PN-AAT-142
40718

# PRODUCTION OF MEASLES VACCINE AND POLIO VACCINE IN INDONESIA

A Report Prepared By PRITECH Consultants:
MURRAY COOPER, Ph.D.
ALLAN GRAY, Ph.D.
ROBERT BINNERTS

During The Period:
SEPTEMBER 8 - SEPTEMBER 21, 1984

TECHNOLOGIES FOR PRIMARY HEALTH CARE (PRITECH) PROJECT:
Supported By The:
U.S. Agency For International Development
AID/DPE-5927-C-00-3083-00

AUTHORIZATION:
AID/S&T/HEA: 5/17/85
ASSGN. NO: DC 47

# TABLE OF CONTENTS


| | | Page |
|---|---|---|
| | EXECUTIVE SUMMARY | i |
| I. | INTRODUCTION | 1 |
| II. | TERMS OF REFERENCE FOR THE STUDY | 2 |
| III. | ASSESSMENT OF CURRENT SITUATION | 3 |
| IV. | STUDY ASSUMPTIONS | 5 |
| V. | MAJOR OPTIONS | 6 |
| VI. | RECOMMENDATIONS CONCERNING THE OPTIONS | 7 |
| VII. | RECOMMENDED PRODUCTION TECHNOLOGY | 9 |
| VIII. | RECOMMENDED METHODOLOGY OF PROJECT EXECUTION | 10 |
| IX. | MAJOR REQUIREMENTS AND ESTIMATED COSTS FOR PROJECT EXECUTION | 12 |
| X. | PERSONNEL | 17 |
| XI. | FINANCIAL PROFILE | 18 |
| XII. | ANTICIPATED TIME FRAMES | 20 |
| XIII. | SUMMARY OF ESTIMATED CAPITAL COSTS BY YEAR | 22 |
| | APPENDIX A | 23 |
| | APPENDIX B | 24 |

## EXECUTIVE SUMMARY

The team studied the technical and economic feasibility of Biofarma producing measles and polio vaccines in Indonesia and we recommend a step-wise approach to basic production of these two vaccines, as follows:

1) Increase the processing of polio vaccine from imported bulk concentrates from the current 30% of the amount used to 100%.

2) Process measles vaccine from imported bulk concentrate;

3) Introduce basic production of measles vaccine; and

4) Move to basic production of polio vaccine.

This step-wise approach allows for gradual transfer and assimilation of production skills, moving from less to more difficult types of vaccine technologies. It also allows for re-appraisal of the recommended program on actual performance.

We estimate that the total capital investment to achieve basic production of both vaccines would be approximately $5.3 million, excluding the cost of technology transfer.

Our estimate of the cost per dose is $0.12 for measles vaccine and $0.04 for polio vaccine. These estimated domestic production costs appear to be of the same order as those of vaccines imported into Indonesia.

Concurrent with the development of production capabilities at Biofarma, the capability of the national control laboratory must be strengthened to assure that vaccines will meet WHO specifications.

Subject to the acquisition of production technology from an outside source, coupled with the provision of new facilities and considering the present level of expertise at Biofarma, we are confident that the basic production of measles vaccine and polio vaccine in Indonesia has an excellent chance of success.

# I. INTRODUCTION

Under the auspices of WHO, UNICEF, and USAID a team of international experts was gathered to undertake a "Feasibility Study regarding the Production in Indonesia of Polio Vaccine and Measles Vaccine" the names of the members of the Team are stated in Appendix A).

The Team visited Jakarta and Bandung from September 10 to 20, 1984.

## II. TERMS OF REFERENCE FOR THE STUDY

The team spent approximately five days acquainting itself with the prevailing local conditions and obtaining definitions of the terms of reference for the Study. Following discussion with the Secretary-General of the Kementerian Kesehatan, the Director-General of Communicable Disease Control and other members of the Ministry of Health (see Appendix B) the following parameters were established:

- the products to be considered are:
  measles vaccine (live) and
  poliomyelitis vaccine (oral);

- the maximum annual production capacities are to be:
  measles vaccine - 7 million doses
  polio vaccine - 20 million doses;

- the options available to Indonesia are to be indicated;

- general recommendations are to be made concerning the choice of options, methodologies, and technologies to be employed;

- estimates are to be prepared of the approximate costings of the various options (whenever practical) broken down into individual components (such as buildings, equipment, etc.);

- estimated manpower requirements are to be indicated.

