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Health Organisation

INTERGOVERNMENTAL CONFERENCE OF FAR-EASTERN COUNTRIES ON RURAL HYGIENE

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REPORT OF SIAM

GENEVA, 1937.

Intergovernmental Conference of Far-Eastern Countries on Rural Hygiene

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INTRODUCTION.

With a view to preparing for the Intergovernmental Conference of Far-Eastern Countries on Rural Hygiene convened by the Council of the League of Nations at Bandoeng (Netherlands Indies) for August 3rd, 1937, the various countries invited to attend have been asked to draft national reports dealing with the various questions on the agenda of the Conference.

Attached herewith is the report of Siam, drawn up by the Siamese delegation to the Conference.

The delegation of Siam will be composed as follows :

Phya Prakit KOLASASTRA, Chief Engineer of the Public and Municipal Works Department, Ministry of the Interior, Bangkok ;

Phra Jan VIDHIVEJJ, Doctor of Public Health, Chief of Division, Provincial Health Division, Ministry of the Interior, Bangkok.

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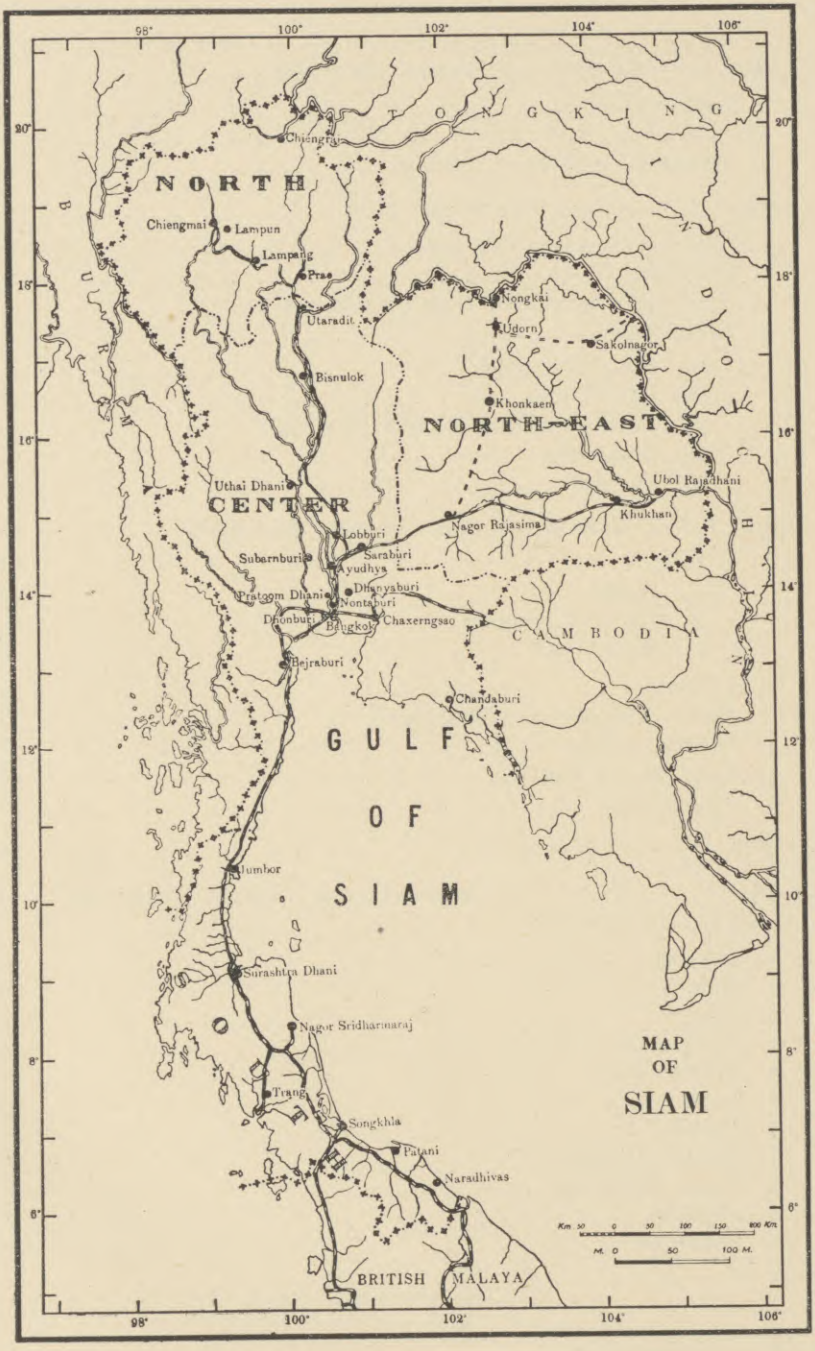
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INTERGOVERNMENTAL CONFERENCE OF FAR-EASTERN COUNTRIES ON RURAL HYGIENE

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

REPORT OF SIAM

Population : 13,308,000.

Area : 518,000 square kilometres.

I. HEALTH AND MEDICAL SERVICES.

1. Organisation.

Public health work was officially recognised in Siam in the year 1918, when the Department of Public Health was instituted to organise and control both preventive and curative medicine in the country. This was made possible through many former institutions and past efforts in medical services. Vaccination was introduced into Siam some eighty years ago. The capital was given a Local Sanitation Act in 1897 and provided with a staff of doctors, engineers and assistants to organise health work. The beneficial result obtained in the metropolis gave birth to the Provincial Sanitary Organisation Law of 1909, when sanitary boards were organised in several provincial centres. Rural service was not instituted until the year 1914, when a Local Organisation Act was promulgated setting up commune medical officers throughout the country with certain responsibility for local health work.

The Department of Public Health took over all existing organisations then functioning and undertook the following duties :

(*a*) Setting up an efficient central force to regulate and control al phases of health work in the Kingdom ;

(*b*) Collecting and tabulating all possible health statistics for guidance in both the present line of action and future work ;

(*c*) Carrying out of health education and campaigns throughout the country, both for adults in their homes and for children at school ;

(*d*) Instituting maternity and child welfare work to prevent unnecessary wastage of population and to promote better growth of the race ;

(*e*) Promoting and controlling sanitation work for progress in the general health of the communities ;

(*f*) Organising curative medicine for more modern practice, so that the people may benefit from the discoveries of modern science ;

(*g*) Preventing the spread of infectious diseases and combating epidemics by appropriate organisation.

With the above aims, the department has worked from a small beginning with little encouragement and many difficulties to its present position of national importance. The Assembly of the People's Representatives gave the country the long-awaited Local Government Organisation Act in 1934. This law enlarges the scope and further facilitates the health activities of the department. A year later the Public Health Act and the Communicable Diseases Act were passed, giving appropriate power for a better control of the health work of the Kingdom both by the central and local authorities.

Private institutions, such as the Siamese Red Cross Society and the medical missionary organisations, contribute in no small measure towards health work in this country, and the Government is alive to their good work and encourages them with suitable grants.

The health organisation had previously been somewhat centralised, owing to limited means and personnel. Only one or two qualified doctors could be placed in most provinces and they had to deal with nearly all preventive measures as well

as with medical treatment. This was perhaps the only method then possible. With the institution of provincial sanitary boards, a certain degree of decentralisation was encouraged ; but, as the members of these boards were mostly officials and the public health officers were the mainstays of the boards, local responsibility was only slightly fostered.

The institution of municipalities has further effected decentralisation by laying down definite local responsibility, and, as the work is to be done by a purely local staff, public interest in health work is better developed. The disadvantage of such decentralisation is in the standard of the personnel. Only few localities can afford to employ experts, and, until the local authorities are in a position to utilise a fully qualified personnel, the class of work to be handed over to them must be carefully limited to their capacity.

The practice at present, therefore, is to give as much power and duty to a local authority as it can effectively utilise with the technical advice and assistance of the central administration, and continuously to encourage the local bodies to take a greater share of public health work, so that the Department of Public Health may ultimately concentrate all its energy on general control, research and problems of national interest.

The advantage of permitting local authorities to promote their own health work is that an enterprising locality may advance beyond the possible average that a centralised organisation tends to maintain. Public health work is only effective with the full co-operation of the local inhabitants, and the creation of local responsibility is an important means towards that end.

The primary units of health work in rural Siam are the so-called *medical officers of the communes*. These men are selected from the most active empirical healers residing in the localities and given an official status with certain privileges and with a few simple duties to perform, such as reporting on cases of specific diseases and helping to keep local records. Most of them also dispense a few simple remedies prepared by the Department of Public Health. The provincial public health officer is in constant touch with these men in his area, and through them manages to get a considerable amount of health

work done. Vaccination is, for example, quite effectively done in rural districts at very low cost to the country by means of these commune officers.

The principle of division of labour as applied to preventive and curative medicine has proved to be sound in this age of specialisation and mass production. But such a principle assumes that there are adequate competent services in both branches of work, that the public fully appreciates the benefits from those services and that there is an active demand for them.

In Siam, modern medicine is little known in rural areas and the people are still sceptical of its benefits, even when these are demonstrated to them. The expense of modern curative medicine is also an obstacle to its extensive appreciation by people of a low economic standard, such as are usually found in rural areas. Thus it will be seen that, not only is the demand for modern medicine lacking, but that such demand as exists is ineffective.

With this background, public health education is faced with a great obstacle. The science of public health can only advance by the art of curative medicine. It is therefore considered that, in this country, both preventive and curative medicine should go hand in hand and be under a single central control. Although the public health officers may aim at health work as the more important part of their duty, they can drive home public health doctrines effectively only by demonstration of the superior efficacy of modern medicine in comparison with the usual cures locally offered. The people are in need of medical service, so by promoting curative medicine the advance of public health will be greatly facilitated.

