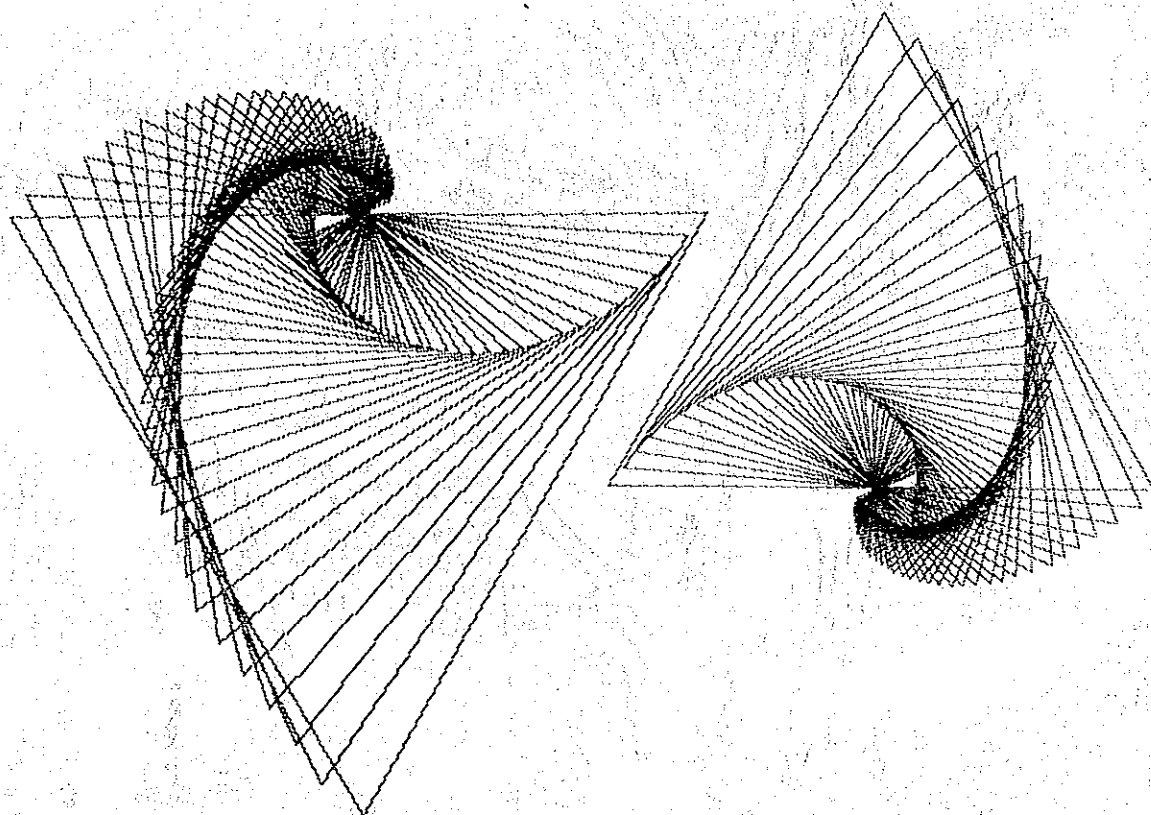


**JAPAN/WHO JOINT TECHNICAL COOPERATION  
FOR HEALTH LABORATORY PROJECT**

**(KINGDOM OF TONGA)**



**March 1989**

**Institute for International Cooperation  
Japan International Cooperation Agency (JICA)**

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JAPAN/WHO JOINT TECHNICAL COOPERATION  
FOR HEALTH LABORATORY PROJECT  
(Kingdom of Tonga)

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## PREFACE

The Project-type Technical Cooperation is an integrated form of cooperation whose aim is to realize technology transfer to relevant personnel of the project in the recipient country, by effectively combining such assistances as dispatch of experts, training of counterparts in Japan, and supply of equipment as required. It is intended to assure smooth and systematic implementation of technical cooperation program through planning, implementation and evaluation.

The duration of cooperation is usually about five years. When the project is actually commenced, a variety of survey teams and experts are dispatched to the recipient country, preparing work reports.

This case study of Project-type Technical Cooperation has been compiled originally in Japanese, then translated into English, based upon a number of these reports prepared at each stage of planning, implementation and evaluation of the project.

We would be pleased if it would be of some usefulness as reference material for those who are interested in our technical cooperation.

March 1989

Director  
Institute for International Cooperation  
Japan International Cooperation Agency (JICA)



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## Outline of the Project

The Japan/WHO Joint Technical Cooperation Project on Health Laboratory in the Kingdom of Tonga is of the so-called multi-bilateral cooperation through which the Government of Japan, working closely with WHO, extends its official cooperation to the Kingdom of Tonga. The Record of Discussions and the Minutes of the Meeting were signed on December 15, 1981 by the Japanese Implementation Survey Team and the Tongan authorities concerned to carry out the cooperation project of 5 years.

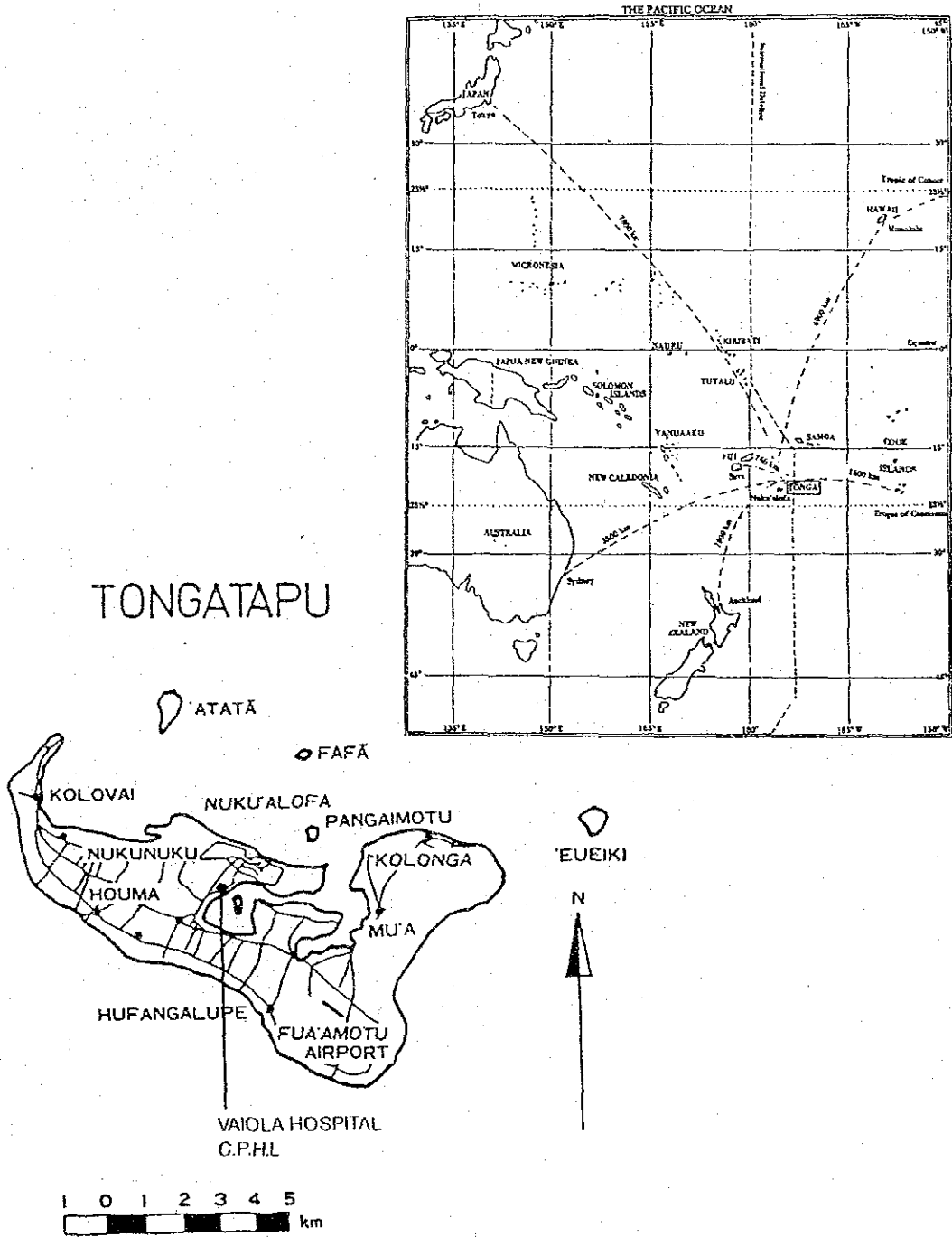
The objectives of the Project are to contribute to measures for coping with disease and primary health care through expanding and strengthening laboratory functions at the health and medical treatment facilities in the Kingdom of Tonga. More precisely, the Project is intended to expand the functions of the existing clinical laboratory at Vaiola Hospital; to integrate them with the public and environmental sanitation test functions in an effort to establish comprehensive central sanitary examination functions in Tonga; and to improve the local hospital laboratories and health centers throughout the country in order to establish a nationwide network of test organizations.