## III. ASSESSMENT OF CURRENT SITUATION

### A. Demographics of Indonesia

Estimated total population: 160,000,000
Birth-rate: 3.3 to 3.5%
Number of new borns annually: 5.2 to 5.6 million infants.

### B. Major Causes of Infant Deaths

Diarrheal diseases
Acute respiratory infections
Tetanus

### C. Estimated Immunization Coverage

| | |
|---|---|
| ° For diphtheria, tetanus and whooping cough - using DPT vaccine | 40% |
| ° For tuberculosis - using BCG vaccine | 80% |
| ° For poliomyelitis - using polio vaccine | less than 10% |
| ° For measles - using measles vaccine | less than 10% |

### D. Vaccine Demand

Current demand for vaccines is determined largely by Government purchases; the private market demand is small.

REPELITA IV, the Indonesian five-year plan that began in 1984/85 states as one of its aims a minimum of 65% overall immunization coverage. Eventually the Government intends to achieve 95% average.

### E. Infra-Structure for Vaccine Distribution

Biofarma - Bandung is responsible for all imports and production of biologicals, both for Government and private market use. Biofarma distributes to the propinsis, which in turn sends it to the kabupatens from which it goes to the kecamatans. Actual immunization is effected through the puskesmas (community health center).

### F. Biogarma - Bandung

Biofarma is the organization in Indonesia manufacturing and importing biologicals. It is a Government entity, responsible directly to the Minister of Health. However, it operates as a

private concern and pays taxes applicable to a private Indonesian concern. Currently Biofarma manufactures the following:

- Cholera vaccine
- Typhoid vaccine
- TAB vaccine
- Cholera - TAB vaccine
- Pertussis vaccine
- Plague vaccine
- Polyvalent Staphylococcal vaccine
- Polyvalent Streptococcal vaccine
- BCG vaccine
- Diphtheria toxoid
- Tetanus toxoid
- DT toxoid
- DPT vaccine
- DP vaccine
- Rabies vaccine
- Oral polio vaccine (from imported concentrates)
- Diptheria antitoxin
- Tetanus antitoxin
- Rabies antitoxin
- Infusion fluids (6)
- Diagnostics (8)

The team visited Biofarma and was extremely impressed with the level of expertise, facilities, and housekeeping as applied to products currently being manufactured. Biofarma has essentially no expertise nor facilities for the large-scale production of measles and polio vaccines and limited expertise and facilities for the control of these two products.

## IV. STUDY ASSUMPTIONS

The following major assumptions have been made:

- Biofarma will continue to be the sole source in Indonesia of all human vaccines.
- Technology for basic production of measles and polio vaccines will have to be obtained in one form or another from source(s) outside Indonesia.
- The annual consumption of polio vaccine will eventually reach 20,000,000 doses and that of measles vaccine 7,000,000 doses.
- The polio vaccine required will be the oral live vaccine type rather than the Injectable killed vaccine type.
- Production and quality control (Q.C.) facilities will conform to the pertinent WHO specifications. The final products will also conform to the appropriate WHO product specifications.
- Indonesia will have an adequate supply of cynomolgus monkeys.
- All estimates have been made on maximum capacity of 20 million doses polio vaccine and 7 million doses of measles vaccine.
- All figures stated in this report are estimates only, based on 1984 price. Before proceeding with implementation of any of the options, a detailed, up-to-date costing should be undertaken.
- The price of technology transfer has not been included in the Report as the possible configurations and components of technology transfer arrangements are highly variable. This cost will have to be determined by negotiations between Biofarma and potential sources of such technology.
- It is noted that in order to comply with the requirements of WHO the establishment of a comprehensive, independent national control facility must precede the manufacture of biological products. It is therefore assumed that if a decision is taken to initiate the production of measles and/or polio vaccines in Indonesia, the Q.C. capability of the Food and Drug Directorate will be increased appropriately.
- As instructed by the Director - General of CDC the "cost of money" has not been included.