In order to draw up definite plans as part of a national programme of public health work, the Government has appointed a committee for studying schemes of health and medical service. The members of this committee consist of public health and medical experts, together with representatives of the Red Cross, the Army Medical Service, the Ministry of Public Instruction and the Department of Public and Municipal Works. Amongst the many schemes under deliberation there is a report on rural hygiene, which has received the approval of the Government. As this programme will illustrate the ultimate aim of health

organisation in this country, it may be of interest briefly to state some of its points.

The country is geographically divided into four health divisions—North, East, Centre and South. In each division there is to be set up a first-grade hospital with some 200 beds, capable of dealing with all general cases. It will be provided with adequate laboratories and schools for training medical assistants, health nurses and sanitary inspectors. As a start, there are already two first-grade hospitals in existence, although not yet fully equipped to the standard requirements.

In important provincial centres where communication with the divisional centres is not yet well developed or where the distance from such centres is considerable, there will be set up second-grade hospitals with a capacity of some 100 beds each and suitably equipped with a laboratory for their work. Where required, a nursing-school may be run under the control of such a hospital for the training of local personnel. There are at present only two of this grade of hospital in operation, indicating a large amount of work in store.

In all the other provincial centres, there will be third-grade hospitals each with a capacity of only fifty beds. All the hospitals will have advisory boards, the members of which will consist of local influential persons who will make sure that the institutions obtain the necessary public support. At present, there are only five such third-grade hospitals in the provinces.

For each province there will be a health board, consisting of some of the chiefs of the different sections of the administration as well as representatives of other private organisations and prominent influential private persons. This board will have the Provincial Governor as chairman and the public health officer as secretary. Its duty will be mainly consultative, but its composition is such that its view on all health or reconstruction work will embody the provincial policy, and the support it gives to local health organisations should be of considerable value.

There are to be three other classes of health units more rural in nature. For more important district centres, provision will be made for setting up a first-grade health centre in each

locality ; while, at other places with easy access to one of the hospitals, second-grade health centres should be instituted. A qualified doctor is to take charge of a first-grade centre, but only a medical assistant will look after a centre of the second grade. For sparsely populated areas or where it will not be possible to set up any class of the above-mentioned health units, mobile units will be employed under the leadership of qualified medical officers to attend to the health work in defined areas. All these health centres and units are to be under the direct control of the provincial public health officers, who will use the nearest hospitals as their bases. There are sixty-nine first-grade health centres, 206 second-grade centres and two mobile health units in existence as bases for the development of the scheme.

The aim is gradually to replace the present type of commune healers by trained medical assistants who will provide the rural inhabitants with better medical service. Encouragement is given to communal medical officers to send their sons to be trained as medical assistants. As the profession is handed on from father to son, the replacement of the father by his trained son is only a matter of time.

Another way of approach to the question is by co-operation with the army Medical Service. In calling men to the colours, the service can choose among the recruits the requisite number of young men to be trained as dressers. If possible, the sons of commune medical officers are given preference, or, failing these, men from different communes are selected. When leaving the army, these dressers either return to their villages to carry on their fathers' work or else join the public health organisation after a short period of further training. These men will be encouraged to settle down in their own villages and appointed as future medical assistants for their communes.

These health units and communal medical assistants will serve as a framework into which the other activities of the Department of Public Health can be fitted. As curative medicine progresses to a stage when public health work may be separated from it without disadvantage, the Administration will introduce a dual control, as is usual in more developed countries.

2. Personnel.

The history of *medical education* in Siam shows that there has been a gradual raising of the standard to a course of five years before a doctor is qualified to practise, and the present standard is considered to be equal to that in any other country. Such a standard is admittedly so high that the supply of doctors to meet the demand of the country will not be available for generations to come. There are at present only some 500 qualified medical men and women in the service of the country with a population of over thirteen millions. This is very far short of the desirable ratio of one practitioner to every two thousand persons.

The obvious alternative of creating another class of qualification with a shorter course of study with a view to getting a greater number is not acceptable in this country. As an official, such a second-grade practitioner will not be so useful. He must necessarily cover a large section of the country alone and be ready to deal with all cases. The size of an area requires the best possible training for the only medical officer available. As a private practitioner, he will tend to work in a town. His standard is too high for rural areas. For urban practice it is more economical for the State to supply medical service by a hospital, where a few well-qualified doctors can give better general service to the community.

To meet the need of the rural areas, it is considered that health centres will supply a more efficient service. A few beds may be provided at a centre where a medical officer is one of the staff, while at other centres where only medical assistants are in charge, all serious cases may be transferred to one of the base hospitals. It is obvious that a personnel consisting of the medical assistant grade can be afforded as providers of local medical service under the present economic condition of the people, and the method of securing them has already been discussed.

The training of an *auxiliary staff* for health work is not a technical difficulty in Siam. It is purely a matter of funds. Secondary education, both in the capital and other provincial centres, is sufficiently advanced easily to provide suitable recruits in sufficient number.

Pharmacists are trained only at the Chulalongkorn University. The *medical assistants for health work* are trained at any one of the divisional hospitals. Recruits are admitted after they have passed standard six in secondary education or after they have served as dressers in the Army Medical Service. A training period of three years is required for raw recruits, while men from the Army Medical Service need only be trained for one year. *Health nurses* are required to be trained as above, with a similar qualification on entry. *Sanitary inspectors* are also trained at a divisional hospital school. For those of the eighth standard in secondary education, only a one-year course is necessary, while those of the sixth standard must be trained for two years. *Hospital nurses* are trained under a similar standard as that for health nurses, but such training may also be given at second-grade hospitals.

The question of *midwives* for rural areas is exceedingly difficult. The rural midwives at present available are unacquainted with even the elementary principles of modern practice. The Department of Public Health once organised a short period of training as an experiment. The result was to drive the majority of fully qualified nurse-midwives into the towns. The present aim is to attach a nurse-midwife to each health centre, where, besides her duty in general maternity and child welfare work, she is to inspect and supervise all the registered rural midwives in her area. This is as far as it is found possible to go at present, but it is believed that, with improved communications and a further advance in public education, it may be possible to institute a better class of communal midwives by a system of strict supervision and a higher standard of qualification for registration. With improved communications, qualified midwives in populous centres will be able to give more extensive service than is possible at present.

3. Health Activities and Finance.

The aim of the public health work in this country, as recommended by the National Committee on Public Health and Medical Services, is rather ambitious. The activities of

the Department of Public Health, after taking into consideration the funds at its disposal, may also be considered to be too extensive. Yet the work of promoting social well-being in Siam cannot be judged purely from the size of the public health budget alone. The expenditure of other State departments—in the Ministries of Public Instruction, Defence, Economic Affairs and Agriculture—may also be regarded as including certain phases of health work, of which it will be difficult to attempt a definite estimate.

However, under the new democratic form of administration, Siam is rapidly expanding her health work and organisation to adequate national dimensions, as it is fully recognised that upon the standard of national health depends the standard of national prosperity.

The expenditure of the Department of Public Health and the local authorities for the last three Siamese years is an indication of the increasing activities of health work in this country. The total expenditure for the years B.E. 2477, 2478 and 2479 are respectively 1,382,790, 1,636,337 and 2,173,006 baht.[1] Reimbursement by municipalities will probably show an accelerated increase in the immediate future.

With other demands on the State budget, the grant provided for the Public Health Department may be considered satisfactory. Under the new schemes it is hoped to attain better general economy, thereby releasing part of the available funds for the more urgent phases of the work. The decentralisation of health activities is designed to create local responsibility in health work, and it is in this direction that new resources are to be expected for the future health requirements of the country.

II. RURAL RECONSTRUCTION AND COLLABORATION OF THE POPULATION.

Siam, being a purely agricultural country and therefore mostly rural, is particularly interested in the question of rural reconstruction, which is one of the most important items of her national policy.

[1] 1 *baht* = £0.092 (average rate of exchange, 1936). — *Editor.*

Although the technical aspects of the question do not present any insurmountable difficulty, the peculiarity of the economic condition of the people, characterised by a small money income, will admit of only gradual progress in carrying out the schemes of improvement.

The rural inhabitants of this country, apart from their educational attainments since the introduction of compulsory education some twenty years ago, possess such natural intelligence and adaptability that they can be easily persuaded by sympathetic leadership to co-operate in work of public benefit.

For many years the Public Health Department has carried on extensive health campaigns in every part of the Kingdom by means of countless booklets, lectures, exhibitions and demonstrations, as well as by actual measures intended to serve as examples. Through the Education Department, the schools have received instruction on hygiene with satisfactory results. The health campaigns are designed to reach men, women and children alike. No marked difference in intelligence between men and women has been observed by field workers as far as receptivity is concerned. But, as the women are usually at home during working days, they have received more attention than the men in this respect.

It has been realised that progress in public health must depend on the earning power of the people and that the economic progress visualised in the national economic policy will carry with it progress in hygiene. The road construction scheme, started two years ago with a total grant of 30,000,000 baht for a period of five years, will contribute towards both economic and public health progress.

Before forming practical schemes of reconstruction, surveys of the economic conditions of the rural population must be carried out by experts in the field. The Government has, in co-operation with Harvard University, carried out two extensive rural surveys under the supervision of American experts with Siamese technicians as assistants. The two published reports contain the basic data for any scheme of reconstruction.