In order to implement these plans, the Government of Japan constructed a Central Public Health Laboratory (CPHL) on the premises of Vaiola Hospital and provided it and the existing laboratories with the necessary equipment and materials. At the same time, experts were dispatched to Tonga from both JICA (Japan International Cooperation Agency) and WHO (World Health Organization) and Tongan engineers were received by Japan and other countries to take part in technology transfer. In the second half of the project period, the laboratories at local hospitals and health centers throughout the country were improved to complete the nationwide network of test organizations which serve to connect laboratories with health centers.

In the course of cooperation JICA dispatched teams for mutual consultation, technical guidance, and project evaluation which was jointly conducted with WHO and the Tonga side. At the same time, a domestic committee was set up at JICA headquarters for planning and monitoring of the Project in cooperation with various supporting bodies. The project evaluation showed that the desired end of the Project had been almost attained within the scheduled period and thus the Project could be completed, although there remained the necessity for some follow-up after its completion. The above-mentioned CPHL is planned to be utilized as the training center in the Southern Pacific region and also it is expected to foster the education of engineers from the surrounding countries.



# Map of the Project Site



### Outlined Schedule of the Project

Name of the country: The Kingdom of Tonga  
 Name of the project: Japan/WHO Joint Technical Cooperation Project on Health Laboratory in the Kingdom of Tonga  
 Requested in: 1981  
 Date of R/D signed: December 15, 1981  
 Period of R/D: From December 15, 1981 to December 14, 1986

Fiscal Year	1981	1982	1983	1984	1985	1986
Connection with the grant aid cooperation	No	No	No	No	No	No
Dispatch of survey team	Preliminary survey: 4 members Aug. 14~19 Implementation survey: 5 members, Dec. 7~18	Implementation design: 6 members Mar. 29 ~ Apr. 7	Mutual consultation: 4 members, June 13~26	Technical guidance: 5 members Sept. 9~18	Repair of equipment: 4 members, Feb. 5~16	Evaluation: 6 members, Oct. 14-25
Dispatch of experts 1) Long-term experts  2) Short-term experts		The leader ← 1982.9.3 Coordinator ← 1982.8.9	1983.1.23: 2.1 Serology	1984.12.8 Biochemistry ← 1984.11.4		1986.12.14 1986.12.14
Acceptance of counterpart personnel		1982.3.29 ↔ 1982.4.10 Measures to cope with infectious diseases	3.21 ↔ 3.30 Letting contract for building work 3.19 ↔ 4.2 Contract for building work 5.14 ↔ 2.29 Supervision of construction works 5.14 ↔ 5.27 12.10 ↔ 12.21 Supervision of construction works 7.25 ↔ 8.2 Supervision of construction works 12.2 ↔ 12.14 Guidance of machine installation 3.5 ↔ 3.21 Supervision of construction works	8.12 ↔ 12.8 Bacteriology 1.18 ↔ 9.22 Bacteriology	2.24 ↔ 12.14 Bacteriology 5.19 ↔ 12.14 Hematology 6.1 ↔ 6.18 Pathogenic tissue 9.7 ↔ 9.14 9.28 ↔ 10.25	
		2.10 ↔ 11.17 Microbic serology	10.27 ↔ 10.26 Microbiology 2.26 ↔ 2.25 Water and food physicochemistry 3.5 ↔ 3.23	10.7 ↔ 10.3 Tissue pathology 11.3 ↔ 11.3 Biochemistry	7.25 ↔ 7.23 Hematology 1.9 ↔ 12.24 Microbiology 5.11 ↔ 9.10 Water and food physicochemistry 9.7 ↔ 9.28 Food test Biochemistry	



## Brief History of the Project

August 1980	Japan/WHO joint cooperation project of the multi-bilateral cooperation was proposed by H. Nakajima, Regional Director of Western Pacific Regional Office, WHO.
March 1981	Japan/WHO Joint Project Finding Team was dispatched to three countries: Tonga, Fiji, and the Solomons.
August	Japan/WHO Joint Preliminary Survey Team was dispatched to Tonga.
December	Japanese Implementation Survey Team for Japan/WHO Joint Technical Cooperation was dispatched and the R/D and Minutes were signed.
March 1982	In response to the request for expansion and improvement of the Public Health Laboratory facilities, Japan/WHO Joint Execution Design Survey Team was dispatched.
August	Coordinator was dispatched.
September	Team leader was dispatched.
February 1983	The first trainee was accepted.
March	After bidding and partitioning of the contract for the construction of the Public Health Laboratory, construction work was started.
May	Experts were dispatched for the supervision of construction work.
January 1984	Serological and biochemical experts were dispatched. Methods for expediting the Project were examined.
February	Central Public Health Laboratory (CPHL) was completed.
March	CPHL started its activities.
June	Japan/WHO Joint Team for Mutual Consultation was dispatched to discuss the review of the Project planning and other items.
September 1985	Japan/WHO Joint Technical Guidance Team was dispatched to examine the cooperative situation and undertake an interim evaluation of the Project.
October 1986	Japan/WHO Joint Evaluation Team was dispatched for the final evaluation at the end of the cooperation period of the Project.
December	The cooperation period of the Project ended.



# 1. REQUEST FOR COOPERATION

## 1-1 Background of the Request

WHO has been calling on advanced countries for multi-bilateral cooperation in the field of primary health care to assist developing countries. It approached Japan on various occasions. In August, 1980 when H. Nakajima, Regional Director of the Western Pacific Regional Office, WHO, visited Japan, he asked whether or not some regional project, for example covering the Southern Pacific Region for example, could be taken up as a trial case to see if it is possible for Japan to undertake cooperation with WHO in a global scheme.

In response to this, Japan proposed to make a preliminary survey jointly with WHO covering the Southern Pacific Region. Through the subsequent negotiations with WHO it was decided to carry out the survey covering three countries, Fiji, Tonga, and the Solomons.

