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THE
FOOD OF JAPAN

BY

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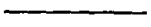
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PREFACE

This work was undertaken on behalf of the Health Section of the League of Nations and was carried out in the Imperial Institute of Nutrition, Tokyo (Director, Dr. Tadasu SAIKI). It comprises statistical data relating to the food supply of Japan and analytical data derived from the writer's personal examination of the food materials. The results of other workers have not been included, this work being in no sense a compilation from other sources, but reference is made at the conclusion to all the literature dealing with the food of Japan so far as the writer has been able to learn of it. Most of the literature is in Japanese, but a perusal of the titles, which have been translated, should enable anyone interested to seek out that which may be of service to him. To increase the usefulness of the work, an index of food materials has been added in Latin, Japanese (Romanised) and in English.

The object of the publication is to supply information as complete as possible with regard to the food of Japan, as a basis for the study of the relation of food to the health of the people. The report confines itself to a statement of the facts, so far as the writer has been able to ascertain them, and avoids any expression of opinion.

The author wishes to take the opportunity of acknowledging his indebtedness to the Director of the Health Section of the League of Nations for help and advice, to Dr. YAMADA, Director of the Public Health Department in Tokyo, and to Dr. Tadasu SAIKI, Director of the Imperial Institute of Nutrition in Tokyo, at whose suggestion and in whose laboratory this work was undertaken, as well as to Dr. TAKAHIRA, acting Director, and to various members of the Institute for their help, and, in particular, to Dr. Taro HINGUCHI and Dr. Yoshimasa YASUDA, whose exceeding kindness and unselfish help have greatly lightened the author's task.

THE FOOD OF JAPAN

Chapter I.

THE QUANTITY OF FOOD IN JAPAN*

The quantity of food available for consumption is given by the sum of the food produced and imported less the amount exported, and, in times of rigid economy, this value will approach closely to that of the food actually consumed by the population. At other times, however, there will be a margin, often wide, representing waste, avoidable or unavoidable, through the destruction of the food or its conversion into material of lesser physiological value — as occurs, for example, in the polishing of rice or the manufacture of high-grade flour or the fermentation of cereals to obtain alcohol.

Table 1, which has been calculated from the statistical returns of the Departments of Finance and Agriculture and Forestry of Japan, published in 1926, sets out in a condensed form the quantities of imports and exports and the production and total consumption of all the important classes of food materials in Japan, and serves to show both the relative importance of the two former in comparison to the latter and the absolute values of all the factors concerned.

Table 1. — EXPORTS, IMPORTS, PRODUCTION AND CONSUMPTION OF FOOD IN JAPAN IN THE YEAR 1925

Kind of food	Totals, in 100,000 kilograms, for the whole population of 59,736,704 persons				Annual consumption calculated in kilograms, per head of population Consumption per head
	Exports	Imports	Production	Total Consumption	
Rice	141.3	4,282.1	86,158.6	90,299.4	151.16
Barley	—	—	20,985.0	20,985.0	35.13
Wheat and flour	—	3,836.3	7,835.4	11,671.7	19.54
Other cereals	—	—	6,701.1	6,701.1	11.22
Soy bean	—	3,106.0	4,871.9	7,977.9	13.36
Other pulses	—	—	6,274.5	6,274.5	10.51
Potatoes	—	—	47,068.1	47,068.1	78.88
<i>Carried forward</i>	141.3	11,224.4	179,894.6	190,977.7	319.80

Table 1. — EXPORTS, IMPORTS, PRODUCTION AND CONSUMPTION OF FOOD IN JAPAN IN THE YEAR 1925 (continued).

Kind of food	Totals, in 100,000 kilograms, for the whole population of 59,736,704 persons				Annual consumption calculated in kilograms per head of population Consumption per head
	Exports	Imports	Production	Total Consumption	
<i>Brought forward.</i>	141.3	11,224.4	179,894.6	190,977.7	319.80
Other root crops	—	—	8,382.1	8,382.1	14.03
Radishes and turnips	—	—	24,997.8	24,997.8	41.85
Green vegetables	—	—	23,407.8	23,407.8	39.18
Fruits	244.2	—	8,170.2	7,926.0	13.27
Sugar	967.6	2,027.4	6,629.4	7,689.2	12.88
Tea	33.9	—	383.2	349.3	.58
Seaweed	134.2	—	3,329.3	3,195.1	5.34
Fish	—	—	18,174.8	18,174.8	30.43
Shellfish	235.9	—	4,246.6	4,010.7	6.71
Dried fish	—	—	1,380.2	1,380.2	2.31
Meat	—	—	1,562.7	1,562.7	2.62
Poultry	—	—	154.3	154.3	.26
Eggs	—	126.0	1,043.9	1,169.9	1.97
Milk	—	—	865.2	865.2	1.45
Condensed milk	—	40.0	—	40.0	.07
Totals	1,757.1	13,417.8	282,622.1	294,282.8	493.64

EXPORTATION.

The export of food from Japan is clearly a minor matter and insignificant in comparison with the total food consumption of the country. Moreover, the commodities exported, of which may be mentioned dried fish, mushrooms, refined sugar, tea, soy and *sake* (the so-called Japanese wine), are for the most part of low physiological value, and, although the materials from which some of them are derived are important foodstuffs, yet, under the present conditions, the exportation amounts merely to a profitable exchange of these for other food materials of still higher nutritional value, so that nothing would be gained by restricting such imports.

The exportation of a certain amount of rice does not indicate a surplus in any district of that commodity, but represents merely an exchange of a high-grade rice, which is exported, for a larger quantity of a lower-grade rice, which is imported.

IMPORTATION.

To any country whose natural boundaries are sharply defined, the necessity of importing foodstuffs becomes a serious matter and a cause of anxiety, a danger which becomes aggravated with an increase of the population. In the case of Japan, therefore, the importance of a clear conception of her position in regard to food supply cannot be overestimated. There are two ways of facing the situation. We may assume that importation of food is necessary and the problem then becomes one for the economist and statesman, or we may refuse to admit such an assumption and direct our attention to finding means of improving the food supply in the country itself, as by increasing the yield of the soil, increasing and improving the stock, developing the fisheries and encouraging the growth of various forms of animal life on land, in the water and in the air; or we may direct attention to diminishing waste, by using mineral fertilisers instead of green crops or other material which might be used as food, to diminishing the losses incurred by polishing rice, manufacturing alcohol, glycerine and other materials which necessitate a destruction of food; or, finally, to actually increasing the stock of food material by new methods, as, for example, the utilisation of soy bean residues and rice polishings, deodorising fish oils, improving the taste of whale flesh and so forth. Such problems are eminently scientific ones.

There are, thus, clearly many alternatives before a country need admit that it is not self-supporting. The need for directing attention to such alternatives, however, may not arise except in times of real want, and in Japan, at the present moment, it cannot be maintained that any such want exists. That an increasing population causes some uneasiness as to the future is another matter. At the present time, the total imports of foodstuffs do not amount to 10 per cent of the consumption, and there is no doubt that the waste of food exceeds this figure.

The chief commodities imported are rice, wheat and soy beans, while other items noticeable in the list are condensed milk and eggs. The excess of rice imported over and above that exported in the year 1925, which is the last year for which the statistics are available, amounted to 4.61 per cent of the total rice consumption, or 3.08 per cent of the total cereal consumption of the country. Very little wheat is grown in Japan and the production has remained stationary during the last ten years. The proportion of wheat imported to that produced in the year 1925 was 51.7 per cent.

How far the figures for imports, exports and production compare with those of other countries may be seen from Table 2, which sets out these data for various countries during the year 1925, the values being given both for the whole country and per head of population.

The figures relating to countries other than Japan have been collected and verified by Dr. WASSERBERG, of the Health Section of the League of Nations, to whom the writer wishes to make grateful acknowledgment.

Table 2. — EXPORTS, IMPORTS, PRODUCTION AND CONSUMPTION OF ALL CEREALS IN VARIOUS COUNTRIES FOR THE YEAR 1925
(100,000's of kilograms.)

		Exports	Imports	Production	Total Consumption	Consumption per head of Population
<i>Japan.</i>	Rice	141.28	4,282.09	86,158.62	90,299.43	151.16
	Wheat	nil	3,836.34	7,835.44	11,671.78	19.54
	Barley	nil	nil	20,985.04	20,985.04	35.13
	Other Cereals	—	—	6,701.14	6,701.14	11.22
	Total	141.28	8,118.43	121,680.24	129,657.39	217.05
<i>Germany.</i>	Wheat	—	—	—	42,437.50	67.9
	Barley	—	—	—	28,376.00	45.4
	Oats	—	—	—	53,187.50	85.1
	Rye	—	—	—	54,500.00	87.2
	Total	—	—	—	178,500.00	285.6
<i>The Netherlands</i>	Wheat	124.34	6,107.27	1,397.50	7,380.43	104.14
	Barley	112.16	2,743.40	673.50	3,304.74	46.63
	Oats	61.83	916.18	2,990.00	3,844.35	54.25
	Rye	194.68	1,388.49	3,908.50	5,102.51	72.00
	Total	493.01	11,155.34	8,969.50	19,631.83	277.02
<i>Canada</i>	Wheat	52,190.40	42.04	71,332.30	19,183.70	218.28
	Barley	4,968.46	—	19,335.10	14,366.64	163.47
	Oats	5,054.68	143.94	62,609.60	57,698.86	656.52
	Rye	1,911.40	1.78	3,492.90	1,583.28	18.02
	Total	64,124.94	187.76	156,769.90	92,832.48	1,056.29
<i>United States of America</i>	Wheat	23,606.62	3,783.71	182,174.30	162,351.39	143.05
	Barley	6,333.21	—	47,463.40	41,130.19	36.24
	Oats	4,291.66	25.87	218,002.10	213,736.22	188.33
	Rye	7,283.63	—	12,369.30	5,085.67	4.48
	Total	41,513.12	3,809.49	460,009.10	422,303.47	372.10

Table 2. — EXPORTS, IMPORTS, PRODUCTION AND CONSUMPTION OF ALL CEREALS IN VARIOUS COUNTRIES FOR THE YEAR 1925 (*continued*).
(100,000's of kilograms.)

		Exports	Imports	Production	Total Consumption	Consumption per head of Population
<i>Poland.</i>	Wheat	942.31	410.48	15,730.00	15,198.17	52.12
	Barley	1,051.21	49.98	16,773.00	15,771.77	54.09
	Oats	343.51	843.38	33,115.00	33,614.87	115.28
	Rye	1,770.62	657.25	65,385.00	64,271.63	220.41
	Total	4,107.65	1,952.09	131,003.00	128,856.44	441.90
<i>Great Britain and Northern Ireland.</i>	Wheat	642.05	49,650.49	14,402.20	63,410.64	151.73
	Barley	188.62	8,064.15	11,666.60	19,542.13	46.73
	Oats	160.50	4,319.42	24,077.20	28,236.12	67.57
	Total	991.17	62,034.06	50,146.00	111,188.89	266.06

The data in Table 2 show that, as regards her supply of cereals, Japan is practically self-supporting, and, if her rice were a little less polished, she would be entirely so. The condition is thus very unlike that of Great Britain or the Netherlands, although worse than in the essentially agricultural countries.

That, moreover, the cereal production of Japan has not been subject to any marked changes during the last ten years may be seen from Table 3, which gives the figures for the production and importation of rice for the years 1915 to 1925, and for other cereals for the years 1916 to 1926.

It will be observed that the production of all cereals during these ten years has been practically stationary, the average harvest being 104.27 million hectolitres, the greatest rise above the average being 8.3 per cent in 1920, and the greatest fall below the average being 4.6 per cent in 1917. The shortage of rice has therefore, during the last ten years, never exceeded 5 per cent of what was reasonably to be expected, and such a loss, if it may be so called, is much less than occurs normally through the polishing of rice or its conversion into alcohol.

THE RELATION OF IMPORTS TO PRODUCTION.

Our attention is drawn to the gradual increase in the importation of rice. The total area of land under cultivation for rice has only slightly

increased during the period under consideration, and, since there has been no increase in the cultivation of other cereals, there is no alternative but to conclude that, under the present conditions of agriculture, the capacity of the land to provide rice for the population has nearly reached its maximum. The matter is considered at the conclusion of this chapter.

How far this increased cereal importation represents an increased need for food, and how far it is to compensate for the losses incurred by the increased consumption of polished instead of natural rice and the increased production of alcohol for consumption or for industry, it is difficult to ascertain, but the fact that, in times of poor harvest, the importation does not obviously increase seems to indicate that it is not so essential.

**Table 3. — PRODUCTION, EXPORTS, IMPORTS AND CONSUMPTION
OF CEREALS IN JAPAN BETWEEN THE YEARS 1915 AND 1926.**
(100,000's. of kilograms.)

	PRODUCTION					
	Rice	Barley	Naked Barley	Wheat	Other Cereals	Total Cereals
1915	100,880	—	—	—	—	—
1916	105,440	12,010	10,850	7,535.8	5,924.1	141,759.9
1917	98,440	11,552	11,230	8,688.0	5,934.9	135,844.9
1918	98,670	10,544	10,655	8,232.3	5,143.6	133,251.9
1919	109,710	12,392	10,440	8,141.9	8,444.4	145,528.3
1920	114,020	10,445	11,367	7,540.3	5,651.9	149,024.2
1921	99,540	11,375	9,664	7,145.2	5,550.1	133,274.3
1922	109,490	11,053	9,771	7,330.1	4,908.9	142,553.0
1923	100,020	9,570	8,023	6,644.0	4,533.2	128,790.2
1924	103,130	10,175	7,862	6,743.2	4,067.9	131,978.1
1925	107,700	11,125	10,657	7,835.4	4,445.8	141,763.2
1926	—	10,797	10,188	7,545.9	—	—

	IMPORTS		EXPORTS	EXCESS OF IMPORTS OVER EXPORTS OF RICE
	Rice	Wheat	Rice	
1917	487	72.6	10,968.3	—10,481.3
1918	4,073	729.1	3,776.8	296.2
1919	5,125	2,552.5	1,368.2	3,756.8
1920	5,941	1,771.2	1,942.8	3,998.2
1921	1,367	2,667.4	1,601.4	— 234.4
1922	2,561	4,613.9	692.3	1,868.7
1923	1,398	3,649.2	529.2	868.8
1924	2,711	4,952.3	420.8	2,290.2
1925	4,273	3,864.7	1,409.7	2,863.3

Table 3. — PRODUCTION, EXPORTS, IMPORTS AND CONSUMPTION OF CEREALS IN JAPAN BETWEEN THE YEARS 1915 AND 1926 (continued).
(100,000's of kilograms.)

	CONSUMPTION ¹		
	Wheat	Rice	All Cereals
1917	8,760.7	87,958.7	125,456.3
1918	8,961.4	98,966.2	144,257.2
1919	10,664.4	113,466.8	151,807.6
1920	9,311.5	118,018.2	154,792.6
1921	9,812.6	99,305.6	135,707.3
1922	11,944.0	107,621.3	149,035.6
1923	10,293.2	100,888.8	133,308.2
1924	11,695.5	105,420.2	139,220.6
1925	11,700.1	110,563.3	148,491.2

¹ The consumption of cereals other than rice and wheat is equal to the production.

FOODS OTHER THAN CEREALS.

The detailed comparison in respect of other foodstuffs is not such an easy matter. In Germany, the consumption of meat per head of the population is placed at 47.1 kilograms for the year 1925. If we wish to make a comparison with Japan, we must not consider the meat consumption, which is only 2.88 kilograms, but the consumption of legumes ¹ and fish, which amounted to 23.9 and 39.5 kilograms respectively per head of the population for the year 1925 (see Table I).

The soy bean accounts for about 60 per cent of the total legumes consumed, and, of this, 39 per cent is imported from China. No other legumes figure in the imports. The importation amounts therefore to 18.6 per cent of the total consumption of this class of food in Japan. Soy bean, however, in Japan, as in China, is mainly used not as such, but after being manufactured into various products, through which process much is lost, and this accounts in part for the large importation of this commodity; moreover, a considerable amount of soy cake ² is used in Japan as fertiliser. In any case, the soy bean could be replaced in part by fish, of which there is a surplus.

Fish is essentially the food for Japanese people, and, owing to the great extent of the islands from Hokkaido in the northernmost to Kyushiu in the southernmost part, with consequent variations in

¹ Largely the soy bean (see Chapter II).

² Residue from soy bean after expression or extraction of the oil.

climate, and on account of the much-indented coast-line, innumerable small islands, bays and inland waters, the supply of fish is varied in kind and vast in amount. Some eighty kinds in common use will be found mentioned in Appendix II and in Chapter IV, where their chemical composition is described.

With such a plentiful supply of fish, the scanty provision of meat need hardly be regarded with concern, even if it is desirable that it should be increased.

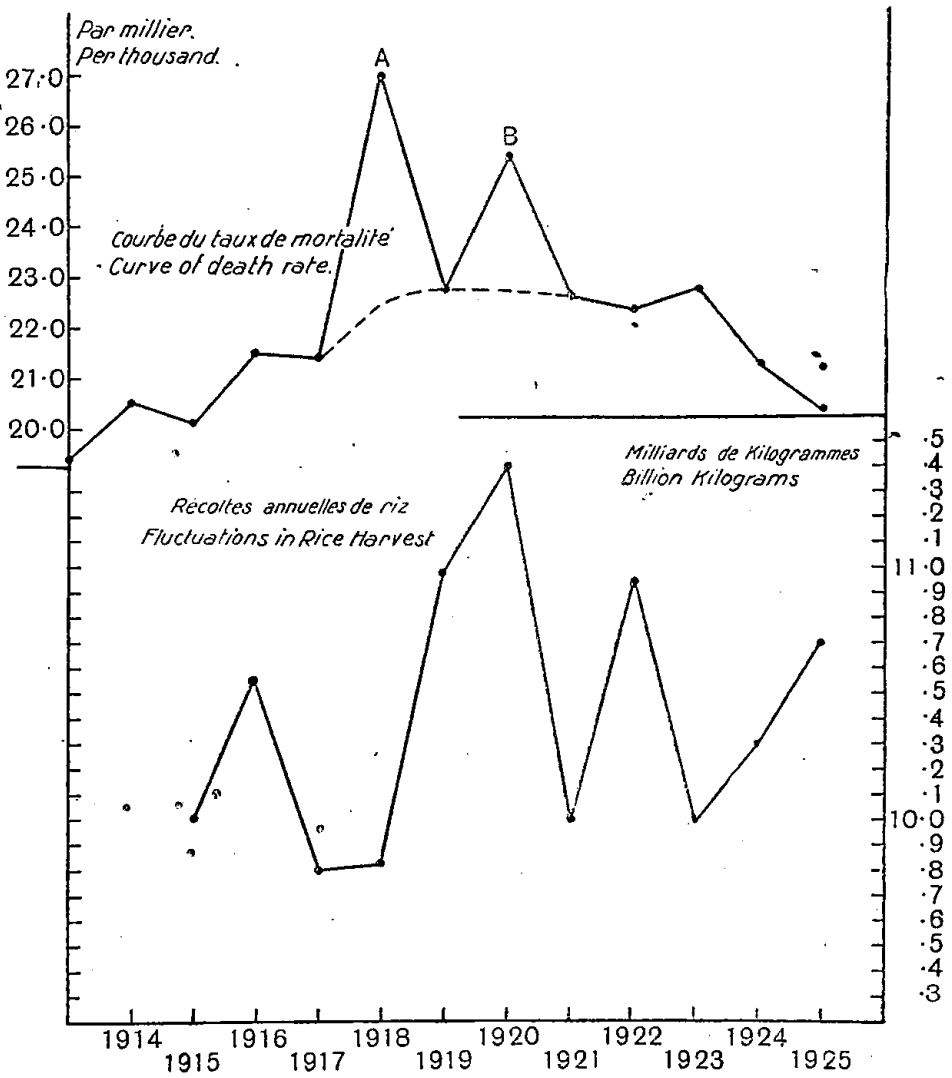
In the matter of root crops and other horticultural crops, Japan likewise appears at no disadvantage as compared with other countries. Potatoes, if we include sweet potatoes, amount to nearly the same consumption as in Great Britain and Northern Ireland, but in Japan many other roots are employed, amounting in all to more than twice the potato consumption. Of such roots, the chief are the Japanese radish (*Raphanus sativus*), the taro and other varieties of *Colocassia antiquorum*, the roots of lily, Indian lotus (*Nelumbo nucifera*), ginger and bamboo shoots. Green vegetables amount to 2,340.5 million kilograms annually, or 39.18 kilograms per head of the population.

We have therefore an amount of food consumption in Japan which compares well with that of other countries, and there is no ground for the statement sometimes made that Japan is in an inferior position to other countries in this respect. And the correctness of the conclusion reached by a study of the statistics is borne out also by certain other considerations which deserve mention. First, in regard to the matter of waste, it is to be observed that, in the year 1925, about 10 per cent of rice was lost by polishing; this refers to loss of total weight: that the loss from the nutritional point of view may be much greater than this is considered in Chapter II. Another 10 per cent of the rice of the country was destroyed by conversion into Japanese wine (*sake*). Of the total catch of fish, 10 per cent was used as fertiliser, and likewise an amount, difficult to ascertain, of soy-bean residue; while, in addition, 5 million tons of green crops were used as manure which might presumably have served either as food or fodder if replaced by mineral fertilisers. There is, therefore, obviously a surplus of food over and above the needs of the population.

In the second place, that there is not, and has not been in recent years, in Japan anything amounting to a serious food shortage is evident from the vital statistics for the past ten years. For it will be seen that, so far from there being any increase in the death rate attributable to food shortage during the years of poor harvest, there is, if anything, an improvement in such years, from which one might be tempted to conclude that the trouble was an excess rather than a deficiency of food. Such a conclusion would doubtless not be warrantable, but the statistics at least may be taken to prove that there has been no generalised food shortage in Japan in recent years. The diagram on page 17 illustrates this point.

The peak A is accounted for by the great influenza epidemic. The peak B appears attributable to a more careful census taken in this year.

Diagram 1. — DEATH RATE AND RICE HARVEST FROM 1914 TO 1926.



Previous to 1920, no census had been taken on European lines and, in consequence, more reliance can be placed on the figures for 1920 and subsequent years. But for the two causes mentioned, there seems little doubt that the mortality curve would have followed the dotted line indicated in the diagram.

The yield of rice in 1917 was 10 per cent higher than in 1916, and it would therefore be reasonable to expect that the mortality would have been increased in that year if the population was living actually near the border-line as regards its food requirements. But no such effect is to be observed, there being, if anything, a slight improvement in the year of the poor harvest. Similarly, in the year 1917, when rice production in Japan touches a minimum, there is no observable influence upon the death rate.

The curve draws attention to the steadily increasing death rate in Japan, but this is a matter which must be considered elsewhere.

It is necessary perhaps to point out that the shortage of rice in any year is not corrected by importation, although an importation usually follows a poor harvest; it would not be in time to correct the effect of the shortage if such an effect were in reality of a serious character. Moreover, if we look to the figures for the importation of rice following a poor harvest, we can ascertain that the deficiency is not made up. For example, in the year 1922, which followed a year of a 10 per cent drop in the rice production, there was an importation of 1.69 million hectolitres over and above the amount imported in the previous year, whereas the yield of rice for the lean year referred to was 109.5 million hectolitres. The importation of rice to make up for the poor harvest amounted, therefore, to less than 1.5 per cent of the rice consumption of the country during the year immediately following the shortage, while, during the lean year 1921 itself, the extra rice imported as compared with the previous year was less than 0.5 per cent of the total rice consumption. Clearly, therefore, such fluctuations as have occurred in the rice production of Japan during the last ten years, amounting, as they do, to a maximum of 5 per cent of the total rice consumption of the average year, have had no appreciable influence upon the mortality of the country; and, if further evidence were needed, it could be found in the fact that during the years of lean rice harvest there has been no special demand for wheat or barley from abroad, although the price of the former was one-half and of the latter one-third that of rice.

We are led to conclude from these considerations, as from the direct study of the quantity of food available per head of the population as compared with that available in other countries, that there is no serious shortage of food in Japan.

Dr. TODA and Dr. IYEHARA, of the Kyoto Imperial University, have expressed a somewhat similar opinion, namely, that the food supply of Japan suffices in quantity for the physiological needs of the people. Their conclusions refer also to the quality of the food, so that further reference to them will be made in Chapter II.

CONCLUSIONS.

1. In respect of total quantity of food, there is no shortage in Japan.
2. The imports of all foodstuffs to Japan in the year 1925, less the exports, amounted to 4.04 per cent of the total food consumption. The imports of cereals amounted to 5.37 of the total cereal consumption. This proportion is less than the losses which occur through the polishing of rice or the conversion of cereals into alcohol.
3. A surplus amounting to 10 per cent of the fish caught in the year 1925 was employed as manure. For the same purpose, 5.26 million tons of green crops were employed, soy-bean cake being also used as fertiliser.
4. Calculated per head of the population, which was computed on October 1st, 1925, as 59,736,704, the quantities of various classes of foodstuffs available for this year were :

	Kilograms per annum	Grams per day
Cereals	217.45	595.8
Dry legumes	23.87	65.4
Potatoes and other root crops	91.91	251.8
Fresh vegetables and fruits	99.64	273.0
Meat	2.62	7.2
Farm produce	3.75	10.3
Fish	33.41	91.5
Sugar	12.88	35.3
Total	485.53	1,330.3

5. The maximum variations in the harvest of rice during the ten years 1915 to 1925 amounted to 8.3 per cent above and 4.6 per cent below the average.
6. The vital statistics show that the years immediately following the poorer harvests are not marked by any increase in the death rate, which confirms the conclusion that the quantity of food in the country suffices for the present needs of the population.

Chapter II.

THE QUALITY OF FOOD IN JAPAN

THE MEANING OF QUALITY.

By quality we mean the quantity of goodness. Apart from quantity, the idea of quality has no meaning. In order, therefore, to appraise the quality of Japanese food, we must enquire first in what proportion the various food materials are available, and, secondly, what are the proportions of the constituents of these foods.

The second question is answered by a chemical analysis of the foods themselves; Chapter IV summarises such information. The first question is answered by the statistics in respect of the various foods, which we may now consider.

THE PROPORTION IN WHICH THE FOODS ARE AVAILABLE.

Table 4 shows the varieties of vegetable foods other than cereals, and the proportion in which they were available in Japan in the year 1925. Table 5 gives similar information with regard to the supplies of fish, and Table 6 of meat and farm products, the foods being arranged in each category in order of abundance.

Diagram 2 illustrates the proportions in which the various vegetable foods are available for consumption in Japan, and Diagram 3 the animal foods. Diagram 4 combines both animal and vegetable foods.

Table 4. — RELATIVE ABUNDANCE OF VARIOUS FORMS OF VEGETABLE FOODS (CEREALS EXCEPTED), 1925.
(100,000's of kilograms.)

ROOTS		GREEN VEGETABLES	
Kind	Quantity	Kind	Quantity
Sweet potatoes	37,929.76	<i>Brassica Chinensis</i>	5,112.59
Potatoes	9,738.38	Egg-plants	3,983.19
Radishes	23,794.90	Pumpkins.	2,808.98
Taro	5,970.65	Water-melons	2,531.29
Burdock	1,856.23	Cucumbers	2,095.34
Turnips	1,426.78	Leeks.	1,893.85
Carrots	1,071.55	Cabbages	1,034.34
Bamboo sprouts	571.18	Onions	753.33
<i>Hydrosme rivieri</i>	538.72	<i>Cucumis concomos</i>	715.13
Indian lotus.	447.85	Musk-melons	489.69
Gingers	284.70	Tomatoes	93.00
Edible lilies	36.18	Chilli peppers	20.76
Arrowheads	19.61		
Total Roots.	83,086.49	Total Green Vegetables.	21,531.49

Table 4. — RELATIVE ABUNDANCE OF VARIOUS FORMS OF VEGETABLE FOODS (CEREALS EXCEPTED), 1925 (continued).