It is believed that one of the most effective means of promoting economic progress or rural reconstruction is to be found in co-operative credit societies. The society members already

realise the benefit of co-operation and are in close touch with the co-operative inspectors, who are held in respect by them. Discussion on the why and wherefore of things has already taken place. By the gradual introduction of other subject-matters and through actual demonstrations and personal contacts with practical officials of the Agriculture, Public Health and Commerce Departments, it is hoped to attain effective and permanent results. Such co-operative inspectors are selected from men of fairly good education, and with their sympathetic understanding there is a promise of continuous progress in the various measures that are being undertaken. Information given through those in whom the people already place their trust is naturally more acceptable, while actual demonstration by practical men should promote ready adoption by them.

For general co-operation between the various organisations, it has been proposed in the national public health scheme to organise local health boards in all the districts and provinces of the Kingdom, with the senior local authorities as *ex-officio* chairmen, while the members of the boards will consist, not only of the various officials concerned, but include representatives of all local interests and organisations. These health boards, besides their normal work as elsewhere described, will form important local consultative bodies and give moral as well as technical support to the co-operative societies.

The main items of rural reconstruction may be summarised as follows :

1. Communication and Transport.

Extensive waterways exist and are largely utilised in the plains. Railways are of sufficient mileage to be regarded as the backbone of our administration, education and commerce. But progress in highway development has not hitherto kept pace with the other means of communication.

Rural reconstruction is unthinkable without modern roads. Countless rural communities are yet unconnected with markets and still remain in a state of relative isolation and self-sufficiency. The absence of an incentive to surplus production, with a consequent low cash income, is a serious handicap for any

scheme of reconstruction. Where a highway has connected a village to a market, the economic standard of the inhabitants is invariably higher and the people are more receptive to public health and other progressive ideas. Ways and means for carrying out development works are thereby made available.

A five-year scheme involving 30,000,000 baht has been enforced for the last two years for highway construction, apart from the ordinary maintenance and improvement charges for existing highways. The construction is being carried out by the Public and Municipal Works Department, the provincial and local authorities collaborating. Successive plans to continue the highway programme are under preparation to ensure that the work will not lose its momentum in the future.

The central idea in the programme is the connecting-up of every village to the nearest market. Benefiting from the experiences of other countries, the highways are planned to open up the country and to eliminate ruinous transport competition, as far as practicable, for the sake of national economy. Isolated rural communities are being brought into contact with commercial centres, thus preparing the ground for other phases of reconstruction works.

2. Planning.

A passive attitude towards local development has resulted in unnecessary wastage, as in most countries. A minimum health standard is more difficult to maintain, and the reconstructive work is made more complicated. Field surveys of many communities have been undertaken and local officials and influential bodies have interested themselves in planning both from the economic and the health points of view.

The Department of Public and Municipal Works has prepared several plans for towns and other communities and submitted them to the local authorities as bases for discussion. Many plans have been accepted and adopted by local bodies in their programmes of reconstruction, while many more are still under consideration.

Local authorities are invited to consult the department in planning. Surveys and plans are supplied gratis to all local

bodies. Realising that town-planning is a complicated subject, the Administration prefers to foster spontaneous demands rather than resort to a procedure of compulsion. No legal power or administrative order has as yet been used. Only technical advice and constructive suggestions are given. Local representatives of the department are also at hand to give further details when needed.

The schemes are not drawn up on hard-and-fast lines, but rather as projects. As soon as general agreement is obtained, more detailed surveys are made of actual sections in immediate prospect of reconstruction. This method simplifies the early discussion, gives flexibility to future improvements or alterations, and expedites both field and office work. It is expected that, with good examples set by enterprising local bodies, the work may progress to such a degree as will justify the enactment of a projected Town and Regional Planning Act, which will embody the future national standard in this sphere of constructive policy.

3. The Local Government Organisation Act.

This Act provides for the incorporation of urban and rural local governments under specific conditions with powers and duties in matters of public safety, health and convenience. These include many aspects of public works and utilities.

Although the resources of the majority of rural communities will not enable them at the outset to carry out ambitious public improvement schemes, the setting-up of local bodies will be highly educative in concentrating public attention on many practical questions of public health and welfare.

The Act is a veritable code for any scheme of reconstruction to be publicly discussed and finally carried out with local co-operation. As the Act has been only recently passed, it is too soon, perhaps, to give a definite judgment of its ultimate success; but, judging from general impressions, it may be justifiable to state that the immediate results are encouraging, especially in the matter of preventive and curative medicine.

The central Government provides technical services and free advice to local bodies, and, when schemes of work are

approved, loans are granted to them on easy terms. Most of such loans so far raised are for works of public utility. But, in cases where fires have destroyed extensive properties, public borrowing has been authorised for the purpose of reconstruction.

The provincial councils, set up by the same Act as advisory bodies to the provincial boards, are also co-ordinative. It is part of their functions to arrange for co-operation between the local bodies themselves as well as to act as a link between them and the central Government in general policy and in regional schemes. Their chief rôle will be to obtain more uniform progress in reconstruction work.

4. Agriculture.

The mainstay of rural economy in Siam is the cultivation of rice, of which there is a large surplus for export. This commodity is also the most important item of the national wealth. Rice is nearly the only commercialised crop, while other agricultural products are generally locally consumed.

The depression, although it has not seriously affected the food supply of farmers, has given them very little cash income to acquire manufactured goods, for investment and as national contribution for taxes. Too much specialisation in rice has not developed sufficient knowledge in the cultivation and marketing of other crops. This is a handicap which renders the work of recovery somewhat more difficult.

The aims of reconstruction in this field are in four directions :

(a) *Rice Cultivation.*

To meet the low level of prices, the cost of production must be reduced. This is to be obtained by better seed selection, more modern methods of cultivation, co-operative credit and marketing, irrigation and better transport facilities.

Agriculture is taught in elementary schools, to give the pupils an early understanding of their probable calling. Experimental and demonstration farms are being set up in many rural communities as an incentive to a more scientific cultivation.

With the support of the co-operative societies, this work should progress in a satisfactory way.

The co-operative credit societies are being developed in Siam as fast as good inspectors can be trained to control them. As it is realised that these societies will form the focal points of reconstruction, they are being carefully fostered for efficiency and soundness.

The satisfactory economic conditions of the members of these societies during the depression as well as the progressive standard of living of the members throughout this distressing period are convincing proof of their essential utility.

The marketing of rice in Siam is still far from satisfactory. Lack of rapid means of transport and the low prices of paddy have made the proposed scheme of marketing by the use of grain elevators more difficult to realise than would otherwise be the case. The mixing of different grades of paddy by traders before its sale to the mills is mainly responsible for the deterioration of quality. Standardisation and marketing will have to go together to ensure successful results. The Government intends to study the question further before embarking on this very important work. The programme of highway construction will materially facilitate the solution.

A large capital outlay has been made for irrigation according to schemes laid down after thorough investigation for many years. Its result in better production of crops and as an insurance against total failure is appreciated. Skill in the use of water has, however, yet to be acquired by farmers unaccustomed to the artificial watering of crops. Results from irrigation of the highlands have been very satisfactory, and great attention is being given to further development in districts in which the people are accustomed to cultivate by irrigation, but where technical works need to be of a more rational and permanent nature.

With the introduction of other crops besides rice, it is expected that irrigation will prove even more beneficial, as rice requires more water than other crops. The sole aim of irrigation is to reduce the cost of cultivation. The higher value of land in irrigated areas is an indication that the above aim is being attained.

(b) *Other Crops.*

In self-sufficing districts, many varieties of produce are raised for local consumption, while in the commercialised areas there has been too much specialisation in rice cultivation. To diversify products to meet changing markets and to develop other areas still untouched by such specialisation, the Department of Agriculture is giving serious attention to the cultivation of cotton, tobacco, sugar-cane, etc. Proper seed selection, methods of cultivation and marketing have to be considered at one and the same time.

The creation of cotton and cigarette factories in the capital has facilitated the marketing of the raw materials for these industries. A sugar factory is being set up in a suitable province of the north, which will similarly ensure a market for sugar-cane.

Suitable seeds for cotton and tobacco are being distributed, with instructions as to the best method of cultivation. Demonstration plots are also cultivated in the schools and experimental stations. The curing of cigarette tobacco is carried out in central depots, and plans are available which will enable co-operative societies or private concerns to set up similar curing plants in suitable localities.

Home-made ginning-machines are already in use by the people in preparing cotton for home weaving. More modern equipment is now made available for use in districts where larger quantities are worked. The establishment of ginning and baling factories is being considered at certain points to economise production and transport. Generally, it may be taken that both cotton and tobacco growing is on the way to success and will materially promote economic progress and reconstruction in the interior.

The sugar industry is being revived in Siam with a view to meeting the demand of the home market and the creation of another paying crop in suitable areas. Sugar was once exported from Siam, but recent specialisation in rice and the cheapness of sugar in the world market have resulted in the abandonment of sugar cultivation on a commercial scale. Some unrefined sugar is still made for local consumption.

The Department of Agriculture is introducing new kinds of cane and also selecting the best local strains for extensive cultivation, in order to meet the expected needs of the new factory. With the success of the scheme in the north, it will be advisable to set up similar plants in other suitable districts, as there is still a large demand for sugar at home, which at present is wholly imported from abroad.

Other crops are being studied and experimented with, in order further to diversify the products and stabilise the economy of the rural population. The same careful consideration for cultivation and marketing will be given to ensure steady progress. As in the case of rice, a quicker means of transport is essential for any important advance.

(c) *Cattle and Other Domestic Animals.*

Siam has large areas of grassland and is favourably situated on the continent to supply cattle for export. She exports a large number of buffaloes, oxen and pigs to various surrounding countries. Many other domestic animals are also bred for local requirements.