Based on this decision, the Japan/WHO Joint Project Finding Survey Team was dispatched from March 28 to April 11, 1981. It was found that, among the requests from the above three countries, the request for expanding the Tongan Central Public Health Laboratory was most feasible in the form of Japan/WHO joint technical cooperation project. Based on the findings, the Government of the Kingdom of Tonga formally requested cooperation from Japan.

## 1-2 Contents of the Request

The Government of the Kingdom of Tonga had planned to expand and strengthen the laboratory functions for health and medical treatment in order to contribute to both efforts to cope with disease and to promote primary health care, taking into account the present situation of examination services there. The Tongan Government intended not only to expand the present laboratory functions at Vaiola Hospital, but to add to them functions capable of dealing with public health tests for which national demand had increased. Thus she planned the establishment of a comprehensive central public health test organization in Tonga. Japan was requested to extend cooperation for it with a cooperation period of five years starting from 1982.

### 1-2-1 Request for the Construction of a Laboratory

The construction of a laboratory was requested to strengthen and expand the laboratory functions of the following seven divisions. It was planned that the 4th, 5th and 7th divisions would remain in the existing laboratory.

#### (1) Public and environmental health division

- Examination of water quality (chemical and microbic test)
- Monitoring of water pollution
- Examination of food



- (2) Microbiology division
  - Fields including bacteriology, parasitology and mycology (salmonella, shigella, vibrio, colon bacteria, venereal disease examination, hepatitis, dengue fever, leptospira, measles, brucellosis, ameba, falaria, and trichomonad)
- (3) Tuberculosis division
  - ZN staining, and culture (susceptibility test and identification of atypical fungus are to be entrusted overseas)
- (4) Blood division
  - General test of the blood
- (5) Immunization and blood-transfusion division
  - ABO group, Rh group and cross matching test
  - Blood bank
- (6) Biochemical division
  - Clinical chemistry
- (7) Cytodiagnosis division
  - Treatment and Papanicolaou test of bone marrow specimen

The laboratory desired by the Tonga side was a one-story building of 43.2 x 14.0 meters. It was planned to contain laboratory rooms for the above seven divisions together with a washing and sterilizing room, a library, a lecture room and executives' offices. The construction cost of the building was estimated at U.S. \$280,000. Although the cost could vary according to the quality of building materials and equipment, the space could be regarded as reasonable in general.

#### 1-2-2 Request for the Dispatch of Experts

The final request for the dispatch of experts is as follows:

- (1) Team leader
 

A senior expert of wide experience specializing in a particular field, more desirably in microbe. The term of dispatch to be more than two years from the second half of 1982.
- (2) Public and environmental health division
 

An expert in chemical analysis who mainly takes charge of the examination of water quality and food. The terms of dispatch were 6 to 12 months in 1983 and 3 to 6 months in 1985 with one expert sent in each period. This division required an expert in the microbic field but a team leader specialized in this field could substitute such expert; otherwise, an expert of the microbiology division mentioned below was to be considered.
- (3) Microbiology division
 

This division was planned to deal with bacteriology, serology, parasitology, and mycology but the dispatch of one expert was requested for one year from 1984. This could vary, however, depending on the specialized field of the team leader.
- (4) Serological division
 

Dispatch of one expert was requested for 6 to 12 months in 1983 for instruction on the serological diagnosis of viral diseases (hepatitis, in particular).

- (5) Cytodiagnosis division  
In this division, dealing with bone marrow specimens was planned with the focus placed on Papanicolaou, and the dispatch of one expert was requested for 6 months in 1986.
- (6) Coordinator  
Dispatch of a coordinator was desired for one year from the start of the Project.

#### 1-2-3 Request for the Acceptance of Trainees

Request for the acceptance of trainees is as follows:

- (1) Public and environmental sanitation division  
A Tongan was studying in the School of Medicine in Fiji on a scholarship from the Government of Tonga. Subsequent to his graduation scheduled in 1983, his further training in water and food chemistry was requested.
- (2) Microbiology division  
Training of the postgraduate level for one year in 1984 was requested for one engineer who already has university graduate qualification.
- (3) Cytodiagnosis division  
Training of the university level was desired for one person from 1983 to 1985 (for 3 years).  
Additionally, in the blood division, one person received training at the postgraduate level for one year in New Zealand on a WHO fellowship. His training was scheduled to be complete by the end of 1981. In the field of clinical chemistry, training at the post-graduate level on a WHO fellowship was provided for one person for one year in 1982.

#### 1-2-4 Request for Machinery and Equipment

The list of machinery and equipment desired by the Tonga side was as follows.

- (1) Desk-top electronic calculator (3 units)
- (2) Electronic copier
- (3) Autoclave (2 units), 40 x 80 cm
- (4) Oven (90°C), 1380 x 800 x 700 mm
- (5) Deionizer
- (6) Dry air sterilizer (160°C), 500 x 1000 x 500 mm
- (7) Water bath (100°C), 700 x 360 x 360 mm
- (8) Wagon (6 units)
- (9) Binocular microscope (4 units), Olympus type BH
- (10) Phase contrast microscope
- (11) High-speed refrigerated centrifuge
- (12) Deep freezer (-20°C), 1300 x 600 x 900 mm
- (13) Water bath (2 units) 37°C - 56°C
- (14) Spectrophotometer
- (15) Spectrophotometer scanner (ELIZA, for test use)
- (16) pH meter
- (17) Electrophoretic apparatus, densitometer
- (18) Bilirubin measuring instrument
- (19) Blood storage (2 - 6°C)

- (20) Balance (0.1 mg), Mettler
- (21) Muffle furnace (750°C), 100 x 130 x 155 mm
- (22) Conductivity meter
- (23) Turbidity meter, Hach model 2511
- (24) BOD incubator (20°C)
- (25) Dryer (103 - 105°C), 500 x 400 mm
- (26) Binocular microscope for training use (18 units)
- (27) PCV measuring instrument, Arthur-Thomas
- (28) Typewriter (2 units), long-carriage
- (29) Automobile (for transportation of specimens and blood)
- (30) Voltage regulator

## **2. DISCUSSION OF THE PROJECT IMPLEMENTATION**

### **2-1 Dispatch of Preliminary Survey Team**

As described in the preceding chapter, the Project Finding Survey Team found that the request for expanding the Tongan Central Public Health Laboratory was most feasible in the form of a Japan/WHO joint technical cooperation project. Based on this, the Preliminary Survey Team was dispatched to Tonga from August 14 to August 29, 1981 to investigate whether the request is feasible and appropriate as the object of a Japan/WHO joint technical cooperation.

### **2-2 Dispatch of Implementation Survey Team**

The Implementation Survey Team was dispatched to Tonga for the period from December 7 to 18, 1981 to discuss and examine the basic contents of the cooperation with both officials concerned of the Government of the Kingdom of Tonga and the WHO and conducted a field survey. Based on the results of the survey and the discussion with both parties concerned, the Record of Discussions and the Minutes of the Meeting were signed.

### **3. PROGRESS OF THE PROJECT IMPLEMENTATION**

#### **3-1 Construction and Arrangement of CPHL**

The opening of the Central Public Health Laboratory (CPHL) established in February, 1984 was an important factor which determined whether or not the Project was successful. CPHL, which is spacious and is the most functionally and fully equipped facility in the Southern Pacific Region, has become the central place for technology transfer by experts. At the same time, a major result of the Project is that Tongan engineers who returned home after the completion of their training in Japan or other became served to strengthen CPHL. Officials concerned on the Tonga side, including the Minister of Health, are very proud of this CPHL and have a deep sense of gratitude for JICA who observed true willingness to maintain the results of the Project into the future. This can be felt also from the fact that the national radio service broadcast the news of the departure of JICA experts on the day they left Tonga after the completion of the Project, and announced that CPHL must be maintained and managed by the Government of the Kingdom of Tonga.