## V. MAJOR OPTIONS

### Summary of Option

Option A - Import Polio Vaccine bulk concentrate and import Measles Vaccine in final containers.

Option B - Import both Polio and Measles Vaccine bulk concentrates.

Option C - Import Polio Vaccine bulk concentrate and basic production of Measles Vaccine.

Option D - Basic production of both Measles and Polio Vaccine sequentially.

Option E - Basic production of both Measles and Polio Vaccine simultaneously.

All of these Options can be pursued, and with the exception of Option E none are exclusive of one another. In arriving at the final recommendation the team considered a large number of factors such as cost, technical expertise, chances for success (or failure) and the often stated objective of almost all of the Indonesian officials to make Indonesia independent of outside sources of polio and measles vaccines.

The teams analyses, although only estimates, indicate that the cost of vaccine produced in Indonesia could be competitive with currently purchased vaccine once facilities and technologies are in place. On the other hand opportunities may exist for reductions in the purchase price of vaccines from outside sources.

## VI. RECOMMENDATIONS CONCERNING THE OPTIONS

### Step 1:

Currently Biofarma purchased 30% of Polio Vaccine as bulk concentrate for dilution and filling and 70% as final filled containers.

As the initial step we recommend that all Polio Vaccine be purchased as bulk concentrate for finishing at Biofarma (Option I).

We also recommend that improvements in long-range planning coupled with increased purchase volumes might be used as factors in negotiating lower prices for both vaccines.

### Step 2

Measles vaccine currently is purchased in final containers. It is recommended that Measles Vaccine be bought as bulk concentrate for filling, freeze-drying and finishing (Option B). Although there may not be any savings, this would provide Biofarma with valuable additional technical experience in freeze-drying and final container Q.C.

Financial outlay for processing of measles vaccine bulk concentrate represents a very significant portion of the total outlay required for basic production, so that the additional outlay required for Step 3 is greatly reduced.

### Step 3

It is recommended that Biofarma introduce the basic production of measles vaccine while continuing to finish polio vaccine from bulk concentrates. (Option C). Having already introduced the processing of measles vaccine from bulk concentrate in Step 2, the major outlays for equipment and facilities will have already been made.

Basic production of measles vaccine requires simpler production and control methods than that of polio vaccine, and thus would lead to greater possibility of initial success.

### Step 4

Once the measles vaccine basic production program has been successfully completed, polio vaccine basic production should be introduced (Option D).

It is strongly recommended that measles and polio vaccine basic production not be undertaken simultaneously (Option E). The resources and facilities at Biofarma or likely to be available to Biofarma are, in our view, inadequate to handle both vaccine programs simultaneously.

Step 1 could be initiated immediately, only requiring additional filling equipment. Initiation of Step 2 will need the provision of suitable space and services and purchase and installation of filling and freeze-drying equipment for measles vaccine.

Outside expertise must be attained, preferably from the transferor of measles vaccine technology, prior to purchase and installation of the equipment. It is important to assure the compatibility of the equipment with the final facility design and production process.

A proposed time-table for Steps 3 and 4 can be found below.

## VII. RECOMMENDED PRODUCTION TECHNOLOGY

### A. Introduction

It should be emphasized that the following recommendations are those of the team but that final choice of technology has to be made by Biofarma and the transferor of technology.

It is anticipated that the technology adopted will be similar or identical to that used in many major production laboratories. The technology will have been proven in past experience, and it is anticipated that this technology will not be displaced by an improved technology in the forseeable future.

Stress is laid on the absolute need for the transferor of technology to supply Biofarma not only with expertise (see "Recommended Methodology of Project Execution") but also most importantly, with seed strains, cell substrates, and continuing technical support.

### B. Measles Vaccine Technology

Chick embryo fibroblasts should to used to grow a strain of measles approved by WHO.

### C. Oral Polio Vaccine Technology

Primary monkey kidney cells should be used, with the Sabin seed strains approved by WHO.

## VIII. RECOMMENDED METHODOLOGY OF PROJECT EXECUTION

It is essential for Biofarma to first make arrangements with a current, large volume producer of Measles Vaccine for the transfer of the necessary technology and know-how, and for Polio Vaccine at some later date.

