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Health Organisation

INTERGOVERNMENTAL CONFERENCE OF FAR-EASTERN COUNTRIES ON RURAL HYGIENE

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REPORT OF THE NETHERLANDS INDIES

GENEVA, 1937.

Intergovernmental Conference of Far-Eastern Countries on Rural Hygiene

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Geneva, June 1937.

LEAGUE OF NATIONS

Health Organisation

INTERGOVERNMENTAL CONFERENCE OF FAR-EASTERN COUNTRIES ON RURAL HYGIENE

Preparatory Papers :

REPORT OF THE NETHERLANDS INDIES

Prepared at the Head Office of the Netherlands Indies Public Health Service, Batavia-C. (Java),

With the Collaboration of Many Authorities in the Fields of Administrative, Economic, Social, Educational, Health, Medical and Sanitary Matters.

Series of League of Nations Publications

III. HEALTH
1937. III. 15.

INTRODUCTION.

In view of the Intergovernmental Conference of Far-Eastern Countries on Rural Hygiene, which will be held in Bandoeng (Java) from August 3rd to 13th, 1937, the participating countries have been invited to prepare national memoranda covering the items of the agenda of the Conference—*i.e.* :

I. Health and Medical Services.

II. Rural Reconstruction and Collaboration of the Population.

III. Sanitation and Sanitary Engineering.

IV. Nutrition.

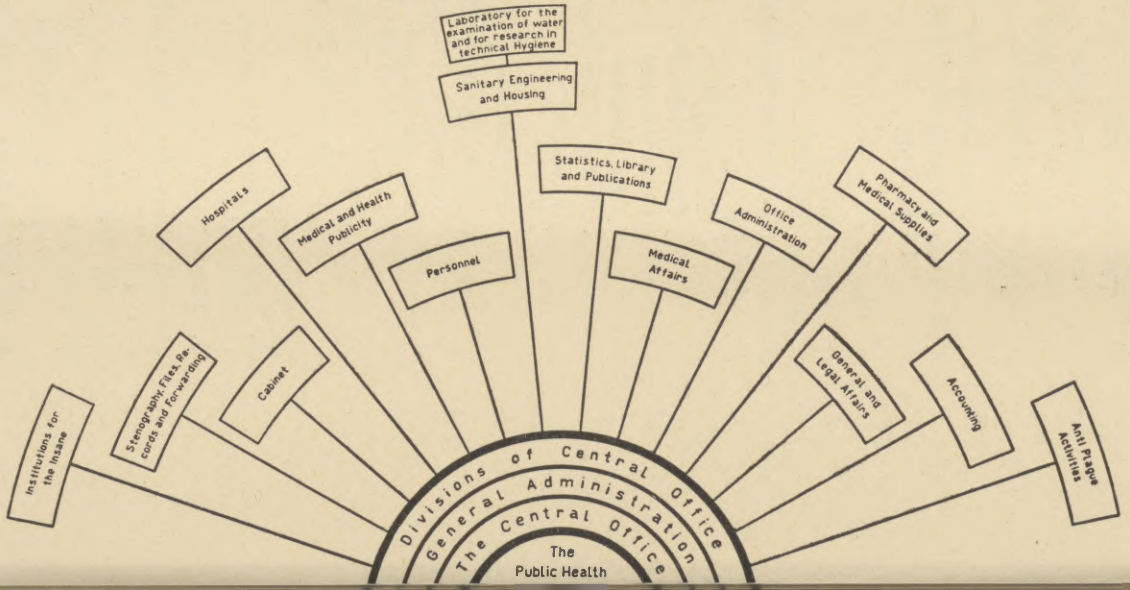
V. Measures for combating Certain Diseases in Rural Districts.

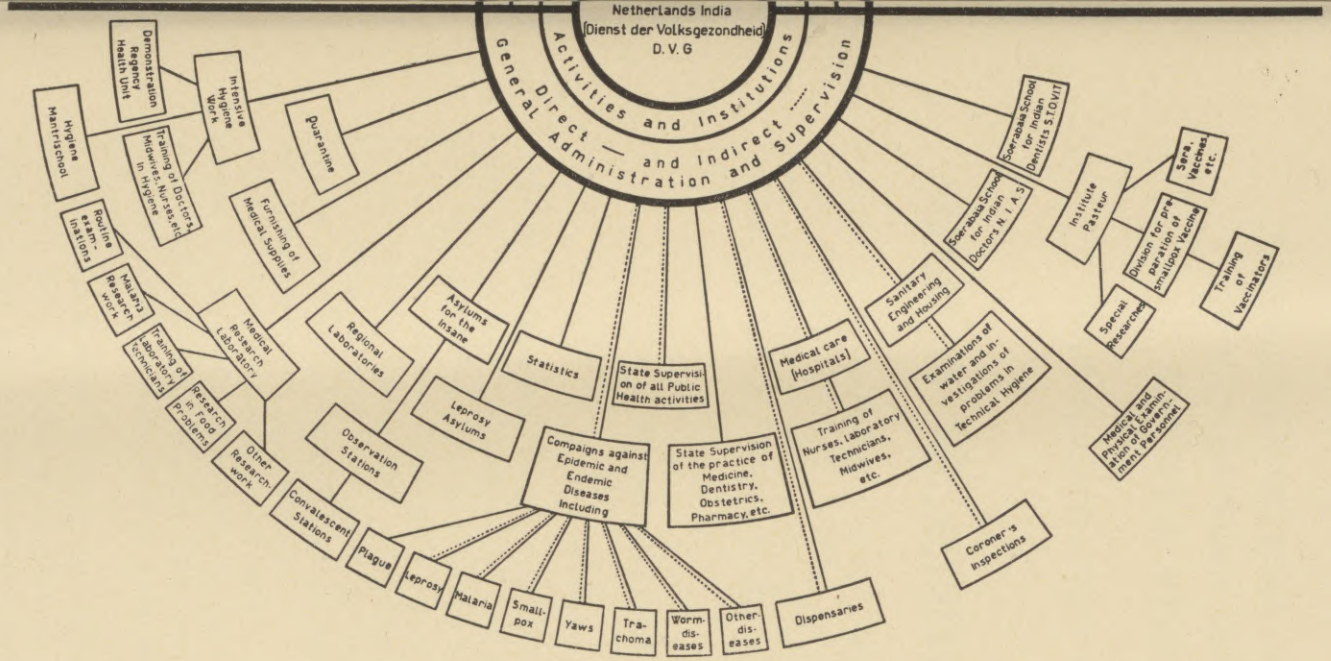
Herewith is the report for the Netherlands Indies.

CONTENTS.

S. d. N. 1405 (A.) 7/37. Imp. du J. de Genève

Divisions, Activities and Institutions
of the
Public Health Service of Netherlands India




Netherlands India
(Dienst der Volksgezondheid)
D.V.G
Activities and Institutions
Direct — and Indirect —
General Administration and Supervision
Demonstration Regency Health Unit
Intensive Hygiene Work
Hygiene Mantrischool
Training of Doctors, Midwives, Nurses etc. in Hygiene
Routine examinations
Malaria Research work
Training of Laboratory Technicians
Research in food problems
Other Research work
Medical Research Laboratory
Quarantine
Furnishing of Medical Supplies
Regional Laboratories
Observation Stations
Convalescent Stations
Plague
Leprosy
Malaria
Small-pox
Yaws
Tra-choma
Worm-diseases
Other dis-eases
Asylums for the Insane
Leprosy Asylums
Statistics
Compaigns against Epidemic and Endemic Diseases including
State Supervision on of all Public Health activities
State Supervision of the practice of Medicine, Dentistry, Obstetrics, Pharmacy, etc.
Medical care (Hospitals)
Training of Nurses, Laboratory Technicians, Midwives, etc.
Dispensaries
Sanitary Engineering and Housing
Examinations of water and investigations of problems in Technical Hygiene
Coroner's inspections
Soer-abaia School for Indian Dentists S.T.O.V.I.T
Soer-abaia School for Indian Doctors N.I.A.S
Institute Pasteur
Sera, Vaccines, etc.
Division for preparation of smallpox Vaccine
Special Researches
Training of Vaccinators
Medical and Physical Examination of Govern-ment Personnel

INTERGOVERNMENTAL CONFERENCE OF FAR-EASTERN COUNTRIES ON RURAL HYGIENE.

(Bandoeng (Java), August 3rd, 1937.)

REPORT OF THE NETHERLANDS INDIES

Prepared at the Head Office of the Netherlands Indies Public Health Service, Batavia-C. (Java), with the Collaboration of Many Authorities in the Fields of Administrative, Economic, Social, Educational, Health, Medical and Sanitary Matters.

INTRODUCTION.

1. Geography.

The Netherlands Indies, a part of the Kingdom of the Netherlands, is a group of islands which lies between South-Eastern Asia and Australia. The archipelago is situated between the South China Sea and the Pacific Ocean on the north, and the Indian Ocean on the south : extending from 6° north latitude to 11° South latitude, and from 95°-141° East longitude, its greatest boundaries being Sumatra's most westerly point, and the eastern point of New Guinea.

This Island Empire extends over a distance of 5,000 kilometres (3,000 miles) from west to east, or one-eighth of the earth's circumference (twelve days by steamer), whilst from north to south it forms a band 2,000 kilometres (1,200 miles) wide.

The distance from Batavia, its capital, to Amsterdam, as the crow flies, is 11,340 kilometres, to Cape Town 9,460, to Sydney 5,049, and to San Francisco 14,090 kilometres.

2. Area.

The total area of Netherlands Indian territory is 1,904,345.7 square kilometres :

	Square kilometres
Java and Madura	132,174.1
Sumatra	473,605.9
Borneo	539,460.0
Celebes	189,034.9
Bali and Lombok	10,290.2
Timor and dependencies	63,324.3
The Moluccas, including New Guinea	496,456.3
Total	1,904,345.7

3. Population.

According to the latest census (1930), the total population of the Netherlands Indies amounted to 60,727,000 ; since that census, the number of inhabitants has increased by approximately 4 millions.

Of this number, about 42 millions live in Java, which implies a great density of population (314.5 per square kilometre). Java has always been the most densely populated of all the islands, which is to be ascribed, in addition to its being centrally situated, to the extraordinary fertility of a great proportion of its soil, on account of which, from olden times, Java has furnished rice to the other parts of the archipelago. This is evident from its name, derived from " Yavadvipa " which means " rice country ".

Bali and Lombok have a density of population of from 120 to 175 per square kilometre, whilst that of the other islands of the archipelago averages 11 inhabitants to the square kilometre.

The population of the Netherlands Indies can be divided into the following groups (in thousands) :

	Europeans	Natives	Chinese	Other non-indigenous Orientals
Java	192	40,891	582	53
Outer Provinces	48	18,247	651	63
Total Netherlands Indies	240	59,138	1,233	116

Characteristic of the Netherlands Indies is its inconsiderable city population. Of the people of Java, only 4.5% live in cities of more than 50,000 inhabitants, whilst, in the other islands, the percentage is a good deal lower.

If classified according to the usual demographic standards, the native population of the Netherlands Indies would have to be included in the group of young and vigorous peoples, and this is indicated by its continued great increase. Although it is practically certain that the rate of increase has declined in the course of the past century, the present increase, estimated to amount to about 1½% per annum is still notable.

4. Soil.

A long range of volcanoes traverses the entire archipelago. Beginning in the northern part of Sumatra (Achin), the mountain range continues along the whole of Sumatra's west coast and Java's south coast, after which the volcanic series takes its course along the Minor Sunda Islands, to bend westward across the Islands of Banda, thence passing over Celebes and the Moluccas, whence is turns northward over Ternate, Halmaheira and Sangir to the Philippine Islands. It is only natural, therefore, that volcanic eruptions occur in all parts of the archipelago. The constitution of a portion of the soil is closely connected with the disintegration of erupted rock. The soil of Java consists of about 75% of disintegration products of volcanic rock. The humid tropical climate of the Netherlands Indies results everywhere in a rapid and deep disintegration of solid rock formations. Naturally, the many rivers wash the fertile disintegration products down to the lower coastal regions. Also, the dense vegetation plays an important part in the formation of the soil.

5. Climate.

The Netherlands Indies possess one of the most equable climates of the earth.

At the Royal Meteorological and Magnetic Observatory at Batavia, one of the best equipped scientific institutions for the study of the atmosphere in the tropics, observations have been made since the year 1866. In 1877, a tropical temperature of

96° F. was registered, whilst, in the same year also, the lowest tropical temperature was recorded—namely, one of 66° F.

Owing to its situation between the continents of Asia and Australia, there prevail in the Netherlands Indies the seasonally changing " monsoon " winds, which are more intense in its northern than in its southern parts. Locally, the climate is strongly influenced by the high range of mountains which cross the islands and it is therefore difficult to give a complete description of the climate. The east and west monsoons chiefly determine the rainfall, thus causing the dry and the wet seasons in the greater part of the archipelago.

In by far the greater portion of the archipelago the climate is very damp, although the south-eastern group of islands is affected by the arid Australian winds, so that one finds there a definitely dry season. The snow-line lies above 4,000 metres, so that it is only in New Guinea that a few mountain-tops are covered with perpetual snow. The temperature decreases by about 0.5° C. for every 300 feet increase in altitude, or 1° F. for each 335 feet.

The west monsoon is accompanied by heavy rains, which may last uninterruptedly for days and even for weeks, causing the rivers to swell, so that the lower lands are often inundated.

In Java, the rainfall is least during the period May to August inclusive, whilst the greatest precipitation occurs from December to February inclusive.

6. Government.

Politically, the Netherlands Indies is a part of the Kingdom of the Netherlands. The Queen and the States-General are the highest legislative power. In actual practice, however, this body is concerned exclusively with the promulgation of laws of general constitutional import and for regulating the economic life. The general supervision over the executive power is vested in the Crown. The Governor-General of the Netherlands Indies rules this country in the name of the Queen. Both in his legal and executive capacities he is guided by an advisory body, the Council of the Netherlands Indies; whilst in his other governmental duties he is assisted by the Heads of Government Departments, who, together with the Commanders of the Land

and the Sea Forces, form a Council of Departmental Chiefs. For disposing of official correspondence and for the execution of his executive orders, the Governor-General has at his disposal a Cabinet known as the General Secretariat. Since 1916, a representative body has been created, referred to as the People's Council, now consisting of one President and sixty members (twenty-five European, thirty native, and five of other Oriental origin), in part elected and in part appointed by the Governor-General. The Governor-General may consult this body in all matters and is obliged to bring before it for discussion all matters which concern the budget, colonial loans, and bills and general measures of Government having reference exclusively or in considerable degree to the Netherlands Indies.

As regards administration, the Netherlands Indies is divided into twenty-three provinces under the supervision of Governors or Residents.

Politically, the regions under Netherlands authority are divided into (1) directly administered territory and (2) " self-administering " territories.

The directly administered territory has not been entirely divided up into lesser civil communities. The principal autonomous body is the province, whilst townships, regencies, local resorts, native communities and irrigation areas are also recognised.

The self-administering territories consist of self-administering regions in which the highest authority is vested in the native executive bodies (native princes). Such executive bodies have a more or less extensive right to self-administration (with their own budget, their own legislature, their own judicature, etc.). The self-administering regions which are best known are the so-called principalities in Java (Surakarta and Djocjakarta) and in the outer provinces, Deli, Langkat, Serdang, Asahan and Koetei.

7. Economic Situation.

The body economic may be divided into the western capitalistic, which is principally connected with the export of produce, and the native, in which the production of native articles of consumption is emphasised. Between these two forms there are numerous stages of transition.

The native sphere bears primarily the character of an agricultural economy, so that even a considerable proportion of its industry retains an agrarian background.

In the sphere of economics, the credit system, which is strictly controlled by the Government, plays a very important part.

I. MEDICAL AND SANITARY SERVICES.

Historical Outline.

On August 24th, 1626, the Governors of the United East India Company passed a resolution appointing the Doctor Medicinæ Jacobus Bontius to the position of "Doctor", Apothecary and Overseer of the Chirurgeons in the Indies". Dr. Bontius arrived here on October 13th, 1626, and the Medical Service of the Netherlands Indies dates from that day.

In the course of the years, various medical instructions and regulations were issued, until, in 1820, and entirely new and comprehensive set of rules and regulations was drafted, covering the Civil Medical Service in the Netherlands Indies, to be placed under the general supervision of a commissary, whilst vaccination was entrusted to a special inspector.

In 1827, a statutory enactment was promulgated combining the Civil and the Military Medical Services under one head.

It was not until 1911 that this service was again divided, the direction of the Civil Medical Service being placed in the hands of an Inspector-in-Chief. Since that period, this service, the name of which, by virtue of *Staatsblad 1925*, was altered to "The Public Health Service", has developed greatly, expanding its activities over the entire archipelago.

1. The Organisation and the Principles underlying the Services (see frontispiece, pages 8 and 9).

General Organisation.

The care of the public health in the Netherlands Indies is entrusted—under the general supervision of the Governor-General—to the Public Health Service ("*Dienst der*

Volksgezondheid" = *D.V.G.*), which comes under the Department of Education and Public Worship. Up to quite recently, the Public Health Service exercised a rigidly enforced central authority over all parts of this archipelago. On January 1st, 1937, however, a beginning was made with the decentralisation of the Public Health Service of Java and Madura, since these two islands constitute a separate administrative unit. This decentralised public health organisation and the supervision over the personnel in charge thereof has been transferred in part to the provinces and in part to the regencies and townships.

In some places, especially in the outer provinces, the Military Medical Service (M.G.D.) conducts activities for the Public Health Service, especially as regards preventive measures; whilst, on the other hand, in some respects, the Public Health Service physicians lend their assistance—mainly curative—to the Military Medical Service. In this sphere, especially in connection with the curative branch of public health care, there co-operate with the central Government organisation, in addition to the provincial, regency and township authorities, the missionary bodies, the Salvation Army and certain associations established for the care of the sick, which, as regards the exercise of their activities, receive support from the Government, but which, for the rest, are dependent upon charity, both in this country and abroad. Finally, it may be mentioned that co-operation is also extended by the greater agricultural estates, both in Java and in the outer provinces. These, in addition to curative work, assist the native population to a very considerable degree along the lines of preventive hygiene.

In the course of the first few years of its existence, the D.V.G. concentrated its activities on the individual care of the sick; activities connected with quarantine and general preventive measures.

However, since 1917, though recognising its responsibility in certain fields, such as the medical care of prisoners and members of penal communities and institutions, the Central Government has considered that *curative activities belong in general to the task of private initiative and local administrative bodies*, and efforts are being made to shift the burden of curative care into these fields. Thus it is becoming possible for the

D.V.G. to develop more and more its preventive activities, and also gradually to increase its efforts to obtain the co-operation of the native population by establishing a desire on their part for better health habits.

The manner in which the curative activities of public health care are divided between Government and private initiative will be evident from the subjoined tabulation.

Conditions prior to the Decentralisation (end of 1936).

	Total number	Total capacity
General hospitals:		
Governmental	58	5,734
Private, subsidised by the Government	92	6,619
Private, not subsidised by the Government	324	24,907
Local, subsidised by the Government	19	2,239
Local, not subsidised by the Government	2	32
Total	495	39,531
Establishments for the care of eye diseases:		
Governmental	1	166
Private, subsidised by Government.	3	358
Private, not subsidised by Government	1	25
Total	5	549
Asylums for the insane:		
Governmental	15	9,372
Tuberculosis sanatoria:		
Private, subsidised by Government.	4	363
Private, not subsidised by Government	2	73
Total	6	436
Leper asylums:		
Private, subsidised by Government.	18	2,535
Private, not subsidised by Government	24	1,685
Total	42	4,220
Stations for the care of the mental defective:		
Private, subsidised by Government.	1	90
Stations for opium addicts:		
Private, subsidised by Government.	1	28
Dispensaries (self-supporting):		
Governmental	167	—
Private	803	—
Total	970	—

Combined Medical and Sanitary Services.

From the above, it is evident that the Public Health Service of the Netherlands Indies does not separate preventive and curative health care, since the entire organisation is supervised by one Director, who outlines the programmes covering the activities in both fields. The interest of the leaders of the regional health services in Java, established subsequently to December 31st, 1936, as well as that of the medical inspectors in the outer provinces and of the various physicians working under their supervision, covers both curative and preventive care. Nevertheless, there are in Java nine Indian physicians concerned exclusively in preventive work, while in thirteen places in the Netherlands Indies there are local organisations of subordinate personnel engaged exclusively in work of prophylaxis. In the beginning of the activities at these centres, treatments for hookworm disease were given, but now even these patients are sent to dispensaries and hospitals for treatment. It may thus be said that in thirteen places there is actually a separation of preventive and curative activities.

Furthermore, subordinate personnel assigned to preventive measures is often exclusively engaged in preventive work—as, for example, in vaccination against smallpox.

Obviously, the budget determines in great measure the possibility of a division between these two activities, as two separate services, in the nature of things, require more personnel, and are therefore more costly.

Determination of the comparative values of curative and preventive medicine may be indicated by the following considerations :

(1) Curative activities are unavoidable ; despite all prophylactic measures, cases of illness and disease will continue to occur.

(2) For an effective campaign against epidemic diseases, isolation of the patients, and the treatment associated therewith, is imperative.

(3) The individual care of the sick constitutes a slowly penetrating, but effective, propaganda for healthy living, in that it affects the patient at the correct psychological moment ; the individual effect is very pronounced.

(4) Preventive care, as is necessary in the case of endemic diseases, such as ankylostomiasis, malaria or frambœsia, cannot be initiated without mass treatment of the patients ; ultimately, this treatment becomes individual curative care.

(5) Our modern hygiene has its origin in the clinic and is born of clinical experience, so that all preventive care should keep in close contact with the clinic if it is to attain efficiency.

The Task outlined.

The task of the D.V.G. may be outlined as follows :

(*a*) Investigation of the state of the public health, indication of measures for its improvement, and the stimulation of their proper application ; the organising of campaigns against, and the direct prevention of, infectious and endemic diseases ; the improvement of individual care of the sick, sanitation of the soil, provision of drinking-water, removal of refuse and the betterment of housing conditions ; the maintenance of population statistics in so far as they relate to the above indicated activities ;

(*b*) The execution and maintenance of the legal regulations drawn up in the interest of public health, and the exercise of supervision over the execution and maintenance of such regulations in so far as they have been relegated to others.

For the proper promotion of this task, the Public Health Service has at its disposal a many-side corps of assistants, which in organic co-ordination extends its branches to the utmost corners of the archipelago, and, in addition, not only a number of scientific institutions, such as laboratories, the Pasteur Institute, experimental stations, etc., but other establishments and organisations more immediately adapted to the practical application of Government care in medical and hygienic spheres of action—such as hospitals, dispensaries,

asylums for the insane, training-schools, health stations, etc. These establishments and institutions will be dealt with in greater detail a little further on.

Central Organisation.

The central direction of the Public Health Service is exercised by the Head of the Public Health Service from his main office at Batavia. This service leader is a medical man who, in the exercise of his appointed task, is assisted by medical and legal experts, by engineers, a pharmaceutical expert, as well as by administrative personnel of various degrees.

The work is divided into the following divisions :

(1) The Division for Medical Affairs, such as medical examination and inspection, sick leave, etc. ;

(2) The Division of Statistics and Publicity, including the supervision of the medical library ; this section also takes care of the interchange of epidemiological data with the Eastern Bureau of the League of Nations, established at Singapore, and of correspondence with foreign institutions and individuals in connection with medico-hygienic matters ;

(3) The Division of General and Legal Affairs, which deals with all matters pertaining to the preparation and the application of medico-hygienic legislation ;

(4) The Hospital Service Division ;

(5) The Division for Asylums for the Insane ;

(6) The Pharmaceutical Division ; the pharmaceutical inspector exercises official supervision over all pharmaceutical establishments, and is in charge of the distribution of medicines, etc. ;

(7) The Section of Sanitation and Housing, which works out projects for, and issues technical advice on the laying of water conduits and on drainage works, campaigns against malaria and the promotion of housing ;

(8) The Personnel Division ;

(9) The Division of Medical Hygienic Propaganda designs, manufactures and distributes propaganda materials, such as demonstration charts, photos, films, slides, etc. ; distributes forms for field work ; investigates the use of materials distributed and studies and tests old and new materials and methods ;

(10) The Division of Anti-Plague Campaigns, which takes care of all central matters having reference to the fighting of this disease ;

(11) The Administrative Division ;

(12) The Division for Files, Records, Forwarding, Stenography and Intra-office Affairs.

In addition, the Head of the Public Health Service (" Dienst der Volksgezondheid ") has at his disposal five special advisers —namely, the Medical Adviser on Quarantine Affairs and Infectious Diseases, the Adviser for the Organisation of Hygiene and Educational Activities, the leaders of the campaigns against malaria, plague and leprosy.

2. PERSONNEL (see diagram, pages 24 and 25).

(a) *Medical Personnel.*

Classification.

The Public Health Service has at its disposal :

179 European physicians ;
318 Netherlands Indian physicians, and
17 Chinese physicians.

They may be grouped according to their training as follows :

(1) Physicians sent out from the Netherlands, with a Netherlands diploma ;

(2) Physicians who have received their training at the School of Medicine of Batavia (" Geneeskundige Hoogeschool") and have a Netherlands Indian diploma, regarded as equivalent to the Netherlands diploma ;

(3) Netherlands Indian physicians (*a*) graduates of the School for Training of Indian Physicians (S.T.O.V.I.A.), which has been discontinued, and (*b*) graduates of the Netherlands Indian School for Physicians (N.I.A.S.) at Surabaya, at which instruction is still being given ;

(4) Netherlands Indian physicians who have graduated from the S.T.O.V.I.A. and the N.I.A.S., and, after further studies, have obtained a diploma either in the Netherlands or at the " Geneeskundige Hoogeschool " (School of Medicine) of Batavia.

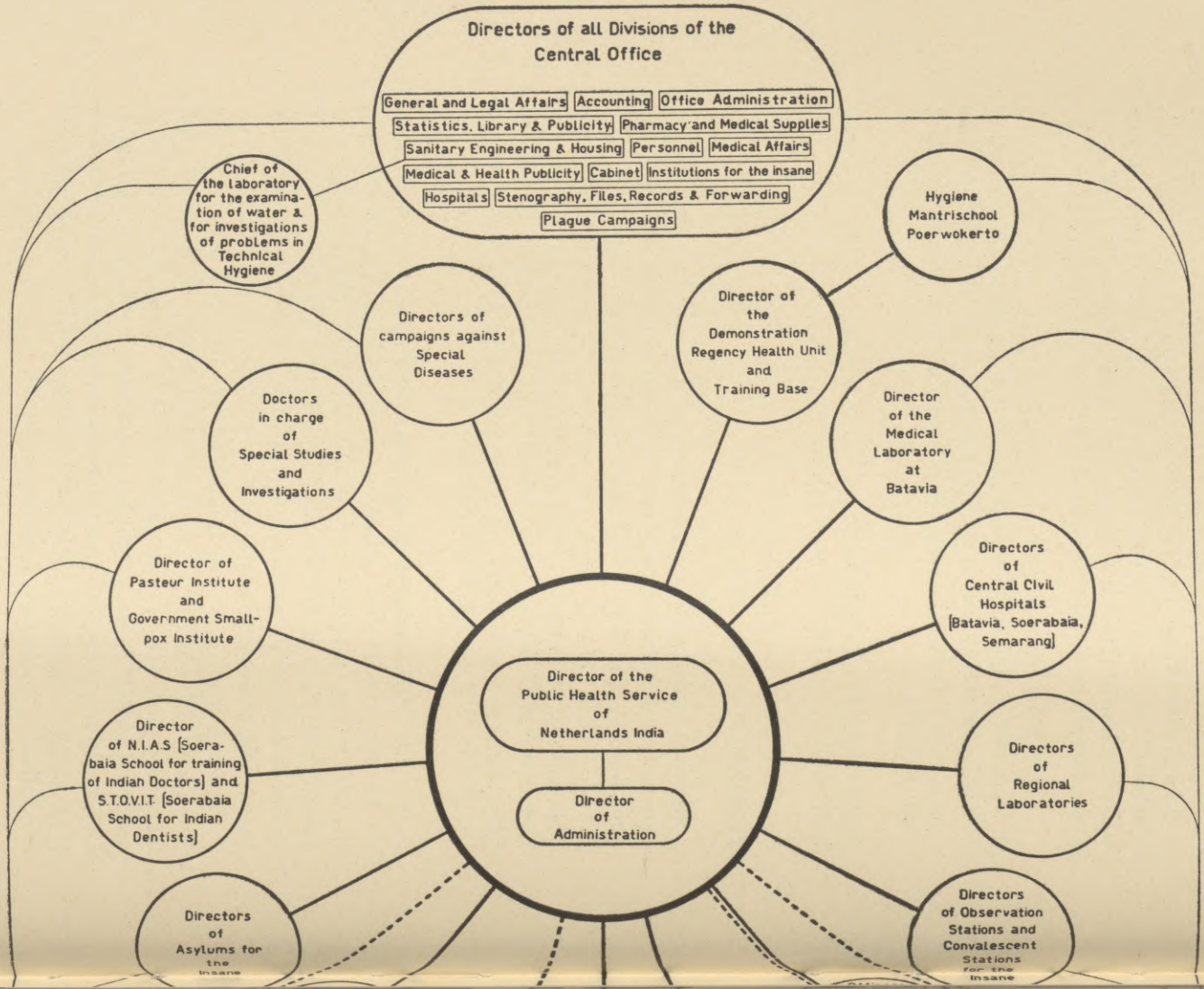
Persons of all nationalities are admitted to the training indicated under (2), (3) and (4).

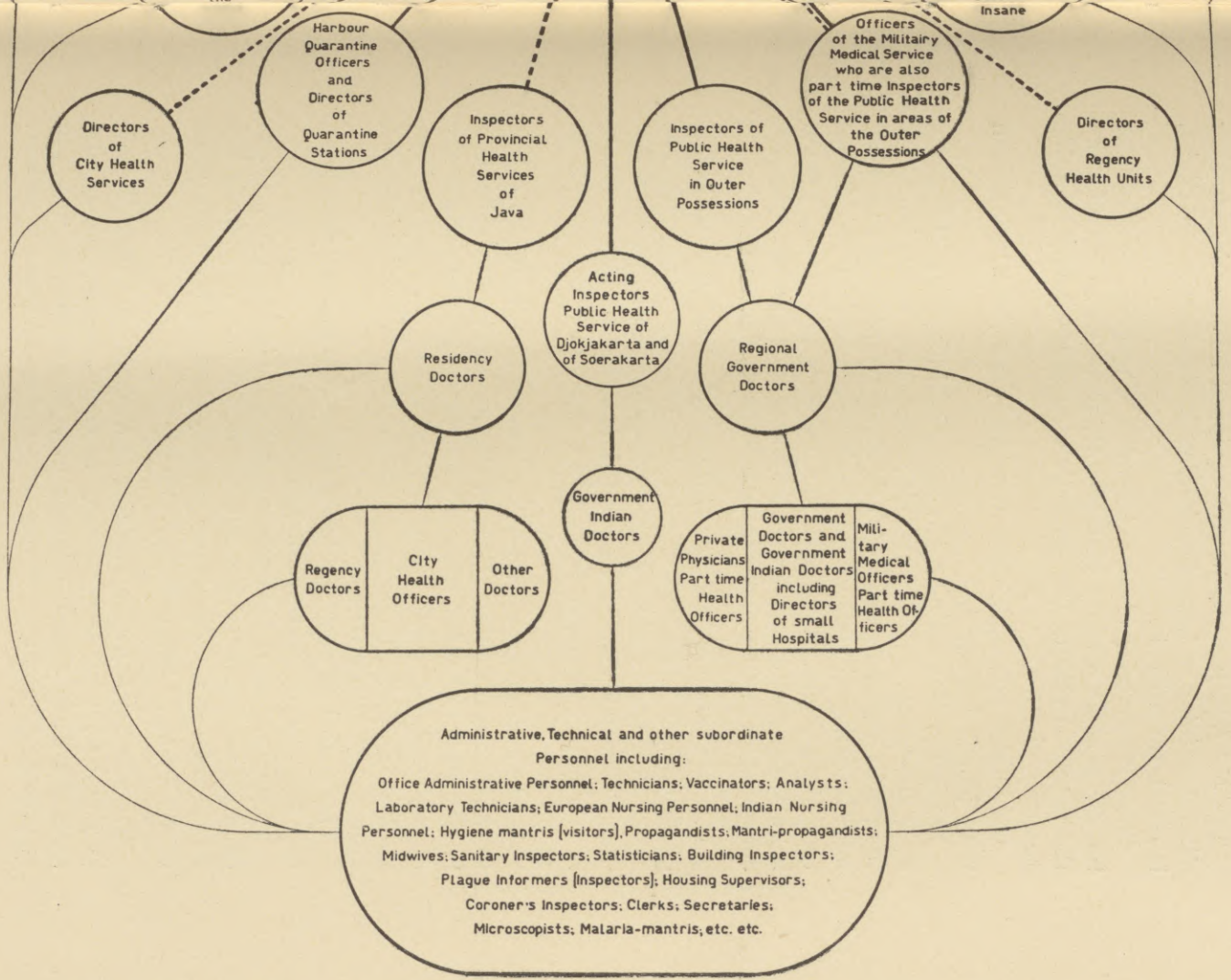
Training.

Medical training was first begun at Batavia in 1851, with a curriculum covering two years, later with one of three years, and finally, in 1875, with one of five years. In 1902, the S.T.O. V.I.A. moved into its own buildings with residential quarters for 200 pupils. After the School of Medicine of Batavia had been established, this school for the training of Indian physicians was gradually merged into the higher school and so the S.T.O. V.I.A. has been discontinued.

A. *The Netherlands Indian School for Physicians* (*N.I.A.S.*). — In 1913, a second school was established at Sourabaya, at which the medical curriculum, entirely modernised, was extended to eight years. Its final diploma carries with it complete qualification for the practice of medicine, surgery and obstetrics in the Netherlands Indies.

The requirements for admission to the N.I.A.S. are the certificate of successful final examinations of a school for advanced elementary education (" MULO "), a general secondary school ("AMS "), or a higher secondary school (" HBS "). In addition, a very stringent selection is applied before admission is granted. Approximately 60% of the pupils admitted pass their final examinations successfully.


Directors of all Divisions of the Central Office
General and Legal Affairs
Accounting
Office Administration
Statistics, Library & Publicity
Pharmacy and Medical Supplies
Sanitary Engineering & Housing
Personnel
Medical Affairs
Medical & Health Publicity
Cabinet
Institutions for the insane
Hospitals
Stenography, Files, Records & Forwarding
Plague Campaigns
Chief of the laboratory for the examination of water & for investigations of problems in Technical Hygiene
Directors of campaigns against Special Diseases
Doctors in charge of Special Studies and Investigations
Director of Pasteur Institute and Government Smallpox Institute
Director of N.I.A.S (Soerabaia School for training of Indian Doctors) and S.T.O.V.I.T. (Soerabaia School for Indian Dentists)
Directors of Asylums for the Insane
Hygiene Mantrischool Poerwokerto
Director of the Demonstration Regency Health Unit and Training Base
Director of the Medical Laboratory at Batavia
Directors of Central Civil Hospitals (Batavia, Soerabaia, Semarang)
Directors of Regional Laboratories
Directors of Observation Stations and Convalescent Stations for the Insane
Director of the Public Health Service of Netherlands India
Director of Administration


Insane
Harbour Quarantine Officers and Directors of Quarantine Stations
Officers of the Militairy Medical Service who are also part time Inspectors of the Public Health Service in areas of the Outer Possessions
Directors of City Health Services
Inspectors of Provincial Health Services of Java
Inspectors of Public Health Service in Outer Possessions
Directors of Regency Health Units
Acting Inspectors Public Health Service of Djokjakarta and of Soerakarta
Residency Doctors
Regional Government Doctors
Government Indian Doctors
Regency Doctors
City Health Officers
Other Doctors
Private Physicians Part time Health Officers
Government Doctors and Government Indian Doctors including Directors of small Hospitals
Militairy Medical Officers Part time Health Officers
Administrative, Technical and other subordinate Personnel including:
Office Administrative Personnel; Technicians; Vaccinators; Analysts; Laboratory Technicians; European Nursing Personnel; Indian Nursing Personnel; Hygiene mantris [visitors], Propagandists; Mantri-propagandists; Midwives; Sanitary Inspectors; Statisticians; Building Inspectors; Plague Informers [Inspectors]; Housing Supervisors; Coroner's Inspectors; Clerks; Secretaries; Microscopists; Malaria-mantris; etc. etc.

The N.I.A.S. has excellently equipped laboratories, and for clinical training, a large hospital, with dispensaries and clinics, is connected with it.

Since the training given is intended to prepare the graduates for the general practice of medicine, more stress is laid upon the practical side of the work than upon its purely scientific aspect.

On August 1st, 1936, there were 363 pupils, of which sixteen were female students.

Naturally, this training is more school-like than that given at a university, so that, on this account, the supervision over the pupils and the results of their study are perhaps somewhat more intensive. Pupils who, twice in succession, fail to advance to a higher class, or who, in the course of their study period, have failed thrice to pass their examinations at the end of a course of instruction, are required to leave the school.

B. *The School of Medicine of Batavia.* — The great extension of secondary education in the Netherlands Indies brought about an urge to have higher education available, modelled upon the same plan as that existing in the Netherlands, and, as a result, a Medical School was established at Batavia in 1927.

Medical education at Batavia at present is entirely equivalent to the medical training at one of the universities in the Netherlands, with the same requirements for admission, whilst the diplomas issued confer identical rights and the same titles, valid in the Netherlands Indies and, after a few mere formalities, also in the Netherlands.

This school of medicine has become a flourishing institution and has already more than 500 students.

To what extent the prevailing condition of having two varieties of physicians each having had a different sort of training has its advantages and disadvantages may form an important point of discussion at the coming Conference.

C. *The School for the Training of Netherlands Indian Dentists (S.T.O.V.I.T.).* — For the sake of completeness, the training of Netherlands Indian dentists may be mentioned, although at present no graduate of this school is in Government service.

Students of all nationalities are also admitted to this college. It has a five-year course, and the number of pupils on August 1st, 1936, amounted to seventy-one, among whom were twenty-two female students.

The S.T.O.V.I.T. has completely equipped laboratories and out-patient departments, whilst its arrangements for housing of students correspond to those of the N.I.A.S.

The Organisation of the Medical Staff of the Public Health Service outside of the Central Office.

In the various areas of the Netherlands Indies, the general medical-hygienic supervision is entrusted to inspectors (in Java, after the recent decentralisation, to the Heads of the Provincial Public Health Services) and to acting inspectors. The latter are not actually members of the Public Health Service, but are senior medical officers of the Military Service, who, in addition to their military duties, exercise the function of inspector under the authority of the Director of the Public Health Service, maintaining close contact with the head office of that service.

The inspectors are assisted by the regional Government medical officers. Each of these is, as a rule, in charge of a residency, and is called in Java and Madura, since the decentralisation, Residency Doctor. These officers, just as the inspectors, have become provincial functionaries. As in the case of the inspectors, it is their task to look after the improvement of the public health in its entire scope. They perform their appointed task, in so far as is possible in co-operation with the civil administration officials.

According to the density of the population and the public health requirements, the above-mentioned officers are in charge of a varying number of Government physicians, senior Government physicians, Government Indian physicians, senior Government Indian physicians, military health officers (who, in addition to their military duties, are in charge of the civil public health service) and civil physicians (physicians in private practice who are given a Government allowance for carrying out certain activities for the Government). Generally speaking,

these Government officers perform health work in the interest of preventive public health care, as well as clinical work. This health work includes the collecting of data having reference to mortality and morbidity, the systematic campaign work against infectious diseases, such as plague, smallpox and dysentery, the treating and control of malaria, tuberculosis, ankylostomiasis, beriberi and other endemic diseases, as well as quarantine service, health propaganda work, supervision of industrial and estate hygiene, etc.

Their clinical activities comprise the medical supervision of Government hospitals and dispensaries, the fighting of frambœsia and of trachoma and other eye diseases, the carrying-out of medical examinations, the inspection of prisons, reformatories and the like, supervision of private hospitals subsidised by the Government, leper asylums, sanatoria, etc.

In addition, there are in service a number of medical specialists, such as the heads of laboratories, leprosy specialists, port health officers, etc.

(b) *Auxiliary Personnel.*

Classification.

The auxiliary assistance which the above-mentioned physicians have at their disposal is composed mainly of the following groups :

(1) The *male and female first-grade nurses* in Government hospitals and insane asylums, who, as regards the nursing service, are generally in charge of a hospital ward, and in some instances even of a small hospital. These nurses are, of course, under the medical guidance of a physician. Outside the central civil hospitals and the insane asylums (which will be discussed later) there are nineteen such nurses active in the general nursing service, and ten in the insane asylums. On the whole, their work is more or less similar to that of head nurses in Europe, the ordinary nursing work being performed by assistant nurses.

(2) The *European nurses* (*male and female second grade*) form a group with certificates of lower grade. This group is

gradually disappearing from the Government Civil Nursing Service, but is still in service, mainly in prison hospitals.

(3) The *mantri* (*assistant*) *nurses* (*male and female*) *in the Government hospitals* constitute the ordinary nursing personnel of these institutions, where they work under the guidance of European nurses. The older, and the more experienced, are put in charge, under the supervision of a medical man, of the routine management of small Government dispensaries. Outside the three large hospitals, there are 421 assistant nurses.

(4) The *mantri* (*assistant*) *nurses in the insane asylums* also constitute the ordinary nursing personnel of these institutions. Outside the four large asylums there are seventy-nine.

(5) The *Government midwives*, on duty both inside and outside the hospitals. Not counting those active in the three large hospitals, there are seventy of these. The need of this useful personnel increases day by day, so that an ever larger number of girls are being taken into training without, however, it being possible for the time being to satisfy the great demand for them in all parts of the archipelago.

(6) The *hospital and insane asylum attendants* take a very modest but nevertheless indispensable part in the organisation of the nursing groups, being used chiefly for the rougher kind of nursing work; there are about 2,000 of such attendants.

(7) The *malaria mantris* (*assistants*) are active in the malaria campaigns and, under medical supervision, are charged with the finding and determining of the varieties of anopheles, and with searching for the breeding-places of malaria-carrying mosquitoes.