Further, CPHL is effectively used for laboratory activities not only by WHO but by medical teams from Australia and New Zealand in cooperation with the laboratory engineers of Tonga.

#### **3-2 Technology Transfer by Division**

##### **3-2-1 Microbe Division**

Test of all items initially planned for the technology transfer nearly became possible through the education of 2 trainees in Japan, the training provided at the site by the 5 experts dispatched, and the completion of equipping the interior and exterior of CPHL. Thus the original objectives have been attained satisfactorily.

(1) Separation and identification of bacteria

The techniques to separate pathogenic microorganisms from stool, urine, blood, sputum, and spinal fluid were particularly improved after the Project with almost no problem left.

(2) Test of parasitosis

Quick and easy tests of ancylostoma, ascaris, enterobius and trichuris became possible by the cello tape method. However, there still remains some problem about the test of giardia and antamaeba.

(3) Test of rota virus

The test became possible by the enzyme antibody method.

(4) STD test

Screening tests of gonorrhoea and syphilis became possible.

(5) AIDS test

Screening test became possible. For established diagnosis, the system was established to entrust it to the Cooperation Center of WHO in Australia.

- (6) Basically important matters such as preparation of media, obtaining of specimens, and arrangement of test data became possible.
- (7) Surveillance of diarrheal diseases

The facts of diarrheal diseases in the island of Tongatapu were made clear and at the same time a system was established to connect CPHL with the Public Health Bureau, hospitals, and health centers.

Items of tests in the microbic field, before and after the Project, respectively are as follows:

A. Before the Project

- a. Blood ..... Anaerobic culture.
- b. Stool ..... Examination of parasite eggs by the floatation method; and culture test of salmonella, shigella and vibrio. So far, confirmation and identification were sent overseas.
- c. Urine ..... Microscopic examination and culture test.
- d. Drinking water ..... Quantitative test of excremental colon bacteria and enterococcus by the Millipore filter method.
- e. Sputum ..... Staining by the smear method and microscopic examination.
- f. Swab of earlobe and nose ..... The same as above.
- g. Skin ..... Examination of true fungi by the KOH treating method.
- h. Sperm ..... All examinations.
- i. Body fluid ..... Bacteria count, Gram staining, smearing and culture test.
- j. Swab of urinary tract ..... Gram staining and microscopic examination.
- k. Swab of cervix uteri ..... Gram staining and culture test.
- l. Ear, eye, and pus ..... Gram staining, culture test and drug sensitivity test.

B. After the Project

- a. Parasite ..... Mainly, examination by the cellotape method.
- b. Bacteria ..... For salmonella and shigella, examination by type also became possible. For colon bacteria, differentiation of EPEC, ETEC and EIEC. *Campylobacter*  
*Vibrio* (*V. parahaemolyticus*, *V. cholerae* and *V. mimicus*).  
*Yersinia* and other pathogenic bacteria.
- c. Rota virus ..... Detection of antigen by the enzyme antibody method.
- d. Venereal disease ..... For gonorrhea, screening by the VDRL method is performed for patients, blood donors and applicants. For AIDS, screening examination is routinely performed in parallel with VDRL.
- e. Tuberculosis ..... Culture test of tubercle bacilli became possible and direct and concentrated smearing examinations are performed for materials other than sputum.
- f. *Leptospira* ..... Microscopic examination by the dark-field method, culture examination and blood-cell agglutination test.
- g. Blood ..... Anaerobic culture and aerobic culture.
- h. Various swab and body fluid ..... Improved technique to identify *N. gonorrhoea*, *C. neoformans*, yeast, and *trichomonas*.

### 3-2-2 Bacteria and Physicochemistry Division of Water and Food

This field which one of the requested fields is an entirely new one except for the examination of bacteria in drinking water. As the technology transfer was expedited by selecting items of examination based on the realities in Tonga, the objectives could be achieved to a considerable extent within the project period.

#### (1) Bacteriological examination

Bacteriological examination became possible for drinking water, ice cream and seawater. Drinking water and ice cream, are examined for colon bacteria group and salmonella, and seawater is examined for colon bacteria group and vibrio. In particular, the examination of drinking water is carried out routinely.

#### (2) Physicochemical examination

The examination of drinking water became possible for the minimum necessary items including potassium permanganate consumption, hardness, chloric ion concentration, and residual chlorine. For food, the examination became possible for additives (artificial coloring agents and preservatives), nutrition (fat and protein) and mercury and alcohol concentration in fish meat. For the examination technique for Shigaterratoxin in fish meat. For the examination technique for Shigaterratoxin in sea food, one person was accepted for training in Tohoku University in 1987 under a WHO plan.

On the other hand, an expected problem to be solved was the introduction of techniques to examine agricultural chemicals and various environmental pollutants which were feared to be increasing.

#### (3) The methods for collection and transportation of specimens and for administrative guidance have been transferred in cooperation with the Public Health Bureau.

The technology transfer on completion of the Project is listed by item in the following.

##### 1) Drinking water and seawater

- (1) pH
- (2) Taste
- (3) Bad odor
- (4) Color
- (5) Turbidity
- (6) Hardness
- (7) Consumption of potassium permanganate
- (8) Nitric acidic nitrogen
- (9) Nitrous acidic nitrogen
- (10) Ammoniacal nitrogen
- (11) Residue on evaporation
- (12) Residual chlorine
- (13) Concentration of chloric ion

The above items are examined only for drinking water.

- (14) Bacteria
  - Colon bacteria group (MPN method)
  - Vibrio family
- 2) Food
  - (1) Nutrition
    - a. Lipid
    - b. Protein
    - c. Total lime percentage
  - (2) Fat
    - a. Acid number
    - b. Peroxide
  - (3) Food additive
    - a. Artificial coloring agent (11 items)
    - b. Preservative (sorbic acid)
  - (4) Total mercury (fish meat)
  - (5) Minerals
    - a. Tin
    - b. Lead
  - (6) Alcohol
    - a. Ethanol %
    - b. Methanol
  - (7) Bacteria
    - a. Excremental colon bacteria
    - b. General bacteria
    - c. Other pathogenic bacteria
  - (8) Shigaterratoxin (sea food)<sup>\*1</sup>
  - (9) Agricultural chemicals (vegetables and fruits)<sup>\*2</sup>

\*1 Training in 1987 is scheduled by WHO.

\*2 In the present condition, reliable data can be obtained at low cost by entrusting samples to examination institutes abroad.

### 3-2-3 Biochemistry and Serology Division

The activities in this field were, like in the blood and blood transfusion division, carried on routinely and most actively before the start of the Project. Due to the training in Japan of two postgraduates, the guidance by the experts dispatched on a long-term basis, and the provision of appropriate equipment and materials, the techniques were so much improved and the items of examination were so much expanded that any examination became possible with almost no trouble by the time the Project was completed. The Project also aimed at saving the expenditures of the Kingdom of Tonga by reducing the cases of examination entrusted overseas. Judging from the fact that these cases of examination entrusted overseas. Judging from the fact that these cases have decreased in inverse proportion to the yearly increase in the number of specimens and of cases of examination, the Project attained nearly all of its objectives.



The reliability of examination data was improved due to the precision control of reagents and the guidance of equipment maintenance. Among all fields, this field was the most successful along with the microbe field.

