



**MINISTRY OF ECONOMIC AFFAIRS.**

**Bangkok, Siam.**

**DEPARTMENT OF SCIENCE.**

**( Government Laboratory )**

**7<sup>TH</sup>. REPORT.**

**FROM APRIL 1st. 1932 TO MARCH 31st. 1934.**

**B.E. 2475 AND 2476.**

**Bangkok, July 1936.**

**Price 50 satangs**



Ministry of Economic Affairs.

August 13th B.E. 2479

To His Excellency Phya Bahol Balabayuha Sena,  
President of the State Council.

Sir,

I have the honour to lay before Your Excellency the Seventh Report of the Director-General of the Department of Science on the work of this Department for the Years B.E. 2475 and 2476.

I have the honour to be, Sir,  
Your obedient servant,

**BORIBHANDH**

State Councillor in charge of the Ministry.  
of Economic Affairs.



Department of Science.  
Ministry of Economic Affairs.

July 1st. B.E. 2479

To

His Excellency Phra Boribhand Yudhakitch,  
State Councillor in charge of the Ministry of  
Economic Affairs.

Your Excellency,

I have the honour to lay before your Excellency the  
Seventh Report of my Department covering the work  
carried out in the years B.E. 2475 and 2476.

I have the honour to be, Sir,  
Your obedient servant,

TOA LABANUKROM

Director-General

7th. REPORT  
OF  
THE DEPARTMENT OF SCIENCE  
( Government Laboratory )  
(MINISTRY OF ECONOMIC AFFAIRS)

From April 1st. 1932 to March 31st. 1934  
B.E. 2475 and 2476.

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**Senior Professional Staff.**

Director General: { † Phya Prasada Dhatukaraya. B. Chem.  
M.A. (Cornell) (in charge)  
Nai Toa Labanukrom Ph. D. (Berne)  
(acting)

*Government Laboratory Division.*

C.J. House, B.Sc. (London), A.R.C.S. F.I.C.

Phra Krasarbna Bibhag.

Luang Vichien Dhatukara L. ès Sc, I.C. (Poitiers)

Nai Prachuab Bunnag Ph. D. (Berne)

The staff of the *Agricultural Science Division* is given at the beginning of the report of this section.

† Phya Prasada Dhatukaraya went on sick leave on March 19th. 1934 and did not rejoin the department. Later in the year he retired on pension.

There were no additions to the senior staff during this period.

Siam adopted a constitutional form of government on June 27th. 1932 and Nai Toa Labanukrom and Nai Prachuab Bunnag had the honour of being elected to the first Assembly of the peoples representatives.

Nai Toa Labanukrom also served as a State Councillor from June 27th. 1932 until March 31st. 1933.

Nai Prachuab Bunnag was transferred to the scientific establishment of the Ministry of Defence on March 1st. 1934.

### **Introductory.**

During the period covered by this report the work was in charge of Phya Prasada Dhatukaraya but the duty of preparing this report falls to his successor, Nai Toa Labanukrom who assumed the position of Director-General on April 1st. 1934.

Subsequent to the change in the form of Government in 1932 the whole of the official services were re-organised. The Government Laboratory was combined with the Bureau of Agricultural Science, formerly a division of the Department of Agriculture, and formed a new Department of Science in charge of an official of the rank of Director-General. This change became effective on October 1st. 1932. The Department was to be organised in Divisions and Sections but the scheme of organisation need not be given here as it did not function during the period of this report.

The total number of samples reported upon during the two years was 13,872 as compared with 9,193 during the previous period. The large increase is due to increase in opium dross control (10,327 samples compared with 7,018 formerly) and to 1,367 samples of river water specially examined for the Harbour Development Board but there is a definite increase in the general work as well, there being 2,169 samples as compared with 1,858 for B.E. 2473 and 2474.

The fees received amounted to Baht 14,142.15 summarised as follows:—

Analytical work for the public,	Baht 2,999.20
Sales of preparations,	Baht 11,142.95

This compares with a total of Baht 14,002.33 for the last period of which Baht 3,118.50 represented analytical fees

### **Exhibitions.**

The Department assisted in preparing the exhibit for the Siamese pavilion in the World Grain Exhibition held at Regina, Canada, during the summer of 1933. Phya Prasada was also a member of the executive committee.

In December 1933 the Department arranged an exhibit at the Sanranrom gardens on the occasion of the second anniversary of the granting of the Constitution, showing scientific methods of detecting crime and method of manufacture of Hydnocarpus ethyl esters. H.M. King Prachati-pok visited the exhibit and was pleased to examine some of the apparatus which was actually working.

## Notes and Reports on Materials of Interest.

### (1) Drugs for the treatment of Leprosy.

Work has continued on the same lines as before but there was a large increase in the manufacture of mixed ethyl esters of the oil of *Hydnocarpus anthelmintica*.

Altogether 240 litres were issued as compared with 70 litres in the previous two years and nearly all of this was exported abroad by the agency of the Siam Medicinal Oil Works who have continued the pressing of *Hydnocarpus anthelmintica* oil of high quality.