(100,000's of kilograms.)

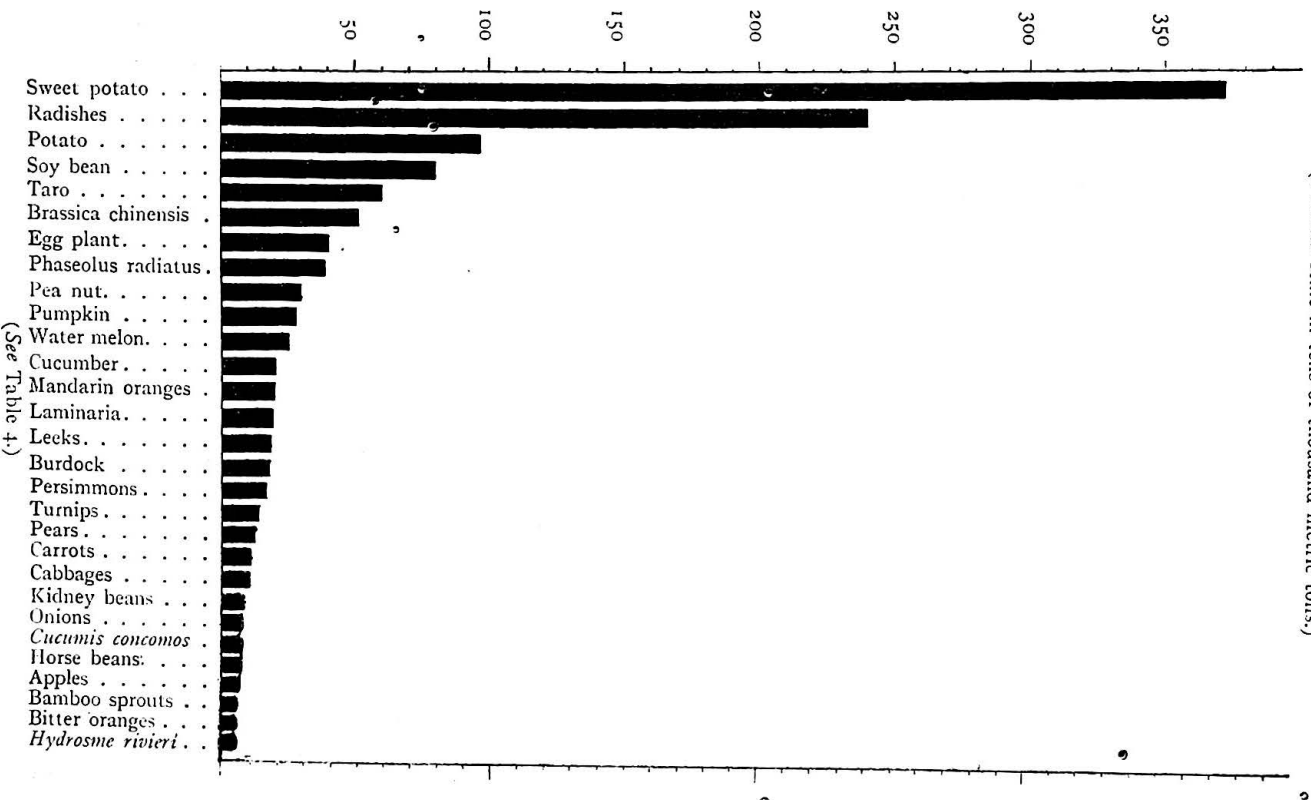
FRUITS		LEGUMES	
Kind	Quantity	Kind	Quantity
Mandarin oranges	2,003.04	Soy beans	7,977.90
Persimmons	1,701.81	<i>Phaseolus radiatus</i>	3,979.70
Pears (native)	1,244.61	Pea nuts.	2,957.92
Apples.	577.01	Kidney beans.	804.89
Bitter oranges	563.76	Horse beans	680.20
Peaches	447.86	Peas.	456.53
Grapes.	354.97		
Other citrus	200.54	Total Legumes	16,857.23
Navel oranges.	122.57		
Loquats	119.29	EDIBLE SEAWEEDS	
Cherries	30.50	Kind	Quantity
Pears (imported origin).	25.70	Laminaria	1,974.25
Strawberries	24.21	Porphyra	183.02
Plums.	15.41	Uudaria	133.04
		Tengusa	62.97
Total Fruits	7,431.28	Total Edible Seaweeds	2,053.28

Table 5. — THE CONSUMPTION OF FISH, SHELLFISH AND OTHER MARINE PRODUCTS IN JAPAN IN THE YEAR 1925.

(100,000's of kilograms.)

FRESH FISH		SALT-CURED FISH		SHELL FISH, ETC.	
Kind	Quantity	Kind	Quantity	Kind	Quantity
Sardine and anchovy	6,273.67	Sardine	149.49	Squid	
Herring	5,473.52	Mackerel	59.76	(<i>Ommastrephes</i>)	1,892.44
Mackerel	755.34	<i>Oncorhynchus keta</i>	54.19	Mussels	242.86
Bonito	649.91	<i>Oncorhynchus masou</i>	44.67	Oysters	210.50
Skipper	641.00	Whale	44.74	Tapes	197.30
Cod	620.39	Cod	23.46	Prawns and shrimps	187.73
Sea-bream	576.24	Anchovy	8.49	Octopus	167.31
Flatfish	462.55	Herring	7.93	Sea-cucumber.	84.40
Shark	391.40	Yellow-tail	6.40	Squid (<i>Ioligo</i>)	71.23
		Tunny.	0.45	Cuttlefish	70.58
Carried forward.	15,844.02	Total	398.68	Carried forward.	3,124.35

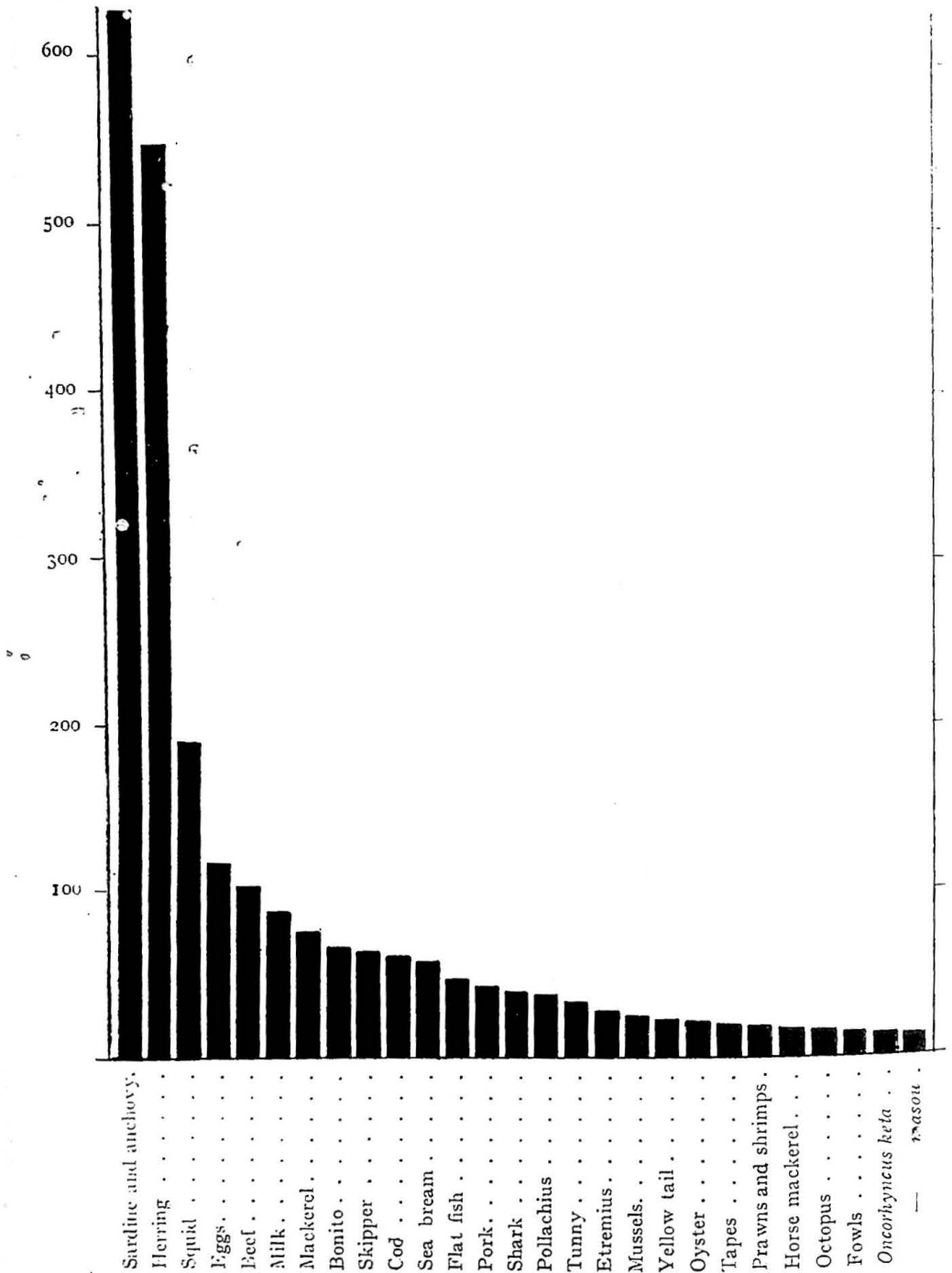
Diagram 2.
 THE PROPORTIONS IN WHICH THE VARIOUS VEGETABLE FOODS OTHER THAN CEREALS
 WERE AVAILABLE IN JAPAN IN 1925
 (Vertical scale in tens of thousand metric tons.)



(See Table 4.)

Diagram 3.

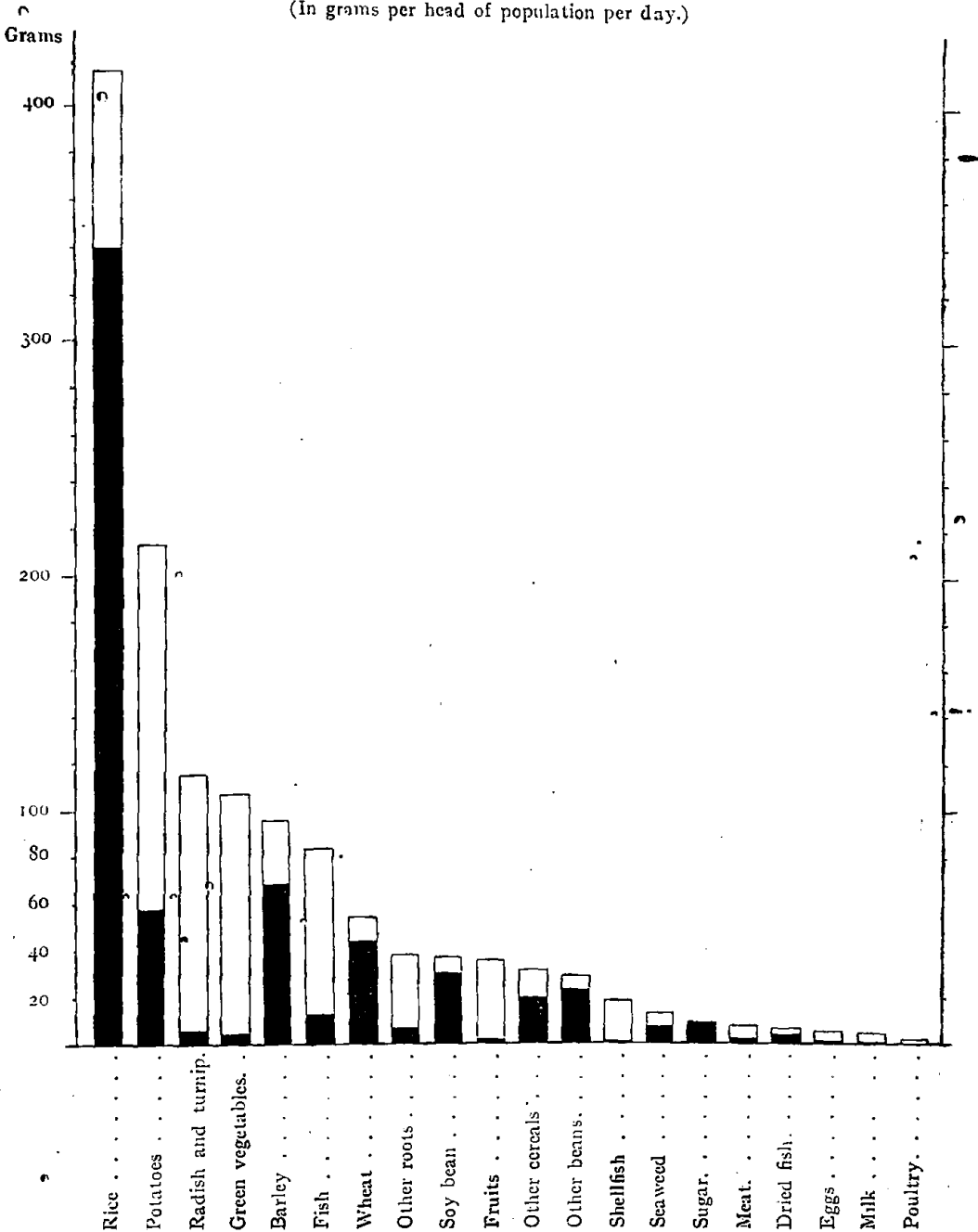
THE PROPORTIONS IN WHICH THE VARIOUS ANIMAL FOODS WERE AVAILABLE IN JAPAN IN 1923;
(Vertical scale in thousands of metric tons.)



(See Tables 5 and 6.)

Diagram 4.

THE PROPORTIONS IN WHICH THE CHIEF FOODS WERE AVAILABLE IN JAPAN IN 1925
(In grams per head of population per day.)



The vertical heights represent the proportions of the various foods available for consumption in Japan in the year 1925.

The blackened portion of each column corresponds to the proportion of solid matter contained in the food which it represents.

The total height in each column represents the amount available per day per head.

**Table 6. — THE CONSUMPTION OF MEAT AND FARM PRODUCE IN JAPAN
IN 1925.
(100,000's of kilograms.)**

Meat		Farm Produce	
Beef	1,034.17	Eggs	1,169.90
Pork	420.59	Milk	865.20
Horseflesh	96.45	Fowls	145.81
Veal	10.52	Ducks	7.66
Goatflesh	0.94	Turkeys	0.79
Mutton	0.06		
Total butcher-meat	1,562.74		2,189.36
Total flesh, including poultry.	1,717.00		

THE SPECIAL CHARACTERS OF JAPANESE FOOD.

Certain facts stand out clearly from these tables and the accompanying diagrams, foremost being the overshadowing of animal by vegetable food. It is clear that, even on a basis of equal distribution of food among the population, it would be impossible to provide a diet comparable to that with which we are familiar in the West.

The second fact which stands out noticeably is the rather unique position of rice. Probably in no country in the world at the present time does one article of food represent such a large proportion of its total food supply as does rice in Japan. Next in order in the list of foods consumed come potatoes (chiefly sweet potatoes), and third comes a group of roots, many unfamiliar to the West, such as the taro or sweet root (*Colocasia antiquorum*), lily root, Indian lotus root and bamboo.

After these come wheat and barley and poorer cereals, chiefly millet and maize, oats not being used as human food in Japan. These, with a further group of watery roots, represent 72.8 per cent of the total food supply before we come to the two main sources of protein, namely, fish and beans (chiefly soy bean). Meat consumption is extremely small, less even than that of seaweed. Milk, including imported condensed milk, represents only 1.52 per cent of the food, while other items of dairy produce familiar to the West, such as cheese and butter, find no place in the list.

But even this picture gives an exaggerated view of the nutritive value of the food, for two reasons : there is, with foods such as vegetables, fruit and fish, especially shellfish, a great deal of waste; and there is also, in such foods, an abundance of water. To form a clearer idea, therefore, of the relation of the various ingredients of the food supply

to one another, we should calculate the food consumption in terms of solid edible material. The result of such a calculation is given in Table 7.

Table 7. — THE FOOD OF JAPAN IN 1925.
(Kilograms per head of population.)

	Crude Food	Unavoidable Waste	Edible Portion	Solid Matter in Edible Portion	Percentage of the total Food consumed
Rice	151.56	9.09	142.47	123.95	50.83
Barley	35.13	7.03	28.10	24.73	10.15
Wheat	19.54	0.98	18.56	16.15	6.63
Other cereals.	11.22	2.24	8.98	7.90	3.24
Soy bean	13.36	—	13.36	11.62	4.76
Other beans	10.51	—	10.51	9.04	3.71
Potatoes	77.88	7.79	70.09	21.03	8.63
Other roots	14.03	2.80	11.23	2.49	1.02
Radishes and turnips	41.85	0.83	41.02	1.64	0.67
Green vegetables	39.18	5.71	33.47	1.28	0.53
Fruit	13.27	3.32	9.95	0.85	0.35
Seaweed.	4.41	0.44	3.97	3.00	1.23
Fish	30.43	12.17	18.26	4.20	1.72
Shellfish.	6.71	6.04	0.67	0.07	0.03
Dried fish	2.31	0.23	2.08	1.66	0.68
Meat	2.62	0.13	2.49	0.62	0.25
Poultry	0.26	0.03	0.23	0.04	0.02
Eggs	1.97	0.26	1.71	0.44	0.18
Milk	1.52	0.00	1.52	0.18	0.07
Sugar.	12.88	—	12.88	12.88	5.30
Total.	490.66	59.09	431.55	243.78	99.99

In constructing the table, average values have been employed based on a consideration of the relative abundance of the varieties of food materials in each category. Diagram 4 presents pictorially the facts of Table 7. We observe from Table 7 that the consumption of solid food in the form of fish and shellfish represents 2.43 per cent, meat of all forms 0.27, milk 0.07, eggs 0.18, beans as actually used 8.47 per cent, green vegetables amount to 0.53 per cent and fruit to 0.35 per cent of the total solid food. The remainder, excepting tea and seaweed, consists of cereals, potatoes and other roots and amounts to 87.7 per cent of the whole food supply, calculated as solid edible matter.

Having reduced the data for the food supply to terms of solid edible matter, we have next to calculate the amounts of the essential constituents: protein, fat, carbohydrate and mineral matter, in order to decide as to its adequacy or inadequacy in respect of quality.

Table 8 gives the requisite information in respect of the main factors by which the quality of the food may be judged.

Table 8. — THE COMPONENTS OF JAP.
(Calculated as grams per day)

	Crude Food	Waste	Edible Portion	Water	Solid Matter	Protein	Fat
Rice	415.2	24.9	390.3	50.7	339.6	27.3	0.98
Barley	96.2	19.3	76.9	9.1	67.8	9.2	1.53
Wheat	53.5	2.7	50.8	6.6	44.2	6.6	1.01
Other cereals	30.7	6.1	24.6	3.0	21.6	2.4	0.74
Soy bean	36.6	—	36.6	4.8	31.8	13.9	6.03
Other beans	28.8	—	28.8	4.0	24.8	5.8	2.88
Potatoes	213.3	21.3	192.0	134.4	57.6	3.3	0.40
Other roots	38.4	7.6	30.8	24.0	6.8	0.8	0.06
Radishes and turnips	114.7	2.3	112.4	107.9	4.5	0.7	0.35
Green vegetables	107.3	15.6	91.7	88.2	3.5	1.4	0.18
Fruit	36.4	9.1	27.3	25.0	2.3	0.3	0.03
Seaweed	12.1	1.2	10.9	2.7	8.2	0.9	0.05
Fish	83.4	33.3	50.1	37.5	12.6	10.0	2.51
Shellfish	18.4	16.5	1.9	1.7	0.2	0.2	—
Dried fish	6.3	0.6	5.7	1.2	4.5	3.4	0.17
Meat	7.2	0.4	6.8	5.0	1.8	1.5	0.23
Poultry	0.7	0.1	0.6	0.5	0.1	0.1	—
Eggs	5.4	0.7	4.7	3.4	1.3	0.5	0.42
Milk	4.2	—	4.2	3.7	0.5	0.2	0.13
Sugar	35.3	—	35.3	—	35.3	—	—
Total	1,344.1	161.7	1,182.4	513.2	669.0	88.5	17.7

PER HEAD OF POPULATION AS AVAILABLE IN 1925.
(per head of population.)

Carbo- hydrate	Fibre	Total Mineral Matter	Calories	Alkali Production CCS Normal	P ₂ O ₅	CaO	
304.4	1.0	3.20	1,369.1	4.0	1.76	0.12	Rice.
54.3	1.3	1.50	274.6	—	0.92	0.31	Barley.
34.9	1.0	0.71	179.5	—	0.41	0.08	Wheat.
18.0	0.2	0.36	90.5	—	0.20	0.07	Other cereals.
9.2	1.1	1.70	150.8	146.4	0.37	0.10	Soy bean.
15.8	1.4	0.86	115.3	86.4	0.14	0.03	Other beans.
51.2	1.3	1.40	227.2	15.4	0.23	—	Potatoes.
5.0	0.6	0.30	24.3	3.1	0.06	0.02	Other roots.
1.8	1.1	0.56	13.5	5.6	0.03	0.06	Radishes and turnips.
0.3	0.8	0.83	8.6	9.1	0.06	0.18	Green vegetables.
1.1	0.7	0.14	6.0	1.6	0.01	0.01	Fruit.
6.2	—	1.09	29.6	2.7	0.01	0.05	Seaweed.
—	—	0.70	64.3	4.0	0.48	0.08	Fish.
—	—	—	0.8	—	0.06	—	Shellfish.
—	—	0.93	15.5	0.6	0.06	0.03	Dried fish.
—	—	0.07	8.3	0.3	0.03	—	Meat.
—	—	—	0.4	—	—	—	Poultry.
—	—	0.34	6.0	0.1	0.05	0.01	Eggs.
0.1	—	0.04	2.6	—	0.01	0.05	Milk.
35.3	—	—	144.7	—	—	—	Sugar.
537.6	10.5	14.7	2,731.6	279.3	4.9	1.20	Total.

When thus we come to consider the food of Japan not merely in terms of total quantity but in respect of nutritive or body-building value, the matter assumes quite a different aspect, and, in the first place, our attention is directed to the low protein content of the food.

THE LOW PROTEIN CONTENT OF JAPANESE FOOD.

There are two causes of the low protein content of Japanese food : first, that it is chiefly vegetable; and, secondly, that the main cereal — namely, rice — is poor in protein in comparison with other cereals.

There is a belief common in Japan that the protein of rice is superior in quality to other proteins. If this is so, it is of supreme importance, but the matter requires careful investigation before the truth of the statement can be admitted. It must not be forgotten that a digestive system accustomed to one kind of food may not readily adapt itself to another. The factors to be considered are so many — the climate, the season, the form in which the food is taken, the method of cooking, the relation of the food to other foods in the diet. The habits of the individual, his condition of health, the degree of energy expenditure required of him, his age, his temperament and his tastes — all have to be taken into account before the conclusion can be reached with regard to any particular food which the individual consumes that it is superior or inferior to another. Conclusions based upon a few experiments on the digestibility or absorbability of a particular food, and which do not take into account all the above-mentioned considerations, do not suffice to decide such a matter. The problem of determining upon the most suitable source of its protein is of vital importance to a nation and it deserves the most thorough study.

The question of the relative merits of proteins of different origin extends, however, beyond the intention of the present report and, moreover, beyond the requirements of our study, and, before we need stop to consider such a refinement, we must answer the question whether the quantity of protein in Japan suffices for the needs of the people. In this connection, two questions arise : first, How does the protein consumption of Japan compare with that of other countries? and, secondly, Does the protein suffice?

The first question is more readily answered than the second, since there is, with regard to this latter question, the difficulty that opinions differ much as to what are the absolute body requirements in respect of protein and the further difficulty of ascertaining what portion of the food in the country really goes to human consumption and what proportion is wasted or otherwise employed. These difficulties apply less to the first question. We may begin by considering the protein which is available in various countries in the form of cereals. Such information is derived from Table 2, by multiplying each of the figures given by the percentage of the protein in the cereal to which it refers. This gives us Table 9.

In the light of this table, the cereal food of Japan, which compared favourably with other countries in respect of quantity, now falls below them. In the form of cereals there was available in Japan, in 1925, 18.81 kilograms of protein per head of the population. Or, expressed in grams per day, the quantities are : for Japan 51.53, Germany 92.22, the Netherlands 91.26, and Great Britain and Northern Ireland 92.91; while Poland, Canada and the United States show figures considerably greater.

Table 9. — PROPORTION OF NUTRITIVE MATERIAL (PROTEIN) AVAILABLE IN THE CEREALS OF JAPAN AND OTHER COUNTRIES.
(Kilograms per head of population in 1925.)

Country,	Source of Protein					Total Protein from Cereals	
	Rice	Wheat	Barley	Oats	Other Cereals	Kilo-grams per annum	Grams per day
Japan	10.581	2.540	4.567	—	1.122	18.810	51.53
Germany	—	8.827	5.902	10.212	8.720	33.661	92.22
Netherlands	—	13.538	6.062	6.510	7.200	33.310	91.26
United States of America	—	18.597	4.711	22.600	0.448	46.356	127.00
Canada	—	28.376	21.251	78.782	1.302	139.711	356.74
Poland	—	6.776	7.032	13.834	22.041	49.683	136.15
Great Britain	—	19.725	6.079	8.108	—	33.912	92.91

We would not, of course, conclude from such data that the quantity of protein in the form of cereals in Japan was inferior to that of other countries in respect of its ability to supply the needs of the population, for, in Japan, the average adult body weight is much less than in the other countries referred to in the table; and, moreover, with a rapidly increasing population and also a high death rate, it is clear that, in Japan, the proportion of children to adults must be greater than in the other countries, a factor which still further reduces the general average body weight.

Still less should we infer from such data that the supply of protein in the form of cereals was inadequate to the needs of the population.

The fact, however, that Japan is largely a vegetarian country makes the low protein content of the main cereal a more serious matter than it would otherwise be, and this leads us to the second question, namely, as to the adequacy of the protein supply.

To answer this question we must know, in the first place, the sum of the protein of all sources; in the second place, the average body weight of the population; and, in the third place, the average requirements of protein for maintaining the average weight. The sum of all protein available per head is given in Table 8. It amounts to 88.5 grams per

day. The average body weight has been computed by the writer to be 39.34 kilograms and hence there is available per kilogram of body weight 2.25 grams of protein.

The amounts of the main essential factors available in Japan per kilogram of body weight are, therefore :

Protein	2.25
Fat	0.45
Carbohydrate	13.67

and yielding

Calories	69:5
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THE CORRECTION OF THE PROTEIN DEFICIENCY.

It is evident from Tables 7, 8 and 9 that Japanese people rely on fish and soy bean to correct the deficiency of protein which arises from the low protein content of rice and other constituents of their diet. Both of these foods also, though chiefly the latter, serve to supply other constituents which are lacking, such as fat, phosphorus, lime, potash and alkali, which points will be considered later.