The items of examination at the time when the Project was completed are as follows.

(1) Blood

(1) Glucose (including G.T.T.), (2) urea, (3) Na<sup>+</sup>, K<sup>+</sup>, (5) creatine, (6) uric acid, (7) C. reactive protein, (8) rheumatic factor, (9) infectious mononucleosis, (10) total protein, (11) S-GOT, (12) S-GPT, (13)  $\sigma$ -GPT, (14) alkaline phosphatase, (15) HBs-Ag and Ab, (16) total bilirubin, (17) direct bilirubin, (18) cholestrol, (19) amylase, (20) ASOT, (21) ASK, (22), anti dinase- $\beta$ , (23) creatine kinase, (24) lactate dehydrogenase, (25) blood gas and (26) triglyceride.

Note: Items (10) - (26) are those of which examination became possible after the start of the Project.

(2) Urine

(1) HOG, (2) sugar, (3) protein (quantitative and qualitative tests), (4) ketone, (5) bilirubin, (6) blood, (7) pH, (8) nitrite, (9) urobilinogen and (10) SP gravity.

(3) Cerebrospinal fluid

(1) Sugar and (2) protein.

(4) Feces ..... Occul blood.

(5) Body fluid ..... Protein.

**Trend of the number of specimens and tests in the past 5 years.**

(1) Routine tests

	1982	1983	1984	1985	1986*
Number of Specimen	4,315	5,416	6,528	7,095	6,238
Number of tests	7,170	11,284	12,025	15,918	11,837

\* only from Jan - Aug

(2) Tests entrusted overseas

	1982	1983	1984	1985	1986*
Number of Specimens sent overseas	781	884	760	640	380
Number of tests performed overseas	3,062	2,719	1,457	1,101	439

\* only from Jan. - Aug.

Note: Tests entrusted overseas include all specimens not limited to those in the biochemical field.

**3-2-4 Division of the Science of Blood and Blood Transfusion**

As mentioned above, due to the training of Tongan engineers in Japan, the guidance by the experts dispatched, and the provision of appropriate equipment and materials, the techniques of testing were so much improved and the items of examination were so widely expanded that the examination of 33 items became possible by the completion of the Project compared with the 22 items at its beginning. The items of which testing became possible are as follows:

(1) White blood cell count, (2) red blood cell count, (3) hemoglobin, (4) hematocrit volume ratio, (5) hematocrit sediment volume, (6) blood cell density, (7) hemoglobin volume, (8) blood sedimentation, (9) classification of white blood cells, (10) blood-picture, (11) microfilaria protozoan, (12) malaria protozoan, (13) leukemia cell, (14) blood platelet count, (15) reticulocyte count, (16) bleeding time, (17) coagulation time, (18) PCT, (19) APTT, (20) T.C.T., (21) factor XIII, (22) bone marrow smear, (23) special staining, (24) FDP, (25) eosinophil count and (26) phagocyte

Note: Items (18) ~ (26) are those of which examination became possible after the start of the Project.

### 3-2-5 Division of the Science of Pathogenic Tissue and Cell

In Tonga this field was an entirely new one, and the one in which the technology transfer was thought initially to be most difficult among all the fields. However, more than was expected was again obtained, as mentioned before, by the training of Tongan physicians in Japan, by training young engineers in Fiji (in techniques for preparing specimens), thanks to the guidance of the experts dispatched, and to the provision of appropriate equipment and materials. The technology transfer at the time when the Project was completed was as follows. It was a new field, so follow-up training was desired.

#### (1) Pathogenic tissue

Normally, tests of all materials by hematoxylin and eosin stain method.

#### (2) Cell

Tests of sputum, samples from the uterine cervix and vagina, water on the chest, and ascites by Giemsa's stain (Papanicolaou smear).

### 3-2-5 Surveillance of Diarrheal Diseases

This surveillance was planned by Ohashi (a member of the Domestic Committee), approved and supported by the Committee. Because the approval of its draft enforcement plan was delayed at the site, it was implemented by the experts dispatched, with the result that the realities of diarrheal diseases in Tongatapu, the main island, were made clear. Also, the connection between the Central Public Health Laboratory and the institutes including hospitals, health centers, and Public Health Bureau was established through the implementation of routine surveillance. The data of the implementation after having been arranged by the parties concerned, were to be published later in the International Journal of Diarrheal Diseases, a scientific journal based in Bangladesh.

In the above, the results of input (effects) were discussed by itemizing. These results were summarized from the standpoint of the Tonga side as follows:

- 1) The construction and appropriate equipping of the Central Public Health Laboratory contributed significantly to the technology transfer.

- 2) As regards the technology transfer, satisfactory results were by and large obtained in all divisions for which the Tonga side initially requested such transfer. That is, it may be said that the results were achieved of nearly 100% in the four divisions including microbe, tuberculosis, clinical biochemistry, and serology and blood. Also, in the pathogenic tissue division, for which the technology transfer was thought most difficult, nearly satisfactory effects have been obtained in spite of its being an entirely new division; there still remains some slight difficulty. Further, in the division of physicochemical examination of water and food which was the origin of the Project, it is believed that nearly satisfactory effects have been obtained in the minimum necessary items of examination adapted to the realities in Tonga.
- 3) For the formation of a nationwide test organization network, the system to connect local hospital examination rooms and health centers with the Central Public Health Laboratory was established with the CPHL as its nucleus.
- 4) A surveillance system for diarrheal diseases in Tongatapu is under way and the system to connect the Central Laboratory with hospitals, health centers, and the Public Health Bureau established.
- 5) The Government of the Kingdom of Tonga increased the staff of the Central Public Health Laboratory considerably over the initial plan and thus the shortage of manpower was solved.

For the reasons of the Project having achieved its original objectives, the following facts could be mentioned:

- 1) The Project was set up in good timing.
- 2) The Project was appropriately operated by the Domestic Committee with the cooperation of its members.
- 3) The staff in charge of the Project in JICA constantly maintained communication with the experts on the site.
- 4) The orientation of the Project was appropriately carried out by the Survey Teams headed by Makoto Ohashi (for discussion of the plan) and by Hiromasa Inoue (for technical guidance) respectively dispatched in 1983 and 1984 and thus the plan could be formulated without difficulty on the site.
- 5) The Government of the Kingdom of Tonga responded responsibly to the cooperation of JICA.
- 6) The operation of the Central Public Health Laboratory was realized by the administration side of the Ministry of Health, the Kingdom of Tonga and by the staff of the Laboratory.
- 7) There was no resignation of the trainees from the project.
- 8) The dispatched experts fulfilled their respective responsibilities.

## 4. FINAL EVALUATION OF THE PROJECT

### 4-1 Dispatch of the Evaluation Team (Oct. 14 – Oct. 25, 1986)

The objectives of dispatching this Team could be roughly divided into two. The first objective was to evaluate the Project and the second was to determine the policy for the measures after the end of the cooperation period.

For the evaluation, the first objective, it was planned to make a field survey according to the items of evaluation shown below:

- 1) Evaluation of the input.
- 2) Evaluation of the results.
- 3) Evaluation of various effects produced by the Project.
- 4) Evaluation of the design and management of the Project.

For the determination of the policy for future measures, the second objective, the most important point was firstly –

1) to judge clearly, in the face of the scheduled end of the cooperation period drawing near, whether or not the Project should be completed as originally scheduled.

At the same time, even if the project were completed, the Team would be burdened with another important duty.

2) to develop proper cooperative relations with Tonga and WHO in the future and to arrange suggestions.