Analytical constants for the oil of *Hydnocarpus anthelmintica* and for the mixed ethyl esters produced are as follows:—

	Oil		Esters
	1932 crop	1933 crop	
Acid value as oleic acid %	0.95	0.73	0.15
Specific Gravity 30°/4° C	0.943	0.944	0.899
Saponification value	203.2	205.1	195.5
Iodine value (Wijs)	87.0	85.0	82.1
Specific rotation	49.24	49.25	46.5
Refractive index 30° C	1.471	1.475	1.455

### (2) Seeds of *Strychnos* spp.

Following the discovery that seeds of *strychnos* species in Siam (Salaeng chai) yielded nearly 2% of strychnine which was recorded in the 6th. Report, during the 1932 season an attempt was made to collect an experimental

consignment of 20 tons for export. The collecting ground was the forest on the banks of the river near Ubol but the results were disappointing as one sample contained only 0.56% of strychnine and another 1.26%. The difficulty of collecting the high yielding seeds in sufficient quantities has not yet been overcome.

### (3) Yang Nong.

Yang nong (ยาพิษ) is an arrow poison prepared by forest peoples in Siam and used in hunting. It is in most cases the prepared sap of the tree *Antiaris toxicaria* and therefore identical with the Upas poison of Java and Malaya but the Botanical section had reason to believe that Yang nong in the northern part of Siam was prepared from strophanthus species which might very likely yield seeds of commercial value. However samples of arrow poison are difficult to procure and samples of bark of strophanthus spp. did not yield any glucosides. A samples of Yang nong from Amphur Ta Sothorn (Changvad Ubol) Lab. No. B. 637 was found to be very old and no glucosides could be obtained from it. Sample lab. No. F. 358 from the south (Changvad Setul) was a brown milky liquid containing 2.2% of the glucoside Antiarin (melting point 220° C) and therefore was derived from the orthodox source.

By the courtesy of the Department of Physiology, Chulalongkorn University, some physiological tests were carried out with the specimen of Antiarin as this glucoside is reputed to be one of the most powerful poisons known to science. The smallest amount which could be detected by



means of the frogs used (*Rana rugulosa*) was 0.05 milligram which is considerably greater than the amount given in the literature.

#### (4) **Mai chanchamot.**

This is a perfumed wood derived from the tree *Mansonia gagei* which has been felled and left in the forest to decay for a number of years. The living wood possesses no perfume. It is esteemed for its musk-like odour and the name chanchamot (literally civet sandalwood) sometimes causes it to be confounded with true sandalwood in commerce since this is called Mai chan in Siamese.

A preliminary test having shown that this wood contained a crystalline odorous principle, 25 kilograms of wood were subjected to steam-distillation in the Technical Laboratory. 50 grammes of ether-soluble material volatile in steam were obtained, the yield being 0.088% on one quality of wood and nearly 0.1% on a superior grade. This consisted of a mass of crystals mixed with a brown viscid liquid which had an ill-defined odour masking the musk odour of the crystalline principle. The crystals were freed from the uncrystallisable liquid by repeated crystallisation first from ether and then from benzene which appeared to be the best solvent for the purpose. The pure crystals were white in colour and possessed a powerful perfume of musk having very lasting properties so that the least trace of this material could be detected by smell for a long time afterwards. The purest specimens were obtained by repeated steam-distillation but this was too wasteful for general

application. Pure white crystals were not obtained by recrystallisation from solvents.

The crystalline product amounting to about 25 g. has been handed to Professor J. F. Thorpe of the Imperial College of Science and Technology, London who kindly promised to investigate the chemical structure as far as possible with the limited material available.

#### **(5) Native asphalt.**

A sample of native asphalt from Muang Fang, Chiang-mai province, was found to contain 17% of bitumen (soluble in carbon bisulphide) the remainder being sandy matter. Such asphalt does not possess sufficient binding properties to be used in road construction but it could be mixed with imported asphalt to produce a usable mixture.

#### **(6) Kratom (*Mitragyne speciosa*).**

Early in 1934 the Department was fortunate enough to interest Dr. H.R. Ing of University College, London, in this subject and he took over the alcoholic extract which had been prepared for the late Dr. Dixon.

The object of his research is to investigate alkaloids other than Mitragynine that may occur in Kratom leaves, as from the effects recorded in the 6th. report it appears probable that Mitragynine is not the only active principle contained in this curious drug.

**Bangkok**  
**TAP**  
**B.E.**

Date			Total solids	Dis-solved solids	Total hard-ness	Per-manent hard-ness	Tempo-rary hard-ness
1932	April	...	19.7	19.7	10.5	0.8	9.7
	May	...	31.7	31.7	14.5	4.4	10.1
	June	...	18.1	18.1	10.5	2.0	8.5
	July	...	17.0	17.0	11.0	3.0	8.0
	August	...	16.3	16.3	7.5	2.1	5.4
	September	...	12.0	12.0	7.5	3.4	4.1
	October	...	14.2	14.2	6.5	4.4	2.1
	November	...	9.4	9.4	5.0	3.0	2.0
	December	...	8.8	8.8	4.0	1.9	2.1
1933	January	...	13.4	13.4	8.0	1.8	6.2
	February	...	14.9	14.9	9.5	1.7	7.8
	March	...	16.4	16.4	10.5	1.8	8.7
Average for the year			16.0	16.0	8.75	2.5	6.2