For technical reasons and as a matter of practicality the purchase of technology should go hand in hand with the purchase of bulk concentrates from the same source. This is essential as production technology of one manufacturer may not be appropriate to process bulk concentrates from another producer.

Transfer of technology to Biofarma should as a minimum, cover the following major items. It is, of course, understood that for all of these the transferor of technology will work in close collaboration with Biofarma.

### A. General Consulting

- scheduling of all major tasks and the monitoring thereof;
- lay-out design of the facilities and collaboration with local architect/contractor;
- regular inspection of the building of the facilities;
- selection of the required equipment and production components and potential sources thereof;
- purchase of the equipment and pre-shipment inspection thereof (if so desired);
- shipment and insurance of equipment and production components (if so desired);
- supervision of the installation of all static equipment;
- validation of buildings and equipment;
- trial production runs;
- monitoring of the manufacture of the "consistency" production runs;
- supply of all essential manuals;
- assistance in obtaining product "registration" from the appropriate local authorities;
- "trouble-shooting".

B. Training

- training of selected Biofarma personnel in premises of the transferor of technology in all required aspects of production, Q.C., maintenance, record-keeping, etc;

- assistance in the training of other Biofarma personnel in Bandung.

C. Duplicate Q.C.

- Duplicate testing by the transferor of technology during certain stages of production until both parties are satisfied that production and Q.C. are running satisfactorily.

## IX. MAJOR REQUIREMENTS AND ESTIMATED COSTS FOR PROJECT EXECUTION

### A. Site

Sufficient ground is available at Biofarma to accommodate buildings for production and quality control of Measles Vaccine and Polio Vaccine and related requirements. No cost for land has been included in the calculations.

### B. Buildings

For production and quality control it is proposed that one building be erected consisting of the following:

- quality control facilities for both measles vaccine and oral polio vaccine (Space A);
- production facility for measles vaccine (Space B);
- central facility for washing and sterilizing, media preparation, water distillation, inspection, packaging, warehousing which can serve both measles and polio (Space C);
- production facility for oral polio vaccine (Space D).

Such a building can be erected in two stages: Space A, B and C first with Space D later. In addition, before Polio Vaccine production can be commenced a separate Animal Holding Facility will have to be erected (Space E).

The following figures for area and building costs are approximations only and must be refined jointly by Biofarma and the transferor of technology.

| Designated Space | Area in Sq. Meters | Cost/ Sq. M* (Rp.000's) | Estimated Total Total Cost (Rp.000's) |
|---|---|---|---|
| A | 230 | 250 | 57,500.0 |
| B | 450 | 250 | 112,500.0 |
| C | 550 | 250 | 137,500.0 |
| Sub total I | 1,230 | | 307,500.0 |
| D | 550 | 250 | 137,500.0 |
| E | 550 | 200 | 110,000.0 |
| Sub total II | 1,100 | | 247,500.0 |
| Grand Total | 2,330 | | 555,000 |

* The cost/sqm was estimated by Dr. Nasution of Biofarma and does not include airconditioning/purification

C. Services

No provisions have to be made for the generation of either steam or electricity as Biofarma has sufficient spare capacity. Water is also in abundance apparently, but provision will have to be made for deionization and distillation facilities. Gas will have to be purchased in bottles (LPG) and compressors will have to be installed for compressed air.

D. Estimated Equipment Costs

(includes airconditioning/purification)

| Q.C., Measles Production and Services | Rps. 000's | US$ 000's |
|---|---|---|
| Space A (Q.C. Facilities) | | 105.0 |
| Space B and C (measles Production and Central Services) | | 1,600.0 |
| Freight and Insurance | | 170.5 |
| Duty, Sales Tax, VAT | 600,160.0 | |
| Installation and Validation | | 85.0 |
| Sub Total I | 600,160.0 | 1,960.5 |
| **Polio Vaccine** | | |
| Space D (polio vaccine production) | | 1,300.0 |
| Freight and insurance | | 130.0 |
| Space E (animal house) | | 120.0 |
| Freight and insurance | | 12.0 |
| Duty, Sales Tax and VAT | 449,840.0 | |
| Space E (animal house locally made equipment) | 30,000.0 | |
| Installation and validation | | 71.0 |
| Sub Total II | 529,840.0 | 1,633.0 |
| | (Rps.000's) | (US$000's) |
| Grand Totals | Rps.1,130,000.0 | $3,593.5 |

E. Animals

In this case "animals" refer only to the monkeys required for polio vaccine production and quality control. Other animal requirements are small and can be serviced by Biofarma's existing animal facilities.

