|------------------|--------------------|-------------------|------------|------------|
| | 1 - 4 | 5 - 19 | 20 - 99 | 100 - 400 | >500 |
| Central | 125 | 62 | 18 | 1.7 | 0.14 |
| North | 344 | 68 | 7 | 0.2 | 0.01 |
| Northeast | 363 | 59 | 6 | 0.2 | 0.01 |
| South | 170 | 37 | 3 | 0.04 | 0.001 |
| <u>Total</u> | <u>1,002</u> | <u>225</u> | <u>33</u> | <u>2.1</u> | <u>0.2</u> |
| Percent of households | .79 | .18 | 2.7 | 0.2 | 0.01 |
| Production system | Smallholder | Private commercial | Intensive company | | |
| No. pigs /b | 1,202,400 | 2,580,000 | 660,000 | | |
| Percent of pigs /b | 27 | 58 | 15 | | |

/a 1978 data from DLD.

/b Assuming an average of 1.2 pigs per smallholder, 10 per private commercial farm, and 300 per intensive company.

Table 13

| Animal | Concentrate | Complete | Total | Feed / ^a required (tons) | Percent / ^b |
|-----------------------------------|----------------|------------------|------------------|---|------------------------|
| Broiler | - | 702,000 | 702,000 | 656,640 | 107 |
| Layer and breeder | 93,600 | 218,400 | 312,000 | 515,200 | 61 |
| Fattening and breeding Pigs | 234,000 | 234,000 | 468,000 | 2,020,000 | 23 |
| Ducks | 62,400 | 15,600 | 78,000 | 736,000 | 11 |
| <u>Total</u> | <u>390,000</u> | <u>1,170,000</u> | <u>1,560,000</u> | <u>3,927,840</u> | 40 |

^a As estimated by Division of Feed Quality Control, DLD.

^b Percentage of demand met in 1982. Assumes feedmixes and concentrates used without substitution by locally available feedstuffs. Strong private enterprise nature of market suggests that demand is in fact being met.

Table 14

Numbers and Production of Registered Companies

| Companies | Numbers | | | Production (million t) | | |
|----------------------------|---------|------|------|------------------------|------|------|
| | 1980 | 1981 | 1982 | 1980 | 1981 | 1982 |
| Feedmix | 27 | 32 | 32 | 1.43 | 1.56 | 1.57 |
| Fish meal | 73 | 78 | 84 | 0.28 | 0.25 | |
| Soybean and Peanut meal | 15 | 26 | 25 | 0.06 | | |

Table 15

Principal Feedmix Companies and Production Capacity

| Names of company | Capacity/hour | Production (t) | |
|------------------------------|---------------|----------------|---------------|
| | | Day | Month |
| Bangkok Feed Mill Co. Ltd. | 50 | 1,000 | 33,000 |
| Bangkok Livestock Processing | 50 | 400 | 4,200-8,500 |
| Laem Thong Corporation | 40 | 300-350 | 10,000-12,000 |
| Central Food Products | 40 | 400-430 | 10,000 |
| Betagro | 30 | 400 | 8,000-9,000 |
| Charoen Pokphand Industry | 20 | 350-400 | 8,000 |
| CP Feedmill | 25 | 350 | 8,000 |

Table 16

Registered Feedmix Companies and Locations

| Company name | Location | |
|---------------------------|---------------|-----------------------|
| | District | Province |
| Charoenpan | Ratburana | Bangkok |
| Rienthong | Muang | Samutprakarn |
| Welgro | Krathumbaen | Samutprakarn |
| Sahapatanakaset | Bangbain | Phranakonsri Ayuthaya |
| Centagro | Khlong luang | Bathumthani |
| A 1 Mitkai | Yannawa | Bangkok |
| Touangsawan | Tha moang | Kanjanaburi |
| Bangkok Feedmill | Bangphali | Samutprakarn |
| Charoenphokaphan | Yannawa | Bangkok |
| CP Feedmill | Muang | Lamphoon |
| Pokapansakol | Yannawa | Bangkok |
| Laenathong Cooperative | Muang | Samutprakarn |
| Utsahagamcharoenmit | Bakred | Nonburi |
| Krang thep khasat | Sriracha | Chonburi |
| Asia basusat | Phasicharoen | Bangkok |
| Thai Feed Industry | Sampran | Nakornpathom |
| Vrachai Farm | Muang | Singburi |
| Betagro | Phrabradaeng | Samutprakarn |
| A.J. Feedmill | Muang | Nakornpathom |
| C.P. (Songkhla) | Hadyai | Songkhla |
| Inter-Industry | Phasicharoen | Bangkok |
| Sahaphan basusat | Phrakhonong | Bangkok |
| Sampran Feed | Sampran | Nakornpathom |
| Sahagit Feed | Muang | Nakornpathom |
| Bangkok phokapua | Nong khen | Bangkok |
| Chanapan Industry | Kra thum baen | Bangkok |
| National Security Command | Phanomsarkham | Chachoengsao |
| Srithaibasusat | Muang | Samutprakarn |
| Ruamthong | Muang | Samutprakarn |
| Cargill | Muang | Chachoengsao |