It must not be thought, however, that the correction of protein deficiency in these ways is quite ideal. Of the two sources of protein, fish is by far the more valuable; the supply is abundant, the material is fresh, the food as a whole is easily digested and absorbed, and, what is also of great importance, it contains accessory food factors essential for growth. It has, however, the disadvantage that it is not readily transported and, in consequence, it is not very readily available for the agricultural classes. On the other hand, the production of the soy bean in Japan is not sufficient in quantity to meet the needs of the country, and over one-third of the amount consumed must be imported from China. The bean is dry and readily transported and hence available for the rural classes. It must, however, be soaked in water for twenty-four hours before it can be cooked and cooking requires a longer time than is necessary with other beans, and it appears likewise to be difficult to digest. In consequence, the bean is not employed as such but is manufactured into bean curd or bean paste, in either of which operations there is loss of protein and of other constituents to a varying extent, and such accessory factors or vitamins as may be present in the original soy bean disappear entirely in the manufacturing process. According to FUGIMAKI, of the Imperial Nutrition Institute, Tokyo, 30 grams of fresh bean curd do not suffice to keep off the so-called polyneuritis of pigeons and are likewise incapable of promoting growth in rats. It is therefore important to bear in mind that, though bean curd may be excellent as a source of protein, it is not equivalent to fish or meat, owing to the absence from it of many factors which are present in these foods, not least of which are the vitamins.

The problem of supplying the Japanese people with protein in sufficient quantity and in a suitable form is therefore as yet unsolved. There seem difficulties in the way of rearing live-stock. How real these difficulties are, the writer is not in a position to say. On account of such difficulties, SAIKI urges the rearing of small animals, though the matter does not yet appear to have been taken up with great enthusiasm. It certainly should be found possible to rear pigs and poultry.

But, with regard to the solution of the problem of increasing the protein supply of Japan, it must be realised that a large section of the population has an aversion from animal food. Even for milk a substitute made from soy bean is often employed, though, speaking generally, all Japanese children are breast-fed. The difficulty of finding suitable infant food is evidenced by the enormous mortality of children under four years, mainly from diseases which have their focus in the alimentary tract and are classified in the statistics as diarrhoea and enteritis.

If better methods of handling the milk supply could be introduced and a more efficient control of its quality assured, much might be done to popularise its use and, with the more extensive use of milk, the infant mortality might be much reduced. Moreover, the present practice of nursing children for a long period, a necessary consequence of a poor supply of cow's milk, must be a great drain on the strength of the mother.

The aversion with which animal food products are held in Japan is due certainly, in a considerable measure, to the inferior quality of much of the food on the market. In striking contrast to the exceeding cleanliness of most things in Japan, the condition of the dairies leaves much to be desired. The sterilisation of milk is regarded as essential, and it is certainly indispensable in Japan under the present conditions. The imported butter on the market is of excellent quality, although it has come from Europe, America, Canada and other distant places, yet the butter of Hokkaido is as often rancid as not. The milk is of poor quality. Of the milk from twelve of the Tokyo suburbs examined by the author, 50 per cent contained less than 3 per cent of butter fat, and some were adulterated with cane-sugar. Under such conditions, it is not surprising that milk and dairy products are not very popular. A further reason for aversion from animal food is ignorance of the methods of cooking it properly.

Finally, in this connection, a word should be said by way of raising the question again as to whether something could not be done to increase the consumption of cereals richer in protein and to diminish the consumption of rice. Barley is one-third of the price of rice and it contains twice the protein of the latter. The protein of barley is therefore one-sixth of the price of the protein of rice. It is difficult to believe that, under the circumstances, it is wise that so much rice and so little barley should be used. Moreover, the physical character of rice is such that a people of cultivated tastes are bound to use it in the polished condition, for rice must be consumed as grain. It cannot be made into a bread comparable to wheaten bread because the protein has none of the elasticity of wheat gluten, and, for the same reason, it is impossible for the Japanese people

to convert rice into a form of macaroni, the ingenious device by which the Italian people have solved the difficulty of subsistence on a largely vegetarian diet without incurring the dangers of an excess of carbohydrate. The natural rice grain is rough to the tongue and unpleasing to the palate, it is not so easily digested and it has none of the pleasing appearance of the pure white grains of polished rice. It appears of little use, therefore, to insist on the evils of white rice and urge the virtues of the brown. White rice has an æsthetic appeal which must not be forgotten, especially in Japan, where colour means so much. For these reasons, it would be better to encourage in Japan the use of other cereals in the form of bread and diminish the use of rice and, also, to find means of putting back into the food, in some other form, the vitamins lost by polishing, than to attempt to stay the natural tendency to the use of food with a good taste and appearance. FRAZER and STAUNTON, in their studies of Beriberi disease in the Malay States, point out how the people, though knowing the danger, preferred the white rice with the disease to the natural rice without it. If this is true of the unskilled labourers in the Malay States, how much truer must it be in Japan?

THE IMPORTANCE OF THE RATIO OF PROTEIN TO NON-PROTEIN FOOD MATERIAL.

When cereals bulk largely in the diet, and especially when that cereal is rice, increasing the protein by adding a little fish or bean product or even meat — even though it may be to the extent of supplying the amount of protein considered necessary according to European ideas — does not alter the fact that the amount of carbohydrate to be burned up in the body will be large in proportion to the protein. In other words, the bulk of the food remains large in comparison with its nutritive value, and this state of affairs is the predisposing condition for the onset of intestinal disease, which, as a cause of death in Japan, surpasses even tuberculosis.

But, even if the large excess of carbohydrate can be successfully passed on from the intestine to the blood-stream without undergoing fermentation of an undesirable kind, there remains the difficulty of the tissues of the body to deal with more fuel than they require.

Little is known of the changes which glucose or fat undergo prior to their ultimate conversion into CO_2 and H_2O .

The mere formation of CO_2 necessarily increases the hydrogen ion concentration at the seat of oxidation, and anything short of complete combustion of the fuel would increase this concentration to a still greater extent. In this way, a vicious circle is quickly established, for, if one may judge at all by analogy with carbohydrates decomposition by enzymes, the course of decomposition must be rapidly modified by an accumulation of hydrogen ions. Various intermediate products are doubtless formed injurious to the tissues and causing pathological signs and symptoms characteristic of impaired tissue respiration.

Whatever the nature of these changes may be, it is clear that the combustion by the tissues of an excessive amount of fuel must lead to damage to the tissues themselves and, sooner or later, to breakdown, and it is reasonable to suppose that this breakdown may be delayed or averted by supplying material for repair. There is, indeed, much evidence that the ills of carbohydrate excess may be lessened by adding nitrogenous substances to diets even without increasing the vitamin B. It must suffice, however, in this place, to draw attention to the abnormally high ratio of fuel food in the Japanese diet and to point out that herein lies undoubtedly a cause of ill-health, a cause possibly not less important than vitamin deficiency in producing deficiency disease. The remedy

Table 10. — FUEL RATIO OF SOME IMPORTANT FOODSTUFFS.

Kind of Food	Composition			Fuel ratio :
	Protein	Fat	Carbo- hydrate	$\frac{\text{Carbohydrate} + (\text{Fat} \times 2.25)}{\text{Protein}}$
Beef	20.0	4.0	nil	0.5
Bream	19.0	5.0	nil	0.6
Pork	21.0	6.0	nil	0.6
Tofu	6.5	3.2	1.0	1.3
Skipper.	19.0	12.0	—	1.4
Soy bean	36.0	16.0	25.0	1.7
Radish leaves	1.5	—	3.0	2.0
Egg	13.0	16.0	—	2.1
Cheese	34.2	33.0	—	2.2
Azuki bean	20.0	0.5	56.0	2.9
Tunny	19.0	26.0	—	3.0
Pea-nut.	32.0	45.8	16.0	3.7
Milk	3.0	3.0	6.0	4.3
Radish root	0.6	0.3	1.8	4.3
Carrot	1.1	—	5.0	4.5
Onion	1.0	—	5.0	5.0
Wheat	13.0	2.0	70.0	5.7
Barley	12.0	2.0	68.0	6.0
Fruit	1.0	—	6.0	6.0
Bread	9.0	1.0	56.0	6.5
Buckwheat	7.0	1.0	66.0	9.7
Roots	2.0	—	20.0	10.0
Rice (unpolished)	7.5	2.0	75.0	10.6
Rice (polished).	7.0	0.2	78.0	11.2
Potato	1.2	—	20.0	16.6
Sweet potato	1.0	—	28.0	28.0
Average for all Japanese food	88.5	17.7	511.1	6.2
Voit's standard	118.0	56.0	500.0	5.3

Note. — The "fuel ratio" is the ratio of calories produced by non-protein to calories produced by protein, and is thus the inverse of what is sometimes called the "nutritive ratio". It represents the heating capacity as contrasted with the body-building capacity of the food, and has the advantage of drawing attention to the high value of the former in vegetarian diets, and especially in the diets of the rice-eating peoples.

must be to raise the proportion of protein in the diet until it is nearly one-fifth or one-fourth of the whole, so that the ratio :

$$\frac{\text{Carbohydrate calories} + \text{Fat calories}}{\text{Protein calories}}$$

shall be not greater, on an average, than 5. For children it may be 6. For adults it is better nearer 4.

This ratio is a little easier to understand than the converse, which is sometimes called the nutritive ratio, and it might be instructively called the fuel ratio. What this ratio is in various foods may be seen from Table 10 (page 35), in which, for convenience of memory, only simple ratios are shown. Such a table shows very strikingly the difference between such foods as milk and cheese and meat at the one extreme and polished rice and potatoes at the other. In natural rice the fuel ratio is 10, and in polished rice actually 11. With bread the ratio is 5. Rice is thus better classed with potatoes than with cereals in respect of nutritive value, if we consider such foods on the basis of the solid matter which they contain.

DEFICIENCY OF FAT.

As far as may be judged from the statistics of the food available in Japan, there is an insufficiency of fat. If we consider fat and carbohydrate as sources of energy equally acceptable to the body from the chemical point of view, with only the physical difference that the energy of 4.1 grams of fat must be supplied by 9.3 grams of carbohydrate, then it might be argued that fat could be dispensed with for human beings as a source of energy and its place taken by the equivalent of carbohydrate. Such is the attitude, apparently, of many writers upon this subject. The course of the combustion of these two classes of materials is, however, so different *in vitro* that it is difficult to accept the view that *in vivo* they are entirely equivalent. Apart, however, from serving as a source of energy, fat has other important functions. Animal fat serves as a vehicle for fat soluble vitamin, and consequently the fact that, in Japan, the greater proportion of fat is supplied as vegetable oil indicates a smaller supply of this vitamin than is available in countries where there is a considerable supply of animal fat in the diet.

Animal fats, moreover, do not consist of carbon, hydrogen and oxygen only; they contain always, in the natural state, nitrogen and phosphorus, and especially in the case of fats derived from richly cellular organs.

According to European standards, a man should receive daily 1.5 grams of fat per kilogram of body weight. Calculated to an average adult body weight in Japan of 52 kilograms, the amount of fat requisite would be 78 grams. In Japan, the average fat consumption amounts to from 15 to 20 grams and of this more than 85 per cent is vegetable oil.

THE EXCESSIVE ACID PRODUCTION OF THE FOOD.

It has been pointed out previously that all food produces acid by oxidation, and, although the reaction is continually being adjusted through the escape of carbon dioxide from the lungs as well as by the other channels of excretion, yet an undesirable concentration of hydrogen ions would quickly be reached unless hydroxyl ions were formed to remove them. Food materials which yield hydroxyl ions to the body are such as to leave an alkaline ash on incineration, and it is therefore important to know the extent to which food materials have this property. No food material produces an acid ash, but in the case of cereal foods, especially rice, the ash is almost neutral and hence in oxidation of such food materials an acid reaction is quickly developed. Fish and meat likewise produce but little alkali in the body, though they are superior to rice in this respect. Vegetables and fruit, however, yield alkali abundantly. The alkali production of the food materials may be found by reference to Chapter IV.

Polishing rice and refining cereals increases their acid-producing power, but, even when used in the natural state, it is doubtful whether the neutrality of the body tissues could be efficiently maintained on purely cereal diet. This is a point of considerable importance to Japanese urban people, for whom but little fruit is available; and it must be pointed out that, although it is true that beans yield alkali to the body in common with other vegetables, yet such is not true in regard to the bean products employed by the Japanese people. For, as may be seen by reference to Chapter IV, although 100 grams of natural soy bean yields over 20 cc. normal water-soluble alkali, tofu (bean curd), which is the chief solid form in which the soy bean is employed, is almost devoid of water-soluble alkali, and the same remark applies to aburage and gammadoki, forms of fried tofu; and even miso (bean paste), which is used as soup regularly in the Japanese household, yields only a fifth of the water-soluble alkali produced by the equivalent of natural soy bean.

It is necessary to draw attention to the fact, moreover, that most of the vegetables grown in Japanese soil contain a lower concentration of salts, and hence of potential alkali, than appears to be the case in other countries. This fact may be due to the intensive cultivation of the soil, the humid atmosphere and heavy rainfall, the insufficient drainage of the soil or other causes, but the result is that, bulk for bulk, many Japanese vegetables are, in this respect, inferior to the corresponding materials in many other countries. Something might perhaps be done by the use of artificial fertilisers, but the matter is evidently one requiring special investigation.

The most pleasing way to correct the acid production of the main foods is by the consumption of fruit. But as to the supply of fruit in Japan, opinions seem to differ. According to the statistics for fruit production, the supply is very small, but, according to certain experts, there is in the country an abundance. Professor Shozo TODA refers, in an article on

food consumption in Japan, to the abundance of green vegetables and fruit throughout the country. In Tokyo, fruit is quite costly, and in several institutions the writer has visited fruit does not appear as an article of diet. Possibly the truth is that, though abundant in the country, it is scarce in the towns. If, however, one cannot rely on the statistics in this respect, it is best to refrain from an opinion.

VITAMINS IN JAPANESE FOODS.

In the present state of our knowledge — or, we might say, lack of knowledge — of the essential accessory food factors or vitamins in the Japanese foods, it is impossible to form an opinion as to their adequacy in any quantitative sense, and, unless our knowledge of such factors is quantitative, it is not very helpful. Wisdom lies, therefore, in aiming at an excess of these vital factors in the diet and this, so far as the writer is aware, can only be assured by using food as nearly as possible in the state in which nature has made it. Any form of artificial treatment of food, such as polishing, refining, curing, sterilising, preserving, freezing, and even mere keeping, causes deterioration, so that more of such food must be taken to secure the equivalent physiological action of fresh natural food.

It happens that, in Japan, a very considerable portion of the food is subjected to artificial treatment before it reaches the home of the consumer. Thus virtually all rice is polished and other cereals are likewise refined to flour; practically no cereals are employed in the natural state. The soy bean is manufactured into bean curd (tofu), bean paste (miso) and bean sauce (shoyu). Salted and pickled vegetables are articles of daily consumption in Japan, so that a large proportion even of the green food is not used in the fresh state; other green leaves are used for the extraction of vegetable oil, as likewise are soy bean, pea-nuts, sesame. With fruits and vegetables, moreover, there is considerable waste, estimated at from 20 to 30 per cent of the total weight, but the actual loss of quality may be much greater, as is the case in regard to the loss of vitamin incurred by discarding the seeds.

Marine products represent for the Japanese people an abundant and unending source of vitality, but unfortunately it is not possible to regulate the catch, so that, at one season, a superabundance leads to a large waste of fish as manure, while, for the other seasons, shortage is obviated by salted, cured and dried material. Moreover, even when fresh fish is apparently abundant, there is a large consumption of dried and salted fish and fish products, partly because these are cheaper and partly because they are more convenient.

When, therefore, we take note of the proportion of food which reaches the consumer in its fresh natural condition, we find it is extremely small; in fact, reckoned as edible solid matter, it represents at most 10 per cent of the total food of the consumer.

CONCLUSIONS.

1. If the various foodstuffs of Japan are employed as far as possible in their natural state, altered only by such an amount of cooking as is unavoidable, they are able to provide all the factors and accessory factors necessary for healthy life and in quantities adequate for the needs of the present population.

2. As calculated from the statistics of the food of Japan in the year 1925, the proportion in which the various factors are available for consumption, prior to any artificial interference with the foods, is as follows, the figures being in grams per day per head of the population :

Protein	88.5
Fat	17.7
Carbohydrate.	537.6

with a total energy value of

Calories	2,732
--------------------	-------

From these figures it may be observed that the protein and fat are proportionally low, the carbohydrate proportionally high.

3. The chief cause responsible for the high ratio of carbohydrate in the food supply is the preponderance of rice. Japanese rice in its natural state contains 1 part of protein to 10 parts of digestible carbohydrate, and, after polishing, the ratio is raised to 1 part of protein to 11 parts of digestible carbohydrate.

5. The preponderance of rice amongst the foods of Japan is responsible also for the low proportions of fat, water-soluble mineral salts, lime, iron and alkali-forming salts.

6. The dilution of these essential food factors by the high carbohydrate content of rice is increased by the presence of other farinaceous materials, such as potato and sweet potato, Japanese yam, taro, arrowhead, kikyō root (*Platycodon grandiflorum*), lily root, lotus (*Nelumbo nucifera*) and other roots which contribute to the food supply. Most of the roots mentioned, however, contain more lime, iron and water-soluble mineral salts and produce more alkali than rice.

7. The concentration of the essential food factors is raised by the presence of legumes, chiefly soy bean, and fish, of which latter there is an abundant supply, and by green vegetables and fruit, the first two raising in concentration principally the organic, the second two the inorganic factors. The scanty supply of milk, dairy produce, flesh and animal fat is to be noted.

8. Certain physical characters of the foods deserve note as being responsible in a measure for the artificial treatment to which such foods are subjected. Rice is, in its natural state, coarse, less soluble or digestible than after polishing. Soy bean is extremely hard, requiring at least twenty-four hours' soaking in water before it is ready for cooking. Fish and fruit constitute a somewhat erratic supply. They are very perishable and difficult to transport. In addition, fish is inconvenient

to prepare and there is with it considerable waste. As a source of protein and fat readily distributed, constant in supply with little waste, readily prepared and available in as nearly as possible the fresh natural state, flesh is undoubtedly superior to fish.

9. Although the quantities of the various food factors and accessory factors present in Japanese foods in their natural state may be judged adequate for the needs of the present population, there is not any superfluity. Any artificial interference with the food leads to a loss of one or more of these factors or accessory factors, with the result that it may readily happen that the food supply no longer suffices in quality for the needs of the population, although in quantity it may appear adequate.

The consumption of quantity without quality is in some respects more dangerous than starvation, for the latter is obvious and a remedy is sought; the former may remain a hidden source of evil, gradually reducing the vitality of the people. This appears the great danger in Japan. The polishing of rice, the milling of other cereals and the manufacture of various products such as *fu*, *kingyobu*, *somen*, *hoshiudon*, prepared from cereals for the sake of increasing the concentration of protein, the manufacture from soy bean of *tofu*, *miso*, *kinako*, *akamiso* and other bean products for the same reason, lead to a loss of valuable factors and especially accessory factors or vitamins. The same remarks apply to the practice of salting and drying fish and the manufacture of fish products, the canning of fish and fruit, the sterilising of milk and the use of milk powder and condensed milk, the salting and pickling of vegetables and fruits, practices all too common in Japan.

10. As a result of artificial interference with the natural food supply of Japan, it would appear that, calculated in terms of solid edible material, 90 per cent of food has been deprived partially or wholly of its vitamins before it reaches the consumer.

11. The most important points, therefore, to which attention must be paid in regard to improving the quality of Japanese food are :

- (i) To lower the fuel ratio or, in other words, to raise the proportion of protein to carbohydrate till it becomes 1 : 4 or not less than 1 : 5;
- (ii) To avoid loss of accessory factors, by diminishing artificial interference with food material.

12. Since rice is responsible for most of the faults alluded to, benefit may be expected to follow the replacement of rice by cereals richer in protein, by supplementing the protein of cereals by the use of animal food, which would also add to the supply of accessory factors requisite for growth.

It is of interest to note that, in the year 1925, rice in Japan was twice the price of wheat and three times the price of barley, and therefore, since rice contains only half the protein which is contained in the same weight of either of these other cereals, the protein of rice was four times as costly as the protein of wheat and six times as costly as the protein of barley.

Chapter III.

THE DISTRIBUTION OF FOOD IN JAPAN

Distribution has two aspects, natural and artificial, and with each we have to consider both quantity and quality.

NATURAL DISTRIBUTION.

In natural distribution of food, quantity and quality for the most part go hand in hand, for where the soil is fertile and yields an abundant harvest, it is not likely that there will be a deficiency of any factor or accessory food factor essential to human life. Nevertheless, even this conclusion must be accepted with reserve, for, just as plants may languish in one region and soil, so also may human beings when continually living on food material produced from the same locality, and may improve on a more varied diet. It is thus obvious that if only one type of plant were cultivated in a district, even if it were a cereal of high quality, the quantity of the harvest might be an inaccurate estimate of its sufficiency for the needs of the population, and for this reason we may view the necessity of rotation of crops as a providential measure to ensure vitality not only to plant but also to animal and human life. In Japan, where agriculture is of such an intensive type as sometimes to produce as many as three harvests in the one year, it is hardly to be thought that all the essential factors are not gathered from the soil, but there is one point of view which may perhaps sometimes escape notice, namely, that only a part of the materials harvested from the soil is actually utilised.

Far from utilising the whole of the plant, we seldom use even one-half of it, and often a mere fraction of it. How much of the rice-plant is employed as food and how much goes into ropes, sandals, baskets, brooms, mats and manure? The grain alone is selected for use and much even of this is wasted by polishing.

The seed of the plant is certainly the only part of the plant which can be considered a living unit, capable of life itself and comparable to a part of an animal in a certain sense, but it would be untrue to say that the seed contains all the factors necessary for life, for this is very far from being the case. A seed will live, but only in contact with a solution of salts. The grain of rice is devoid of soluble salts. It cannot, therefore, manifest life. During the germination of the seed changes occur, such

as the production of vitamin C. Whether vitamin C is produced in our bodies when we eat the grain, we do not know. Free vitamin C, however, may not be essential for life. Rats appear to dispense with it. It is clear, however, that no grain is complete food for man, still less when milled or polished.

These remarks, however, extend into the subject of artificial distribution, which will be considered later.

The natural distribution of cereal foods in Japan may be seen from Tables II and 12, and from the diagrams. No. 5 is for rice, No. 6 for barley and No. 7 for naked barley. Other cereals are not of great importance in Japan. The natural distribution of soy bean is shown in Diagram 8.

In constructing these diagrams, the data published by the Ministry of Agriculture, Forestry and Fisheries have been employed. In the diagrams published by the Agricultural Department, the shading indicates the production in the district independent of any consideration as to its area. It has seemed to the writer, however, that it would be more instructive to construct the diagrams in such a manner as to bring out the relative productivity of the districts; which result is achieved by the plan herein adopted. The production of each district has been divided by the area and the result so obtained used as a basis in deciding upon the depth of shade necessary to represent the productivity of the region.







Table 11. — THE PRODUCTION OF RICE IN THE VARIOUS PROVINCES OF JAPAN.

	Name of Province	Area of Province : 100 square kilometers	Total Production : 100's of hectolitres	Production in hectolitres per square kilometer of Province
1	Hokkaido	923.40	38,369	41.551
2	Aomori	98.09	20,510	209.093
3	Iwate	160.24	20,709	129.237
4	Miani	74.50	31,117	417.677
5	Akita	113.21	36,818	325.219
6	Yamagata	92.80	38,135	414.150
7	Fukushima	138.04	30,035	217.582
8	Ibaraki	61.39	34,906	568.594
9	Tochigi	65.70	25,579	389.330
10	Gumma	60.77	12,700	208.984
11	Saitama	38.40	22,928	597.083
12	Chiba	50.13	36,313	724.376
13	Tokyo	21.28	5,592	262.782
14	Kanagawa	23.14	8,478	366.379
15	Niigata	127.71	58,086	454.827
16	Toyama	39.95	29,783	745.597
17	Ishikawa	41.95	21,052	501.835
18	Fukui	39.64	18,093	456.432
19	Yamanishi	45.81	7,739	168.937
20	Nagano	135.57	26,734	197.197
21	Gifu	108.89	21,376	196.308
22	Shidzuoka	76.35	21,881	286.588
23	Aichi	49.20	31,767	645.670
24	Miye	54.14	21,827	403.158
25	Shiga	34.86	26,066	747.734
26	Kyoto	45.19	14,485	320.535
27	Osaka	18.51	20,312	109.735
28	Hiogo	82.67	42,284	511.479
29	Nara	39.79	12,988	326.414
30	Wakayama	45.04	11,816	262.345
31	Tottori	35.32	11,311	320.243
32	Shimane	67.40	17,318	256.944
33	Okayama	68.63	30,757	448.157
34	Hiroshima	84.21	23,072	273.982
35	Yamaguchi	60.15	24,984	415.362
36	Tokushima	41.49	10,228	246.517
37	Kagawa	17.12	16,235	948.306
38	Ehime	55.83	17,678	316.640
39	Kochi	74.80	12,573	168.088
40	Fukuoka	49.97	42,410	848.709
41	Saga	24.21	21,972	907.559
42	Nagasaki	39.18	9,471	241.730
43	Kumamoto	74.65	30,197	404.514
44	Oita	64.47	19,067	295.750
45	Miazaiki	77.89	17,227	221.171
46	Kagoshima	91.31	22,910	250.904
47	Okinawa	22.21	1,245	56.056

Diagram 5.

THE PRODUCTION OF RICE IN THE VARIOUS REGIONS OF JAPAN.