**Water Supply**

**WATER**

2475

Chlorides as Chlorine	Oxygen consumed	Saline ammonia	Albuminoid ammonia	Nitrites as Nitrogen	Nitrates as Nitrogen	Loss on Ignition	Iron
3.2	0.14	0.001	0.004	nil	0.023	3.6	0.01
8.5	0.14	nil	0.004	nil	0.014	5.6	0.02
2.7	0.14	nil	0.004	nil	0.009	0.2	0.015
1.8	0.14	nil	0.005	nil	0.021	2.5	nil
1.6	0.15	0.003	0.007	nil	0.033	3.0	nil
0.9	0.16	nil	0.005	nil	0.014	2.2	nil
0.8	0.13	nil	0.003	nil	0.011	3.0	0.02
0.7	0.14	nil	0.003	nil	0.009	2.0	0.02
0.8	0.18	0.001	0.005	nil	0.005	1.8	nil
1.1	0.15	0.001	0.005	nil	0.018	2.4	0.01
1.5	0.15	nil	0.005	nil	0.014	1.8	nil
1.7	0.16	nil	0.004	nil	0.011	1.9	nil
2.1	0.15	0.0005	0.005	nil	0.015	2.5	0.008

**Bangkok**  
**TAP**  
**B.E.**

Date			Total solids	Dis-solved solids	Total hard-ness	Per-manent hard-ness	Tempo-rary hard-ness
1933	April	...	37.3	37.3	13.5	4.2	9.3
	May	...	22.4	22.4	13.0	3.0	10.0
	June	...	18.2	18.2	12.5	2.3	10.2
	July	...	18.8	18.8	10.0	5.1	4.9
	August	...	12.2	12.2	7.0	2.7	4.3
	September	...	12.3	12.3	6.5	1.8	4.7
	October	...	11.9	11.9	6.5	1.9	4.6
	November	...	10.1	10.1	6.0	2.0	4.0
	December	...	10.5	10.5	7.0	2.5	4.5
1934	January	...	14.3	14.3	8.0	0.0	8.0
	February	...	15.0	15.0	8.5	0.0	8.5
	March	...	15.8	15.8	10.0	0.0	10.0
Average for the year			16.6	16.6	9.0	2.1	6.9

**Water Supply****WATER**

2476

Chlorides as Chlorine	Oxygen consumed	Saline ammonia	Albuminoid ammonia	Nitrites as Nitrogen	Nitrates as Nitrogen	Loss on Ignition	Iron
11.4	0.12	nil	0.004	nil	0.015	4.4	nil
3.3	0.15	nil	0.005	nil	0.022	3.0	nil
1.7	0.18	0.001	0.008	nil	0.045	1.3	nil
1.3	0.14	nil	0.004	nil	0.038	3.2	0.01
0.6	0.12	nil	0.006	nil	0.014	2.0	0.01
0.9	0.19	nil	0.006	nil	0.009	1.8	nil
0.8	0.27	nil	0.008	nil	0.011	1.6	nil
0.7	0.21	nil	0.007	nil	0.007	1.7	nil
0.9	0.23	nil	0.011	nil	0.011	1.9	nil
1.2	0.23	nil	0.007	nil	0.034	2.2	nil
1.3	0.17	nil	0.004	nil	0.023	1.2	0.02
1.5	0.16	nil	0.005	nil	0.020	2.4	0.01
2.1	0.18	nil	0.006	nil	0.021	2.2	0.004

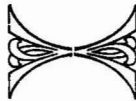
**Technical Laboratory.**

467 litres of Vitamin B extract were prepared and issued.

The demand has lessened considerably compared with the previous four years on account of the reluctance of Government departments to purchase the extract formerly issued to them free of charge. More of the extract was sold direct to the public than in former years and 64% of the output is disposed of in this way.

A new wing was added to the Technical Laboratory building in 1933 in order to provide for the increased manufacture of Hydnocarpus ethyl esters.

This also provides temporary office accommodation for the Stores and Account sections.



## Notes on Special Branches of Work.

### (I) Toxicology.

90 cases of suspected poisoning were submitted during the two years under review as compared with 58 cases during the previous period. The actual number of exhibits examined was 170. Thus there has been an increase in this work which had hitherto remained at the same level for several years.

38 of the cases came from Bangkok district.

Poisons were found in 44 of the cases, (48.9%) which is the highest proportion of positive findings since this Laboratory was instituted. It is hoped that this indicates that fewer cases are being submitted in which there is no evidence of poisoning beyond superstitious fears of the supposed victim. A number of samples of matches and other articles of common daily use from the Eastern Province which should clearly be included in this description, have not been included in the poisoning statistics and separate reference will be made to them later.

Human viscera were submitted in 17 cases.



The poisons were as follows:—

Arsenic	...	...	13 cases
Datura or mydriatic alkaloids			7 „
Sodium cyanide		...	3 „
Strychnine	...	...	3 „
Aconite	...	...	2 „
Sulphuric acid		...	2 „
Adrenalin	...	...	1 „
Digitalin	...	...	1 „
Cocaine	...	...	1 „
Nitric acid	...	...	1 „
Mercuric chloride		...	1 „
Methyl salicylate		...	1 „
Cerbera odollam		...	1 „
Phenol	...	...	1 „
Morphine	...	...	1 „
Thymol	...	...	1 „
Lead	...	...	1 „
Kratom	...	...	1 „
Gloriosa superba		...	1 „
Broken glass		...	1 „
		Total	<u>44</u> cases.