(8) The *vaccinators and apprentice vaccinators* are charged with the systematic campaign against smallpox amongst the entire population of the Netherlands Indies, to which end the archipelago is divided into a network of vaccination districts. According to a plan approved by the physician in charge of the residency, they travel from village to village, in connection with which the village authorities instruct the mothers to bring their children on the date of their arrival.

In Java and Madura, four rounds are made annually in each vaccination district, each round taking eight weeks ; in the outer islands, two to four such rounds are made per annum. In so far as is necessary, in the outer islands, the revaccination of older persons, wherever required, is carried out at the same time that the infants are being vaccinated. In Java and Madura, and in certain districts of the outer islands, the so-called divided system has been introduced, in which separate rounds of about five weeks each are made for revaccination. The total number of vaccinations and revaccinations performed annually runs into millions.

(9) The *mantri* (*assistants*) *informers of the anti-plague campaign* are charged in the plague regions of Java with the search for, and the reporting of, cases of plague, with performing, wherever possible, splenic punctures on all bodies of persons that have died in the plague districts, and with having the splenic fluid examined for plague bacilli. In certain districts indicated by the Government, such corpses may not be buried before a splenic puncture has been made, or until the " Information Service " has given premission for burial. These mantri informers, of which there are about 130, are selected, as far as possible, from assistant nurses.

(10) The *informers of the anti-plague campaign* are European employees, most of them having formerly served as second-class nurses. Their activities are confined mainly to the centres of European population. At present, six of these are in service.

(11) The *inspector informers of the anti-plague campaign* exercise supervision over the two preceding groups.

(12) The *mantri-supervisors, the supervisors and the inspector supervisors of the anti-plague campaign* can be subdivided into supervising personnel in charge of (*a*) the systematic improvement of housing, (*b*) the inspection of houses and (*c*) the supervision of building activities.

(13) The *laboratory technicians* are important and greatly appreciated helpers in connection with practical and scientific laboratory activities.

(14) The *laboratory assistants and mantri laboratory assistants* are employed in the laboratories as helpers of the laboratory technicians and perform the simpler laboratory work.

(15) The *hygiene mantris* and *mantri propagandists* are charged with health propaganda amongst the village population in accordance with the principles demonstrated at the Regency Health Service at Poerwokerto.

(16) The *supervisors of public health*, some of whom are employed as assistant hygienists by the City Health Services for health inspection of various industries, small factories, bakeries, etc.

(17) The *supervisors of sanitation in the ports* are at the disposal of the port health officers and lend their assistance, in ports such as at Tandjong Priok (Batavia), Samarang, Surabaya, Macassar, Belawan Deli (Medan) and Sabang, in connection with the deratting of ocean-going vessels, in order to avert the danger of plague. They also perform, under the supervision of the port health officer, the so-called exemption examination on the vessels where this may be required ; that is, a careful and expert examination of the ship to determine whether it can be considered as rat-free, or at least as harbouring so few rats that the ship, by virtue of the stipulations of the Sanitary Convention of Paris of 1926, and on the basis of such examination, can be granted a certificate exempting it from being deratted (" exemption certificate ").

(18) The *administration officers of the larger hospitals, insane asylums, and observation stations for the insane* are functionaries in charge exclusively of the administratoin of these institutions.

Training.

Ad (1) *and* (2) (male and female first-grade nurses and European male and female second-grade nurses). — A considerable number of the European nursing personnel have obtained their general nursing certificates in the Netherlands. But opportunity is also given in private hospitals in the Netherlands Indies for training for that diploma, provided that a diploma of the " MULO " can be submitted at entrance. The training

takes four years, and the diploma granted is recognised in the Netherlands as equivalent to the Netherlands certificate. For this training, also, girls other than of Netherlands birth are accepted. In the military hospital at Tjimahi, opportunities are afforded for men to be trained as second-class nurses.

The nurses at the insane asylums are required to produce a special diploma for the nursing of the insane.

Ad (3) *and* (4) [mantri (assistant) nurses (male and female) in the Government hospitals and the insane asylums]. — The training for mantri (assistant) nurse is obtained in Government and private hospitals and lunatic asylums specifically indicated by the Director of the Public Health Service. To be admitted to this training, candidates are required to produce a certificate to the effect that they have passed through the full native school curriculum, second class. They then follow a course of study lasting three years, in the course of which they acquire sufficient theoretical knowledge, though, naturally, the practical training receives the greater attention. During this period, the students are carefully observed as regards their character, to ascertain whether they have the abilities required for the vocation they have chosen. As a rule, the mantri nurses, after they have obtained their diploma, continue work in a hospital for some time.

Most of these students undergo a special training of from three to six months in simple laboratory work, and, after having passed their examination, may be given a special annotation for laboratory work.

The mantri nurses having this special annotation on their certificates, and, after having worked for some years without immediate supervision in a hospital, or been in charge of a dispensary for some time, are given the opportunity to take their examination for first-class mantri nurse.

It is from these first-class mantri nurses that a head mantri nurse can be selected without it being necessary for him to pass a further examination.

The possibility is now being studied of providing a special training for mantris to guide them into a definite direction, in order that they may become more fit to serve along more

specialised lines of activity. For example, it is intended to train female mantris specifically as children's nurses by means of a six-month course. There is, further, in preparation a line of training which will enable them to obtain an annotation as house-to-house visitor in connection with the campaign against tuberculosis, or one for district nursing; whilst for those who prefer work outside a hospital or dispensary, a two-year course of training is instituted along purely hygienic lines, to qualify them as public health mantris. Finally, the possibility is being considered of enabling them to obtain a special training to qualify as mantri for tuberculosis and mantri for ophthalmic nursing.

The qualifications required to be admitted as mantri nurse in an insane asylum are identical with those for hospitals, as is also the period of training, though obviously the theoretical and practical preliminary training is slightly different. Such mantri nurses can also become first-class and head mantris.

An experiment is at present being made in the three large hospitals in Java to admit Indo-European girls also for training as mantri nurses. Thus far, only native girls had been considered. It is understood that in every respect they are to follow the same course of training as that required for the native girl. But the time since this experiment was initiated is still too short to allow of a proper judgment to be formed as to its feasibility. The only difference will be that the Government is not bound to take the Indo-Europeans into service, as it is in the case of Indian assistants trained in Government institutions.

Ad (5) (Government midwives). — Female mantri (assistant) nurses, after having succeeded in obtaining their mantri certificate, and having worked in a hospital for one year, can then be trained as midwives in institutions specifically indicated for that purpose. This course takes two years, so that their entire training will have taken six years.

Although other mantri nurses, male and female, are not allowed to take up private practice, the midwives are permitted to do so.

There is still another course of training for midwives. The one above described can be followed only by the Netherlands

Indian girl of lesser preliminary education, but the other course is for Netherlands Indian girls who have obtained their "MULO" school certificate, or for girls of other race or nationality having the identical preliminary qualification. It is a three-year course of study and practical work at Batavia, Samarang or Surabaya.

In connection with midwifery in the native village, the so-called *doekoens* play a part of considerable significance. Although, obviously, they can hardly be counted in as subsidiary help, nevertheless this quite important subject will be given some space at the end of this chapter.

Ad (6) (hospital and insane asylum attendants). — These attendants, male and female, are not given any definite schooling, but obviously acquire some practical training in the hospitals or insane asylums.

Ad (7) (malaria mantris (assistants)). — The malaria mantris receive their training at the malaria laboratories in Batavia and Surabaya. The requirements for their admission are the same as those for mantri nurses. Their schooling, which is especially directed towards the acquisition of a simple theoretical and practical understanding of the malaria problem, takes about a year, after which they must pass an examination.

Consideration is still being given to the question as to whether it would not be desirable for mantri nurses to be trained as malaria mantris.

Ad (8) (vaccinators and apprentice vaccinators). — The training for vaccinator is given at the Government Smallpox Institute at Bandoeng, and takes four months. The age-limit for admission is somewhat higher than that for mantri, in view of the fact that the training course is so much shorter, and also because they will have a certain status in relation to the native Government administration officials. They are required to have had a simple preliminary schooling (native primary school, second class) and must be fairly well versed in arithmetic.

Ad (9), (10), (11) and (12) (mantri (assistant) informers, informers, inspector informers, mantri supervisors, supervisors and inspector supervisors of the anti-plague campaign). — In connection with these categories, no definite training is given.

At the moment, however, the advisability is being considered of causing the mantri informer to follow a special three-month course of study, based chiefly on practical work. A real training-school, however, is not being contemplated, in view of the fact that such mantri informers are to be recruited from amongst the mantri nurses, so that they will have already acquired an adequate knowledge of the work demanded of them, whilst that which they will need in connection with this specific position can be learned only through actual practice.

It is the intention to recruit the personnel indicated under (12), which hitherto has been taken on in a somewhat haphazard fashion, from such persons as have had a training in construction at one of the schools for artisans.

Ad (13) (laboratory technicians). — This personnel receives its training in the Medical Laboratory at Batavia. The requirement for their admission is that they must have had three years' schooling at a secondary educational institution. Soon after the beginning of the course, the training is divided into bacteriological and chemical courses, in connection with which those who intend to become bacteriological technicians must take chemistry as a secondary study, and the others bacteriology.

After having passed their final examination, they are accepted as laboratory assistants.

Ad (14) (laboratory and mantri laboratory assistants). — Only those are admitted to this examination who, after having passed successfully their examination for mantri nurse, have had at least one year of supplementary training, which training is specifically intended to give them an opportunity to acquire some simple laboratory experience.

Ad (15) (hygiene mantris and mantri propagandists). — The training of mantri propagandists, which is now carried out at Poerwokerto, was formerly given by each doctor in charge of a station, and was mainly a training in practical work. One of the principal things taught is the carrying-on of propaganda in the home. The main requirement in connection with this work is that, in their talks with the natives, the mantris will

know exactly how to approach and interest them, adapt themselves entirely to the habits and customs of the village and of the population, and present themselves as civilised persons who know how to pursue their work with perseverance.

Since April 1936, a special school has been established at Poerwokerto to give a more systematic training—theoretical as well as practical—to this category of propaganda personnel, who will then be referred to as " hygiene mantris ". This special study, which begins where the tuition at the native primary schools has left off, takes a year and a half. The training, as also the demonstration work at Poerwokerto, is in the immediate charge of Public Health Service physicians specially appointed for this purpose.

Ad (16) (supervisors of public health). — These are functionaries who, after having had a secondary-school education lasting three years, have subsequently had a three-year vocational training with the Public Health Service, especially in the principles of hygiene as applied to the house and the garden, to the city, food and water, and who are also being instructed in the theories of the spread, cure and prevention of the principal infectious diseases.

Ad (17) (supervisors of sanitation in the ports). — No special schooling exists for this class of functionaries, although they are carefully selected ; they are given only some practical teaching.

Ad (18) (administration officers in the various institutions). — For these functionaries no special schooling exists in the Public Health Service. Obviously, persons are employed who have had some training in book-keeping.

Finally, a few words may not be amiss with reference to the *doekoens* mentioned above. These are mostly elderly women whose assistance in connection with childbirth has some magical or other significance in the eyes of the villagers. If these people could be persuaded to adopt hygienic habits, a great deal of harm would be avoided in the villages. The principal hygienic habits in point have to do with the washing of their hands and with the use of clean instruments in dealing with the infant's navel. The contact with these *doekoens* is established by the

midwife, whose task it is to see that such hygienic habits are cultivated.

Experiments were recently started with a kind of assistant whose place is about halfway between a *doekoen* and a trained midwife. By getting some training in one of the smaller hospitals under the supervision of a Netherlands Indian physician and a midwife, the girls, who have been educated in one of the native second-class primary schools, are given a two-year course of practical work. This training consists chiefly of teaching them the simple nursing of native patients and antiseptic principles. They are then taught the ordinary course of normal childbirth and first aid to infants, after which they are required to assist in the consultation dispensaries for pregnant women and mothers with infants. If they have received sufficient instruction, they first accompany a midwife as assistant in cases of childbirth, until gradually they can do this work independently. When their training is completed, they receive a small allowance from the regency or the village, after which they are supposed to earn their own living.

In this manner there will be two kinds of obstetric employees—the thoroughly trained midwife, for the time being few in number, whose training has been fairly lengthy and expensive, and side by side therewith a very simply trained helper, inexpensive but available in considerable numbers. It would, indeed, be interesting to weigh up in greater detail the advantages and disadvantages of the system here indicated, especially with a view to conditions prevailing in other countries.

General Survey of the Medical and Auxiliary Personnel at the Disposal of the Public Health Service.

Medical :	
European physicians	177
Netherlands Indian physicians	316
Chinese physicians	17
Nursing :	
Head nurses and nurses first class A.Z. [1]	88
Nurses A.Z.	9
Head nurses and nurses first class K.Z.W. [2]	52

[1] A.Z. = Hospital service.
[2] K.Z.W. = Lunatic asylum service.

Nurses K.Z.W.			1
Mantri nurses A.Z.			978
Mantri nurses K.Z.W.			232
Midwives			151
Malaria mantris			30
Vaccinators			420
Pupil vaccinators			15
Anti-plague campaign :			
Mantri informers			135
Informers			5
Supervising informers			7
Mantri overseers			223
Overseers			38
Supervising overseers			7
Laboratory technicians :			
Chemical			14
Medical			14
Anti-plague campaign analysts			3
Supervisors for the Public Health Service			6
Supervisors for the Sanitary Port Service			6
Administrative			35
Mantri laboratory workers			10
Mantri laboratory worker anti-plague campaign			1
Mantri propagandists (paid by local councils, etc.) :			
(*a*) Java and Madura :	Female propagandists	11	
	Male propagandists	125	
(*b*) Outer Islands :	Male propagandists	20	
			156

3. Curative and Preventive Activities.

A. *Curative Activities.*

Hospitals.

In general, in its present stage of development, the part curative activities play in promoting the general state of health cannot be considered important numerically. Only 40,000 general hospital beds are available, furnishing 14,600,000 nursing days per year. Calculating for each patient an average of twenty nursing days, then 730,000 patients can be accommodated per year.

With a mortality of 20‰ and a population of 64,000,000, only a little more than half the number of those whose illness ends with death would be able to enter the hospitals.

These general hospital beds are to be found in : (*a*) Government hospitals, (*b*) private hospitals subsidised by the Government, (*c*) private hospitals not subsidised by the Government, such as those of estates, big concerns, etc.

(a) *Government Hospitals.* — The " Centrale Burgerlijke Ziekeninrichtingen " (C.B.Z.) (Central Civil Hospitals) are established in Batavia, Semarang and Surabaya. They are intended to supply good and cheap, even gratis, medical treatment and nursing care for the poor, the low-salaried people and, up to a certain income limit, also for the middle-class of all nationalities and races. In addition to clinical treatment and nursing, these institutions offer a liberal opportunity for cheap or free polyclinical treatment in every specialistic field. Further, they possess a separate department for sufferers from contagious diseases.

(1) The " *C.B.Z.* " *at Batavia*, with a normal capacity of 1,000 beds, is equipped with various modern installations, among which there is an excellent Röntgen equipment. Besides being a central practice hospital, this establishment is of great value as an academical hospital for the students of the School of Medicine of Batavia.

Further, in this institution are trained mantri (assistant) nurses (male and female), who receive a theoretical and practical instruction free, together with free board and lodging and some pocket-money.

Besides the professors of medicine, a Director and an Assistant Director (both physicians) are employed in the " C.B.Z. " ; also 23 Government physicians and Netherlands Indian physicians, a head nurse (matron), 4 European head nurses, 20 (European) nurses, first grade (male and female), 118 mantri (assistant) nurses (male and female), 4 midwives, 2 pharmacists, 11 pharmacist-assistants, 2 administrators and a great variety of subordinate administrative, technical and other personnel.

The number of nursing days in 1936 amounted to 255,756, and the number of polyclinic consultations to 192,944.

(2) The " *C.B.Z.* " *at Surabaya* is similar—in regard to size, task and purpose—to that of Batavia, except that it

is a very old institute ; however, plans have been made to build an entirely new hospital according to the most modern principles of hospital construction. The equipment of the existing hospital, however, is very modern and it has also an excellent Röntgen equipment. This hospital also has a capacity of 1,000 beds, and next to its practical task has a scientific purpose : it offers the opportunity for practical instruction to the students of the " N.I.A.S. " and the " S.T.O.V.I.T. ", and here, too, mantri nurses are being trained.

Including the medical professor-specialists, the personnel consists of a Director (physician), 22 Government physicians and Netherlands Indian physicians, 4 European head nurses, 18 European nurses (male and female), first grade, 155 mantri nurses (male and female), 5 midwives, 1 pharmacist, 4 pharmacist assistants, 2 administrators and miscellaneous subordinate administrative, technical and other personnel.

The number of nursing days in 1936 amounted to 199,393, and the number of polyclinic consultations to 191,959.

At the same time, this hospital serves as a naval hospital for all the Marines of the Netherlands Indian Navy, which has its base at Surabaya.

(3) The " *C.B.Z.* " *at Samarang*, up to date as regards buildings and equipment, but smaller than those at Batavia and Surabaya, is primarily a practice hospital and does not at the same time serve as an academical hospital. Mantri nurses are also trained here.

The capacity is 642 beds. The personnel consists of a Director (physician), 15 Government physicians and Netherlands Indian physicians, 2 (European) head nurses (male and female), 13 (European) nurses, first grade (male and female), 62 mantri nurses (male and female), 10 midwives, 2 pharmacists, 5 pharmacist assistants, 2 administrators and the subordinate administrative, technical and other personnel.

The number of nursing days in 1936 amounted to 171,192, and the number of polyclinic consultations to 81,218.

The " Gouvernements Burgerlijke Ziekeninrichtingen " (G.B.Z.) (Government Civil Hospitals), more simply equipped and managed, are situated all over the Netherlands Indies.

Up to January 1st, 1937, these 56 hospitals, with a capacity of 3,258 beds, were managed by the Government. The 32 institutions in Java, with a capacity of 2,187 beds, have now been transferred to the regencies. In some of these hospitals, mantri nurses are also being trained.

Furthermore, the Public Health Service runs 167 separate polyclinics, out of which number 89 were transferred to the regencies of Java on January 1st, 1937.

(b) *Private Hospitals subsidised by the Government.* — These hospitals, subsidised by the Government, are in general run in the same way as the Government institutions. The greater part of the patients, both poor and low-salaried people, are admitted to these hospitals either free of charge or at much reduced rates. Only a few can contribute sufficiently to cover the cost of their treatment. Sick-funds are still very little developed. Compulsory care by third parties is undeveloped in this country. Therefore, private initiative is, in the main, dependent upon private charity. The great number of those attached to the missions (Roman Catholic, as well as the different Protestant sects) are promoting their object by being content with low salaries and by trying to earn extra money on behalf of the hospitals in which they are active.

As something unusual in the field of curative care of the sick, we may mention a special way to promote the individual curative activities in rural areas. The birthplace of this system is Djocjakarta. The *Petronella Hospital*, centrally situated, is surrounded by " daughter establishments " (auxiliary hospitals), built at regular distances from, organically connected with, and relying upon the " mother-hospital ". The daily management of these auxiliary hospitals is entrusted to specially trained subordinate personnel, under the direction and regular supervision of the central medical staff ; this auxiliary personnel is able to recognise and treat the most common diseases occurring amongst the population.

The *raison d'être* of this system may be summarised as follows :

(1) It is impossible to have sufficient well-trained medical personnel at hand for the individual care of the sick for a long time to come. The yearly increase of physicians averages

one hundred, and, if it is desired to have one physician available for every 10,000 persons, 6,000 physicians would be needed. For many years to come this number cannot be provided, either by importing or by training. Besides, it would be impossible to pay them.

(2) Generally speaking, the native population is averse to Western medicine. Simply trained medical auxiliary personnel, recruited from the people themselves, will overcome the difficulties sooner and more easily.

(3) The costs are low and will therefore be more suitable to the economic circumstances of the rural population.

(4) In the field of midwifery, the native midwife, whose training consists of a course of two years, is recognised.

The purpose is no more than the creation of a transition period, similar to that through which the European countries passed during the time of their development—namely, a period in which curative care was in the hands of country practitioners, practically trained physicians, who for years have come well up to requirement.

The disadvantages of the system are the following :

(1) Insufficiently trained persons are given a difficult and responsible task.

(2) The possibility that the simply trained auxiliary personnel will withdraw from the organisation and practise independently of it ; in this way the forming of an incompetent group is stimulated.

(3) The great vulnerability of the system ; without a central hospital, no auxiliary hospitals or polyclinics can be maintained.

Not only are the missions giving important support in the field of curative activities, but the Salvation Army and some European and Netherlands Indian societies are also doing much in this respect.

(c) *Private Hospitals not subsidised by the Government.* — Several large estates and companies give extensive medical assistance to their employees, curative as well as preventive.

The most complete organisation in this field is one which has been developed over a long period of years—namely, that of the East Coast of Sumatra, a very important cultivation area (Figures 1 and 2).

According to the coolie ordinance, the employer is charged with the care of the labourer. Owing to the fact that coercion can be exercised to a certain extent, and to certain peculiarities of this cultivation area, medical-hygienic activities in this area have taken on special characteristics, the most important details of which are :

(1) Compulsory hospitalisation of all sick labourers ; every labourer not able to do his work is automatically taken into a hospital.

(2) Hospitalisation of slightly ill persons; this is necessary on account of the vastness of the estates.

(3) The employer must also care for the housing of his labourers, the water supply and the removal of refuse.

(4) In certain circumstances, the employer can influence the food supply.

(5) The relation between employer and employee makes it possible to bring the healthy labourer also under the influence of medical and health measures.

It will be seen from the above that preventive measures play an important part in the whole system, and are more important than the treatment of the sick.

About thirty-two hospitals are scattered over the cultivation area just mentioned ; the smallest have accommodation for 100 patients, the largest for 950 patients. Except for those central hospitals, there is no other place for the treatment of sick people. The old-fashioned system of branch hospitals is absolutely abandoned.

In view of the fact that nearly every death occurs in a hospital, the diagnoses, and especially the statistics of the causes of death, have reached a high degree of accuracy.

A maternity ward, managed by a native midwife, is sometimes connected to the hospital ; the physician gives his assistance only in case of complications.

Most of the polyclinics are held in the hospitals ; outdoor polyclinics are very rare.

As an indispensable support for the hospitals must be mentioned the Pathological Laboratory at Medan.

This excellent medical service has proved to be economically quite justified, not only for the benefit of the native population, but also because a generally good state of health of the labourers means economically a large saving for the employers (see disgram opposite).

The Care of the Insane.

For this subject see Chapter V, 8, of this report.

B. *Preventive Activities.*

The various immunisations, the bacteriological, serological and parasitological work, the control of drinking-water, quarantine measures and, finally, infant and maternal welfare all come under this heading.

Three institutions are concerned in the greater part of these activities—namely :

(*a*) The Pasteur Institute and Government Smallpox Institute, at Bandoeng ;

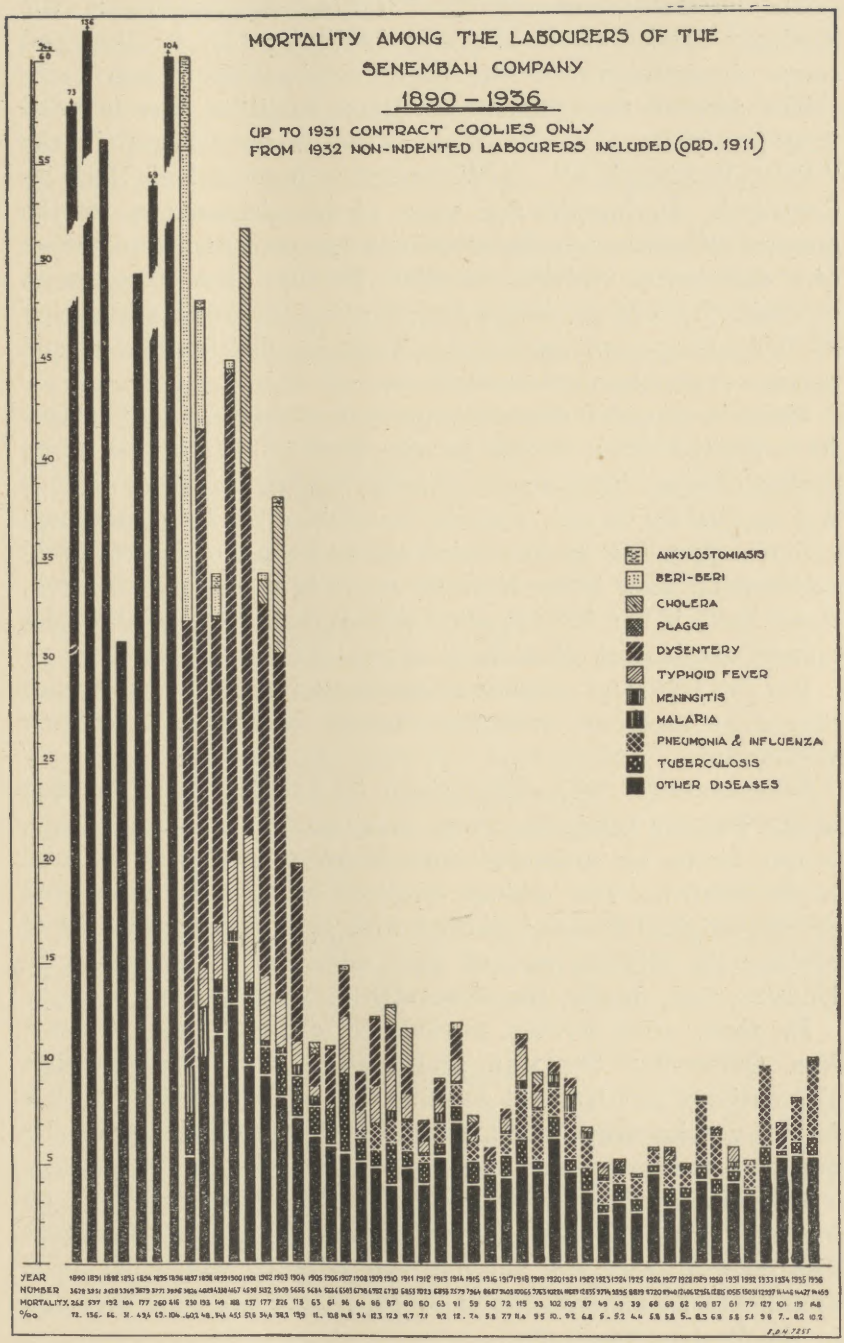
(*b*) The Medical Laboratory, at Batavia-Centrum ;

(*c*) The Laboratory for the Purification of Water and for Investigations in Technical Hygiene, at Bandoeng.

The activities in rural areas are carried out by the residency physicians, the Government (Netherlands Indian) physicians and by other personnel.

(a) *The Pasteur Institute and Government Smallpox Institute.*

In this institute, which performs an important task in the campaign against contagious diseases in the Netherlands Indies, the different vaccines and sera for prophylactic and therapeutic purposes are prepared, so that in this regard this country is independent of other countries.


MORTALITY AMONG THE LABOURERS OF THE
SENEMBAH COMPANY
1890 – 1936
UP TO 1931 CONTRACT COOLIES ONLY
FROM 1932 NON-INDENTED LABOURERS INCLUDED (ORD. 1911)
ANKYLOSTOMIASIS
BERI-BERI
CHOLERA
PLAGUE
DYSENTERY
TYPHOID FEVER
MENINGITIS
MALARIA
PNEUMONIA & INFLUENZA
TUBERCULOSIS
OTHER DISEASES
YEAR
NUMBER
MORTALITY %oo

The institute comprises the following departments : the smallpox institute, the Pasteur Institute, the vaccine and serum department and the bacteriological laboratory.

The present Government Smallpox Institute was founded forty-five years ago. In 1890, activities were begun in the " Parc Vaccinogène " at Weltevreden (now called Batavia-Centrum). During the first years of its existence, one of the greatest difficulties was the necessity for preparing large quantities of a sufficiently virulent vaccine. Finally, after many years of work, NIJLAND succeeded in protecting the whole population of this archipelago against smallpox by distributing animal vaccine from the central institute.

Since in tropical climates glycerine vaccine is only active for a limited space of time (at the most a few months), a new process of preparing vaccine—namely, by preservation *in vacuo*—was applied by OTTEN, whereby he avoided the long-continued action of glycerine. Such vaccine was found to remain absolutely active even after being kept for years in a hot climate, and, since 1928, it has been applied with success even in the most remote vaccination districts of the outer islands.

For the technical practice of smallpox vaccination, reference should be made to what has already been said concerning vaccinators.

Treatment for rabies was given for the first time in 1895 in the Pasteur Institute. From every part of the archipelago, people bitten by suspected animals are sent to the institute to be treated. The various methods which have been used are the original Pasteur method with the dried spinal cord of rabbits, the dilution method with rabbit brains according to HÖGYES, and, finally, the same with monkey brains.

In 1930, after having carried out elaborate experiments, Mrs. OTTEN-VAN STOCKUM proceeded to treat patients first alternatively and later all persons during the first week with a formol vaccine from monkey brains. The preliminary results are very satisfactory.

In founding the vaccine and serum department in 1913, an important advance was made in the campaign against contagious diseases. All sera and vaccines the value of which has been established by experiments or by experience are now prepared in the Pasteur Institute.

It must be especially mentioned that, in contrast with other countries, the Netherlands Indies has been fighting bacillary dysentery by means of a vaccine since 1926.

In former years, especially during the great war, efforts were repeatedly made to immunise with a carbol-dysentery vaccine, prepared in the ordinary way ; the very strong vaccination reaction, however, was an obstacle to a general application. After OTTEN and KIRSCHNER, in 1925, had experimentally proved that formalin is able to render dysentery bacilli atoxic without diminishing the antigenic properties, experimental vaccinations were performed on a small scale. As they did not cause serious vaccination reactions, the preparation of dysentery vaccine in large quantities was started in 1926. During the following years, this method was applied on a large scale as a prophylactic in the campaign against serious epidemics.

Since 1934, regular vaccination, and revaccination in the army, have been carried out in this country with a vaccine in which tetanus anatoxin is added to the cholera-typhoid fever-dysentery vaccine. The combination of these vaccines does not cause any stronger vaccination reaction.

The preparation of sera was begun in 1914, and during the following years tetanus, dysentery, meningococcic, snake-poison and also diphtheria sera were distributed. The usual high-potency sera, as well as some obtained by the electro-osmotic method, have been prepared since 1928.

Finally, in 1934, the preparation of a vaccine consisting of living plague bacilli was started in order to protect the population against plague ; more details on this subject are given in the chapter on plague (V, 2) of this report.

(b) *The Medical Laboratory at Batavia.*

This establishment, founded in 1888, serves as an advisory institution in hygienic, bacteriological, serological, parasitological and chemical matters, not only for the Public Health Service, but also for other Government and private bodies.

Its activities comprise the study of tropical diseases, their cause, spread, prevention and control ; the investigation of all

kinds of pathological specimens for purposes of diagnosis ; examinations of articles of food in order to determine their composition, digestibility and vitamin content, in the interest of the nutrition of the population ; investigations in regard to food poisoning ; examinations of water, ice and aerated liquids ; microscopical, biological and chemical researches on behalf of the Courts of Justice. It also produces the necessary quantity of vitamin B_1 (in form of powder, tablets and ampoules) for the Netherlands Indies. This production has gradually grown to a considerable amount, and includes also a supply for export. Finally, analysts are trained here. For this training, reference may be made to what has already been mentioned on this point.

The Medical Laboratory is also the headquarters of the head of the *Malaria Control Service*, who has at his disposal a malaria laboratory, some specially trained physicians, sanitary inspectors, malaria mantris (assistants), microscopists, etc. The malaria mantris' training is also given here.

In addition to this central laboratory, there are three smaller laboratories, the so-called " Gewestelijke " (regional) laboratories at Samarang, Surabaya and Macassar, in which various investigations (for the greater part routine investigations) are carried out with the help of which a regular control of drinking-water, ice, aerated drinks, etc., is exercised.

In the laboratory at Samarang the Leprosy Laboratory is housed. For the activities of the latter we may refer to the chapter on leprosy in this report.

(c) *The Experimental Station for the Purification of Water and Investigations into Problems of Technical Hygiene.*

This institute is established in a section of the building of the Technical School at Bandoeng. Its task is performed in close co-operation with the Department of Sanitary Engineering of the Public Health Service, to which it also gives advice. Its activities are of a strictly physical-scientific and technical nature and include :

(*a*) Chemical and bacteriological researches concerning the sources and the purification of water in connection with drinking-water supplies ;

(*b*) Investigations into the disposal and treatment of refuse water, and the handling of dry refuse matter ;

(*c*) Investigations into the influence of the tropical atmosphere on health and air-conditioning ;

(*d*) Giving advice, based on these investigations, concerning the establishing and maintenance of sanitary engineering works for water, soil and air in this country.

Quarantine Measures.

The Netherlands Indies Public Health Service has at its disposal four quarantine stations—viz. :

(1) On the island of Poeloe Roebiah, near Sabang, with accommodation for 1,700 persons ;

(2) On the islands of Onrust and Kuiper, in the Bay of Batavia, with accommodation for 3,500 persons (Figure 3) ;

(3) At Soekolilo, on the island of Madura, with accommodation for 900 persons ;

(4) At Gloegoer, near Medan, with accommodation for 700 persons.

These quarantine stations are rarely used now, as mass quarantining of passengers and crew owing to the occurrence of contagious diseases has fortunately not been necessary for many years in the Netherlands Indies. Up to some years ago, the quarantine station at Poeloe Roebiah was frequently used as an observation station for Netherlands Indian pilgrims returning from Djeddah. But, as contagious diseases hardly ever occur now on board the returning pilgrim ships, the examination of pilgrims has, during the last few years, been limited to an inspection on board ship.

Consequently, the quarantine stations have become quiet outposts, and it is hoped that they will be no longer, or very seldom, required.

Infant and Maternal Welfare.

It was not until ten to twenty years ago that this subject came into the radius of interest, because the campaign against

tropical diseases had to come first. The social-medical interest in this subject was first shown in the towns of Java, later on the East Coast of Sumatra on behalf of the estate labourers' families, and now it is also penetrating rural areas.

In consequence of the lack of experience in this subject, work has to be carried out with caution. Statistics concerning maternal, infant and child mortality are still too fragmentary to serve as a basis for infant and maternal welfare work. It will be necessary to collect vital statistics before practical work can be accomplished.

So far, this has been realised in one place in the Netherlands Indies—viz., in the Regency Health Service at Poerwokerto. The activities there concern, not only hygiene, but also obstetrics and pediatrics. In order to improve maternal welfare, obstetric care is combined as much as possible with elementary hygienic work. Consultation bureaux for infants, managed by midwives, have also been established.

Such health centres, organised in the same way, though on a somewhat smaller scale, are also found in the neighbourhood of Bandoeng, Klaten, Djocjakarta, Blitar and Toeloengagoeng, whilst some time ago the same kind of work was started at Kajoeagoeng in the Residency of Palembang.

Differing somewhat from those mentioned above are the health centres in West Java in the neighbourhood of Tjiamis, Garoet, Tjiandjoer and Cheribon, and in Middle Java near Pekalongan and Magelang.

In the towns, experience in obstetric and infant consultation work has shown that the " kampong " population are very grateful for the help given in this field.

Nearly two-thirds of the deliveries in Batavia now take place under the guidance of a midwife, and the attendance at the infant consultation bureaux is extraordinarily great.

There is no doubt that there is equal need for this work in the rural districts.

It also seems possible in this simple way to reduce maternal mortality considerably. By proper prenatal care, practised by midwives, and by obstetrical help given under their supervision, it may be possible to reduce maternal mortality to the present European level.

It will be more difficult to reduce the infant mortality, though last year's experience has taught that much can be done, not only in towns, but also in rural areas ; the supervision of the food of nursing mothers will be an important factor in this matter.

It will be difficult to supervise the artificial feeding of infants, where this is necessary. The milk supply remains a very big problem for the greater part of the population. Central milk-kitchens for the poor in provincial towns and in the more important " desas " (native villages) will perhaps bring the desired help.

As will be discussed later on, several health measures have been taken on the East Coast of Sumatra, in the neighbourhood of estate hospitals, on behalf of the labourers' children. These include maternity hospitals, special examinations of children and infants, hospital care for the underfed (this measure can only be carried out at the risk of much opposition), public nurseries for children whose mothers are working on the estate, school feeding, etc. Up to the present, it cannot be said that these efforts have met with much success, with the exception of the births in maternity wards.

Finally, the excellent work done in the field of maternal and infant welfare at Batavia by the Chinese association " Jang Seng Ie " may be mentioned here. About fifteen years ago, physicians practising among the Chinese population observed that infant mortality was needlessly high owing to incorrect technique of delivery or to inefficient care ; we need only think of the occurrence of tetanus neonatorum, infant beriberi, and of the various alimentary diseases.

When maternity welfare was organised at Batavia, the women were not examined during pregnancy. In starting a polyclinic for the examination and treatment of general diseases, more and more people were reached and consequently the pregnant woman and the infant also. In 1930, an infant consultation bureau was opened, where pregnant women were also examined. District nurses secure a " delivery-list " from the midwives, visit mothers and babies and try to secure the carrying-out of certain necessary health measures. These district nurses and house-to-house visitors are all trained in

the " Jang Seng Ie " hospital, after having completed a three-year " MULO " course. Not only nursing, but also the elementary principles of hygiene and social medicine are taught in special courses.

Batavia's example has been followed by Malang, while in several places Chinese associations have started consultation bureaux for infants ; the greater part, however, only managed to open infant polyclinics.

C. *Health Activities.*

The manifold requirements concerned with health activities are discussed under the various headings of this report, which also describe the activities which have been or are still being carried out in the interest of health care, so that at this point only a few general remarks on rural hygiene, health work on the estates and in a large town need be given.

It is hardly necessary to emphasise the fact that health measures cannot be expected to be successful without the co-operation of the people themselves. In rural districts, no compulsion should be used, at any rate in the beginning, though in the larger cities this may be found to be necessary.

The teaching of the elements of hygiene and the value of healthy habits has been included in the activities of the health service for several years in order to secure permanent results so far as possible.

The purpose of developing systematic activities in the field of hygiene has been primarily the final organisation of small health services. It was planned that the preliminary programmes begun in 1925 and subsequent years should be developed into full health units. Since, however, this development proceeded very slowly, it was decided in 1932 to begin the organisation and development of a small health service which would serve as a demonstration. In 1933, a Regency Health Service was established at Poerwokerto. At this unit, medical and subordinate personnel are trained in the technique of organising and of carrying out intensive health work.

The central office of any Public Health Service needs a place in the periphery where new methods and materials can be

studied and tested and where special studies of all kinds can be carried out. Such studies and experiments are being conducted at the *Demonstration Regency Health Service at Poerwokerto.* Naturally, such a unit must be under the immediate supervision of the central office of the Public Health Service.

The programme recommended for small health services in the Netherlands Indies is as follows :

(1) General administration : correspondence, reports, financial records, schedules, programmes, etc. ;
(2) General survey in advance of extension of the area ;
(3) Statistics : the collection and study of birth and mortality statistics, the preparation of graphs and charts ;
(4) Epidemiology ;
(5) Health education (Figure 4) ;
(6) Activities for the prevention of soil and water pollution;
(7) Antepartum, infant and child welfare (Figures 5 and 6) ;
(8) School work (Figure 7) ;
(9) Laboratory examinations ;
(10) Propaganda for the use of boiled drinking-water ;
(11) The hygiene of the surroundings.

Emphasis is placed upon the selection and the training of medical and subordinate personnel, since experience has shown that the results obtained depend on this.

The personnel of the average units consists of a doctor, a midwife, a microscopist, hygiene mantris (health visitors) and other subordinate personnel.

The budgets for the health units vary from a very small amount appropriated by a regency council for one or two health workers to large amounts appropriated for the organisation and development of complete programmes.

The *Central Office of the Division of Public Health Education* is a part of the Head Office of the Public Health Service at Batavia, Java, and is divided into four sections (Figures 8 and 9).

I. Administration : general administration, correspondence, administration of stocks, preparation of forms and other printed matter ;

II. Equipment and materials : designing, manufacture and distribution of materials ; and the supervision of the upkeep of materials ;

III. Film and photographic work : photographs, lantern-slides, films, etc. ;

IV. Studies : the study and testing of materials.

Thanks to an excellent medical organisation, important health work has also been accomplished on the East Coast of Sumatra. In the first place, there is a very accurate civil registration of the estate population by means of a card-index system, which, besides the usual social data, also contains all particulars of any medical importance, whilst in various sections where hospitals are established this civil registration is being extended over the entire population.

Furthermore, there are periodical general inspections once or twice a year, when all the native labourers with their families are subjected to a short general inspection. In this inspection the remainder of the population participates, practically without any pressure having to be exercised. They are called up according to previously prepared lists. In addition, special inspections concerning various specific problems are made.

Moreover, the manager of the estate and his assistants—and also periodically the resident physician—exercise control over the hygiene of the native dwellings, the water supply, latrines, etc. On this score the co-operation of the population is not yet as active as could be desired.

To this must be added, as has already been mentioned, various health measures more specifically taken in the interest of the workers' children.

On the East Coast of Sumatra the native labourers are almost exclusively immigrants, who, prior to having signed a labour contract, were examined and vaccinated, whilst upon their arrival they are subjected to a general quarantine.

Thanks to these extensive health (and prophylactic) measures, the health conditions on the East Coast of Sumatra, both as regards native labour and the local rural population, are very satisfactory (see diagram, page 45).

As has already been indicated, demands are made of the health activities in rural districts other than those in the larger cities. Here the health is much more specialised, whilst certain subdivisions thereof may be entrusted to lay service heads (housing hygiene, native market hygiene, the control of cattle-sheds, etc.).

At Batavia, there are four special sections of the health service. The first comprises all medical activities, such as the dispensary service, the medical district service, the obstetrical aid, etc. Another section is concerned exclusively with campaigning against infectious and endemic diseases, and comprising a continuous epidemiological investigation, vaccinations, the fighting of malaria, etc. A third section mainly exercises control activities, of which *post-mortem* examinations and statistical work represent a not unimportant branch ; furthermore, it exercises control over all kinds of industrial activities. The last section, finally, covers the social health activities, the various consultation bureaux, and health propaganda.