Hectolites per Hectare or per
Hectolites per square Hectare

	None or Less than 50
	More or Greater than 100
	250
	350
	550
	800

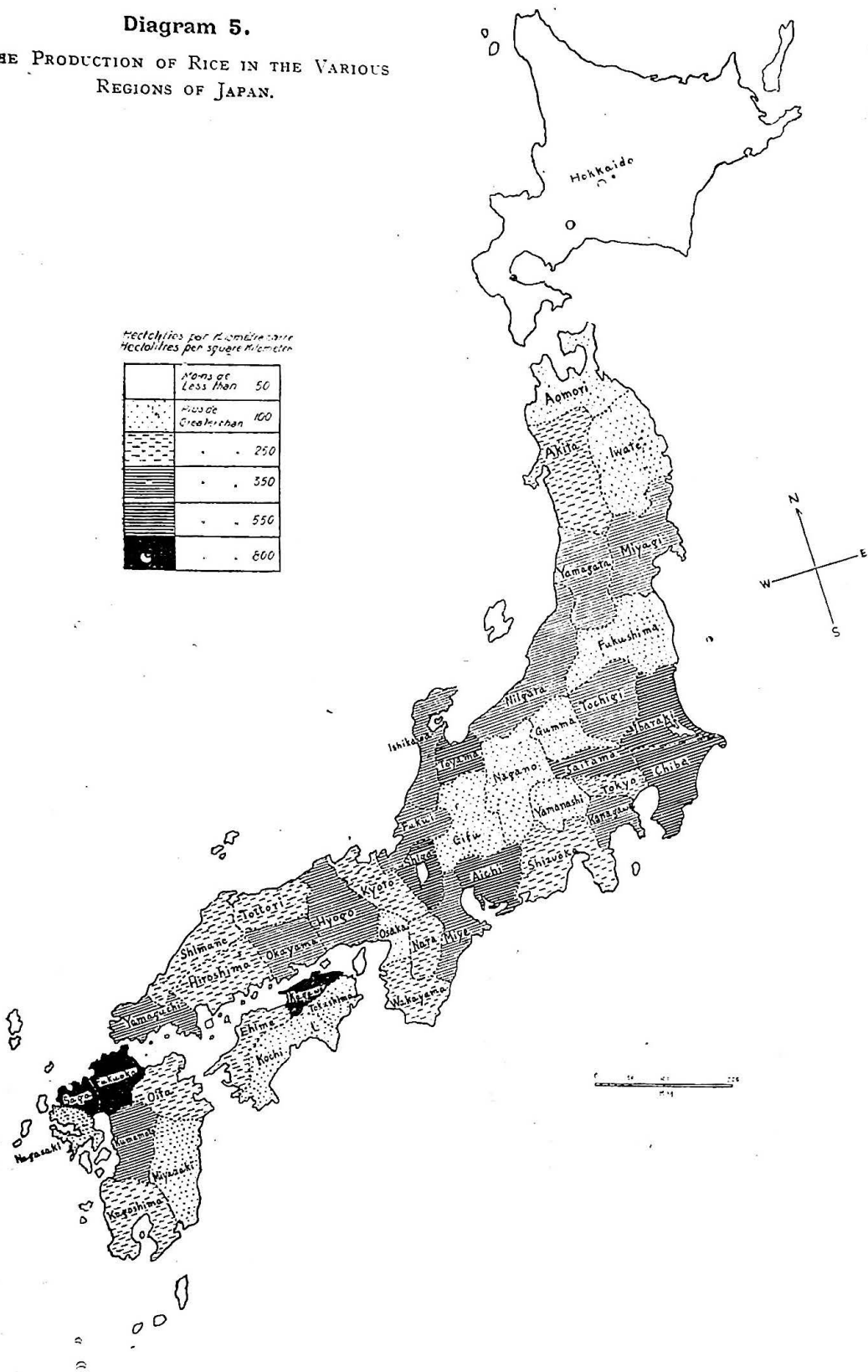


Table 12. — THE PRODUCTION OF BARLEY, NAKED BARLEY AND SOY BEAN IN THE VARIOUS PROVINCES OF JAPAN

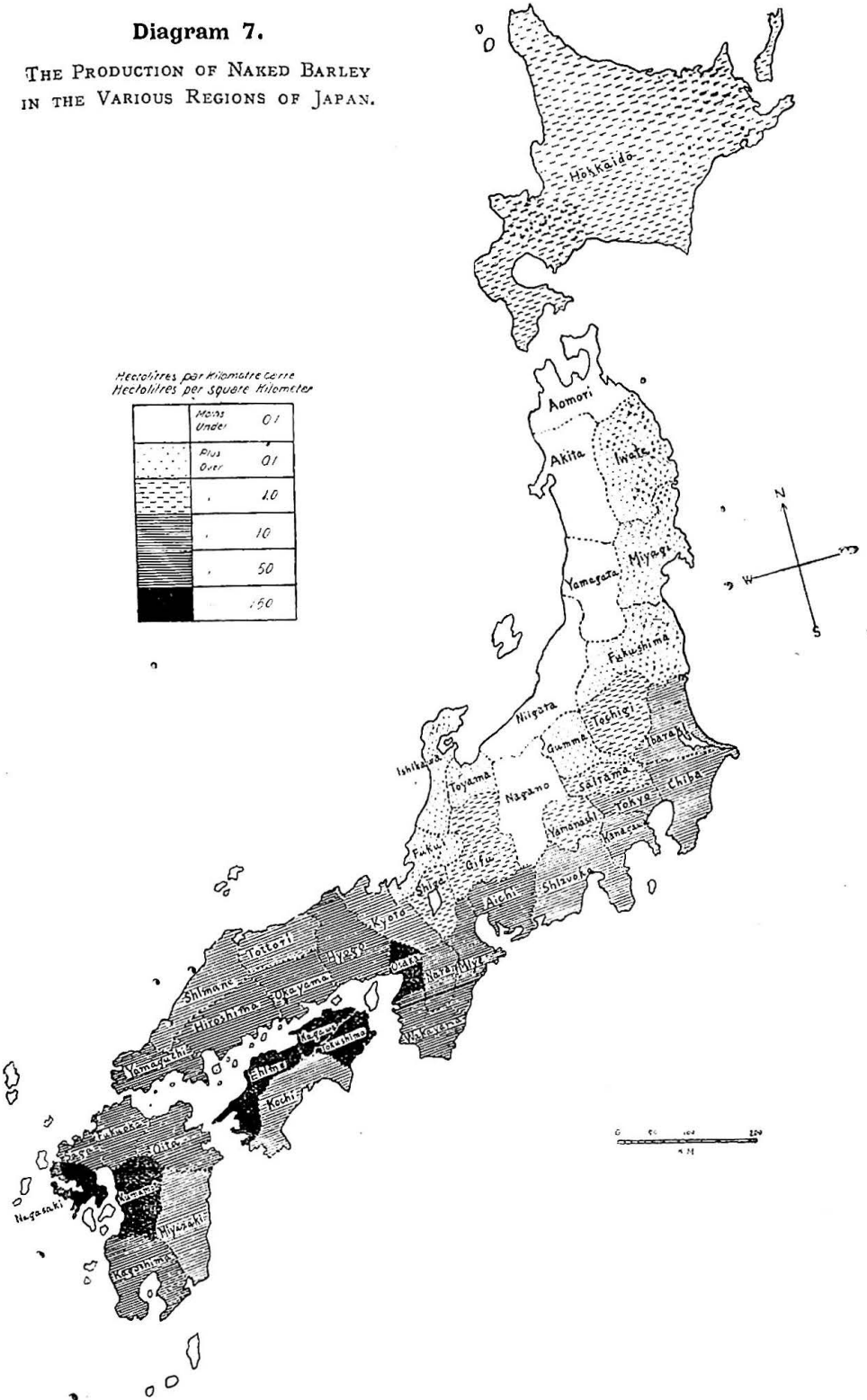
No.	Name of Province	Total Production of the Province : 100's of hectolitres			Production in hectolitres per square kilometre of Province			No.
		Barley	Naked Barley	Soy Bean	Barley	Naked Barley	Soy Bean	
1	Hokkaido	774	3,122.56	12,143.92	0.838	3.382	15.151	1
2	Aomori	48	—	2,458.73	4.893	—	25.066	2
3	Iwate	7,795	135.29	6,194.63	48.645	0.844	38.658	3
4	Miagi	8,859	23.45	2,833.94	118.910	0.315	38.039	4
5	Akita	43	1.80	1,333.09	0.380	0.016	11.775	5
6	Yamagata	446	—	1,244.70	4.844	—	13.517	6
7	Fukushima	5,704	32.47	2,101.56	41.321	0.235	15.224	7
8	Ibaraki	16,131	1,194.18	3,456.29	262.760	19.452	56.300	8
9	Tochigi	9,792	362.58	867.68	149.040	5.519	13.207	9
10	Gumma	9,909	19.84	995.76	163.050	0.327	16.385	10
11	Saitama	17,693	220.07	2,954.80	460.750	5.731	76.947	11
12	Chiba	12,629	775.68	2,346.89	251.920	15.473	46.816	12
13	Tokyo	5,110	294.03	129.88	240.350	13.817	6.103	13
14	Kanagawa	5,859	566.43	414.90	253.190	24.478	17.930	14
15	Niigata	1,052	1.80	2,446.10	8.237	0.014	19.154	15
16	Toyama	235	25.25	541.00	5.882	0.632	13.542	16
17	Ishikawa	1,066	10.82	784.70	23.980	0.258	18.706	17
18	Fukui	855	21.64	550.19	21.569	0.546	13.870	18
19	Yamanashi	4,264	64.94	411.29	93.080	1.418	8.978	19
20	Nagano	4,991	10.82	2,229.63	36.814	0.070	16.446	20
21	Gifu	4,907	849.64	553.80	45.063	7.803	5.086	21
22	Shidzuoka	5,791	2,029.39	351.76	75.848	26.580	4.607	22
23	Aichi	6,213	2,758.17	377.02	126.280	56.060	7.663	23
24	Miye	1,638	3,575.35	250.74	30.253	66.038	4.631	24
25	Shiga	1,728	306.66	391.45	49.569	8.797	11.229	25
26	Kyoto	2,002	1,318.66	211.06	44.301	29.180	4.671	26
27	Osaka	1,043	3,416.61	211.06	56.347	184.581	11.403	27
28	Hiogo	1,652	9,270.29	777.49	19.983	112.140	9.402	28
29	Nara	126	2,949.39	256.16	3.165	7.134	6.438	29
30	Wakayama	—	2,880.84	158.74	—	63.961	3.524	30
31	Tottori	1,092	981.32	202.04	30.889	27.783	5.720	31
32	Shimane	1,811	698.11	519.53	26.869	10.357	7.708	32
33	Okayama	3,124	6,034.08	692.70	45.519	87.921	10.093	33
34	Hiroshima	1,797	9,466.92	519.53	21.339	112.420	6.169	34
35	Yamaguchi	1,658	5,583.10	505.09	27.564	92.819	8.397	35
36	Tokushima	204	7,240.89	389.64	4.916	174.521	9.391	36
37	Kagawa	9	9,172.88	277.80	0.526	535.580	16.226	37
38	Ehime	157	9,672.57	553.80	2.812	173.250	9.919	38
39	Kochi	135	1,933.79	138.90	1.805	25.852	1.857	39
40	Fukuoka	1,167	7,424.89	591.68	23.354	148.586	11.840	40
41	Saga	424	2,651.74	627.76	17.520	109.530	25.929	41
42	Nagasaki	994	8,025.60	2,103.36	25.370	204.839	53.684	42
43	Kumamoto	1,003	11,929.26	2,732.92	13.436	159.802	36.609	43
44	Oita	462	7,819.95	631.37	7.166	121.295	9.793	44
45	Miazaki	511	3,564.53	1,230.27	6.561	45.763	15.794	45
46	Kagoshima	1,167	5,684.12	2,873.63	12.780	62.250	31.471	46
47	Okinawa	76	32.47	514.11	3.423	1.462	23.147	47

Diagram 7.

THE PRODUCTION OF NAKED BARLEY
IN THE VARIOUS REGIONS OF JAPAN.

Hectolitres par kilomètre carré
Hectolitres per square kilometer

	Moins	0.1
	Under	0.1
	Plus	0.1
	Over	0.1
		1.0
		1.0
		5.0
		5.0
		15.0
		15.0



ARTIFICIAL DISTRIBUTION

If we consider the distribution of food in Japan from the point of view of mere quantity, the problem offers no serious difficulties, for the greatest distance of any district from the sea does not exceed 100 miles and the railway communications are well developed. The distribution of quality, however, is another matter. For it has been noted in Chapter II that the food supply of Japan is at a certain disadvantage in three respects : there is a lack of protein, or, more strictly speaking, the protein in the chief food is too much diluted by non-protein material. There is also a lack of mineral salts, and it has been further noted that the sources most helpful in making good the deficiencies are fruit, green vegetables and fish. But it is precisely these materials which are so essential which happen to be the most perishable and, in consequence, although the supply of these materials may be theoretically adequate for the country considered as a whole, the difficulty in distribution may lead to an inadequate supply in certain parts of the country. Thus, the towns, being near the sea, may receive sufficient fish but insufficient fruit, and conversely with the districts inland. The consequences are, as might be expected, that the town-dwellers suffer from lack of vitamin B and those in the country from lack of vitamin A. It must be realised that the distribution to the country of salted and dried fish, and, likewise, the consumption in the town of salted, pickled, preserved and tinned fruits and vegetables is not equivalent to the distribution of the same foodstuffs in the state in which nature has provided them. There is a tendency, moreover, in the towns to redistribute the quality of the food materials owing to the various factory methods employed. Economic causes also accentuate the inequality in the distribution of food quality. Food is sometimes kept in the towns for long periods, to the detriment of its vitamin content, and often, for the sake of so-called preservation, it is subjected to various forms of well-meant interference, which still further rob it of its power to confer vitality on the people. It is partly for this reason that country people, however poor, apparently are never so poor in reality as the poorest dwellers in the towns.

The facts above mentioned appear somewhat strikingly if we represent them diagrammatically.

In Chapter II we have Diagrams 2, 3 and 4, representing the relative proportions of various foodstuffs available for consumption in Japan. If, therefore, the distribution of both quantity and quality throughout the country were equal, these diagrams would give a picture of the diet of the people. But, as the food materials differ so much in their qualities, it is possible that the actual distribution of food values is far different from what might be imagined.

It would, however, be a simple matter to construct " quality " diagrams in a manner analogous to that employed in constructing the " quantity " diagrams, the vertical heights corresponding to some quality such as protein or vitamin.

In such food diagrams, the total available food value or virtue would be clearly represented by the sum of the areas, each of which separately represents quantitatively the food value of a particular food.

If now, with such diagrams, we consider the consumption of food by the population, we observe that there are three ways in which this may happen. The consumption may take place in a manner which would be indicated by drawing a series of parallel lines horizontally on the diagram; such lines would represent a consumption on a basis of quantity, the first food to be consumed being that in greatest quantity and the last that in least quantity, and, although the least might be the best, no one would be deprived of some share of it. Or the consumption might be represented by a parallel set of lines drawn vertically on the diagram and commencing at the extreme right. Such lines would indicate a consumption of food on a basis of quality. The food of greatest quality would be the first and that of least quality the last to be consumed. Clearly, in this latter case, it is possible and, in fact, almost certain that some part of the population will be deprived of the best food. Some will be obliged to subsist on the coarsest food only. Between these two extremes any number of ways of dividing up the food may be conceived, which would be represented by lines drawn obliquely across the diagram. The actual course of the consumption will therefore be represented by a series of lines gradually more oblique to the base line, each representing the consumption of a certain class of society — those most capable of helping themselves working in a direction of consuming quality, those least able in the direction of quantity; others, between these extremes.

Knowing, therefore, that the best food materials will be the first consumed, we should be able from the statistics to construct diagrams by means of which to calculate how far any particular food material will go in its distribution among the population. Such a method would tell us much concerning the diet of the different sections of the community.

CONCLUSIONS.

1. The present natural distribution of foodstuffs in Japan shows that the northern island, Hokkaido, is but poorly cultivated, so that here there are considerable possibilities of increasing the food supply.

2. The northern and western regions of the main island yield poorer harvests per unit of surface than the southern and eastern regions or than the southern island of Kiushu.

3. The artificial distribution of quantity offers no difficulty, since no region in Japan proper is distant more than 100 miles from the sea, and land communications are good.

4. The artificial distribution of quality may offer difficulties owing to the perishable character of the sources of certain factors, and particularly accessory factors, and owing to the localised production of such factors. As a result, there is a lack of vitamin A in the rural districts and of vitamin B in the urban districts.

5. Owing to the poor supply of certain factors, such as protein, fat, phosphorus, alkaline salts, and also accessory factors (vitamins), the effects of unequal distribution of quality in food would be felt more acutely in Japan than in most other countries.

Chapter IV.

THE COMPOSITION OF JAPANESE FOODS AS CONSUMED

INTRODUCTORY REMARKS.

Various factors affect the composition of food materials, amongst which may be mentioned the soil, method of cultivation, climate, method of storage and any treatment to which the material may be subjected at the farm or in the factory, such as sterilising or pasteurising, treatment by preservatives, adulteration, milling, grading, refining, desiccating, and other mechanical processes, as well as any conditions which may lead to fermentation, putrefaction and so forth. Added to this are the changes which are consequent upon the treatment of the food material in the home, as in the preparation and cooking. All of these factors the student of nutrition will take into consideration in conjunction with the use of a dictionary of food. There are, moreover, other considerations, such as the appearance, odour, taste, consistency, specific gravity, melting point, solubility and enzymes, which must not be forgotten, owing to their importance in relation to digestion. Last, but not least, are the vitamins, or accessory food factors, about which we know very little, and doubtless other factors accessory to these about which at present we know nothing. It may be said that such accessory factors or vitamins, present in minute amount, make all the difference between true foods and what may be called food materials. A dictionary of food materials, therefore, must be used to supplement, not to replace, a sound practical empirical knowledge of food values.

CLASSIFICATION.

The following is the arrangement adopted in this chapter :

1. *Plant Food Products.*

- I. Cereals and Cereal Products.
- II. Legumes, Pulses and Legume Products.
- III. Roots, Greens and other Vegetables.
- IV. Mushrooms and Seaweeds.
- V. Fruits, Soft Fruits, Nuts and Dried Fruits.
- VI. Vegetable Oils.
- VII. Other Vegetable Products.

2. *Animal Food Materials.*

- VIII. Dairy Products.
- IX. Eggs.
- X. Meat and Animal Fat.
- XI. Fish : Sea Fish, River Fish, Fish Eggs, Crustacea, Coelenterata, Polyyps, Molluscs.

3. *Condiments, Beverages, etc.*

XII. *Condiments, Beverages, etc.*

ARRANGEMENT OF ANALYTICAL RESULTS.

In this chapter, the results refer to the analysis of the edible portion of the food material and are expressed as percentages of the fresh food. In Chapter V the results refer to the whole material as purchased.

METHODS OF ANALYSIS.

Certain modifications deserve mention.

Sampling. — With but few exceptions, at least a kilogram of material has served as the starting-point in the analysis, the whole of a plant or small animal (fish) or several such being employed where possible. After removal of waste, the edible portion has been dried at a temperature ranging from 100° to 110° C., and then passed through a mill until reduced to a fine powder. This procedure is applicable to most materials of plant or animal origin.

Two exceptions are when either an excess of fat or sugar is present. In the former case, the greater part of the fat is allowed to drain from the food material while it is drying in the oven, by using a funnel with perforated partition; the residue is washed once or twice with ether or petroleum ether and may then, after drying from the solvent, be passed through the mill in the usual way. In the case of fruit with an excess of sugar, which would cause charring in the oven and a sticky residue difficult to operate, the procedure adopted is to carry out upon the original material such analyses as are not conveniently carried out after drying; as, for, example, the estimation of fibre. For this purpose, a quantity of, say, 50 grams may be conveniently employed for each analysis.

In by far the majority of cases, however, the general method described above will be found applicable without any modification.

The general procedure here recommended is most convenient as a preliminary to the analytical work. It ensures even sampling and yields a material in compact form suitable for all the subsequent analytical operations, and which may be preserved indefinitely.

Total Moisture. — The main portion of the water having been driven off in the process of preparing the material for analysis, it remains to determine the residual moisture in the part-dried sample and to calculate this to the original material. An example will illustrate the method :

	Per cent
1,000 grams of leaves of Japanese radish (daikon) gave, on preliminary drying, 72 grams solid matter. Preliminary moisture	= 92.8
• Residual moisture determined on the part-dried material after thorough mixing of sample was	= 8.6
Extra moisture to be added to preliminary moisture is therefore 8.6×0.072	= 0.62
Total moisture $92.8 + 0.62$	= 93.42

Total Nitrogen and Protein. — The usual modification of Kjeldahl's method has been used and the value for nitrogen multiplied by 6.25 to obtain the figure for protein. For practical purposes this is sufficient, though in certain cases the factor is not quite correct.

Water-Soluble Nitrogen and Protein. — This has been determined in the case of meat and fish, in order to give an indication of the suitability of the material for the preparation of soup, and as a measure of digestibility. One gram of the powdered material has been extracted with boiling water, and the nitrogen determined by Kjeldahl's method as above. This value is multiplied by 6.25 to obtain the figure for water-soluble protein. It represents, therefore, gelatine, proteose, albumose, peptone and any products of protein as well as nitrogen of extractives. In the case of fish, the water extract contains about 30 per cent of the total nitrogen. Though not corresponding entirely to water-soluble protein, it is a figure of practical value.

Fat. — The figures given represent crude fat as obtained by extraction in a Soxhlet apparatus with ethyl ether. The material, being already sufficiently dried by the process of preparation described above, is in a suitable state for ether extraction. From 2 to 5 grams have been employed according to the nature of the material, and in all cases the extraction has been carried out for not less than twenty-four hours.

Fibre. — The objectionable frothing accompanying the boiling with acid or alkali in the method as usually described may be entirely avoided by placing the flasks in an oven at about 110° C. For filtering the acid solution, a stout cloth filter is convenient, since it may subsequently be shaped in such a way as to permit of the washing of the residue back into the flask with a minimum of water. But for the alkali filtration, owing to the swelling of the cloth fibres, it is more convenient to employ a thin, lightly woven cloth. In other respects, the method is that usually described.

• *Total Phosphorus.* — This has been estimated by Neumann's method.

Ash. — The following method of determining the ash will be found to possess many advantages. About 3 or 4 grams of the material is used to estimate the residual moisture and then charred in a platinum dish until

fumes cease to be evolved. The mass is extracted with boiling water and turned upon a filter paper, the filtrate being conveniently collected in the dish employed previously for the moisture determination. The filtrate is evaporated on the water bath dried at 110° C. and weighed as water-soluble ash. The charcoal in the filter paper is now dried in the oven and transferred to a small shallow platinum capsule. Such a capsule may be made with less than 4 grams of platinum. Several such capsules are introduced into a muffle furnace and heated till the ash is white or coloured only by mineral matter. The heating requires only two or three hours, and often less. This portion represents the water-insoluble ash. By this method the ash is rarely found to melt and is therefore readily removed. By removing water-soluble matter prior to employing a high temperature, the loss of volatile materials is entirely prevented. The separation of the soluble and insoluble portions of the ash makes possible several determinations which are of value and are described later.

P. N. BERNARD and A. LAMBERT¹ describe a method based upon the same principle as regards the use of the muffle furnace, but they do not keep separate the two portions of the ash, possibly because they are dealing only with rice, where the soluble ash is insignificant. As a general method, however, that here described has great advantages, for the two parts of the ash may be separately titrated to obtain the alkalinity due to potash and soda and lime and magnesia.

On the water-soluble ash the chlorides may be estimated directly by silver nitrate, using potassium chromate as indicator, after neutralisation by sulphuric acid in the process of determining the alkalinity due to soda and potash.

Alkalinity of the Ash. — This figure is of considerable importance as indicating the capacity of the food material to produce alkali in the body. The water-soluble alkalinity has been estimated by titrating the water-soluble ash with $N/10$ H_2SO_4 , with methyl orange as indicator. This does not interfere with the subsequent estimation of the chlorides by silver nitrate. The alkalinity due to carbonates of calcium and magnesium is determined by titration with $N/10$ HCl , after which the solution is evaporated and treated with concentrated HCl to dissolve any oxide of iron, the treatment being repeated until the insoluble residue is free from any brown colour. The solution is then made up to a definite volume and a portion used for the estimation of calcium, and another for the estimation of iron.

Calcium. — A portion of the hydrochloric acid solution of the insoluble ash, prepared as in the preceding paragraph, is neutralised with a few drops of a concentrated solution of sodium hydroxide, a drop of phenol phthalein being added as indicator; the solution is then reacidified by the addition of a few drops of glacial acetic acid, after which it is

¹ *Trans. Sixth Congress Far Eastern Assoc. Trop. Med.* (1925), page 133.

brought to the boil and, while boiling, a solution of sodium or ammonium oxalate added gradually from a pipette, enough being added to precipitate all the calcium as calcium oxalate. When precipitated at the boiling point, the precipitate, however small, is crystalline and can thus be easily filtered and washed in the Gooch crucible. The precipitate of calcium oxalate, together with the asbestos, is removed from the Gooch crucible to a beaker, treated with a few drops of concentrated sulphuric acid and titrated with N/20 potassium permanganate solution, for which purpose, when dealing with small quantities of lime, as in the case of rice and other cereals, a microburette is of great advantage.

1 c.c. N/20 K_2MnO_4 solution is equivalent to 0.0014 gram CaO .

Iron. — A second portion of the fluid prepared as above is used to determine the iron iodometrically. This method is liable to give very faulty results unless carried out in a consistent manner, with attention to details. The following are the conditions which the writer has found the most convenient.

To 50 c.c. of the solution containing iron prepared as described above, and therefore containing 0.5 c.c. conc. HCl, is added 5 c.c. of a 20 per cent solution of potassium iodide, the solutions being mixed in a well-stoppered bottle. The exclusion of all air by a stream of carbon dioxide, as recommended by WOLTER, is not necessary, but a blank experiment should be made as control for the reagents, 0.1 c.c. of thiosulphate being usually required for the control. After standing about thirty minutes, the solution is titrated by thiosulphate solution N/200, which has been standardised by potassium dichromate, or by other suitable method, starch being added as indicator.

1 c.c. N/200 sodium thiosulphate is equivalent to 0.00028 gram Fe. Usually, after standing a few minutes, the blue colour of the iodide of starch returns and more thiosulphate must be added. After discharging this colour, however, once or even several times during the first half-hour from the beginning of the titration, the solution should remain colourless for at least half an hour. Subsequently the colour will reappear, but is ignored. It is advisable to check the accuracy of the conditions by employing a standard solution of ferric sulphate, which may be readily obtained by oxidising ferrous sulphate after previous standardisation by potassium dichromate or permanganate. The operation, as described above, is carried out at room temperature, the heating recommended by some being unnecessary.

Digestible Carbohydrate. — This is given by the difference between total solid matter and the sum of the constituents estimated, *i.e.*, protein, fat, fibre and ash.

Calorific Value. — This is given by the sum of the percentages of protein and carbohydrate multiplied by 4.1 plus the percentage of fat multiplied by 9.3, the result being large calories per 100 grams of food material.

THE CHEMICAL COMPOSITION OF

I. CEREALS AND

Numéros	Céréale et District de provenance	Eau — Water	Protéine Protein N x 6.25	Graisse — Fat	Hydrate de carbone Carbohydrate	Fibre	Cendres — Ash	Calories	Teneur en alcali Alkalivalue	Total de l'azote Total nitrogen
Riz non glacé.										
1	Hokkaido	14.9	9.0	1.64	72.7	0.84	1.00	346	0.5	1.444
2	Hokkaido	14.2	8.1	1.92	74.0	0.75	1.10	354	2.0	1.297
3	Aomori	12.4	8.7	2.12	75.6	0.59	1.10	363	0.5	1.390
4	Akita	13.2	6.3	2.38	75.2	1.13	1.60	356	—	0.960
5	Toyama	12.3	7.9	2.20	75.7	0.76	1.17	362	0.5	1.257
6	Kanagawa	12.7	8.3	2.20	74.9	0.81	1.20	361	0.2	1.324
7	Gifu	13.4	8.7	2.66	73.1	0.54	1.62	360	—	1.392
8	Osaka	12.7	6.7	2.00	76.6	0.90	1.13	360	2.3	1.404
9	Ehime	13.4	7.6	2.26	74.8	0.84	1.12	359	—	1.200
10	Ehime	13.6	7.6	2.20	74.4	0.93	1.36	356	—	1.200
11	Kagoshima	12.5	7.7	1.88	76.0	0.95	0.93	361	2.9	1.230
Riz glacé.¹										
12	Hokkaido	13.8	7.2	0.24	77.7	0.20	0.87	350	4.0	1.150
13	Kokkaido	13.2	7.1	0.34	78.2	0.20	0.97	353	2.0	1.136
14	Aomori	12.6	8.0	0.14	78.3	0.20	0.80	355	1.0	1.284
15	Akita	13.0	6.5	0.86	78.1	0.40	0.84	355	—	1.040
16	Toyama	12.6	6.4	0.16	79.9	0.24	0.70	355	0.2	1.029
17	Kanagawa	13.7	8.8	0.14	76.5	0.24	0.63	351	0.2	1.070
18	Gifu	12.8	8.7	0.36	77.1	0.30	0.74	355	—	1.392
19	Osaka	13.2	6.5	0.26	78.3	0.30	1.37 ²	350	—	1.043
20	Ehime	12.8	6.5	0.64	79.1	0.32	0.62	351	—	1.040
21	Ehime	13.0	6.5	0.70	78.2	0.20	1.06	356	—	1.040
22	Kagoshima	12.6	6.6	0.32	78.9	0.48	1.07	354	—	1.056
23	Siamese (importé) . . .	12.0	7.4	1.17	78.1	0.39	0.51	362	—	1.185

¹ Le riz glacé n'a pas été lavé et conserve donc une partie de la poudre à glacer; voilà pourquoi sa teneur en chaux, en alcalins et en fer est plus élevée que celle du riz non glacé.

² Frelaté avec de la poudre à glacer.