**Notes of poisoning cases.**

As in previous years there are more cases of Arsenic and Datura poisoning than any other and if we include the Cyanide and Strychnine cases we get 26 cases which are cases of intentional criminal poisoning rather than suicides and dispensing errors. Datura is used for purpose of robbing; none of the victims in the 7 cases died.

Two accidents occurred with powerful drugs used in the course of medical practice by registered Chinese doctors as follows:—

**Adrenalin.**

A child aged 5 years died after an injection of 1 milligram of Adrenaline-Buisson during treatment for bronchial asthma. The opinion was expressed that the dose was rather large for so young a child.

**Digitalin.**

A woman aged 45 years, obviously seriously ill, succumbed to a dose of 1 milligram of Digitaline-Buisson injected as a heroic remedy to restore the heart beat. The only notable point about these cases is that such drugs can only be tested for potency by physiological experiments which were not available at that time.

**Phenol.**

A Burmese medical practitioner registered in the 2nd. category was accused of causing the death of a retired police officer by injection a 70% solution of Phenol in Glycerine in order to cure haemorrhoids. The treatment is usual in medical practice and the accused had a reputation for success in treating the complaint. Although the chemist's evidence at the court did not support the assertion that the phenol was the cause of death the Lower Court sentenced the doctor to imprisonment for negligence but the Court of Appeal subsequently reversed the decision.

**Cerbera odollam.**

A boy aged 15 years died as a result of administration of seeds of *Cerbera odollam* as medicine to cure a cold.

The symptom of stomach-ache came on one hour after taking and drowsiness set in later leading to death after 30 hours.

The Siamese name for this drug is Teen pet (ตีนเป็ด) literally "duck's feet". According to \*Phya Vanpruk Picharn the same name in the north refers to *Alstonia scholaris* which is a harmless tree of which the bark is used as a bitter tonic. This confusion of names is unfortunate.

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\* List of Common Trees etc. in Siam, 1923.

**Gloriosa Superba.**

A woman aged 32 years died from taking medicine containing a decoction of tubers of *Gloriosa superba* in the Eastern province where this drug is named Ton pim maha (ต้นพินมหา), the more usual name is Dong Deung (ดองดิ่ง).

The symptoms were vomiting and severe irritation of the digestive tract leading to violent purging and death in 24 hours. Evidently an overdose was given of this powerful drug. No chemical tests for the active principle are known at present.

**Thymol.**

An Indian doctor administered Thymol dissolved in essential oil of camphor as a vermifuge draught and the patient died. It appears that Thymol is too irritating to the alimentary tract to permit of its use in this way. It should be dispensed in cachets.

**Lead.**

The single case of lead poisoning was due to the dispensing of "boiled oil" for linseed oil in a veterinary drench. A horse died as a result of this error.

**Psychic poisoning.**

In April 1932, series of cases were reported from three of the North-Eastern provinces (Ubol, Khonkaen and Udorn)

in which common articles of daily use were supposed to have caused poisoning. Matches were the articles most complained of (17 cases), but there were also 2 samples of yarn, two dyes, one hat, one soap and one well-known brand of cigarettes. In the case of the matches death was attributed to this cause in 3 cases the symptoms always being described as dizziness, cyanosis, and convulsions leading to unconsciousness. Those that recovered felt weak and had a painful throat for some days.

The samples of matches submitted as having caused these symptoms were the ordinary brands in common use, either manufactured in Bangkok, or Swedish matches imported from abroad. The complaint evidently did not apply to any one make. Chemical examination showed that the matches were of the ordinary safety type, the heads containing antimony sulphide, potassium chlorate, powdered glass, etc. with nothing of a poisonous or exceptional nature.

The symptoms described were no doubt due to the inhaling of sulphur dioxide derived from the combustion of the match heads for it was said that the people commonly used several matches at a time in order to light a cigarette.

It is thought that the deaths reported were certainly not caused by matches but that the real cause of death was lost sight of in the prevalent fear of the matches. So great was this fear that nearly all the rural population were said to have given up the use of matches and returned to the use of flint and steel and home-made lighting devices. The effects of yarns, soaps and hats on their victims must surely

have been due to flights of the imagination while supposing that these common things were endowed with supernatural properties.

The scare lasted until August of the same year after which nothing further was heard of it.

### **(2) Examination of stains for human blood.**

The police and public health authorities submitted 45 exhibits in 30 cases in which a positive finding was reported in 6 cases only.

### **(3) Harmful habit forming drug law.**

As before, many samples have been submitted under this heading due to police activity in suppressing the illicit trade in these articles.

The total number of samples was 424 of which 352 were submitted by the police. Only 14 of the latter were found not to contain drugs, but a further 56 consisted of Novocaine which is not prohibited.

The Customs submitted 72 imports under this heading but only 3 contained prohibited principles.