Table 17

Present Staffing of the Feed Quality Control Division /a

| Position | PC Level | | | | | | Total |
|--------------------------|-----------|----------|-----------|-----------|----------|----------|--------------|
| | 1 | 2 | 3 | 4 | 5 | 6 | |
| Director | - | - | - | - | - | 1 | 1 |
| <u>Administration</u> | | | | | | | |
| Administrative Officer | - | - | - | 1 | - | - | 1 |
| Statistical Officer | - | 1 | - | - | - | - | 1 |
| Typist | 2 | - | - | - | - | - | 2 |
| Clerk | 3 | - | - | - | - | - | 3 |
| <u>Field Inspection</u> | | | | | | | |
| Veterinarian | - | - | - | 5 | 4 | - | 9 |
| Animal Husbandry Officer | - | - | 7 | 5 | - | - | 12 |
| Technician | 9 | - | - | - | - | - | 9 |
| <u>Legislation</u> | | | | | | | |
| | - | - | - | - | 1 | - | 1 |
| <u>Registration</u> | | | | | | | |
| Animal Husbandry Officer | 1 | - | 2 | 1 | 3 | - | 7 |
| <u>Laboratory</u> | | | | | | | |
| Scientist | - | - | 4 | 2 | 1 | - | 7 |
| Veterinarian | - | - | - | 1 | - | - | 1 |
| Animal Husbandry Officer | - | - | - | 1 | - | - | 1 |
| Technician | 3 | - | - | - | - | - | 3 |
| <u>Total</u> | <u>18</u> | <u>1</u> | <u>13</u> | <u>16</u> | <u>9</u> | <u>1</u> | <u>58 /b</u> |

/a At end of calendar year 1982.

/b Twenty-one of these positions approved but not yet funded (17 of these are in the Field Inspection Service).

Table 18

Present Staffing of the Laboratory Section, FQCD /a

| Position | PC level | | | | | Total |
|----------------------------|----------|----------|----------|----------|----------|--------------|
| | 1 | 2 | 3 | 4 | 5 | |
| Head of Section - - | - | - | - | - | 1 | 1 |
| <u>Chemical Analysis</u> | | | | | | |
| Scientist | - | - | 2 | 1 | - | 3 |
| Technician | 1 | - | - | - | - | 1 |
| <u>Mineral Analysis</u> | | | | | | |
| Scientist | - | - | 2 | - | - | 2 |
| Technician | 1 | - | - | - | - | 1 |
| <u>Biological Analysis</u> | | | | | | |
| Veterinarian | - | - | - | 1 | - | 1 |
| Scientist | - | - | - | 1 | - | 1 |
| Technician | 1 | - | - | - | - | 1 |
| <u>Physical Analysis</u> | | | | | | |
| Scientist | - | - | 1 | - | - | 1 |
| <u>Total</u> | <u>3</u> | <u>-</u> | <u>5</u> | <u>3</u> | <u>1</u> | <u>12 /b</u> |

/a At end of calendar year 1982.

/b Six of which have been funded.

Table 19

Laboratory Output and Targets
(No. samples)

| Quality analysis inspection | Quantity of work, budget year | | | | |
|---|-------------------------------|--------------|--------------|--------------|---------------|
| | 1980 | 1981 | 1982 | 1983 | 1984 |
| <u>Chemical Inspection Section</u> | | | | | |
| <u>Value of Feed Inspection Unit</u> | | | | | |
| Protein | 41 | 489 | 173 | 1,247 | 1,902 |
| Fat | - | 121 | 18 | 280 | 414 |
| Ash | - | 78 | 23 | 142 | 280 |
| Moisture | 893 | 99 | 583 | 1,000 | 1,313 |
| <u>Mineral and Heavy Metal Inspection Unit</u> | | | | | |
| Mineral | - | 292 | - | - | - |
| Trace element | - | - | - | 23 | 43 |
| heavy metals | - | - | - | - | - |
| <u>General Chemical Inspection Unit</u> | | | | | |
| Poisonous material | - | - | - | - | - |
| Crude materials (sand and gravel) | 1 | - | 9 | 23 | 50 |
| Ash | - | - | - | - | - |
| <u>Physical Inspection Section</u> | | | | | |
| <u>Raw Material Inspection Unit</u> | | | | | |
| Concentrate Inspection Unit | 290 | 60 | 70 | - | - |
| Concentrate Inspection Unit | 200 | 37 | 33 | 150 | 188 |
| Feed Mixture Unit | - | - | - | - | - |
| <u>Micro Organism Inspection Unit</u> | | | | | |
| <u>Expired Feed Inspection Unit</u> | | | | | |
| <u>Fungal and Fungus Toxin Inspection Unit</u> | | | | | |
| Fungal | 373 | 236 | 246 | 119 | 637 |
| Fungus toxin | - | 0 | 19 | 27 | 28 |
| <u>Bacterial Inspection Unit</u> | | | | | |
| Bacterial Inspection Unit | 350 | 571 | 517 | 112 | 340 |
| <u>Biological Products Inspection Units</u> | | | | | |
| New work by law | | | | | |
| <u>Biochemical Inspection Section</u> | | | | | |
| <u>Vitamins Inspection Unit</u> | | | | | |
| New work, must be done according to F.C. law | | | | | |
| <u>Amino Acid Inspection Unit</u> | | | | | |
| New work, must be done according to F.C. law | | | | | |
| <u>Drug and Chemical Products Inspection Unit</u> | | | | | |
| Drug and Chemical Products Inspection Unit | 390 | 1,901 | 760 | 1,247 | 1,902 |
| Total | 1,969 | 2,797 | 2,669 | 3,330 | 12,363 |

JICA