³ Après le lavage, le riz glacé contient en moyenne 0,004 CaO et 0,0015 Fe₂O₃ pour cent. Par suite de la présence de la poudre à glacer, les chiffres indiquant la teneur du riz glacé en chaux et en fer sont très variables avant le lavage et sans intérêt puisque ce riz est toujours utilisé après un lavage complet.

JAPANESE FOODS AS CONSUMED

CEREAL PRODUCTS

P ₂ O ₅	NaCl	Cendres — Ash		Alcalinité due à Alkalinity due to		Ca O	Fe ₂ O ₃	Facteur de conversion en denrée alimentaire sèche Factor converting to dry food	Name of Cereal and District from which Cereal has come	No.
		Solubles dans l'eau Water-soluble	Insolubles dans l'eau Water- insoluble	la soude et à la potasse soda and potash	la chaux et à la magnésie lime and magnesia					
0.705	néant nil	néant nil	1.00	néant nil	0.5	0.0056	Moyenne 0.002 Average	1.175	Rice (Unpolished).	
0.703	»	»	1.10	»	2.0	0.0053		1.166	Hokkaido	1
—	»	»	1.10	»	0.5	0.0053		1.142	Hokkaido	2
0.860	»	»	1.60	»	—	0.0042		1.152	Aomori	3
0.788	»	»	1.17	»	0.5	0.0100		1.143	Akita	4
—	»	»	1.20	»	0.2	0.0046		1.144	Toyama	5
0.873	»	»	1.62	»	—	0.0042		1.154	Kanagawa	6
0.797	»	»	1.13	»	2.3	0.0053		1.145	Gifu	7
0.732	»	»	1.12	»	—	0.0056		1.145	Osaka	8
0.851	»	»	1.36	»	—	0.0030		1.154	Ehime	9
0.788	»	»	0.93	»	2.9	0.0045		1.156	Ehime	10
							1.143	Kagoshima	11	
									Rice (Polished) ¹ .	
0.439	»	»	0.87	»	4.0	0.0200	Voir la note ³ du bas de la page See foot- note ³	1.158	Hokkaido	12
0.479	»	»	0.97	»	2.0	0.0262		1.152	Hokkaido	13
0.581	»	»	0.80	»	1.0	0.0051		1.144	Aomori	14
—	»	»	0.84	»	—	0.023		1.149	Akita	15
0.460	»	»	0.70	»	0.2	0.047		1.149	Toyama	16
0.479	»	»	0.63	»	0.2	0.047		1.157	Kanagawa	17
0.371	»	»	0.74	»	—	0.036		1.147	Gifu	18
0.386	»	»	1.37	»	—	0.5341		1.152	Osaka	19
0.316	»	»	0.62	»	—	0.045		1.147	Ehime	20
0.334	»	»	1.06	»	—	—		1.149	Ehime	21
0.433	»	»	1.07	»	0.5	0.045		1.144	Kagoshima	22
0.334	»	»	0.51	»	—	0.047	1.136	Siamese (imported)	23	

¹ The polished rice has not been washed and retains, therefore, some polishing powder; hence the values for lime and alkalinity and iron are greater than for unpolished rice.

² Adulterated with whitening powder.

³ After washing, polished rice contains an average of 0.004 CaO and 0.0015 Fe₂O₃ percent. Owing to the presence of polishing powder: the figures for lime and iron in polished rice before washing are very variable and of no significance, since the material is always used after thorough washing.

I. CEREALS AND

Numéros	Céréale et District de provenance	Eau — Water	Protéine Protein N x 6.25	Graisse — Fat	Hydrate de carbone Carbohydrate	Fibre	Cendres — Ash	Calories	Teneur en alcali Alkali value	Total de l'azote Total nitrogen
Riz glutineux ou Riz mochi.										
24	Kanagawa { Non glacé.	11.4	10.2	2.36	74.1	0.40	1.48	367	—	1.584
25		10.8	9.9	1.06	76.6	0.66	0.86	365	—	1.625
Froment.										
26	Hokkaido	12.5	12.9	1.63	71.1	1.6	1.33	359	3.7	2.056
27	Aomori	12.8	10.3	2.08	72.3	1.2	1.33	357	3.8	1.636
28	Kanagawa	11.0	13.5	2.48	70.1	1.62	1.30	365	3.5	2.160
29	Osaka	11.4	11.9	1.63	71.9	1.8	1.42	356	6.6	1.906
30	Kagawa	10.8	13.3	1.54	70.4	2.47	1.52	358	4.2	2.120
31	Oita	11.6	11.2	1.60	73.1	1.14	1.37	360	3.8	1.744
Orge non glacée.										
32	Hokkaido	12.0	14.2	1.86	68.2	1.62	2.12	355	4.0	2.295
33	Aomori	12.1	10.2	1.80	72.7	1.50	1.65	357	4.0	1.636
34	Near Tokyo	11.8	12.5	1.90	70.1	1.81	1.87	356	3.3	2.000
35	Osaka	12.5	9.9	2.05	71.9	1.80	1.83	351	3.6	1.576
36	Kagawa	12.2	10.0	2.16	71.4	1.91	2.40	354	4.6	1.592
37	Ehime	12.0	10.5	1.70	71.7	1.90	2.22	354	4.3	1.672
38	Kiushu	12.7	10.8	1.58	71.3	2.00	1.60	352	2.7	1.726
Orge glacée.										
39	Near Tokyo	11.8	8.4	1.82	74.7	1.60	1.72	358	4.0	1.320
Autres céréales.										
40	Soba (Sarrasin)	9.0	13.6	3.67	66.1	0.7	2.20	380	7.0	2.172
41	Tomorokoshi (Maïs)	14.1	8.4	4.00	71.7	0.7	1.08	366	5.0	1.351
42	Kibi (Millet)	12.2	11.4	4.82	65.6	4.1	1.88	361	—	1.808
43	Awa (Millet d'Italie)	11.0	11.5	2.36	73.0	1.2	0.90	368	—	1.800
44	Hije (Millet Sava)	12.4	9.7	3.10	68.5	4.5	1.82	349	—	1.552
45	Morokoshi (Grand Millet)	10.9	9.2	4.00	73.4	1.5	1.02	366	1.1	1.472

* Voir note * à la page précédente.

CEREAL PRODUCTS (continued).

P ₂ O ₅	NaCl	Cendres—Ash		Alcalinité due à Alkalinity due to		CaO	Fe O ₂	Facteur de conversion en denrée alimentaire sèche Factor converting to dry food	Name of Cereal and District from which Cereal has come	No.	
		Solubles dans l'eau Water-soluble	Insolubles dans l'eau Water-insoluble	la soude et à la potasse soda and potash	la chaux et à la magnésie lime and magnesia						
0.886	néant nil	néant nil	1.48	néant nil	—	0.047	1	1.130	Kanagawa district { Unpolished . Polished . . .	24	
0.426	»	»	0.86	»	—	0.142	1	1.121		25	
Wheat.											
1.190	»	»	1.33	»	3.7	0.047	Moyenne 0.0085 Average	1.142	Hokkaido	26	
1.143	»	»	1.33	»	3.8	0.084		1.147	Aomori	27	
0.742	»	»	1.30	»	3.5	—		1.123	Kanagawa	28	
1.170	»	»	1.43	»	6.6	trace	Moyenne 0.0045 Average	1.129	Osaka	29	
0.819	»	»	1.52	»	4.2	0.0560		1.121	Kagawa	30	
0.791	»	»	1.37	»	3.8	0.0336		1.132	Oita	31	
Barley (Unpolished).											
1.205	»	»	2.12	»	4.0	0.0470	Moyenne 0.0045 Average	1.136	Hokkaido	32	
1.112	»	»	1.65	»	4.0	0.0840		1.137	Aomori	33	
1.125	»	»	1.87	»	3.3	0.0480		1.134	Near Tokyo	34	
1.267	»	0.43	1.40	1.3	2.3	trace	Moyenne 0.0045 Average	1.142	Osaka	35	
1.127	»	néant nil	2.40	néant nil	4.6	0.0364		1.139	Kagawa	36	
1.400	»	»	2.22	»	4.3	0.0480		1.136	Ehime	37	
1.143	»	0.43	1.17	2.0	0.7	trace	Moyenne 0.0045 Average	1.145	Kiushiu	38	
Barley (Polished).											
0.947	»	néant nil	1.72	néant nil	4.0	0.0336		—	1.134	Near Tokyo	39
Other Cereals.											
1.206	»	»	2.20	»	7.0	0.050	—	1.099	Soba (Buckwheat)	40	
0.828	»	0.25	0.83	2.5	3.0	0.056	0.015	1.163	Tomorokoshi (Indian corn)	41	
0.797	»	néant nil	1.88	néant nil	—	0.008	—	1.139	Kibi (Millet)	42	
0.453	»	»	0.90	»	—	0.004	—	1.124	Awa (Italian millet) . . .	43	
0.856	»	»	1.82	»	—	0.017	—	1.141	Hije (Sawa millet)	44	
—	»	0.08	0.94	0.1	1.0	0.059	—	1.122	Morokoshi (Great millet) .	45	

¹ See note ² on previous page.

I. CEREALS AND

Numéros	Nom de la céréale	Eau — Water	Protéine Protein N X 6.25	Graisse—Fat	Hydrate de carbone Carbohydrate	Fibre	Condres—Ash	Calories	Teneur en alcali Alkali value	Total de l'azote Total nitrogen
Produits de céréales (secs)										
46	Kona (Farine de froment):									
	a) Marque { 1 ^{re} classe .	12.3	8.9	0.92	76.9	néant nil	1.00	360	2.5	1.426
	b) Také { 2 ^e classe .	12.0	11.2	1.25	73.9	»	1.55	361	3.0	1.786
	c) Marque Aigle (qualité supérieure)	12.5	11.6	0.70	73.8	»	1.40	357	3.5	1.861
	d) Marque Napoléon (qualité supérieure)	12.0	11.1	1.25	74.7	»	0.95	363	3.5	1.771
	e) Marque Yacht (1 ^{re} cl.)	12.5	12.9	0.95	73.0	»	0.66	361	2.0	2.056
	f) Marque Botan (2 ^e cl.)	12.5	14.7	1.75	69.9	»	1.10	363	2.0	2.357
	g) Marque Shime (3 ^e classe)	12.0	14.8	2.55	68.3	»	2.35	365	6.0	2.372
47	Hikiwari (Semoule d'orge)	13.8	10.4	1.40	72.7	trace	1.73	354	5.3	1.606
48	Oshimugi (Orge écrasée).	14.0	8.6	2.45	72.9	»	1.97	358	5.3	1.381
49	Sobako (Farine de sar- rasin)	9.0	7.1	1.08	80.8	0.38	0.56	375	2.5	1.136
50	Soba Mai (Mélange de farine de sarrasin et de farine de riz	11.0	10.0	2.77	72.5	0.50	3.16	364	9.0	1.591
51	Menzai (Riz)	12.8	11.5	7.10	63.3	1.33	3.95	373	8.5	1.840
52	Nuka (Son de riz)	12.2	12.5	18.20	35.3	9.2	12.60	365	22.3	2.005
53	Fu (Protéine de froment).	11.3	31.2	0.91	56.1	néant nil	0.50	367	1.0	4.992
54	Kingyobu (Protéine de froment)	11.0	52.4	1.30	33.9	»	1.40	366	3.0	8.384
55	Hoshiudon (Macaroni)	13.4	10.4	0.86	70.1	»	4.16	342	1.5	1.664
56	Somen (Macaroni)	14.2	10.6	0.79	68.1	»	6.34	330	5.0	1.696
Produits de céréales (non secs)										
57	Chikuwabu (Préparation de froment)	55.6	7.3	0.15	36.7	»	0.18	182	0.7	1.170
58	Mochi (préparation de riz pilé)	46.0	4.6	0.18	49.1	»	0.13	221	néant nil	0.740
59	Awa Mochi (Mochi fait avec du millet italien).	48.2	5.5	0.90	45.0	»	0.36	215	»	0.880

CEREAL PRODUCTS (continued).

P ₂ O ₅	Na Cl	Cendres — Ash		Alcalinité due à Alkalinity due to		Ca O	Fe ₂ O ₃	Facteur de conversion en denrée alimentaire sèche Factor converting to dry food	Name of Cereal	No.
		Solubles dans l'eau Water-soluble	Insolubles dans l'eau Water-insoluble	la soude et à la potasse soda and potash	la chaux et à la magnésie lime and magnesia					
Cereal Products (Dry)										
0.171	néant	néant	1.00	néant	2.5	0.007	0.005	1.140	Kona (Wheaten flour) :	46
0.284	nil	nil	1.55	nil	3.0	0.056	0.004	1.136	(a) Také 1st class .	
0.215	»	—	1.40	—	3.5	0.077	0.005	1.142	(b) Mark 2nd class .	
0.185	»	—	0.95	—	3.5	0.056	0.004	1.136	(c) Eagle Mark (high class).	
0.216	»	—	0.65	—	2.0	0.035	0.003	1.142	(d) Napoleon Mark (high class).	
0.295	»	—	1.10	—	2.0	trace	0.005	1.142	(e) Yacht Mark (1st cl.)	
0.720	»	—	2.35	—	6.0	»	0.010	1.136	(f) Botan Mark (2nd cl.)	
0.766	»	—	1.73	néant	5.3	0.233	0.003	1.158	(g) Shime Mark (3rd cl.)	
0.658	»	0.27	1.70	nil	4.0	0.065	0.003	1.161	Hikiwari (Ground barley)	47
0.349	»	néant	0.56	1.3	2.5	0.016	—	1.099	Oshimugi (Ground barley).	48
		nil		néant					Sobako (Buckweat) . . .	49
0.980	1.03	1.10	2.03	1.0	8.0	0.058	—	1.124	Soba Mai (Ground buckwheat).	50
2.338	néant	0.20	3.75	2.0	6.5	néant	0.005	1.147	Menzai (Rice polishings) .	51
5.346	nil	0.17	12.37	9.3	13.0	0.147	—	1.139	Nuka (Rice bran). . .	52
—	»	néant	0.50	néant	1.0	0.084	—	1.127	Fu (Wheat protein) . . .	53
—	»	nil		nil						
—	»	0.15	1.25	»	3.0	0.098	—	1.124	Kingyobu (Wheat protein)	54
—	3.18	3.28	0.78	»	1.5	0.059	0.0032	1.155	Hoshiudcn (Macaroni) . .	55
—	3.30	3.46	2.88	»	5.0	0.022	0.0044	1.165	Somen (Macaroni). . . .	56
Cereal Products (Moist)										
—	néant	néant	0.18	»	0.7	trace	0.007	2.252	Chikuwa bu (Wheaten preparation)	57
0.076	»	»	0.13	»	néant	néant	trace	1.852	Mochi (Pounded rice preparation)	58
0.220	»	»	0.36	»	»	0.022	0.001	1.931	Awa Mochi (Mochi made of Italian millet) . . .	59

I. CEREALS AND

Numéros	Nom de la denrée alimentaire	Eau — Water	Protéine Protein N x 6.25	Graisse — Fat	Hydrate de carbone Carbohydrate	Fibre	Cendres — Ash	Calories	Teneur en alcali Alkali value	Total de l'azote Total nitrogen
	Produits de céréales (cuits).									
	<i>Pain, Biscuits et Gâteaux de froment.</i>									
61	Shokupan :									
	a) Pain blanc	33.3	8.3	0.81	56.7	néant nil	0.77	274	3.0	1.293
	b) Pain bis	33.0	9.9	0.13	55.8	trace	1.22	271	12.0	1.590
62	Anpan	36.1	6.7	0.15	56.4	0.3 néant	0.28	360	0.9	1.074
63	Katapan	16.5	7.2	2.74	73.0	nil	0.55	355	—	1.150
64	Kasuitera	20.3	7.0	3.63	68.4	»	0.69	344	6.0	1.119
65	Bisuketto	10.8	10.2	6.10	72.3	»	0.70	395	2.0	1.630
66	Cream Finger	6.5	6.9	17.10	68.2	trace	1.30	467	10.0	1.110
67	Wafer	20.3	7.0	néant nil	72.3	»	0.40	325	2.0	1.119
	<i>Biscuits et Confiserie.</i>									
68	Amakara Senbei	10.2	7.5	0.20	79.4	néant nil	2.70	399	4.1	1.184
69	Kawara Senbei	14.7	7.2	0.38	77.2	trace	0.50	350	—	1.150
70	Maki Senbei	23.6	2.9	1.04	73.2	néant nil	0.25	322	—	0.460
71	Shiwo Senbei	7.5	8.7	0.12	81.1	0.10 néant	2.55	369	—	1.390
72	Boru	16.3	2.4	0.60	80.2	nil	0.45	344	1.5	0.380
73	Rokugan	14.0	3.5	0.28	81.9	»	0.30	353	—	0.560
74	Amanatto	23.3	7.0	0.63	68.4	—	0.69	315	6.0	1.119
75	Daifuku Mochi	50.2	5.8	0.14	43.7	—	0.13	204	2.2	0.922
76	Dorayaki	37.0	5.4	0.60	55.9	0.6	0.47	257	3.4	0.858
77	Kanoko	41.5	7.2	0.69	49.1	1.3	0.20	237	1.2	1.158
78	Kintsuba	57.8	8.2	0.55	31.8	1.3	0.36	170	3.5	1.000
79	Kuri Manju	34.0	4.6	0.11	60.3	0.4	0.55	267	5.3	0.730
80	Mushiyokan	44.8	4.4	0.07	48.8	0.9	0.19	219	0.2	0.709
81	Neri-Yokan	47.5	5.0	0.04	47.1	0.6	0.31	214	0.5	0.801
82	Soba Manju	23.8	6.0	0.64	67.0	0.5	2.08	301	19.3	0.960
83	To-Manju	43.5	5.1	0.99	50.3	—	0.11	236	0.7	0.812

CEREAL PRODUCTS (continued).

P ₂ O ₅	Na Cl	Cendres — Ash		Alcalinité due à Alkalinity due to		Ca O	Fe ₂ O ₃	Facteur de conversion en denrée alimentaire sèche Factor converting to dry food	Name of Food	No.
		Solubles dans l'eau Water-soluble	Insolubles dans l'eau Water-insoluble	la soude et à la potasse soda and potash	la chaux et à la magnésie lime and magnesia					
Cereal Products (Baked)										
<i>Bread, Biscuits and Cakes of Wheat.</i>										
0.156	0.18	0.45	0.32	1.0	2.0	trace	0.0060	1.500	Shokupan :	61
0.354	0.15	0.25	0.97	4.0	8.0	0.078	0.0120	1.492	(a) White Bread	
0.385	néant	néant	0.28	néant	0.9	néant	0.0026	1.565	(b) Brown Bread	
0.020	»	»	0.55	—	—	0.087	—	1.198	Anpan.	62
0.243	»	0.24	0.45	2.9	3.1	néant	—	1.255	Katapan.	63
—	»	»	0.70	néant	2.0	nil	—	—	Kasuitera	64
0.241	»	»	1.30	nil	10.0	»	—	—	Bisuketto	65
0.410	»	»	0.40	»	2.0	0.112	—	—	Cream Finger.	66
—	»	»	»	»	»	néant	0.0100	1.255	Wafer.	67
<i>Biscuits and Confectionery.</i>										
—	1.25	1.55	1.15	0.2	3.9	trace	—	1.114	Amakara Senbei	68
0.083	néant	néant	0.50	—	—	néant	—	1.172	Kawara Senbei	69
0.020	nil	»	0.25	—	—	nil	—	1.308	Maki Senbei	70
—	1.92	1.96	0.59	—	—	»	—	1.081	Shiwo Senbei	71
—	néant	0.10	0.35	néant	1.5	»	—	1.195	Boru	72
—	nil	néant	0.30	nil	néant	—	—	1.163	Rokugan	73
0.361	»	0.24	0.45	2.9	3.1	néant	0.017	1.304	Amanatto	74
0.240	»	0.07	0.06	0.8	1.4	»	0.003	2.008	Daifuku Mochi	75
0.398	»	néant	0.47	néant	3.4	»	—	1.587	Dorayaki	76
0.253	»	nil	»	nil	»	»	—	1.587	Dorayaki	76
0.253	»	»	0.20	»	1.2	trace	0.005	1.709	Kanoko	77
0.250	»	0.19	0.17	2.3	1.2	»	0.013	2.370	Kintsuba	78
0.324	»	néant	0.55	néant	5.3	néant	0.004	1.471	Kuri Manju	79
0.131	»	nil	0.19	»	0.2	nil	0.003	1.812	Mushiyokan	80
0.313	»	»	0.19	»	0.2	»	—	1.905	Neri-Yokan	81
0.313	»	0.04	0.27	0.5	néant	»	—	1.905	Neri-Yokan	81
0.185	»	néant	2.08	néant	19.3	nil	0.015	1.312	Soba Manju	82
0.146	»	nil	»	nil	0.7	0.790	0.003	1.770	To-Manju	83
0.146	»	»	0.11	»	0.7	nil	0.003	1.770	To-Manju	83

I. CEREALS AND

Numéros	Nom de la denrée alimentaire	Eau — Water	Protéine Protein N x 6.25	Graisse — Fat	Hydrate de carbone Carbohydrate	Fibre	Cendres — Ash	Calories	Teneur en alcali Alkali value	Total de l'azote Total nitrogen
Produits de céréales (cuits) (suite).										
Biscuits et Confiserie (suite).										
86	Amakûri	40.2	4.9	1.98	48.9	2.9	1.14	239	4.1	0.71
87	Endomame	6.3	23.3	1.30	62.9	3.0	3.20	366	8.6	3.71
88	Furogetto	5.7	9.5	néant nil	81.1	néant nil	3.67	371	28.3	1.53
89	Gengimame	2.7	7.6	10.10	77.1	»	2.53	442	0.6	1.21
90	Natsume	29.2	1.2	0.48	—	—	0.64	»	4.7	0.11
Confiserie (simple).										
92	Ame	9.5	0.7	néant nil	89.5	néant nil	0.30	370	néant nil	0.11
93	Gâteau de banane ¹	14.4	5.0	»	80.5	»	0.13	332	0.7	0.71
94	Chocolat	4.9	6.8	11.4	76.4	»	0.50	447	3.0	1.01
95	Pastilles	1.8	trace	0.2	97.6	»	0.48	402	0.3	0.01
96	Hakka Koshi	3.4	»	néant nil	95.3	»	0.57	391	0.7	0.01
97	Horagai	3.3	1.8	0.10	94.5	»	0.30	396	1.0	0.21
98	Hoshimitsu	20.8	0.6	néant nil	78.5	»	0.10	324	néant nil	0.11
99	Mizuame	16.5	0.9	»	81.9	—	—	339	—	0.11
100	Umeboshi	1.3	—	—	98.0	—	0.66	402	6.0	—
101	Zeribinzu	4.4	—	—	94.0	—	1.57	385	5.3	0.01

II. LÉGUMES, PULSES

Légumes frais.										
111	Edamame (Fève de soya en cosse)	75.7	9.9	4.56	7.7	0.68	1.42	115	17.8	1.51
112	Sayaingen (Haricot vert)	93.0	1.8	0.13	3.6	0.80	0.70	23	4.5	0.21
113	Soramame (Féverole)	50.6	17.5	1.31	26.8	0.40	3.38	194	15.8	2.81
Légumes secs.										
116	Ainumame (Haricot vert de Ainu)	17.2	16.6	1.73	55.3	3.0	4.14	311	34.9	2.61

¹Semblable au fruit par la forme et l'odeur seulement.

CEREAL PRODUCTS (continued).

P ₂ O ₅	Na Cl	Cendres — Ash		Alcalinité due à Alkalinity due to		Ca O	Fe ₂ O ₃	Facteur de conversion en denrée alimentaire sèche Factor converting to dry food	Name of Food	No.	
		Solubles dans l'eau Water-soluble	Insolubles dans l'eau Water-insoluble	la soude et à la potasse soda and potash	la chaux et à la magnésie lime and magnesia						
0.395	0.21	0.77	0.37	0.2	3.9	néant	—	1.304	Cereal Products (Baked) (continued). Biscuits and Confectionery (continued).	86	
0.725	1.20	2.80	0.40	8.3	0.3	"	0.003	1.067		87	
—	néant	néant	3.67	néant	28.3	1.023	0.004	1.060		88	
0.621	nil	nil	0.20	0.3	0.3	néant	0.004	1.028		89	
néant	2.23	2.33	0.20	0.3	0.3	nil	0.004	1.028		89	
nil	néant	0.43	0.21	3.3	1.4	0.051	0.021	1.412		90	
nil	nil	0.43	0.21	3.3	1.4	0.051	0.021	1.412		90	
néant	néant	néant	0.30	néant	néant	—	—	1.105		Confectionery (Plain).	92
nil	nil	nil	0.30	néant	nil	—	—	1.105		Ame	92
0.151	"	"	0.13	"	0.7	néant	0.002	1.168		Banana Cake ¹	93
trace	"	"	0.50	"	3.0	nil	0.002	1.168	Banana Cake ¹	93	
néant	"	"	0.50	"	3.0	0.061	—	1.052	Chocolate	94	
nil	"	"	0.43	"	0.3	0.061	0.003	1.018	Drops.	95	
trace	"	"	0.57	"	0.7	0.131	0.010	1.035	Hakka Koshi.	96	
néant	"	"	0.57	"	0.7	néant	0.017	1.034	Horagai	97	
nil	"	0.07	0.23	0.3	0.7	nil	0.017	1.034	Horagai	97	
0.066	"	néant	0.10	néant	néant	—	0.002	1.263	Hoshimitsu	98	
—	—	—	—	—	—	—	—	—	Mizuame.	99	
néant	néant	néant	0.66	néant	6.0	néant	0.004	1.013	Umeboshi	100	
nil	nil	nil	0.66	nil	6.0	nil	0.004	1.013	Umeboshi	100	
"	"	"	0.57	"	5.3	0.187	0.018	1.046	Zeribinzu	101	

AND LEGUME PRODUCTS

									Fresh Legumes.	
0.424	néant	0.35	1.07	12.0	5.8	0.078	0.0102	4.115	Edamame (Soy bean in pod)	111
0.098	nil	0.35	1.07	12.0	5.8	0.078	0.0102	4.115	Edamame (Soy bean in pod)	111
0.098	0.03	0.36	0.34	2.8	1.7	0.066	0.0065	14.280	Sayaingen (French beans in pod).	112
0.864	néant	1.80	1.58	4.0	11.8	0.027	0.0200	2.024	Soramame (Broad bean)	113
0.864	nil	1.80	1.58	4.0	11.8	0.027	0.0200	2.024	Soramame (Broad bean)	113
									Dry Legumes (Pulses).	
1.110	néant	2.17	1.97	18.3	16.6	0.101	0.044	1.208	Ainumame (French bean).	116
1.110	nil	2.17	1.97	18.3	16.6	0.101	0.044	1.208	Ainumame (French bean).	116

¹ Resembling the fruit in shape and odour only.