The results are summarised as follows:—

Morphine	.	.	280 samples
Opium	.	.	2 "
Cocaine	.	.	1 "
Codeine	.	.	2 "

Samples submitted as suspected illicit opium are not included in the above.

**(4) The Skimmed Milk Act B.E. 2470.**

Rather fewer samples were submitted than in the previous period, there being 205 samples as compared with 220 formerly. The reduction was due to the submission of fewer samples by the public than during the period when the law had been recently promulgated.

180 samples were submitted by the Customs Department, 3 by the Courts of Justice, 6 by the Department of Public Health and 15 by the Public. Of these, 16 samples, representing 11 different brands were found to be deficient in milk-fat or total milk-solids and were reported as being skimmed milk within the terms of the Act.

The samples from the Public Health Department were concerned with a suspicion that foreign fats were being introduced into cheap brands of sweetened condensed milk in order to replace the more valuable butter-fat. It is understood that the technique of incorporating emulsions of foreign fats into skimmed milk is well known abroad. Quantities of the fats from suspected brands were extracted and examination by the usual methods for testing butter-fat indicated that no such adulteration had taken place.

**(5) Police Department.**

The number of samples submitted shows a small increase, being 516 as against 480 in the previous period. A

large number of these samples are suspected harmful habit forming drugs and have been dealt with under that heading.

55 guns and firearms were submitted to ascertain if they had been recently fired, this work having commenced at the beginning of B.E. 2475.

The only definite information given by chemical tests is as to whether a gun has been fired since it was last cleaned or not. Absence of rust in the barrel is the only indication upon which an opinion as to date of firing can be based. The chemical tests referring to smokeless powder, which is universally used, are made on aqueous washings of the barrel and consist of the Griess-Ilosvay test for nitrite and the Diphenylamine and Phenol-sulphonic acid tests for nitrates. Experimental shootings were carried out on two occasions during 1932, and it was found that, with the three different kinds of smokeless powder used, strong reactions for nitrite and nitrate were obtained even after such a long interval of 21 months. Rusting of barrels commences earlier with some powders than others but in no case in less than two days. This depends upon the amount of visible fouling and in the case of "Lepco" powder which fouls the barrel very little, rusting may be delayed as long as 3 months.

A large automatic pistol gave satisfactory reactions as for shot guns but a small pistol gave negative results; both were tested 2 days after firing.

This very limited information seems to be helpful to



the prosecuting authorities as guns continue to be sent in frequently. Detailed examination of cartridges and bullets for marks etc., is not referred to this Department.

Four bombs contained the usual Arsenic sulphide-potassium chlorate mixture very neatly packed with broken glass in tin canisters; a layer of Kapok wadding was inserted top and bottom to prevent undue sensitivity.

Few samples of counterfeit coins are submitted now owing to the almost complete disuse of the Siamese silver coinage. Such cases as occurred were counterfeit rupees which are still current in markets of the Northern provinces near the frontier of the British Shan states.

#### **(6) Customs Department.**

The number of samples submitted by the Customs Department was 446 compared with 550 in the previous period. The reduction is entirely due to fewer samples sent for alcohol determination (21 as compared with 207) as the new Customs tariff was drafted in such a way as to avoid much of this work.

Of the examination of imports, milk and drugs are discussed elsewhere. The most important service which the laboratory renders to the Customs Department is in connection with the classification of imports for tariff purposes. 68 samples were examined in this category and the imports usually submitted were milk-foods, disinfectants, fertilisers and fabrics.

Infant milk-foods are accorded the same low rate as dried milk although they do not comply with the standard for dried milk under the Skimmed Milk law because they contain added lactose.

A ruling was given that milk foods would be granted the preferential tariff rate if they contain only milk or milk products. Thus dried milk products containing added cane sugar, cocoa or malt extract are not assessed as infant milk-foods.

#### **(7) Disposal of town refuse by biological methods.**

In June 1932, The Chief Engineer of the Department of Public Health conducted a test of a method of rubbish disposal by mean of a Zymothermic cell or silo erected at Bangrak.

The charge consisted of town rubbish classified by bulk as follows:—

Paper (not pressed)	. . . . .	10.8%
Baskets, wood etc.	. . . . .	5.4%
Rags	. . . . .	1.8%
Glass, crockery and tins	. . . . .	5.6%
Other refuse	. . . . .	76.4%

The material was well wetted and filled into the cell and left for 30 days. The temperature rose rapidly to 65° C and then fell slowly to 50° C.

The residue which had about half the bulk of the original refuse, was dried and sifted, the sifted residue being 34% of the whole in bulk. Analyses of these residues gave the following results:—

	Sifted %	Unsifted %
Moisture . . . .	4.3	6.6
Nitrogen . . . .	1.0	1.3
Phosphorus as $P_2O_5$ . . . .	1.1	1.3
Ash . . . . .	62.4	50.0

Both samples contained considerable combustible matter and it was suggested that paper, baskets etc. should be separated and burnt for use as fuel in drying the residue.

It was thought that the residue would have little value as a fertiliser but would have to be used for filling waste ground, for which purpose it should be entirely inoffensive.