For full Polio Vaccine production/quality control it is estimated that the following number of monkeys will be required annually:

- production: 140 "clean" monkeys
- quality control: 430 monkeys (not necessarily "clean")

(The quantity for production may be over-stated.)

Assuming a 50% rejection rate of incoming monkeys the total estimated annual requirements are:

| | |
|---|---|
| ° production | 280 animals |
| ° quality control | 430 animals |
| | 710 animals |

It has been assumed that monkeys will be purchased from local sources at a laid-down price in Bandung of Rps. 30,000 each. Hence, total annual costs (in Rps. 000's) would be:

710 x Rp. 30 = Rps. 21,300.0.

(It is assumed that this figure will allow for feeding, etc., of the animals as well.)

F. Production Components

These comprise all chemicals, fetal calf serum, filters, etc., required for production and quality control.

Estimated costs.

| | Rps. 000's | US$000's |
|---|---|---|
| Measles Vaccine Production | | 225.0 |
| Quality Control | | 50.0 |
| Duty, Sales Tax, VAT | 27,500.0 | |
| Sub Total I | 27,500.0 | 275.0 |
| Polio Vaccine Production | | 225.0 |
| Duty, Sales Tax, VAT | 22,500.0 | |
| Sub Total II | 22,500.0 | 225.0 |

G. Vials

1. Measles Vaccine

It has been assumed that locally made vials will be used for the diluent and imported ones for the vaccine itself. It has further been assumed that approximately 15% breakage and discards will be experienced.

| Estimated costs: | Rps. 000's | US$000's |
|---|---|---|
| Diluent vials | | |
| 805,000 x Rps. 49 | 39,445.0 | |
| Vaccine vials | | |
| 805,000 x US$0.12 | | 96.6 |
| Duty, Sales Tax, VAT | 20,500.0 | |
| | 59,945.0 | 96.6 |

2. Polio Vaccine

It has been assumed that locally made vials will be used. Breakage and discards to be the same for Measles Vaccine.

| Estimated costs | Rps. 000's |
|---|---|
| 2,300,000 x Rp. 32 | 73,600.0 |

H. Seals

Locally made ones will be used.

| Estimated cost: | Rps. 000's | US$000's |
|---|---|---|
| Measles diluent | | |
| 805,000 pieces | 3,220.0 | - |
| Measles Vaccine - | | |
| 805,000 pieces | 3,220.0 | - |
| VAT | 161.0 | |
| Sub Total I | 6,601.0 | |
| Polio Vaccine - 2,300,000 | 9,200.0 | - |
| VAT | 230.0 | |
| | 9,430.0 | |

I. Stoppers

Imported stoppers will be employed.

| Estimated costs: | Rps. 000's | US$000's |
|---|---|---|
| Measles Diluent 805,000 | | 4.8 |
| Measles Vaccine 805,000 | | 4.8 |
| Duty, Sales Tax, VAT | 2,040.0 | |
| Sub Total Measles | 2,040.0 | 9.6 |

| | | |
|---|---|---|
| Polio Vaccine 2,300,000 | | 13.8 |
| Duty, Sales Tax, VAT | 2,932.5 | |
| Sub Total Polio | 2,932.5 | 13.8 |

J. Dropper/Stoppers for Polio Vaccine

Imported Dropper/Stoppers will be used, as is the case currently.

| Estimated costs: | Rps. 000's | US$000's |
|---|---|---|
| 2,100,000 stoppers | | 42.0 |
| Duty, Sales Tax, VAT | 8,925.0 | |
| | 8,925.0 | 42.0 |