II. LEGUMES, PULSES AND

Numéros	Nom de la denrée alimentaire	Eau — Water	Protéine Protein N X 6.25	Graisse — Fat	Hydrate de carbone Carbohydrate	Fibre	Cendres — Ash	Calories	Teneur en alcali Alkali value	Total de l'azote Total nitrogen
Légumes secs (suite).										
117	Aoendo (Pois vert)	13.4	21.7	1.00	55.7	6.0	2.22	327	16.8	3.47
118	Azuki (Petit haricot rouge).	14.2	20.5	0.66	56.4	5.2	3.05	321	27.0	3.20
119	Dainagon (Petit haricot rouge).	14.0	20.4	2.00	56.3	4.3	2.97	334	22.3	3.26
120	Ao Daizu (Fève de soya).	11.4	35.7	17.5	26.7	4.2	4.48	419	42.0	5.71
121	Kurō Daizu (Fève de soya noire).	13.3	36.4	15.9	24.8	4.3	5.13	399	40.2	5.82
122	Shiro Daizu (Fève de soya blanche).	13.0	39.1	16.0	25.8	1.4	4.72	415	38.1	6.23
125	Rakkasei (Pistache de terre).	3.7	31.6	46.2	15.7	0.8	2.00	623	14.0	5.06
126	Shiro Ingen (Haricot à cosse blanche).	17.2	18.3	1.34	53.7	5.9	3.62	309	37.9	2.92
127	Soramame (Féverole).	13.3	26.0	1.15	50.9	5.8	2.77	326	18.0	4.21
128	Uzuramame (<i>Phaseolus vulgaris</i>).	15.8	19.8	1.39	54.6	5.3	3.11	318	29.8	3.16
Produits de fèves, haricots, pois, etc.										
131	Aburage (Pâte de haricots frite).	53.2	21.1	22.0	2.4	néant nil	1.25	301	6.7	2.82
132	Aka Miso (Pâte de fèves de soya).	50.8	12.6	4.48	17.5	1.8	2.77	165	11.5	2.02
133	Gammodoki (Pâte de haricots frite avec mixture d'algues marines).	30.1	35.2	27.18	5.7	néant nil	1.84	418	2.2	5.63
134	Kinako (Poudre de fèves de soya).	5.7	39.3	19.76	26.3	3.7	4.28	443	25.2	6.28
135	Kori Dofu (Pâte de haricots séchée).	7.3	60.2	24.6	5.2	néant nil	2.88	497	—	9.63
136	Namaage (Pâte de haricots frite).	74.4	12.4	9.25	3.0	»	0.95	149	néant nil	1.98
137	Natto (Fève de soya fermentée).	61.2	18.1	9.69	8.0	0.8	2.21	197	19.3	2.90
138	Sarashian (Poudre de haricot rouge).	10.1	24.4	0.72	63.0	0.6	1.22	365	1.1	3.90
139	Shiro Miso (Pâte blanche de fève de soya).	52.5	10.0	1.68	29.2	1.0	5.56	176	8.1	1.59
140	Tofu (Pâte de fèves de soya).	88.7	6.5	0.32	3.9	néant nil	0.61	46	1.1	1.04

LEGUME PRODUCTS (continued).

P ₂ O ₅	Na Cl	Cendres — Ash		Alcalinité due à Alkalinity due to		Ca O	Fe ₂ O ₃	Facteur de conversion en denrée alimentaire sèche Factor converting to dry food	Name of Food	No.
		Solubles dans l'eau Water-soluble	Insolubles dans l'eau Water-insoluble	la soude et à la potasse soda and potash	la chaux et à la magnésie lime and magnesia					
Dry Legumes (Pulses) (continued).										
—	trace	0.80	1.42	6.0	10.2	0.081	0.012	1.155	Aoendo (Green pea) . . .	117
0.620	néant nil	1.13	1.92	10.0	17.0	0.123	0.012	1.166	Azuki (Small red bean).	118
—	»	1.20	1.77	10.0	12.3	0.096	0.017	1.162	Dainagon (Small red bean)	119
1.080	»	1.64	2.84	15.4	26.6	0.258	0.025	1.129	Ao Daizu (Soy bean). . .	120
—	trace	2.87	2.26	22.6	17.8	0.288	0.030	1.151	Kuro Daizu (Black soy bean)	121
—	»	2.08	2.64	16.8	21.3	0.269	0.030	1.150	Shiro Daizu (White soy bean)	122
0.287	néant nil	0.50	1.50	1.5	12.5	0.084	0.014	1.038	Rakkasei (Pea-nut) . . .	125
—	trace	1.28	2.34	13.4	24.5	0.202	0.013	1.207	Shiro Ingen (White French bean)	126
0.918	néant nil	1.00	1.77	5.7	12.3	0.140	0.022	1.154	Soramame (Broad bean).	127
0.330	»	0.73	2.38	7.0	22.8	0.188	0.009	1.187	Uzuramame (<i>Phaseolus vulgaris</i>)	128
Bean Products.										
0.882	néant nil	néant nil	1.28	0.6	6.1	0.167	0.016	2.140	Aburage (Fried-bean curd)	131
0.700	11.48	11.54	1.23	1.7	9.8	0.173	0.036	2.033	Aka Miso (Soy-bean paste).	132
1.399	néant nil	néant nil	1.84	0.6	1.6	0.258	0.023	1.430	Gammodoki (Fried-bean curd)	133
—	»	2.20	2.06	19.2	6.0	0.266	—	1.060	Kinako (Soy-bean powder).	134
—	»	néant nil	2.88	néant nil	—	—	—	1.078	Kori Dofu	135
—	»	0.09	0.86	»	néant nil	néant nil	0.002	3.906	Namaage (Fried-bean curd)	136
0.360	trace	0.97	1.24	8.9	10.4	0.130	0.017	2.900	Natto (Fermented soy bean)	137
—	néant nil	0.08	1.14	0.1	1.0	0.227	0.029	1.112	Sarashian (Red-bean powder).	138
0.335	4.54	4.58	0.98	1.9	6.2	0.104	0.010	2.105	Shiro Miso (White soy-bean paste).	139
0.232	0.25	0.15	0.46	0.3	0.8	0.045	0.019	8.850	Tofu (Soy-bean curd) . .	140

II. LEGUMES, PULSES AND

Numéros	Nom de la denrée alimentaire	Eau — Water	Protéine Protein N x 6.25	Graisse — Fat	Hydrate de carbone Carbohydrate	Fibre	Cendres — Ash	Calories	Teneur en alcali Alkali value	Total de l'azote Total nitrogen
Produits de fèves, haricots, pois, etc. (suite)										
141	Tofu Kasu (Déchets de fèves de soya)	83.4	4.6	2.24	7.6	1.6	0.55	71	9.0	0.740
142	To Nyu (Lait de fève de soya)	92.4	3.7	1.29	2.2	néant nil	0.37	36	3.8	0.600
143	Yuba	10.7	51.5	24.13	10.5	"	3.20	479	25.6	8.240

III. ROOTS, GREENS

Numéros	Nom de la denrée alimentaire	Eau — Water	Protéine Protein N x 6.25	Graisse — Fat	Hydrate de carbone Carbohydrate	Fibre	Cendres — Ash	Calories	Teneur en alcali Alkali value	Total de l'azote Total nitrogen
Racines comestibles.										
145	Daikon (Radis géant japonais)	95.9	0.6	0.31	1.80	0.9	0.50	13	5.0	0.096
146	Gobo (Bardane)	79.4	2.5	0.14	15.0	1.8	1.17	73	7.3	0.392
147	Jaga-Imo (Pomme de terre)	79.5	2.0	0.03	17.3	0.5	0.67	79	13.9	0.317
148	Jinenjo (Igname japonaise)	72.0	1.1	0.19	25.4	0.2	1.06	111	8.6	0.170
149	Kabu (Navet)	97.2	0.7	0.11	0.8	0.7	0.53	7	0.9	0.117
150	Kikione (Racine de kiki)	84.0	3.5	0.28	11.2	néant nil	1.02	63	8.4	0.558
151	Kuwai (Flèche d'eau)	68.2	4.4	0.23	25.4	0.4	1.37	124	11.7	0.700
152	Nagaimo (Igname chinoise)	74.6	2.7	0.16	21.1	0.6	0.84	99	7.9	0.430
153	Nataikoa (Flèche d'eau chinoise)	84.1	1.4	0.05	10.3	2.8	1.29	49	8.2	0.220
154	Ninjin (Carotte)	91.3	1.1	0.30	4.7	1.7	0.93	27	9.4	0.180
155	Renkon (Racine de lotus)	85.7	2.3	0.08	10.7	0.6	0.62	54	7.1	0.305
157	Sato Imo (Taro)	72.4	2.7	0.22	22.9	0.9	0.97	107	11.6	0.431
158	Satsumaimo (Patate)	69.8	1.1	0.23	28.4	0.7	0.74	123	6.8	0.180
159	Shoga (Gingembre)	91.1	2.1	0.86	3.7	1.7	0.54	32	5.9	0.330
160	Takenoko (Pousse de bambou)	91.8	2.8	0.23	3.9	0.5	0.84	29	7.1	0.445
161	Tamenegi (Oignon)	93.1	1.0	0.13	5.0	0.5	0.31	26	2.9	0.157
162	Tororo Imo (Igname chinoise)	70.4	4.9	0.06	22.2	1.4	1.22	112	11.5	0.777
163	Udo (<i>Aralia cordata</i>)	95.4	0.7	0.08	2.6	0.7	0.50	14	4.8	0.110
164	Wasabi (<i>Eutrema wasabi</i>)	69.7	5.1	0.20	22.3	1.4	1.27	114	7.5	0.820
165	Yatsugashira (<i>Colocasia gigantea</i>)	75.6	2.8	0.04	20.3	0.4	0.85	96	8.2	0.443
166	Yuri (Racine de lys)	65.6	4.3	4.90	23.5	0.4	1.25	160	8.3	0.680

LEGUME PRODUCTS (continued).

P ₂ O ₅	Na Cl	Cendres — Ash		Alcalinité due à Alkalinity due to		Ca O	Fe ₂ O ₃	Facteur de conversion en denrée alimentaire sèche Factor converting to dry food	Name of Food	No.	
		Solubles dans l'eau Water-soluble	Insolubles dans l'eau Water-insoluble	la soude et à la potasse soda and potash	la chaux et à la magnésie lime and magnesia						
0.188	néant nil	0.19	0.36	2.2	6.8	0.127	0.010	6.024	Bean Products (continued).	Tofu Kasu (Soy-bean residue)	141
0.113	"	0.08	0.29	0.6	3.2	0.021	0.003	13.160		To Nyu (Soy-bean milk)	142
—	"	0.72	2.48	6.4	19.2	0.280	0.007	1.120		Yuba	143

AND OTHER VEGETABLES

										Root Vegetables.	
0.028	0.11	0.35	0.15	3.3	1.7	0.050	0.001	24.57	Daikon (Japanese giant radish)	145	
0.166	trace	0.29	0.88	1.5	5.8	0.070	0.016	4.85	Gobo (Burdock).	146	
0.088	"	0.41	0.28	3.3	10.6	néant nil	0.016	4.88	Jaga-Imo (Potato)	147	
0.077	0.08	0.78	0.28	7.0	1.6	0.033	0.015	3.57	Jinenjo (Japanese yam)	148	
0.063	0.40	0.41	0.12	0.5	0.4	néant nil	0.002	35.46	Kabu (Turnip)	149	
0.250	0.05	0.46	0.56	2.5	5.9	0.065	0.017	6.25	Kikione (Kikio root).	150	
0.478	trace	1.00	0.37	8.6	3.1	trace	0.020	3.15	Kuwai (Arrowhead).	151	
0.470	0.05	0.62	0.22	5.7	2.2	0.025	0.004	3.94	Nagaimo (Chinese yam)	152	
—	0.20	0.82	0.47	5.8	2.4	0.016	0.023	6.29	Nataikoa (Chinese arrow-head)	153	
0.084	0.12	0.66	0.27	6.9	2.5	0.070	0.028	11.52	Ninjin (Carrot)	154	
0.200	0.27	0.43	0.19	2.7	4.4	0.027	0.007	6.99	Renkon (Lotus root).	155	
0.088	néant nil	0.72	0.25	8.0	3.6	trace	0.005	3.62	Sato Imo (Taro)	157	
0.124	"	0.37	0.37	3.2	3.6	—	0.005	3.32	Satsumaimo (Sweet potato)	158	
0.044	trace	0.27	0.27	2.3	3.6	0.020	0.003	11.19	Shoga (Ginger)	159	
0.046	0.06	0.65	0.19	5.7	1.4	0.007	0.003	12.20	Takenoko (Bamboo shoot)	160	
0.107	trace	0.16	0.15	1.4	1.5	0.043	0.002	14.49	Tamanegi (Onion).	161	
0.194	0.26	1.00	0.22	9.4	2.1	0.070	0.007	3.38	Tororo Imo (Chinese yam)	162	
"	trace	0.30	0.20	3.0	1.8	0.011	0.010	21.75	Udo (<i>Aralia cordata</i>).	163	
0.265	"	0.49	0.78	2.3	5.2	0.130	0.007	3.30	Wasabi (<i>Eutrema wasabi</i>).	164	
0.135	néant nil	0.32	0.53	3.4	4.8	0.080	0.003	4.10	Yatsugashira (<i>Colocasia gigantea</i>).	165	
0.236	trace	0.75	0.50	6.2	2.1	0.372	0.082	2.91	Yuri (Lily root).	166	

III. ROOTS, GREENS

Numéros	Nom de la denrée alimentaire	Eau — Water	Protéine Protein N x 6.25	Graisse — Fat	Hydrate de carbone Carbohydrate	Fibre	Cendres — Ash	Calories	Teneur en alcali Alkali value	Total de l'azote Total nitrogen
Légumes verts.										
178	Daikon no ha (Feuilles de radis)	93.4	1.5	0.27	1.3	2.2	1.26	14	10.9	0.241
179	Fuki (<i>Petasites Japonica</i>).	95.1	0.7	0.07	2.6	0.6	0.86	14	5.4	0.109
180	Horensu (Épinards)	93.0	2.2	0.39	2.7	0.4	1.33	24	—	0.346
181	Kabu no ha (Feuilles de navet)	94.2	1.7	0.30	1.0	1.8	1.04	14	2.1	0.278
182	Komatsuna (<i>Brassica chinensis</i>)	94.5	1.7	0.20	1.0	1.4	1.26	9	11.3	0.265
183	Kya Betsu (Chou)	93.2	1.3	0.23	3.6	1.2	0.49	22	6.4	0.202
184	Kyona (<i>Brassica campestris</i>)	94.0	2.5	0.41	1.1	1.4	0.64	19	10.9	0.400
185	Miogatake	97.1	0.7	0.10	1.0	0.4	0.68	8	5.0	0.107
186	Mitsuba (<i>Cryptolaimia Canadensis</i>)	94.4	1.1	0.20	1.7	1.7	0.93	13	6.5	0.170
187	Negi (Poireau)	91.9	1.4	0.42	3.6	2.2	0.5	24	7.8	0.227
188	Nira	90.7	2.3	0.51	4.9	0.3	1.32	34	9.9	0.374
189	Seri (Persil)	93.5	1.8	0.26	2.8	0.5	1.18	21	6.5	0.129
190	Salade	93.5	1.4	0.29	2.6	0.8	1.41	19	5.4	0.220
191	Tsukena	96.3	1.1	0.09	1.2	0.4	0.88	10	3.8	0.170
192	Warabi	89.5	2.2	0.19	5.0	1.6	1.53	31	5.4	0.351
193	Zenmai	88.3	3.1	0.18	4.4	3.8	0.31	32	1.1	0.487
Autres parties de plantes utilisées comme légumes.										
194	Kabocha (Potiron)	92.1	1.2	0.40	4.6	1.0	0.70	28	5.8	0.196
195	Kikunohana (Fleurs de chrysanthème)	87.5	1.9	0.91	5.3	3.7	0.66	38	5.8	0.296
196	Kiuri (Concombre)	96.6	0.7	0.12	1.9	0.4	0.29	12	3.0	0.110
197	Nasu (Mélongène)	93.0	1.3	0.20	4.0	0.8	0.65	24	4.6	0.199
198	Neimo	95.0	0.5	0.11	3.0	0.8	0.60	15	3.5	0.074
199	Rakkyo (Ail)	80.4	2.2	0.31	13.1	4.0	3.82	66	2.2	0.350

AND OTHER VEGETABLES (continued).

P ₂ O ₅	NaCl	Cendres — Ash		Alcalinité due à Alkalinity due to		CaO	Fe ₂ O ₃	Facteur de conversion en denrée alimentaire sèche to dry food	Name of Food	No.
		Solubles dans l'eau Water-soluble	Insolubles dans l'eau Water-insoluble	la soude et à la potasse soda and potash	la chaux et à la magnésie lime and magnesia					
Green Vegetables.										
0.074	0.40	0.71	0.55	2.8	8.1	0.176	0.008	15.20	Daikon no ha (Daikon leaves)	178
—	0.31	0.64	0.22	1.9	3.5	—	—	20.41	Fuki (<i>Petasites Japonica</i>).	179
0.155	0.21	0.68	0.65	—	—	0.051	0.007	14.28	Horenso (Spinach)	180
0.054	0.34	0.51	0.53	0.4	1.7	0.190	0.006	17.24	Kabuno ha (Turnip leaves)	181
0.063	0.35	0.76	0.50	3.2	8.1	0.220	0.001	18.02	Komatsuna (<i>Brassica chinensis</i>)	182
0.072	0.01	0.25	0.24	2.0	4.4	0.060	0.003	14.71	Kya Betsu (Cabbage)	183
0.096	0.29	0.73	0.70	5.2	5.7	0.197	0.011	16.67	Kyona (<i>Brassica campestris</i>)	184
—	0.09	0.52	0.16	4.3	0.7	—	—	34.48	Miogatake	185
0.022	0.27	0.65	0.28	4.3	2.2	0.050	0.002	17.85	Mitsuba (<i>Cryptotalmia Canadensis</i>)	186
—	néant nil	0.17	0.33	1.2	6.6	0.050	0.019	12.30	Negi (Leek)	187
0.080	0.17	0.17	0.84	6.5	3.4	0.059	0.027	10.75	Nira	188
—	0.70	0.70	0.48	0.8	5.7	0.051	0.002	15.38	Seri (Parsley)	189
0.021	0.07	0.65	0.76	3.4	2.0	0.067	0.019	15.38	Salad	190
0.080	0.35	0.57	0.31	3.1	0.7	0.096	0.008	27.03	Tsukena	191
0.054	0.09	0.42	1.11	2.7	2.7	0.034	0.007	9.52	Warabi	192
0.112	néant nil	0.12	0.19	0.1	1.0	—	0.006	8.53	Zenmai	193
Other Parts of Plants used as Vegetables.										
0.038	0.06	0.38	0.32	3.9	1.9	néant nil	0.002	12.66	Kabocha (Pumpkin).	194
0.115	0.03	0.29	0.37	2.7	3.1	0.090	0.039	8.00	Kikunohana (Chrysanthemum flowers).	195
0.089	0.04	0.12	0.17	1.1	1.9	0.027	0.003	29.41	Kiuri (Cucumber).	196
0.109	0.07	0.39	0.26	2.8	1.8	0.040	0.004	14.28	Nasu (Egg-plant).	197
néant nil	néant nil	0.34	0.26	2.4	2.1	0.104	0.008	20.00	Neimo	198
0.150	2.68	2.72	1.10	0.4	1.8	0.080	0.005	5.10	Rakkyo (Garlic)	199

III. ROOTS, GREENS

Numéros	Nom de la denrée alimentaire	Eau — Water	Protéine Protein N × 6.25	Graisse — Fat	Hydrate de carbone Carbohydrate	Fibre	Cendres — Ash	Calories	Teneur en alcali Alkali value	Total de l'azote Total nitrogen
Autres parties de plantes utilisées comme légumes (suite).										
200	Shirourj (Concombre) . . .	95.8	0.9	0.07	2.0	0.7	0.45	13	1.4	0.142
201	Shungiku (Chrysanthème).	93.2	2.0	0.26	2.4	0.9	1.24	20	9.4	0.326
202	Suika (Melon d'eau) . . .	96.0	0.4	0.10	3.2	0.1	0.20	16	2.0	0.070
203	Takenoko (Pousses de bambou)	91.8	2.8	0.23	3.8	0.5	0.84	29	7.1	0.445
204	Togan (Courge)	98.3	0.2	0.02	1.2	0.2	0.13	6	1.0	0.034
205	Tomate	95.6	0.8	0.40	1.8	0.8	0.62	14	3.6	0.125
206	Tamanegi (Oignon) . . .	93.1	1.0	0.13	5.0	0.5	0.31	26	6.1	0.160

IV. MUSHROOMS

"Algæ" et "Fungi".										
<i>Champignons.</i>										
207	Matsudake	87.7	1.9	0.34	6.8	2.5	0.81	38	5.7	0.304
208	Matsudake (de conserve).	92.2	1.3	0.02	4.1	2.0	0.38	22	néant nil	0.206
209	Shutake	17.2	15.5	1.45	64.6	1.2	3.42	342	41.0	2.475
<i>Algues marines.</i>										
216	Arame (<i>Ecklonia cava</i>) . .	19.3	7.5	0.10	60.6	néant nil	12.50	280	—	1.200
217	Asakusanori ¹ (a)(<i>Porphyra tenella</i>)	11.35	36.6	trace	44.0	»	8.00	331	11.5	5.856
218	Asakusanori (b)	11.10	35.2	»	44.9	»	8.75	328	16.3	5.636
219	Asakusanori (c)	13.35	30.0	»	45.7	»	10.85	310	35.3	4.800
220	Aonori (<i>Enteromorpha compressa</i>)	3.65	20.7	0.30	61.6	7.2	6.56	340	—	3.312

¹ (a) (b) (c) 1^{re} 2^e et 3^e catégories, telles qu'au moment de leur achat.

AND OTHER VEGETABLES (continued).

P ₂ O ₅	NaCl	Cendres — Ash		Alcalinité due à Alkalinity due to		CaO	Fe ₂ O ₃	Facteur de conversion en denrée alimentaire sèche Factor converting to dry food	Name of Food	No.	
		Solubles dans l'eau Water-soluble	Insolubles dans l'eau Water-insoluble	la soude et à la potasse soda and potash	la chaux et à la magnésie lime and magnesia						
trace	néant nil	0.11	0.34	1.0	0.4	0.042	0.002	23.80	Other Parts of Plants used as Vegetables (continued).	Shirouri (Cucumber)	200
0.95	0.23	0.68	0.56	4.9	4.5	0.134	0.018	14.71		Shungiku (Chrysanthemum)	201
0.008	néant nil	0.07	0.13	0.7	1.3	0.019	0.006	25.00		Suika (Water-melon)	202
0.046	0.06	0.65	0.19	5.7	1.4	0.007	0.003	12.19		Takenoko (Bamboo shoots)	203
0.003	0.01	0.09	0.04	0.8	0.2	néant nil	0.001	58.82		Togan (Gourd melon)	204
0.013	néant nil	0.58	0.04	1.5	2.1	0.114	0.018	22.73		Tomato	205
0.107	trace	0.16	0.15	1.0	5.1	0.043	0.002	14.49		Tamanegi (Onion)	206

AND SEAWEEDS

Algæ et Fungi.										
<i>Mushrooms.</i>										
0.104	néant nil	0.32	0.49	4.2	1.5	0.031	0.008	8.160	Matsudake	207
0.085	"	néant nil	0.38	néant nil	néant nil	0.004	0.010	12.82	Matsudake (tinned)	208
0.850	"	2.25	1.17	33.8	7.2	trace	0.023	1.210	Shutake	209
<i>Seaweeds.</i>										
—	1.70	5.00	7.50	—	—	1.920	—	1.240	Arame (<i>Ecklonia cava</i>)	216
—	1.39	4.55	3.45	7.5	4.0	0.027	0.029	1.128	Asakusanori ¹ (a) (<i>Porphyra tenella</i>)	217
—	2.20	5.90	2.85	11.3	5.0	0.027	0.029	1.125	Asakusanori (b)	218
0.450	3.30	8.40	2.45	28.3	7.0	0.044	0.054	1.154	Asakusanori (c)	219
—	1.13	4.36	2.20	—	7.0	—	—	1.038	Aonori (<i>Enteromorpha compressa</i>)	220

¹ (a) (b) (c) First, second and third grades as purchased.

IV. MUSHROOMS

Numéros	Nom de la denrée alimentaire	Eau — Water	Protéine Protein N X 6.25	Graisse — Fat	Hydrate de carbone Carbohydrate	Fibre	Cendres — Ash	Calorics	Teneur en alcali Alkali value	Total de l'azote Total nitrogen
	<i>Algues marines (suite).</i>									
221	Hijiki (<i>Turbinaria fusiformis</i>)	16.80	8.1	1.71	56.8	néant nil	16.60	282	—	1.296
222	Kanten (<i>Gélose</i>)	20.10	2.3	0.13	72.5	»	2.90	308	—	0.368
223	Kombu (<i>Laminaria japonica</i>)	16.3	22.7	1.21	27.7	4.3	27.81	218	88.9	3.631
224	Mozuku (<i>Mesoglossia decipiens</i>)	73.9	0.7	0.37	0.6	—	24.36	9	17.1	0.111
225	Ogonori (<i>Gracillaria confervoides</i>)	83.5	2.3	0.19	11.5	—	2.48	57	2.2	0.363
226	Tororo Kombu (<i>Laminaria cichorioides</i>)	7.9	2.8	0.84	63.8	néant nil	24.70	281	—	0.450
227	Wakame (<i>Undaria pinnatifida</i>)	23.5	11.6	1.44	43.5	3.3	16.72	241	55.8	1.860

V. FRUITS,

Fruits (frais).										
237	Anzu (Abricot)	87.0	0.6	0.34	10.6	0.9	0.61	46	3.9	0.089
238	Banana (Banane)	81.3	1.3	0.22	13.0	3.5	20.65	61	4.6	0.210
239	Biwa (Néflier du Japon)	89.0	0.3	0.11	0.9	0.3	0.35	6	2.7	0.043
240	Budo (Raisin)	87.0	0.4	—	12.1	0.2	0.29	51	3.3	0.059
241	Buntan	94.3	0.6	0.09	4.4	0.4	0.23	21	4.3	0.094
242	Ichigo (Fraise)	94.5	0.6	0.21	3.4	0.9	0.41	18	2.5	0.094
243	Ichigiku (Figue)	89.5	1.1	0.19	6.6	2.0	0.62	33	6.3	0.168
244	Kaki	85.9	1.3	0.09	9.4	3.1	0.41	45	4.4	0.210
245	Kinkan (Cumquat)	84.3	1.2	0.20	9.6	3.7	0.51	46	6.0	0.190
246	Lemon (Citron)	92.0	0.7	0.8	5.2	0.6	0.72	32	5.9	0.107
247	Mikan (Mandarine)	87.1	0.9	0.25	10.9	0.4	0.38	51	4.0	0.140
248	Momo (Pêche)	93.5	0.6	0.05	4.9	1.5	0.30	23	2.6	0.102

AND SEAWEEDS (continued).