In actual practice, especially at Poerwokerto, it has been found that the best method of securing the co-operation of the native population consists of *house-to-house visits*, carried on by well-trained health workers, and also that practical demonstrations and moving-picture demonstrations are of more value than public lectures. Such films, however, should be shown only after preliminary work has already been going on for some time, the idea being to stimulate and retain the interest already aroused by the preceding activities.

D. *Pharmaceutical Activities.*

In the Netherlands Indies, which are inhabited by 64 million persons, there are only seventy-six public and private pharmacies, run by pharmacists, who have had a six- or seven-year academic education in Europe. Sixty-nine of these are in Java (40 million inhabitants), in all of which the " apotheker " is assisted by qualified assistants (a total of 190, of whom forty-six are women). In addition, about 500 doctors have hospital pharmacies or small doctors' pharmacies for preparing

their own prescriptions. Only qualified chemists (" apothekers ") have the right to use the sign " Apotheek ".

The Government has three large central pharmacies—namely, in the central hospitals of Batavia, Samarang and Surabaya. The Government pharmacy at Batavia has a complete set of machines for the preparation of tablets, ampoules, pills, ointments, emulsions and sterilised solutions. From this factory the products are distributed all over the archipelago. All patent medicines are substituted by products made in the Government pharmacy, though sometimes the original chemicals must be bought (dilaudid, dicodid).

European physicians seldom make use of the Netherlands Indian herbs, though several Indian herbs and seeds have found a place in the Netherlands Pharmacopœia, which is used in the Netherlands Indies also.

One native seed is very much appreciated—viz., *Cucurbitæ semen*—which is the seed of *Cucurbita moschata*, Duch. An emulsion prepared from 800 to 1,000 of these seeds is a perfect, agreeable and harmless medicine against tapeworm, and could be substituted for the disagreeable *Filicis rhizoma* all over the world.

Another Netherlands Indian herb, now used in large quantities in Europe in case of renal calculus, is *Orthosiphonis folium.* A specially dried quality which has an agreeable flavour is exported from Java.

The Government subsidises a Commission which encourages the culture of Indian herbs.

Pharmaco-therapeutic Institution.

For standardising medicines which cannot be examined by pharmacists, the Government has established the laboratories of the Pharmaco-therapeutic Institution, where cod-liver oil, pituitrin, digitalis and insulin are examined. If these products are up to standard, the packings are sealed and then sold to the public. It is planned gradually to increase the list of articles which must be tested.

Malaria is treated in the Netherlands Indies by oral administration of technically pure quinine sulphate (Pharm. Britt.,

1932) in the form of sugar-coated tablets of 0.222 gm. (five tablets each day for five days). Injection of neutral quinine-urethane is used only in cases of coma, vomiting and diarrhœa. The use of the acid salts (bihydrochloride) for injection is not encouraged, since its injection produces infiltrations and is very painful.

For children, the tasteless ethylcarbonate is used (tablets of 0.1 gm., sweetened with saccharine).

Frambœsia (yaws) is treated thoroughly only in hospitals by a series of intravenous injections of neoarsphenamine. Most of the products come from Germany (neosalvarsan) ; the remainder from France.

Scabies. — In Java, a simple treatment for scabies consists of using a liniment containing 25% of sulphur and 75% of coconut oil.

Dusting-powders containing lead were used in considerable quantities by poor Chinese and Indian mothers for their babies. The lead causes severe nerve disturbances and the importation of these powders was prohibited (International Convention for the Prevention of Intoxication with Dry White-lead). The Customs officers test samples of powder with the *Natrii sulfidum* test.

Tincture of iodine deteriorates very quickly in this country. It becomes dangerous, since the alcohol evaporates and the substitution of iodine in the ethyl alcohol forms hydroiodic acid and aldehydes. Hence the tincture is only effective in the hands of physicians, who usually dilute the official tincture with an equal volume of strong pure alcohol before use.

Vitamin B_1 tablets, liquor, powder and injections are used in considerable quantitites for the prevention and treatment of beriberi. These products are prepared at the Central Medical Laboratories at Batavia.

Hookworm disease is treated with chenopodium oil. As a purgative, magnesium sulphate is given either with the oil or after an interval of one or two hours. Intoxications have not

been reported, though hundreds of kilogrammes are used yearly. On the plantations of Sumatra's East Coast, every coolie and his family are given treatment once or twice a year.

Influenza is treated by the administration of tablets containing acetylsalicylic acid 0.25 gm., camphor 0.1 gm., opium 0.015 gm., powdered ipecacuanha 0.015 gm.

The number of drugs for medical care in rural areas must be as small as possible. For the treatment of patients, a standard collection of various ampoules, tablets, ointments and solutions should be sufficient, especially when the treatment is carried out by assistant physicians, dressers and nurses (" mantri ") under the supervision of a doctor.

In the Netherlands Indies, it is necessary to permit laymen to practise as doctors in places where no physicians or " mantris " are present in the neighbourhood. In these isolated places, missionaries and Government officers distribute medicines. The officers on board ships do the same while at sea. The Government has issued a booklet on treatment by laymen. This book describes only two injections : quinine and emetine. These may only be administered by those laymen who know how to give injections properly. The tablets which they are allowed to use are : acetylsalicylic acid 0.5 gm. (= acetosal), quinine ethylcarbonate 0.1 gm., amidopyrine 0.2 gm., cinchophen, codeine 0.010 gm,, hexamine 0.5 gm.. santonin 0.025 gm., spirocid (stovarsol) 0.25 gm., sulphate of oxyquinoline 0.5 gm., and vitamin B_1 containing 25 international units. For the treatment of anæmia following malaria and hookworm disease, the Government issues tablets containing reduced iron 0.1 gm., trioxyide of arsenic $\frac{1}{10}$ mgm. and dry extract of nux vomica 0.005 gm. For healing wounds, petrolatum with 2% of salicylic acid is employed. For use as an anti-parasitic ointment in cases of skin diseases, 4% of sulphur is added to this salicylic-acid ointment.

The assistant chemists formerly came from the Netherlands. In 1921, a school was founded at Batavia to train assistants in this country. Later on, the training was concentrated in the three big hospital pharmacies in Java, where native and Chinese boys and a few girls with a nine-year school education (in the

Netherlands) study pharmacy for two to three years. Then they take a Government examination. In this way it will be possible for hospitals to take one or more of these qualified assistants in their pharmacy. Up till now, it has not been possible for hospital directors to appoint approved pharmacy assistants, because the assistants imported from Europe were too expensive.

E. *Military Medical Activities.*

Although this service obviously has an entirely different object in view, the co-operation between the Public Health Service and the Military Medical Service (" Militair Geneeskundige Dienst " = M.G.D.) is such that the activities of the latter should be mentioned. The Military Medical Service lends its aid to the Public Health Service both as regards curative and preventive health work. In various military hospitals (especially in the outer provinces), one or more wards are set aside for the treatment of civilians, and where the garrison is very small a civil Government physician will give medical treatment to the military patients. Furthermore, in various smaller settlements, military health officers, in addition to their own tasks, are charged with the activities carried on by the Public Health Service, and look after the interests of public health, especially as regards preventive measures, in a praiseworthy manner.

At Kotaradja (Acheen), Padang, Pontianak and Bandjermasin, the senior military medical officers have been appointed acting inspectors of the Public Health Service, and as such are in charge of the medical-hygienic activities in their districts.

In addition, some of the military medical officers in the Netherlands Indies have been placed entirely at the disposal of the Public Health Service, so that their army service is more or less nominal. Whenever necessary, the same holds good for the military pharmacists.

In determining the preventive and control measures in connection with malaria in an area in which a new military settlement is to be established—a problem which constantly

has to be faced—the co-operation and advice of the Public Health Service is sought. Although the complete prevention of malarial infection in the Netherlands Indies army must be regarded as unattainable for the time being, it has certainly been possible to decrease malaria morbidity. This has been accomplished through the reduction of the malaria-transmitting anopheles by means of a campaign directed against their breeding-places, through a mechanical prophylaxis by the use of mosquito-netting and by a purely therapeutic prophylaxis.

The Military Medical Service also disposes of a considerable medical personnel. A Major-General, with the additional title of Inspector of the Military Medical Service and with head-quarters at Bandoeng, is in charge of a medical corps composed of fifteen senior and 142 subaltern medical officers. In connection with the care of the sick, the Military Medical Service has at its disposal a considerable number of hospitals, divided, according to their size, into five classes, and for smaller garrisons it has wards in civil hospitals divided into three classes. The nursing personnel is in the main military, though it is supplemented by civil personnel. In the hospital at Tjimahi, near Bandoeng, there are courses of training for male and female nurses, and the diploma issued is equivalent to that given in the Netherlands.

The corps of military pharmacists is composed of eighteen persons, at least two of whom have the rank of field officer.

All the medical army personnel is recruited in the Netherlands ; but at the Military Hygiene Institute at Batavia the newly appointed medical officers sent out from the Netherlands are given a further course of training, so as to fit them for their task in the tropics—a task which to a great extent lies within the field of the Public Health Service. This course in tropical diseases and tropical hygiene extends over five months, and is conducted by a physician, a bacteriologist and a malaria expert and parasitologist, whilst a military pharmacist also gives instruction on various subjects, especially relating to the inspection of milk, water and meat. The Military Medical Service has also at its disposal a chemical laboratory, in which young pharmacists are temporarily put to work for additional training. It has two sections—the galenic, charged with the manufacturing of galenic preparations (ampoules, tablets,

etc.), and the chemical, in which medicines and foodstuffs are examined, and examinations and investigations are carried out for other services, such as the Department of Justice, in connection with toxicological and graphological investigations.

Finally, the General Store for Drugs and Medical Articles may be mentioned. This central establishment purchases all medicines, surgical appliances and instruments required for Government purposes, and distributes these to the autonomous bodies.

In the army, considerable attention is being paid to immunisation. Formerly, vaccination was not compulsory, but now refusal to submit to these injections is being regarded as military insubordination, and may be a reason for refusing the prolongation of a soldier's service.

In 1915, cholera-typhoid vaccination was introduced, followed by a biannual revaccination. Since 1927, revaccination is carried out annually.

In view of the increasing morbidity from bacillary dysentery, the bacillary dysentery vaccine was added in 1931 to the cholera-typhus vaccine, and tetanus anatoxin is now also added to the mixed vaccine given to soldiers.

These vaccinations have caused the disease index to fall considerably, though it must be remembered that the health conditions in the cantonments have greatly improved.

4. Budget.

The expenditure incurred for medical and health purposes is divided into two main groups—namely, that for the care of the sick and that for preventive activities. This expenditure is borne by the Government, by religious and missionary organisations, by private associations and by the agricultural estates. The following table (page 62) gives a survey of such funds as are contributed by the Government, either in the form of immediate expenditure or as indirect contributions, such as subsidies.

The percentage of the country's expenditure in connection with public health as compared with the total Government budget was somewhat reduced during the years of the economic

General Survey of Expenditure incurred by the Central Government
(Public Health Service).

	1931	1932	1933	1934	1935	1936
Budget of Public Health Service (florins) . .	20,154,857	17,611,962	14,946,135	12,544,294	11,593,879	12,113,255
Expenditure chargeable to other divisions of the budget (pensions and transfer) (florins)	3,637,415	2,671,463	2,834,264	2,458,853	2,090,049	2,009,552
Total expenditure of Public Health Service (florins)	23,792,272	20,283,425	17,780,399	15,003,147	13,683,928	14,122,807
Total budget for the Netherlands Indies (florins)	767,062,000	630,940,000	554,062,000	508,473,000	478,123,000	512,745,000
Percentage of the country's expenditure available for the Public Health Service .	3.10%	3.21%	3.21%	2.95%	2.86%	2.75%
Number of inhabitants	59,582,000	60,475,000	61,382,000	62,303,000	63,238,000	64,186,000
Country's annual expenditure *per capita* for public health (florin).	0.40	0.34	0.29	0.24	0.22	0.22

crisis, for reasons of economy and in consequence of reduced costs due to the general price decline.

The figures refer only to gross expenditure, various items of income not having been taken into account.

In 1936, the Central Government expended 6,972,465 guilders for the care of the sick ; the other authorities (the principalities, the provinces, regencies, townships, local resorts, local councils, and the self-administering regions), 2,700,784 guilders.

Thus, for the curative aspect of health care the total sum expended by the Government and the local authorities amounted to 9,673,249 guilders. Obviously, this amount does not represent the total actually expended on the care of the sick amongst the population, as the expenditures of private bodies (religious and missionary organisations, agricultural estates, industrial undertakings and private associations) must be added. This amount cannot be given accurately.

In 1936, 7,150,342 guilders were spent by the Government for prophylaxis work. In addition, 336,058 guilders were spent by the local authorities, giving a total of 7,486,400 guilders.

The above figures, therefore, may be summarised as follows :

For entire health care the Government expended 14,122,807 florins, [1] whilst the local authorities paid out 2,700,784 florins.

The country's entire budget for 1936 was 512,745,000 florins ; so that the percentage expended for public health amounted in 1936 to 2.75%.

In 1936, the total number of inhabitants of the Netherlands Indies amounted to 64,186,300, so that the country's expenditure for public health care amounts to approximately 0.22 florin *per capita* per annum.

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[1] 1 Dutch florin = £0.136 (average I-IX.1936) ; £0.11 (average X-XII. 1936).—*Editor.*

II. RURAL RECONSTRUCTION : CO-OPERATION OF THE POPULATION.

In an agrarian sense, the Netherlands Indian Archipelago can be divided into two sections : on the one hand, the densely populated islands of Java and Madura, Bali and Lombok, with their intensive " sawah " (wet field) rice cultivation ; and, on the other hand, the extensive " Buitengewesten " (Outer Islands), with their sparse population which, generally speaking, provides for its sustenance by agriculture on dry ground.

Java and Madura, Bali, Lombok.

The rural districts of Java, Madura, Bali and Lombok are characterised by their extremely dense population : in Java and Madura, outside the larger cities and their environs, there are fully 300 inhabitants per square kilometre. In some parts along the north coast of Central Java, the density of the population exceeds 1,000 per square kilometre, whilst in one district of Tegal there are even more than 1,600.

Agriculture is carried on almost exclusively on a small scale. Any development into large landownership is almost entirely prevented by the agrarian legislation, which, amongst other things, prevents the giving of land to non-natives, and by the fact that in numerous regions the soil is the common property of the population. Despite this, large landownership does exist in some parts, but such ownership is only tenable economically by sub-letting to those who own no land.

The cultivation of rice is the most important branch of agriculture. In some regions it is alternated with the growing of maize, which in the eastern portion of the archipelago represents an important ingredient of the native diet. In the course of the last few years, efforts have been made to improve and intensify cultivation in the house garden or compound (" erfbouw ") with a view to the growing of various accessory foods necessary for the otherwise rather one-sided menu of the native.

In addition to the cultivation of grain and compound garden cultivation, the growing of commercial crops (comparatively limited in Java) and wages for labour on the large agricultural estates all over Java are sources of additional income to the small farmers (" tanis ").

The village communities, the " desas ", are valuable self-sufficient social units of the countryside. The small farmer's love of the soil is proverbial. Although the population of Java is in a local sense unstable, because the people wander to the cities and to parts where something may be earned (through the construction of larger works) or on the estates, this local migration of the people is of but temporary significance. The work in the fields is often done collectively, the people mutually helping each other, the payment for which (usually *in natura*) is rather an expression of gratitude than an actual compensation. He who by happy circumstance owns more ground than he can work usually gives the remainder to one less fortunately situated, to be cultivated on a share basis usually against a fixed proportion of the produce. The village community is characterised by a considerable mutual dependency, the results of which may be very praiseworthy, though they hamper the free differentiation in social position.

The life of the peasant during the period between harvests follows a regular rhythm from the time of harvesting (" panen ") through the " patjeklik " (the time in which the food stocks are subsiding), to the new harvest again. The domestic ceremonies (marriage, circumcision) and the village feasts are also affected by the seasons, which at the same time determine the periodicity of the necessary credits.

During the harvest season, every person is occupied. When the rains begin, the cultivation of the soil demands the full exertion of the peasants ; but, once the fields cease to require much attention, the farmer and his family occupy themselves with some home industry, or else he offers his services to small industrial undertakings, to the extent that he needs cash to pay his way. In this connection one may mention the payment of debts and credits received, the purchase of clothes and other articles that neither he nor his family can make themselves and the payment of his taxes.

It is according to the pressure exercised by these factors that his efforts to do some industrial work become greater, in order that he may be able to earn the cash required.

The spinning and weaving of the nineteenth century have for the most part been eliminated by the cheaper and mechanically produced products from the Western industrial centres, so that this source of additional income has been reduced to a minimum. Nevertheless, the "batik" industry as a whole has been able to maintain itself adequately, whilst the native cigarette industry, which provides work for 100,000 men and women, is of comparatively recent date. During the late period of depression, it was fortunate that this small industry could develop, as this country, with its superfluous reserve of labour, is well adapted to this work.

As regards the greater industries, the outlook so far is only moderately good; capital is expensive and supervision is costly. The machinery required is not manufactured in this country and must therefore be imported in its entirety from abroad. True, here and there some industrial centres are being established, especially in the larger cities, such as Batavia, Cheribon, Djocjakarta, Koedoes and Surabaya. But it remains true that big industry as well as the textile industry in Java plays but a relatively minor part. The widely distributed small and medium industries prevent the coming into existence of an extensive industrial proletariat.

Sumatra, Borneo and Celebes.

In the outer islands, rural society is very varied. There are regions greatly resembling Java in this respect, such as Sumatra's West Coast, Southern Celebes, and also the Ulu Sungai in Southern Borneo. In the regions mentioned, the density of the population is also fairly high, whilst the rice cultivation in wet fields is the principal agriculture.

Elsewhere, however, the agrarian conditions are characterised by a superfluity of cultivable land, though this is not everywhere as fertile as it generally is in Java. The inhabitants have attained a very divergent degree of civilisation. Thus, one may hardly compare the intensive agriculture in certain parts of Sumatra

with that of the Dyak country in Borneo. In the outer islands, the cultivation of commercial crops is the principal activity. The great abundance of land makes it possible to cultivate large sections with crops that take several years to mature, such as rubber, coconuts and coffee. Of great importance also is the cultivation of pepper and " gambir " (oleo-resins), chiefly in Sumatra and Western Borneo, and of " kapok " and maize in Southern Celebes. The food crop is planted chiefly in dry ground, and frequently assumes the character of cultivation by means of the application of fire, forests being hewn down and burnt, after which one or two harvests are obtained from the ground and the land abandoned again.

The sparsely populated regions here cause the estate cultivation, which in some places is very extensive, to exhibit an entirely different character from that which it bears in Java. The cultivated region along the East Coast of Sumatra, where the famous Deli tobacco is grown, is so poor in coolie labour that practically its entire labour must be imported from Java. A similar condition prevails in South Sumatra, though here the autochthonous population is somewhat denser. But these people are so prosperous, owing to their cultivation of commercial crops, that they cannot be induced to work for wages.

In some regions in Banka, Riouw and the Western Division of Borneo, the colonisation of Chinese immigrants complicates the picture of the rural population. These Chinese are not incorporated by the autochthonous population, so that they remain foreigners in the regions. Nevertheless, their settlement assumes a permanent character. An important section of the Chinese population originates from families who have lived in the Netherlands Indies for generations.

The local communities, those with identical customs (" adat "), are of very rigid structure, and, though many of the old ways of living are changing owing to more intensive traffic, the old institutions of these rural communities firmly retain their influence over the consciousness of the people.

The Government does not concern itself with the native population of the outer islands to the same extent as it does in Java and Madura. Economic assistance, such as is required in Java fairly regularly, has not been required to the same extent

in the outer islands, requiring the Government to direct its attention thereto specifically.

Since the various services, organisations and institutions aiming at the improvement of the economic level and the standard of living in the agrarian regions are based upon the advice provided by officials of the Civil Administration, a short survey concerning the origin and the development of the Civil Administration in this country may not be out of place.

Government.

The first contact of the Netherlanders with the inhabitants of this archipelago was exclusively in the nature of a trade relationship. Factories were established along the coast. These were protected settlements or rather trading posts of the servants of the United East India Company, which in 1602 formed a combination of hitherto separate interests. It was from these factories that attempts were made to widen the commercial sphere of influence of the East India Company. This did not demand immediate contact with the population as such, for the practically unlimited power of the native rulers caused the people to be bound entirely by any agreements made with these princes. The main thing was that the company came and remained in contact with these rulers, who, besides the princes themselves, were also those native officials—namely, the " bupatis " or regents—who held sway over the people in their name, sometimes at great distances from the court and the ruler's palace (" kraton "). This contact was assiduously cultivated by the residents, who represented the company with the native powers. Such residents did not concern themselves with native rule, they did not criticise internal matters, nor did they bring about any changes in the relations existing between the native Government and the population.

Government in Java and Madura.

It was not until after the United East India Company had ceased to exist, and after these "Asiatic Possessions and Establishments" had become "Colonies and Possessions" of the Netherlands in

Asia, that one may speak of a Netherlands Government in this country. Gradually this Government became more intensive, and was accompanied by the formation and extension of European governing officials; but, generally speaking, the population is still approached through the intermediary of the ruling princes and chiefs. To these latter, since then appointed by the Government, lesser native Government officials (" wedanas ", assistant " wedanas ", etc.) were added, and these form, under the guidance of the native regents, the native corps of Government civil administrative officials.

At the beginning of this century and after the financial decentralisation introduced at that time, various local councils were formed. Of greater importance is the decentralisation in Java dating from 1925, which was further developed as from January 1st, 1937.

Decentralisation.

The aim of this " governmental reform ", as this *decentralisation* is usually called, was to change fundamentally the colonial form of government and to establish autonomous communities, or to promote their establishment. This is the purpose of the Netherlands statesmanship : the development of the resources of the Netherlands Indies by the Netherlands Indian peoples themselves as much as possible, whilst fitting them to look after their own interests and their own administration, so that this may be regarded as a foundation upon which they can build up an ultimate self-government.

Java, with the exception of its self-administered principalities (" Vorstenlanden "), was divided into three provinces : West Java, Mid-Java, and East Java ; each of these being again subdivided into already existing regencies, governed by Provincial and Regency Councils, at the head of which have been appointed Governors and Regents, respectively. The Governor is the highest European, the Regent the highest native, civil administrative official.

The Provincial and the Regency Councils consist of Netherlanders, natives, and non-indigenous Orientals (Chinese,

Arabs, etc.) ; their members are in part elected, in part appointed.

Both the Provincial Councils and the Regency Councils are *autonomous* (they regulate their own administration), but they also have *co-government* (co-operation in the task of government as a whole) ; thus they are required to make their own regulations, though they are not allowed to regulate items upon which a higher authority has already ruled.

Both of these councils, moreover, are empowered to establish regulations valid for their own districts, the transgression of which they can punish by means of detention or fine.

The Regency Councils mainly serve the native interests (in connection with which the number of native members considerably exceeds that of Europeans and non-indigenous Orientals). They look after the collection and disposal of refuse, the fire brigade, the lighting of streets, the cemeteries, the markets, the slaughter-houses, and also maintain their own roads.

The Provincial Councils are actively concerned, amongst other things, with the following matters : irrigation (care of rivers, waterworks, roads, etc.), sanitation, the agricultural propaganda service, the veterinary service (cattle-breeding, etc.), public instruction, the public health service, etc.

A complete description of the tasks of the central Government, the province and the regency would be too long, so that the above general description must suffice. But practically all the activities of the bodies here mentioned, in so far as they are concerned with the population of the country, are carried out through the intermediary of the European and the native Government civil administrative officials, through the village head (" lurah ").

A short description of the village unit, of the task entrusted to the head of the village and that of the functionaries he has at his disposal follows.

The " Desa " in Java.

The " desa " (village) in Java is an age-old institution which was in existence even before the advent of Islamism, and certainly before the arrival of the Hollanders here. Both Islam

and the Government of the United East India Company, with its subsequent Netherlands rule, have left this institution intact.

The " desa " is the centre of the life in Java in rural areas. It is, as it were, a great family with a highly developed communal sense and feeling of solidarity, which is most clearly exemplified by the mutual help extended, as prescribed by the " adat " (traditional usage), in building a house, in the watch service, in harvest festivals, etc.

The " desas " have their own regulations as regards their internal affairs—as, for example, the assignment or deprivation of any share in the communal grounds, in so far as these belong to the " desa " ; moreover, there are arrangements for village services by its inhabitants, etc., comprising also penalties for non-compliance, which may be enforced if an inhabitant does not perform his duties.

This " desa " construction, in the course of the centuries, has lost practically nothing of its solidity (except, of course, in the so-called " town desa ", where this bond has become a good deal less firm). The Government finds in it a mighty instrument for its purposes, and it is not to be doubted that the success of the Netherlands colonial rule is in no unimportant degree to be attributed to this " desa " construction.

From an administrative point of view, the " desa " is a Government the political character of which is circumscribed in Article 128 of the Netherlands Indian State Regulation, wherein its autonomy has been laid down. Nevertheless, this autonomy is of a different kind from that exercised by the provinces and the regencies. In 1906, the so-called Native Community Ordinance was promulgated, which left the regulation of the native communities and the administration of their economy to themselves, provided these were in compliance with the ordinances issued by the Governor-General, the provincial authorities, or the administration of the self-administered communities, as indicated by ordinance.

This Native Community Ordinance contains regulations concerning the composition and the arrangement of the " desa " administration, and also instructions having reference to the interior affairs of the " desa " in connection with property

and other judiciary matters. After the establishment of the autonomous divisions (regencies and provinces), the Native Community Ordinance was amended in the sense that the authority over such " desa " affairs as are indicated therein, which formerly had remained within the hands of the central authorities (the European and Native Civil Administration), was transferred to the administration of the aforementioned autonomous communities.

The " Desa " Administration.

The head of the " desa " is elected by such inhabitants of the village as have the right to vote for him. The further composition of the " desa " administration is determined by the Regency Council, subject to the approval of the Board of Deputies (the Executive Committee of the province). These bodies, co-operating with the " desa " head, are not bound by any sharply outlined tasks ; at any rate, in actual practice they do not confine themselves to any definite task, but their activities more or less overlap.

In addition to the functionaries mentioned, amongst the more important personages in the " desa " must also be counted the teachers of the " desa " schools ; and also the " ulu-ulu desa ", whose main duty consists in supervising the distribution of the water intended for irrigation purposes.

The ordinary daily affairs are kept going by the " desa " administration, but this body does not take decisions in regard to matters of great importance, such as the annual budget, the construction of new village works, and other affairs of judiciary and financial importance to the " desa ", except after deliberation at a conference participated in, not merely by the members of the " desa " administration, but also by the electorate and by other villagers concerned.

The decision arrived at by such a meeting is entered in a register, which is submitted to the regent or the College of Committeemen (the Executive Committee of the autonomous regency) for its information and, whenever necessary, its approval.

The Task of the Village Head.

The head of the " desa " occupies a dual position. He is both the head of his village population and the lowest Government civil administrative official. Through the predominant significance of his relationship to the Government, his function as a Government servant comes greatly to the fore. The activities for the Government usually outweigh the promotion of the interests of his particular village community.

Of the activities with which the head of the " desa " is charged by the Government, we may mention :

(*a*) The collecting of the taxes ;

(*b*) The maintenance of the public peace ;

(*c*) The general care for the public safety ;

(*d*) The promotion of the well-being of the native population (industry, agriculture, cattle-breeding) ;

(*e*) The promotion of health ;

(*f*) The promotion of education, not only that in charge of the " desa ", but also that given by the Government ;

(*g*) The regulation of credits.

Thus it will be seen that the cares of the head of the " desa " are not by any means limited merely to the actual task of governing, but that practically all branches of Government service require the aid of the "lurah" and of hisf ellow " desa " administrators.

Several " desas " together form a sub-district, at the head of which is placed an assistant " wedana " ; a small number of such sub-districts together form a district, with a " wedana " at its head ; whilst, finally, three or four districts form a regency with a regent in charge. Every regent has an assistant resident, who in his turn has under him several " controleurs ", who act merely as aids.

The regent, the head of a regency—a governmental unit which has its own finances and the average population of which is from 600,000 to 700,000—is, indeed, the head of his native

commonwealth. His influence over the native population is very great; it is not based upon police or military power, but exclusively upon his moral prestige. The regents are frequently descended from ancient families, some of which have been rulers of their territories for centuries past, and for this reason alone they are highly respected by the native population. But, besides this, the regent is the religious head of his regency, and presides over the Clerical Council, and this also greatly adds to his prestige in the eyes of the people.

A special position is occupied by the so-called principalities, Djocjakarta and Soerakarta, which are autonomous, the former being ruled by a sultan, the latter by the "susuhunan", who are aided in their task by a Netherlands Governor.

Goverment in the Outer Islands.

In the outer islands—that is to say, those parts of the Netherlands Indies outside of Java and Madura—conditions are entirely different. Here, as a rule, the resident is the highest Government civil administrative official. The sultanates there are much more dependent than are those in Java, and generally are under the supervision of the resident. Whereas in Java, outside of the two sultanates mentioned, the regencies are the largest territorial units governed by native administrative officials, in the outer islands these are the "landschappen" (counties), which are not greatly subdivided, except in the residency of Sumatra's West Coast. In this latter residency, there are also lower native Government civil administrative officials, called "demangs" and assistant "demangs" (to be compared with the "wedanas" and the assistant "wedanas" in Java), who, however, stand immediately under the assistant resident and the "controleur". For the "controleur" in the outer islands has also a definitely executive function, and is in charge of a area of his own, which is not the case in Java.

Thus it is that the outer islands are more directly governed —that is to say that the European Government there is more executively active, without the intermediary of any native

heads of Government. Here and there we find county councils, with their own financial resources, which, with the consent of the resident, they may also expend.

But here there are no regents acting as the real heads of the native community in its civil and religious aspects; and thus it is that the contact of the European Civil Administration with the native population is more direct, but also more superficial.

From the above it may be seen that rural reconstruction in the true sense of the word—that is, a system of reconstruction of definite communities (local units), as the term for this movement in British India and in China has grown to signify—is difficult to carry out in the Netherlands Indies because of the structure of the native social life which has developed during the historical period of the administrative system.

A village community can be compared with a local unit, but it is not suitable for use in carrying out a complete system of rural reconstruction. It is too closely bound to administrative, police and fiscal government systems for this, and it can be used socially and economically only for very necessary regulations (for example, the regulation of the time of planting, for the improvement of agriculture) or in a sphere in which the differentiation is not great.

However, for some time the standpoint has been taken in the Netherlands Indies that the economic, social and hygienic activities of the central and regional Governments should be based as far as possible upon the smaller native communities. The village schools, the village rice banks and the village banks are therefore organised officially and actually as village institutions, in regard to which supervision is exercised only by administratively higher bodies.

The village people have always contributed and still contribute to the cost of the village buildings, such as, for example, the schools. They also contribute to the cost of teaching materials, and to credit institutions. The upkeep of village irrigation canals and of village roads, the regulation of the village watch service, etc., are carried out by the people themselves under the leadership of the administrative personnel of the smaller native communities.

Welfare Services.

In the Netherlands Indies, full attention has been given for a long time to the systematic improvement of the social condition of the rural population. Originally, this advancement of the health and economic welfare of the people was a part of the extensive task of the European and native administrative staff. As such care increased, during the nineteenth and twentieth centuries, special services were originated charged with more specific and expert supervision of its various branches. In these services, the tendency sometimes was to get directly in touch with the population, to the exclusion of the Government civil administrative officials. But experience soon taught such workers that measures not sponsored by the Government civil administration or receiving the co-operation of the " desa " authorities aroused the distrust of the population.

But with the aid of the civil administration such welfare services represent an indispensable factor in arriving at an improvement of the standard of living and of public instruction of the rural population, this being a primary requirement in connection with rural reconstruction in the broader sense of the term. For essentially all rural reconstruction is nothing more or less than a fight against poverty and its correlative—ignorance.

For this reason, intensive propaganda is needed to show the people what improvements should be made in their age-old systems. Although it is impossible to reach every single individual in this manner, it is quite within reason to expect that the more prominent members of the communities and their future leaders can be enlightened. These people should take hold of the instruction given them and profit by it, but they must at the same time be taught to make it also serve their surroundings, not merely in a passive sense (as an example), but also actively (through the persuasion of the lesser developed amongst them), in connection with which one may count upon the above-described public-spiritedness, their feeling of general solidarity and their sense of moral obligation towards their less intelligent and poorer neighbours.

The greater the number of people impressed by new ideas, the more rapidly the process of rural reconstruction can take its course.

Education and Propaganda.

For many years past in the Netherlands Indies much care has been bestowed, under the guidance of the Department of Education and Public Worship, upon elementary education. Thus in this country there are :

(1) Native elementary schools (" desa " schools, mixed boys and girls) : Number of schools, 16,728 ; number of pupils, 1,518,768.

(2) Native continuation schools (mixed boys and girls) : Number of schools, 2,160 ; number of pupils, 147,211.

(3) Native girls' continuation schools : Number of schools, 194 ; number of pupils, 39,542. (The above figures date from 1935.)

(4) Courses for the training of teachers in elementary schools : Number of courses, 65 ; number of pupils, 1,050.

(5) Normal schools for the training of teachers in continuation schools, separated into normal schools for male and female pupils : Number of schools, 6, of which 5 for female and 1 for male pupil-teachers ; number of pupils, 375.

(These latter data are of very recent date.)

From a hygienic point of view, the school buildings must fulfil certain set requirements : light and air must be admitted in full measure, the flooring must be of cement tiles, the number of latrines is prescribed in accordance with the number of school-rooms, the school-yard must be planted with shade trees and have sufficient space for instruction in physical exercises. When new schools are planned, this must be done in consultation with the Public Health Service.

The curriculum on the whole is adapted to the simple demands of rural surroundings. It may also be mentioned here in brief what the various curricula contain with reference to sanitary science and general hygiene.

(1) *Elementary Schools.*

In the elementary schools, hygiene is not taken up in the curriculum separately, but the teacher is required, in the course of his instruction, to give repeated hints concerning personal hygiene and the sanitary condition of living-quarters and compound gardens.

(2) *Courses for the Training of Teachers in Elementary Schools.*

In connection with the subject of natural science, the curriculum contains such items as : the human body, with specific reference to the vital functions ; hints with regard to personal hygiene, and the sanitation of the house and of the compound garden and its practical application. Text-books are now in preparation which will serve as manuals for teachers in elementary schools in connection with instruction in hygiene and which will also be used during the courses for the training of such teachers.

(3) *Continuation Schools.*

In the highest class (fifth year) of the continuation school, the subject of natural science includes a dissertation on the human body, and in connection therewith the teaching of the principles of hygiene. For this purpose a primer, " Pendjaga diri ", is issued in the Malay, Javanese, Sundanese and Madurese languages, and at the moment it is being read by some 200,000 pupils. In this illustrated booklet are to be found lessons, in story form, concerning the importance of hospital nursing in the case of serious sickness ; the sanitation of the compound garden, the hygienic arrangement of the native kitchen ; the employment of knife, fork and spoon ; hygiene as applied to the native food shop (" waroeng ") ; the care of the teeth ; information concerning bacteria and infectious diseases ; damage to the lungs through dusty roads ; the care of infants ; the danger of opium, alcohol and quack medicines.

Besides this primer, the teacher has at his disposal, for his own reference, a few other elementary text-books which he

has studied in the course of his training in the normal school for teachers in continuation schools.

In the sixth class of the continuation schools, where instruction is given in agricultural husbandry, one hour each week is devoted to hygiene, following on the instruction given in the preceding class. A couple of small text-books for this purpose are now being prepared.

(4) *Girls' Continuation Schools.*

The curriculum of the girls' continuation schools comprises, for the highest class : sanitary science ; the care of the body, of the habitation, furniture and clothing ; the handling of drinking-water ; foodstuffs ; the care of children and of the sick. Two hours a week are devoted to these subjects. No special text-book for use in this school has as yet been issued. The teachers impart to their pupils such knowledge as they have themselves learned in their training-school.

(5) *Normal Schools for the Training of Teachers in the Continuation Schools.*

In the girls' normal schools (those for boys have all, with one exception, been discontinued temporarily), the third and fourth classes devote one hour per week to sanitary science. The curriculum includes on this point : care of the house, its environment and its furniture ; the handling of foodstuffs and water ; care of the sick and of children ; food hygiene.

It should also be mentioned that, for the propagation of better and more appropriate diet, all continuation schools are soon to be provided with the so-called " vitamin charts ", with an accompanying manual (see chapter on diet).

At the same time, hygiene is also being applied practically in the schools, in order that hygienic habits may be cultivated. Pupils coming to school improperly washed or clothed may be sent home by the head of the school, whilst in handling text-books and educational appliances it is prescribed that the teachers are to see to it that, before the lessons begin, the pupils shall wash their hands.

The schools are visited and inspected as regularly as possible by Government physicians (Government physicians, Government Indian physicians, provincial Government physicians and medical inspectors) on their rounds. On these occasions, attention is given both to the hygienic condition of the buildings, latrines and surroundings, and to the state of health of the teachers and pupils.

Sick pupils, and children with skin affections, small wounds, ulcers, eye diseases, etc., are sent daily by the teachers to the polyclinics, where they are treated either free of charge or for a minimum fee.

Furthermore, there are special directions in connection with infectious diseases, concerning which the following may be noted: pupils suffering from infectious, unsightly or troublesome diseases, as also children not properly vaccinated against smallpox, are not admitted to the school. Those who live in houses or boats where infectious diseases prevail are prohibited from visiting the schools, in accordance with the Epidemic Ordinance.

Admittance to the schools is also denied children who suffer from leprosy or who are suspected of being affected with this disease, but children of leprous parents, if there is no suspicion that they have contracted this disease, may visit the schools provided they submit once every quarter to a medical examination.

Finally, a good deal of attention has been paid during the last few years to the danger of tuberculosis in the schools. The teachers in the continuation schools are supplied with a pamphlet, issued by the Central Association for combating Tuberculosis in the Netherlands Indies (S.C.V.T.), in which hints are found concerning the manner in which they can discuss with their pupils the campaign against tuberculosis. This pamphlet has been published in the Malay, Sundanese and Javanese languages.

The school inspectors are under obligation to cause teachers suspected to be suffering from tuberculosis to submit to a medical examination.

Pupils who desire to be trained as teachers are obliged to be medically examined, and specific attention is paid to

tuberculosis ; in the course of their training, such examinations must be repeated once every two years.

As an example of the educational work of the above-mentioned S.C.V.T., especially in connection with schools, the institution of the so-called "Monday cent" may be mentioned. All school-children who can possibly do so contribute each Monday one cent for the campaign against tuberculosis. In this manner they bring together each year thousands of guilders for this work, while—and this is the most important point—the real purpose of this movement is to interest the school-children and to bring them directly into the campaign against tuberculosis.

Bureau for Popular Literature ("Kantoor van Volkslectuur").

Within the sphere of elementary education and popular instruction, much important work is being done by the Bureau for Popular Literature ("Balai Poestaka") at Batavia. This bureau publishes in various languages of the archipelago—principally in Malay, Javanese, Sundanese and Madurese—booklets aiming at the instruction of the native population on various subjects : hygiene, agriculture, cattle-breeding, etc.

There is much demand for the many booklets dealing with sexual diseases. During the last few years, 30,000 copies of such booklets have been sold. Booklets dealing with malaria and plague are also in good demand, though those on tuberculosis do not seem to make much headway. Other propaganda literature on health include pamphlets dealing with hookworm, cholera, eye affections, scurvy, rabies, beriberi, influenza, infant and maternal care, the campaign against opium and alcohol, and other books dealing with health generally.

The Bureau for Popular Literature has sold as many as 190,000 copies of these booklets.

People's Libraries.

Most of these booklets and pamphlets, as well as simple literary works, are available in the people's libraries, which

are attached to all secondary native schools and to all Netherlands native schools.

Such an attempt at popular education is a primary requirement in a primitive and superstitious Oriental environment, owing to the necessity and utility of explaining all kinds of Government measures to the people at large in such a way as they will readily understand.

The bringing of such enlightenment to the people is an extremely difficult task, demanding not only a great deal of tact, but also an adequate insight into the mentality and the preconceived notions of the population as regards their customs and religious conceptions.

Thus, difficulties experienced in the introduction of measures of sanitation are based upon :

(*a*) The lack of acquaintance on the part of the rural population with Western curative methods, which they regard with a good deal of scepticism ;

(*b*) The deeply rooted conviction that their native medicine men (" doekoens ") and their native medicines are infallible ;

(*c*) The belief in spirits as the originators of disease ;

(*d*) The customary habits (" adat ") or their religious conceptions, according to which certain sanitary measures may not be in accordance with their " adat " or with Islamic precepts.

To overcome these objections, the education of the people will have to be taken firmly in hand, or continued, as the case may be, and this not merely by the Department of Education, but also by other services, and with the co-operation of the native Government civil administrative officials of all grades. These Government officials are in daily and constant contact with the population. Such contact is necessary, because, in addition to the children (in the schools), it is also the adults (in village and other assemblies) into whose minds understanding must penetrate. They should learn, for example, that before taking food one should wash one's hands, that flies may transmit typhoid fever and other diseases, that wounds ought to be

treated and dressed properly, and that the application of medicines such as chicken droppings, one's own fæces, urine, etc., is dangerous. In short, one should deal with those hygienic principles which have direct reference to the daily life of the people.

It is necessary, therefore, to aim at " popularising " Western medical science, whilst combating the native's firm belief in the infallibility of his " doekoens ", and in spirits as the originators of disease.

Health propaganda, however, is not only being carried out by Government civil administrative officials, but also by certain personnel in the employ of the Public Health Service, specially trained to do this kind of work. Amongst such personnel may be mentioned the hygiene mantris of the various Regency Health Services, already referred to in Chapter I of this report.

From the above it is sufficiently evident that, in order to convince the people of the usefulness of health measures, there is needed :

(*a*) Popular education by instruction and by means of intensive propaganda and enlightenment by the leaders and personnel of the Public Health Service ;

(*b*) In the case of epidemics, etc., and generally in cases where stringent measures must be applied, a previous discussion with the population of the districts concerned.