Breeding has not been very scientific, and, owing to the extensive nature of the country, the control of disease has never been an easy task. Although internal transport is indifferent for cattle marketing, the lack of adequate commercial centres near most of the villages has necessitated long journeys for the disposal of the animals and is a handicap to steady trading. Export of live-stock is naturally expensive and the return not as advantageous as in the case of carcasses. By-products, such as hides, bones, manure, etc., are lost in the process.

The Department of Agriculture is giving attention to breeding schemes and has appropriate powers of control. Experimental research stations are continually at work to promote better results and the advance in highway construction will facilitate both the control work and marketing. The inhabitants need little demonstration in the economic advantage of rearing domestic animals as farm products, and only require better channels for disposal and the elimination of wasteful diseases.

Progress so far obtained indicates that this will be an outstanding source of rural wealth.

The question of meat exports is receiving much attention in business and official circles. A refrigerating plant has recently been set up in Bangkok, while cold-storage ships frequently call at the port. The meat market may be extended to China, Japan and India, besides those neighbouring countries to which cattle are already being exported.

This trade will tend to grow in time to its natural dimensions, and at the same time the local industries of hide preparation and leather manufacture will be developed to meet both the increasing internal demand and export. More varieties of meat can be marketed with the help of refrigeration. Apart from affording an increased income to rural areas, this will at the same time cheapen the cost of meat for domestic consumption.

(d) *Commerce.*

In areas possessing good railway communication, commercial development is proceeding satisfactorily, resulting in increased production of agricultural products and better market prices for them, as well as favourable prices for manufactured goods. Better housing and sanitation are thereby made possible for the people. Good communications bring commerce, and this in turn creates better general economic conditions in the self-sufficing areas. Thus, the programme of highway construction will set the ball rolling towards the desired end.

The Siamese rural population is, however, unacquainted with business and may be unfairly exploited by traders, thus slowing down the rate of development. Provision should be made for imparting information concerning prevailing prices and for transporting produce to the best market, as an alternative to direct disposal to traders. This will prevent a monopoly by middlemen. It is hoped that the co-operative societies, or some other form of public utility enterprise under governmental control, will fulfil this necessary function.

The Department of Commerce is setting up trade commissioners in many parts of the country to study in detail the question of preparing definite schemes suitable for the

different areas. Meanwhile, these trade officers are giving advice to local authorities and co-operative societies as to the most suitable method of marketing and business connections according to the means at present available. The success obtained with cotton and tobacco gives promise of satisfactory results in other commodities.

As a purely agricultural country, Siam is not aiming at general industrial development ; the idea is that industries should be set up only as a support to agriculture, by creating a market for the produce in the neighbourhood. Once the people have sufficient experience and are in a position to expand production, commercialisation for the export market should naturally follow.

Even industries in this limited sense cannot be economically created for all raw materials locally produced. Skilled labour is scarce in rural districts and the volume of trade is yet too small for many classes of goods. It is proposed to encourage cottage industries to meet such small business in an extensive area, and at the same time to create a demand for skilled labour, which may eventually form the background for future small industrial undertakings.

Handicraft schools have been tried with promising results. The Siamese population of self-sufficing areas must necessarily do every kind of work themselves and are fair craftsmen, while farmers in commercialised districts should soon reacquire the necessary technical skill if properly fostered. The crux of the question is the collecting and marketing of these home-made goods. The scheme for rural commerce will take this important problem with it for eventual development and will occupy an important place in rural reconstruction.

(e) *General.*

The work of reconstruction in rural Siam is recognised as of supreme importance to national well-being and economy and is regarded as the first item of our national economic policy. Outlines of the various questions involved in obtaining the desired end have been briefly indicated. The problems are not regarded as difficult ; but, owing to the extensive area of the

country and its sparse population and to the fact that most things have to be started from the beginning, the time taken to cover all phases of development all over the country will necessarily be prolonged.

The authorities are faced here with the question of compulsion or co-operation. Apart from the temporary nature of its result, compulsion as a principle is contrary to the democratic ideas recently introduced into Siam. The Siamese farmers are naturally very independent and dislike interference in any form, however beneficial to themselves. They appreciate intelligent leadership and are eager to follow examples when these are shown to be beneficial to themselves or to the national institutions.

The methods previously practised and to be pursued are to persuade influential persons to set good local examples and also to give actual demonstrations on the spot, with lectures and booklets if necessary. For simple issues, ordinary means of popular education have been fairly effective, but for general betterment nothing short of a well-organised and persistent effort in adult education is required.

The Department of Public Health has adequate powers for compulsion when necessary. With a better understanding of the aims by the general public and when more means are available, the Government will not hesitate to coerce the minority for the benefit of the whole community.

III. SANITATION AND SANITARY ENGINEERING.

The problem of rural sanitation in this country presents many difficulties, none of which are due to religious practice or national habits. The main difficulty is economic. Effective modern sanitation requires much material and labour, in addition to competent technical supervision.

The labour is there ; but materials cost money and supervision requires good means of communication and a well-organised central force. Skilled labour, as previously stated, is scarce. It seems, therefore, that sanitation must necessarily follow rural reconstruction if it is to be on an extensive scale.

Popular educational work of various kinds has been carried out by the Department of Public Health, supplemented by

pamphlets of instruction and type plans of barns, wells, latrines, etc., for the guidance of local authorities and the supervision of individual effort. The Department of Public and Municipal Works has latterly fallen into line with the Public Health Department, and many more type plans have been prepared and supplied free of cost to local authorities.

Where the nature of the work does not involve expenditure of any magnitude, the people have co-operated and carried out the general instructions given ; while, for works that involve considerable outlay, difficulties have been encountered and grants have to be given for completion.

The following notes outline certain efforts and aims connected with some phases of sanitation and sanitary engineering in rural Siam :

1. Water.

Rural inhabitants in localities remote from large rivers and canals, especially outside the central plains, obtain their water supply from shallow wells, while those living near rivers, streams or canals get it direct from these. Even here it is generally understood that earth and sand act as a natural filter and purify the water to a certain extent. In many districts, water is obtained from river banks through temporary wells, to get filtration of the untreated river water.

During the rainy season, when the rivers are in flood, there are no noticeable bad effects, but during the dry months the riparian population is liable to periodical cholera epidemics, while those using well water in certain areas do not find a sufficient supply and must economise its use at the expense of personal hygiene. As a rule, however, well water is found to be wholesome and sufficient in quantity. Wells of unsound construction and materials are liable to be polluted, while the drawing of water by buckets and rope is not desirable, especially in the case of public wells, where reasonable care in handling is not to be expected.

The case of the riverine population is, however, more serious and more difficult of solution. General instructions to boil the water before use may sound simple and effective, but the cost of boiling water is generally too high to be practical,

especially in densely settled districts where fuel is scarce and valuable. This method is in the nature of a palliative, and is resorted to only during periods of epidemics, while at other times things are left more or less to chance.

Chemical means of sterilising water are even more difficult to introduce, as the necessary chemicals are not available in rural shops and, where obtainable, are often too dear to be extensively employed. Only alum is generally used throughout Siam for clarifying muddy water. There is, however imperfect appreciation of its use, so that full benefit is not yet derived even from this simple means.

During the previous cholera epidemic, the Ministry of the Interior gave grants and provided plans, as well as the necessary technical advice, to enable communities along the rivers to organise temporary water supplies, consisting of a few galvanised tanks, sedimentation by alum and sterilisation by chloride of lime, by means of which the raw river water was rendered relatively safe under the supervision of local committees, with either a medical officer or an engineering technician in actual charge.

The people were ready enough to avail themselves of the treated water and to pay a nominal fee for it. The result was found to be generally satisfactory. But such plants can be properly worked only where there is adequate supervision. The filling of tanks by hand has proved to be rather costly, while the use of a motor-pump introduced further complications in working and necessitated the employment of a mechanic. Only fairly large communities can benefit from such plants, and the relatively high cost of production tends to restrict their use to periods of epidemic. However, the experiment has shown the possibility of some practical means being found of meeting the requirement of a pure water supply in such rural areas.

The general objectives are three in number—namely :

(a) *Wells.*

The principle is to give grants for the digging and proper construction of public wells according to the official type plan. If possible, the well is closed and water is drawn by a hand-pump. This, besides augmenting the local water supply, furnishes a valuable object-lesson to those who can afford it in their own

homes. Hundreds of such wells have been constructed by grants and thousands have been copied by well-to-do villagers. This work will be expanded yearly.

The maintenance of the hand-pumps has been found to be a problem in some localities. The pumps are not carefully handled at public wells, and, if broken or damaged in any way, there is usually no one capable of repairing them. The immediate result of a defective pump is so serious that closed wells have to be opened up and worked by bucket and rope, with the consequent risk of contamination. The problem may probably be solved either by the duplication of pumps or, preferably for remote districts, by a bucket-and-rope device so arranged that there is no human contact when in use. When communications are improved, the problem of proper maintenance of pumps will solve itself.

Where concrete-making materials are easily procurable, the cost for sinking wells is considerably reduced, but where sand and stone are scarce the cost is often prohibitive. Brick wells with cement mortar have been tried in some districts where sufficient good bricks are available. The cost is moderate, but the work needs close supervision. Although not so reliable, brick wells are the only possibility in many districts. Progress in this respect depends upon the manufacture of better bricks and better workmanship. Promotion of the use of better construction material will be further discussed under housing.