### (8) Harbour Development Board.

In July 1933 the newly constituted Harbour Development Board submitted 1,376 samples of water in connection with the visit to Siam of Mr. Nijhoff, a member of the expert commission appointed by the League of Nations at the request of the Siamese Government.

The amount of silt was estimated in samples taken from the river at Bangkok but most of the samples were

collected from points at the bar of the river and determinations of chloride as well as silt were required. The results assisted the experts in calculating the average amount of silt deposited on the bar annually and in forming an opinion as to the ebb and flow of salt water in the lower reaches of the river. Local opposition to the deepening of the bar is based upon a popular idea that this will enable salt water to come further up the river than before thus damaging valuable garden land to the west of Bangkok. The report of the commission did not indicate any danger of this kind from the dredging of the deep channel proposed.

#### **(9) Bangkok Water Supply.**

In consequence of complaints of abundant rust from water mains entering private consumers' supplies and to the discovery of serious corrosion in the pipes, an expert from the Fonderies de Pont à Mousson visited Siam in April 1933 and was permitted to work in the laboratory for a short time. It was found that domestic supplies sometimes contained as much as 22 parts per 100,000 of Iron in the residential part of the city. The expert recommended the addition of lime to the water at the Waterworks and this has been continued ever since with satisfactory results.

The increase in the hardness of the water is scarcely noticeable in the tabulated results but it will be seen that the average iron content of the Laboratory tap water is reduced to one half of its former figure,

## Appendix

### 1. PREPARATIONS.

#### A. Drugs for the treatment of leprosy.

Description	Quantity litres	Issued to
Mixed ethyl esters of oil of Hydnocarpus anthelmintica	22.00	Siamese Red Cross Society.
Do.	4.00	Department of Public Health
Do.	213.30	Public
Do.	0.25	Naval medical service.
Total	239.55	
Oil of Hydnocarpus anthelmin- tica	17.00	Siamese Red Cross Society
Do.	2.50	Department of Public Health.
Do.	562.50	Chiengmai Leper Asylum.
Do.	93.25	Public
Do.	76.00	American Presbyterian Mission.
Total	751.25	
Oil of Hydnocarpus anthelmin- tica with 4% Creosote	93.90	Siamese Red Cross Society
Do.	2.50	Department of Public Health.
Do.	35.00	Public
Total	131.40	

#### B. Vitamin B extract.

	Quantity litres	Issued to
	309.10	Public
	57.00	Department of Public Health
	50.50	Chulalongkorn Hospital
	80.00	Police Department
	20.25	Naval Medical Service
Total	466.85	

## II. ANALYSIS

No. of Samples	Description
<b>MINISTRY OF INTERIOR</b>	
38	Benzine
1	Clothing for blood stains
9	Matches
18	Material for poison
2	Road metal
<b>68</b>	<b>Total</b>
<b>MINISTRY OF DEFENCE</b>	
2	Activated charcoal
1	Alcohol
2	Aluminium
2	Benzine
1	Cast iron
34	Castor oil
4	China clay
3	Copper
4	Diesel & Fuel oil
4	Lubricating oil
1	Pig iron
1	Piston ring
3	Rice
12	Wolfram
1	Zinc
<b>75</b>	<b>Total</b>

## II. ANALYSIS (Continued)

No. of Samples	Description
<b>DEPARTMENT OF PUBLIC HEALTH</b>	
2	Alcohol
9	Articles for examination for human blood stains
1	Cocaine for purification
1	Colour
2	Disinfectant for available chlorine
12	Drugs for examination under the Harmful habit-forming drugs Law.
1	Eucalyptus oil
2	Fertilizers
6	Food for examination for poisons or narcotics
6	Milk
3	Morphine for purification
1	Oil
70	Powders, drugs, and liquids for examination for poisons or narcotics
3	Viscera
64	Water
88	Water supply, Bangkok.
52	Water supply, Bangkwang.
323	<b>Total</b>
<b>EXCISE AND OPIUM DEPARTMENT</b>	
24	Material for harmful habit-forming drugs Law.
5	Medicinal wines
1	Mineral

## II. ANALYSIS (Continued)

No. of Samples	Description
<b>EXCISE AND OPIUM DEPARTMENT (Contd.)</b>	
7	Molasses
10,327	Opium dross
2	Prepared Opium
1	Samshoo
8	Silver
5	Spirit for alcohol determination
36	Suspected illicit opium
4	Tin Ore
1	Vinegar
10,421	<b>Total</b>
<b>POLICE DEPARTMENT</b>	
34	Articles for examination for human blood stains
4	Bombs
6	Counterfeit coins and apparatus
340	Drugs for examination under Harmful habit-forming drugs Law
7	Drugs, Powders and liquids for examination for poisons and narcotics
55	Fire-arms, cartridges etc.
55	Food for examination for poisons
13	Viscera
2	Vomit for examination for poisons
516	<b>Total</b>



## II. ANALYSIS (Continued)

No. of Samples	Description
<b>CUSTOMS DEPARTMENT.</b>	
16	Denaturants
74	Drugs for examination under Harmful habit-forming drugs Law
17	Fertilizers
48	Imports for examination for tariff classification
1	Kerosene
180	Milk
12	Pyridine
3	Quinine
49	Samshoo
21	Spirits for alcohol determination
8	Tobacco Flavouring
17	Wood Naptha
<b>446</b>	<b>Total</b>
<b>DEPARTMENT OF MUNICIPAL AFFAIRS</b>	
1	Fuel
2	Road metal
1	Sodium silicate
3	Stone for road metal
3	water
<b>10</b>	<b>Total</b>
<b>BANGKOK WATER WORKS</b>	
1	Alloy