It will be of great advantage, before such discussions are being held, to acquaint oneself thoroughly with the religious and " adat " conceptions of the people, especially as regards the questions in point, and to consult in these respects with native experts, such as, for example, the religious teachers.

At all events, one definitely requires in this connection the assistance of the " desa " administration, whose complete co-operation can be obtained only if the members composing this body are themselves thoroughly convinced of the urgency of the measures proposed. After this, the introduction and application of governmental measures, thanks to the tractable character of the population, is not usually a very difficult matter.

The above has served to explain the factors to be taken into account by the Public Health Service and the Civil Administration, in order to be successful with their propaganda and campaign of popular enlightenment with the great mass of the population.

A recent example of the splendid results obtainable where there is proper co-operation on the part of the Civil Administration in all its ranks with the Public Health Service was the great success that attended the vaccination against plague in a completely rural environment. Despite the very short time during which it was possible to take preparatory measures, 90% of the population attended for purposes of vaccination.

To effect improvement in the standard of living and in the economic condition of the rural population, more is required than the collective efforts of the services above mentioned. All services whose sphere of activity extends to the population of the rural areas must lend their aid, so that, through complete mutual co-operation, the purpose of rural reconstruction may be pursued. Just as a population enfeebled by sickness is little susceptible to advice along economic lines, so an impoverished and economically helpless population provides an unfavourable soil for instruction in health matters.

Credit Systems.

Since usury with its consequences is one of the worst scourges of a primitive and economically weak population, the first requirement is facilities for credit on reasonable terms. The credit requirements are considerable, as the native small businesses, whether in agriculture or in industry, are carried on with very scanty capital.

Private credit in the "desa" is abnormally costly and is limited usually to short-term loans, a frequent form of which is the so-called "ijon". The "ijon" is furnished upon the crop in the field, during the time it is still under cultivation, and later on, when there is a scarcity of food. In reality, this form of credit granted is nothing more or less than an advance sale, at a very low figure, of the harvest crop or a portion thereof.

Credits obtained for more than one year, in connection with which rice fields and orchards are usually mortgaged or rented, lead, especially in bad times, to intolerable conditions. The credit is so high-priced that the yield of the security barely suffices to pay off the interest on the contracted debt ; as a rule, there is no further question of redemption, so that the farmer thus loses the free disposal of his grounds, reverting practically to the coolie state.

The *official* credit system, in regard to which various Government departments and services, such as the Civil Administration, the Department of Economic Affairs, the People's General Credit Bank (" Algemeene Volkscredietbank "), and the Pawnbroking Service (" Pandhuisdienst ") co-operate, can be divided into :

(1) *The village credit system :*
   (*a*) " Desa loomboongs " (rice credit banks, " banques du riz ") ;
   (*b*) " Desa " banks (village banks) ;
(2) *People's credit banks* (" Volkscredietbanken ") ;
(3) *The Pawnbroking Service* (" Pandhuisdienst ").

The credit officially granted is of short duration and expensive, owing to the relatively high costs of administration in relation to the loans, which are usually very small ; nevertheless, it is immeasurably cheaper than the credit supplied by the private moneylenders.

Ad 1 (*a*). — The " desa loomboongs ", which are really the village rice-barns (of which several thousand are spread all over Java), provide credit up to the time of the harvest, usually for six months. This credit is given in the shape of seed " padi ", and is again repaid *in natura*. This loan system prevents the population, in times of " padi " shortage, from falling into the hands of usurers. The original capital required is formed by voluntary deposits *in natura* by the population.

Ad 1 (*b*). — The " desa " bank, which advances money chiefly to villagers of good name and reputation for the purpose of

setting up in some little business, or for trading purposes, requires redemption as a rule in eleven or twenty-two weekly instalments, sometimes in eleven monthly payments.

Ad 2. — The People's General Credit Bank (" Algemeene Volkscredietbank "), a large organisation extending over the whole of the Netherlands Indies, advances larger sums for all sorts of economic purposes, demanding redemption usually within one year. During the past few years, these credit banks, under Government guarantee, have made long-term private credit advances ; and such action, intended to free people from their debts, especially after the severe crisis years, had become very urgent. In addition, the People's Credit Bank acts as the supervisory body over the village credit institutions.

Ad 3. — The Pawnbroking Shops (" Pandhuizen "), which extend a form of credit upon primitive capital (valuable goods and chattels, such as trinkets and household effects), generally speaking supply credit for eight months. These Government pawnshops play a very important rôle in the native economy.

Along with the great advantage of providing the villager with easy and cheap credit, the " desa " bank has the disadvantage of being an organisation outside the sphere of the lender, so that its educational value is lost to the population. The initiative and management of credit originate with the Government, the people's co-operation being entirely passive in character. This organisation, therefore, works only *for* the people, without, however, rooting *within* the people.

It would be a different matter altogether were the people themselves to originate and manage such establishments. Up to the present, however, this has been difficult, as capital is required for this purpose. This is hard to obtain in the native sphere. The income of the farmer is small, and his saving instinct has not been developed to any extent. Furthermore, the low stage of development of the majority of the population, especially in economic matters, constitutes an obstacle to the success of any such undertaking.

Another disadvantage of a more objective nature is that small private banks are frequently intent more on making profit for their founders, rather than supplying credit advances as

cheaply as possible. This objection, however, would disappear if such a credit institution (where savings could also be deposited) were established on a co-operative basis. In this case, any profits made out of high interest charges would revert to the participants in the shape of dividends.

That private initiative on this score can be productive of favourable results is proved by a number of successful co-operative organisations established in various places, an example of which may be given here.

In the Regency of Bandoeng there is a co-operative savings and credit association known as " Itikeorih-Hibarna ", established in the " desa " Magoeng in the Tjiparaj district. This association was established in October 1929, its promoter being a native intellectual, a pensioned inspector of schools, who, after his retirement, took up his residence at Magoeng early in 1922.

Being well acquainted with the needs and the requirements of the rural population, especially with those of the small farmer, he sought a method for bringing improvement into their mode of life. After attending a lecture given by the Regent of Bandoeng concerning the Peasant Loan Banks in the Netherlands, he consulted this official and developed a plan to organise a similar institution for the region in which he lived. In November 1929, the first contact—since then never relinquished—was established with the Co-operation Service of the Department of Economic Affairs, and on June 12th, 1930, his corporative organisation was officially registered, by which act it acquired the status of a native body corporate. This example found emulation in the surrounding country, so that since that time, with the aid and under the guidance of this former inspector of schools, similar institutions have been established in five other " desas ". Towards the end of 1933, these rural establishments were, through his efforts, organically joined into one whole by the founding of a *Central Office.*

Since 1934, ten new primary co-operative establishments from various villages have associated themselves with this Central Office at Magoeng.

The savings account, at the end of 1935, showed deposits amounting to 12,424.50 florins, and at the end of 1936 this amount had grown to 17,768.10 florins.

The amount given out in loans at the end of 1935 was 14,907.35 florins, and at the end of 1936 it was 28,108.10 florins.

The interest was fixed at 2% monthly for loans up to 300 florins, at 1½% monthly for loans between 300 and 600 florins, and at 1% monthly for loans in excess of this latter amount. Savings could be deposited at an annual interest of 3%.

This Central Office is granted a small subsidy by the Government.

In addition to the above-mentioned co-operative establishments, the Central Office at Magoeng has also taken charge of some " padi loomboongs " (rice banks). This " padi " loan undertaking has also been organised upon the instigation of the same ex-inspector of schools.

Originally, this " padi " loan undertaking was under the management of the Savings and Credit Association " Itikoerih-Hibarna ", but in 1932 these " loomboongs " separated from the mother association, to be recognised as an independent native body corporate. The regulation of its activities is, in the main, the same as that of its well-known official sister organisations, the village " loomboongs ".

This co-operative " padi " bank system soon became popular, so that at present they are to be found in eighteen other " desas " (total, thirty-three "loomboongs") in the Regency of Bandoeng.

This is an example of what can be accomplished through the private initiative of the native population. These co-operative savings and credit associations and co-operative " padi loomboongs " (" Loemboeng Sri "), especially by reason of their propaganda value, have become a precious possession for the whole of the Netherlands Indies, and more specifically for the Preangan regencies.

Veterinary Service.

One of the oldest welfare services in the Netherlands Indies is the Veterinary Service, which originally was concerned only with the fighting of infectious and epidemic diseases of cattle, but which later actively promoted the improvement of the live-stock in this archipelago, thus advancing the level of prosperity of the population. In so far as this campaign concerns diseases transmissible to man, it serves rural hygiene also.

The development of cattle-breeding and the improvement of the stock, amongst other things, is also promoted by making excellent breeding cattle available, both by the Government and local districts; whilst Government regulations and local by-laws restrict the export of good breeding stock. In the Lesser Sunda Islands, in Java (Preangan) and in Sumatra (Residency of Sumatra's West Coast), particular attention is being paid to the *breeding of horses* and to the improvement of the common horse of this country, even though the horse, owing to the development of mechanical transportation, no longer plays such an important rôle as formerly.

Of great economic significance for the population is the advancement of *cattle-breeding*.

Cattle are very greatly needed, not only for the working of the soil, but also for the transportation of material. These animals cannot be dispensed with for the conveyance of heavy burdens over short distances and along bad roads, nor can they be replaced by mechanical traction. They also supply the meat and the milk required.

Through the co-operation of the Government, and under the guidance of the Veterinary Service, the native cattle in Java and Sumatra are being improved and crossbred with zebus. The zebu bulls required for this purpose are being bred of pure strain in the islands of Soemba and Soembawa. Towards the end of 1935, there were in Java 2,629, and in Sumatra, 529, zebu bulls available for service.

At the same time, the breeding of good *milch cows* is being officially encouraged. Frisian-Dutch cattle are chiefly used for milk production, as well as milch cows imported from Australia, in addition to the pure strain and crossed descendants, bred in Java. Furthermore, through the intermediary of the Government and with the aid of subsidies, Frisian-Dutch bulls, bred at the *General de Wet Farm* at Tjisaroea (Java), are available.

The breeding of goats, too, is being encouraged, chiefly through crossing native stock with " etawah " goats imported from British India.

In Java, by means of city and regency regulations, everything possible is done to ensure the hygienic condition of meat and milk. In so far as such hygiene activities are not performed by

the veterinary surgeons, they are relegated to assistant personnel (" mantris " and inspectors), supervised by the veterinaries.

In the outer provinces, meat inspection and milk supervision are carried out only in the more populous centres, by native inspectors, under the supervision of veterinary surgeons.

An example of what is being done to promote public health by means of measures also of great economic value is provided by the campaign against *cysticercosis* (*Tænia saginata*) in Bali. This campaign, on the one hand, adds to the value of the meat cattle of Bali, and, on the other hand, is directed against the frequent occurrence of tapeworm amongst the population of Bali, and everywhere else where meat of Bali cattle is consumed without proper cooking. The construction of latrines obviously is of great importance in this connection. The great difficulty, however, is to induce the population to make use of these latrines after they have been constructed. To this end, intensive propaganda must be carried on, in which respect the Public Health Service and the Veterinary Service co-operate.

A second similar example is afforded by the campaign against *trichinosis*, which is fairly frequent, at any rate in pigs and in dogs, in the Batak and the Karo countries.

Tuberculosis in cattle also represents an example of a disease which is combated both in the interests of public health and of the stock-raisers, whilst *rabies* is fought by the Veterinary Service primarily in the interest of public health.

Numerous legal provisions have been made for the prevention and the combating of infectious cattle diseases, and their application once again demands co-operation between the Civil Government and the Veterinary Service.

In addition to the application of these so-called " police measures " for combating cattle diseases, use is also made of sera and vaccines which are prepared at the Veterinary Institute at Buitenzorg. This institute also performs all investigations necessary in connection with the combating of infectious cattle diseases. The Netherlands Indian Veterinary College (N.I.V.A.S.) at Buitenzorg provides for the training of Netherlands Indian veterinary surgeons and auxiliary help, such as cattle and meat inspectors and the so-called " meat mantris ".

Traffic and Public Works (" Verkeer en Waterstaat ").

The Irrigation Service, which is grouped with the Department of Traffic and Public Works, as also is the Veterinary Service, dates from very long ago. In Java, any intensive cultivation of the soil without irrigation is practically unthinkable, and from ancient times the population has provided the irrigation required.

The improvement of the public health carries with it an increase in the population, and this increase must be accompanied by a widening of the possibilities of existence.

Since a good irrigation system is indispensable to the Netherlands Indies for its rice cultivation, especially in view of its tropical climate and its fairly intense periods of drought, the care of irrigation of the rice-fields constitutes an important aspect of Government activity, and this has been recognised and acted upon for decades past.

Although irrigation work is never undertaken directly with the aim of improving public health, nevertheless, wherever such works are being carried out, attention is always paid to the possibility of improving the health conditions in the district.

The system of supply and drainage canals necessary for rice-field irrigation can be used simultaneously for the supply and the removal of bathing and washing water for the population, and for the removal of filth and refuse through flushing conduits in the " kampongs " (villages).

But more specifically in connection with the campaign against malaria is consultation and co-operation with the Public Health Service an absolute requirement, in view of the danger of injudicious irrigation or inadequate drainage of the "sawahs", or both.

A striking instance of this is the Tjihea plain, where irrigation has been entirely adapted to the need for malaria prevention (see Chapter V, under Malaria).

Since proper regulation of the water supply requires a complete control of *water distribution*, permanent irrigation works (water intakes and distribution works) have been and still are being constructed, wherever necessary and possible.

As regards irrigation, also, the co-operation of the native population is necessary. The less important channels are maintained as much as possible with the help of the people themselves, who are also required to dig the outlet trenches in the "sawahs".

In certain regions, where these activities are of considerable direct importance for the health of the people, the Irrigation Service has funds at its disposal to recompense the "desa" inhabitants for their labour.

In irrigation districts along the sea-coast, the Irrigation Service has to take into account other factors in the interest of the public health. Here the formation of a brackish-water zone must be prevented if possible, and special instructions are issued to collect the water to be carried off to the sea in as concentrated a manner as possible by joining drains, whilst the natural channels in which the water drained from the "sawahs" becomes brackish are to be flushed out at least once a week.

The Department of Traffic and Public Works is also charged with the care of the roads. The traffic problem is of vital importance to the well-being of the population and its development. A well-arranged and constantly improving traffic system not only promotes public prosperity, but also contributes to the people's social and intellectual well-being, besides having a distinctly beneficial effect on the people's health.

We may here insert a table indicating the number of kilometres of road constructed etc., and a table indicating the number of hectares of land irrigated with the aid of the Irrigation Service, of the moneys expended thereon, etc. (see Appendices 1 and 2).

Appendix 1.

I. Roads in Java
(under the control of Provinces, Regencies and Municipalities).

In Java there are about 10,000 kilometres of provincial roads, more than 10,000 kilometres of regency roads, and about 1,200 kilometres of municipal roads, making a total of 21,200 kilometres of excellent passable roads, of which about 6,500 kilometres are asphalt-paved.

In addition, there are by-roads everywhere (village roads) which are non-metalled or only partly metalled and therefore not suitable for heavy traffic. These roads will be gradually improved in the future.

II. Roads in the Outer Islands

(under the control of the Department of Traffic and Public Works and of the Civil Administration).

	Total length of roads practicable for motor traffic	Asphalted roads	Gravel or macadam roads	Non-metalled roads
	Kilometres	Kilometres	Kilometres	Kilometres
Sumatra (Banka and Billiton included)	24,472	2,453	16,678	5,341
Borneo	3,304	359	2,005	940
Celebes	7,847	308	4,231	3,308
Bali and Lombok	2,006	305	1,463	238
Timor and Dependencies	3,402	14	2,264	1,124
Moluccas	365	19	298	48
Total	41,396	3,458	26,939	10,999

The programme for the next few years in the outer islands includes the construction of more than 1,600 kilometres of roads, whilst many hundreds of kilometres of road will be improved considerably.

The present cost of construction amounts to about 6,000 to 10,000 florins per kilometre in flat country, and to about 10,000 to 20,000 florins per kilometre in hilly country.

Appendix 2.

Expenditure on the Construction of Irrigation Works.

Year	Amount	Year	Amount	Year	Amount
	Florins		Florins		Florins
1900	1,158,000	1912	4,308,000	1924	6,030,000
1901	1,887,000	1913	6,066,000	1925	6,707,000
1902	2,180,000	1914	5,873,000	1926	7,501,000
1903	2,023,000	1915	4,677,000	1927	8,253,000
1904	2,206,000	1916	5,508,000	1928	8,390,000
1905	2,084,000	1917	6,734,000	1929	8,167,000
1906	2,019,000	1918	7,739,000	1930 [1]	7,769,000
1907	2,103,000	1919	8,175,000	1931 [1]	5,672,000
1908	1,902,000	1920	9,245,000	1932 [1]	2,855,000
1909	1,813,000	1921	9,594,000	1933 [1]	2,242,000
1910	4,597,000	1922 [1]	6,035,000	1934 [1]	1,274,000
1911	4,207,000	1923 [1]	5,571,000	1935 [1]	1,661,000
				1936 [1]	1,638,000
Total	28,179,000	Total	79,471,000	Total	68,159,000
					79,471,000
					28,179,000
				Grand total	175,809,000

[1] Years of economic depression.

Before 1900, an amount of about 35 million guilders was spent on irrigation works, so that for technical irrigation purposes a total of 210 million guilders was spent (about 190 million guilders for Java and about 20 million guilders for the outer islands).

By this means, the technical irrigation of 1,400,000 hectares of rice-fields was made possible, the cost per hectare therefore amounting to fully 135 florins.

Generally speaking, it can be said that the irrigation works pay their way, as they cause a considerable increase of the yield of the soil, and, consequently, an important improvement of the economic situation in the rural districts.

FULLY TECHNICALLY IRRIGATED AREAS IN JAVA.

Name of large irrigation works	Irrigable area in hectares	Irrigated area in hectares ult. 1936	Details
	Province of West Java		
Tjioedjoeng works . . .	29,000	27,000	Not yet terminated
Tangerang works	51,500	10,500	Not yet terminated
Krawang works.	71,000	54,000	Not yet terminated
Tjipoenegara works . . .	27,500	27,500	
West Tjimanoek works .	44,500	44,500	
Tjiloetoeng works. . . .	15,800	15,800	
Rawah Lakbok works . .	10,000	—	Not yet terminated
Smaller irrigation works .	146,200	146,200	
Total	395,500	325,500	
	Province of Mid-Java		
Pemali works.	31,200	31,200	
Goeng Koemissik works .	25,900	25,900	
Tjomal Tjatjaban works .	26,900	26,900	
Bodri works	19,100	19,100	
Demak waterworks . . .	33,700	33,700	
Kroja works	14,000	—	Not yet terminated
Melahajoe works	13,200	11,800	Not yet terminated
Smaller irrigation works .	205,700	205,700	
Total	369,700	354,300	
	Province of East Java		
Patjal works	14,100	13,800	Not yet terminated
Sidoardjo works	32,000	32,000	
East Kraksaän works . .	10,100	10,100	
South Banjoewangi works	43,500	14,100	Not yet terminated
Bondojoedo-Tanggoel works	19,000	19,000	
Bedadoeng works . . .	15,500	15,500	
Waroedjajeng-Kertosono works	12,100	12,100	
Madioen works	12,800	12,800	
Smaller irrigation works .	239,700	239,700	
Total	398,800	369,100	

Agriculture and Fishery Service (" Dienst voor Landbouw en Visscherij ").

More recently, about thirty years ago, the Agricultural Information Service was established. On the basis of a large number of well-managed experimental and demonstration complexes, certain locally well-known officials assist the population both by advice and by actual aid. Amongst the principal activities of this service may be mentioned the study of infections, a better choice of varieties, the introduction of commercial crops new to a particular region, campaigns against plant diseases and against insect and rodent pests, agricultural instruction, the care and sale of the product, etc.

Horticulture and fishery, in all their varied aspects, are also included in the work of the Agriculture and Fishery Service, which, like the Industrial Information Service and the Inland Commercial Information Service, is under the Department of Economic Affairs.

As regards Java, the Irrigation Service, the Agricultural and Horticultural Information Service and the Veterinary Service have been decentralised, and now belong to provincial work.

Efforts have been made to apply some of these aids to prosperity directly to the native population during the past few years. For, in addition to a purely objective prosperity policy, personal welfare policy is also an essential requirement, as the mentality of the people will have to be influenced and changed. Otherwise, millions will have been expended on roads and bridges, irrigation conduits, better cattle and more effective seed all to little or no purpose.

The slight social differentiation in the rural districts provides but few points of contact for the application of a personal welfare policy. With very few exceptions, there is a total lack of a middle and higher agricultural class. Industry is practically confined to home industry and small industries, whilst trade is almost exclusively retail.

Nevertheless, points of contact have to be found. Thus, the Agricultural Information Service, since the beginning of the century, has established agricultural schools for the children of the better-situated farmers. In later years, also, the Division

of Industry has endeavoured to establish contact with the principal industrial activities in the "desa". In 1929, a special Middle-class Committee was established for the study of the exceptionally weak position occupied by the native middle classes in the Netherlands Indies.

In the course of the past few years, through close co-operation between the Co-operation Service ("Dienst van de Coöperatie") and the Bureau for Inland Trade Information ("Kantoor voor de Binnenlandsche Handelsvoorlichting"), both of which are concerned with the organisation of the smaller commercial native efforts, a beginning has been made with the systematic care for the interests of the native middle class.

Co-operation.

A new element introduced into this procedure is that one of the objects of the aid to be given specifically refers to the organisation of the native industrial efforts. The formation of functional organisation has here become necessary, as an individual prosperity policy on a large scale remains impracticable on account of the fact that the economic structure is unable to support it.

This kind of organisation is exemplified by about 200 small associations of agriculturists in the Besoeki Residency. The man in charge here, an official of the Agricultural Information Service, made use of a system (already ten years in existence) as a basis for agricultural educational courses for persons between 15 and 40 years of age. After completing their course, the students selected good rice seed plants and began to use them in their fields. Thereupon they were supplied with tobacco-planting material, whilst also they combined in sending cabbages to the markets on a collective basis.

Within a few years this organisation was able to show very favourable results.

Similar organisations have been put into operation amongst fishermen, "batik" workers, silversmiths, tile-makers, weavers and various other groups of industrial producers during the past few years.

As regards these organisations, the Netherlands Indian Legislature recognises one form only in connection with which incorporation is possible—*i.e., co-operation.* As a matter of fact, the co-operative form of working is well adapted to a country with so little social differentiation. Some years ago, when the word " co-operation " was taken up by the population, which had come considerably under its spell, several thousand co-operative associations were founded, most of which, however, were not inscribed in the register kept by the adviser on Co-operation, so that they were not incorporated under the law, nor were they subject to legal supervision and control. The result was that most of these bodies, sooner or later, were either dissolved or led a rather languishing existence.

At present, about 350 of these co-operative associations have been officially inscribed—a modest beginning for a population counting more than 60 millions. It is the Co-operative Credit Association which enjoys the greatest popularity and which, as we have seen above, in a certain sense may be regarded as constituting the people's own organisation, side by side with the official and semi-official " desa loomboongs " ," desa " banks, and the People's Credit Banks.

After about six years of profound economic depression, caused by the very sharp decline in the prices of the export products and the contraction of the sugar industry, the structure of the " desa " economy was seriously disrupted in certain regions, especially in Java. This became evident principally by the farmers and the owners of super-annual plantings having lost the disposal of their property through having had to mortgage it. During the last two years, the Civil Administration, the General People's Credit Banks and the Co-operation Service have been engaged in activities aiming at the release of these debtors from their debts. In this connection, the claims of the moneylenders are to be taken over against a low rate of interest by the General People's Credit Bank under Government guarantee. In many instances, a co-operative organisation of producers retains charge of the grounds and orchards of the debtors (they are entitled to do so through being legally incorporated as a native corporation), so that it is impossible for them to mortgage their possessions again ; the intention

being that this *enforced* organisation, or official guardianship, shall be transformed into a *voluntary* producers' organisation after the debts have been liquidated. This organisation will then be in a position to take care of its own purchase of material, the sale of its own products and the supplying of credit to its members.

Forestry Service

(" Dienst van het Boschwezen ").

The *Forestry Service* must also be mentioned here. This service, which is under the Department of Economic Affairs, encourages the economic welfare of the " desa " inhabitant. It has charge, not only of the great teak and other forests, but endeavours to prevent their devastation by continuous supervision on the part of its personnel (inspectors, foresters, overseers and " mantris ") spread all over the archipelago. In places where in former years destruction of forest complexes took place, there is now reafforestation, by means of which regions that had become totally unproductive or threatened to become so are once more inhabitable by an agricultural population.

The assistance of the Civil Administration is indispensable in this connection in order that the population may thoroughly become acquainted with the dangers and disadvantages of the reckless destruction of forests.

Transmigration.

Finally, this chapter must include some information on the work of transmigration which has been carried on for several years with increasing success by the Department of Civil Administration, more specifically by its Division of Agrarian Inspection, with the full co-operation of the native Government officials.

The purpose of this colonisation work is to transfer at Government expense preferably young families with generally not more than one or two small children from the most populous and poorest regions of Java to the more fertile and still uncultivated regions of the outer provinces.

When a beginning was made with this effort in 1905, the work of colonisation was but indifferently successful. This is not to be wondered at when it is considered that the officials in charge of this activity had had no experience in a matter of this kind, nor were there any means of propagating the idea amongst the population. Thus the people had to be induced to colonise by means of money premiums and advances. The result was that the right kind of human material was not obtained—that is to say, not the real farmer—and the plan cost the Government far too much. After all kinds of reverses, the final outcome was that, towards the end of 1927, there were two adequate Javanese colonies in the Lampong districts of South Sumatra totalling 24,000 people, on whom the Government had expended approximately 3½ million guilders, not counting the costs connected with the irrigation of this colonisation territory, on which another 1,650,000 florins had been expended.

Nevertheless, it was due to these colonies of farmers that the transmigration activities were resumed during the recent economic depression, when towards the end of 1931 it became apparent that in the harvest season there was a shortage of labour. The colonists were anxious to have members of their family come over from Java to help them, but there was no money to defray the expenses of the journey.

In early 1932, therefore, the colonisation activities were renewed with vigour and, owing to the prevailing unfavourable economic conditions, and particularly better propaganda and preparation, the Government, by the experience gathered in preceding years, this time made a success of it.

European and native Government officials (residents, regents, "wedanas" and "lurahs") left Java for a visit to the colonised territory, in order to see the conditions there with their own eyes. Colonists who had returned on furlough or

for a visit to their families—formerly poor farmers, now prosperous landowners—were ideal propagandists who were able to induce the stay-at-home village Javanese to leave his native soil.

A good deal of attention was also paid to the preparation of the region to be colonised, after it had been carefully selected by the Civil Administration officials in conjunction with those of other Government departments and services (Traffic and Irrigation, Agriculture and Horticulture, Public Health Service) ; the irrigation possibilities and the malaria problem were studied, and extensive measures were taken to guard the health conditions and food supply during the first few difficult months of colonisation. Furthermore, before their departure from Java, the colonists are medically examined ; they are inoculated against typhoid fever, cholera and dysentery, and revaccinated against smallpox, whilst they must also submit to a treatment for hookworms.

In this manner an average of from 3,300 to 3,500 families (about 12,000 to 15,000 persons) have been transferred to the South Sumatra colonisation region during the last three years, and all this in spite of the fact that this time no premiums or advances were supplied and only the actual travelling expenses were paid by the Government. But even these travelling costs will have to be refunded in part by these colonists within the course of a few years.

In this manner it has been possible to reduce the Government colonisation expenditure during the past three years to approximately 12 florins per family, whereas formerly it amounted to fully 560 florins per family. At the same time, the policy of paying no premiums or advances and the rigorous selection of candidate colonists ensure that real farmers are obtained in the colonisation territory, ready to clear by hard work their own rice lands out of the virgin forest.

At present, 80,000 Javanese live in the colonisation territories in the Lampong districts, whilst an additional 30,000 Javanese have settled just outside these areas. This constitutes a fairly large number when it is considered that the total

population of the Lampong districts amounts to no more than 360,000.

This colonisation movement is likely to be further extended in the near future, thanks to an allotment from a 25-million-guilder fund which in 1936 was appropriated by the mother-country in the form of a contribution intended to improve the prosperity in this archipelago.

The colonisation has mainly a double purpose—in the first place, the opening-up and the making productive of the still uncultivated fertile regions of the outer islands ; and, in the second place, a slight reduction of the over-populated districts in Java.

Thus it is that both in Java and in the outer islands there is likely to come about improvement and a widening of economic possibilities for the population : in Java by a small reduction of the over-population in certain regions, and in the outer islands by means of an increase in the available labour, by a reclamation of virgin forest, and by the construction of roads and irrigation works, etc.

The activities of the Public Health Service are not further described separately in this section, since the task and organisation of this service are sufficiently discussed in Chapter I.

From the above description it is evident that the funds which the Netherlands Indies uses for rural reconstruction are not allotted to a separate item of the general budget, but are included in the budgets of the different departments and services which co-operate in this work.

However, in this regard, the above-mentioned appropriation of 25 million guilders granted by the mother-country for special activities concerning welfare should be mentioned. This appropriation must be used in the four years 1937, 1938, 1939 and 1940.

III. SANITATION.

1. Housing.

Mysticism and imagination still play an important part in medicine in native society, and one must not be surprised to learn that the building and the position of native dwellings have a close relationship with the occurrence of certain diseases.

The basis of this lies in the superstition that the earth is inhabited, not only by humans, but also by beings of a finer material not perceptible to the human eye, but which have to be definitely considered. This is the reason why, in building houses, special instructions must be carried out in order not to clash with the interests of the invisible co-inhabitants.

The first spade thrust into the ground is accompanied by reciting a charm. Besides this, the situation of the house as regards the four winds is important.

As the wife is considered to be the manager of the house, her birthday must be taken into account ; and that part of the house intended to be fixed up as the bedroom must be chosen with every precaution and with much attention to many rules. Only by following these precautions very conscientiously can one avoid disturbing the supposed harmony between the four primary elements and thus prevent the occurrence of diseases.

Netherlands Indian building material is used mainly for constructing Indian dwellings : material of a temporary or semi-permanent character, such as wood, bamboo, " atap " (dried leaves of the nipa palm tree) and " idjoek " (fibres of the aren palm). More permanent materials, such as bricks and tiles, are only used sparingly ; if they are used, this shows that the people are more well-to-do.

The different dwelling types and the material employed vary according to the part of the country and the type of population. A short description will be given of some of the unusual types.

In Sumatra, for example, house construction is very important, and beautiful primitive native architecture is found. This is

the case with the Karo and Toba Bataks and the Minangkabau people in the Padang Highlands.

Karo Bataks construct their houses around a somewhat oval space rendering their kampongs—called "hoetas"—into small fortifications by surrounding them with walls with bamboo bushes planted on top. On the sides where no natural protection in the form of ravines, etc., is found, a large ditch is dug all along the outer edge of this wall. One can enter the kampong only on two sides by means of small gates made of bamboo. As a rule, the houses are very big and solidly constructed, decorated with stylistic buffalo and horses' heads and genuine buffalo horns. Each house offers room for some eight families assigned to various sections without any wall or screen of partition between them. A single opening in the wall serves as a door and windows are entirely lacking, so that the houses are fairly dark inside. Houses are more durable when constructed of a solid kind of wood and covered with "idjoek". All connections are made with wooden pins or with "idjoek" rope and rattan. No nails are used.

The *Toba Bataks* build their houses in two parallel rows, thus forming a kind of street. The roofs, sloping towards the middle in the shape of a saddle, protrude considerably at the front and rear. The front of the house is often decorated with very artistic and fine carving work.

In the Toba areas the stables are found underneath the houses. This increases the pollution. Karo as well as Toba Batak houses are exceedingly unhealthy, dark and dirty.

Minangkabau house construction, just as the general development of this population group, stands on a higher plane than that of the Bataks. The peculiar shape of the roofs gives these houses a very fine form. Elaborate decorations are found on the houses of the more well-to-do people.

In *Java,* one cannot speak of a definite uniform style of building. Here, again, the material generally employed is wood, bamboo and "atap"; the wooden frame rests upon a brick foundation or upon poles in the ground or upon a foundation of masonry.

The walls and the partitions consist of woven bamboo ("gedek"). The roof covering usually consists of "atap", whereas zinc or galvanised iron, and brick tiles of native make are also used. In houses of a better type, the floor is made of concrete or tiles; in houses constructed on piles or brick foundations, it is made of wood or bamboo; but as a rule it is of packed-down soil. Only better-situated people live in brick houses.

A principal characteristic of all real native houses is the scarcity of windows and doors, so that an insufficient amount of light enters the houses.

However, one should not attribute primarily to the imperfect construction of the houses the more or less unfavourable, and sometimes even decidedly bad, health conditions. There are other factors which play an important part—viz., an unhealthy situation, insufficient water supply, the often poor and faulty disposal of domestic garbage and excreta, and, as concerns big communities, the crowding of dwellings in the kampongs.

In general, with the exception of some kampongs in the larger towns, one cannot speak of an unhealthy overcrowding of the houses—at any rate, not as it occurs in Europe.

On account of the climate and manner of living in this country, the factors of space and floor area per inhabitant are less important, so far as housing problems are concerned, than in Europe.

Yet various difficulties arise here to a greater or less extent, and it is the duty of the State to give them the necessary consideration. It will be of importance to pay more attention to the surroundings of the dwellings than to the houses themselves.

Apart from the fact that in some cases an eventual shortage of houses will have to be dealt with, one should in the very first place seek the solution of the problem in the establishment of sanitation works. The economic conditions of the population make it impossible to have houses built in such a way that they fully and radically improve dwelling conditions, and the Government is not in a position to supply the population with the required funds.

Consequently, the task of the Division of Housing is fairly limited. New housing or even improvement of dwellings is

only justified when conditions cannot or can only insufficiently be improved by sanitation work.

Only in those cases where the existing houses form a direct danger to public health must local improvement of dwellings be considered to be of urgent and immediate necessity—*e.g.*, when combating plague (see section on plague).

The rebuilding of houses in connection with population increase will be necessary only in the larger towns. At the beginning of this century, several local councils and some building corporations, as well as the Government itself—in so far as houses for Government officials are concerned—began to take steps for fighting this shortage of houses, whenever this deficiency is not, or is only insufficiently, handled by the population itself.

No uniformity existed in the methods of handling the many technical and financial questions which arose, probably because the organisations worked independently and mistakes made elsewhere were not taken into account.

The Social Technical Company then brought to the notice of the Government the importance of good housing and the methods for obtaining it by drawing attention to the important resolutions made by that company at a conference held in 1932.

The Government, after studying the problem of housing in the larger cities in this country, decided in 1935 to participate direct in housing plans, the supervision of which was entrusted to the Public Health Service.

Since the local bodies are not sufficiently strong financially to take the housing improvement in hand, and since it was considered that good housing in cities is a local as well as a general matter of importance, the central Government supports the housing improvement financially. The Government regulates proceedings in two respects :

(*a*) In obtaining building ground ;
(*b*) With regard to obtaining financial support.

Ad (*a*). — Measures to obtain building land in the very first place comprise the means to expropriate land for the benefit of housing ; at the same time, the principle of preliminary

legal seizure after depositing a security has been introduced. Thus one can secure the desired property before the procedure for expropriating the land has been completed, which as a rule takes much time.

Another measure which aids the housing problem, so far as land is concerned, is the so-called preferential rights of municipalities to Governmental property. In the Netherlands Indies, the selling of rural property belonging to natives to other than natives must go through the phase in which Governmental rights come into force again after the possessor sells his rights, thus making those lands Crown property again temporarily. The Government makes use of the special interpretation implied in the agrarian laws for property, the possessive rights of which have been sold, either to hold it at its disposal or to lend it to municipalities, indemnifying the persons who sold the property. The Government, however, thinks itself justified in doing this only if real general interests are concerned, which sooner or later would have rendered expropriation of land inevitable.

To the preferential rights mentioned above, the Government has added others by allowing municipalities to have preference to property in cases where municipal projects devised for the improvement and enlargement of the town have been submitted for the approval of the Government.

Applicants for property who buy property rights without considering the municipal plans are not considered for indemnification, and at the same time they cannot exercise any rights whatever to the land. An important advantage of this measure is that no considerable amounts of money have to be invested in order to prevent property speculations and future trouble, when the project for the extension of the town is being put into action.

Ad (*b*). — In a financial respect, the Government gives its support to the improvement of housing by entering into a partnership with the municipalities for the establishment of joint-stock companies. These companies are supposed to operate exclusively in the interest of the housing of the population, in so far as private initiative does not handle the

situation or does so insufficiently. Apart from this, statutes to attain the purpose have been formulated in the broadest possible sense. Thus, these joint-stock companies may also take part in other legal contracts—*e.g.*, the giving of credits to building corporations.

In order to make it clear that these companies do not aim at big profits, it has been embodied in the Statutes that the maximum dividend is 6%.

The share in the investment capital of the joint-stock companies has been fixed at three-quarters for the Government and at one-quarter for the municipality. When the company is established, 10% of the joint-stock capital is paid into the funds by the Government and by the municipality. Further payments must take place by virtue of the general resolutions taken at the general meeting of the shareholders.

The building projects carried out by the companies must be based on a footing of productiveness. Operations are paid for, so far as they are sufficient, from the company's own funds. However, operations are mostly carried out with borrowed money, because only 10% of the capital of the company is paid by the Government and the municipality, as it never was their intention to increase their payments, thus burdening unnecessarily the budgets of Government and municipality. The payment of interest and the paying-off of loans made for the building companies are guaranteed by the Government, which fact makes these loans sufficiently favourable on the money market.

Besides this indirect support, the Government has also given regular financial support to the building of houses for the poorer part of the population, whose houses are in urgent need of improvement, but cannot be built profitably. The Government agreed in principle to pay to the companies a certain subsidy for such unprofitable building schemes up to three-quarters of the capitalised deficit of expended costs, provided the municipality pays for the remaining deficit.

That it might obtain a clear insight into the market for houses, the Government finally consented to pay subsidies to the companies, in order to meet the expenses of collecting information on existing housing conditions.

In connection with the important financial interests of the Government with the joint-stock companies for housing, the Government plays an important rôle on their boards. The central supervision has been entrusted to the Head of the Public Health Service, who is being assisted by a Government Director for housing, while the Department of Finances has the joint supervision of financial matters of the joint-stock companies.

Up to the present, some sixteen joint-stock companies for housing have been established, with a total capital of 8,980,000 florins, of which 10%—viz., 898,000 florins—has been deposited.

Up to the present, only ten of these companies have managed to achieve practical results. The financing of their building projects is assured by loans obtained by them in the free market up to a total of 6,525,000 florins, with a guarantee of the Government as to payment, interest and redemption of these loans.

The principal revenues of the companies are rents, so fixed that the capital invested barely returns profits. The financial crisis, however, brought about a decline of those revenues, whereas the obligations remained the same. Consequently, the greater part of the ten companies mentioned above have had financial difficulties. By means of additional payment of the capital, by which losses still to be expected may be met, and by partial redemption and/or conversion of outstanding loans, it is hoped to cope with this financial trouble.

2. Drinking-water Supplies.

Central plants for drinking-water are found in most of the more important communities and on various estates. These plants supply pure water ; several additional plants are being planned.

According to the origin of the water, the plants can be grouped as follows :

	In Java	Outer Islands	Total
(1) Spring-water systems	115	85	200
(2) Subterranean-water plants . .	12	20	32
(3) Surface-water plants.	11	38	49
	138	143	281

Of this total, 20 are being built or are planned in Java and 26 outside of Java.

As to the reliability of the water, the following requirements must be taken into consideration :

Bacterial count in 1 c.c.	10
Glucose fermentation 37° C.	negative in 50 c.c.
Lactose fermentation 37° C.	negative in 100 c.c.
Glucose (EYKMAN) fermentation 45° C. .	negative in 100 c.c.
B. coli	absent in 100 c.c.

In some cases, however, deviation from these requirements is permitted on account of local circumstances.

The testing of the purity of water is done by the Public Health Service, in the course of the supervision it exercises over public health. This testing can be done in different ways :

(*a*) The various authorities can come to an agreement with one of the laboratories of this service for examining the water ;

(*b*) The authorities can carry out the examinations themselves, under supervision of the Experimental Station for the Purification of Water, established at Bandoeng.

It is very difficult to obtain accurate figures as to the number of persons provided with reliable drinking-water, or the number of persons connected with a water-supply plant. In the following towns the figures for the percentage of persons connected are known ; they are :

	Europeans %	Chinese %	Natives %
Cheribon	76	43	2
Djember	100	58	3
Banjoewangi	100	45	1.9

Hence, one of the important tasks of the Public Health Service is the search for methods of increasing the number of persons connected with water-supply installation. One of the principal reasons why those not connected are so numerous can be traced to the fact that, as a rule, this group consists of persons unable to meet the cost. Thus it will be necessary to find a means of reducing the cost of installations and to look for methods of

getting a limited quantity of water available at lower price for the poorer people. It goes without saying that measures to this end must not bring with them a financial, technical and administrative burden which would prove too heavy for the plants.

Two methods may be taken into consideration :

(*a*) A central supply of water for the different communities —*e.g.*, by means of public hydrants, by the establishing of places where water may be bought and by establishing public bathing and washing places ;

(*b*) To put at the disposal of the people a definite amount of drinking-water at fixed prices per week or per month. So-called water-consumption limiters, known as " unit taps ", " dripping taps " or " calibre taps ", are used for this purpose. One should keep in mind, however, that these taps can furnish a pure water supply only in cases where they are constructed in closed reservoirs, in which the permanently flowing water will be kept.

The installations, so far as they are employed for general benefit, are run by the Government, provinces, local agencies and by private persons. The management of water-supply plants on estates is entrusted to the estates themselves.

As to the public water-supply installations, the Public Health Service is held to be the central institution for advice on all problems connected with a regular and well-operated water supply. For this purpose, this service has a technical subdivision at its disposal, and is further assisted by a central board for drinking-water supplies with experts of other departments as well as representatives of the Public Health Service as members.