### 4-2 Summary of the Evaluation

#### 4-2-1 Method of Survey

The Team visited Tonga October 14–25, 1986 and carried out its survey as follows.

- (1) The Team visited CPHL (Central Public Health Laboratory) to investigate the present condition of its facilities and activities. At the same time, the Team had an individual interview with each of the Japanese experts (Hotachi, the leader, and Sagawa, Okanda, and Soma, the experts) dispatched from JICA and consulted them about their opinions on the progress and the present state of the Project.
- (2) The Team made a courtesy call on the King of Tonga, the Minister of Health, the Deputy Acting Minister of Foreign Affairs, and the Acting Minister of Finance and endeavored to hear an evaluation of the Project from personnel concerned at various ministries.
- (3) The Team organized the tripartite conference on October 20 and 21 with Dr. Foliaki, Acting Minister of Health, the officers of the Government concerned, and Dr. Umeuchi, Chief of Disease Preventive Measure Section of Western Pacific Regional Office. The purpose of this meeting was to exchange opinions about the whole of the Project, to learn about their evaluation of the Project, about the problems to be solved and their views on measures for the future on the Tonga and WHO sides.

#### 4-2-2 Results of the Evaluation

- (1) Construction and activities of CPHL
  - 1) CPHL was opened and began its services in February, 1984. Subsequent to its opening, with the introduction of new techniques and addition of various items of examination to the laboratories caseload, Tonga increased the staff to cope with the situation (technical staff is 24 persons as of October, 1986). It may be said that activities are smoothly under way.
  - 2) Since November, 1984 CPHL has been used several times as a facility for various Workshops organized by WHO and JICA (supported by WHO). On the WHO side, the facilities are expected to play a role as the center of various training efforts the neighboring countries in the Western Pacific. Also, the Kingdom of Tonga sincerely hopes that CPHL will play the central role in domestic health and sanitation networks now under planning.
- (2) Present condition of operation and servicing of machinery and equipment  
Regarding various test machinery and equipment provided to demonstrate the functions of CPHL, operation and servicing cannot be said to be adequate at present. The reasons are that the staff is not sufficiently skilled in operating techniques and the maintenance and repair is not adequate. This problem is well recognized by the Tonga side who desire that Japan continue its support for the maintenance of the machinery and equipment after the completion of the Project.
- (3) Results of the technology transfer
  - 1) So far the engineers who received technical training in Japan included 12 persons who are now serving at their respective posts after having returned to CPHL. Although the posting is not appropriate in some cases, it may be said that their training is generally producing results in CPHL and thus, as mentioned above, new techniques are implemented progressively at CPHL. On the Tonga side, gratitude has been expressed for the technology transfer. The cooperation extended by various organizations in Japan who accepted the trainees for technical training should be highly evaluated.
  - 2) Overseas training of engineers (4 persons) by the assistance of WHO was originally limited to the undergraduate course, but it was later expanded to the postgraduate course. In any case, this is believed to have produced good results. Several Workshops organized by WHO are also supposed to have served indirectly to further the technology transfer by the Project.
  - 3) Japanese experts dispatched to Tonga on a long-term or short-term basis, 27 persons in total, contributed to the technology transfer and high appraisal should be made of their endeavors. On the Tonga side too, deep gratitude was expressed for their contribution. Among others, the expert Hotachi, Japanese team leader for the Project, should be highly evaluated in that he stayed Tonga for a long period and contributed to the construction and opening of CPHL and its subsequent operation. This Project, having been the first Japan/WHO joint project, naturally raised various complicated problems. Even if the action taken by the leader Hotachi to cope with such problems was not appropriate at times, this by no means reduced the value of his contribution.

(4) Future problems and prospects

Although the Project should be said to have attained its original objectives for the most part, there still remain some problems to be solved as mentioned below.

- 1) In order to maintain the techniques and facilities of an adequately equipped CPHL, tremendous efforts are required on the Tonga side and some support by both Japan and WHO is essential.
- 2) For the present, some support must be rendered for the equipment and materials (mainly for equipping terminal test facilities) to be provided after the completion of the Project.
- 3) Some support should be considered for the establishment of a system on the Tonga side for servicing of various machinery and equipment to be provided subsequently, and for the purchase of reagents and supply of spare parts necessary to maintain and utilize that machinery and equipment.
- 4) A supporting system is still necessary for monitoring and improving the technique of the engineers working in CPHL and for this it is desirable that Japan and WHO extend their respective cooperation.

### 4-3 The Evaluation by Field

The evaluation is as follows:

#### 4-3-1 Microbe Division

##### (1) Results and evaluation of the Project

- 1) Almost all of the examination items originally planned were smoothly introduced during the project period. Noteworthy technical improvement was attained in every item of the examination implemented before the beginning of the Project. Overall, this is the most successful field of the technology transfer in the examination among the whole divisions.

##### 2) Examination activity aspect

Examination activities are making satisfactory development both qualitatively and quantitatively. In particular, two senior technical staff members are to be praised for the completeness of their training and their willingness to sit for the examination.

##### 3) Public health contribution

The test activities in this field are very useful not only in clinical examination but in surveillance and preventive measures for diarrheal diseases, STD, and hepatitis B which have been long-standing problems, as well as for food and environmental sanitation (through stool testing of persons handling food) and the bacteriological examination of drinking water. Further, it cannot be overlooked that through these activities, communication between CPHL, clinicians, and the Public Health Bureau has been promoted a cooperative system has been established.

##### (2) Future problems and suggestions

Strengthened manpower and completed equipment and materials are important for maintaining and improving the activities in this field.

In the present condition, no problem is found in the number, composition, technical level and will of the staff. However, some measure should be considered to deal with problems such as sudden resignation of senior staff or long-term staff vacations.

Self-help efforts on the Tonga side are required including the maintenance and management of test equipment, the securing of a purchase route for stable provision of test reagents, media, and supplies and of budgetary allocations.

#### 4-3-2 Clinical Biochemistry and Serology

The objectives planned initially are to adequately equip the facilities of examination, to strengthen the contents of tests, to guide and improve the technique of examination, and to decrease the number of specimens and of test items received from outside. These objectives were nearly attained and the Project contributed significantly to improving the level of health and sanitation in the Kingdom of Tonga.

Although the present level is expected to be maintained after the end of the cooperation period, self-help efforts are required in business management of laboratories including the maintenance and management of machinery and equipment, as well as the supply and precision control of reagents, and also in personnel administration. In order to maintain the results of the Project, it is necessary to continue the connection between the Kingdom of Tonga, Japan and WHO and to establish some follow-up system.

#### 4-3-3 Hematology

The technology transfer was completed for the tests of blood groups and coagulation and the original desires of the Tonga side were satisfied. Although self-reliance is possible regarding the technical aspects, secure and stable provision of supplies is required after the completion of the Project.

#### 4-3-4 Science of Pathogenic Tissue

The equipping of facilities and the technology transfer were nearly completed and self-reliance is fairly possible. The majority examination for diagnosis of pathogenic tissue which was wholly entrusted to New Zealand before the start of the Project became possible to deal with at CPHL. This represents remarkable progress, especially the technique was regarded as one requiring the highest precision among the techniques transferred in the course of the Project. In order to maintain the results of the Project after completion, a system in long-term prospects should be established in cooperation with WHO for the maintenance of equipment and the provision of materials.

#### 4-3-5 Physicochemical Examination of Water and Food

This is the field which was introduced at the first stage of the Project. With the equipping of facilities and storing of materials, the examination of water and food became technically possible for the minimum items required of Tonga and remarkable effects were recognized. Technical follow-up is still desired, however, in the future for the physicochemical examination of food.