## X. PERSONNEL

The following minimum staffing will be required:

| | Sr. Scientist | Engineer | Sr. Technician | Technician | Attendant |
|---|---|---|---|---|---|
| Quality Control* | 1 | | 1 | 5 | 1 |
| Maintenance | | 1 | | | |
| Measles Production | 1 | | 5 | 14 | 3 |
| Sub Total I | 2 | 1 | 6 | 19 | 4 |
| Polio Production | 1 | - | 5 | 14 | 3 |
| Animal House | 1 | | 1 | 4 | 2 |
| Sub Total II | 2 | - | 6 | 18 | 5 |
| Grand Totals | 4 | 1 | 12 | 37 | 9 |

* For polio vaccine Q.C. a consultant histopathologist and two technicians will be required over and above the above staffing.

Annual salary costs have been taken at the undermentioned figures which were supplied by Dr. Nasution of Biofarma and are expressed in RPS. 000's:

- Sr. Scientist 6,000 + 40% fringe = 8,400.0
- Engineer (est) 4,000 + 40% fringe = 5,600.0
- Sr. Technician 3,000 + 40% fringe = 4,200.0
- Technician 2,100 + 40% fringe = 2,940.0
- Attendant 1,800 + 40% fringe = 2,520.0

Consequently the estimated annual salary costs calculate out as follows (in Rps. 000's):

- Measles production and Q.C. Rps. 113,540.0
- Polio production and Animal house Rps. 107,520.0

## XI. FINANCIAL PROFILE

All figures states are estimates only and must be refined jointly by Biofarma and the transferor of technology prior to proceeding with project execution. Estimated 1984 costs served as a basis. No allowance has been made for inflation, and the "cost of money" has not been taken into account.

Direct production costs only have been calculated. None of Biofarma's overhead charges have been included.

Depreciation has been calculated straight line 10 years for equipment and 50 years for buildings (as requested by Dr. Nasution of Biofarma).

The cost of technology transfer has not been included (see "Assumptions").

Estimated Direct Costs of Measles Vaccine Production

| | Rps. 000's | US$000's |
|---|---|---|
| Depreciation Buildings | 6,150.0 | - |
| Depreciation Equipment | 60,016.0 | 196.0 |
| Production Components | 27,500.0 | 275.0 |
| Vials | 59,945.0 | 96.6 |
| Seals | 6,601.0 | - |
| Stoppers | 2,040.0 | 9.6 |
| Salaries | 113,540.0 | - |
| | 275,792.0 | 577.2 |
| No. of Doses produced: 7,000,000 | | |
| Cost per Dose | Rps. 39.40 | US$0.0825 |
| Total cost/dose ($1 US = Rps. 1000) | Rps. 121.90 | |

Estimated Direct Production Costs - Oral Polio Vaccine

| | Rps. 000's | US$000's |
|---|---|---|
| Depreciation Buildings | 4,950.0 | - |
| Depreciation Equipment | 52,984.0 | 163.3 |
| Monkey Supply | 21,300.0 | - |
| Production Components | 22,500.0 | 225.0 |
| Vials | 73,600.0 | - |
| Seals | 9,430.0 | - |
| Stoppers | 2,932.5 | 13.8 |
| Droppers | 8,925.0 | 42.0 |
| Salaries | 107,520.0 | - |
| | 424,841.5 | 444.1 |

| | | |
|---|---|---|
| No. of Doses produced: 20,000,000 | | |
| Cost per Dose | Rps. 15.21 | US$ 0.0222 |
| Total cost/dose ($1 US = Rps. 1000) | Rps. 37.41 | |

## XII. ANTICIPATED TIME FRAMES

The following time table assumes that Option C will be executed with Option D commencing in Year four. Again it has to be stressed that Biofarma should redefine this time table with the transferor of technology.

Year 1

- Planning of buildings for measles vaccine and Q.C.;
- Erection of buildings for measles vaccine and Q.C.;
- Selection and ordering of equipment for measles vaccine and Q.C.;
- Overseas training of Biofarma's senior staff in "intermediate" production and quality control of measles vaccine.