P ₂ O ₅	NaCl	Cendres — Ash		Alcalinité due à Alkalinity due to		CaO	Fe ₂ O ₃	Facteur de conversion en denrée alimentaire sèche Factor converting to dry food	Name of Food	No.
		Solubles dans l'eau Water-soluble	Insolubles dans l'eau Water-insoluble	la soude et la potasse soda and potash	la chaux et à la magnésie lime and magnesia					
Seaweeds (continued).										
—	1.68	8.62	7.94	—	4.0	1.971	0.026	1.202	Hijiki (<i>Turbinaria fusiformis</i>)	221
—	néant nil	0.65	2.25	—	—	0.560	0.007	1.252	Kanten (<i>Algar</i>)	222
0.552	13.39	19.40	8.41	32.0	56.9	1.019	0.063	1.195	Kombu (<i>Laminaria japonica</i>)	223
0.423	20.18	23.27	1.09	0.3	16.8	0.086	0.007	3.831	Mozuku (<i>Mesoglossa decipiens</i>)	224
—	trace	0.21	2.27	néant nil	2.2	0.713	0.080	6.061	Ogonori (<i>Gracillaria confervoides</i>)	225
—	12.50	19.65	5.05	—	—	1.300	—	1.086	Tororo Kombu (<i>Laminaria cichorioides</i>)	226
1.080	6.40	10.52	6.20	39.2	16.6	0.095	0.020	1.307	Wakame (<i>Undaria primatifida</i>)	227

NUTS AND SEEDS

										Fruits (Fresh).
0.006	néant nil	0.15	0.46	1.2	2.7	0.002	trace	7.69	Anzu (Apricot)	237
0.064	0.08	0.30	0.35	2.6	2.0	néant nil	0.001	5.35	Banana	238
néant nil	néant nil	0.14	0.21	1.4	1.3	0.020	0.001	9.09	Biwa (Loquat)	239
0.037	»	0.09	0.20	0.9	2.4	trace	0.003	7.69	Budo (Grape)	240
0.033	»	0.07	0.16	1.0	3.3	0.023	0.001	17.54	Buntan	241
trace	»	0.11	0.30	1.3	1.2	0.014	0.005	18.18	Ichigo (Strawberry)	242
0.042	0.05	0.46	0.16	5.1	1.2	0.100	0.005	9.49	Ichigiku (Fig)	243
0.041	néant nil	0.23	0.18	2.7	1.7	0.020	0.003	7.07	Kaki (Persimmon)	244
—	trace	0.21	0.30	2.4	3.6	0.088	0.008	6.58	Kinkan (Cumquat)	245
0.054	néant nil	0.15	0.57	1.0	4.9	0.056	0.012	12.50	Lemon	246
0.050	»	0.18	0.20	2.0	2.0	0.041	0.003	7.75	Mikan (Mandarin orange)	247
néant nil	»	0.11	0.19	1.4	1.2	0.002	0.002	15.38	Momo (Peach)	248

V. FRUITS, NUTS

Numéros	Nom de la denrée alimentaire	Eau — Water	Protéine Protein N X 6.25	Graisse — Fat	Hydrate de carbone Carbohydrate	Fibre	Cendres — Ash	Calories	Teneur en alcali Alkalivalue	Total de l'azote Total nitrogen
Fruits (rais) (suite.)										
249	Nashi (Poire)	86.7	0.4	0.02	11.7	0.6	0.55	50	1.8	0.060
250	Natsumikan (Citron chi- nois)	90.5	1.0	0.20	7.1	0.3	0.88	35	10.1	0.162
251	Oto (Cerise)	85.5	1.1	0.48	11.9	0.4	0.60	17	4.9	0.171
252	Pineapple (Ananas)	91.8	0.5	0.25	6.3	0.7	0.35	30	3.2	0.081
253	Ringo (Pomme)	89.8	0.3	0.07	8.9	0.7	0.24	28	2.8	0.050
254	Tarugaki (Kaki en con- serve)	85.2	0.5	0.09	12.9	1.0	0.40	55	26.6	0.080
255	Yuzu (Cédrat)	82.8	1.8	0.19	12.7	1.05	0.77	61	11.7	0.290
Fruits (secs).										
265	Hoshianzu (Abricot sec) . .	30.0	3.0	1.83	56.8	5.1	3.27	247	21.2	0.480
266	Hoshi Budo (Raisin sec) . .	21.2	2.6	6.62	66.7	1.0	1.90	346	15.3	0.410
267	Hoshi Gaki (Kaki sec) . . .	32.0	6.3	0.44	45.6	15.0	1.99	218	21.3	1.018
268	Hoshi Ichijiku (Figue sèche)	22.0	8.2	1.41	49.0	14.8	4.61	245	46.8	1.248
Noix et graines.										
271	Asanomi (Chênevis)	13.6	27.1	25.60	7.4	20.3	6.10	380	—	—
272	Ginnan (Fruit de capil- laire)	59.4	5.3	1.54	31.5	0.7	1.57	165	10.1	0.845
273	Goma (Kuro) (Sésame, noir)	6.3	20.7	43.0	21.5	—	8.50	573	—	3.312
274	Goma (Shiro) (Sésame, blanc)	5.9	21.9	50.0	15.4	—	6.75	618	—	3.504
275	Kuri (Châtaigne)	60.1	3.5	0.41	34.8	0.9	0.88	161	9.2	0.565
276	Kurumi (Noix)	4.1	27.2	60.30	5.2	0.9	2.27	582	—	4.358
277	Suikatame (Kuro) (Graines de melon d'eau, noires).	10.8	14.8	20.1	12.6	23.1	8.55	299	30.00	2.370
278	Suikatame (Shiro) (Grain- es de melon d'eau, blanches)	6.9	27.4	32.9	8.7	6.7	17.40	454	46.0	4.380

AND SEEDS (continued).

P ₂ O ₅	NaCl	Cendres — Ash		Alcalinité due à Alkalinity due to		CaO	Fe ₂ O ₃	Facteur de conversion en denrée alimentaire séchée Factor converting to dry food	Name of Food	No.
		Solubles dans l'eau Water-soluble	Insolubles dans l'eau Water-insoluble	la soude et à la potasse soda and potash	la chaux et à la magnésie lime and magnesia					
Fruits (Fresh) (continued)										
néant nil	néant nil	0.23	0.32	0.2	1.6	0.022	0.014	7.52	Nashi (Pear)	249
0.060	0.19	0.25	0.63	5.0	5.1	0.058	0.012	10.53	Natsumikan (Chinese lemon).	250
néant nil	néant nil	0.22	0.38	2.0	2.9	0.024	0.003	6.90	Oto (Cherry)	251
0.013	"	0.12	0.23	1.5	1.7	0.021	0.007	12.20	Pineapple	252
—	—	0.10	0.14	1.3	1.5	0.003	0.007	9.80	Ringo (Apple)	253
0.042	néant nil	0.25	0.15	20.9	5.7	0.080	0.005	6.77	Tarugaki (Persimmon, seasoned).	254
—	—	0.45	0.32	7.0	4.7	0.080	0.004	5.81	Yuzu (Citron)	255
Fruits (Dried).										
0.033	néant nil	0.79	2.48	6.5	14.7	0.011	0.002	1.391	Hoshianzu (Dried apricot)	265
0.220	"	0.43	1.47	4.0	11.3	0.093	0.008	1.269	Hoshi Budo (Raisin). . .	266
0.199	"	1.115	0.87	3.1	8.2	0.097	0.014	1.471	Hoshi Gaki (Dried persimmon).	267
0.310	0.37	3.42	1.19	37.9	8.9	0.742	0.037	1.282	Hoshi Ichijiku (Dried fig).	268
Nuts and Seeds.										
0.208	0.10	0.59	5.60	—	—	0.230	—	1.157	Asanomi (Hemp seed) . .	271
0.366	néant nil	0.56	1.01	6.7	3.4	néant nil	0.006	2.463	Ginnan (Fruit of maiden-hair)	272
—	—	—	—	—	—	—	0.019	1.067	Goma (Kuro) (Sesame, black).	273
—	—	—	—	—	—	—	0.017	1.063	Goma (Shiro) (Sesame, white)	274
0.182	néant nil	0.32	0.56	4.9	4.3	trace	0.022	2.500	Kuri (Chestnut)	275
0.112	—	—	—	—	—	0.13	0.010	1.040	Kurumi (Walnut)	276
2.008	5.80	5.85	2.70	néant nil	30.0	0.350	0.122	1.121	Suikatame (Kuro) (Watermelon seeds, black) . .	277
1.533	13.50	13.50	3.9	1.0	45.0	0.196	0.054	1.074	Suikatame (Shiro) (Watermelon seeds, white) . .	278

VI. VEGÉTA

Numéros	Nom de la denrée alimentaire	Pesanteur spécifique à 15° C. Specific gravity at 15° C.	Eau — Water	Protéine Protein N x 6.25	Graisse — Fat	Hydrate de carbone Carbohydrate	Fibre	Cendres — Ash	Calories	Teneur en alcali Alkalivalue	Total de l'azote Total nitrogen
280	Amanin Yu (Huile de lin)	0.9335	Le pourcentage d'eau n'est jamais supérieur à 0,01 % In no case greater than 0.01 per cent	néant nil	néant nil	néant nil	néant nil	—	Même quantité pour toutes les huiles For all oils the same	—	Négligeable Negligible
281	Daizu Yu (Huile de fève de soya)	0.9237									
282	Goma Yu (Huile de sésame)	0.9247									
283	Kaya Yu	0.9236									
284	Natañe Yu.	0.9153									
285	Olive Yu (Huile d'olive)	0.9160									
286	Rakkasei Yu (Huile d'arachide)	0.9138									
287	Tsubaki (Huile de camélia)	0.9101									
288	Yashi (Huile de copra)	At 23°C 0.9161									

VII. OTHER VEGE

290	Dempun Kata Kuri (Amidon de dent de chien)	—	16.6	0.9	néant nil	82.4	néant nil	0.60	340	néant nil	0.14
291	Dempun Kuzu (Amidon d'herbe à la flèche (arrow-root)	—	16.8	0.8	0.04	82.4	»	0.35	340	»	0.13
292	Kampyo (Écorce de courge)	—	33.7	7.6	0.13	56.9	1.0	0.73	266	6.9	1.22
293	Konnyaku (Éléphantope)	—	96.8	0.06	0.01	2.8	trace	0.37	12	5.1	0.01
294	Shiro Sato (Sucre de canne)	—	2.6	néant nil	néant nil	96.8	néant nil	0.55	397	néant nil	néant nil
295	Tensaito (Sucre de betterave)	—	1.1	»	»	98.8	»	0.13	405	1.3	0.06
296	Tomitsu (Mélasse)	—	4.6	»	»	93.2	trace	2.05	382	16.0	0.10

BLEND OILS

P ₂ O ₅	NaCl	Cendres — Ash		Alcalinité due à Alkalinity due to		CaO	Fe ₂ O ₃	Facteur de conversion en denrée alimentaire sèche Factor converting to dry food	Name of Food	No.
		Solubles dans l'eau Water-soluble	Insolubles dans l'eau Water-insoluble	la soude et à la potasse soda and potash	la chaux et à la magnésie lime and magnesia					
—	—	—	—	—	—	—	—	—	Amanin Yu (Linseed Oil).	280
									Daizu Yu (Soy bean oil) . .	281
									Goma Yu (Sesame oil) . .	282
									Kaya Yu	283
									Natane Yu.	284
									Olive Yu (Olive oil) . . .	285
									Rakkasei Yu (Pea nut oil)	286
									Tsubaki (Camelia oil) . .	287
									Yashi (Coconut oil) . . .	288

TABLE PRODUCTS

néant nil	0.20	0.30	0.30	néant nil	néant nil	néant nil	—	1.198	Dempun Kata Kuri (Starch from kata kuri).	290
»	néant nil	néant nil	0.35	»	»	»	—	1.201	Dempun Kuzu (Starch from kuzu).	291
—	0.07	0.46	0.27	3.9	3.0	trace	0.005	1.508	Kampyo (Gourd rind) . .	292
0.018	0.10	0.14	0.23	0.2	4.9	0.122	0.002	31.25	Konnyaku (Elephant foot)	293
néant nil	néant nil	néant nil	0.55	néant nil	néant nil	néant nil	néant nil	1.027	Shiro Sato (Cane sugar) .	294
»	»	»	0.13	»	1.3	»	0.005	1.011	Tensaito (Beet sugar) . .	295
»	0.45	0.75	1.30	1.0	15.0	0.476	0.010	1.048	Tomitsu (Molasses) . . .	296

Numéros	Nom de la denrée alimentaire	Eau — Water	Protéine Protein N X 6.25	Graisse — Fat	Hydrate de carbone Carbohydrate	Cendres — Ash	Calories	Teneur en alcali Alkali value	Total de l'azote Total nitrogen	Pesanteur spécifique Specific gravity
Lait et produits du lait.										
300	Tokyo (meilleure qualité) ¹	87.6	3.1	3.8	4.9	0.62	67	3.0	0.486	1.028
301	Tokyo (moyenne de dix échantillons)	88.5	2.9	3.1	4.9	0.62	61	2.6	0.454	1.030
302	Lait condensé	25.0	8.3	9.0	56.3	1.43	349	8.0	1.320	—
303	Lait en poudre	6.6	23.4	20.1	44.8	5.07	467	26.6	3.750	—
304	Beurre	11.7	0.8	86.5	néant nil	0.96	808	1.6	0.120	—
305	Fromage.	29.8	34.2	32.9	»	4.60	466	18.0	5.470	—

¹ Composition de 100 grammes de lait.

Numéros	Nom de la denrée alimentaire	Eau — Water	Protéine Protein N X 6.25	Graisse — Fat	Hydrate de carbone Carbohydrate	Cendres — Ash	Calories	Teneur en alcali Alkali value	Total de l'azote Total nitrogen
311	Blanc d'œuf	88.2	11.2	trace	—	0.65	46	4.6	1.790
312	Jaune d'œuf	52.6	16.0	30.0	—	1.45	345	néant nil	2.600
313	Total de la partie comestible	74.0	13.1	12.0	—	0.97	165	2.8	2.114

PRODUCTS

P ₂ O ₅	NaCl	Cendres — Ash		Alcalinité due à Alkalinity due to		CaO	Fe ₂ O ₃	Facteur de conversion en denrée alimentaire sèche Factor converting to dry food	Name of Food	No.
		Solubles dans l'eau Water-soluble	Insolubles dans l'eau Water-insoluble	la soude et à la potasse soda and potash	la chaux et à la magnésie lime and magnesia					
Milk and Milk Products.										
—	0.05	0.07	0.52	0.4	2.4	—	—	8.197	Tokyo (best) ¹	300
0.243	0.05	0.06	0.50	0.4	2.2	0.185	0.001	8.695	Tokyo (average of ten samples)	301
0.855	0.15	0.22	1.20	2.0	6.0	0.345	0.002	4.000	Condensed milk	302
1.625	0.33	0.67	4.40	3.3	23.3	1.260	0.005	1.071	Milk powder	303
trace	0.67	0.83	0.13	1.3	néant nil	0.028	néant nil	1.008	Butter	304
1.826	1.00	1.00	3.60	—	18.0	1.500	—	1.425	Cheese	305

¹ Composition of 100 grams of milk.

EGGS

P ₂ O ₅	NaCl	Cendres — Ash		Alcalinité due à Alkalinity due to		CaO	Fe ₂ O ₃	Facteur de conversion en denrée alimentaire sèche Factor converting to dry food	Name of Food	No.
		Solubles dans l'eau Water-soluble	Insolubles dans l'eau Water-insoluble	la soude et à la potasse soda and potash	la chaux et à la magnésie lime and magnesia					
0.034	0.26	0.50	0.15	4.0	0.6	0.019	0.007	8.474	White of egg	311
1.190	néant nil	0.21	1.14	néant nil	néant nil	0.203	0.0014	2.109	Yolk of egg	312
0.588	0.16	0.39	0.58	2.4	0.4	0.093	0.0011	3.846	Whole edible portion	313

X. MEAT ANI

Numéros	Nom de la denrée alimentaire	Eau — Water	Protéine Protein N X 6.25	Graisse — Fat	Hydrate de carbone Carbohydrate	Cendres — Ash	Calories	Teneur en alcali Alkalivalue	Total de l'azote Total nitrogen	Azote soluble dans l'eau Water-soluble nitrogen
Vianades.										
320	Bœuf	74.5	19.6	3.3	—	0.94	111	5.1	3.120	—
321	Poulet	71.8	19.5	7.8	—	0.96	153	5.2	3.140	—
322	Canard	71.8	19.8	7.4	—	1.03	150	4.6	3.163	0.471
323	Jambon	57.3	22.7	14.0	—	4.20	223	7.2	3.630	—
324	Viande de cheval	75.9	20.1	2.2	—	0.95	103	4.6	3.209	0.438
325	Pigeon	65.5	20.4	13.2	—	0.98	207	4.0	3.267	0.480
326	Porc	72.2	21.2	6.0	—	1.00	143	5.2	3.390	—
327	Tortue	84.1	14.9	0.24	—	0.99	63	2.0	2.382	0.480
328	Viande de baleine	73.9	22.5	2.46	—	0.88	115	3.9	3.597	0.531
Graisses d'animaux.										
335	Graisse de bœuf	néant nil	0.3	99.7	néant nil	néant nil	927	—	0.045	—
336	Saindoux	»	0.2	99.8	»	»	928	—	0.030	—
337	Margarine ¹	4.7	0.1	94.5	»	0.70	879	0.9	0.020	—

X.

Poissons de mer.										
345	Ainame (Truite de roche).	79.8	17.5	1.05	—	1.38	82	4.4	2.798	—
346	Alcaei (Raie épineuse)	79.8	21.8	0.98	—	2.29	99	7.3	3.490	—
347	Amadai (<i>Latilus Sinensis</i>)	77.8	17.8	2.44	—	2.18	96	3.9	2.847	0.84
349	Anago (Congre).	76.7	17.7	4.41	—	1.65	114	5.2	2.830	0.55
350	Anko (Baudroie)	85.0	12.8	0.57	—	0.94	58	3.7	2.043	0.55
351	Ara (<i>Nippon Spinus</i>)	76.7	20.7	1.00	—	1.48	94	6.7	3.310	0.44
352	Bora (Mulet gris)	70.4	20.0	7.76	—	1.06	154	5.9	3.201	0.66
353	Buri (Poisson jaune).	73.9	22.2	2.16	—	1.45	111	5.1	3.555	0.54
354	Fugu (Tétronon)	79.7	18.6	0.42	—	1.35	80	5.6	2.976	0.52
355	Hamo (<i>Muraenesox cine- reus</i>) (Murène cendrée).	76.2	17.9	5.55	—	1.29	125	3.4	2.863	0.44
356	Haze (Gobie).	79.5	18.7	1.11	—	1.65	87	6.4	2.990	0.72

¹ Graisse végétale surtout.

ANIMAL FAT

P ₂ O ₅	NaCl	Cendres — Ash		Alcalinité due à Alkalinity due to		CaO	Fe ₂ O ₃	Facteur de conversion en denrée alimentaire sèche Factor converting to dry food	Name of Food	No.
		Solubles dans l'eau Water-soluble	Insolubles dans l'eau Water-insoluble	la soude et à la potasse soda and potash	la chaux et à la magnésie lime and magnesia					
Meat.										
0.056	0.20	0.52	0.42	3.0	2.1	néant nil	—	3.922	Beef	320
—	0.29	0.79	0.17	4.5	0.7	trace	0.006	3.546	Chicken	321
0.688	0.25	0.78	0.42	2.7	1.9	0.020	0.005	3.546	Duck	322
0.508	—	3.67	0.53	2.6	4.6	—	0.009	2.342	Ham	323
—	trace	0.27	0.68	1.3	3.5	néant nil	0.003	4.149	Horseflesh	324
0.648	»	0.47	0.51	2.0	2.0	0.023	0.005	2.899	Pigeon	325
0.364	0.26	0.86	0.17	4.4	0.8	néant nil	0.004	3.597	Pork	326
0.500	0.15	0.28	0.71	1.4	0.6	0.218	0.003	6.289	Turtle.	327
0.684	0.17	0.25	0.63	1.1	2.8	0.021	0.019	3.831	Whale-Flesh	328
Animal Fat.										
—	—	—	—	—	—	—	—	1.000	Beef Suet	335
—	—	—	—	—	—	—	—	1.000	Lard	336
—	néant nil	néant nil	0.70	néant nil	0.9	néant nil	—	1.049	Margarine ¹	337

FISH

Sea Fish.										
0.572	0.26	0.57	0.81	1.9	2.5	0.139	0.010	4.950	Ainame (Rock trout) . .	345
1.245	0.22	1.27	1.02	4.4	2.9	0.400	0.006	4.950	Akabei (Sting-ray) . . .	346
0.555	0.38	0.57	1.61	2.6	1.3	0.591	0.005	4.496	Amadai (<i>Latilus Sinensis</i>)	347
0.533	0.79	1.03	0.62	1.7	3.5	0.178	0.006	4.292	Anago (Conger eel) . . .	349
0.326	0.22	0.54	0.40	1.8	1.9	0.032	0.020	6.666	Anko (Angler)	350
0.609	0.12	0.86	0.62	3.6	3.1	0.060	0.004	4.292	Ara (<i>Niphon spinosus</i>) .	351
0.510	0.36	0.59	0.47	4.4	1.5	0.060	0.006	3.381	Bora (Grey mullet) . . .	352
0.651	0.78	0.95	0.50	1.4	3.7	0.074	0.004	3.834	Buri (Yellow-fish). . .	353
0.688	0.32	1.12	0.23	4.5	1.1	0.028	0.005	4.927	Fugu (Globe-fish). . .	354
—	0.23	0.53	0.76	2.4	1.0	0.158	0.001	4.202	Hamo (<i>Muraenesox cine-</i> <i>reus</i>)	355
0.825	0.18	0.76	0.89	3.4	3.0	0.255	0.004	4.878	Haze (Goby)	356

¹ Mostly vegetable fat.

Numéros	Nom de la denrée alimentaire	Eau — Water	Protéine Protein N X 6.25	Graisse — Fat	Hydrate de carbone Carbohydrate	Cendres — Ash	Calories	Teneur en alcali Alkali value	Total de l'azote Total nitrogen	Azote soluble dans l'eau Water soluble nitrogen
Poissons de mer (suite).										
357	Hirame (Flétan)	79.5	18.6	0.62	—	1.25	82	5.3	2.976	1.129
359	Hobo (Trigle).	73.4	21.3	4.92	—	0.57	133	3.1	3.411	0.934
360	Ibodai.	76.6	15.1	6.92	—	1.57	114	5.6	2.416	0.599
361	Inada (Petit poisson jaune)	74.6	21.6	2.60	—	1.64	113	4.7	3.455	0.166
362	Isaki (<i>Paraprisli pomum</i> <i>trilinearatum</i>)	71.8	21.5	4.68	—	1.58	132	7.2	3.433	0.624
363	Ishimochi (<i>Sciæna Schlegli</i>)	79.9	13.2	5.33	—	0.58	104	2.2	2.108	0.686
364	Itoyori (<i>Nemipterus Sinen</i> <i>si</i>)	78.2	17.8	2.70	—	1.23	98	4.3	2.848	0.624
365	Iwashi (Sardine)	77.3	19.8	1.45	—	2.33	95	5.4	3.170	0.644
366	Kanagashira (<i>Lepidotrigla</i> <i>alata</i>)	76.4	19.7	2.88	—	2.14	108	8.0	3.150	1.031
367	Kamasu (<i>Sphyrana Japonica</i>)	67.9	21.9	5.00	—	4.88	136	18.3	3.507	0.704
368	Karei (Poisson plat)	74.9	18.5	4.80	—	4.81	121	3.6	2.957	0.891
370	Katsuo (Bonite).	60.7	25.9	11.03	—	1.59	209	4.7	4.142	0.771
371	Kawahagi (<i>Monacanthus cirrhifer</i>)	78.6	20.2	0.44	—	1.51	87	3.5	3.230	—
372	Kisu (<i>Sillago Japonica</i>)	80.9	17.0	1.11	—	1.17	80	4.2	2.920	0.541
373	Koaji (<i>Trachurus Japonicus</i>)	76.3	19.1	2.93	—	2.63	106	4.0	3.056	—
374	Kochi (Tête plate indienne).	78.6	20.2	0.69	—	1.72	99	5.9	3.230	0.60
375	Kodai ("Porgy", de la famille des "Sparidæ")	75.8	19.2	6.35	—	2.08	137	8.0	3.057	0.586
376	Konoshiro (Alose).	81.6	15.9	0.89	—	1.54	74	2.8	2.550	0.32
377	Kurodai (Daurade)	72.4	20.6	5.18	—	1.60	133	5.6	3.291	—
378	Maguro (Thon)	51.9	19.3	26.20	—	3.50	341	8.6	3.081	1.25
379	Managatsuo (<i>Pseudo clennius</i>)	74.5	18.2	5.45	—	1.98	125	5.8	2.912	0.66
380	Mebaru (<i>Sebastes Schlegeli</i>)	77.4	21.0	1.64	—	1.43	102	6.6	3.360	0.69
381	Mutsu (<i>Scombrops cheilodiptroides</i>) (Maquereau)	76.2	18.5	4.02	—	1.15	113	5.3	2.955	0.42
382	Nezumizame	62.4	13.4	24.15	—	0.85	—	3.9	2.145	0.59
383	Nishin (Hareng)	74.1	15.8	8.45	—	1.32	143	3.6	2.529	0.42
384	Okoze (<i>Minous Adamsi</i>)	81.5	17.0	0.36	—	1.19	73	5.1	2.726	—
385	Saba (Grand maquereau).	73.9	16.4	8.60	—	1.10	148	4.7	2.621	0.36
386	Samma (Espèce de brochet)	64.3	20.6	12.60	—	3.00	202	5.2	3.302	1.18

(continued).