## APPENDICES

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## 1. The Record of Discussions (R/D)

The Record of Discussions between  
the Japanese Implementation Survey Team and  
the Authorities Concerned of the Government  
of the Kingdom of Tonga on the Japan-WHO  
Joint Technical Cooperation Project  
in the Kingdom of Tonga, Health Laboratory

The Japanese Implementation Survey Team (hereinafter referred to as "the Team") organized by the Japan International Cooperation Agency (hereinafter referred to as JICA) and headed by Dr. Akira Shishido visited the Kingdom of Tonga from December, 10 to December, 17, 1981 for the purpose of working out the details of the technical cooperation program concerning the Japan-WHO Joint Technical Cooperation Project in the Kingdom of Tonga, Health Laboratory.

During its stay in the Kingdom of Tonga, the Team exchanged views and had a series of discussions with the Tongan authorities concerned in respect of the desirable measures to be taken by both Governments for the successful implementation of the above-mentioned Project.

As a result of the discussions, the Team and the Tongan authorities concerned agreed to recommend to their respective Governments the matters referred to in the document attached hereto.

Nuku'alofa, Tonga, 15th December, 1981

Akira Shishido, M. D., Ph. D.  
Head of the Japanese  
Implementation Survey Team  
Japan International Cooperation Agency

Hon. Dr. S. Ma'afu Tupou  
Acting Minister of Health,  
Ministry of Health,  
Kingdom of Tonga

## THE ATTACHED DOCUMENT

### I. COOPERATION BETWEEN BOTH GOVERNMENTS

1. The Government of Japan and the Government of the Kingdom of Tonga will cooperate with each other in implementing the Japan-WHO Joint Technical Cooperation Project in the Kingdom of Tonga, Health Laboratory (hereinafter referred to as "the Project") for the purpose of improving the health laboratory services in the Kingdom of Tonga.
2. The Project will be implemented in accordance with the Master Plan which is given in Annex I.
3. the World Health Organization (hereinafter referred to as WHO) is invited to cooperate with the Government of Japan and the Government of the Kingdom of Tonga in implementing the Project.

### II. DISPATCH OF JAPANESE EXPERTS

1. In accordance with the laws and regulations in force in Japan, the Government of Japan will take necessary measures through JICA to provide at its own expense services of the Japanese experts as listed in Annex II through the normal procedures under the Technical Cooperation Scheme of the Government of Japan.
2. The Japanese experts referred to in 1. above and their families will be granted in the Kingdom of Tonga the privileges, exemptions and benefits as listed in Annex III and will be granted privileges, exemptions and benefits no less favorable than those granted to experts of third countries or international organizations performing similar missions.

### III. PROVISION OF MACHINERY AND EQUIPMENT

1. In accordance with the laws and regulations in force in Japan, the Government of Japan will take necessary measures through JICA to provide at its own expense such machinery, equipment and other materials necessary for the implementation of the Project as listed in Annex IV, through the normal procedures under the Technical Cooperation Scheme of the Government of Japan.
2. The articles referred to in 1 above will become the property of the Government of the Kingdom of Tonga upon being delivered c.i.f. to the Tongan authorities concerned at the ports and/or airports of disembarkation, and will be utilized exclusively for the implementation of the Project in consultation with the Japanese experts referred to in Annex II.

#### **IV. PROVISION OF SPECIAL MEASURES**

For fostering the smooth promotion of the Project, in accordance with the laws and regulations in force in Japan, the Government of Japan will take necessary measures through JICA to supplement a portion of the local cost expenditures for the execution of the physical infrastructure such as construction work of laboratory facilities and so on when necessity arises.

#### **V. TRAINING OF TONGAN PERSONNEL IN JAPAN**

1. In accordance with the laws and regulations in force in Japan, the Government of Japan will take necessary measures through JICA to receive at its own expense the Tongan personnel connected with the Project for technical training in Japan through the normal procedures under the Technical Cooperation Scheme of the Government of Japan.
2. The Government of the Kingdom of Tonga will take necessary measures to ensure that the knowledge and experience acquired by the Tongan personnel from technical training in Japan will be utilized effectively for the implementation of the Project.

#### **VI. SERVICES FOR TONGAN COUNTERPART PERSONNEL AND ADMINISTRATIVE PERSONNEL**

1. In accordance with the laws and regulations in force in the Kingdom of Tonga, the Government of the Kingdom of Tonga will take necessary measures to secure at its own expense necessary services for Tongan counterpart personnel and administrative personnel as listed in Annex V.
2. As to the Tongan counterpart personnel, the Government of the Kingdom of Tonga will endeavor to allocate the necessary number of suitably qualified personnel corresponding to each Japanese expert to be dispatched by the Government of Japan as specified in Annex II, for effective and successful implementation of the Project.

#### **VII. MEASURES TO BE TAKEN BY THE GOVERNMENT OF THE KINGDOM OF TONGA**

1. In accordance with the laws and regulations in force in the Kingdom of Tonga, the Government of the Kingdom of Tonga will take necessary measures to provide at its own expense:
  - (1) Land, buildings and facilities as listed in Annex VI,

- (2) Supply or replacement of machinery, equipment, instrument, vehicles, tools, spare parts and any other materials necessary for the implementation of the Project other than those provided through JICA under III above;
  - (3) Transportation facilities and travel allowance for the Japanese experts for the official travel within the Kingdom of Tonga;
  - (4) Suitably furnished accommodations for the Japanese experts and their families.
2. In accordance with the laws and regulations in force in the Kingdom of Tonga, the *Government of the Kingdom of Tonga* will take necessary measures to meet:
- (1) Expenses necessary for the transportation within the Kingdom of Tonga of the articles referred to in III above as well as for the installation, operation and maintenance thereof;
  - (2) Customs duties, internal taxes and any other charges, imposed in the Kingdom of Tonga on the articles referred to in III above;
  - (3) All running expenses necessary for the implementation of the Project.

#### VIII. ADMINISTRATION OF THE PROJECT

1. The Japanese experts will give necessary technical guidance and advice to the Tongan authorities and staff associated with the Project pertaining to the implementation of the Project, and the Tongan authorities concerned will be responsible for the administrative and managerial matters pertaining to the Project.
2. For the successful implementation of the Project, the Coordinating Committee will be established with the members as listed in Annex VII.  
The Committee will meet at least once a year.  
The functions of the Committee are as follows;
  - (1) To formulate the detailed plan of works for the Project,
  - (2) To review the implementation of the Project,
  - (3) To advise the Tongan authorities concerned about the implementation of the Project at all stages.

#### IX. CLAIMS AGAINST JAPANESE EXPERTS

The Government of the Kingdom of Tonga undertakes to bear claims, if any arises, against the Japanese experts engaged in the Project resulting from, occurring in the course of, or otherwise connected with the discharge of their official functions in the Kingdom of Tonga except for those arising from the willful misconduct or gross negligence of the Japanese experts.

## X. MUTUAL CONSULTATION

There will be mutual consultation between the two Governments on any major issues arising from, or in connection with this Attached Document.

## XI. TERM OF COOPERATION

The duration of the technical cooperation for the Project under this Attached Document will be five (5) years from the date of signature. However, there will be a general review by the Coordinating Committee on the progress of the implementation of the Project after three (3) years from the commencement of the cooperation taking account of measures to be taken by the two Governments in order to decide if the cooperation should be continued for two (2) more years.