## II. ANALYSIS (Continued)

No. of Samples	Description
<b>BANGKOK WATER WORKS (Contd.)</b>	
104	Bangkok water supply
6	Commercial Soda
2	Earth re pipe corrosion
20	Lime
30	Sulphate of Alumina
8	Water ( other samples )
171	<b>Total</b>
<b>ROYAL STATE RAILWAYS</b>	
1	Alloy
1	Asphalt
1	Bituminous Paint
2	Disinfectants
1	Lignite
1	Linseed oil
12	Lubricating oil
13	Paint
19	Red lead
2	Sulphuric Acid
4	Water
57	<b>Total</b>
<b>MINISTRY OF ECONOMIC AFFAIRS</b>	
1	Bandage
1	Coins

## II. ANALYSIS (Continued)

No. of Samples	Description
<b>MINISTRY OF ECONOMIC AFFAIRS (Contd.)</b>	
1	Kratom leaves
1	Metal for Silver
4	Water
8	<b>Total</b>
<b>ROYAL IRRIGATION DEPARTMENT</b>	
1	Pig iron
1	Tin
30	Water
32	<b>Total</b>
<b>DEPARTMENT OF AGRICULTURE &amp; FISHERIES</b>	
2	Buffalo faeces
5	Derris
3	Fertilizers
1	Iron Pyrites
1	Mineral for identification
2	Papain
1	Salt
15	<b>Total</b>
<b>OTHER DEPARTMENTS</b>	
<i>Criminal Court</i>	
1	Bullet for examination
3	Documents
1	Suspected illicit opium

## II. ANALYSIS (Continued)

No. of Samples	Description
<b>OTHER DEPARTMENTS (Contd.)</b>	
<i>Criminal Court (Contd.)</i>	
1	Wood for blood stain
<i>Department of Commerce</i>	
2	Alloy
12	Mineral for identification
1	Opium Dross
1	Papain
6	Rice-meal
3	Strychnos seeds.
<i>Fine Arts Department</i>	
1	Antique axe
<i>Harbour Development Board</i>	
1376	Water
<i>National Store Department</i>	
20	Ink
1	Gamboge
1	Gum
1	Soap
<i>Post &amp; Telegraph Department</i>	
1	Alloy
1	Lubricating oil
1	Water used for cooling Radio
<i>Prison Department</i>	
6	Stone

## II. ANALYSIS (Continued)

No. of Samples	Description
	<b>OTHER DEPARTMENTS (Contd.)</b>
	<i>Royal Household</i>
3	Water
	<i>Royal Survey Department</i>
1	China clay
1444	<b>Total</b>
	<b>PUBLIC</b>
	<i>( Firms and private individuals )</i>
1	Alcohol
3	Alloy
1	Bat guano
4	Castor oil
5	Coal
1	Coins
69	Damaged cargo
7	Deposits from boilers
2	Drugs for poisons or narcotics
1	Eucalyptus oil
1	Glue
2	Groundnut cake
2	Hair belting
2	Kaolin
1	Liquor
1	Lotion

## II. ANALYSIS (Continued)

No. of Samples	Description
<b>PUBLIC (Contd.)</b> <i>( Firms and private individuals )</i>	
2	Lubricating oil
1	Material taken from pipe
2	Material, suspected to be poison
2	Methylated spirit
24	Milk
36	Mineral for identification
4	Oil
4	Paddy
14	Rice
9	Road metal
2	Soda ash
8	Soil
3	Sticklac
1	Sulphate of Alumina
1	Tin
2	Tooth paste
13	Water
26	Water for boiler purposes
24	Water from swimming pool
3	Whisky
2	Wood naphtha
<b>286</b>	<b>Total</b>

## Division of Agricultural Science.

### Senior Staff.

W.R.S. Ladell, F.I.C.

Nai Sangar Sharasuvana, C.D.A. Hons. (Seale.-Hayne.)

Nai Aree Supol, B.Sc., (Calcutta)

Kun San Kosiyabastra.

Nai Sroung Charuprakara.

Nai Boon Seub Ahlobho, Dip. Sc. (Chulalongkorn  
University)

The Division of Agricultural Science was transferred from the Department of Agriculture to the Department of Science as from October 1st. 1933 under the scheme of re-organisation of the official services referred to at the commencement of the report.

Mr. W.R.S. Ladell returned to England on March 17th. 1934 on termination of his contract and Nai Sangar Sharasuvana was appointed Chief of the Division in his place.

During the period of this report the laboratories of the Division were situated at Dusit but in 1933 it was decided to move them to a situation nearer to the Department of Science in order to assist administration and to provide additional space for increasing work. The Ministry of War offered the Department of Science a large store building in the Sanam Chai Road exactly opposite the Ministry of Economic Affairs and this convenient site was gladly accepted. The Government granted a considerable sum to enable the building to be adapted to its new purpose so that construction was in progress at the end of B.E. 2476. The Division actually occupied the completed premises in January 1935.