Year 2

- Training of staff in Bandung in "intermediate" production and final container quality control of measles vaccine;
- Installation and validation of equipment;
- Validation of buildings;
- Production of measles vaccine from imported concentrates;
- Overseas training of Biofarma's senior staff in basic production and quality control of measles vaccine.

Year 3

- Training of staff in Bandung in basic production and quality control of measles vaccine;
- Production of measles vaccine from imported concentrate until basic production is running satisfactorily.

Year 4

- Planning of buildings for oral polio vaccine;
- Erection of buildings for oral polio vaccine;
- Selection and ordering of equipment for polio vaccine;
- Overseas training of Biofarma's senior staff in basic production of oral polio vaccine;
- Basic production of Measles Vaccine continues.

Year 5

- Training of staff in Bandung in basic production and quality control of oral polio vaccine;
- Installation and validation of equipment;
- Validation of buildings;
- Biofarma's production of oral polio vaccine from imported concentrates is moved from current facility to new building and continues until basic production of oral polio vaccine runs smoothly;
- Basic production of measles vaccine continues.

Year 6

- End of Project.

## XIII. SUMMARY OF ESTIMATED CAPITAL COSTS BY YEAR

| Year | Details | Rps000's | US$000's |
|---|---|---|---|
| 1. | Building for Measles Production and quality control | 307,500.0 | |
| | Downpayment for Measles/Q.C. Equipment (33%) | | 568.0 |
| | | 307,500.0 | 568.0 |
| 2. | Remaining Measles/Q.C. Equipment Costs | | 1,137.0 |
| | Freight/Insurance Equipment | | 170.5 |
| | Duty, Sales Tax, VAT on Equipment | 600,160.0 | |
| | Installation and Validation Equipment | | 85.0 |
| | | 600,160.0 | 1,392.5 |
| 3. | Buildings for Oral Polio Vaccine Production | 247,500.0 | |
| | Down payment for Equipment for Oral Polio Vaccine Production and for Animal House | | 473.0 |
| | | 247,500.0 | 473.0 |
| 4. | Remaining Polio/Animal House Equipment Costs | 30,000.0 | 947.0 |
| | Freight/Insurance Equipment | | 142.0 |
| | Duty, Sales Tax, VAT on Equipment | 449,840.0 | |
| | Installation and Validation Equipment | | 71.0 |
| | | 529,840.0 | 1,160.0 |
| 1 - 5 | GRAND TOTAL | 1,685,000.0 | 3,593.5 |

## APPENDIX A

## TEAM MEMBERS

Name

Dr. Miroslav Beck (Chairman), WHO

Mr. Robert E. Binnerts, USAID

Dr. Murray S. Cooper, USAID

Dr. Alan Gray, USAID

Dr. Stephen J. Lerman, UNICEF

Dr. David Magrath, WHO

## APPENDIX B

## LIST OF PERSONS MET BY THE TEAM

1. Ministry of Health

Dr. Soekaryo, Secretary General

Dr. Brotowasisto, Head, Planning Bureau

Prof. Dr. Loedin, Director, Research & Development

Dr. Median Siraid, Director General, Food & Drugs

Mr. Charles Siregar, Head Technical Implementation Unit, Food & Drugs

Dr. M. Adhyatma, Director General, CDC

Dr. Gandung Hartono, Secretary

Dr. Gunawan, Head Epidemiology and Immunization

Dr. Karyadi, Chief, Epidemiology and Surveillance

Dr. Titi Indijati Soewarso, Medical Officer, Epidemiology and Surveillance

Dr. Guno Wiseso, Chief, Immunization

Dr. Sorta Toruan, Medical Officer, Immunization

2. Perusahaan Umum Bio Farma

Dr. M.S. Nasution, Director

Mrs. S. Soeharto, Commercial Director

Dr. Sutaryo, Production Director

Dr. Ina Madiapura, Head, Virus Vaccine Production

3. Resident Agencies

Dr. David H. Calder, Chief, Office of Population and Health, USAID

Mr. Warren Jones, Administrative Officer, USAID

Dr. Richard S. Arnold, Medicalf Epidemiologist, USAID

Mr. Daniel J. Brooks, Representative to Indonesia UNICEF

Mr. Rodney Hatfield, EPI Project Officer, UNICEF