## ANNEX I. MASTER PLAN

### 1. Objective

The Project aims at improving health laboratory services in the Kingdom of Tonga with special emphasis on functions of the Central Health Laboratory.

### 2. Implementation

The Ministry of Health of the Kingdom of Tonga will have overall responsibilities for the implementation of the Project, taking into account the proposal made by the Coordinating Committee. For implementing the Project, the Government of Japan will dispatch Japanese experts, accept Tongan personnel for training in Japan and provide necessary equipment and materials.

The Governments of the Kingdom of Tonga and Japan will also work in cooperation with WHO, under terms of its Plan of Operations.

### 3. Activities under the Project

The Project will consist of the following areas and related activities.

(1) Environmental & Food sanitation

(2) Microbiology

(3) Bacteriology (T.B.)

(4) Haematology

(5) Clinical chemistry

(6) Cytology

(7) Other fields and activities mutually agreed upon as necessary.



## ANNEX II. JAPANESE EXPERTS

Expert in

- (1) Environmental & Food sanitation
- (2) Microbiology
- (3) Bacteriology (T.B.)
- (4) Haematology
- (5) Clinical chemistry
- (6) Cytology
- (7) Other fields mutually agreed upon as necessary.

## ANNEX III. PRIVILEGES, EXEMPTIONS AND BENEFITS

1. Exemptions from income tax and charges of any kind imposed on or in connection with the living allowances remitted from abroad;
2. Exemptions from import and export duties and any other charges in respect of personal and household effects, including one motor vehicle per family, which may be brought into the Kingdom of Tonga from abroad;
3. Free medical services and facilities to the Japanese experts and their families.

## ANNEX IV. LIST OF THE ARTICLES

Machinery, equipment and materials for the Project mutually agreed upon as necessary.

## ANNEX V. LIST OF TONGAN STAFF

1. Project Director
2. Counter Personnel
  - Environmental & Food Sanitation
  - in Microbiology
  - in Bacteriology (T.B.)
  - in Haematology
  - in Clinical Chemistry
  - in Other fields mutually agreed upon necessary.
3. Clerical and service personnel
4. Other personnel mutually agreed upon as necessary for the Project

## ANNEX VI. LIST OF LAND, BUILDINGS AND FACILITIES

The Tongan authorities offer land, buildings and facilities necessary for the Project.

## ANNEX VII. COMPOSITION OF THE COORDINATING COMMITTEE

Chairman: Director of Health, Ministry of Health, Kingdom of Tonga

The Tongan side

Senior Medical Officer i/c

Vaiola Hospital

Senior Medical Officer i/c

Public Health Division

Officer i/c Laboratory Services

Other officers may be coopted  
when required.

The Japanese side

Experts

Note: The representative(s) of WHO will be invited to the meeting.

## THE MINUTES OF THE MEETING

### BETWEEN THE JAPANESE IMPLEMENTATION SURVEY TEAM AND THE AUTHORITIES CONCERNED OF THE WORLD HEALTH ORGANIZATION ON THE JAPAN-WHO JOINT TECHNICAL COOPERATION PROJECT IN THE KINGDOM OF TONGA, HEALTH LABORATORY

The Japanese Implementation Survey Team (hereinafter referred to as the Team) and the Authorities concerned of the World Health Organization (hereinafter referred to as WHO) discussed the matters relating to the contributions to be made by the Government of Japan and WHO to the technical cooperation programme as provided in the Record of discussions between the Team and the Authorities concerned of the Government of the Kingdom of Tonga, signed on 15th December, 1981, (hereinafter referred to as the R/D), on the Japan-WHO Joint Technical Cooperation Project in the Kingdom of Tonga, Health Laboratory (hereinafter referred to as the Project).

As a result of the discussions, the Team and the Authorities concerned of WHO agreed to recommend to the Government of Japan and WHO, respectively, the following matters.

1. The Government of Japan will take necessary measures through the normal procedures under the Technical Cooperation Scheme of the Government of Japan to dispatch Japanese experts, to provide machinery and equipment as well as to train Tongan personnel in Japan for the implementation of the Project according to the Attached Document of the R/D.
2. WHO will take the following measures within its own framework to cooperate with the Government of Japan and the Government of the Kingdom of Tonga for the smooth and effective implementation of the Project:
  - (1) To assign WHO experts in fields mutually agreed upon.
  - (2) To provide fellowships, as requested by governments, and intercountry training programmes, not only for Tongan personnel but also for those in the other South Pacific countries.
  - (3) To provide facilities, equipment, supplies and other materials to support the implementation of the Project.

WHO will set aside a portion of the present budget and will allocate the necessary amount from the next budget cycle 82/83 for the smooth implementation of the above-mentioned measures.

3. There will be close mutual consultations between the Government of Japan and WHO for the implementation of the Project and on any matters arising from, or in connection with, these Minutes.

Nuku'alofa, Tonga, 15th December 1981

Akira Shishido, M. D., Ph. D.  
Head of the Japanese  
Implementation Survey Team  
Japan International Cooperation Agency

Hiroshi Nakajima, M. D., Ph. D.  
Regional Director  
Western Pacific Regional Office  
World Health Organization

The Government of the Kingdom of Tonga acknowledges the above cooperation scheme to be implemented by both the Government of Japan and WHO

Hon. Dr. S. Ma'afu Tupou  
Acting Minister of Health,  
Ministry of Health,  
Kingdom of Tonga

## 2. List of Main Machinery and Equipment Granted

Name	Quantity	Amount (in thousand yen)
F.Y. 1982 (Total 38,683 thousand yen)		
High-pressure steam sterilizer	2	3,200
Constant-temperature dryer	2	1,500
Water softening plant	1	1,230
Autostill	1	1,590
Egg incubator	5	2,435
Water jacket for egg incubator	1	1,640
Muffle furnace	1	480
Microplate photometer	1	2,290
Binocular microscope	4	2,540
Stereomicroscope (trinocular type)	1	540
High-speed refrigerated centrifuge	1	2,340
Electrophoretic apparatus	1	520
Clean bench	1	1,370
Draft chamber	1	810
Cold storage of blood	1	610
Fluorescent microscope	1	910
Mettler balance	2	980
Dry copier	1	757
Voltage regulator	5	2,700
Toyota, Hiace	1	1,045
F.Y. 1983 (Total 43,508 thousand yen)		
Flame photometer	1	560
Automatic counter of the blood corpuscles	1	3,300
Discussion microscope	1	891
BOD incubator	1	980
Turbidity meter	1	680

Name	Quantity	Amount (in thousand yen)
F.Y. 1984 (Total 34,430 yen)		
Collyzer	1	2,200
Hematic slide stainer	1	2,300
pH/blood gas meter	1	6,560
Binocular microscope	2	1,320
Clean bench (for test of tubercle bacillus)	1	1,430
Photo BH meter (digital)	1	400
Autoclave, small type	2	980
Copier	1	477
Video set	1	1,050
Toyota, Dyna	1	1,502
Toyota, Hiace	1	1,162
F.Y. 1985 (Total 18,229 thousand yen)		
Superlow temperature refrigerator	1	1,000
Spectrophotometer	1	2,180
Microtome	1	373
Microtome cryostat	1	2,189
Paraffin melter	1	560
Photodesk, comet	1	642
Toyota, Cresta	1	1,502
F.Y. 1986 (Total 24,360 thousand yen)		
Visible spectrophotometer	4	2,640
Flame photometer	1	2,800
Dynamo	3	1,110
Hitachi flame photometer	1	2,800







JICA