The shortage of water in shallow wells in certain localities during the dry months and the danger from contamination by latrines had drawn the attention of the authorities to the question of deep wells as a source of better public supply. Plant for deep-well boring has been acquired and trials are being made in a few localities where the demand for water is most urgent. Such deep wells can be afforded only by municipalities ; otherwise, they must be maintained wholly by grants from the central Government.

(b) *Water Treatment.*

For districts in the central plains, shallow wells are generally of no use. The supply must come from the rivers, swamps or canals, and for a good many months in the year there is always considerable risk to the population. It is almost certain that

surface water is responsible for the periodical outbreak of cholera. As previously stated, the solution seems to be some method of water treatment that may be easily introduced and carried out by the local inhabitants.

In large villages, where a local authority may be established and some supervision may be provided, it is proposed to replace temporary plant by a more permanent installation, so that the cost of operation may be reduced and the quality of water made even better. Such waterworks may be made self-supporting. Loans may be necessary to enable some of the smaller villages to make a start. More thorough investigation by provincial engineers and standardisation of plant will be necessary for economical operation. If chemicals are purchased by a central authority, the running costs will also be appreciably reduced.

For scattered homes along the waterways, the problem is one of great difficulty. The first step is to give instruction in the proper use of alum for sedimentation. This alone, if generally adopted, would greatly reduce the risk of many diseases. Fortunately, the people are already familiar with this chemical, and all that is required is to show them how to use it to the best advantage.

The next step in this line will be filtration by sand. The Department of Public Health is investigating a model home-filtration plant, employing only country water-jars and other easily procured local materials. When this has been found satisfactory and reliable, its popularisation will be a simple matter. Much is expected from this measure for the solution of a difficult problem, and no effort will be spared for further research.

On account of its cost, sterilisation can be considered only in the larger plants and only in times of epidemic in household filters. With improved communications and the growth of trade, the necessary chemicals will become available at a more reasonable price.

(c) *Rain-water.*

Rain-water is fully utilised by rural inhabitants, who collect it in all available jars and tanks. In the rainy season, this is the main factor in a clean bill of health. Carelessness occurs in collection, storage and use, but on the whole this source of supply is probably the most reliable.

The trouble is that there is not sufficient storage, and the shortage coincides with the period when supplies from other sources are least reliable. For many districts, such as those near the seacoast, rain-water is often the only available source of supply.

To increase the general supply in certain villages, it is proposed to set up " hydrauleums ", or public rain-water supplies, as in the case of public wells. A corrugated roofing area will be arranged with a few large concrete tanks, and the water will be retailed at nominal cost. The commune authority or the co-operative society will have charge of these water-stations, and there is a good prospect of their being self-supporting. The initial cost of installation may have to be met from a central fund, as in the case of public wells.

Such hydrauleums can, of course, never meet the requirements of a whole village, unsupported by private collection and storage by the villagers themselves. By improvement in home storage, the village supply will become more satisfactory and the increased use of pure water will result in better health.

Such improvement depends, in the first place, upon the supply of good and cheap water-jars. Suitable concrete water-jars can be obtained in many rural districts of Siam at a very low cost. Earthenware jars of large size are only made near the capital, while small ones obtainable in other centres are of little use for rain-water storage and are expensive when demanded in large numbers.

To overcome this difficulty, it is necessary to introduce the art of making concrete or large earthenware jars for sale at a reasonable price in as many rural villages as possible. The immediate aim of this scheme is to provide for a more careful collection and storage of water. The equipment for home sand-filters will, of course, serve a useful purpose for those who need water of better quality.

2. Latrines.

Since the days of its co-operation with the Rockefeller Foundation in the anti-hookworm campaign, the Department of Public Health has for many years worked for the installation

of proper latrines in rural areas. Demonstration with actual models, distribution of plans and supervision of construction have been unsparingly given. These efforts have resulted in a great many standard structures in every part of the country. Proper installation is necessarily expensive and maintenance is constantly required, especially where unsound and non-durable materials are employed.

The danger of a latrine being situated near a shallow well is fully understood, and there is no difficulty in obtaining compliance with the regulations once attention is called to the danger. The increasing use of precast concrete has resulted in a cesspool design which is of considerable interest. A round or square concrete box is placed underground with a concrete cover in which a seat is integrally cast, having a water trap which effectively seals the latrine, while the sewage can be flushed into the tank with only a small bowl of water.

Flies and odour are entirely eliminated. Usually, two tanks are set up side by side and connected with each other by a short concrete pipe, one tank acting as soak-pit for the other. Some septic action takes place, with the result that only after a fairly long interval of years is a new installation required. This type of latrine is popular and large numbers are made yearly and sold to an increasing public. To keep down the price, the tanks are made rather thin and are thus difficult to transport for any great distance. This somewhat limits the radius of their installation from the point of manufacture.

In localities where shallow wells are used as sources of water supply, some concern is felt for the indiscriminate use of this type of cesspool. As shallow wells are still a necessity, the line of progress must be in the improvement of the latrines themselves. A design with greater septic action and a certain amount of filtration of the effluent is being considered and experimented upon, the necessary low cost of installation for extensive use being constantly kept in mind. Should this prove successful, the problem may be regarded as temporarily solved for some time to come. In the work of promoting better sanitation, the appeal of obvious convenience has been found most effective.

3. Refuse Disposal and Drainage.

The question of the disposal of refuse in rural areas has not generally presented any serious difficulty, as houses are far apart and the amount of refuse very small. The hot climate, which intensifies putrefaction, speedily completes the drying process. A better understanding of the use of garbage for manure has resulted from the instruction given by the Department of Agriculture, and the small amount available is usually buried or used for agricultural purposes.

The disposal of stable manure is more complicated, as the construction of stables and pens still lacks many desirable features. Dung has been very little used as manure. Persistent persuasion on the part of the Department of Agriculture for the general use of stable manure will dispose of the sanitary aspect of the question at the same time. It is considered that a general understanding of the economic value of all refuse or manure will be more helpful in solving the question of refuse disposal than the usual approach along conventional public health lines.

Drainage, also, is not of great importance. In upland districts it is automatic, while in the plains the question does not arise during the high-water season for many months of the year, and during certain months there is never enough water to soak the ground except in very few places. In most cases, the seepage pit of the latrine can be utilised as a means of disposal for household waste water.

4. Control of Flies.

Flies breed quickly and abundantly in manure-heaps and during the fruit season. Thus, when a satisfactory solution is found for refuse disposal, the question of fly control will be automatically solved.

Manure is only used during the early period of cultivation, while refuse is always being created. Storage is liable to breed flies, unless it takes the form of burial. This, even if generally observed, would not be practicable in the plains during the high-water season.

The fermentation of refuse under cover was tried, with some success in urban centres. It is therefore proposed to design a simple method of storage with the use of precast concrete or bricks in suitable areas. This will form a valuable store for manure and eliminate fly-breeding. However cheap the construction, the general application of the method must wait until the inhabitants acquire a somewhat greater earning power. The question is not of great urgency and much is to be expected from the work of the Department of Agriculture.

5. Building and Housing.

The Siamese rural population generally constructs its houses on high poles or posts, even on high land. The materials are mostly of good timber, bamboos being used only to a small extent for outhouses and roofs. In fact, the houses of rural peasants are generally of better construction and plan than those of the poorer classes in many urban centres.

Attaps, grass and leaves are generally employed for roofing, but the use of galvanised iron, shingles, clay and concrete tiles is increasing all over the country. The self-sufficing districts usually have plenty of good timber at hand. Houses are generally well built and kept in good repair. In commercial areas, materials of construction are more expensive, but more varieties are available in the market. Better houses may be obtained for money. The depression retarded the building trade in such areas. Maintenance has also much deteriorated, owing to the reduced incomes.

There is no question of overcrowding in rural Siam, but planning is not very economical and varieties of suitable material are not yet available in all areas. Together with the work of planning already mentioned, standard plans of rural houses and other necessary buildings are being recommended to the inhabitants. Influential people are urged to adopt such plans and thus set an example to others.

Although these standard plans provide for more economical use of materials, many necessary parts can only be acquired by purchase, and in many districts the prices are still too high owing to poor communications. Progress must therefore await

the development of roads. The question of building materials is being studied by the Department of Public and Municipal Works. It is trying to encourage the employment of local materials and the manufacture in many local centres of parts too costly for long-distance transport.

The Building Act recently enacted provides local authorities with suitable power to regulate new construction and the alteration of dangerous existing buildings. Model by-laws and regulations to be enforced in suitable cases will be furnished to these authorities. By example, technical assistance and publicity, it is expected that this law will gradually lead to better rural housing.

6. Engineering.

Sanitation and reconstruction will not be possible without technicians in sufficient number in such a large country as Siam. Even if the number becomes available, the rural inhabitants can hardly be expected to be able to afford such technical service without central help. This question is being dealt with by the Department of Public and Municipal Works, which is earnestly trying to discharge its responsibility.

The extension of public works demands more technical staff than is at present available. Intensive training is being given by a departmental school, the Society of Engineers and many private institutions, beside the Chulalongkorn University, for all classes of necessary personnel. Nevertheless, the demand will not be fully met for a considerable time to come.

Each province has an overworked public works engineer, and some assistants. With the centralisation in the preparation of plans and schemes, the local officers can spend most of their time in the field. They help also in the training of practical assistants for a variety of work, thus developing the necessary technical service in a practical manner. The ultimate aim is to have an engineer for each administrative district, apart from other technicians employed by the local authorities themselves. Schools for mechanical industry and handicrafts are being instituted by the Ministry of Public Instruction in all important

centres, and thus an adequate engineering staff will soon be available.