Wherever the people are not connected with water installations, they must use the water out of the rivers or wells, or else collect rain-water. Hygienically speaking, the quality of this water is almost always very bad. How far the drinking of this water unfavourably influences the condition of health cannot be proved by statistical data. First of all, reliable data are lacking as to the occurrence of diseases which are transmitted by the use of bad water. Secondly, one should not forget that,

besides the establishing of water supplies, numerous other measures for the benefit and improvement of public health have been carried out.

An indication of the favourable influence of distributing reliable drinking-water can be traced by comparing the mortality figures for typhoid fever among Europeans in Batavia during the periods 1917 to 1922 inclusive, and from 1923 to 1928 inclusive, with the same figures of the same group of inhabitants at Surabaya from 1923 to 1935. These figures amounted respectively to 5 ‰, 3.9 ‰ and 2.7 ‰. This shows that, since 1922 (the year in which the water-supply plant was established at Batavia), typhoid fever has considerably diminished, whereas at Surabaya, where the installation has been in operation since 1903, a still lower mortality index is observed.

Since the other health measures carried out in Batavia and Surabaya during this period are comparable, the conclusion may perhaps be drawn that the longer period of operation of the water supply of Surabaya had an influence in lowering the mortality figure for that city.

3. Disposal of Sewage, Garbage and Refuse.

As a rule, the garden and household refuse in rural areas and also in smaller population centres consists almost entirely of leaves and rubbish from the garden. As this rubbish can be burnt quite easily, it is gathered together in heaps and burnt daily. No objection whatever can be raised to this way of disposing of refuse.

In some larger rural centres, this method of disposal of refuse is not feasible and it is therefore removed by local services to the outskirts of the town and burnt there, or used for filling up swamps. In the latter case, the refuse is covered with a layer of soil in order to prevent the breeding of flies. Incinerators for the destruction of refuse are not used, because, as has been stated above, refuse of this kind is sufficiently inflammable in itself, whereas at a proper distance from the residential quarters of a town there are always suitable places for burning the refuse in the open air without causing any unpleasant results.

A sufficiently well-designed method for the disposal of street refuse and of manure from horse-stables and cow-stables belonging to dairy farms situated just on the outskirts of towns has not yet been devised. The disposal for these places is, in general, still unsatisfactory and must be regarded as a source of infection for larger towns. The same can be said of the removal of garbage from the small factories for " mi ", " bihoen ", soya, " tahoe ", etc., as well as for pig-breeding places, found on the outskirts of towns.

Thus, in general, it is only the disposal of refuse in the surroundings of the large cities that causes trouble, whilst the removal in rural areas gives no difficulties.

Not much has been done in regard to the drainage of surface water and the disposal of excreta and household water in rural communities. Activities in this field have as yet been carried on mainly in large cities, for the reasons stated in the chapter on housing.

In connection with the necessary drainage of enormous quantities of rain-water in the tropics, as well as with the large areas covered by the Netherlands Indies cities, the so-called " divided " system is used for carrying off rain and household water and excreta. In this system, the rain-water is carried off in open drains and the sewage and household water are disposed of by means of covered sewers.

A general sewer with an outlet into the sea or into a large river is really the ideal method of disposal, but for the present this cannot be considered for the rural areas in the Netherlands Indies.

The sewerage system in Medan, which is under construction, and that for a part of Cheribon, have been built along the lines of a *tout à l'égout* system. The sewerage systems in Bandoeng and Djocjakarta, which are still under construction, are being laid according to the " divided " system. The systems planned for Batavia and Surabaya are also " divided " systems. The effluent of sewers and drains is discharged into the sea or into the rivers.

The problem of the purification of sewage is still in the experimental stage. For this purpose, Bandoeng possesses

an " Imhof " tank installation which has been used for several years. In Djocjakarta, experiments are being carried out on precipitation in shallow, flat tanks. Where sewers are not present, the excreta is collected in septic tanks, cesspools or pit latrines, or carried off to places outside the town by means of open drains. In these cases, household water is carried off together with the rain-water through open drains.

A special kind of sanitation is the so-called " kampong improvement " in cities—viz., the improvement of native dwelling-places. By insufficient enforcement of building permits and limitation in former years, intolerable conditions have often arisen as a consequence of the accumulation of houses: insufficient disposal of rain-water, household water, and excreta, and absence of proper streets, as has occurred in European towns, where, however, this problem was recognised earlier. " Kampong improvement " comprises, in the first place, the improvement of the system for discharging rain and household water ; then the laying-out of streets and sidewalks ; and, if necessary, the pulling-down and removal of houses in order to bring about better housing in the " kampong ". Further efforts are made by means of supplying good drinking-water and by establishing public baths and washing-places, as well as public latrines, to promote hygienic conditions in the town " kampongs ".

The *disposal of excreta* is a very important problem, and in the Netherlands Indies attempts are made by means of rural hygiene propaganda to secure better conditions. For ages the inhabitants of areas in which water is abundant have defæcated in rivers and streams, which carry off the excreta. In areas where water is not so plentiful, the people simply pollute the soil at any convenient spot or defæcate in a shallow hole in the ground. When the hole is full, it is covered up and a new one is dug a little farther away. Needless to say, these primitive methods of excreta disposal may, by fly transmission, give rise to intestinal diseases.

Attempts are being made, therefore, to put an end to the depositing of excreta in open drains, canals or rivers or in the yards. The solution of this problem is being sought in methods whereby the excreta are utilised for the soil.

The Medical Hygienic Propaganda Division of the Public Health Service has organised intensive propaganda work in many areas to stimulate the people in the " kampongs " to use latrines.

Latrine Work.

On account of the differences in various areas, in economic conditions, types of houses, customs of the people, etc., no one type of latrine may be applied in all districts. The proper type of construction must be found for each area. In places subject to floods, for example, types must be found which can be built up so that the floor of the latrine remains above the level of the flood water.

On account of the economic conditions in most rural areas, the most common type is the ordinary pit latrine, which has an unlined pit, a floor of bamboo or other material, and a small hole in the centre of the floor with a cover of tin or other material. The superstructure of the latrine is of bamboo or thatch (Figure 10).

In some areas where economic conditions are better, the people buy cement slabs, and in other areas where the people are accustomed to burn brick for their houses, brick latrines are built (Figure 11). In Sumatra, most of the latrines are made of boards.

The so-called " lateral " type of latrine is not usually approved, because the amount of water used is rarely enough to flush the pipe properly and keep it clean. The ordinary " central " type latrine, in which the hole is over the pit, is usually recommended during the beginning of the work in an area.

The bored-hole latrine is used in many places, but this type is limited in its use to sections in which there are not many stones in the ground and in which the walls of the hole do not crumble easily.

It has been found very easy to compel the people to build latrines, but impossible to compel them to use them. For this reason, local authorities and health directors are urged to conduct the work in rural areas as a part of health education. The latrines are then built only by those who are convinced that it

is worth while to build one and to use it, and this system is more successful.

It is advisable that the type of latrine recommended in any case be proportional in cost to the value of the house. A village man who has a house of bamboo will not willingly build a brick latrine which would cost him almost as much as a new house.

Latrine work does not end with the construction of latrines. Frequent inspections are necessary and educational work must be carried on over many years in order to secure proper use. After inspecting a latrine properly with an electric torch, experienced health workers can determine whether the latrine is or is not well used, if they know the date on which it was put into use, the number of persons in the family, and the size of the pit.

In many areas, the latrines are dug in such a manner as to reach the ground water. There is no objection to this system, since the people are taught to drink boiled water.

4. Fly Control.

One must give the utmost attention to the breeding-places in the fight against flies. Without the application of exceedingly strict rules for making these breeding-places harmless, the most intensified campaign for combating flies will not be successful. In those places where the authorities can keep a well-equipped refuse removal service and where the people carefully follow the instructions, success may be assured.

Refuse Removal Service.

In the towns, every house should have a proper dustbin with a well-fitting lid. The contents of these dustbins must be collected daily by the cleaning service personnel in the refuse lorries specially designed for this purpose. Then the refuse must be taken to one or more central refuse dumps, if possible outside the building area. The control of a few of these big yards by the authorities (fly-breeding places) is possible, but no control can be effected when there are a great number of refuse dumps.

Therefore, it should be strictly forbidden to collect refuse in private compounds if remains of food garbage are included in it. The depositing of garden refuse from trees and plants offers no danger and occasionally may be allowed. (In the notorious mango season, every rotten mango falling from the tree, as well as the leavings of eaten mangos, forms an excellent breeding-place for flies.)

In general, the supervision of refuse removal in European quarters and in densely populated town " kampongs " can easily be carried out. In " kampongs " on the outskirts of towns extending over a wider area, collecting by an official service is not so easy, and it is preferable to throw the refuse into a hole dug in the ground and burn it daily.

Stables should never be overlooked, as horse-dung is an excellent breeding-place for flies. If this manure is not taken away daily by the cleaning service, it should be collected as soon as possible in special masonry pits with tightly fitting lids.

In mountainous areas, where practically every family has its own horse stationed on the compound, a breeding-place for flies can be found in almost every yard. Consequently, these places are for the most part notorious for their fly plagues. This can only be controlled if these heaps of manure are gathered in a central place or if the people are instructed as to how they should dispose of it and render it harmless.

Primitive native latrines also form important breeding-places for flies. The latrine pit should therefore be constructed in such a way as to reach below the subsoil ground water, and be covered with a proper lid.

Special attention should also be paid to the refuse-heaps of the markets (" passar "), as these form a great attraction for flies and are excellent breeding-places at the same time.

Refuse Dumps.

The refuse collected by the authorities is taken to refuse dumps or used for filling swamps, or again for raising low-lying plots. If not employed for level-raising, the best method for preventing the breeding of flies is the burning-up of the heaps.

In case, however, the refuse is needed as material for filling, burning would render it useless for the purpose.

In the tropics, the refuse of markets and dustbins is mostly already infected with flies' eggs, which very soon develop into larvæ. Covering the refuse deposited on the refuse dumps with soil is not sufficient in the tropics. The larvæ move about freely in the refuse, and by the time they are full-grown they creep into the layer of soil in order to pupate. Against a reinfection by eggs, the covering with a layer of earth is of some help naturally; and this is equally important, because the refuse, as a rule, contains a large number of flies which feed on it and deposit their eggs in it if is not covered up in time. Consequently, reinfections will in any case be eliminated by this covering with earth.

As the adult larvæ and the pupæ must collect in the upper layer in order to be able to escape later on as flies, the best method for combating them consists in spreading some inflammable matter on top of the covering layer, which need not exceed a few centimetres, and setting it on fire. Larvæ and eggs get roasted in the layer, whilst the refuse does not get burnt. In this method one should go to work systematically, dumping the refuse into separate compartments, and marking the different heaps after covering them up. Burning the material on or about the fourth day gives the greatest success.

If the refuse is used for raising the level of the ground, it will be necessary to dump it into a very deep layer of about two metres, if a lasting result is aimed at, because refuse in settling diminishes to a quarter of the original amount. Furthermore, the surface is particularly important in regard to the production of flies. The bigger the surface the more extensive the breeding-place. In a refuse heap 2 metres high, only the first half-metre need be taken into account.

In filling up a deep hole or hollow, one should begin to fill at the bottom first and not at the sides, however difficult this may be technically. Every subsequent layer of refuse covers up the pupating phase and prevents the young flies from coming through. The dumping of rubbish along the sloping sides of the ravines offers a very large and uncontrollable breeding-place.

One need not adhere too strictly to the well-proved method mentioned above in the full wet season or in the very dry and hot season. These periods have proved to be less favourable to the breeding of flies. In contrast with these periods are the so-called transition periods, when continual observance and activity are urgent. As a good many fly imagines accompany the refuse—and even those refuse heaps that are best controlled produce flies—it will be useful to destroy flies as much as possible on the refuse dumps themselves.

This destruction of flies can be effected by hanging strips of hoop-iron inside simple bamboo huts which serve as sheltering-places for the flies against rain, sun and wind. These strips of iron must be kept straight by fastening stones on them. They are smeared with axle-grease, the cheapest kind of fly-catcher. The catch should be taken away daily and a new supply of axle-grease applied.

An excellent material for application to refuse dumps without the slightest danger is a solution of arsenic and sugar with calcium or sodium arsenite concentration of 2%, sprayed on the refuse most recently dumped on the heap. The thirsty flies refresh themselves on the little drops, spread all over the refuse, and die in large numbers.

IV. NUTRITION.

1. Composition of the Menu and Methods used for preparing the Food.

In the Netherlands Indies, as in all other tropical countries, rice is one of the most important of the staple foods. However, there are in this country many places where maize also plays an important part among the staple foods, while cassava and sweet potatoes (" oebi "), as a rule, either boiled or steamed or in the form of various prepared dainties, make up a considerable percentage of the daily ration. In certain parts of the outer islands, such as Ambon and the Moluccas, sago, either wholly or in part, takes the place of rice or maize.

According to the degree of prosperity, polished or undermilled rice is used. The peasant (" tani ") as a rule uses the rice he

has raised himself and little milled rice. It is only at the communal meals and feasts (" slamatans ") that the white, entirely polished rice is used.

If the curves compiled by the Central Bureau of Statistics in Batavia (1) (2), showing the yearly available quantities of the principal carbohydrate sources in the native menu, are studied—namely, curves of rice, maize, cassava and sweet potatoes (" oebi ")—it appears that there have been differences in the quantities during the years from 1925 to 1936, particularly in 1926 and 1934, when the available amounts were very much reduced, whereas during the other years they were practically constant.

The most recently available figures—viz., those for 1935—kindly furnished by SCHELTEMA, show for consumption a yearly available quantity of rice, *per capita*, of 85 kg. ; of maize, 42 kg. ; of cassava, 132 kg. ; and of sweet potatoes, 30 kg. ; whereas for 1936 the tentative estimate is : rice, 85 kg. ; maize, 44 kg. ; cassava, 146 kg. ; and sweet potatoes, 32 kg. This is about the same as the quantities available during the period 1925-1928.

That the curve for cassava shows a decline after 1925 is due to the fact that the propaganda for the planting of cassava which took place as late as 1921 was soon discontinued.

No alarming conclusion can therefore be drawn from the curves regarding the staple food. A more liberal consumption of accessory foodstuffs most probably compensated a somewhat smaller available amount of the four foodstuffs mentioned during the years 1929-1934.

In an agricultural country such as the Netherlands Indies, such differences are always to be expected when the harvest is bad ; in such periods it will be necessary to give full attention to a liberal planting of accessory foodstuffs. The increased planting of soya beans, which are also increasingly appreciated both in Europe and America for their high nutritive value, is one of the means to help complete an eventual smaller available quantity of the four staple foods in times of poor harvest.

The Propaganda Services of the Bureau of Agriculture and Fisheries of the Department of Economic Affairs (formerly

the Department of Agriculture, Industry and Commerce) have certainly taken no small part in this innovation. It may be seen from the curves prepared by the Central Bureau of Statistics that, from 1931 to 1935, inclusive, an increase took place in the area of soya beans (*Glycine soja* Sieb. et Zucc.) planted. This rose from about 190,000 hectares to more than 300,000 hectares per annum in Java and Madura. It is surely not necessary to adduce further proof that a temporary reduction in the quantity of available staple foods does not appear to be so serious a matter, in view of the increased output and the excellent nutritive value of soya beans, from which in the Netherlands Indies " tempé kedelé ", a preparation which forms an important part of the menu in many regions of Java and Madura, is made by a process in which the material is treated with a mould.

The soya proteins have an especial value for supplementing the shortcomings of the rice proteins in the native menu (JANSEN and DONATH (3)) ; and the intensive propaganda carried out in these regions during the past few years for soya beans and the foodstuffs prepared from them, particularly " tempé ", may well be seen in the so-called " Kedelé Number " of the periodical *Landbouw*. (*Note.* — The local name for soya beans is " katjang kedelé ".) (4)

Up to a very short time ago, our information concerning the principal articles of diet in this country was quite satisfactory, thanks to the publications of SCHELTEMA and VAN LIJNDEN, but in regard to the total composition of the native menu we had only a very sketchy knowledge. Much more is now known, however, through the researches of OCHSE and TERRA (5), about the accessories and dainties that serve to complete the daily diet of the natives.

In Kotawinangoen (near Keboemen, in Middle Java) and in a number of villages around Grissee (near Surabaya) the quantities of food consumed were noted in detail every day for a whole year : in 20 families in the former place and in 101 in the latter, with populations of about 120 and 500, respectively. At present a similar investigation is taking place in villages in the neighbourhood of Cheribon, Pekalongan and Blora.

If the results are examined, one is at once struck by the fact that the consumption of animal proteins, especially those derived from fish, is much greater in the villages around Grissee, lying near the sea. VAN VEEN (6) showed recently that the proteins of the Netherlands Indian fish varieties also form good supplements to the rice proteins (see table on page 132).

The great value of well-planted compounds is shown by the differentiation between villages in the Solo Valley, where a very intensive cultivation of crops on the compounds surrounding the houses takes place, and those lying outside the Solo Valley, where considerably less crops are grown on the compounds. Also, among twenty families in Kotawinangoen, the best diet was observed in those who owned the best-planted compounds. In this way, of course, the menu becomes much more varied, and often the compounds yield such bountiful crops that what is not needed for home consumption can be sold in the markets (see Appendix 3).

For those not conversant with the " Kotawinangoen Report ", it may be of interest to observe that crops are grown principally in three locations : first, in " sawahs ", or irrigated fields ; secondly, in " tegalans ", or non-irrigated fields ; and thirdly, in the " erf " (compound). The latter is the arable ground immediately surrounding the houses of the people, usually fenced in, in which are grown many products, such as coconuts, fruit and nut-bearing trees of various kinds, and vegetables. Although the researches of OCHSE and TERRA are naturally no criterion for all regions of the archipelago, it has appeared most conclusively from both works already completed that, *for improving the diet of the masses*, particular attention should be given to crops planted on the compounds ; moreover, the provisional results obtained from the work being done in the other districts mentioned above also point in the same direction.

As is the case with all people with a relatively low income, the use of animal products (meat, milk, eggs) is very limited and the majority of it is consumed at feasts (" slamatans "). If the varied composition of the menu at such a feast is observed, it will be seen that, with its meat, chicken, eggs, fish, etc., it approaches that of lavishly sufficient menus from temperate

Appendix 3.

Consumption per 50 Kg. Body Weight (Adult Male) per Day in Grammes.

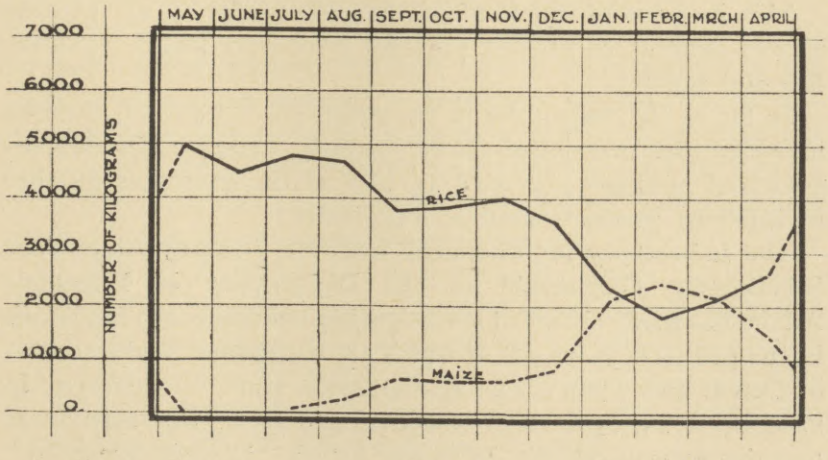
	Outside the Solo Valley	In the Solo Valley	Kotawi-nangoen
Rice	351.6	388.1	442.9
Maize	62.3	119.6	—
Glutinous rice (ketan)	6.2	16.0	4.5
Coconut	8.1	19.5	46.5
Coconut oil	3.8	6.8	8.3
Palm sugar	1.0	3.0	6.8
Cane sugar	14.1	23.6	1.0
Pulses	9.3	11.7	49.5
Of which tempé	5.6	8.7	27.0
Tubers	29.0	56.9	78.1
Fruits	15.9	20.4	88.6
Vegetables	88.1	111.4	82.6
Of which leafy vegetables and young pulses	25.4	29.5	57.1
Trasi (unsalted dried fish)	2.3	4.1	1.1
Meat	6.5	12.2	4.5
Eggs	0.1	1.2	0.2
Fresh fish	21.7	39.5	0.6
Salted fish	2.6	2.1	0.8
Dried fish	1.7	2.9	—
Salt	5.9	8.3	13.5
Total salt (that from salted fish included)	6.4	8.6	13.7
Total proteins consumed	47.1	63.4	60.0
Meat proteins	1.3	2.7	0.7
Fish proteins	6.2	9.3	0.4
Rice proteins	26.4	29.1	34.1
Maize proteins	5.6	10.8	—
Soya proteins	1.4	2.2	10.1
Total carbohydrates consumed	374.6	478.0	427.9
Total fat consumed	15.7	25.6	49.5
Total calories consumed	1,828	2,398	2,402
Cost of the food in florin-cents	3.9	5.0	4.2
Cost per 1,000 consumed calories in florin-cents	2.1	2.1	1.75

regions. In his *daily menu*, however, the average native is practically a vegetarian, and the majority of the protein is consumed in the form of rice and maize, and in some districts in the form of " tempé kedelé ". The villages by the sea are an exception, as in them considerable quantitites of fish are also eaten.

Another notable point in regard to the carbohydrate elements in the diet concerns (see Appendix 3) the consumption of rice in Kotawinangoen (442.9 grammes) and of rice and maize in the Solo Valley (388.1 grammes + 119.6 grammes = 507.7 grammes in all) in the menu, which in both regions has approximately the same caloric value, and the coincident greater consumption of " tempé " in Kotawinangoen (27 grammes against 8.7 grammes).

The relative amounts of rice and maize used depend on the harvest periods (7) and also on the prosperity of the consumer. The better off he is financially the more rice he consumes (the richest using entirely polished rice), and the nearer the time to the new rice harvest, the larger the percentage of maize in the rice-maize mixture (see diagram below).

Consumption of Rice and Maize in 100 Families in the Former Regency of Grissee (Staple Food).



In the most difficult time of the year, when the new rice or maize crop is not yet reaped and the old stocks begin to become exhausted—the so-called " patjeklik "—here and there a complete divergence may be observed from the ordinary daily menu, and a consequent lowering of the caloric value. Sometimes at such periods all sorts of products are consumed which have a much lower nutritive value and which, under normal conditions, would be discarded.

The feasts are of great value. In the native communal life they fulfil a function far greater than that of mere festivities ; through these ritual and continually recurring functions and as a result of the much better ingredients consumed, shortages in the daily diet, especially those of animal proteins, are made good. The influence for good exerted by these ritual meals on the average composition of the diet is shown in the Kotawinangoen report (in percentages) :

(*a*) Average annual protein content in fifteen peasant families without " slamatans "	11.3
(*b*) Average annual protein content in fifteen peasant families including " slamatans "	12.3
(*c*) Average annual protein content in five wage-earners' families without " slamatans "	13.6
(*d*) Average annual protein content in five wage-earners' families including " slamatans "	14.7

This increase of about 1% is caused chiefly by an increase in the amount of animal proteins consumed (meat, chicken, fish and eggs).

So far as the vegetables in the menu are concerned, the two investigations mentioned above—namely, those in Kotawinangoen and Grissee—also give an idea of the enormous number of different products used as vegetables.

The Laboratory for Chemical Research (Laboratorium voor Scheikundig Onderzoek) of the Department of Economic Affairs has made chemical investigations on about 250 foodstuffs in the past few years, all of which are mentioned in the reports of Ochse and Terra (8). At the same time, the content in vitamins A, B_1, B_2 and C of a large percentage of these substances was also determined (9). In Ochse's work " Indische groenten "

(Netherlands Indian Vegetables), not less than 400 plants are described, all of which are used in the native world as vegetables, legumes or tubers. Practically speaking, then, every weed that grows in the " sawahs " or " tegalans " (fields) is used in the mixture of vegetables from which the " sajoer ", a sort of vegetable soup consumed daily, is prepared.

Therefore, so far as the *average* quantitative composition of the daily diet is concerned, and the available proteins, carbohydrates, fats and calories contained in it, the Netherlands Indies compares very favourably with other tropical countries.

However, where the qualitative composition is concerned, here and there in certain districts improvements are possible, as is shown by a study of the *preparation of the various products.* In that connection, we may pass without comment over the well-known fact that rice which has been milled too much or which is entirely polished gives rise to beriberi when not accompanied by a sufficient accessory diet. Also, the influence of washing and steaming on the vitamin B_1 content of the rice has been repeatedly studied (10).

There are, furthermore, regions in Java where the people pound their maize and feed the kernels and the pericarp, the carriers of the fat and vitamins B_1 and A, to the chickens, and even the endosperm, consisting principally of carbohydrate, is washed out further for three full days in running water, so that any vitamin B_1 that might remain over is thereby lost (11). In Madura, the poorest classes use maize almost exclusively ; the richer the people are, the more half-milled rice is mixed with the maize. In that island, however, the whole of the pounded maize (kernels and pericarp) is also included in the daily menu in the form of a porridge (" boeboer "), so that practically no loss of fat or vitamins A and B_1 takes place. It was on this basis that JANSEN and DONATH tried to explain why the Madurese maize-eaters were better developed and stronger than the Javanese maize-eaters.

In some of the other parts of the country, where much maize is consumed, the people have the habit of taking the old maize, which has been kept a long time and has become hard and dry, and soaking it in lime-water, subsequently boiling or steaming it. This has a fatal effect on the vitamin B_1 content, as has been shown repeatedly by VAN VEEN and DONATH.

So far as the preparation of the rice is concerned, it almost always takes place in the so-called " koekoesan ", a rice-steamer. This is a vessel so shaped that a basket of woven bamboo in which the rice is placed fits over a deep pan of boiling water so that the rice is cooked by the rising steam. Rice is seldom boiled in the villages.

Vegetables are eaten daily in the form of " sajoer ", a kind of soup made by boiling vegetables in water, or in the form of " lalab "—that is to say, vegetables dipped for an instant in boiling water so that they are just softened.

The fact that here and there amongst groups of persons maintained by the Government (usually in the jails) sporadic explosions of scurvy occurred was traced to cooking the vegetables too long. An outbreak of xerophthalmia was caused by failure to deliver ducks' eggs, prescribed in the prison menus. As soon as such outbreaks resulting from a deficient diet were recognised, the errors could always be traced at once by the Public Health Service. Some peas and beans, such as green gram (*Phaseolus radiatus* L.) and soya beans (*Glycine soja* Sieb et Zucc.), are eaten with relish in the form of the sprouting plantlets, a few centimetres long—the so-called " taogeh ". Peas and beans, especially the " katjang pandjang " (*Vigna sinensis* (L) *savi* ex Hassk.), again are added to the " sajoer " ; they are seldom prepared in their natural form.

Soya beans are added to the " sajoer " in some places, but are usually eaten in the form of " tempé ", which is made from boiled soya beans on which certain definite moulds are then allowed to grow. These lumps, white with mould, are cut up and then either added to the " sajoer " or fried in coconut oil. Lack of space precludes mention of other good native foodstuffs. It should be mentioned, however, that the greatest percentage of the fat in the menu is derived from cocanut flesh or oil, while ground nuts, " katjang tanah " (*Arachis hypogea* L.), must also be regarded as a most valuable food because of their high fat content and richness in vitamin B_1. " Ontjom ", a product also made by the action of certain definite moulds on the cake prepared from ground nuts by pressure, is also of importance in the native diet.

There are in the native menu a number of products, especially among the beans, such as a variety of " katjang prasman " (*Canavalia gladiata*, Jacq.), " kratok beans " (*Mucuma utilis*, Wall *ex* Wight) and also certain varieties of leaf-greens, such as those of the " ketella pohon " (*Manihot utilissima*, Pohl.), which, owing to the presence of amygdalosydes in them, are definitely poisonous for men and animals if used in their natural state. Among the much-used cassava roots are also poisonous varieties. But the natives understand the art of removing sufficiently these poisonous ingredients (usually prussic acid), either by steeping in water or by repeated boiling or steaming, or both, or by roasting them (12).

At this point reference may be made to the poisonings which sometimes occur in the neighbourhood of Banjoemas (Mid-Java) as a result of improper preparation of the so-called " bongkrek ", which is prepared by the action of certain moulds on the cake prepared from coconuts by pressure. VAN VEEN and MERTENS were able to isolate from this " bongkrek ", which had given rise to fatal poisonings, two very poisonous products, one of which is " bongkrek acid ". They proved that this acid is a metabolic product of undesirable bacteria. Although it is not directly to be regarded as a poisonous product, " djengkol beans " (" stink beans "—*Pithecolobium lobatum*, Bth.), when used in the large quantities habitual here, often give rise to lesions of the urinary system. VAN VEEN and HIJMAN were able to isolate from the urine of patients suffering from this condition finely crystalline " djengkolic acid " and to identify it as a new amino-acid containing sulphur.

Many of the side-dishes, the so-called " sambalans ", eaten with the rice are prepared with " soya " (the Chinese " kechap ", a sauce prepared from the soya beans) and with chillies (" lombok ") (*Capsicum annuum* L.). The latter, both green and red varieties, are very rich in vitamin C ; the " tjabé rawit ", the very small, very hot type, also has a high content of vitamin C (13).

Sweet potatoes and cassava (tapioca roots) are eaten boiled or steamed, and from them are made a large number of delicacies, often combined with (cane) sugar or " aren " palm sugar (" goela djawa ") and coconut or coconut oil. Other raw

materials for these delicacies are principally rice and rice-flour, maize and cornflour and especially glutinous rice (" ketan " —*Oriza* L. *forma glutinosa*). Products of animal origin are not much used for the preparation of these delicacies, although in certain regions all sorts of creatures, such as bee larvæ, grasshoppers, frogs and snails, are eaten. Fruits are always eaten raw, but some, such as " terrong " (egg-plant, *Solanum melongena*, L.) and " ketjipir " (Goa bean, *Psophocarpus tetragonolobus* (L.), A. DC.), are worked into the " sajoer ". Sometimes a mixture of soya, chillies and a number of fruits, usually unripe and cut into small pieces (*e.g.*, mangoes), is consumed as the so-called " roedjak ". Wherever possible, the Horticultural Service of the Department of Economic Affairs advises the plucking of fruit only when it has ripened on the trees. For all that, many of the native fruits are still plucked too green and kept to ripen, as a result of which they develop neither the same nutritive value nor the same pleasant taste as that of fruit allowed to ripen on the trees.

We still know but little about sago, the principal staple food of Amboina and the Moluccas. It is certain, however, that the absolute absence of vitamin B_1 in sago is supplemented by a free use of canarie nuts, which are rich in that vitamin. In these two regions, vegetables and fruit form a large portion of the daily diet.

In addition to water, the average native drinks principally tea and coffee, with or without sugar, but usually without milk. Milk, as such, is practically not drunk by adults. After the children are taken from their mothers' breasts (which in some parts of the country only happens after several years), they, too, consume practically no more milk. Here and there, especially in the large cities, tinned milk is used for infants. As a rule, sweetened condensed milk is used, since it does not sour rapidly after the tin is opened. For the same reason, this type of milk is in great demand for use in coffee and tea, but principally by those who are better off.

The milk from European or Australian milch cows is drunk, principally by the Europeans, the Indo-Europeans and the natives in very good circumstances. In and around the large cities there are herds of cows of good quality, but the price of

milk, owing to various circumstances beyond the control of the dairymen, is too high for it to become a drink for the masses. Even in European households, fresh milk is not always used ; a large part of the demand is filled by imported tinned milk.

The water-buffalo or carabao is not a good milch cow ; it gives just enough milk for its own calf. Therefore, in spite of the higher fat content of carabao milk, which would make it an excellent food, it is but little drunk. Here and there goat's milk is drunk, but the amount is too small for it to be considered as an article of diet for the masses.

In some places, wine is manufactured from fermented rice or sugar and sometimes palm sugar also, but the average native makes very little use of alcoholic beverages.

The diet of Chinese born in the Netherlands Indies and of those who live there differs in many respects from the average diet of the natives, although the poorer members of their community must be satisfied with a daily ration of rice with " sajoer " and sometimes a little dried fish or " tempé kedelé ". As yet, but little is known about the diet of the Chinese, who can spend a little more on their food than the average native ; but everything points towards our finding when the investigations are completed that a good Chinese menu is richer in proteins (especially those of animal origin) and fats. To what extent " mi " (Chinese spaghetti) and other specifically Chinese foodstuffs replace the rice in the native diet is also dependent on the grade of financial prosperity of the family. That the Chinese, even the less wealthy ones, set more store by well-polished table rice than the native peasants is well known.

2. The Nutritional Value of the Principal Oriental Foodstuffs.

A comparison can readily be made between the nutritional values of the principal foodstuffs consumed in the tropics and those of similar products consumed in the temperate zones.

The chemical composition of the animal products in the native diet is, in the very nature of things, so little different from that of similar animal products in Europe that there is scarcely any difference in nutritive value to be spoken of. The same is

really true for the vegetable products, especially for the principal articles of diet, rice and maize, as compared with bread and potatoes. Sago, cassava (crude tapioca) and sweet potatoes in practice lack proteins, fats and vitamins (although in the red and orange coloured sweet potatoes vitamin A is found, as it is in the red, orange and violet coloured varieties of maize (14)). They are therefore to be regarded as pure carbohydrate foods, and the accessory foods must supply the deficiencies in these products.

There is also much similarity in the matter of vitamin content between the foods here and those of Europe. A large number of the Netherlands Indian products have been tested for their vitamins by JANSEN, VAN VEEN, SPRUYT and DONATH. The Netherlands Indian vegetables, and especially the leaf-greens, are rich in water, just as they are in the temperate zones, and, just as there, may be regarded as carriers of vitamins A and C, and of the salts. Peas and beans, with the exception of "katjang idjoe" (green gram—*Phaseolus radiatus*, L.), which contain practically no fat, are mostly good sources of proteins and fats, and they also carry vitamin B. There are certain varieties of fruit which, thanks to their comparatively high content in solid matter, may also be regarded as calorie suppliers in the native diet; for example, mangoes (15), bananas (16), avocados and "doerians". The majority of the other fruits are of importance as suppliers of vitamin C and weak organic acids as well as aromatic ingredients which stimulate digestion.

We are not fully conversant with the total amount of vitamins in the diet, because researches into the vitamin content of blood and urine have only recently been begun. DE HAAS and MEULEMANS (17) determined the vitamin C (ascorbic acid) content of mothers' milk, the cow's milk distributed in Batavia and in artificial infant diets prepared with milk. They concluded that the native and Chinese children consume per day rather less ascorbic acid than European children.

An investigation was begun by RADSMA (18) and his assistants into the mineral metabolism of dwellers in the tropics. The difficulty in the way of this, as of investigations into the vitamins, is that there are no data known as yet concerning the normal or minimum amounts of all the substances consumed or which should be consumed daily by the natives.

No definite answer can be given yet to the question whether foodstuffs in the tropics are poorer in calcium than those in temperate zones.

Nor do we know with certainty the number of calories that a qualitatively good diet should yield per person per day. It is impossible to accept entirely the norms determined for moderate climates ; first, because the basal metabolism of the inhabitants of these islands is from 10 to 15% lower than that of the inhabitants of cooler regions (as was demonstrated by RADSMA (19) and also by TEDING VAN BERKHOUT (20)) ; secondly, because it is most difficult to compare the work done by the families investigated with that done under European conditions. It may safely be assumed that the genuine peasant does not put in more than 170 days of intensive work in the fields per year. The average daily need in calories is greatly influenced by this fact and is not immediately comparable with norms for places with moderate air temperatures. Such comparisons are further hampered by the difference in the quantities of food of animal origin consumed. In general, it is seen that the animal foods consumed are considerably higher in quantity in the diet of persons in temperate zones, who have also a relatively higher degree of prosperity, than in those of the majority of the inhabitants of the tropics.

3. The Minimum Cost of an Adequate Diet and the Proportion of the Family Budget allocated to Food.

The minimum costs of a sufficient diet in Java and Madura may be placed roughly, in the case of a peasant family, at 3 cents per day per person and 5 cents per adult man of 50 kilogrammes body weight. For wage-earners, these figures are 3.5 and 6, respectively.

These figures were obtained as the result of a number of food investigations made in this country during the past few years, notably at Kotawinangoen and Grissee. SCHELTEMA reached roughly the same results in his studies, which have been mentioned above.

The composition of an adequate diet in agricultural districts obtainable for the higher of the sums just mentioned could be determined on the basis of the following analyses :

(Expressed in grammes.)

	Kotawinangoen		Grissee	
	Per person	Per 50 kg. body weight	Per person	Per 50 kg. body weight
Rice	295.0	442.9	257.1	387.3
Maize	—	—	58.7	88.4
Glutinous rice (ketan)	3.0	4.5	7.4	11.1
Coconut	31.0	46.5	10.1	15.3
Coconut oil	5.5	8.3	4.3	6.5
Palm sugar	4.5	6.8	1.4	2.1
Cane sugar	0.6	1.0	14.1	19.6
Pulses	33.0	49.5	8.0	12.1
Of which tempé	18.0	27.0	5.4	8.1
Tubers	52.0	78.1	31.5	47.4
Fruits	59.0	88.6	15.3	23.1
Vegetables	55.0	82.6	65.1	98.0
Trasi (unsalted dried fish)	0.7	1.1	2.2	3.3
Meat	3.0	4.5	6.6	9.9
Eggs	0.1	0.2	0.5	0.8
Fresh fish	0.4	0.6	26.3	39.7
Salted and dried fish	0.5	0.8	3.7	5.6
Salt	9.0	13.5	4.7	7.1
Total consumed calories	1,600	2,402	1,470	2,214
Protein	40.2	60.0	38.8	58.5
Of which: Meat proteins	0.5	0.7	1.3	2.0
Fish proteins	0.3	0.4	5.9	7.7
Rice proteins	22.7	34.1	19.3	29.0
Soya proteins	6.7	10.1	1.3	2.0
Maize proteins	—	—	5.3	8.0
Fat	33.0	49.5	15.4	23.1
Carbohydrates	285.0	427.9	293.9	442.7

4. Diet and Health: Deficiency Diseases.

From the above it appears that the menu of the agricultural (rural) population consists principally of carbohydrates; that it is very poor in fats; and that the protein, amounting to slightly more than 1 gramme per kg. of body weight per day, is almost exclusively of vegetable origin. Little is known at

present of the mineral content of the diet. The consumption of cooking salt must be regarded as low; it will not exceed 7 grammes per person per day for the great mass of the people, although exact figures are not obtainable.

Researches into the comparative physiology of Europeans and natives and of the poorer and the better situated natives in this country have been carried out in the department of physiological chemistry of the School of Medicine of Batavia by RADSMA and his collaborators (18).

Extensive data concerning chemical composition of the blood, acid-base equilibrium, mineral metabolism, basal metabolism, body weight, body length and surface, and respiration and circulation have been collected by these workers.

Distinct differences were discovered between the poorer and better situated natives and between the poorer natives and Europeans as regards the chemical composition of the blood (lower content in hæmoglobin, cholesterol, phosphatides, non-protein nitrogen, urea, lower bicarbonate content, lower pH with the poor natives), in acid-base equilibrium (excretion of more NH_3, less fixed bases, morning alkaliuria less frequent with the poorer natives). The fact that most of these differences between the poorer natives and the Europeans are evident but do not exist or are at least far less distinct between Europeans and better situated natives (students) makes it probable that these differences are not racial differences, but are caused by external factors, most probably by differences in nutrition.

The question whether the data obtained in the researches mentioned above prove the existence of differences between the inhabitants of this country and inhabitants of countries with a temperate climate cannot, in most cases, be answered with certainty. Differences, if existing, are small and not far from the limits of methodical accuracy when measurements are carried out by different observers in different countries.

In the absence of epidemic diseases, and granted an adequate diet, quantitatively and qualitatively, the general state of health of the people may be regarded as good. Scarcity of food as a result of seasonal influences (in Middle and East Java and the eastern end of the archipelago) is manifested, amongst other things, by an increased mortality from infectious diseases.

An unstable dietary condition, whether caused by entire or partial under-nourishment, reduces the resisting power of the person concerned and fosters the appearance and spread of infectious diseases, with the resultant increase of both morbidity and mortality. On the other hand, the influence of endemic infectious diseases, especially malaria and ankylostomiasis, as well as bacillary dysentery, yaws, syphilis and tuberculosis, on the state of nutrition of the people, cannot be exaggerated. These diseases work, not only directly through exhaustion of the sick person, but also indirectly in that the tilling of the soil suffers. For instance, the state of nutrition of the people in the malaria and hookworm free highlands of West Java is considerably better than that in the infected lowlands, although the agricultural surroundings are practically alike. Instructions by the Government on the question of diet, the distribution of food when necessary and direct attacks on the infectious diseases must, therefore, go hand in hand. That results have already been attained by the co-operation of the Public Health Service, the Civil Administration and the Service of Agriculture and Fisheries appears from the fact that, according to the detailed reports of Government district physicians, the state of health of the people has not deteriorated more than it has during the past few years of economic depression, in spite of the reduced quantity of food consumed.

That a number of diseases commonly met with in temperate climates are seldom seen among the agricultural classes in the Netherlands Indies has long attracted attention. Amongst these are nephritis, cholelithiasis, hypertension, diabetes mellitus, adiposity and chronic rheumatism. Since these diseases are far from rare among the natives who are accustomed to richer food than the masses and consume larger quantities of fat and protein (the " prijahis ", Government servants, etc.), some connection between them and the diet is not unlikely. Strangely enough, gout is met with occasionally among the rural population. How close a relationship there is between the extreme infrequency of gastric and duodenal ulcers and the diet has not yet been shown. It seems highly probable that the coincidence of malaria, ankylostomiasis and under-nourishment, the latter often the result of the two former infections, contribute much towards the incidence of the nephroses that are so often

met with. Hunger œdema is at present seldom met with. Kidney and bladder stones are very frequent, but their connection with the condition of nourishment, especially with a shortage of vitamin A in the food, is contested.