The Department of Science is about to co-operate with the Department of Agriculture in making a complete soil survey of Siam which will ensure plenty of work in the new building.

In the table of samples examined given at the end it may appear that the number of soil samples is very large in view of the short period included in this report.

The majority of these soil samples were only tested for their reactions (pH) in connection with experiments on fertilisers. They were mostly soils from Klong Rangsit experimental station. Water samples were also sent with the soils from Klong Rangsit experimental station to be examined mainly for conductivity and pH.

### **Papain.**

The dry powdered juice from papaya fruits is gradually becoming a regular export of Siam and the number of papain samples sent in by various firms to determine their proteolytic activities is steadily increasing. The proteolytic (albumen dissolving power) is the factor which determines the price of papain and since purchasers abroad are not likely to accept papain with low digestive power, all samples of papain which are to be sent abroad ought to be tested for activity in this respect.

### **Rice.**

Rice grain samples were sent mostly from the Department of Agriculture to find their food values in conjunction with the fertiliser experiments at Ploen Chitt Road.



### Division of Agricultural Science

Summary of samples received from October to the end of March  
B.E. 2476

No. of Samples	Description
<b>DEPARTMENT OF AGRICULTURE</b>	
173	Soils
112	Waters
42	Rice Grains
5	Manures
<b>332</b>	<b>Total</b>
<b>DEPARTMENT OF SCIENCE</b>	
12	Soils
1	Papain
<b>13</b>	<b>Total</b>
<b>PUBLIC</b>	
3	Papain
1	Rice Grain
<b>4</b>	<b>Total</b>

### Schedule of Fees.

All work for Government Departments is performed free of charge.

The following fees are payable by the Public.

#### *Alcoholic beverages.*

Alcohol determination	Baht	5.00
Total solids . . . . .	„	5.00
Complete analysis (spirits)	„	40.00

#### *Copra*

Oil . . . . .	Baht	10.00
Moisture . . . . .	„	5.00
Nitrogen . . . . .	„	10.00

*Damaged cargo, re cause of damage.* Baht 10.00

#### *Denaturants*

Kerosene . . . . .	Baht	5.00
Pyridine . . . . .	„	10.00
Wood Naphtha . . . . .	„	20.00

*Drugs, re Harmful habit forming-drugs law* Baht 10.00

#### *Fuel*

Ash . . . . .	Baht	5.00
Calorific value . . . . .	„	20.00
Moisture (as received) . . . . .	„	10.00
Moisture (air-dry sample) . . . . .	„	5.00
Sulphur (total) . . . . .	„	10.00
Volatile matter . . . . .	„	5.00
Complete examination . . . . .	„	40.00

*Fuel* (liquid)

Density	...	...	Baht	5.00
Distillation test	...	...	,,	10.00
Flash point	...	...	,,	10.00

*Instruments*, standardisation of

Minimum	..,	...	Baht	10.00
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*Milk* (fresh or unsweetened condensed)

Fat	...	...	Baht	10.00
Total milk solids	...	...	,,	5.00

*Milk* (sweetened condensed)

Fat	...	...	Baht	10.00
Total milk solids	...	...	,,	10.00

*Mineral assays*

Gold and/or silver ore		...	Baht	20.00
Lead and silver ore		...	,,	20.00
Tin ore	...	...	,,	10.00
Wolfram:	{	Tungsten determination	,,	15.00
	{	Arsenic determination	,,	5.00

*Mineral*, identification of

Minimum	...	...	Baht	2.00
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*Oil seeds*, oil

	...	...	Baht	10.00
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*Oil and fats*

Acidity	...	...	Baht	5.00
Iodine value	..	...	,,	10.00
Saponification value		...	,,	10.00
Refractive index		...	,,	5.00
Specific gravity		...	,,	5.00
Viscosity	...	...	,,	10.00

*Papain*, (digestive activity) ... Baht 8.00

*Pepper*, Moisture ... Baht 5.00

*Ricemeal*

Ash ... .. Baht 5.00

Moisture ... .. „ 5.00

Crude fibre ... .. „ 10.00

Fat ... .. „ 10.00

Proteins ... .. „ 10.00

Sand and/or silica ... .. „ 10.00

Complete examination ... .. „ 40.00

*Road Metal*

Qualitative analysis and carbonate  
determination ... Baht 15.00

*Sticklac*

Moisture ... .. Baht 5.00

Soluble in cold alcohol (lac resin) .. 10.00

*Water*, for industrial purposes.

Total solids, hardness, chlorine, oxygen  
consumed ... Baht 15.00

*Water*, for potable purposes.

Total solids, hardness, chlorine, oxygen  
consumed, saline and albuminoid  
ammonia, nitrites and nitrates Baht 25.00

*General*

Quantitative analysis, each constituent Baht 10.00

Qualitative analysis, Minimum .. 5.00

*Attendance in Court*

For delivery of expert evidence, per  
visit           ...           ...       Baht 50.00

*Reductions.*

A reduction of 20% is made when two or more samples of the same kind are submitted together. A reduction may be made if regular work is submitted from one source.