Local materials and methods are being studied with promising results. It is intended to expand this research work sufficiently to meet national requirements. Only by elaborate research along lines adapted to local conditions and resources may any general progress be expected. The latest advance in the technical sciences will only prove useful in rural areas if it can be adapted to suit the special requirements and economic conditions of each locality.

Siamese engineers are confident that much can be done, given the necessary time for research and experiment. The national policy of rural reconstruction has been a challenge to Siamese engineers and doctors. This challenge they have accepted, well knowing that by industry and patience ultimate victory lies within their reach.

IV. NUTRITION.

The question of nutrition was previously regarded as among the less urgent of the many problems of preventive medicine in this country. It was realised that, for many reasons, the diet of the people was not as it should be ; but, since the problem was so complicated and there were so many other matters needing immediate attention, very little was done concerning nutrition in Siam.

Siam, like most tropical countries, produces practically no milk, and imports yearly an increasing quantity of condensed milk and milk foods in the form of powder. To safeguard the inhabitants from inferior quality, especially for infant feeding, the Skimmed Milk Act was passed in 1929, fixing the minimum content of the total milk fats for all milk and milk products on sale for public consumption. This legislative measure was specially needed owing to the circumstances under which large quantities of skimmed milk were imported from cheese-producing countries in Europe. Owing to ignorance and misunderstanding, this skimmed milk, when given to children, resulted in blindness in certain cases.

Educational measures on the principles of nutrition have been taken both in schools and through the various health centres, but the Department of Public Health is not yet in a position to devote to this question the attention it deserves. It has recently referred the question to the National Committee on Public Health for consideration of a national policy in this matter, but the subject is still being examined.

The two rural economic surveys of Siam carried out by two experts from Harvard University furnished sufficient data to convince the Department of Public Health that nutrition problems in rural areas are urgent. It has therefore detailed one of its most highly qualified officers to study the whole question, and this officer is leaving for Europe and America to make further enquiries into the technique of research on nutrition in those continents. Scholarships are also being granted for post-graduate training in Japan in this highly important question.

As in the other aspects of health work in this country, the policy of the Administration is first to organise a central section competent to deal with the problem before launching out into extensive operations in the field. After a policy has been marked out on the advice of the National Committee, it is expected that, concurrently with research work, an intensive training will be given to the available public health officers on the subject of nutrition. It is also hoped that the Chulalongkorn University will give a more prominent place to nutrition in its medical curriculum.

As stated in other parts of this report, Siam is a great producer of foodstuffs and exports a considerable surplus to other countries. There is thus no question of lack of food here in any part of the country, even in times of depression. The problem as seen to-day is mainly one of ignorance in food values and a certain amount of prejudice due to local habits. The lack of communications and commercialism in some rural areas is no doubt responsible for the want of variety in food, but the problem is further complicated by commerce itself. An instance of this is to be found in the growing preference for white polished rice in commercialised areas.

All classes of people in Siam prepare and consume more or less the same kind of meals, consisting principally of boiled

rice, eaten with a variety of ingredients containing various preparations of meat, pork, chicken, fish, egg and vegetable, usually strongly seasoned. A considerable amount of sugar is consumed in sweets prepared from egg, coco-nut and rice. Fruit is also largely eaten, according to the season.

In urban centres, variety in supply is always possible, and the tendency is also to vary certain meals in the Chinese and Western styles. In rural areas, there are many drawbacks. These are summarised below.

(*a*) In commercialised areas, rice is usually milled instead of being prepared by pounding at home ; polished rice is thus largely consumed. The lack of pericarp in white rice is supposed to be met by the increased consumption of other foods made available by commerce. But habits are not changed with the introduction of white rice, and the general ignorance of food values exposes some of the inhabitants to the danger of contracting beriberi. To urge people once accustomed to white rice to go back to pounded rice would be as difficult as asking a European to forsake his white bread for brown or black. The industry of rice milling is too advanced in the national economy to be radically altered to suit local nutrition problems. Any solution must aim at getting people to balance their diet by consuming other foods as well, and a variety of such foods should be made available.

(*b*) Fish is practically the main animal food consumed by the Siamese people in rural areas, while meat, chicken and eggs are only occasionally eaten. In commercialised districts, the supply of inland fish is being depleted. Salted and pickled fish are increasingly imported from other districts along the seacoast, where the supply is so great that a considerable amount is exported annually. It is believed that salted and other preserved fish are no substitute for fresh fish as a suitable diet. Although the scheme of inland fish conservation and breeding pursued by the Agriculture and Fishery Department will help to increase the available supply, the solution of this problem is to be found in public education, by persuading the people to eat more animal food, and in the provision of more fresh sea-fish in rural markets as a result of better means of communication.

(*c*) Although the rearing of live-stock is an important industry in Siam, the inhabitants do not generally slaughter the larger animals, save in exceptional circumstances. Therefore, although there is plenty of animal food available, only a small amount is locally consumed. Pork, beef and poultry are obtainable in local markets, but the radius of supply of such fresh food is limited in an extensive rural area. The domestic animals in question are generally raised by Siamese farmers for the markets, which are usually controlled by Chinese merchants.

The solution of this curious state of affairs seems to be the obvious one of education ; the people should be induced to abandon their scruples as to the slaughter of home-reared animals for food. Such a simple solution, however, might be very difficult to realise. The co-operative societies may provide the means for a more practical solution, as it will be much easier to supply one butcher for the service of a village than to get every man to become his own butcher.

The self-sufficing areas usually raise a variety of vegetables for local consumption, but in commercialised districts most of the supply is obtained from the markets. This leads to a tendency to buy only the kinds of vegetables which last longest. As a result, the variety available to the inhabitants who do not grow for their own needs is restricted.

The Government is trying to solve this question by teaching children to grow vegetables at the schools and by introducing choice varieties into various districts through local school gardens and demonstration farms, as well as by supplying the necessary seeds.

In " Siam, Rural Economic Survey, 1930/31 ", some statistics concerning the food generally consumed by the rural inhabitants are given as a rough indication of the national diet, and certain kinds of foods have been analysed in the Government laboratory to ascertain their composition and heat value. Eight tables are reproduced at the end of this chapter for easy reference. The conclusion of this survey is that diet deficiency does not exist to any great degree in rural Siam, and any shortcoming is mainly due to ignorance of food values on the part of the people.

It is, however, realised that the economic progress of the country depends upon a reform of the national diet. Nutrition

is recognised as one of the most important items of preventive medicine. It may be premature to predict the outcome of the national policy on this question, but it may be stated that, as soon as some headway has been made with this phase of health work, considerable progress should follow in the near future.

Table I. — Average Daily Food consumed by One Adult in the Rural Districts of Siam.[1 2 3]

(Two children were considered an adult.)

Sections	Eggs	Glutinous rice (grammes)	Non-glutinous rice (grammes)	Green beans	Shrimp paste (grammes)	Fermented fish (grammes)	Sauce of fish and shrimp (grammes)	Fish	Shrimp	Shell-fish	Beef	Pork	Chicken	Salt (grammes)
For all classes :														
North	s	715	n	o	11	11	6	o	s	s	s	s	s	12
North-east	vs	672	n	o	n	27	10	o	s	s	s	s	s	7
Centre	s	s	577	s	13	40	13	o	s	s	s	s	s	9
South	s	n	529	o	18	32	12	o	s	s	s	s	s	15
Average	s	693	553	o	14	27	10	o	s	s	s	s	s	10
Wealthy	o	653	547	o	13	25	10	o	s	s	s	s	s	10
Moderate	s	716	582	o	15	29	9	o	s	s	s	s	s	12
Poor	s	665	519	s	12	25	11	o	s	s	s	s	s	9

[1] Diet deficiency diseases found were :

1 case of beriberi out of 2,859 persons, in the north.
14 cases of beriberi out of 1,988 persons, in the north-east.
10 cases of beriberi and 3 cases of scurvy out of 2,743 persons, in the centre.
2 cases of rickets out of 1,838 persons, in the south.

[2] d = daily.
o = often, 6-25 times a month.
s = seldom, 1-5 times a month.
vs = very seldom, less than once a month.
n = practically none.

[3] Milk and coffee are not consumed. Fruit is often consumed by every family. Vegetables are consumed daily by every family. Pickled tea-leaf is consumed daily by every family in the northern circle. Areca-nut and betel-leaf are consumed daily by every family. The average adult consumed an average of 8 grammes of bean sauce daily in the villages near Trang and Bhuket in the south.

Table II — Food Value of Non-glutinous Rice.
(Analyses by Siamese Government Laboratory.)

Locality	Lab. No.	Moisture %	Protein %	Fat %	Ash %	Crude fibre %	Carbohydrate %	Calories Per kg.	Remarks
Chiengmai....	G 937	14.2	6.8	1.0	0.7	0.3	77.0	3,529	
Nagor Rajasima...	H 131	11.4	7.9	1.2	0.9	0.3	78.3	3,646	
Chandaburi...	H 167	11.9	7.2	1.6	0.6	0.4	78.3	3,654	
Patani.....	H 268	11.5	8.4	1.6	1.1	0.9	76.5	3,630	
Trang.....	H 340	11.5	8.3	1.4	0.6	0.4	77.8	3,660	
Chaxerngsao .	H 336	12.7	6.2	0.5	0.6	0.2	79.2	3,573	
Pisnuloke	H 393	10.7	9.2	1.0	1.1	0.4	77.6	3,652	
Average....	—	11.9	7.7	1.1	0.8	0.4	77.8	3,620	
One adult consumed 553 grammes per day.....	—	65.8	42.5	6.0	4.4	2.2	430.2	2,001	Calories per 553 grammes
Average of 27 other Siam rice samples	—	11.4	7.7	0.4	0.5	79.9		—	Phosphorus as P_2O_5 percentage 0.25

Table III — Food Value of Glutinous Rice.
(Analyses by Siamese Government Laboratory.)