Beriberi, formerly one of the most important of deficiency diseases in the Netherlands Indies, is still a potential danger, though epidemic outbreaks are rare and sporadic cases amongst the rural population scarce with a low mortality. In general, this disease threatens the city dwellers more than the rural population. It is not observed at all among races or tribes living in a state of nature. Moreover, in all parts where the people still live exclusively from agriculture and prepare their food in the traditional way, the dishes consumed contain sufficient vitamin B_1 to prevent beriberi. One or two small districts in the east of the archipelago where sago forms the principal article of diet are an exception to this rule. In general, beriberi is rather a sign of prosperity than the opposite. The disease comes and goes with industry and the free circulation of money. In the rubber regions of Sumatra, beriberi appeared during the boom period. The people neglected the cultivation of their fields and are imported polished rice. As soon as the rubber prices went down again and the money disappeared from the land, the peasants returned to the growing of their own rice in the old-fashioned way and beriberi disappeared.

A hypovitaminosis B_1 undoubtedly plays a most important rôle in the pathology of these areas. It is more and more probable that there is a close relationship between it and the infectious and post-infectious polyneuritides very commonly encountered here. This is of great importance in the dietetic side of the treatment of prolonged febrile diseases, such as typhoid fever. These relationships are still undergoing investigation. Manifest symptoms of beriberi are especially prone to develop when, in addition to a deficiency in vitamin B_1, an excess of carbohydrates is consumed. Beriberi seldom appears when the under-feeding is general. Generally weakening factors, such as high and prolonged fever and repeated pregnancies, may cause, in apparently well-fed persons who are, however, deficient in vitamin B_1, a sudden outburst of very dangerous symptoms (malignant beriberi, which the Japanese call " shoshin "). The acute beriberi of Chinese women in pregnancy and parturition and

of their infant offspring, a syndrome well known and deeply feared in the cities, owes its origin to the pernicious habit of feeding the prospective mothers during the last few months of their pregnancies on a diet very rich in carbohydrates and entirely bereft of vitamin B_1—namely, a mush of polished rice. This condition is also seen sporadically among the rural population (for instance, in Sumatra and among the Chinese farmers in Borneo).

The Government combats beriberi with great success by encouraging the planting and eating of leguminous plants rich in vitamin B_1 ; by distributing red or " silver fleece " (half-polished) rice, and, where necessary, also " katjang idjoe " (green gram) and preparations of vitamin B_1 ; and by exercising control over the dietary of estate labourers. The pioneer work of the great privately owned agricultural estates in Sumatra's East Coast Province must not be forgotten in this connection. For this reason, beriberi occurs less frequently now than formerly, but continuous control remains imperative, especially in regard to the increase in the number of mechanical rice-polishing mills in the rural districts.

Xerophthalmia, keratomalacia and hemeralopia are met with in many places in the archipelago. Investigations into the vitamin A content of blood and urine are being made ; the values found must be regarded as low. It is not improbable that a hypovitaminosis A is very common ; by many it is considered the most important deficiency disease at present occurring in the Netherlands Indies. This question is still being studied. Scurvy and rickets are unknown among the rural population. Tropical sprue is not found among natives and, so far as is known, neither is chlorosis tarda nor pernicious anæmia.

The excellent condition of the teeth among the native folk is striking. Pellagra is seen sporadically, and then, for the most part, secondary to chronic gastro-intestinal diseases. Even in the maize-eating regions, endemic pellagra is unknown. Endemic goitre is very prevalent in certain of the mountain regions (Gayo Loeös, the Diëng Plateau, Kediri and Bali). The drinking-water analysed there has been shown to be poor in iodine. The Government is distributing kitchen salt with added iodine in those districts.

5. Scheme of a Dietary Policy based on Co-operation between the Public Health Service, the Department of Education and the Bureau of Agriculture.

From the point of view of the scientific basis on which any efficient dietary policy must be built, it follows from the above that, first of all, a more accurate understanding of the minimum demands that must be made on all the components of the native diet must be sought. In other words, we must attempt to find the minimum quantity of proteins of good quality whose properties supplement each other, and which must be consumed daily; we must attempt to find, amongst other things, the normal vitamin level and the necessary amounts of mineral foods. To this end, various researches are being undertaken by the members of the Institute for Nutrition Research founded in 1934 by De Langen, Van Veen and Donath (21). For instance, the biological protein value of various Netherlands Indian foodstuffs is being redetermined with greater accuracy than was possible formerly by Jansen and Donath (22), when our knowledge of the various vitamins was far less than it is to-day.

The vitamin level in blood and urine is being determined for vitamins A, B_1, B_2 and C, at least for such principal foodstuffs as are of primary importance for the Netherlands Indies. The mineral metabolism of natives who feed well and of those who feed less well is now being worked out. The feeding of infants and young children is a subject much in the limelight and is being investigated; and the chemical composition of various foodstuffs and delicacies appearing in the native menu is being determined. The importance for the Netherlands Indies of the vitamin B complex is being studied.

These are a few of the more scientific studies being undertaken by the members of the Institute for Nutrition Research. This institute has no building of its own, but the work is divided among various existing laboratories.

The physiological researches in the department of physiological chemistry of the School of Medicine of Batavia on blood chemistry, mineral metabolism, basal metabolism, respiration

and circulation by RADSMA and his co-workers are in steady progress. In the study of nutrition, these physiological researches form an indispensable link.

So far as the field work of the Institute is concerned, in the regions investigated by OCHSE and TERRA, the state of nutrition of the persons making up the control families was investigated by two physicians. The investigation carried out in Kotawinangoen and Grissee is now being repeated by a horticultural consulting expert, assisted by three adjunct experts, in a region near Tjiandjoer, where the prosperity and good state of nutrition of the people were known beforehand.

Future plans include similar work in a region where sago is used as the principal foodstuff, in one of the colonisation areas in Sumatra and in a region where xerophthalmia has been observed from time to time; as well as in all those regions where such an investigation may appear to be needed. Thanks to the lavish financial support of the Government of the Netherlands Indies, two physicians, one horticultural consulting expert, three adjunct horticultural consulting experts, four chemists and the minor personnel required to assist these persons, are now working for the Institute on the problems raised by native dietetics.

But in spite of this, in order to carry out efficient propaganda for better food, in addition to all that is being done already by the Public Health Service through its Bureau of Medical Propaganda (23), the co-operation of the Department of Internal Administration, of the Government district physicians and of the agricultural and horticultural consulting experts is most necessary.

The question is not so much one of getting the people to eat more, but to instruct them as to which of their products have good food value and which less. Instruction should be concentrated, therefore, on an improvement of the quality rather than of the quantity of the daily food consumption. Everything which, in the course of years, has been found and proved by countless investigators in this country to be worth knowing concerning native diet, but which has not yet penetrated to the deepest layers of the people, should be brought home to them by planned and efficient propaganda through the

medium of persons of their own race, even while we are still awaiting the results of more scientific investigations, such as those mentioned above.

For instance, DONATH and OCHSE have compiled two coloured school charts, one of which gives a review of the products which contain large quantities of the vitamins which are important in the Netherlands Indies, while the other shows the products of the common fields which contain considerable quantities of proteins, fats, carbohydrates, salts and organic acids. DE MOL has written a very popular handbook accompanying the charts, which deals in the most elementary manner with all the children need to know about digestion, while, naturally, he has not forgotten to point out the dangers arising from eating bad food and its infection by flies with germs causing many diseases. These charts and the accompanying booklet are distributed to the lower schools gratis by the Institute for Nutrition Research, and the native teachers ("goeroes") must devote about ten hours per course to subjects concerning the diet as explained by this handbook. Lectures in which the most important matters concerning dietetics are treated in a simple and comprehensible way must be held for the native administrative officials and for agricultural and horticultural consulting experts, so that they may be in a better position to co-operate in carrying out efficient propaganda concerning diet. Popularly written pamphlets on dietetics, such as that compiled by DONATH and OCHSE entitled, "Why must we eat Vegetables and Fruit?" (24), and popular articles such as those written by DONATH for the *Volksalmanak*, should be disseminated more widely.

The people must be instructed in the enormous importance of a well-planted compound and the need for introducing sufficient variety into the daily diet. They should learn to know which of the products of their own fields are good foodstuffs, as well as knowing those which, either through a shortage of vitamins or other shortages—as, for instance, proteins, fat, etc.—are, in certain circumstances, of less food value. Furthermore, the closest attention must be given to well-spread information concerning the preparation of various dishes.

The co-operation between the Institute for Nutrition Research and the agricultural and horticultural consultant experts will, therefore, be of great importance. For instance, in certain regions where the diet is far from the optimum from a qualitative point of view, it will be possible to confer in deciding just which agricultural and horticultural products would possibly be best suited to improve the composition of the menu. It would then have to be found for which of these plants the particular soil and climatological conditions were favourable. In this connection, it is interesting to refer again to the above-mentioned intensive propaganda of the Bureau of Agriculture and Fisheries of the Department of Economic Affairs concerning soya beans.

As far as financial possibilities permit it, the people must be shown the value of using animal products. We do not need to prove that the help and co-operation of the Civil Veterinary Service is necessary to this end. The propaganda already carried out by this service for many years for the improvement of the herds (not only of cattle and carabaos, but also of smaller animals and fowls) must presently be backed up by an efficient propaganda campaign for the consumption of animal products, although the relatively higher price of these foodstuffs as compared with vegetables will present difficulties. Efforts to increase the catch of both fresh-water and salt-water fish and propaganda for the consumption of these products have already been carried out for years by the Bureau of Agriculture and Fisheries of the Department of Economic Affairs, while, through a fortunate collaboration between this Bureau and that of Sanitary Engineering of the Public Health Service, in many parts of the country good fresh-water and salt-water fishponds have been produced out of former hotbeds of malaria.

Amongst the functions of the Interior Government Administration in connection with dietetics is the task of co-operating with the Department of Economic Affairs in bringing food from other places to regions where crop failures have resulted in a shortage of foodstuffs, in order to make up the deficiencies. It is obvious that it is of the greatest importance to choose for that purpose products which at that moment are most needed in the stricken district. As a rule, of course, the shortage is in one of the principal articles of diet (usually rice or maize,

or both), which is then brought in from elsewhere and distributed. It should be remarked that the Department of Economic Affairs keeps a very strict control on the importation and exportation of rice and maize, as a result of which it is possible to maintain the prices of rice and maize at a normal level within the financial reach of the natives. Various branches of the Bureau of Agriculture and Fisheries are attempting by selection to bring about as great a yield as possible of these principal articles of diet in as good a quality as possible. Experiments with various kinds of fertilisation, of course, play an important part in these efforts at improvement.

Summary.

The diet of the people in tropical countries, at least so far as that of adults is concerned, should not be judged according to Western standards.

The relationship of the sums spent daily for food to those spent for other daily needs, such as clothing, is entirely different in countries with temperate climates from that in tropical countries. Clothing and the need for clothing is reduced in the case of the average native to an irreducible minimum (he spends no money for shoes, socks, stockings, underclothing, European-type tailored outer garments, or winter clothes). There may be some readers who would be interested to know what clothing such a peasant does wear if, indeed, he does not buy any of the things mentioned above. The usual working dress of a male field labourer consists of a pair of cotton shorts. The women wear a cylindrical skirt (" sarong ") of dyed muslin, usually of sombre hue, rolled down from the top, to form a sort of belt which is sufficient to keep it in place, and a cotton blouse. On his way to work, a man may wear a garment of some sort to cover the upper part of his body. This is often a singlet, sometimes a sort of open coat—home-made. The working-dress of the men and women in many parts of the archipelago is the same. For festivals, fuller and more elaborate clothing is, of course, worn by both sexes.

In the Netherlands Indies, there are regions where the diet definitely leaves much to be desired in the way of quality—a property which they share, however, with impoverished districts

in temperate lands. Here and there in the Netherlands Indies, persons or families can be pointed out as suffering from a somewhat insufficient or faulty diet, but this, again, is not a specifically tropical phenomenon. In the temperate-zone countries, where there is relatively a far higher standard of financial prosperity, tramps and paupers are to be found in whom under-nourishment or dietetic errors may be seen.

Therefore, the treatment of the dietetic problem in Eastern countries cannot be carried out on the basis of observations made in countries with temperate climates and higher levels of financial prosperity. This must be effected entirely within the framework of the native methods of life, which differ from those of the temperate zones, not so much in possible differences in the composition of the menu as in the entirely different magnitude of the needs of a native population. Moreover, the well-known hospitality of the Orient is a sufficient guarantee that, at least quantitatively, everyone eats enough.

A simple determination of the values involved in an Oriental menu—as, for instance, a statement of the caloric value only, or a simple statement of other important factors—appears to be incorrect and even dangerous, since here more than elsewhere the chance of an erroneous qualitative composition is so very great. This is increased by the small amount of variety in a native's diet. It is entirely possible to conceive the planning of an Oriental menu which would liberally meet the requirements as to calories but would be totally deficient in all other respects. The closest attention must be paid to the composition of the menu, and not to the amount of food consumed per person per day.

The people should primarily be informed of the errors they are making unconsciously and through ignorance in preparing their food. They should further be instructed to vary their diet as much as possible, as in that way lies the best chance of their arriving at a normal composition of the menu. The greatest attention should be given to a good planting of the compound and an intensive agricultural cultivation, while, always keeping the financial difficulties in mind, the menu should be rendered less vegetarian by the use of more animal products.

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V. MEASURES FOR COMBATING CERTAIN DISEASES IN RURAL DISTRICTS.

1. Malaria.

The most important community disease in the Netherlands Indies is malaria, which is found to a greater or less extent in every island of the archipelago ; no other disease undermines, in the long run, the health of the people so intensely or causes so much morbidity and mortality. It is particularly the native inhabitants who suffer intensely from this disease, since they are still largely ignorant of how to protect themselves and, generally speaking, lack the means to that end.

From the very foundation, as an independent organisation, of the Civil Medical Service in 1911—the service that later

developed into the present Public Health Service—investigations were made with the object, on the one hand, of finding out whether the development of malaria plasmodia could also be demonstrated in Netherlands Indian *anophelinæ* (SCHÜFFNER, DE VOGEL) and, on the other, of studying as intensively as possible what causes contributed to the prevalence of malaria in certain definite places and how malaria could best be combated (TERBURGH, KIEWIT DE JONGE).

Medical knowledge in those days was still insufficient for an organised fight against malaria, but this was changed when, through the co-operation of SCHÜFFNER and SWELLENGREBEL, the foundations were laid for a rational attack on malaria in this archipelago. They investigated which of the *anophelinæ* found in this country play an important rôle in the transmission of malaria. A large number of investigations followed, which demonstrated that only one species of anopheles—namely, *A. ludlowi*—is absolutely and constantly dangerous, while the other malaria carriers are sometimes of significance and sometimes not.

The fight against malaria in the archipelago was so comprehensive a task that the need for hygienists specially entrusted with this work became felt more and more. In 1924, therefore, a Central Malaria Bureau was founded as a subdivision of the Public Health Service.

This *Malaria Bureau* keeps in constant touch with the Division of Sanitary Works and Community Housing of the Service in question. In this way, it is possible to maintain daily contact with the engineers, who advise how malaria sanitation should be carried out from a technical point of view.

In 1929, the Health Service established a Malaria Bureau in Surabaya, with a Government physician at its head, whose task it is to study and combat malaria problems in the eastern part of the archipelago. As the majority of the Government physicians often had too little time for the routine work of a complete malaria investigation, the Malaria Bureau opened a course for the training of so-called " malaria mantris " (malaria assistants) in 1926. Candidates for this course were required to have completed a secondary native elementary school education.

A second course followed in 1927, and at present there are 143 malaria assistants spread over the entire archipelago in the employment of local resorts and self-governing districts. There are also a number of such assistants at the disposal of the Public Health Service, who are sent out, whenever it may be necessary, to assist physicians in malaria investigations. These assistants are trained to determine the various species of anopheles mosquitoes and their larvæ, to examine blood preparations, to make stomach sections of mosquitoes and to chart simple local sketch-maps.

Since no other disease occurring in this archipelago causes so many deaths as malaria, it is worth while considering the subject a little more fully at this point.

The general death rate for rural Java averages 20 per thousand. However, in regions where malaria is chronically endemic, the mortality curve rises to between 25 and 50 per thousand according to the density of infection (*i.e.*, the number of infections per person per annum). If malaria appears epidemically, the mortality may be very high indeed, even reaching 400 per thousand, as was the case in the village of Kendal, in the Regency of Cheribon, in 1917.

In general, in this colony the mortality is higher in the towns than in the rural districts. This is to be attributed partly to the crowding together of the inhabitants, which, especially in the tropics, contributes to the transference of disease. It has repeatedly been proved also that malaria, in the days before sanitary works were undertaken, had a detrimental influence on the mortality statistics of towns; for instance, the annual mortality in the Mangga Dua district of Old Batavia was 105 per thousand.

It is more difficult to evaluate the *relationship between natality and the intensity of malaria*. In regions with chronic endemic malaria the *birth rate* is not low, as was shown by SCHÜFFNER in Mandailing and by SOESILO in Nias. As a result of the repeated malaria infections, an immunity has been set up and pregnancy takes its normal course in the majority of the women. The *infant mortality* is, however, high.

If malaria appears epidemically among a non-immune population, the chances of an interruption of pregnancy, either

by abortion or premature birth, are far higher. According to SCHÜFFNER, the effect—that is to say, the decline of the population—is the same : in the case of endemic malaria, the decline is a result of the high infant mortality, while in that of epidemic malaria it is the result of the interruptions of pregnancy.

Before taking up more fully the subject of malaria in the rural districts, it is of interest to refer to SCHÜFFNER'S classical study " Twee onderwerpen uit de malaria-epidemiologie " (" Two Topics from Malaria Epidemiology "), published in the *Mededeelingen, Burgerlijke Geneeskundige Dienst*, 1919, which is entirely built up of data culled from rural centres and as a result of which we learned to evaluate correctly the combined spleen and blood examinations.

In a region heavily afflicted with chronic endemic malaria, such as Mandailing, where SCHÜFFNER carried out his investigations, the splenic index is high both among very young children and adults (from 80% to 90%). The percentage of parasite carriers (the parasite carriers index) is lower, but among infants and children it is higher than among adults. The percentage of gamete carriers is low, but higher among children than among adults. The very youngest children pass through an epidemic without being infected.

This will be seen from the table given below, which records the results of a spleen and blood investigation carried out by SOESILO among people suffering from chronic endemic malaria on the island of Nias.

The large number of enlarged spleens indicates a high density of infection and malaria of other than recent date.

Sub-district of Idanogawo (Nias).

Number of persons examined	Spleen					
	0	I & II	III & IV	V & up	Total enlarged	Splenic index
Children . . 761	30	302	429		731	96.0
Adults . . . 1,036	80	390	566		956	92.5

The blood examination showed the following :

Names of the villages	Children			Adults			Gamete carriers	
	Number investigated	Parasite index %	Spleen index %	Number investigated	Parasite index %	Spleen index %	Children	Adults
Bobodsjioli and Lolomberuwa .	27	48.2	100.0	56	14.3	91.0	2	1
Bawalia and Sidrodro . . .	93	50.5	92.5	126	20.3	90.5	3	0
Hilibowo and Biutsji	89	57.5	100.0	77	9.1	91.0	4	0
Bogao, Hilimbana	23	21.8	100.0	36	2.8	83.4	3	0

In the case of an epidemic among a population previously free from malaria, the picture is different ; in this case, especially in the beginning, the parasite carriers index is found to be higher than the spleen index and practically the same among children and adults.

The percentage of gamete carriers is high, and again almost the same among children and adults.

Village	Number examined	Spleen					Parasite index	Gamete carriers
		0	I	II	III & up	Spleen index		
Tjipondok	Children :					%	%	
	Below 6 45	37	9	—	—	20	40	8
	Above 6 37	33	4	—	—	11	38	6
	Women. 50	48	2	—	—	4	35	5
	Men . . 50	45	3	—	—	6	38	6

The absence of large spleens points to a malaria of recent date.

We owe, in the first place, our knowledge of the systematics of *anophelinæ* occurring in the Netherlands Indies to SWELLENGREBEL and SCHÜFFNER.

Further important research into the transmission of malaria by the *anophelinæ* has been carried out at one time or another by SWELLENGREBEL, SCHÜFFNER, BRUG, RODENWALDT, WALCH, MANGKOEWINOTO, SOESILO, DE ROOK, and STOKER.

Of the sixty-five varieties and species of *anophelinæ* found in this archipelago, a small number only are malaria carriers—namely :

A. ludlowi var. *sundaica*,
A. aconitus,
A. minimus,
A. minimus var. *flavirostris*,
A. maculatus,
A. hyrcanus,
A. subpictus,
A. kochi,
A. leucosphyrus,
A. umbrosus,
A. punctulatus typicus,
A. punctulatus typicus var. *moluccensis*,
A. bancrofti.

The last three species mentioned above are specially carriers of malaria in the eastern part of the archipelago (New Guinea, amongst other places).

It will suffice to make a few short remarks concerning the typical breeding-places of these *anophelinæ* (see Appendix 4).

When attacking the danger arising from the breeding-places of anopheles, it is possible to limit the attack to the breeding-places of the species especially dangerous for the district in question (*species sanitation*). This renders the task of combating malaria considerably easier.

When knowledge concerning the transmission of malaria by anopheles had once been acquired, it is quite comprehensible that the efforts at fighting the disease were directed in the first place against malaria in the towns, the most important centres of population. The malaria problem was at least just as serious in the towns as in the rural districts. Various coastal towns, both in Java and in the other islands, were notorious for their malaria.

It is easy to understand why measures of malaria prevention were first applied in the towns, the important population centres. The carrying-out of such measures in rural districts with their dispersed population, and taking into consideration the

extensiveness of the districts involved, would have implied such a disproportionately high outlay that the community could not have afforded it at the time.

The entire urban organisation renders the carrying-out of the prevention measures much easier than would be the case in the rural districts, and, when sanitary engineering operations have once been undertaken, the necessary control of the maintenance of the technical works is also much easier to carry out.

Since 1919, such sanitary engineering operations have been put into effect in various places along the coasts of Sumatra and Java ; to mention only the most important, successively at Sibolga, Belawan Deli, Tjilatjap, Samarang, Tegal, Batavia, Surabaya, Panaroekan, Patjitan, Toeban and Tambakbojo. This work was all undertaken against the notorious *A. ludlowi* var. *sundaica*, which, in places other than North Sumatra, breeds exclusively in brackish-water zones. It is spread throughout the Greater and Lesser Sunda Islands as far as the island of Roma and breeds principally in the brackish water of fishponds and in lagoons.

In the outer possessions, too, a few more or less important sanitation projects were carried out, but these will not be considered further here.

If a study be made of the distribution of malaria in the rural districts, it will be seen that the disease appears to a greater or less extent practically everywhere from the coast to altitudes of from 4,000 to 5,000 feet above sea-level. The principal part in this distribution is played by *A. ludlowi* var. *sundaica*, *A. aconitus*, *A. minimus* and *A. maculatus*, while to a lesser extent *A. subpictus* contributes its share.

Separate consideration should be given to the chronic endemic malaria in the interior of North Sumatra, in the longitudinal valleys intersecting the Barisan Mountain Range (in Greater and Lesser Mandailing, at an altitude of from 500 to 1,000 metres—1,640 to 3,280 feet). For this manifestation of the disease, the so-called " fresh-water form " of *A. ludlowi* var. *sundaica* is to blame. This mosquito breeds principally in fresh-water fishponds. Separate mention must also be made of the severe epidemics of malaria in the marshy regions of South Sumatra, where *A. hyrcanus* is the carrier. (Recent researches

of SOESILO in West Java brought to light the fact that in that province, too, *A. hyrcanus* plays a rôle in malaria distribution.)

A. umbrosus is the malaria carrier in the coastal districts and in the interior of Borneo, as well as in the island of Banka. In the eastern part of the archipelago, the severe malaria which occurs principally along the coasts and in the interior of New Guinea is transmitted by *A. punctulatus typicus*, *A. punctulatus* var. *moluccensis* and *A. bancrofti* (DE ROOK).

In Celebes, the density of *A. subpictus* reaches a high level on the south and west coasts. Although it is but seldom found infected, it plays a part in these regions in transmitting malaria on account of its density.

From what has been said, it will be apparent that in almost all the islands of the archipelago, both along the coast and in the interior, malaria is more or less prevalent and that various *anophelinæ* are involved in its distribution.

According to some investigators, there are, however, a few isolated islands free from malaria. There are also districts in the broad mangrove zone of Borneo and eastern Sumatra which are practically free from malaria.

As mentioned above, sanitary engineering work was carried out chiefly in the principal coastal towns in the course of the years following 1919. Comparatively little was done during the same period to combat malaria in rural districts. The only method employed to check malaria in rural districts was the systematic distribution of quinine among the people at the time of severe epidemics—that is to say, of epidemics with increased mortalities—with a view to reducing the high number of deaths. In this connection, it was always expressly stipulated that there should be house-to-house visits of bedridden patients, that quinine tablets should be given to every patient and that great care should be taken to see that the tablets *were really swallowed.*

However, there were various important sanitation measures carried out in rural districts, of which mention should, in the first place, be made of those on the Tjihea and Tjiandjoer plains. These aimed at combating the " sawah " (irrigated rice-field) malaria, and the sanitation of various complexes of salt-water fishponds along the north and east coasts of Java.

Mention should also be made of the sanitary work done on the fresh-water fishponds, the attack on the malaria danger from the lagoons, and finally shading as a biological method of combating the breeding-places of *A. maculatus*.

The Tjihea Plain.

(Surface area, 8,000 bouws = 5,600 ha. = 13,838 acres.)

The name of MANGKOEWINOTO is unforgettably connected with the sanitary works carried out on this plain. In order to bring this poverty-stricken region to prosperity, large-scale irrigation works were carried out by the Government between 1891 and 1904, at a cost of about 1,000,000 florins, so that the " sawahs " could be better irrigated. Unfortunately, sufficient attention was not paid to the drainage.

The people planted these " sawahs " in a rapid succession of crops, so that the ground was never turned over to dry. As soon as one crop had been reaped, the fields were again inundated ; this was possible since no planting regulations existed and since insufficient precautions had been taken to ensure adequate drainage.

As a result of these continual floodings, the conditions of life for *A. aconitus* were greatly favoured. This anopheles breeds especially in wet, fallow " sawahs " after the harvest and in neglected canals.

The *aconitus* density increased and so did the malaria. In 1917, the natural infection index of *A. aconitus* was 7%. The splenic indices grew constantly higher ; the percentage of large spleens increased. Many persons deserted the region, so that many " sawahs " lay unused and inundated ; in this way the *A. aconitus* density continually increased and, with it, malaria.

In 1919, on the advice of MANGKOEWINOTO, the following measures were taken to combat the disease :

(*a*) Complete drying-out of the " sawahs " following the reaping of the rice crop, and of the " sawahs " that were lying fallow and unused ;

(*b*) Planting all the " sawahs " at the same time ;

(*c*) Maintenance of the supply and drainage canals of the irrigation works ;

(*d*) Better drainage of surplus irrigation water.

Moreover, a Government agricultural centre was set up on the Tjihea Plain charged with the instruction of the people and the control of the sanitary measures.

In 1922, there was already a definite decrease in the splenic indices. The average splenic index for the entire Tjihea Plain, which in 1919 had been 88%, fell in 1922 to 72% ; further, in 1931 to 20.4% and in 1935 to 12.5%.

The annual death rate, which in 1919 was 33.5 per thousand, fell slowly and in 1935 was only 15 per thousand.

The Tjiandjoer Plain.

(Area, 17,860 bouws = 12,502 ha. = 30,893 acres.)

In the Tjihea Plain, the " sawahs " could be planted at the same time and allowed to dry out all together at the time of the east monsoon. The region had a technically constructed irrigation system, so that the flow of water in and out could be regulated properly. Such a method was not wholly possible in the Tjiandjoer Plain for combating the severe chronic endemic malaria found there, and for which the *A. aconitus* must again be held responsible, because in this plain a largely natural irrigation system was met with, while the agricultural system was more complicated. Paddy (rice) is standing in the fields at all times of the year ; moreover, here a fish-breeding industry has developed in the " sawahs ", which is also carried on during the dry east monsoon. Further, there were numerous permanent fishponds found in this region.

From an economic point of view, account had to be taken of all these factors when planning the sanitation of the Tjiandjoer Plain. It was impossible to demand that the whole district should be laid dry during the east monsoon.

Regulations concerning water and planting were enforced in connection with the sanitary engineering. These included the planting of the whole district at the same time in the west

monsoon. As a rule, water was supplied for irrigating these plantings from October 1st to March 1st. During the east monsoon, two-thirds of the region was laid dry in rotation, while one-third was planted with east monsoon rice (the so-called " paddy gadoe "). Water was then supplied to that part only from April 1st to September 15th. As a result of this rotation rule, a partial drying-out takes place during the east monsoon and at the same time a regular planting of the crops has been attained.

Pisciculture in the east monsoon may only be carried out in a definite part of the Tjiandjoer Plain over an area of 300 hectares (741 acres). It is essential to keep this fish industry concentrated with an eye to maintaining a proper control.

In order to live up to the ideals of this crop rotation, irrigation works, including small field irrigation, were necessary so as to be able to control completely the distribution of the water. These irrigation works are now partly carried out ; in 1936, the so-called Tjiandjoer I and II regions were technically irrigated over an area of 5,000 bouws (8,649 acres). The cost of this work amounted to 60,000 florins. In April 1937, the above-described planting regulations (the so-called " golongan " regulations) were put into effect for that region. The expense involved in irrigating the remainder of the Tjiandjoer Plain will amount to 400,000 florins, and the work in question will be carried out during the years 1937, 1938 and 1939.

In connection with the danger of malaria arising from fish culture in rice-fields, it has been shown that the method of pisciculture followed by the natives (the so-called " popular pisciculture ") is accompanied by great risks. In this method, water is allowed to accumulate in the " sawahs " after harvest and the rice-stalks are not cut down. In a large number of instances, a marsh vegetation develops on the " sawah " and the " galangans " (narrow dykes surrounding the " sawahs ") are not kept free from grass and other vegetation (Figure 12). When this method of " sawah " pisciculture is followed, *A. aconitus* larvæ are repeatedly found in the " sawahs ".

A search was made for a better method, and it appears that, when the so-called " educational method " (Figure 13) is used, no *A. aconitus* larvæ are met with in the " sawah " fishponds.

According to this method, the people are taught to cut the rice-stalks and lay them in heaps. The surface of the water is clean and the " galangans " are kept free of vegetation. Small marginal ditches should be dug and the earth so obtained used to raise the level of the dykes. A depth of water of 30 cm. (12 inches) is desirable.

When the so-called " hygienic method " (Figure 14) is followed, a step farther is taken and the cut straw is cleared away entirely.

Furthermore, a propaganda campaign has been begun with a view to informing the people of the use of the hygienic exploitation of the " sawah " fishponds.

In the case of the permanent fishponds, care must be taken to keep them also free from vegetation ; the surface of the water should be clean ; the " galangans " should be kept bare of vegetation and the water depth in the pond should be at least 40 cm.

It is strongly recommended that, in both permanent and " sawah " fishponds, a number of *Haplochilus panchax* (in Malay, *ikan kepala timah*) should be placed. This small fish feeds on mosquito larvæ.

During the past few years, increasing attention has been paid to " sawah " malaria. So far as possible, the advice is given : " Plant all ' sawahs ' at the same time ; after the harvest, leave the ' sawahs ' dry and attend to the irrigation ditches." In districts with the so-called natural irrigation, it is, however, impossible to carry out these instructions fully.

Very much the same methods as were adopted for suppressing the " sawah " malaria in the Tjihea Plain, where *A. aconitus* was the carrier, can be recommended for combating malaria in various parts of South Sumatra.

In various colonisation centres in South Sumatra, malaria is endemic, the carrier mosquito being *A. hyrcanus*. The *A. hyrcarnus* larvæ are found particularly in " sawah " districts in enormous numbers between ripening crops, in " sawahs " lying fallow after the harvest, in neglected irrigation canals and in swamps. If the " sawahs " are naturally irrigated, the density of the *A. hyrcanus* will increase, for which reason, in these districts too, it would be advisable to recommend a technical irrigation system in which drainage is carried out.

Further, a water and planting schedule should be instituted providing that, shortly before the harvest, all inflow of water should be stopped ; that planting of all the " sawahs " must take place as far as possible at the same time ; that all the " sawahs " should be dried out after the harvest and that the irrigation canals be kept scrupulously clean—in other words, measures analogous to those taken when applying sanitation measures to the Tjihea Plain, although there malaria was transmitted by another kind of mosquito.

The measures applied in the Tjihea Plain for combating the danger of malaria in connection with " sawah " fishponds and permanent fishponds could also be applied here.

The Periodic Drying-out of Rice-fields.

The method of periodically drying out the " sawahs " has also been fully studied ; SMALT (Singaradja, in Bali) was one of the first to apply this method and to observe its influence on the larval fauna.

In his experiment, the " sawahs ", after having been flooded continuously for nine days, were then dried out for two consecutive days, the process being repeated as long as necessary. The result was a destruction index of the larval fauna of 75%, compared with a control " sawah " complex which was continuously irrigated. If it proves possible to secure such a reduction as this in applications on a large scale, a considerable decrease in malaria cases may be expected.

In the first experiment, the fields thus periodically dried proved to yield 7.4% less paddy. This may, of course, be a mere coincidence, but will have to be carefully controlled before such measures are applied too widely. Such experiments will be made in various places.

The results of such experiments in Indo-China appear, in this connection, to be very hopeful.[1] The periodic drying-out as applied there was very rigorous, however, since in every six

[1] M. ANTOINE : " Prophylaxie rurale du paludisme par irrigation alternée des rizières ", *Bull. Soc. Méd. Chir. de l'Indochine*, No. 6, June 1936, page 129.

days the experimental complex was only irrigated for three days, the result being that the " sawahs " were *completely* dry for twenty-four hours out of the six days. In these experimental " sawahs ", not a single larva was found ; the quality of the paddy was equal to that of the control fields and the yield per hectare practically as great, although there, too, the experimental fields had a somewhat smaller yield than the controls. In Indo-China, also, further experiments will be made and the work extended to other districts.

One thing must not be lost sight of, and that is that all these measures are only applicable where a proper irrigation system exists with a well-regulated supply and drainage of irrigation water. A primitive " sawah " irrigation system renders the application of such measures impossible ; " sawahs " which depend on rainfall for water are also obviously unsuitable for the application of this method.

Salt-water Fishponds.

With interest in fishpond questions growing greater and greater during the past few years, especially in the coastal districts, more and more fishponds have come under control.

The researches of VAN BREEMEN showed, amongst other things, that there was a definite relationship between the presence of salt-water fishponds and coastal malaria.

Abolishing the fishponds would entail a great economic loss. According to the latest data, the total area of the fishponds in Java and Madura was 69,256 hectares (171,135 acres). At that time, no other solution of the problem was known. Probolinggo and Banjoewangi, two important places on the east coast of Java, were therefore treated by opening the fishponds to free connection with the sea.

However, when WALCH, collaborating with REYNTJES, turned his attention to this problem, it proved that another solution was possible whereby the fishponds could be retained. Since that time, this method has been known as the " hygienic fishpond exploitation method ".

The principle involved is that the ponds must be so exploited as to ensure that the surface of the water remains free of all

vegetation and thus free from the larvæ of malaria-carrying *anophelinæ*, in this case usually *A. ludlowi* var. *sundaica*.

Since this mosquito specially likes to breed between the long-fibred floating algæ (*Enteromorpha, Chætomorpha, Spirogyra*) (Figure 15), where it is protected from the attacks of the larvivorous *H. panchax*, the ponds are dried out once a month in order to free them from these surface algæ. During the drying, the fish seek the deep water of a ditch dug in each pond around the margin. The long-fibred algæ are stranded on the raised central portion and are rapidly killed by the sunlight (Figure 16). A very shallow layer of water is then left over the central portion of the pond in order to encourage the growth of the weeds rooted in the bottom of the ponds (Cyanophyceæ), which form a suitable food for the fish (bandeng, Chanos-chanos). Under the influence of the sunlight, this thin layer of water on the central portion is very stimulating to the growth of the " bottom " or " blue " algæ. After having been dried, or rather drained, the pond is filled again with fresh sea-water (Figure 17). The result is a clean pond without algæ or anopheline larvæ. It is essential, however, to stock each pond with the *H. panchax*.

Between the years 1928 and 1932 inclusive, over 291 hectares (719 acres) of fishponds were improved along these lines on the northern boundary of the municipality of Batavia. The length of the coast-line thus treated amounted to 4 kilometres (about 2½ miles). The cost amounted to 2,000,000 florins, of which 750,000 florins were required for buying up ponds.

Since a few complexes of fishponds still dangerous from the point of view of malaria and lying to the east and west of the improved ponds could not be dealt with on account of the financial depression, malaria has not been entirely eradicated from the Old City of Batavia. However, a great reduction in the splenic indices, in the percentage of large spleens and in the annual mortality has been observed in the regions in the neighbourhood of the improved fishpond complexes.

The increased attention focused on the fishponds by this new method of exploitation resulted in the increase of the personnel working in the Service of Inland Fisheries. These persons are employed in instructing the natives in the best methods of fishpond exploitation.

Although this method of sanitary exploitation was first begun in the large centres, *it spread slowly along the entire north and east coast of Java—in other words, over the " rural areas "*. Large sums of money for the purpose of furnishing work were made available by the Government for improving fishpond complexes and, had the financial crisis not set in just at this period, the rent of the fishponds would have gradually covered the Government expense.

But it is not only by Government aid and other subsidies that improvements in the fishpond belt have been brought about ; the people in many places have shown a readiness to co-operate. Persons who are not inclined to change their methods for the purpose of combating malaria are glad to do so when the economic advantages of the change have been pointed out to them.

STOKER gives an attractive example of this from his experiences. He refers to an article written by the Officer of Inland Fisheries at Surabaya, M. SCHUSTER, entitled, " Notes for and from Practical Work ", published in *Landbouw*, Annual Volume XI, No. 2, August 1935. It concerned, in this case, a complex of fishponds in the district of Porrong, in the Regency of Sidoardjo (East Java), almost 500 hectares in area. The supply of sea-water for these ponds was carried along a canal 5½ kilometres in length, the Boejoek River, which was, however, of very insufficient capacity. The result of this was that the complex could not be exploited very efficiently. In 1930, the rental value of these ponds had even fallen to below the sum for which they were assessed in ground tax.

In 1934, one of the ponds in this complex was rented by the Service of Inland Fisheries. It had an area of 13 hectares and was to be exploited in collaboration with the natives as a demonstration. By an intensive preparation of the bottom and special care with the fry, a considerable number of fish could be raised to full size there, while in a large number of the native-exploited ponds the yield was a failure.

But, in spite of this success, the experiment proved conclusively that an efficient improvement of the pond complex could only be attained by increasing the capacity of the supply channel.

As a result of the good stock of fish yielded by the demonstration ponds, the people's interest in their ponds, which had already been partially abandoned, was again aroused. The local civil service officer now called a meeting of the village headmen and the owners of the ponds (" tambaks "). The fish-breeders at once declared themselves prepared to contribute at the rate of 10 cents per bouw (1 bouw = 1.75 acres) of pond surface towards the costs of the necessary improvements, while the village headmen declared in the name of the people that they were prepared to carry out the work in free village labour, but that they would be very grateful to receive a small recompense in the form of money for food for the labourers.

The work was finished in a week. From 800 to 850 men worked each day. The results were not long in coming. Within a few weeks, it was already possible to begin catching shrimps, which can only be done when there is a good supply of sea-water available and which represents an important source of profit for the fish-breeders. The ponds themselves are now easier to maintain and the yields are increasing as the pond flora changes, giving rise to a more favourable food balance for the fish.

A third, and certainly no less important, benefit is that through the improvement in the supply of water the ponds now offer no opportunity for the development of mosquito breeding-places and have become harmless from a hygienic point of view. The satisfactory results obtained by this improvement in the Boejoek River lead to the expectation that further problems may be susceptible of solution by similar co-operation.

This small piece of sanitary engineering has been handled at such length because in this case there was no malaria specialist involved, but a specialist in an entirely different line. By following his advice, in consequence of which the economic value of the fishponds was increased, the danger of malaria was reduced at the same time. This is a most fortunate occurrence, for had it been otherwise, as has already been pointed out, there would have been no question of getting sanitary engineering applied to the fishponds in rural districts ; at least, not in the times through which we are now passing. The advantage of such engineering measures carried out by the people themselves

and within their direct comprehension is, further, that the service and maintenance of the exploitation system are also much better guaranteed.

To a certain extent, in contrast with the above, the engineering works undertaken in the fishponds in the Regency of Panaroekan (Alasmalang, and partly also in the town of Panaroekan) may be cited. Funds were made available by the Regency of Panaroekan for improving the fishpond complexes. Under the leadership of the local Regency Director of Public Works and with the advice of the Malaria Control Service and that of Inland Fisheries, rather costly engineering works were carried out, as a result of which the hygienic exploitation of the fishponds was rendered possible. When everything was finished, however, it appeared that the owners of the fishponds were not at all inclined to follow the new system of exploitation, as a result of which all the work might have been worthless. Fortunately, the propaganda campaign thereupon carried out by the Service of Inland Fisheries has already been able considerably to modify the attitude of the fish-breeders towards the new method of exploitation.

It would appear, therefore, that the system most to be recommended is first to give the people a demonstration of the new method in order that they may understand what it is all about and at the same time realise that it carries with it economic advantages. When the new ideas have once sufficiently penetrated, it is time enough to pass decrees and regulations making it possible to compel the few, who through stubbornness or malice can do so much to spoil the efforts of their neighbours, to adapt themselves to the public welfare.

Lagoons.

In addition to the salt-water fishponds, the closed-off lagoons form the principal breeding-places for *A. ludlowi* var. *sundaica*. These lagoons are found along the west coast of Sumatra, the south coast of Java and the Lesser Sunda Islands, in which regions the brackish-water breeder *A. ludlowi* is responsible for a severe chronic endemic malaria.