Locality	Lab. No.	Moisture %	Protein %	Fat %	Ash %	Crude fibre %	Carbohydrate %	Calories per kg.	Remarks
Chiengmai....	G 906	15.4	9.0	1.1	0.9	0.3	73.3	3,476	
Ubol Rajadhani..	H 132	12.7	6.1	0.9	0.6	0.2	79.5	3,594	
Average....	—	14.0	7.5	1.0	0.75	0.2	76.4	3,535	
One adult consumed 693 grammes per day.....	—	97.2	51.9	6.9	5.1	1.3	529.4	2,449	Calories per 693 grammes

Table IV. — Food Value of Shrimp Paste.
(Analyses by Siamese Government Laboratory.)

Locality	Lab. No.	Moisture %	Protein %	Fat %	Ash %	Crude fibre %	Carbohydrate %	Sodium chloride %	Rough estimate of calories per kg.
Chandaburi	H 168	48.4	21.0	3.2	waste and salt			—	1,159
Chaxerngsao.....	H 367	42.8	20.0	1.8	4.6	—	—	27.2	987
Chiengmai	G 939	59.5	19.9	—	5.7	—	—	13.4	816
Trang	H 342	40.5	32.9	3.4	8.4	—	—	6.8	1,665
Average	—	47.8	23.4	2.8	6.2	—	—	15.8	1,156
One adult consumed 14 grammes per day.....	—	6.7	3.2	0.3	0.8	—	—	2.2	—

Table V. — Food Value of Fermented Fish.
(Analyses by Siamese Government Laboratory.)

Locality	Lab. No.	Moisture %	Protein %	Fat %	Ash %	Crude fibre %	Carbohydrate %	Sodium chloride %	Rough estimate of calories per kg.
Chiengmai	G 908 dry	25.3	33.5	6.3	waste and salt			—	1,959
	G 940 liquid	46.6	10.2	9.4		,,		—	1,292
Nagor Rajasima..	H 133 liquid	50.3	14.7	8.0		,,		—	1,347
Patani.....	H 269 liquid	53.5	15.4	1.3	9.2	—	—	18.8	752
Average	—	43.9	18.4	6.2	—	—	—	—	—
One adult consumed 27 grammes per day.....	—	11.9 grms.	5.0 grms.	1.7 grms.	—	—	—	—	—

Table VI. — CHEMICAL ANALYSIS OF COMMON SALTS CONSUMED IN SIAM.

(By Siamese Government Laboratory.)

(*a*) Analysis on material as received. (*b*) Composition calculated to dry material.

Salts	Moisture or loss at 100° c %	Calcium sulphate %	Calcium chloride %	Magnesium sulphate %	Magnesium chloride %	Sodium chloride %	Iron and aluminium oxide %	Potassium chloride %	Insoluble in water %	Organic matter and other salts by difference %	Total
H. 57, Udorn. Made from swamp water containing traces of phosphates.	(*a*) 3.45	0.75	0.56	—	0.25	93.84	0.005	0.19	0.17	0.78	100
	(*b*) 0.0	0.78	0.58	—	0.26	97.19	0.005	0.20	0.18	0.81	100
H. 129, Sakolnagor. Made by extracting soil with water containing traces of phosphates and nitrates.	(*a*) 9.91	0.36	2.95	—	0.63	85.54	0.01	—	0.52	0.08	100
	(*b*) 0.0	0.40	3.27	—	0.70	94.95	0.01	—	0.58	0.09	100
H. 130, Nagor Panom. Made from saline water containing traces of phosphates.	(*a*) 5.24	4.70	—	0.70	—	88.76	—	—	0.56	0.04	100
	(*b*) 0.0	4.96	—	0.74	—	93.67	—	—	0.56	0.04	100
H. 369, Chaxerngsao. Made from sea-water containing traces of iron, calcium and soluble organic matter.	(*a*) 5.8	—	—	0.8	0.7	90.6	—	—	0.4	1.7	100
Total of (*a*) Average.	24.40	5.81	3.51	1.5	1.58	358.74	0.015	—	1.65	2.6	—
	6.1	1.45	0.87	0.4	0.4	89.68	0.004	—	0.41	0.65	—
One adult consumed 10 grammes	0.6	0.14	0.08	0.04	0.04	8.9	—	—	0.04	0.06	—

Table VII (continuation of table VI). — Chemical Analysis of Common Salts consumed in Siam.

(By Siamese Government Laboratory.)

(*a*) Composition of matter insoluble in water calculated as percentage of material as received.

(*b*) Composition calculated on dry material.

Salts		Calcium carbonate %	Magnesium carbonate %	Iron and aluminium oxide %	Insoluble in dilute HCl. %	Not determined by difference %	Total insoluble in water %
H. 57, Udorn. Made from swamp water containing traces of phosphates.	(*a*)	0.01	0.01	0.01	0.14	—	0.17
	(*b*)	0.01	0.01	0.01	0.15	—	0.18
H. 129, Sakolnagor. Made from extracting soil with water containing traces of phosphates and nitrates.	(*a*)	0.01	0.003	0.05	0.43	0.03	0.52
	(*b*)	0.01	0.003	0.06	0.48	0.03	0.58
H. 130, Nagor Panom. Made from saline water containing traces of phosphates.	(*a*)	0.10	0.03	0.03	0.25	0.15	0.56
	(*b*)	0.11	0.03	0.03	0.26	0.16	0.59

Table VIII. — Food Value of Other Foodstuffs.

(Analyses by Siamese Government Laboratory.)

Food and locality	Lab. No.	Moisture %	Protein %	Fat %	Ash %	Crude fibre %	Carbohydrate %	Sodium chloride %	Calories per kg.
Sauce of fish and shrimp, Chaxerngsao .	H 368	68.2	4.3	3.3	—	—	—	24.2	483
One adult consumed 10 grms. per day.....	—	6.8	0.43	0.33	—	—	—	2.4	4.8
Bean sauce, Trang	H 341	58.3	1.4	—	0.8	—	—	23.7	57
One adult consumed 8 grms. per day.....	—	406	0.1	—	0.06	—	—	1.8	0.4
Bean cakes, Chiengmai ..	G 907	13.0	42.7	14.9	4.6	8.3	16.5	—	3,813
Bird's nest, Jumbor	H 209	16.3	49.8	0.06	7.5 water-soluble ash 5.4	—	—	—	2,047

V. MEASURES FOR COMBATING CERTAIN DISEASES IN RURAL DISTRICTS.

1. General.

The existence and spread of many dangerous infectious diseases, due to improvements in communications, the natural increase of population and the ignorance of the rural inhabitants as regards measures of prevention, have caused the Administration great concern.

The activities of the Department of Public Health have primarily been concentrated on appropriate measures for combating certain diseases considered to be of national importance. It is empowered to take the steps provided for in several Acts, while the ultimate aims of national policy are embodied in the various schemes recently recommended by the National Committee on Public Health and approved in principle by the Government.

The two most important measures recently enacted are the Communicable Diseases Act and the Public Health Act ; these were put into force in the year B.E. 2477 (1935). They give the Administration very wide powers to take adequate measures for the control of many infectious diseases.

Five dangerous communicable diseases are compulsorily notifiable—plague, cholera, smallpox, cerebro-spinal meningitis and yellow fever. The provincial authorities have power to enforce the necessary regulations for the " observation " of carriers or contacts. They may take all necessary preventive measures, including the closing of any building and the destruction of any property necessitated by the work of eradication. Other contagious diseases, such as typhoid fever, paratyphoid, typhus fever, malaria, measles, scarlet fever, chicken-pox, whooping-cough, venereal disease, diphtheria, influenza, pneumonia, mumps, dysentery, anthrax, rabies, tuberculosis and leprosy, are also included in the law ; any of these may be made notifiable by additional Ministerial regulations.

The Public Health Act gives both the central administration and the local authorities the necessary power as regards sanitation, and provides for general public health measures. Beside the legal powers already mentioned, there are also provisions in the Immigration Act, the Local Administration Act, the Local Government Organisation Act and the Act for Navigation in Siamese Waters, which contribute to the efficient control of the national health.

2. Malaria.

This disease presents by far the most serious problem in Siam, both from the health and the economic points of view. It is prevalent mainly in the north and south, where the land is generally hilly and the streams run throughout the year. There is very little malaria in the centre and the east. The country is very dry in these parts for several months of the year and the water is usually too muddy for the favourable breeding of malaria-carrying mosquitoes.

The death rate from malaria is a formidable figure. On an average, there are nearly 35,000 deaths per year in a population of some thirteen millions. The Department of Public Health is accordingly compelled to adopt effective measures for dealing with this urgent problem.

A general policy has been considered by the National Committee on Public Health. A section for the control of malaria is functioning in the Department of Public Health, and the aim is to enlarge its scope and divide its activity into three branches—viz., malariology, entomology and survey. As soon as the necessary staff has been obtained for the work, more intensive operations in the field will be undertaken.

Four survey units, one for each division of the country, are recommended for full-time work in the field. The laboratory work will be confined to the head office in the capital. The result of the survey will be worked out into separate schemes for the various districts. The municipalities will be encouraged to undertake the work within their own areas, with some subsidy from the central administration, if necessary, while work outside municipal limits will be undertaken by the central authority.

The engineering part of the work will be undertaken and supervised by the Department of Public and Municipal Works, in co-operation with the health authority. It is obvious that considerable time will be needed to complete the survey work in such a large country, while the carrying-out of the various schemes within the scope of the national policy will require still more time and considerable expenditure.

To combat this disease, it is therefore necessary to promote the curative branch of health work. Quinine is generally accepted by the public as a remedy for malaria, but the cost of the drug is still beyond the means of a considerable section of the rural population. The Department of Public Health assists each year by selling quinine in rural districts at less than its cost, besides giving it free to those who cannot afford to buy it at any price. It is hoped that the work of quininisation will be continued and the subsidy augmented until the method of control is sufficiently advanced to permit of greater economy in the treatment of cases.

3. Plague.

Bubonic plague was probably imported into Siam in 1904 in foreign shipping. Measures of control and eradication introduced many years ago have been found so effective that plague may at present be regarded as an unimportant disease in this country.

According to records, there were eight cases in the year B.E. 2476 and fourteen in B.E. 2477 throughout the whole country. Since then, no case has been recorded, and it is considered that the disease is not likely to regain a foothold in Siam.

The chief measure adopted against plague was the extermination of rats, both by trapping and poisoning. Full co-operation with the inhabitants is easily obtained in the work of eradication. Attention is mostly given to districts where plague has previously occurred, and good results have been obtained at a reasonable cost.

Trapping alone was not found sufficient to reduce the rat population in a short enough time ; poisoning was therefore introduced as an additional means of extermination. The latter method, though open to greater objections than the former, is

more economical and speedy in effect. The employment of both means gives a relative index for checking the effectiveness of results. The poisoned bait used consists of 18% arsenic mixed with flour and smoked fish, and this was found the most effective of the many preparations tested.

Laboratory work is always carried out in order to ascertain the degree of effectiveness of the field measures. Trapping is continued until laboratory tests indicate no further infection in the rats caught, after which the measures are slowed down.

Public education in rat-proof constructions is constantly fostered. The disposal of refuse and storage of food receive particular attention. Standard plans for rice storage have been prepared and distributed to many rural areas. The non-existence of plague for the last two years is a matter of satisfaction to the Department of Public Health.

4. Ankylostomiasis.

Although hookworm infection is extensive in Siam, it can nowhere be regarded as sufficiently intensive to assume the form of a serious local disease.

In co-operation with the Rockefeller Foundation and the Red Cross Society, the Administration started an extensive campaign against hookworm disease in 1917, and for a period of six years carried out effective measures for its suppression among the rural population.

Since then, this phase of health work has been undertaken solely by the Department of Public Health. The provincial public health officers now directly control these activities and give free treatment to all who need it. A good deal of educational work has been undertaken, mainly as regards the construction of latrines. The disease may be considered as being under effective control in this country.

5. Tuberculosis.

This disease is fairly prevalent in Siam. Over ten thousand deaths a year are shown by the statistics, but the scourge is more common in urban centres than in rural districts.

The Medical Association aroused sufficient public interest in the capital to bring about the formation of the Anti-Tuberculosis Association last year. The association has increasing public support and is doing good work for public education in the metropolis. A centre is being set up in Bangkok for free examination and treatment, and other centres may be established in the provinces where the greatest public support in the work of the association is forthcoming.

The Department of Public Health is not yet ready to deal with this problem. It has, however, requested the National Committee on Public Health to propose a national scheme for the consideration of the Government. This question is still under consideration.

6. Frambœsia (Yaws).

Statistics on yaws are being collected in this country by public health officers. Figures showing the total number of people suffering from this disease are not yet available. In the course of their investigations, the health officers usually give treatment to the inhabitants as part of their routine work, besides imparting the necessary public education in personal hygiene.

The disease is mainly prevalent in the east and occurs in some districts of the south. A special mobile health unit is attending to the rural population of the east. "Spirocid" is the remedy used and found most effective. Other remedies are also being experimented with, in order to find a more economical or more effective cure for extensive use.

It is considered that public education in personal hygiene and knowledge of a simple remedy will be sufficient to check this disease.

7. Leprosy.

A leper survey in Siam has been made and a total number of 16,893 lepers for the whole country indicates a serious state of affairs. The distribution is fairly general; thus, there are 7,041 in the north-east division, 4,256 in the central, 3,165 in the north and 2,431 in the south.

To the Presbyterian Mission must be given the credit for first taking practical measures to deal with this disease in Siam by establishing two leper colonies in the country, one in the north at Xiengmai and another in the south at Nagara Sridharmaraj. The mission receives considerable private support and a yearly grant from the Government for its humane work.

The Administration has established two similar centres, one in Bhuket in the south and another near the capital at Phra Pradaeng. One centre is being prepared in the east and should be ready for operation next year. However, for all five centres, there is provision only for about 1,000 patients, leaving a large number still uncared for. There are, however, a number of leper communities in the north and north-east which have grown up partly as the result of administrative action and partly owing to local customs.

It is not yet possible to isolate all the lepers of the country in centres or colonies, so as to give them adequate medical treatment and reasonable comfort. Although this is the ultimate aim of the Department of Public Health, it is at present adopting the more economical measure of providing units to give treatment to lepers in their homes. This system assures a certain control of the disease. The existing centres could be gradually enlarged to accommodate more patients, until they are all segregated in definite areas.

It is hoped that the municipalities may take a hand in providing additional hospitals for cases in their respective localities, or contribute towards the enlargement of the divisional colonies.

8. Mental Diseases.

Until recently, mental diseases were not given adequate attention in this country. There is a mental hospital in Bangkok, where acute cases are confined and given treatment in accordance with modern practice. Cases up-country are not properly dealt with officially and depend on private arrangements.

The National Committee on Public Health has recommended a scheme providing for four divisional mental hospitals, together with a similar number of colonies to be situated at such easy

distance from the hospitals as may enable each unit to be administered by a single medical officer. The hospital will examine, observe and treat the cases received, while the colony will provide occupational therapy and healthy living conditions for those whose condition permits them to have open-air treatment.

As an accessory to this scheme of hospitalisation and colonisation, such mental cases as are released or convalescent will be dealt with as out-patients at general or special clinics.

The Government has approved the scheme. A hospital is being erected in the south and another is under construction in the north. Land for the two adjacent colonies is also being acquired. Projects for a mental colony for the capital as well as for the eastern unit are being considered.

The rural health centres will be equipped for treating out-patients in their areas, and will be able to give the necessary advice to the relatives of the patients concerning home treatment or to send the more acute cases to the hospital for treatment.

A law for the control of mental diseases is under consideration.

9. Drug Addiction.

Siam is a party to the Opium Convention and observes the provisions relating to habit-forming drugs contained in the Treaty of Versailles. A law for the control of habit-forming drugs, which has been in operation since 1922, gives the Administration complete control of the import, sale, manufacture and use of all such drugs in the country.

The rural population of Siam is not addicted to drugs to any noticeable extent. The use of opium is mainly confined to urban districts, and even then the offenders are mostly Chinese. The smoking of Indian hemp *(Cannabis indica)* is prohibited by law.

The problem is therefore considered to be of little importance as far as the rural inhabitants are concerned, and no action, other than general public education, is required.

10. Cholera.

This disease is endemic during the dry months in various districts of Central Siam. This part of the country is well

watered by several large rivers and intersected by numerous canals, so that it is generally liable to water-borne infections.

The campaign set on foot to deal with this disease may be divided into two parts. One method employed is that of intensive public education in the care of drinking-water (*e.g.*, boiling before consumption ; giving out the necessary chemicals for sterilisation during severe epidemics). Temporary water supplies are provided at suitable centres along the rivers, where distribution of clean water by boats is arranged with the co-operation of charitable bodies. Public attention is drawn to the danger of flies as carriers of infection from latrines and refuse to food. People are urged to give more care to the preparation of meals and to the display of food in markets. Vendors are under constant supervision for cleanliness. The population is recommended to avoid fresh vegetables and other uncooked foods during epidemics. Another method of combating this disease is the use of anti-cholera vaccine. A large staff of health officers and medical assistants is organised to give mass injections in the affected areas, and inoculations to travellers at certain control stations.

Although vaccination only affords temporary protection, the personal contact of the public health staff with the inhabitants has an indirect influence on popular education for other preventive measures. Some statistics of the results during the last two years of the present epidemic may be of interest. Among the hospitalised cholera patients, only about 7% were previously inoculated with anti-cholera vaccine ; 88% of the patients previously vaccinated recovered, while only 58% of the non-vaccinated patients recovered. Further study of the question is being made by several health officers, as it is considered that many variable factors still require verification.

As previously stated in the chapter on sanitation, the ultimate aim of the Administration is the provision of a pure water supply in rural areas by means of properly constructed wells or simple home treatment appliances. This is believed to be the most practical way of checking an epidemic, while it is hoped that public education and natural progress will contribute towards the ultimate elimination of the disease.

11. Smallpox.

This disease is under complete control in Siam. Vaccination is compulsory for the whole population as well as for immigrants. Public opinion fully supports the measures adopted by the Government, and no difficulty has been encountered in this respect.

More than 80% of the people in the country have been vaccinated, and the percentage is increasing yearly. For rural areas the public health officers have a staff of medical assistants, sanitary inspectors and commune medical officers to assist them in the work of vaccination. The commune practitioners are paid by results. The vaccine is supplied free of charge, and for each vaccination a payment of from 3 to 5 satang (cents) is made by the Administration, according to the locality. This is an important source of income for the local practitioners and is doubtless responsible for the effectiveness of the measures in rural areas at a very reasonable cost to the Government. Smallpox may thus be regarded as satisfactorily controlled in rural Siam at the present time.

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