Many rivers can only maintain their outlet to the sea open in the rainy season ; and there are some where even that is not possible. At the mouths of these rivers, through the combined action of the stream and the surf, a bar is formed and built up into a sand wall on the coast-line, through which the river, on account of the small volume of water, especially in the east monsoon, cannot pass. Behind this sand wall, lagoons are formed which lie parallel to the coast.

Small sanitary engineering measures have been carried out along the north coast of Madura, where various villages were suffering from a serious form of malaria caused by *A. ludlowi* breeding in lagoons near the coast. These consisted in building small jetties out into the sea for the purpose of keeping the lagoons open. In a few places—*e.g.*, Sergang—good results were obtained by this method. On the south coast of Java, however, this method would be too costly, since the force of the stream and surf there is far greater. The jetties would therefore have to be much more stoutly built and extended farther out to sea.

As a rule, it is impossible for the people themselves to keep the lagoons open. As a pleasant exception to this rule, STOKER mentions the K. Rawaan district on the south coast of Java. As a result of migration from other parts of Java, quite a large number of people settled here and began to lay out " sawahs ". Whenever the river mouth becomes choked up, the " sawahs " are flooded. When this happens, the people cut through the obstruction, so that for three years the mouth of this river has remained open. Part of the old lagoon has already been filled in and malaria has been greatly reduced.

Since experience gained in other parts of Java show that *A. ludlowi* var. *sundaica* does not willingly breed in shady places, an attempt has been made to afforest the lagoons—amongst others, the Rawah Kalong, near Pelaboean Ratoe, on the south coast of Java. For this purpose, various kinds of " pandan " were used at Pelaboean Ratoe. Up to the present, the results achieved have not been a great success ; the growth of the plants has been satisfactory.

Studies are being made of the possibilities offered by the method of keeping the lagoons free of vegetation and stocking

them with larva-eating fish, such as the *Haplochilus panchax* or *Gambusia affinis*.

Fresh-water Fishponds.

The fresh-water form of *A. ludlowi* was first discovered by SCHÜFFNER and SWELLENGREBEL in North Sumatra in the longitudinal valleys of the Barisan Ranges in Greater and Lesser Mandailing, in Rao Panti and Padang Sidempoean, up to an altitude of from 1,640 to 3,280 feet, and especially in fresh-water -fishponds. It is a remarkable fact that in some of these fishponds *A. ludlowi* did not seem to care to breed, while in other adjacent ponds the larvæ were found in large numbers, although, at a casual glance, all these ponds presented the same appearance. Further investigation will be needed to determine to what this peculiar phenomenon is due.

On the advice of RODENWALDT, it was decided in 1927, in an area of 3 kilometres radius around the most important population centres (Padang Sidempoean, Hoeta Nopan and Sipalangka), to empty the fresh-water fishponds and let them dry out, in order to combat the severe chronic endemic malaria. The intention was that, after being drained, the ponds should be converted into " sawahs ". The result of the drying-out of the ponds was very satisfactory; the splenic index fell off at Penjaboengan, for instance, from 92% in 1917 to 44% in 1930, while the percentage of large spleens also decreased (in 1925 it was still 19%; in 1930, only 1.5%).

From previous observations, it appears that there is no further fear of a breeding-place deviation of the *A. ludlowi*. At first, the possibility of such a deviation could not be excluded. However, after the ponds had been dried out, it was seen that the *A. ludlowi* did not subsequently breed in " sawahs " or pools. Occasionally *A. ludlowi* larvæ could be demonstrated in the " sawahs ", flooded after the harvest with the intention of rearing fish, especially after surface vegetation had developed in them. Such a " sawah " fishpond then takes on the characteristics of a permanent fishpond. These observations have also demonstrated that it is undesirable to rear fish in rice-fields in these districts.

More recently, WALCH and REYNTJES took up the study of the biological sanitation of fresh-water fishponds. This method aims at obtaining a clean water surface by stocking the ponds with " tawes " (*Puntius javanicus*)—a fish which lives principally on the surface vegetation, such as *Hydrilla verticillata* (Djaria-moen). At the same time, the ponds are also stocked with *Haplochilus panchax*, and the margins of the ponds are kept free of marginal vegetation.

Such a biological sanitation of fresh-water ponds was carried out, amongst other places, in the Ketahoen Plain (Moeara Aman, in the Residency of Benkoelen, South Sumatra) in 1934, with a view to checking the malaria in this district. The carrier mosquito here is *A. hyrcanus*, which breeds in the fishponds amongst other places. The result was a marked decrease of the splenic indices. A similar attempt was also made in the region of Rao Panti, in Sumatra's West Coast, where the fresh-water *A. ludlowi* is the carrier. No results can be given as to this latter test, since it is still in its initial stages.

Experiments with " Shading " as a Control of A. maculatus.

As early as 1930, this biological method of combating *A. maculatus* was begun in West Java.

As a rule, when new estates are laid out, the virgin forest is cut down and the ravines are denuded of timber. In this way, all the conditions favouring the breeding of *A. maculatus*, which is a sun breeder, are created. This anopheline breeds principally in hill and mountain districts in dead eddies formed in running streams, in springs and in neglected drains, but always in sunny places. The object of the shading is to restore the original " jungle " and deprive the *A. maculatus* of its chance to breed.

This shade system has been applied on various estates in West Java with success. In addition to the bush *Tithonia diversifolia* (marigold), other trees and shrubs were also used for this with success, amongst which are *Ochromo lagopes* (" balza ") and *Cassia alata* (" kimanilla "). Since the furnishing of shade on the estates also redounds to the benefit of the population in the rural districts, this method of combating

mosquitoes may also be included in the group of measures being taken to control malaria in such rural districts.

Generally speaking, we can say that, *in controlling malaria in rural districts, the biological methods must come first,* being, amongst others, the hygienic exploitation of salt- and fresh-water fishponds and rice-field fishponds, the periodical draining of rice-fields, shading, etc. It is especially necessary to use biological methods *which are not costly.* It is in this direction that the anti-malaria service has to look for the solution of malaria problems in rural districts.

Appendix 4.

A. ludlowi var. *sundaica.*

Breeds especially in brackish water near the coast, and in the brackish-water fishponds and shut-off lagoons. In general, it prefers a low salt content (optimum from 5 to 15 per mille). There is a fresh-water variety in the interior of North Sumatra, which breeds in the fresh-water fishponds at an altitude of from 500 to 1,000 metres (1,640 to 3,280 feet) (Mandailing).

A. aconitus.

The larvæ of *A. aconitus* are found both in the plains and in the mountains, in rice-fields with ripening paddy, in fresh-water fishponds, in neglected irrigation canals, but especially in wet rice-fields lying fallow after harvest. It is found, but in smaller numbers, in running water (brooks).

A. minimus.

The larvæ, in contrast to those of *A. aconitus,* are more commonly found in running water ; to a far less extent in rice-fields and fresh-water fishponds. These larvæ are more restricted to mountainous regions than those of *A. aconitus.*

A. minimus var. *flavirostris* breeds principally in sunny spots in brooks and irrigation canals.

A. maculatus.

The breeding-places are found exclusively in the hilly and mountainous districts, especially in quiet spots in mountain rills and in little springs in sunny places. Sometimes they are also found in rice-fields in hilly districts.

A. hyrcanus.

The larvæ are found in pools, in swamps, in fallow rice-fields after harvest, in badly-kept-up irrigation canals. *A. hyrcanus* is a regular swamp mosquito.

A. subpictus.

The breeding-places of this mosquito are the same as those of the coastal *ludlowi*, but it also breeds in fresh water far from the coast (in rice-fields in the interior, amongst other places). On the other hand, it can tolerate very high salt concentrations (up to 84 per thousand). The larvæ are less attached to floating vegetation in the water than are those of *A. ludlowi*. For instance, they are found in fishponds with a perfectly clean surface and, in Madura, in salt pans without any vegetation. The larvæ of *A. subpictus* have, therefore, a much more extended series of breeding-places at their disposal than those of the coastal *ludlowi*.

A. kochi.

Is spread over almost the whole of the archipelago. It breeds in pools in the virgin forest, in muddy pools on roads, along the overgrown banks of mountain burns, in rice-fields. It shows a marked tendency to adapt itself to various collections of water.

A. leucosphyrus.

The larvæ have a special preference for shade and are found in springs and pools in the virgin forest. *They are also found in buffalo prints and wallows.*

A. umbrosus.

Breeds along the coasts of Borneo and Banka, but also in the interior. It chooses both fresh and brackish water, in pools, ponds and marshes, mostly in the shade, but occasionally in the full sun.

A. punctulatus typicus.

Breeds in all possible collections of water : in footprints into which water has seeped, in drains, even in tins, boats and water-tubs. It may be found either in clear or in turbid water, but not in running water along the banks of large rivers, while it has a *special preference for open and sunny places.*

A. punctulatus typicus var. *moluccensis.*

This also breeds in artificial or natural collections of water, even in brackish water. It flourishes in drains, in rapidly running streams, in puddles and in pools, but always in *sunny places.* It also breeds along the banks of the large rivers.

A. barbirostris bancrofti.

The breeding-places have only recently been found in the interior of Netherlands New Guinea ; they are the banks of a small lake in the interior between water plants and in shady places. On the coasts of South New Guinea, the breeding-places have been found repeatedly.

2. Plague.

(a) *History.*

The plague epidemic in the Netherlands Indies may be regarded as part of the pandemic which became prevalent in the world at large in 1894 and originating in the ports along the China coast. So far as is known, before that time there was no pandemic or selvatic plague in this country. The infection in all probability reached the East Indies along the sea routes connecting it with South China and with the ports of Rangoon and Bassein. Rice cargoes must have formed the medium of transportation and the harbours the *portes d'entrée* of the infection. (Rat) plague was observed consecutively in Belawan Deli (in 1905) and Palembang (in 1920), in Sumatra ; and in Surabaya (in 1911), Samarang (in 1916), Batavia (in 1920) and Cheribon (in 1923), in Java ; and further in Macassar (in 1922), in Celebes.

Spread.

It is only for Java with its very dense population that the infection has had any permanent and important consequences. In Sumatra and Celebes, it quickly disappeared.

In Java, considerable plague areas developed in the hinterland of the seaports ; notably in East Java (Surabaya) in 1911 to 1915, in Mid-Java (Samarang) in 1916 to 1925, and in West Java (Cheribon) in 1923 to 1932 (see Map 1).

Extent of the Epidemic.

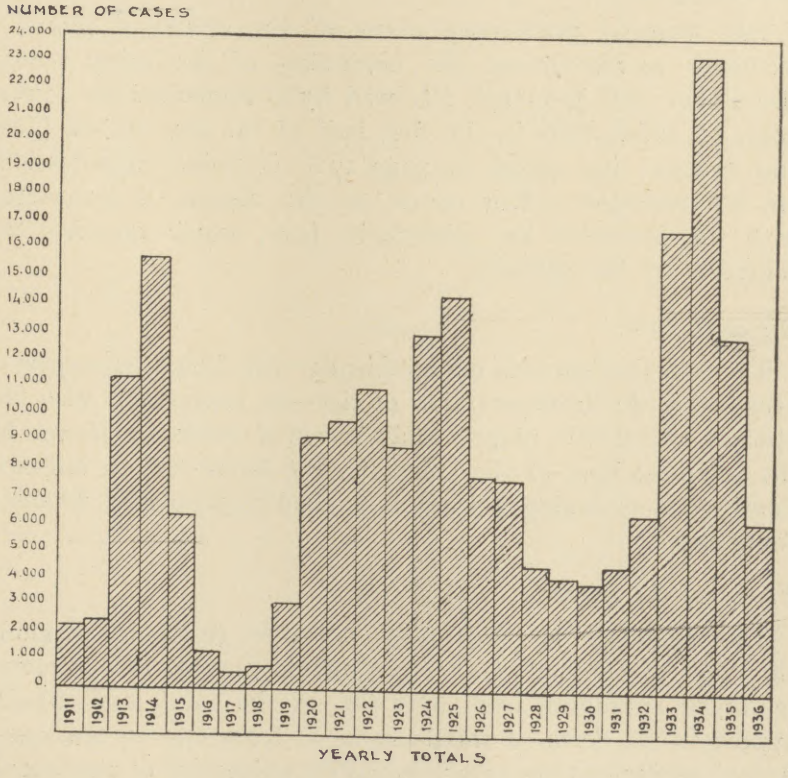
The endemic plague centres have included up to the present time 11 residencies, 36 regencies and about 600 sub-districts, with a population of around 10,000,000 persons. Large portions of this area have, however, in the meantime, been freed again from the disease. The actual plague area lies for the greater part in West Java and the remainder in Mid-Java. It consists of 5 residencies, 13 regencies and about 80 sub-districts, with a population of about 2,500,000 persons. The total number of registered deaths caused by plague from 1911 up to the end of

Map 1.


JAVA SEA
CHERIBON
SEMARANG
SOURABAJA
INDIAN OCEAN
KEY
FORMER PLAGUE AREA
PRESENT PLAGUE AREA

1936 amounted to 207,666 (see graph below). Of these deaths, 39,158 occurred in East Java, 103,823 in Mid-Java, and 64,685 in West Java. There has been practically no more plague in East Java since 1917 ; in Mid-Java the epidemic has decreased very markedly since 1928. In the year 1936, the number of deaths in the whole island amounted to 6,187, of which 4,490 were in West Java, 1,693 in Mid-Java and only 4 in East Java. In connection with the housing conditions, in Java, plague is almost exclusively a disease of the native population ; the houses of the European, Chinese and other population groups generally provide greater protection from plague.

Cases of Plague during the Period 1911 to 1936.



(b) *Epidemiology.*

Topographical.

The Java epidemic shows a distinct preference for hill country above 1,600 feet, where the climate approaches the subtropical and where there is always a high relative humidity. Only thinly populated mountainous districts remain free.

Ethnographical.

There is no definite preference as regards sex, race or age; only the very young infants are spared by the disease. That by far the most victims are natives follows from their enormous numerical preponderance over all other races and, moreover, is a result of the particular housing conditions of that group.

Climatological.

The seasonal prevalence curve of the epidemic shows a recurring maximum at the beginning of the rainy season (December and January), followed by a remission the lowest point of which falls in the first half of the dry season (July and August) (see graph on page 171). Complete intermissions are not recorded. This course of the disease is connected with the prevalent sea climate in Java, which modifies the contrasts of the seasons.

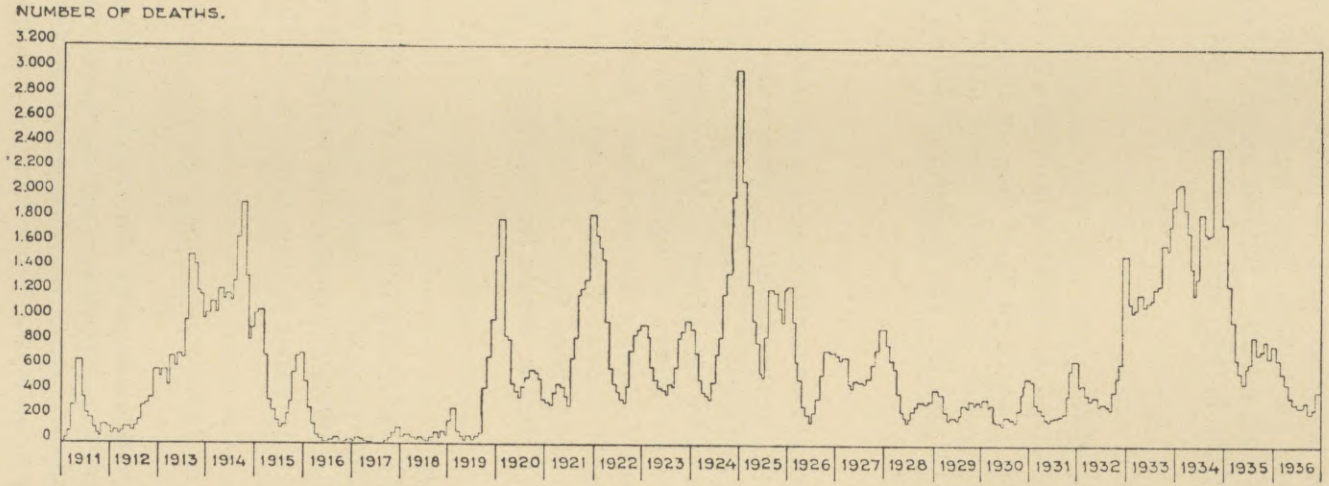
Dissemination.

The infection spreads metastatically with freight transport—principally the transportation of rice—in connection with the absence of selvatic plague and the small tendency shown by the principal host of the epizootic, the house-rat, to migrate. Continuous spreading is limited to thickly populated dwelling complexes.

Forms of the Disease.

The epidemic is principally parasitic (bubonic plague); the cases of contact plague (pneumonic plague) form a small minority, averaging from 6 to 8% of the total, and usually appear in the form of small chains of from two to ten cases. Actual explosions are rare; complete epidemics of pneumonic plague do not occur. The cases of parasitic origin show, in the

DEATHS FROM PLAGUE BY FOUR-WEEKLY PERIODS, 1911-1936.



majority of instances, positive buboes and, in the minority of instances, no buboes (septicæmic plague) ; monolymph-adenitis is predominant. Buboes appear more commonly in the groin than in the axilla or neck. Skin plague seldom occurs.

Virulence.

Plague in Java is, as a rule, very malignant. The mortality of the various forms agrees approximately with figures from British India : 60 to 70 % of cases of bubonic plague, about 90% of septicæmic cases and nearly 100% of the cases of pneumonic plague die. The majority of victims die in from four to six days.

Hosts.

The principal host in all the plague areas is the brown Malayan house-rat (*R. rattus diardii* s. *Mus rattus diardii*). In the mountains, in addition to this rat, an occasional visitor to houses is the *R. concolor ephippium* s. *Mus concolor ephippium.* The part played by *Rattus norvegicus* s. *Mus norvegicus* is very limited, since its haunts are practically limited to the seaports, and the same is true of *R. concolor otteni* s. *Mus concolor otteni.* Plague has never been found to attack epidemically the field or " sawah " rat, *R. rattus brevicaudatus* s. *Mus rattus brevicaudatus.*

Transmitters.

The vector *par excellence* is the flea *Xenopsylla cheopis,* which is universally prevalent among the above-mentioned hosts. *X. astia* and *Stivialis cognatus* are of little or no significance. *X. astia* is only found locally along the north coast of Java.

(c) *Controlling the Disease.*

For the organisation of the attack on plague, the reader is referred to pages 175 and 177. So far as the methods used for controlling plague are concerned, the following remarks may be of interest.

Pneumonic Plague.

This is dealt with by the strict isolation of patients and contacts. Through carrying out inquests in plague-stricken districts, and particularly by the use of lung and splenic punctures, it is possible to determine, even after death, which persons were suffering from pulmonic infections. The so-called "information service" carries out these inquests and also sees to the tracing of suspected cases of sickness or death and of the contacts.

Isolation is carried out for a period of ten days in simple barracks specially built for this purpose. The number of inquests performed during 1936 was 87,076, while 10,407 persons were placed in isolation.

Bubonic Plague.

This is being attacked by a systematic improvement of houses and buildings in the infected areas. In addition, vaccination is being used as an accessory means of attack.

Plague Vaccination.

Since January 1935, mass vaccination with OTTEN's living plague vaccine has been carried out.

Shortly after the first outbreak of plague in 1911, vaccination with killed vaccines was used; this was repeated some ten years later (1920 to 1922) by the method of alternation. The conclusion drawn from these experiments aroused no hope of obtaining satisfactory results by the application of the method systematically.

Moreover, OTTEN observed that with killed vaccines, while a large percentage (84%) of white rats and monkeys (*Macacus cynomolgus*)—neither animal being very susceptible to plague infection—were protected, only 11 to 20% of the highly susceptible house-rats and guinea-pigs were protected. This led him to seek a more active, if possible a living, vaccine, by the use of which the more susceptible animals, such as house-rats and guinea-pigs, and in that case also human beings,

could be protected with certainty against an infection with virulent plague organisms. To this end, he used a strain of *Bacillus pestis* that had become spontaneously avirulent, which was isolated from a dead plague rat found in the district of Tjiwidej. In experimenting with this strain, it was seen that a bacteriological dissociation was taking place : in the cultures there appeared two entirely different types of organisms. One forms colonies called by OTTEN the " smooth " type (typical in form with a marginal area), the other forms " rough " colonies (without the marginal area). These show great differences in antigenic power.

While the " smooth " vaccine was capable of exciting a very high grade of immunity (with from 82 to 98% of surviving animals), the " rough " vaccine only reproduced the protective power of the old dead vaccines (with from 22 to 29 % of surviving animals).

The results of a large number of animal experiments with the " smooth " vaccine during more than four years were so satisfactory that OTTEN, after convincing himself of the innocuity of the vaccine by injecting it into human volunteers, began in November 1934 with an extensive experimental vaccination by the method of alternation (at that time, 37,000 persons were vaccinated). As a dose, adults received 1/10 of an agar culture (= 1½ milliard germs, of which one-third were alive), while children received half of this dose. Even with this large number of injections, practically no reactions were observed. As a result of this experimental vaccination, in the course of the next six months the mortality from plague was reduced by about a tenth.

In 1935, 2,391,024 vaccinations (original and re-vaccinations) were made with this vaccine ; in 1936, there were 1,827,629, the majority being, of course, re-vaccinations.

In all, during 1935, about 3,000 and, in 1936, about 2,000 litres of plague vaccine were prepared by the Pasteur Institute in Bandoeng. It is obvious that the production of such masses of living vaccine is subject to vastly greater difficulties than the preparation of the ordinary vaccines where the organisms are killed and the injection material kept sterile by the use of disinfectants or by heating.

The results achieved appear from the fact that the mortality from plague fell from 23,239 cases in 1934 to 12,995 in 1935 and 6,187 in 1936. There is no evidence that this decrease in mortality could have been caused by a decrease in the virulence or extent of the epidemic.

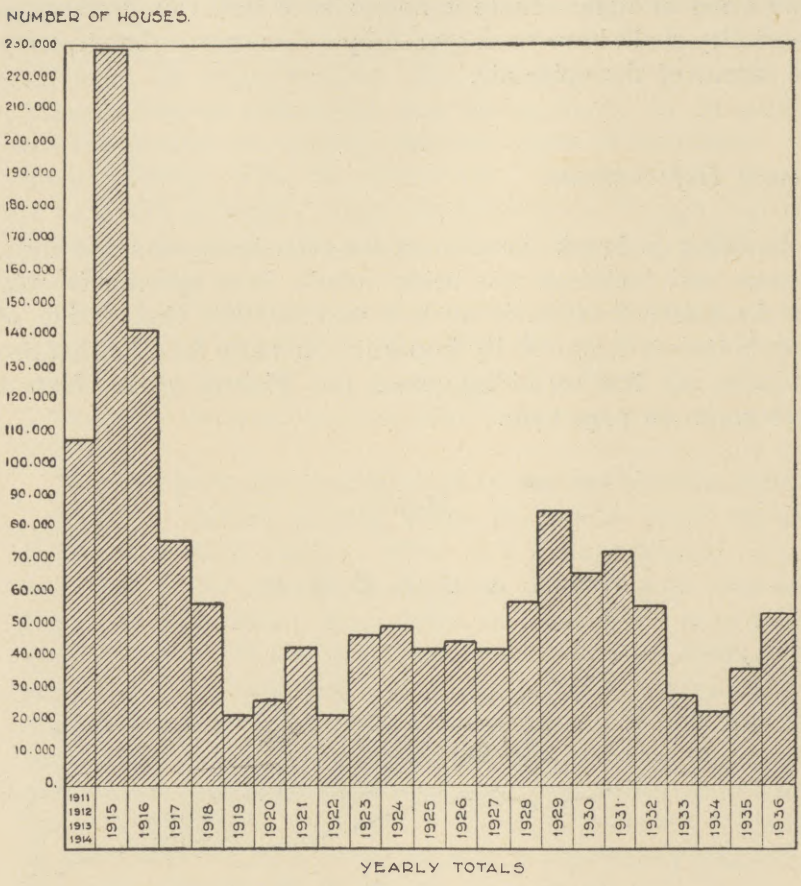
House Improvements.

In order to break the contact between house-rats and men, houses and buildings are being rebuilt in a systematic way in the infected areas, in such a manner that the nesting of rats in houses is practically impossible and any rats that happen to exist can find no hiding-places (see Figures 18-21, Map 2 and graph on page 176).

Map 2.

The principal devices are the replacement of the "atap" (thatch) roofs by roofing tiles, the removal of double walls, and the rendering of all bamboo used in the structure unsuitable as breeding-places for rats; the bamboo is replaced by wood wherever possible, otherwise it is sealed effectively at both ends. The effect of this structural improvement is enhanced by

ANTI-PLAGUE SERVICE: NUMBER OF IMPROVED HOUSES.



subjecting the houses to regular inspections to encourage good maintenance and efficiency. This measure of house improvement has been carried on uninterruptedly since 1914 in all places where plague either rages or threatens to penetrate. The number of " improved " houses treated along these lines has now reached about 1,430,000, of which no less than 53,418 were handled during 1936.

Furthermore, by carrying out a strict control of building, care is taken that in the " improved " areas no new houses are

put up that would constitute a plague menace. The number of new houses, the building of which has been controlled by the so-called Building Inspection, amounts now to about 680,000, of which 69,000 in round numbers were erected in 1936.

Watching the Ports.

The importation of plague infection is prevented by the application of ship-inspection, in this case deratting and quarantine.

The Government of the Netherlands Indies annually assigns the sum of about 1,100,000 florins for plague prevention. Prior to the economic crisis, considerably larger sums were spent annually.

3. Ankylostomiasis.

By reason of the customs of the people in rural areas of the Netherlands Indies, the pollution of surface soil and streams is far more common than the use of latrines, and investigations in rural areas show sometimes that as many as 80 and 90% of the people are infected with intestinal parasites.

Although in most rural areas the proportion of people infected with hookworms is high, the number of worms per infected person, as determined by recent surveys, is not high. Various reports, surveys, and investigations show that, in the period just following the organisation of the Civil Medical Service in 1911, the average number of hookworms per infected person was high and real hookworm disease existed, but that various measures carried out over a number of years gradually reduced the severity of the infection. A general survey of Java in 1924 showed that the infection had already been reduced and gave for that year the average number of worms per infected person as 81 for males and 62 for females. The present averages are about 50% lower. Surveys, re-surveys and other investigations have nearly all been based upon the Stoll method of examination of fæces.

It can be said, therefore, that ankylostomiasis in the sense of a real disease is at present not very common in the Netherlands Indies.

The general decrease in the occurrence of this disease can be attributed to several factors. There are, of course, many local " natural influences ". The people who live in the mountains defecate in the swiftly running streams. In Bali, the pigs and dogs consume fæcal matter as soon as it is deposited on the ground.

The most important factors, however, are the active measures carried out by the Health Service, hospitals, etc. An examination is made of a specimen of fæces of practically every patient who enters a rural hospital in the Netherlands Indies. Since soil pollution is so common, nearly all these patients have ascaris or hookworm eggs in their fæces. Since oil of chenopodium is useful for the treatment of both hookworms and ascaris, these patients all receive a thorough treatment with this drug before they are released from the hospital. All prisoners in gaols are examined and, if found to have intestinal parasites, are treated thoroughly. This method is also carried out in practically all institutions with inmates.

In all out-patient departments and rural polyclinics, the people are urged to undergo examination and receive treatment for intestinal parasites. The various campaigns against intestinal parasites, which include general educational methods, intensive hygiene work, treatment campaigns, latrine campaigns, etc., all tend to reduce the infection. Many estates in the Netherlands Indies have yearly intensive treatment campaigns for hookworm disease and in this way keep the infection on the estates reduced to a low figure.

Naturally, as in all other countries, the combination of hookworm disease and malaria gives very low hæmoglobin figures.

Surveys and investigations show that, of the worms recovered after special treatment for the purpose, 91.8% are *Necator*. Topography, type of soil, climate, density of population, occupation, etc., influence the disease in the Netherlands Indies in about the same measure as in other countries.

Re-surveys have shown that there is a marked decrease in the infection in areas in which intensive hygiene work for the use of latrines has been conducted.

4. Tuberculosis.

In spite of the fact that much difference of opinion still exists concerning the question as to which factors are the most important in the spread of tuberculosis, it is quite certain that tuberculosis is one of the diseases in which general physical resistance, especially in so far as resistance is determined by environmental factors in the widest sense of the word, plays a preponderant part. In addition, infection density is of influence, especially in the sense that in a heavily infected environment the chance is greater that contact with tubercle bacilli and —temporarily—reduced resistance on the part of the individual occur simultaneously.

The campaign against tuberculosis must, therefore, mainly rest on two principles : first, the raising of the collective resistance of the masses, and, secondly, the reducing of the chance of infection. It must not be forgotten, however, that a campaign brought to the perfection found in the United States of America and in many countries of Europe is, and must long remain, merely a devout wish of our physicians so far as the rural millions in Eastern countries are concerned, largely for financial reasons.

The attack on tuberculosis in rural areas of Eastern countries finds itself confronted, in the first place, with the practical question : How can the greatest possible effect be attained with the means available ? It must be admitted at once that little success is to be expected from a direct attack on the infection density until, at the same time, the other primary requirement—a better resistance-producing environment—is also carried out. The means to raise this resistance are all measures promoting the welfare of the people and improving the social level—for instance, by campaigns against other community diseases (*e.g.*, malaria and ankylostomiasis), studying and improving the diet of the people. In this way, tuberculosis is at the same time indirectly fought.

A primary requirement is, therefore, that the direct attack on tuberculosis may not be carried out at the cost of this indirect attack.

The direct attack, which aims at reducing the chance of

infection, may be effected in two ways, which, if correctly applied, must be in close connection and reinforce each other.

The first way is by raising the level of education of the masses and instilling in wider circles of the population, through efficient hygienic propaganda, an understanding of the infectiousness of the disease. Further, they should be made to understand how they can reduce the *chance* of infection by simple means. Keeping in mind the proverb, " The boy is father to the man ", the schools in the Netherlands Indies have already been used with profit to give school-children some conception of the infectiousness of pulmonary tuberculosis and the methods by which it spreads.

The second way is by trying, through treating and isolating persons suffering from open tuberculosis, to reduce the *density* of infection. Government and private initiative are working hand in hand to this end. In addition to the polyclinics and hospitals of the Public Health Service and local resorts, at which all diseases are treated, the programme calls for the organisation of a number of simple sanatoria for the care of consumptives.

The private institutions that concern themselves with combating tuberculosis are the Protestant and Catholic missions and the S.C.V.T. (Stichting Centrale Vereeniging voor Tuberculosebestrijding = *Institution of the Central Association for Tuberculosis Control*). The latter, by setting up a number of consultation bureaux equipped with the apparatus necessary for making X-ray examinations, has created just that number of centres for treatment and investigation. The effort in this direction must be not so much to attain perfection as expansion. The same is true of the *rural sanatoria*, which are constructed as simply but in as large a number as possible. Only in this way can the work be extended to include a considerable part of the inhabitants of the country.

It must be admitted that, in the present stage and with the means at present available, no really important direct reduction in the infection density, and therefore in *morbidity*, can be expected from treatment and isolation of patients in the rural districts. However, much suffering can be relieved and a large

number of human lives are saved by present-day methods when treatment is applied in time. This influences favourably the *severity of the cases* and the *mortality figures*.

Furthermore, this direct method of attack has high propaganda value, which can be greatly increased if the physicians in charge of the cases and the personnel of the consultation bureaux who make house-to-house calls bear constantly in mind that their task is not completed with the detection and treating of patients. Because of the great confidence placed in them by the people, they are the most appropriate persons to bring home hygienic ideas to the people and thus reduce the chance of infection.

The Association for Tuberculosis Control is working along the lines of these principles and will develop its programme similarly in the future. General improvement of dwelling-houses, improvement of the people's diet, and combating social diseases are all undertakings costing millions, especially among an almost entirely rural population with little education and accustomed to very low standards of living. Such undertakings are therefore not adapted to being carried out by an association with limited means. By reason of this lack of funds, the Association has had to choose simple measures to begin with and—retaining a central leadership—to decentralise its efforts as far as possible in order to be able to exploit the factors of " local interests " and " local means ". In this way, many *local branches* have been set up in the towns with their sphere of action in the towns themselves and in the neighbouring regencies. The branches work with their own money and with subsidies from the more local administrative units. Each of these local branches has its own consultation bureau, the personnel of which consists of a physician, nurses, and, for home visits, social workers, who are still being trained.

In the matter of treatment, these consultation bureaux have as their task the making of as many as possible sputum-positive cases among the poor into sputum-negative ones, thus eliminating an equivalent number of sources of infection. The better-situated patients are referred for treatment to their family doctors. Moreover, their work is explorative, social

(co-operation with associations assisting the poor) and hygienic (house-to-house calls). This hygienic task of the bureaux falls into the main task of improving the general hygienic condition of the people. It must begin with the individual : improvement in hygienic conditions in the home (cleanliness, etc.), lighting and ventilation in houses, prevention of the spread of infection (a separate sleeping-place for the patient), and improved diet. Hygienic habits must be taught (sputum prophylaxis). The attempt is made, by contact with the people (house-to-house visiting) and by courses for the more advanced school-children and teachers, to spread knowledge about individual and general hygienic measures to be taken against tuberculosis. Patients discovered by village (" kampong ") inspections are given the opportunity of entering local hospitals or local sanatoria.

These local branches are co-ordinated by being grouped into provincial groups. In Java, these include a province ; in the Outer Possessions, one and sometimes two residencies. These provincial groups maintain the contact between the various local branches situated in the province, are able to assist needy branches financially, and are in their turn dependent financially on money subscribed by the local branches in the form of contributions, on subsidies from the provinces and on assistance from the central headquarters. As a general rule, each province supports one sanatorium, to which patients of the local branches in need of sanatorium treatment may be sent. These sanatoria are well equipped and the effort is still being made to improve them. At the head there is usually a tuberculosis specialist. They are equipped with an X-ray outfit and other apparatus necessary for the special teratment of consumptives.

In addition to these more elaborate sanatoria, some of the local branches are to establish more simply equipped sanatoria, not so termed but which will form an intermediate stage between a simple sanatorium and a tuberculosis concentration camp or a tuberculosis hospital for the people. Ten of these simple sanatoria will be built—eight in Java and two in the Outer Possessions. It is hoped that the latter will receive, for three years, assistance to this end from the Government. It is expected

that this gesture will provide a stimulus for other local branches to found similar simple sanatoria with the financial aid of towns, regencies or private persons.

The more elaborate provincial sanatoria will be equipped as centres for the separate provinces, not only in the matter of caring for tuberculosis patients, but also for the general leadership of the work of local branches and the training of the necessary personnel. In this manner, the doctors needed by the local branches, as well as the nurses, attendants and social workers, will be duly trained. The latter will receive further training in the well-equipped local consultation bureaux.

The provincial groups, the directors of which have in their hands the leadership of tuberculosis control work in the provinces, are together under headquarters, which disposes of the central funds, indicates the general lines along which the work shall be carried out, and in general represents the S.C.T.V. to the public. In this way, it is attempted to build up an organisation whose branches reach out into the regencies, and in which the income and expenditure are as far as possible decentralised so that the burden shall be borne by as large a proportion of the population as possible. The work is greatly hampered by lack of funds. The capital of the association amounts to 170,000 florins (Netherlands Indian currency). The expenses of the association are met from the interest on this sum, from the collections from the annual sale of " Emma Flowers " (which brings in about 20,000 florins a year), and from a subsidy allotted by the Government. The practical execution of direct anti-tuberculosis measures is largely entrusted by the Government to the S.C.V.T. ; the execution out of indirect measures for raising the general hygienic level of the people cannot of course be undertaken with such limited funds.

There are at present fifteen consultation bureaux and four complete sanatoria (Figure 22) utilised by the S.C.V.T. In addition, ten simple community sanatoria are projected. There are also a few private sanatoria—namely, one in the Island of Sumatra (East Coast) ; and two sanatoria run by the Protestant missions in the Netherlands Indies. The number

of beds available in the sanatoria at the beginning of 1937 was about 500, while 600 additional beds will be provided in the community sanatoria.

In addition to these measures for combating or limiting the evil caused by tuberculosis, certain other considerations in connection with this disease apply in the Netherlands Indies. Besides the factors governing this disease that are known in Europe and other countries, there are still many problems that, even in those countries, have not yet been investigated or that, in spite of much research work, have not yet been solved. What is the situation in the Netherlands Indies with its indigenous native population living in a tropical country ? What about the susceptibility of these people to tuberculosis ? What is the customary course of the disease ? What influence has diet on tuberculosis ? What rôle is played by the vitamins ? How is the disease spread ? What factors dominate the infection possibilities ? As yet no exact answer can be given to any of these questions.

Are the factors that determine the propagation and prevention of tuberculosis in the Netherlands and in other European countries the same as those in the Netherlands Indies amongst the natives and the Europeans ? It is not the S.C.V.T. that will ever be able to supply answers to this question. The S.C.V.T. has as its task the practical attack on tuberculosis. However, working with the S.C.V.T. but entirely separate from it, there has also been founded the *Tuberculosis Study Committee*, whose duty it is to undertake the scientific study of the tuberculosis problem in the Netherlands Indies. It must consider the theoretical and scientific side of the problem in its broadest aspect. This Study Committee began its operations in 1936, and amongst other investigations it took up the question of the value of the von Pirquet and the Mantoux methods of studying tuberculosis among the various population groups of the Netherlands Indies, to determine which of these methods should be recommended as the method to be applied uniformly over the whole country for investigating the density of tuberculosis in various parts of the archipelago. Some such uniform method is essential if the results obtained in different places are to be comparable. Since this Committee only began its labours in

1936, little result could yet be expected in case of such a disease as tuberculosis. However, it has already been shown by various data collected that tuberculosis is a very widespread disease among the native inhabitants, especially of the cities, although it cannot yet be said that the entire rural population of the Netherlands Indies has already been attacked by tuberculosis.

In short, it may be stated that in the Netherlands Indies there are an organisation that is undertaking the practical campaign against tuberculosis and an organisation that is studying the theoretical and scientific side of the tuberculosis problem ; but—although these organisations exist—they have been in existence too short a time for any tangible results to have been obtained as yet. This need cause no surprise in the case of a disease such as tuberculosis. The principal thing is that the organisations are already in existence and—in direct ratio to the money available—can be expanded and built up without any difficulty.

5. Pneumonia.

The good results obtained in combating the more prevalent tropical diseases, such as cholera, smallpox and plague, warrant more attention being given to the occurrence and significance of the so-called " cosmopolitan " diseases in tropical regions.

In addition to malaria and tuberculosis, pneumonia is a disease which claims many victims among the native inhabitants of the Netherlands Indies. The great susceptibility of all races living between the two tropics to infectious diseases of the respiratory system is obvious from the detailed review published by Gautier in 1930. [1]

The epidemic occurrence of pneumonia amongst the inmates of penal institutions in Java had already induced several authors to investigate the epidemiology and clinical phenomena accompanying this serious condition (Kievit de Jonge, Hulshoff & De Langen, Leopold, de Granada). It was always possible, by improving housing conditions and especially by preventing

[1] Gautier, R. : " Tropical Pneumonia ". *Quart. Bull. Health Organisation*, 1932, I, 1, page 64.

overcrowding in the sleeping-rooms, to get rid of the major epidemics, although, according to NICOLAI, HEINEMANN, SNIJDERS & STRAUB, and VAN DRIEL, pneumonia still remained one of the principal causes of death both for adults and children amongst the natives on the estates of the Sumatra East Coast.

In the nature of things, it is virtually impossible to give any accurate data concerning the frequency of penumonia among the non-indentured native inhabitants. However, it appears from the statistics of the Public Health Service for the past fifteen years (1920 to 1935) that, in the three principal Central Civil Hospitals in Batavia, Samarang and Surabaya, an average of about 4% of all patients were treated for pneumonia. No differentiation was made between croupous and broncho-pneumonia.

In view of the rather high mortality (averaging 30%), which must largely be accounted for by the fact that it is principally severe and well-advanced cases that seek admission, it may well be assumed that pneumonia is anything but an insignificant disease among the non-indentured population.

Much more accurate data are available from services that exercise medical supervision over a large number of natives, whether soldiers, workmen or prisoners. The writers depart from former custom to the extent of differentiating clearly between genuine croupous pneumonia and the broncho-pneumonias ; furthermore, the type of pneumococcus or other causative organism is determined, so that the data are more comparable with those collected in other countries.

From the data collected in the " Statistische overzichten der behandelde zieken van de koloniale troepen in Nederlandsch Oost- en West-Indië " (" Statistical Review of the Diseases treated among the Colonial Troops in the Netherlands East and West Indies ") it appears that croupous pneumonia plays an important rôle among the diseases of the soldiers. The morbidity from pneumonia varied during the past ten years between 3% and 7% of the total strength, the mortality between 4.3% and 17.2%. Pneumonia accounted for 15 to 30% of the annual total loss through death in the army.

As may be seen from the following table, during the past ten years (1926 to 1935, inclusive), lobar pneumonia has played

a more important rôle, both as regards mortality and morbidity, in the army than typhoid fever.

Mortality and Morbidity of Typhoid Fever and Pneumonia.

Disease	Morbidity per thousand inhabitants		Mortality per cent of patients	
	Europeans	Natives	Europeans	Natives
Pneumonia	2.00	6.54	7.3	13.8
Typhoid fever . . .	1.77	1.00	6.0	9.6

It is striking that pneumonia is three to four times as frequent among natives as among Europeans (calculated per thousand per annum) ; mortality is almost twice as high among natives as among Europeans and exceeds that from typhoid fever. It is further of interest that a far higher percentage of recruits than of men with longer service get pneumonia, and the disease is more serious in character among the former group.

There are available, moreover, data concerning the mortality and morbidity of all diseases (including penumonia) among a large number (200,000 to 300,000) of (male and female) natives and Chinese, which were collected for some years and worked up statistically by the same author, van Driel. These figures apply to estate workers in the outer islands of the Netherlands Indies. Unfortunately, the physicians reporting these cases have also failed in many instances to differentiate between croupous and bronchial forms of pneumonia.

The following figures show the annual mortality due to pneumonia per 100,000 persons as reported by van Driel :

Annual Mortality from Pneumonia per 100,000 Estate Coolies in the Outer Islands.

Year	Deaths per 100,000
1930	195
1931	111
1932	111
1933	145
1934	211

At the same time, these statistics show that the mortality due to pneumonia was higher than that due to typhoid fever and dysentery together, including both the amœbic and bacillary types of dysentery.

Van Driel also collected for some years data concerning the rainfall and the average temperature variations in Medan ; contrary to findings in other countries, he noted no correlation between rainfall or large temperature variations and the frequency of pneumonia. It was often just in the dry months that most cases of pneumonia occurred.

Nor could W. M. Bonne, who observed a large number of croupous pneumonia cases (684) amongst prisoners in some of the convict camps in East Java over a period of more than two years (1932 to 1935), find any connection between the above-mentioned factors and the frequency of this disease. According to Bonne, a combination of rain and wind, causing a marked chilling of the prisoners in their damp clothes ; other illnesses, of which malaria was the chief ; inadequate diet or overcrowding in sleeping-quarters could be predisposing factors to the occurrence of pneumonia. This investigation was carried out by one person alone and applies only to croupous pneumonia ; moreover, in the majority of cases the type of the causative pneumococcus was determined from an investigation of the sputum, the blood, or both.

As in the case of the South African mine-workers, it was proved also in East Java gaols that it was the new-comers who were the most susceptible ; 72% of the new arrivals suffered from attacks of croupous pneumonia in the first three or four months of their sentence. After the institution of a sort of quarantine, where the new-comers were isolated from the older prisoners for the first two or three months, enlargement of sleeping-quarters, and a more careful inspection of the prisoners before they were put to work, there was a definite decrease in the number of cases reported.

Typing of the pneumonias of the patients in the gaol at Bentjoeloek and in the military hospital at Tjimahi was carried out in the Pasteur Institute in Bandoeng ; the following relationships were found :

TYPES OF PNEUMONIA OBSERVED.

Place	Cases	Investigator	Years	Type in percentage				Number of times examined
				I	II	III	IV	
Java + Sumatra	100	KIRSCHNER	1929-1931	42	26	—	32	1
Java . .	83	BONNE	1930/31	44.4	13.89	12.5	29.17	1
Java . .	341	BONNE	1932-1935	28	7	—	57	1
Java . .	113	v.LEEUWEN	1932-1934	42.5	9	—	48.5	1
Java . .	64	v.LEEUWEN	1935	38	8	—	54	3
Java . .	62	SCHIJVE-SCHUURDER	1936	58	8	1.5	32	3
Total .	763	(Average%)	1929-1936	36.6	11.2	1.5	48.7	
America	3,066	BULLOWA	1928-1935	23.6	8.3	9.7	58.4	

The strikingly high percentage of cases showing group IV organisms both among the patients in Bentjoeloek and Tjimahi led to more attention being paid to this group with a view to a possible prophylaxis and treatment.

In order to obtain more certainty that the type IV pneumococci found in the sputum were indeed the causative organisms and not merely the pneumococci found normally in the pharynx, during the past two years material obtained from all the patients in Tjimahi (sputum and blood and, wherever possible, exudate) was examined at least three times (see table above) as was required by various writers on the subject, in particular GUNDEL and his collaborators.

Comparing these figures with those previously obtained, it will be seen that only a slight correction (±6%) has been necessary. From this it will be clear that the typing done in previous years, when only one investigation was made (1929

to 1934), retains its value. In this way the large part taken by group IV pneumococci in causing croupous pneumonia in the Netherlands Indies was confirmed.

It should be added here that, in all cases of death, BONNE confirmed the diagnosis by the aid of autopsies, while, in the military hospital at Tjimahi, in many cases of group IV pneumonia the diagnosis was confirmed by the X rays. Furthermore, in 25% and 15% respectively of the cases the same organisms were also isolated from blood cultures.

As shown in the table on page 189, BULLOWA, of New York, who examined over 3,000 cases of croupous pneumonia, also found a rather high percentage of group IV pneumococci (58.4%), often confirmed by blood culture. In this respect, therefore, the tropics are not exceptional. BULLOWA further reports that repeated examination necessitated corrections of the first findings in only 7% of cases, which also agrees with our findings.

As has been shown in other places, the far more serious prognosis in cases where a bacteræmia has set in was also proved in the patients from Bentjoeloek and Tjimahi. The cases were fatal in all instances in which the number of organisms in the blood approached 100 per c.c.

In many countries, and especially among persons living in penal colonies or indenture communities in the tropics and subtropics, prophylactic pneumococcus vaccines have been used for years as a means of combating croupous pneumonia. Opinions as to the value of this procedure are very divergent (see detailed publications on this subject by GAUTIER (1930) and DINGER (1936)).

In order to obtain information of our own in the Netherlands Indies on this subject, a polyvalent vaccine was prepared in the Pasteur Institute in Bandoeng from pneumococci of types I, II, and III and group IV, and from influenza strains, which contained first 4 milliard and later 6 milliard pneumococci and 1 milliard influenza bacilli per c.c.

With this vaccine, MULDER in Sumatra in 1931 and BONNE in East Java in 1932-1934 inoculated 1,600 and 1,200 persons, respectively, in alternation with persons to act as controls. Both workers, in the observation period that followed (one to two years), were able to observe a reduction of pneumonia

incidence in type I cases ; 11% of the vaccinated and 18% of the controls in East Java got pneumonia. The numbers are too small and the duration of the test too short (in one case one year, in the other two years) to enable accidental coincidences (such as a natural decline of the curve of the epidemic, etc.) to be excluded. For instance, VAN DRIEL, without using vaccination, was able to observe a great decline in the pneumonia mortality in Sumatra's East Coast Province from 1930 to 1932, and believes that this is to be attributed either to a reduction in the virulence of the pneumococci there or to the cessation of immigration of new workers. It is well known that newcomers in an established community appear to be peculiarly susceptible to endemically appearing infectious diseases. In the immediately succeeding years, 1933 and 1934, however, there were no new labourers imported, but the mortality from pneumonia rose again considerably nevertheless.

The value of a prophylactic vaccine in general can only be determined by " alternating " vaccination with controls, in persons living under similar social conditions during severe epidemics (compare OTTEN'S tests of his plague vaccine in two sub-districts) or by observing the course of epidemics during many years.

In order to prevent infectious diseases (and among them also croupous pneumonia) in persons living in penal indenture or restricted liberty communities, such as soldiers, labourers, prisoners, etc., it is recommended that the recruits especially (those newly arrived in the district) be immunised ; and, further, that they be held in quarantine, at least to the extent that for the first few months they should sleep in separate quarters from the older men.

We have no personal experience in the Netherlands Indies of the treatment of croupous pneumonia by serum. In fact, since it is only in type I cases and through the administration of large quantities of the serum during the first few days of the disease that success is to be attained, and since also group IV pneumonias with their very heterogeneous antigenic properties are so predominant here, great difficulties attach to the use of the required type-specific serum therapy in the Netherlands Indies.

6. Yaws.

After the introduction of neosalvarsan into the therapeutics of frambœsia tropica, the attack on this communal disease, which is so widely spread over the Netherlands Indies, was begun in 1919 by the Public Health Service and has been carried on uninterruptedly to the present day. The method generally adopted is a polyclinic treatment of the patients with weekly neosalvarsan injections. This is part of the routine work of all Government physicians who are entrusted with the carrying-out of individual treatments. In the course of years, millions of persons have been treated in this way. The same method of treatment is, as a rule, also applied in many Protestant and Catholic mission polyclinics and in those of many estates.

In addition to this systematic attack, there are the special yaws campaigns that are organised whenever considered necessary in any given district and when requisite funds can be made available. One of the doctors is then specially entrusted with this task. After the people have been warned in advance through the local officers of the Department of Interior Government Administration, mass injections with neosalvarsan are carried out from various centres. As an example may be cited the mass treatments in the Regency of Ngandjoek in 1930. In this case, 8,922 persons were treated in the course of four and a half months, during which time 20,759 injections were given. The plan of administering to all the patients the three injections in consecutive weeks which are thought to be necessary was not completed, for various reasons. Half of the persons treated did not return after the first or second injection.

The impression is gained that the results of this method of attack are satisfactory at least in reducing the frequency of the disease in the immediate neighbourhood of the polyclinics and injection centres. The matter is difficult to control statistically, however.

Another polyclinic method, the results of which are more easily estimated and by which statistical and epidemiological data can be collected, has been tried out since 1934 in Ngandjoek with the financial co-operation of the Regency Council and the assistance of the local government officials, which is so essential.

By this method, efforts are made to attack as far as possible the actual sources of infection in order to protect those who are healthy. The people themselves do not yet realise the importance of this measure, and it is impossible to carry out health education in all districts in an intensive manner.

The following sequence of steps is taken :

(1) *Detection and registration* of all cases of yaws by examining as far as possible *the entire population*, village by village, family by family and person by person. The symptoms observed are entered in a previously prepared population record-book, in which the names of the various persons are arranged by families. This record-book is especially necessary for checking the attendance.

(2) *Selection* of the sufferers with the symptoms that, according to our experience, are able to cause infection.

(3) *Treatment* of the sufferers selected. Treatment is carried out weekly and continued until the infectious signs have disappeared. In the case of each patient, it is decided by weekly examination when the treatment may be stopped. Where various symptoms appear in combination, attention is paid only to the infectious lesions. It is impossible to attempt the complete cure of the patients by this method of treatment.

Since the success of this method of combating the disease depends so greatly on the unfailing return of the people chosen for treatment, it is essential that all the tasks outlined above be carried out *in the villages themselves*, partly to spare the people the necessity for travelling long distances. It is, moreover, unavoidable that the treatment be given gratis, because the duration of the treatment is prescribed for the patients. It might perhaps be possible, however, to recover the costs from the people by other, indirect methods.

All the data concerning each patient selected for treatment, the treatment given and the course of the disease are entered on special individual forms. The localisation of the signs and any typical characteristics of the patients are also recorded to prevent impersonation by others (see Annex 5).

Amongst the infectious phenomena are included the primary papillomas and ulcers, the secondary macro- and micro-

papillomas, circinate yaws, *pian dartré*, and the papillomas of the palms and soles. All other lesions are regarded as non-infectious.

In some tertiary forms, in cases of secondary infections and in cases of combination with various other skin diseases, the diagnosis may be very difficult. Particularly so is the differential diagnosis from syphilis. In the case of such large-scale work, it would be difficult to resort to microscopic and serological investigations. In doubtful cases, the patients are admitted as far as possible to a hospital for further study and treatment. When working out the statistics, such cases have also to be taken into consideration. Furthermore, it is impossible to avoid treating patients suffering from tertiary ulcers, osteitis, and all the other non-infectious but painful yaws lesions. These persons must be assisted, if only from sheer humanity, and to render the men fit to work, and especially to ensure the full co-operation of the people.

Treatment is given weekly and principally with neosalvarsan and similar arsenicals. The doses (per injection) are : for adult males, 450 milligrammes ; for adult women, 350 milligrammes ; for children over 6 years of age, from 200 to 350 milligrammes, and, for children below 6, from 50 to 200 milligrammes.

Except for slight rises of temperature, no unfortunate results have occurred, even among Javanese patients, as a result of using these doses. Increasing or reducing the dose is seldom deemed necessary. It is necessary to resort to other well-known and proved remedies, such as bismuth and locally applied medicaments, only in the most stubborn cases.

When, as a result of a sufficient number of practical observations, it is seen after how many injections the various infectious lesions disappear in the majority of patients, it is possible to give the necessary series of treatments after the first examination and selection of the patient, without repeatedly re-examining him before every injection. A week after the last injection, another examination is given to ascertain if the patient requires further treatment. By this method, in a group of 904 patients it was found that, after from one to ten injections of neosalvarsan administered consecutively at weekly intervals, the infectious symptoms disappeared in 11.2, 35.5, 26.2, 13.6,

5.7, 2.7, 2.2, 1.6, 0.7 and 0.2% of cases, respectively. According to this experience, a series should consist of at least three injections.

This particular work was carried out in twenty-three villages, but the data obtained cannot yet be worked out in full detail. Only the following facts are available.

In sixteen villages, with an aggregate of 23,609 persons, 20,833 (88.2%) were examined at the time of the first " detecting " investigation. The number of sufferers from yaws was 4,331, or 20.7% of those examined. 1,855 cases, or 8.9%, were found to have infectious lesions, and in 2,476, or 11.8%, the lesions were exclusively of a non-infectious nature. These frequency figures agree with those found by GARDJITO in thirty villages in the sub-district of Adiwerno, in Tegal.

In four villages, 1,227 of the 1,234 families living there were examined. The number of families containing yaws cases was 740, or 60.3%. Exclusively non-infectious lesions were found in 365 of these families, while infectious forms of the disease were found in the remaining 375 families. In 238 families, there was only one case per family ; in 137 families, two or more. Many still uninfected children from 1 to 13 years of age were found in these families, although it is our experience that it is precisely at this age that most infections take place. Some of these children had certainly been infected, but, either with or without actual treatment, had already recovered.

In the families containing several cases, we often observed that sufferers from scabies were to be found among the members.

In former years, about 250,000 ampoules of neosalvarsan, each of 0.9 gramme, were used every year by the Public Health Service. Since the decentralisation of some of the public health activities to the local resorts, the amount of neosalvarsan used by the Public Health Service per year is rather less than 200,000 ampoules. It may be assumed that the local organisations, private physicians, etc., consume about the same amount annually. This amount is therefore sufficient for a total of about one and a quarter million injections a year.

Appendix 5.

Regency of .....

FORM FOR YAWS CAMPAIGNS.

Card No. ... Date..... Family No. ..... Register No. .....

Name ..... Sex..... Age ..... Occupation .....

Village..... Hamlet ..... Sub-district.....

Treatment... School-child ?.. Contact person of school-child ?... Village patient ?..

Date.....	....	....	....	....	....	....	....	....	....	....	....	....
Came or not.....	....	....	....	....	....	....	....	....	....	....	....	....
Doses of Neosalv.....	....	....	....	....	....	....	....	....	....	....	....	....
Doses of Bismuth	....	....	....	....	....	....	....	....	....	....	....	....
Doses of	....	....	....	....	....	....	....	....	....	....	....	....
Local	....	....	....	....	....	....	....	....	....	....	....	....

	Symptoms	Date			Localisation		Other data		
		First examination	Check	Check	Symptom No.		Date	Symptom No.	Course of the symptoms of the disease and complications as a result of the treatment ; other peculiarities
I.	1. Papilloma	.....	.....	.....			.....	.....	.....
	2. Ulcers	.....	.....	.....			.....	.....	.....
II.	3. Macro-papillomata	.....	.....	.....			.....	.....	.....
	4. Micro-papillomata	.....	.....	.....			.....	.....	.....
	5. Circinate yaws	.....	.....	.....			.....	.....	.....
	6. *Pian dartré*	.....	.....	.....			.....	.....	.....
	7. Pigmented hyperkeratosis	.....	.....	.....			.....	.....	.....
	Palm and sole :								
	8. Papillomata	.....	.....	.....			.....	.....	.....
	9. Psoriasis II	.....	.....	.....			.....	.....	.....
	10. Psoriasis III	.....	.....	.....			.....	.....	.....
	11. Keratosis	.....	.....	.....			.....	.....	.....
	12. Keratoma sulcatum	.....	.....	.....			.....	.....	.....
	Skin :								
III.	13. Shallow serpiginous ulcer	.....	.....	.....			.....	.....	.....
	14. Deep crater-shaped ulcers	.....	.....	.....			.....	.....	.....
	Joints :								
III.	15. Arthralgias	.....	.....	.....			.....	.....	.....
	16. Hydrarthrosis	.....	.....	.....			.....	.....	.....
	17. Arthritis	.....	.....	.....			.....	.....	.....
	18. Polydactylitis	.....	.....	.....			.....	.....	.....
	Bones :								
III.	19. Ostealgias	.....	.....	.....			.....	.....	Notes at the time of checking
	20. Diffuse osteitis	.....	.....	.....			.....	.....	.....
	21. Diffuse periostitis	.....	.....	.....			.....	.....	
III.	Ligaments :								
	22. Gummous periostitis	.....	.....	.....			.....	.....	.....
	23. Tendovaginitis	.....	.....	.....			.....	.....	.....
	24. Bursitis	.....	.....	.....			.....	.....	.....
	25. Rhino-pharyngitis mutilans	.....	.....	.....			.....	.....	.....
	26. Juxta-articular nodules	.....	.....	.....			.....	.....	.....
	27. *Goundou*	.....	.....	.....			.....	.....	.....

7. Leprosy.

The co-operation of the Department of Interior Government Administration has proved essential in every instance where the investigation or combating of communal or infectious diseases on a large scale was involved. For this reason, the investigation of leprosy in *Java and Madura* has also been based on the co-operation of the Interior Government Administration. The village headman knows the inhabitants of his village and all their affairs and is in a position to give a list of the probable number of lepers in the region under his control. The data from all the villages in a sub-district are collected and listed on cards and form the starting-point of a more scientific investigation (Figure 23).

The medical service begins with the setting-up of a number of inspection centres in each district, so chosen that the distance between them is such that at most 3 kilometres (about 2 miles) must be traversed to reach one of them from any part of the district. Then a schedule is made out showing the place and date when all the cases indicated are to be investigated. The officers of the Interior Government Administration see that the indicated lepers and their housemates report at the specified time and place for medical examination. The medical history of each patient is recorded as well as the results of the examination, bacteriological work included. At the same time, the housemates are examined. In this way, between 1932 and the end of 1936 a total of 5,708 lepers had been discovered, for the most part directly identified by the village headmen.

When this investigation has been ended in any sub-district, the investigation centres are reorganised into treatment centres (Figure 24), at which the patients may be treated once a week with chaulmoogra oil orally or by injections with ethyl-esters. This is of great value as propaganda, to judge from the number of patients who come voluntarily for treatment. This method of work provides also the opportunity of tracking down cases of leprosy, particularly for treatment in the very earliest stages, although the value and permanent effect of an exclusively chemotherapeutic treatment are not regarded as proved.

There are three institutions in Java for isolating serious cases, in which, by the end of 1936, 612 patients were in isolation of their own free will. Further, an effort is being made to prevent the spread of the disease by urging the isolation of advanced cases in their own houses and the erection of a separate hut for those lepers on the compound surrounding the house (Figure 25). This propaganda has succeeded excellently in some districts ; accurate data and figures cannot yet be supplied.

In the *remainder of the archipelago*, a beginning has also been made in tracing lepers, as outlined above for Java. This systematic investigation is still in its early stage, so that data of any value cannot yet be furnished. In the leper asylums of the other islands, at the end of 1936, 4,350 lepers were undergoing voluntary isolation (Figures 27 and 28).

Scientific Investigation.

In addition to the scientific leprosy-investigation work being done in various laboratories, leper asylums and hospitals, special attention is being given to the scientific side of the problem of leprosy in the divisional laboratory in Samarang and in the Koningin Wilhelmina Institute for Leprosy Research in Batavia. The last-named institution began its activities on November 25th, 1935.

8. Mental Diseases : Toxicomania.

Mental Diseases.

In a country such as the Netherlands Indies, with a population of over 60 millions and not more than half a score of cities worthy of the name, practically all hygienic measures fall under the category of " rural hygiene ". This is also true of the care of the insane. In this country, it is a great problem how to free the villages from antisocial and dangerous lunatics. The question as to how many insane persons, in the psychiatrical interpretation of the word, there are in the Netherlands Indies is to a certain extent irrelevant : what is of importance is to know

how many mentally unhinged elements are sufficiently troublesome, even in this very simple and undifferentiated pastoral community, to require removal from it.

Little is known on this subject. The capacity of the institutions is insufficient, and a large number of lunatics, for whose removal to some kind of institution there are urgent social indications, cannot be accommodated. They are then housed in all sorts of places of temporary custody, such as prisons, police-stations, etc. This much is certain, that the number of these troublesome elements is many times greater than the maximum number of places available in all the institutions mentioned, which is hardly more than 9,000.

In 1935, figures concerning the insane were as follows : There were four large asylums with an aggregate capacity of 8,000 (including the 672 insane Europeans, the remainder being Chinese and natives) ; five observation asylums with an aggregate capacity of 1,100, and further some seven observation stations in which 316 patients could be housed temporarily. The latter are all outside Java. In 1936, there was a net gain over the preceding year of 369 available places.

The asylum-admission coefficient for Europeans is 2.8 per mille (672 out of a total of about 245,000 in the country), that for natives 0.1 per mille and for Chinese 0.7 per mille.

The average costs per person per day in these various institutions were as follows (expressed in Netherlands Indian cents) :

Type of institution	Cost of nursing		Cost of feeding	
	1935	1936	1935	1936
Large asylums . . .	52	47	7	7
Observation asylums	64	50	7	8
Observation stations	52	42	8	8

In 1935, 1,227,411 florins net were spent on the care of the insane. In 1936, the sum was 1,119,104 florins. This is a large item in the total net budget of the Public Health Service, which in 1935 amounted to an aggregate of about 10,000,000 florins and in 1936 to about 9,500,000 florins. It remains a large item

even when compared with the total annual expenditure of the Government for the ordinary services—namely, 489,000,000 florins—as the sum spent on the care of the insane is about 2.5 per mille of the total.

The medical staff consists of four directors, three physicians, and eight physicians with local diplomas—in other words, one physician to every 500 patients. The total number of nursing and attendant personnel was such that the relationship in the large asylums was about one to every five patients. Both mortality rate and the percentage of the patients discharged have fluctuated during the past few years around 6%. The following figures are of interest as showing the increase in the number of lunatics admitted to institutions : 212 patients in 1882 ; 4,500 patients in 1925 ; and 9,500 patients in 1935. This extra number was absorbed by increasing the number capacity of the asylums, observation asylums and observation stations.

No recent change has been made in the general lines of the care of the insane. There are a number of openings for admission of lunatics which are sufficiently good to meet all reasonable demands of what an asylum should be, and which involve annually very large running expenses ; on the other hand, it is far from possible to remove from the community all the troublesome persons whose admission to an asylum is socially urgent. These latter must, therefore, perforce be very unsuitably accommodated.

The annual increase, which will continue to rise—not because the number of lunatics is increasing, but because the steady progress in the community's development will more rapidly reach the point of throwing them out—will have to be absorbed in some other manner in the future. For various reasons, in the institutions, where the discharge rate fluctuates around 6%, a residue of patients has collected who no longer need institution treatment, but for some reason or other (such as having no family, not knowing their place of origin, etc.) cannot be discharged. This group of persons, which constitutes a large percentage of the institute population, should by rights be transferred to work-colonies.

Lenteng Agoeng, an experimental colony along these lines, was founded entirely on the private initiative of the Association

for the Care of Mental Invalids, which also runs it, in close connection with the asylum at Buitenzorg (Figure 26). It has already proved that the above-mentioned group of patients can be well looked after in this way at much less expense and can do efficient work. The costs of founding the colony amounted to 14,000 florins for the buildings to house 200 patients ; the charges amount to about 15 cents per patient per day. The profits to be anticipated from the work of the patients in the way of agricultural, horticultural, fishery and animal husbandry work should result in reducing the nursing costs to about 10 cents net per person per day. A subsidy will be necessary to meet this charge, in principle granted from local resources interested in seeing that ex-patients from their districts are cared for in this humane way, and so prevented from returning too soon to village life.

Experience has also shown that these persons may also be cared for quite feasibly in families in the neighbourhood (Figure 29), under the control of the leaders of the colony, and that in this case the total costs per patient amount to 7.5 cents per day. This principle of colonies outside of the Governmental institutions and of well-supervised nursing in private families was first put into practice in 1934. The results so far obtained justify the statement that this principle must be extended, and that it would be unjustifiable to proceed to an extension of the asylum capacity so long as there are in the present asylums large numbers of patients who no longer actually belong there and who could—and for economic reasons must—be transferred to colonies such as those described above.

Countries with a population structure similar to that of the Netherlands Indies, but where the care of the insane has not advanced so far, may derive much profit from the experience gained and the mistakes that must necessarily have been made here in the early days of the development of the care of the insane.

Too large and too elaborate asylums burden the care of the insane unreasonably and make it inefficient. The first asylum in Java, which was founded about 1880, cost 1,095,000 florins and has room for only 200 patients. The charges amount to 300,000 florins yearly. It has been gradually extended to accommodate

2,000 patients, and is now cumbersome to control, costly to run and, with a director, a physician and two locally trained doctors, only moderately well supervised from a medical point of view. In 1925, an asylum was constructed in Magelang for over 2 million guilders. The total invested capital for the housing of the insane amounts to 8 million guilders—*i.e.*, about 1,400 florins per bed—whereas in the above-mentioned colony the cost per bed is only 70 florins. A further objection to asylums of such size—the asylum in Lawang accommodates over 3,000 patients—is that they draw their patients from too large an area and must thus admit patients coming from considerable distances, from regions with other languages and customs, even, at times, from other islands. (In Buitenzorg, Java, there are Balinese and Bataks—a North Sumatra tribe—while, in Lawang, even Dyaks from Borneo are to be found !) From a psychiatrical point of view, this is very unsatisfactory, since contact with family and persons of similar race is entirely cut off. Moreover, the return of such a patient presents great difficulties and the percentage of discharges is in this way adversely influenced.

Nowhere is decentralisation so imperative as in the care of the insane, and this is also true of the financing. Up to the present time, the Government as such bears the entire cost ; the region from which the patient comes remains free from any financial burden, even where the after-treatment of such persons is concerned.

Local resources should be compelled to yield a contribution, not only to the costs of institutional treatment, but also for after-treatment in colonies, so that it would be to their interest to be less ready to cast out the mentally deranged, and more care would be taken to adapt these people to local conditions of life after their return. The decision concerning the admission or discharge of patients should remain, however, in the hands of an independent medical authority, in order to prevent the danger of patients being kept back in order to save costs or collected together in all kinds of unsuitable, improvised places.

Great care should be exercised to obtain complete information, at the time of admission, from all the personalia of the patient.

Precise information should be obtained concerning the place from which a patient comes and which authority is responsible for him. Any carelessness in obtaining such data results in the impossibility of dismissing the patient.

Transitory acute psychoses are comparatively common in the Netherlands Indies. For this reason, and because—even with a new policy of smaller but more numerous asylums—institutions will always be spread thinly over an enormous area, every hospital of any importance should be furnished with facilities for looking after such cases.

Finally, it should be pointed out that doctors practising in remote regions (country doctors) have an important rôle to fill, both medically and socially, in the care of the insane. They should receive training for the task that awaits them, in a medical school with a satisfactory psychiatrical clinic, which is in contact with a lunatic asylum and also with an after-treatment colony.

Toxicomania.

In the Netherlands Indies, Monopoly opium is officially consumed to an annual value of 9,000,000 florins (in 1935, 9,526,587 florins). Considerable sums are also expended on smuggled opium. Per head of the total inhabitants of the Netherlands Indies, an average of 16 cents per year is spent on Monopoly opium.

There are three classes of opium-users : those who smoke it in moderate quantities as a luxury ; the chronically ill who are continually in pain and who seek relief in opium ; and, finally, the psychopathic cases who abuse it.

So far as the first group is concerned—and it includes the great majority of the users—the opium problem is not a medical but a social and economic one. Medically speaking, opium smoked in moderation is a comparatively harmless drug ; although through its high price it lays too heavy an economic burden on the budget of the consumers.

For the second group, opium can be a godsend in this country, where for so many persons medical help is impossible to get, or for whom medicine can no longer do anything.

Those who abuse the use of opium, the real toxicomaniacs, are few. There are places where they can be helped by treatment to cure their habit. It is quite natural, however, that the number of relapses is extremely high, and it is a question whether public expenditure for these psychopathics is justified.

Again, any reduction of the amount of opium available has an undesirable effect : the use of far more noxious poisons, such as morphine, cocaine, heroin, etc., immediately increases. In short, it may be said that the toxicomaniacs—considered in connection with rural hygiene—play a part of little significance.

The same is true of the abuse of alcohol : the continuous misuse of alcoholic drinks (such as palm wine, sagoweer, toewak, arak, and imported alcoholic drinks—*e.g.*, gin, brandy) is —except in individual instances and in some isolated areas— unknown in the Netherlands Indies on any large scale.

Figure 1. — Complex of coolie houses on a tobacco estate on the East Coast of Sumatra.

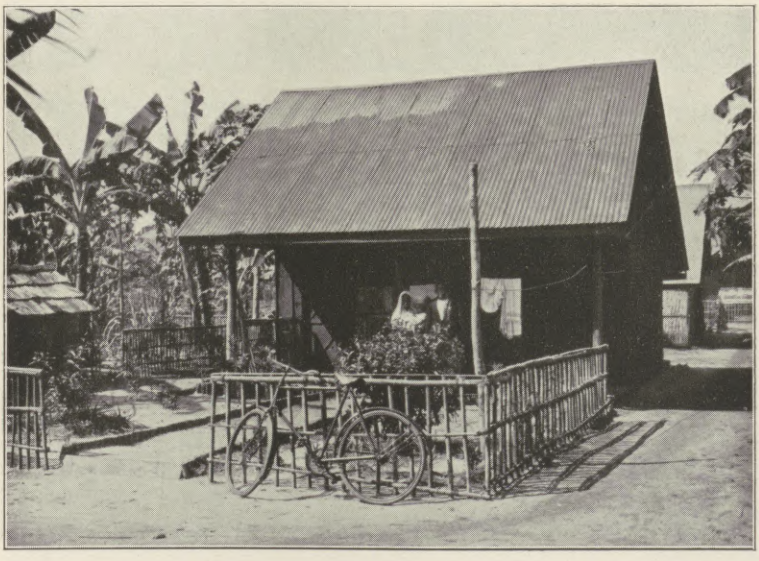


Figure 2. — Small compound house with vegetable garden on a tea estate.

Figure 3. — Quarantine station on the islands of Onrust and Kuiper.

Figure 4. — Special lecture for native civil administrative officials.

Figure 5. — Hygiene centre at Menganti.

Figure 6. — The weighing of infants at a hygiene centre.

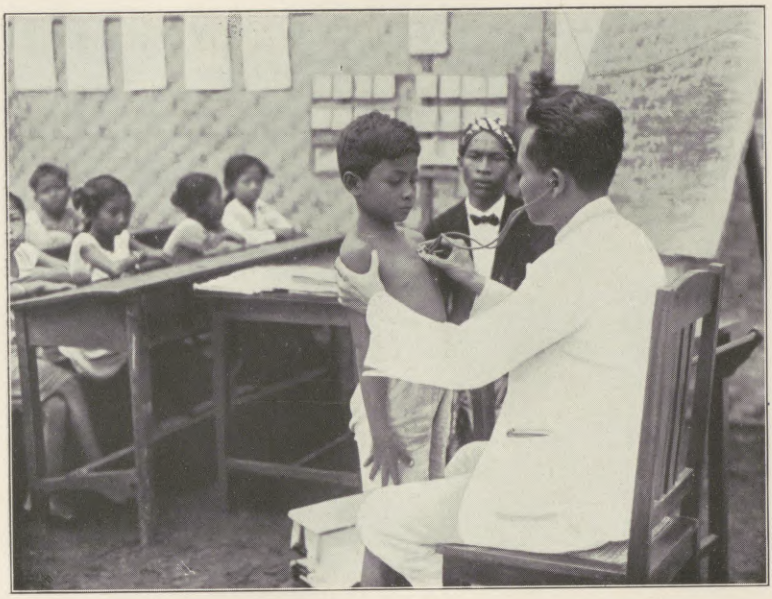


Figure 7. — Medical examination of school-children.

Figure 8. — The lid of the demonstration handcar can be taken off.

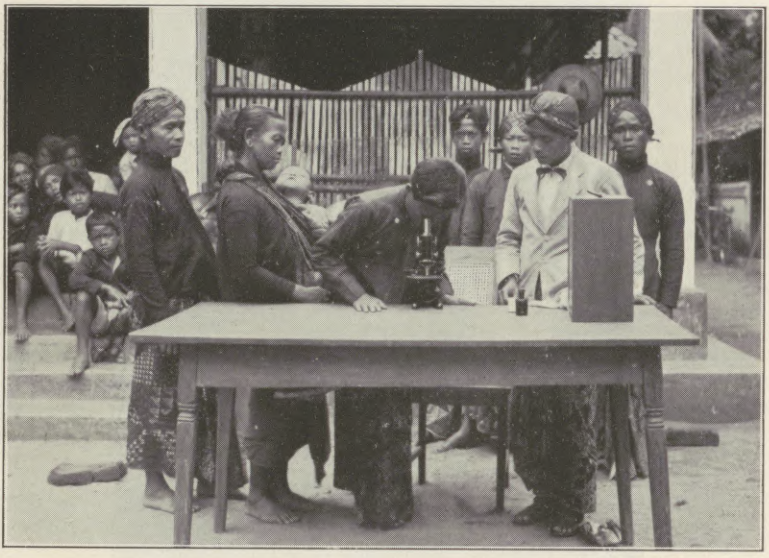


Figure 9. — Microscopic demonstration in the village.

Figure 10. — A costless but, for many areas, a satisfactory latrine.

Figure 11. — Bored-hole latrine with cement floor and brick superstructure.

Figure 12. — Fish-rearing in rice-field.
Native method. — Breeding of *A. aconitus*: stalks remaining in the rice-field: growing of weeds; grasses hanging from the dykes in the water.

Figure 13. — Fish-rearing in rice-field.
Educational method. — Free from *A. aconitus;* dykes kept clean from grasses; stalks heaped up; water surface clean.

Figure 14. — Fish-rearing in rice-field.
Hygienic method. — Free from *A. aconitus;* dykes kept clean from grasses; stalks removed; water surface clean.

Figure 15. — Non-treated fishpond, showing floating algæ. Breeding-place of *A. ludlowi* var. *sundaica.*

Figure 16. — Fishpond after treatment.

Fishpond laid dry; floating algæ stranded on the middle part of the pond and killed by exposure to the sun; they are changed into a white powder; the fish withdraw into the circular ditch.

Figure 17. — Fishpond after treatment.

Every fishpond is provided with a sluice; by means of supply-canals, discharging into a main canal, in connection with the sea, it is possible to drain and to refill every fishpond separately. Water surface clean; no algæ.

Figure 18. — House after improvement.

Figure 19. — A house complex prior to improvement.

Figure 20. — The same complex after improvement.

Figure 21. — Manner of joining architrave beams.

Figure 22. — Sanatorium for tuberculous male patients at Tjisaroea (West Java).

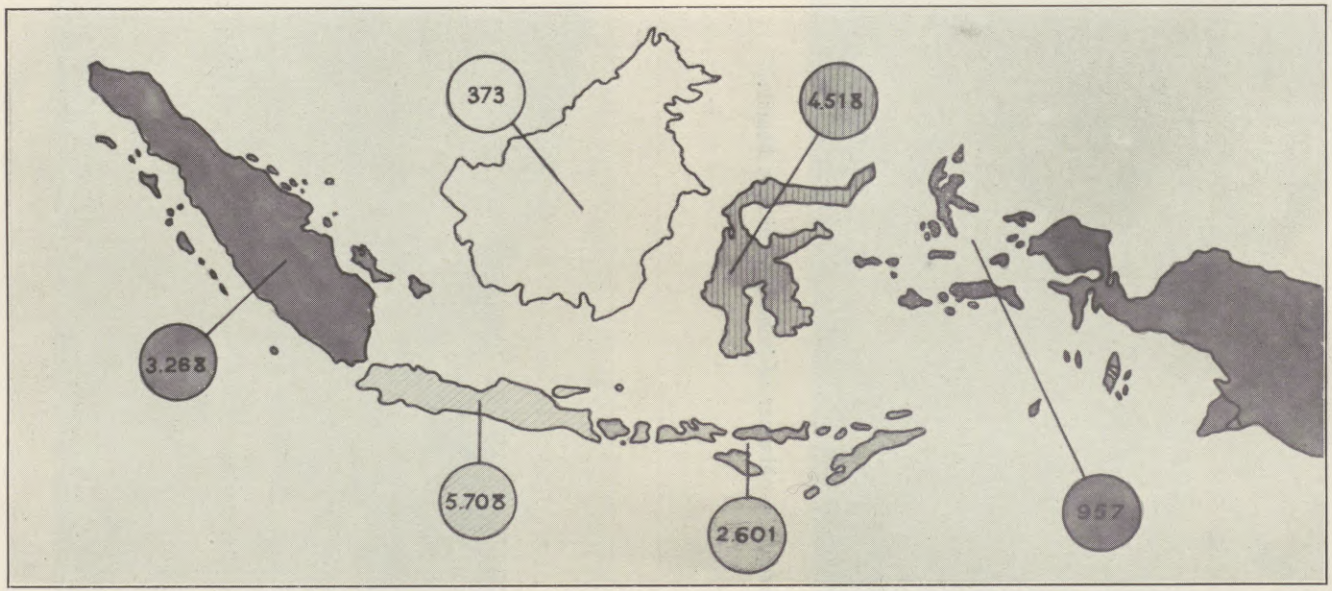


Figure 23. — Leprosy in Netherlands Indies:

Population	60,731,025
Number of leprosy cases	17,425
Leprosy density	0.3 ‰

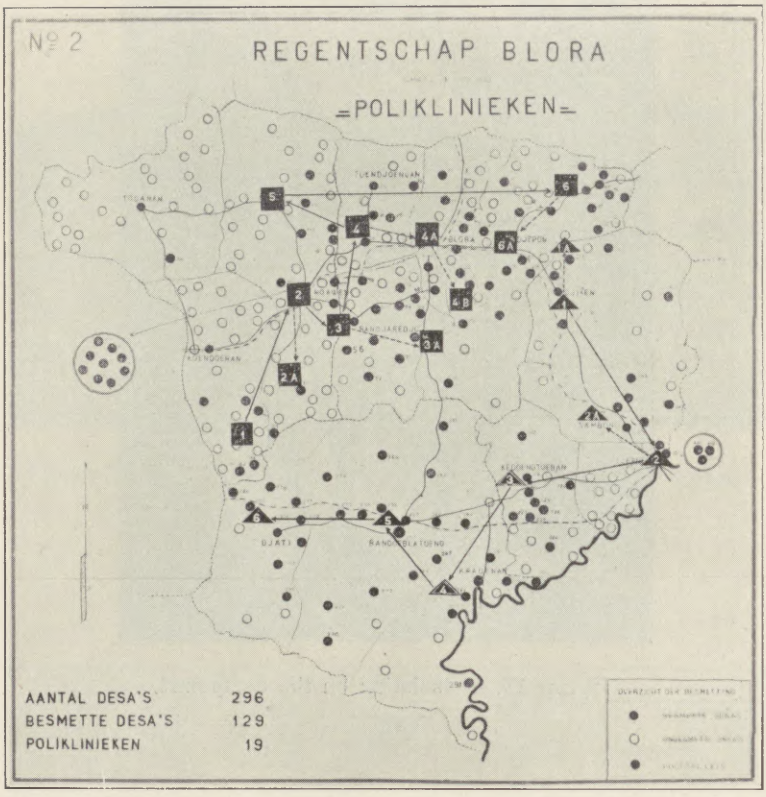


Figure 24. — Leprosy treatment centres (19) in the Regency of Blora:
Number of villages, 296.
Number of villages where lepers are found, 129.

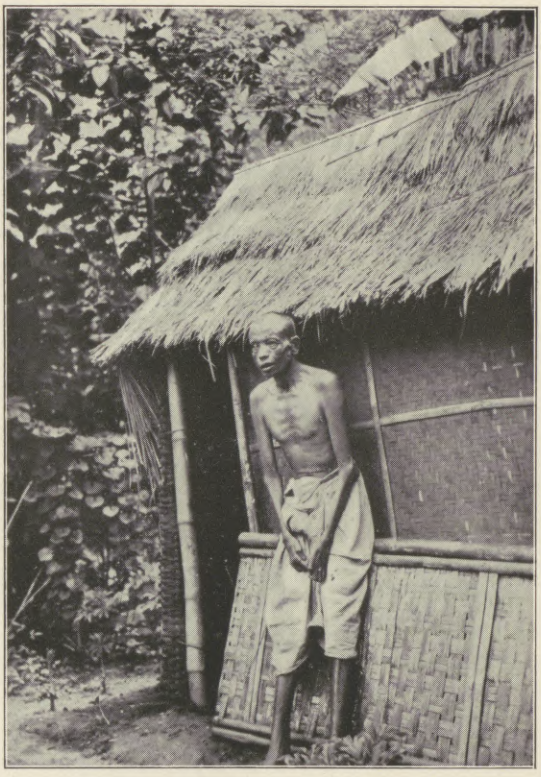


Figure 25. — Isolation on the compound.

Figure 26. — General view of the buildings of the Agricultural Colony for Mental Invalids "Lenteng Agoeng".

Figure 27. — Leper asylum Lao Si Momo (Sumatra's East Coast).

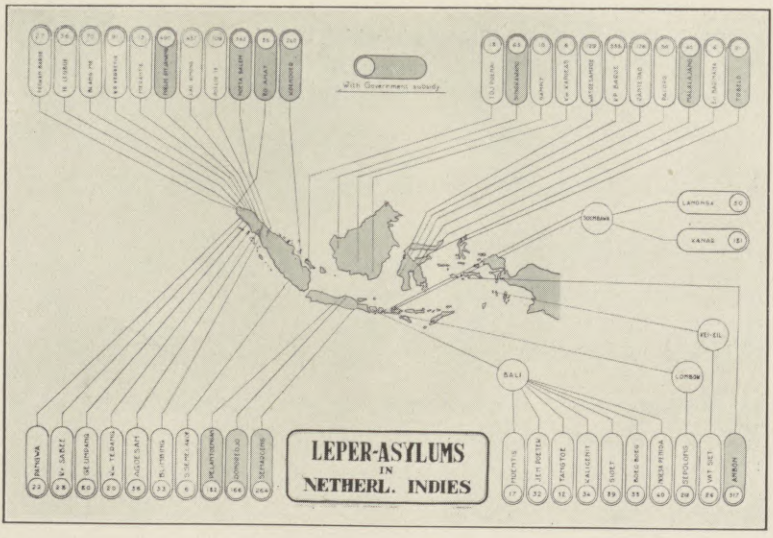


Figure 28.

Figure 29. — Type of house in which families accept patients as inmates.

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