P ₂ O ₅	Na Cl	Cendres — Ash		Alcalinité due à Alkalinity due to		Ca O	Fe ₂ O ₃	Facteur de conversion en denrée alimentaire sèche Factor converting to dry food	Name of Food	No.
		Solubles dans l'eau Water-soluble	Insolubles dans l'eau Water-insoluble	la soude et à la potasse soda and potash	la chaux et à la magnésie lime and magnesia					
Sea Fish (continued).										
3.524	0.29	0.92	0.33	3.7	1.6	néant nil	0.004	4.878	Hirame (Halibut)	357
3.397	0.27	0.29	0.28	2.4	0.7	0.022	0.003	3.765	Hobo (Gurnard)	359
3.692	0.61	0.74	0.83	2.5	3.1	0.253	0.006	4.266	Ibodai.	360
3.621	0.29	0.74	0.90	2.9	1.8	0.176	0.006	3.937	Inada (Young yellow-fish).	361
3.875	0.22	0.72	0.86	3.8	3.4	0.157	0.004	3.546	Isaki (<i>Parapristi pomum trilinealum</i>)	362
0.504	0.30	0.41	0.17	1.8	0.4	0.056	0.003	4.970	Ishimochi (<i>Sciæna Schlegli</i>)	363
0.451	0.24	0.59	0.64	2.8	1.5	0.113	0.013	4.587	Itoyori (<i>Nemipterus Sinenzi</i>)	364
0.479	0.07	1.52	0.81	3.4	2.0	0.218	0.014	4.405	Iwashi (Sardine)	365
0.810	0.24	0.49	1.65	2.0	6.0	0.609	0.004	4.237	Kanagashira (<i>Lepidotrigla alata</i>).	366
1.022	3.22	3.53	1.35	1.1	17.2	0.539	0.003	3.112	Kamasu (<i>Sphyrana Japonica</i>)	367
0.544	4.27	4.45	0.36	2.6	1.0	0.098	0.003	3.986	Karei (Flatfish).	368
0.910	0.51	0.75	0.84	1.2	3.5	0.232	0.006	2.545	Katsuo (Bonito)	370
0.547	0.25	0.87	0.64	1.2	2.3	0.105	0.005	4.673	Kawahagi (<i>Monocanthus eirrhifer</i>)	371
0.527	—	0.47	0.70	1.7	2.5	0.174	0.004	5.236	Kisu (<i>Sillago Japonica</i>) .	372
1.065	0.49	0.75	1.88	2.6	1.4	0.701	0.002	4.216	Koaji (<i>Trachurus Japonicus</i>)	373
3.778	0.17	0.70	1.02	3.0	2.9	0.278	0.006	4.673	Kochi (Indian flathead) .	374
3.605	1.26	1.44	0.63	3.6	4.4	0.081	0.020	4.125	Kodai (Porgy)	375
3.672	0.58	0.82	0.72	1.6	1.2	0.172	0.006	5.435	Konoshiro (Hickory shad)	376
3.376	0.39	0.93	0.67	3.7	1.9	0.100	0.006	3.623	Kurodai (Gilthead) . . .	377
0.812	0.84	1.34	1.16	5.6	3.0	0.373	0.007	2.080	Maguro (Tunny)	378
0.860	1.06	1.48	0.50	3.5	2.3	0.120	0.005	3.922	Managatsuo (<i>Pseudo ctenius</i>)	379
0.766	0.24	0.82	0.61	3.6	3.0	0.067	0.004	4.425	Mebaru (<i>Sebastes Schlegeli</i>).	380
0.592	0.13	0.58	0.57	2.9	2.4	0.074	0.005	4.202	Mutsu (<i>Scombrops cheilodiptroides</i>)	381
0.385	0.30	0.52	0.33	2.6	1.3	0.038	0.006	2.659	Nezumizame	382
0.644	0.30	0.64	0.68	2.3	1.3	0.143	0.005	3.861	Nishin (Herring)	383
0.567	0.41	0.72	0.47	2.8	2.3	0.113	0.003	5.405	Okoze (<i>Minous Adamsi</i>) .	384
0.541	0.31	0.47	0.63	2.4	2.3	0.120	0.013	3.837	Saba (Spanish mackerel).	385
0.607	2.07	2.32	0.68	2.9	2.3	0.227	0.010	2.801	Samma (Skipper)	386

Numéros	Nom de la denrée alimentaire	Eau — Water	Protéine Protein N × 6.25	Graisse — Fat	Hydrate de carbone Carbohydrate	Cendres — Ash	Calories	Teneur en alcali Alkalivalue	Total de l'azote Total nitrogen	Azote soluble dans l'eau Water-soluble nitrogen
Poissons de mer (suite).										
387	Same (Requin) (Voir Nezumizame)	—	—	—	—	—	—	—	—	—
388	Sawara (<i>Cybiium niphonicum</i>)	65.6	22.4	9.16	—	2.48	187	5.7	3.582	0.982
389	Sayori (Demi-bec, poisson de la famille des "Merimphidae")	78.0	18.6	2.10	—	1.85	96	6.2	2.960	—
391	Shitabirame (Sole)	79.0	17.5	1.83	—	2.02	88	5.2	2.800	0.567
392	Shirauo (<i>Salagichthys microdon</i>) (Blanchaille)	84.5	13.3	1.13	—	1.29	65	3.0	2.130	0.812
393	Suzuki (<i>Latolabrax japonicus</i>)	76.8	19.2	3.03	—	2.17	107	6.5	3.067	0.729
394	Tachiuo (Poisson-sabre)	64.0	16.6	18.20	—	1.30	237	5.1	2.656	0.488
396	Takasago (<i>Pseudo penens chrysopleuron</i>)	79.0	19.3	1.01	—	1.36	89	5.0	3.088	—
397	Tara (Morue)	74.7	21.7	0.91	—	1.41	98	5.0	3.476	0.761
398	Tobiuo (Poisson volant)	77.9	20.3	0.33	—	1.27	86	7.0	3.244	—
399	Wakasagi (Éperlan)	77.8	17.1	2.90	—	3.03	97	8.3	2.750	1.106
Poissons de rivière.										
402	Dojo (Loche)	79.8	14.8	1.24	—	3.28	72	9.7	2.365	0.497
403	Funa (Carpe Crussienne)	79.5	16.8	2.93	—	1.30	96	4.5	2.688	0.359
404	Koi (Carpe)	66.0	23.9	10.40	—	1.50	195	5.7	3.831	0.632
405	Namazu (Loup de mer)	77.3	18.3	2.25	—	1.35	96	5.0	2.929	—
406	Tanago (<i>Acheilognathus</i>)	77.7	18.3	1.64	—	2.52	90	7.6	2.931	0.552
407	Unagi (Eel) (Anguille)	46.6	13.4	38.88	—	0.84	417	2.7	2.137	—
408	Yatsume Unagi (Eel) (Lamproie)	67.6	13.1	18.86	—	0.74	229	3.3	2.095	0.481
Poisson séché ou salé.										
409	Gomame	63.2	27.4	1.20	—	7.07	124	16.7	4.380	—
410	Hidara	58.3	31.1	0.53	—	10.15	177	13.9	4.972	1.205
411	Hidara	21.8	58.0	1.52	—	18.80	252	28.0	9.280	2.505
412	Hoshi Ayu	8.9	55.4	27.11	—	10.30	479	20.7	8.865	1.462
413	Katsuobushi	18.3	70.6	11.26	—	3.85	394	—	11.270	—

continued).

P ₂ O ₅	Na Cl	Cendres — Ash		Alcalinité due à Alkalinity due to		Ca O	Fe ₂ O ₃	Facteur de conversion en denrée alimentaire sèche Factor converting to dry food	Name of Food	No.
		Solubles dans l'eau Water-soluble	Insolubles dans l'eau Water-insoluble	la soude et à la potasse soda and potash	la chaux et à la magnésie lime and magnesia					
Sea Fish (continued).										
—	—	—	—	—	—	—	—	—	Same (Shark) (<i>See Nezumizame</i>)	387
0.751	1.48	1.94	0.54	4.8	0.9	0.110	0.007	2.910	Sawara (<i>Cybiu niphonicum</i>)	388
0.595	0.93	1.11	0.74	1.7	4.5	0.173	0.010	4.545	Sayori (Halfbeak).	389
0.974	0.37	0.65	1.36	2.8	2.7	0.521	0.006	4.762	Shitabirame (Sole)	391
—	0.06	0.31	0.98	1.5	1.5	0.254	0.004	6.452	Shirauo (<i>Salagichthys microdon</i>)	392
0.520	1.04	1.16	1.01	4.2	2.3	0.378	0.004	4.316	Suzuki (<i>Lateolabrax japonicus</i>)	393
0.495	0.65	0.82	0.48	1.3	3.8	0.151	0.006	2.776	Tachiuo (Hairtail).	394
0.713	0.24	0.77	0.59	3.1	1.9	0.129	0.006	4.762	Takasago (<i>Pseudo penes chrysopleuron</i>)	396
0.596	0.50	0.58	0.83	2.7	2.3	0.220	0.006	3.945	Tara (Cod).	397
0.691	0.22	0.55	0.72	2.0	5.0	0.100	0.010	4.562	Tobiuo (Flying-fish).	398
1.554	0.11	0.41	2.62	2.2	6.1	1.055	0.007	4.505	Wakasagi (Surf smelt)	399
River Fish.										
1.587	néant nil	0.23	3.05	1.5	8.2	0.913	0.012	4.950	Dojo (Loach).	402
0.707	trace	0.35	0.95	1.9	2.6	0.216	0.006	4.878	Funa (Crussian Carp)	403
0.829	0.17	0.79	0.71	3.1	2.6	0.101	0.007	2.941	Koi (Carp).	404
0.695	0.06	0.80	0.55	3.3	1.7	0.083	0.007	4.405	Namazu (Catfish).	405
1.360	0.26	0.36	2.16	1.8	5.8	0.790	0.004	4.484	Tanago (<i>Acheilognathus</i>).	406
0.560	0.17	0.29	0.57	1.4	1.3	0.102	0.006	1.873	Unagi (Eel) (<i>Anguilla japonica</i>)	407
—	0.16	0.30	0.44	1.3	2.0	0.023	0.007	3.086	Yatsume Unagi (Eel) (<i>Lampetra japonica</i>)	408
Fish, Dried or Salted.										
2.080	3.12	3.77	3.30	4.7	12.0	1.267	0.034	2.717	Gomame.	409
1.313	8.15	8.18	1.97	1.8	13.1	0.560	0.011	2.398	Hidara	410
1.038	12.25	12.80	6.00	3.4	24.6	0.430	0.025	1.278	Hidara	411
—	néant nil	0.65	9.65	4.7	16.0	4.223	0.011	1.098	Hoshi Ayu.	412
1.150	"	1.65	2.20	—	—	—	—	1.254	Katsuoobushi	413

Numéros	Nom de la denrée alimentaire	Eau — Water	Protéine Protein N X 6.25	Graisse—Fat	Hydrate de carbone Carbohydrate	Cendres—Ash	Calories	Teneur en alcali Alkali value	Total de l'azote Total nitrogen	Azote soluble dans l'eau Water-soluble nitrogen
	Poisson séché ou salé (suite).									
415	Niboshi	17.8	58.7	4.28	—	19.75	281	—	9.390	—
416	Shiojake	57.3	27.7	6.7	—	7.30	175	7.6	4.430	—
417	Shirasuboshi	48.2	30.0	3.16	—	18.65	252	—	4.800	—
418	Surume	25.9	61.0	5.50	—	7.42	301	27.0	9.760	—
	Préparations de chair de poisson.									
421	Hanpen	78.1	7.8	0.07	12.1	1.89	82	4.4	1.255	0.434
422	Kamaboko	73.7	11.1	0.06	12.5	2.61	97	2.4	1.782	0.235
	Oufs de poisson.									
427	Hararago (Frai de mulet gris).	49.9	30.3	9.8	3.8	6.22	215	7.4	4.840	0.588
429	Karasumi (Frai de bora).	22.6	41.2	23.03	7.6	5.61	414	11.9	6.595	—
430	Tarako (Frai de morue) .	64.5	26.6	1.90	2.7	4.25	138	7.2	4.260	0.542
431	Shirako (Laitance de sau- mon)	84.2	13.1	2.10	néant nil	1.49	73	2.5	2.103	0.519
	Crustacés.									
433	Ise Ebi (Langouste) . . .	78.2	18.7	1.75	—	1.36	93	5.6	2.992	0.441
434	Kani (Crabe)	78.3	18.6	0.80	—	1.71	84	6.7	2.969	1.123
435	Shako (Crevette géante) .	83.8	12.7	1.10	—	1.62	62	6.3	2.330	0.550
436	Shiba Ebi (Homard) . . .	81.0	17.0	1.25	—	1.05	81	4.0	2.726	0.537
437	Hoshi Ebi (Homard séché)	41.7	40.9	4.10	—	14.40	288	11.5	6.540	1.360
	Mollusques bivalves.									
438	Akagai (<i>Arca inflata</i>) . .	83.8	11.9	0.35	3.7	0.72	65	3.2	1.800	0.411
439	Asari (<i>Tapes Philippina- rum</i>).	76.8	14.4	1.52	4.2	3.09	90	9.6	2.311	0.340

(continued).

P ₂ O ₅	Na Cl	Cendres — Ash		Alcalinité due à Alkalinity due to		Ca O	Fe ₂ O ₃	Facteur de conversion en denrée alimentaire sèche Factor converting to dry food	Name of Food	No.
		Solubles dans l'eau Water-soluble	Insolubles dans l'eau Water-insoluble	la soude et à la potasse soda and potash	la chaux et à la magnésie lime and magnesia					
Fish, Dried or Salted (continued).										
3.322	8.19	8.90	10.85	—	—	0.150	—	1.217	Niboshi	415
0.770	6.56	6.62	0.68	5.0	2.6	0.137	0.007	2.341	Shiojake	416
1.666	15.54	15.60	3.05	—	—	0.460	—	1.929	Shirasuboshi	417
0.325	1.00	2.12	5.30	10.0	17.0	—	1.385	1.350	Surume	418
Fish Meat Preparations.										
0.524	1.38	1.41	0.48	0.9	3.5	0.112	0.002	4.566	Hanpen	421
1.151	1.68	1.80	0.81	0.6	1.8	0.439	0.004	3.082	Kamaboko	422
Fish Eggs.										
2.192	4.41	4.41	1.81	1.4	6.0	0.142	0.008	1.996	Hararago (Roe of grey mullet)	427
0.888	4.57	4.93	0.68	9.6	2.3	néant nil	0.002	1.292	Karasumi (Roe of bora)	429
0.804	1.01	3.57	0.68	5.2	2.0	0.068	—	2.849	Tarako (Roe of cod)	430
1.050	trace	1.26	0.23	2.1	0.4	néant nil	0.001	6.329	Shirako (Salmon sperm)	431
Crustacea.										
0.359	0.70	0.78	0.58	3.3	2.3	0.098	0.004	4.588	Ise Ebi (Spiny lobster)	433
0.768	0.60	1.05	0.66	1.2	5.5	0.084	0.006	4.608	Kani (Crab)	434
0.429	0.39	0.61	1.01	0.8	5.5	0.328	0.004	6.173	Shako (Giant shrimp)	435
0.604	0.23	0.40	0.65	1.6	2.4	0.053	0.007	5.263	Shiba Ebi (Lobster)	436
1.496	10.73	11.05	3.35	4.5	7.0	0.980	0.019	1.715	Hoshi Ebi (Dried lobster)	437
Mollusca : Bivalves.										
0.318	0.03	0.13	0.59	0.7	2.5	0.057	0.009	6.173	Akagai (<i>Arca inflata</i>)	438
0.517	0.46	0.48	2.61	0.5	9.1	0.280	0.093	4.310	Asari (<i>Tapes Philippinorum</i>)	439

Numéros	Nom de la denrée alimentaire	Eau — Water	Protéine Protein N x 6.25	Graisse — Fat	Hydrate de carbone ¹ Carbohydrate ¹	Cendres — Ash	Calories	Teneur en alcali Alkali value	Total de l'azote Total nitrogen	Azote soluble dans l'eau Water-soluble nitrogen
Mollusques bivalves <i>(suite).</i>										
440	Bakagai (<i>Macra sulean- teneae</i>)	84.0	11.5	0.62	1.5	2.37	59	3.2	1.840	0.646
441	Hamaguri	82.4	11.5	0.87	3.7	1.48	70	4.4	1.840	0.618
442	Kaki (Huitre)	79.8	11.6	0.97	5.9	1.67	81	10.4	1.856	—
443	Mirugai (Mollusque bi- valve du genre Lec- traria)	82.7	12.5	0.30	0.2	4.33	55	13.4	2.060	0.596
444	Shijimi (<i>Corbicula læna</i>).	71.2	18.6	2.69	5.1	2.43	125	5.9	2.979	—
445	Torigai (Bucarde)	75.4	15.7	0.68	6.6	1.59	98	6.1	2.509	0.754
Mollusques monovalves										
447	Awabi (Oreille de mer)	77.8	20.0	0.40	0.5	1.27	88	5.7	2.033	—
448	Sazaé	74.5	19.3	0.63	4.2	1.43	102	7.3	3.091	1.130
449	Tanishi (Escargot aqua- tique)	78.2	15.9	0.72	2.6	2.64	72	39.3	2.540	—
Formes marines sans coquille.										
451	Iidako (<i>Octopus membra- naceous</i>)	83.8	12.6	0.92	1.2	1.50	65	5.0	2.020	0.701
452	Ika (Seiche)	81.4	15.9	1.44	—	1.22	79	3.2	2.543	0.760
453	Namako (Holothurie)	91.6	2.5	0.13	1.4	4.32	18	2.3	0.401	0.339
454	Tako (<i>Octopus oolopodia</i>).	77.9	17.7	0.97	1.8	1.58	89	7.4	2.832	0.728
455	Konowata (Entrailles de Namako, salées)	80.7	8.2	0.73	2.8	7.61	52	9.0	1.305	—
456	Shiokara (Plasma d'Iha, salé)	74.2	11.6	2.83	2.7	8.68	86	8.2	1.849	—
457	Uni (Œufs d'oursins, sa- lés)	44.4	25.1	6.30	5.4	18.83	163	13.6	4.012	—
458	Kurage	65.5	6.4	0.05	—	26.57	27	4.7	1.020	—

¹ D'après la différence.

(continued).

P ₂ O ₅	Na Cl	Cendres — Ash			Alcalinité due à Alkalinity due to		Ca O	Fe ₂ O ₃	Facteur de conversion en denrée alimentaire sèche Factor converting to dry food	Name of Food	No.
		Solubles dans l'eau Water-soluble	Insolubles dans l'eau Water-insoluble	la soude et à la potasse soda and potash	la chaux et à la magnésie lime and magnesia						
Mollusca : Bivalves (continued.)											
0.326	0.50	0.65	1.72	1.0	2.2	0.087	0.093	6.250	Bakagai (<i>Macra sulcaneana</i>)	440	
0.431	0.36	0.68	0.86	1.4	3.0	0.084	0.030	5.682	Hamaguri	441	
0.426	0.75	0.63	1.04	0.7	9.7	0.085	0.006	4.955	Kaki (Oyster)	442	
0.275	0.66	0.85	3.48	8.5	4.9	0.171	0.079	5.780	Mirugai (Otto shell) ¹	443	
0.674	0.11	0.25	2.18	0.2	5.7	0.338	0.127	3.472	Shijimi (<i>Corbicula lena</i>)	444	
0.579	0.49	0.62	0.97	1.2	4.9	0.052	0.025	4.065	Torigai (Cockle)	445	
Mollusca : Univalve.											
0.374	0.30	0.50	0.77	0.6	5.1	0.045	0.008	4.505	Awabi (Ear-shell)	447	
0.571	0.38	0.68	0.75	2.1	5.2	0.065	0.025	3.722	Sazae	448	
0.341	trace	0.12	2.52	0.9	38.4	1.430	0.029	4.587	Tanishi (Pond snail)	449	
Marine Forms without Shell.											
0.249	0.57	0.78	0.72	1.6	3.4	0.065	0.009	6.173	Iidako (<i>Octopus membranaceous</i>)	451	
0.427	0.37	0.58	0.64	1.2	2.0	0.048	0.007	5.373	Ika (<i>Cuttlefish</i>)	452	
0.121	1.93	2.14	2.18	0.1	2.2	0.154	0.112	11.900	Namako (Sea-cucumber)	453	
0.480	0.97	1.11	0.47	2.0	5.4	0.053	0.004	4.525	Tako (<i>Octopus octopodia</i>)	454	
0.422	6.50	6.78	0.83	0.4	8.6	trace	0.001	5.181	Konowata (Entrails of Namako, salted)	455	
0.330	7.82	7.90	0.78	0.8	7.4	0.049	0.005	3.876	Shiokara (Plasma of Ika, salted)	456	
1.211	16.74	16.80	2.03	1.3	12.3	0.467	0.015	1.799	Uni (Sea-urchins' eggs, salted)	457	
0.359	25.15	25.49	1.08	0.2	4.5	0.029	0.010	2.899	Kurage	458	

¹ By difference.

XII. CONDIMENTS,

Numéros	Nom de la denrée alimentaire	Eau — Water	Protéine Protein N x 6.25	Graisse — Fat	Hydrate de carbone Carbohydrate	Fibre	Cendres — Ash	Calories	Teneur en alcali Alkali value	Total de l'azote Total nitrogen
Condiments.										
461	Hamana Natto	38.1	25.9	12.44	9.2	1.5	12.90	260	24.8	4.150
462	Kiriboshi (Radis géant séché)	29.5	7.2	1.17	47.1	7.6	7.37	233	36.6	1.150
463	Misozuke	64.7	4.3	0.19	17.0	3.0	10.80	89	16.3	0.674
464	Narasuke	79.8	3.9	0.05	3.6	3.7	8.90	31	5.7	0.620
465	Shoyu.	68.2	6.1	néant nil	4.4	néant nil	21.30	43	14.3	0.982
466	Takuan (Radis confit) . .	78.1	1.7	0.30	5.7	0.9	13.30	33	14.6	0.270
467	Umeboshi (Prune confite)	78.9	0.5	1.33	5.2	0.6	13.50	36	3.1	0.277

Numéros	Nom de la boisson	Pesanteur spécifique Specific gravity	Eau — Water	Protéine Protein N x 6.25	Graisse — Fat	Hydrate de carbone Carbohydrate	Alcool — Alcohol	Cendres — Ash	Teneur en alcali Alkali value
Boissons.									
470	Amazake	—	77.6	2.0	0.10	10.2	—	0.14	néant nil
471	Bière	1.008	—	—	—	3.0	4.5	0.30	»
472	Mirin (Riz fermenté). . .	1.150	—	—	—	34.4	15.0	0.10	0.4
473	Sake (Vin de riz)	0.990	—	—	—	1.0	16.0	0.04	néant nil
474	Porto	1.047	—	—	—	13.0	24.0	0.22	1.1

BEVERAGES, ETC.

P ₂ O ₅	NaCl	Cendres — Ash		Alcalinité due à Alkalinity due to		CaO	Fe ₂ O ₃	Facteur de conversion en denrée alimentaire sèche Factor converting to dry matter	Name of Food	No.
		Solubles dans l'eau Water-soluble	Insolubles dans l'eau Water-insoluble	la soude et à la potasse soda and potash	la chaux et à la magnésie lime and magnesia					
Condiments.										
1.028	10.20	10.88	2.02	3.0	21.8	0.134	0.026	1.616	Hamana Natto	461
0.762	néant nil	3.08	4.29	18.3	18.3	0.554	0.030	1.418	Kiriboshi (Dried daikon)	462
0.346	9.58	9.83	0.92	0.7	15.6	0.134	0.012	2.833	Misozuke	463
0.286	2.70	2.78	0.60	0.4	5.3	0.059	0.003	4.950	Narazuke	464
0.563	19.00	19.00	2.30	1.3	13.0	0.215	0.008	3.145	Shoyu.	465
0.241	11.9	12.45	0.85	néant nil	14.6	trace	0.012	4.570	Takuan (Pickled radish)	466
trace	12.9	13.00	0.46	2.1	1.0	0.068	0.006	4.640	Umeboshi (Pickled plum)	467

Calories	Total de l'azote Total nitrogen	P ₂ O ₅	NaCl	Cendres — Ash		Alcalinité due à Alkalinity due to		CaO	Name of Beverage	No.
				Solubles dans l'eau Water-soluble	Insolubles dans l'eau Water-insoluble	la soude et à la potasse soda and potash	la chaux et à la magnésie lime and magnesia			
Beverages.										
92	0.314	0.185	néant nil	néant nil	0.14	néant nil	néant nil	néant nil	Amazake	470
44	0.171	0.025	»	»	0.30	»	»	0.056	Beer.	471
247	0.364	0.048	»	»	0.10	»	0.4	0.011	Mirin (Fermented rice).	472
114	0.338	0.75	»	»	0.04	»	néant nil	trace	Sake (Rice wine)	473
218	0.364	trace	0.15	0.20	0.02	0.8	0.3	0.028	Port Wine	474

Chapter V

THE COMPOSITION OF JAPANESE FOODS AS PURCHASED

The object of the following tables is to facilitate calculation of the amount of the various constituents of the food which are available in a given weight of the original food material as purchased. Where there is no waste, the figures are naturally the same as those of the composition of the edible part.

TABLE

THE CHEMICAL COMPOSITION OF

ROOT

Numéros	Nom de la nourriture alimentaire	a { Déchets Waste b { Comestible Edible		Eau-Water	Protéine Protein N x 6.25	Graisse — Fat	Hydrate de carbone Carbohydrate	Fibre	Cendres — Ash	Calories
145	Daikon (<i>Raphanus sativus</i>) (Radis japonais)		—	—	—	—	—	—	—	—
146	Gobo (<i>Arctium cappa</i>) (Bardane)		—	—	—	—	—	—	—	—
147	Jagoimo (<i>Solanum tuberosum</i>) (Pomme de terre)	{ a 10.0 { b 90.0	—	71.6	1.8	0.03	15.6	0.50	0.60	71
148	Jinenjo (<i>Dioscorea Japonica</i>) (Igname japonaise)	{ a 17.0 { b 83.0	—	59.7	0.9	0.15	21.1	0.19	0.88	92
149	Kabu (<i>Brassica campestris</i> , var. <i>rapifera</i>) (Navet)		—	—	—	—	—	—	—	—
150	Kikione (<i>Platycodon grandiflorum</i>) (Racine de kikio)		—	—	—	—	—	—	—	—
151	Kuwai (<i>Sagittaria sagittifolia</i>) (Flèche d'eau)	{ a 12.5 { b 87.5	—	59.6	3.8	0.20	22.2	0.3	1.2	108
152	Nagaimo (<i>Dioscorea batatas</i>) (Igname cultivée)	{ a 16.7 { b 83.3	—	62.2	2.2	0.13	17.6	0.5	0.7	83
153	Nataikoa (<i>Sagittaria sagittifolia</i>) (Flèche d'eau chinoise)	{ a 37.8 { b 62.2	—	52.3	0.9	0.03	6.4	1.7	0.8	31
154	Ninjin (<i>Daucus carota</i>) (Carrot)		—	—	—	—	—	—	—	—
155	Renkon (<i>Nelumbo nucifera</i>) (Racine de lotus indien)	{ a 19.7 { b 80.3	—	68.8	1.8	0.06	2.6	0.5	0.50	43
157	Satoimo (<i>Colocasia antiquorum</i>) (Taro)	{ a 23.1 { b 76.9	—	55.7	2.1	0.17	17.6	0.7	0.75	82

JAPANESE FOODS AS PURCHASED

VEGETABLES

Teneur en alcali Alkalivalue	Total de l'azote Total nitrogen	P ₂ O ₅	Na Cl	Cendres — Ash		Alcalinité due à Alkalinicity due to		Ca O	Fe ₂ O ₃	Name of Food	No.
				Solubles dans l'eau Water-soluble	Insolubles dans l'eau Water- insoluble	la soude et à la potasse soda and potash	la chaux et à la magnésie lime and magnesia				
—	—	—	—	—	—	—	—	—	—	Daikon (<i>Raphanus sativus</i>) (Japanese radish).	145
—	—	—	—	—	—	—	—	—	—	Gobo (<i>Arctium cappa</i>) (Burdock)	146
12.5	0.286	0.080	trace	0.37	0.23	3.0	9.5	néant nil	0.014	Jagoimo (<i>Solanum tuberosum</i>) (Potato)	147
7.1	0.141	0.064	0.07	0.65	0.23	5.8	1.3	0.027	0.012	Jinenjo (<i>Dioscorea japonica</i>) (Japanese yam)	148
—	—	—	—	—	—	—	—	—	—	Kabu (<i>Brassica campestris</i> , var. <i>Rapifera</i>) (Turnip).	149
—	—	—	—	—	—	—	—	—	—	Kikione (<i>Platycodon grandiflorum</i>) (Kikio root)	150
10.2	0.612	0.418	trace	0.87	0.33	7.5	2.7	trace	0.017	Kuwai (<i>Sagittaria sagittifolia</i>) (Arrowhead)	151
6.6	0.358	—	0.05	0.52	0.18	4.8	1.8	0.021	0.004	Nagaimo (<i>Dioscorea batatas</i>) (Cultivated yam)	152
5.1	0.137	—	0.12	0.51	0.29	3.6	1.5	0.010	0.014	Nataikoa (<i>Sagittaria sagittifolia</i>) (Chinese arrowhead)	153
—	—	—	—	—	—	—	—	—	—	Ninjin (<i>Daucus carota</i>) (Carrot)	154
5.7	0.292	0.160	0.22	0.35	0.15	2.2	3.5	0.022	0.006	Renkon (<i>Nelumbo nucifera</i>) (Indian lotus root).	155
8.9	0.331	0.067	néant nil	0.55	0.19	6.1	2.8	trace	0.004	Satoimo (<i>Colocasia antiquorum</i>) (Taro)	157

VEGETABLES (continued).

Teneur en alcali Alkali value	Total de l'azote Total nitrogen	P ₂ O ₅	Na Cl	Cendres — Ash		Alcalinité due à Alkalinity due to		Ca O	Fe ₂ O ₃	Name of Food	No.
				Solubles dans l'eau Water-soluble	Insolubles dans l'eau Water- insoluble	la soude et à la potasse soda and potash	la chaux et à la magnésie lime and magnesia				
7.2	0.166	0.114	»	0.34	0.34	3.0	3.3	»	0.005	Satsuma Imo (<i>Ipomœa batatas</i> , var. <i>edulis</i>) (Sweet potato)	158
—	—	—	—	—	—	—	—	—	—	Shoga (<i>Zingiber officinale</i>) (Ginger).	159
—	—	—	—	—	—	—	—	—	—	Takenoko (<i>Phyllostachys nunitis</i>) (Bamboo shoot).	160
—	0.134	0.091	trace	0.13	0.13	—	—	0.0037	—	Tamanegi (<i>Allium cepa</i>) (Onion)	161
10.0	0.673	0.118	0.23	0.86	0.19	8.1	1.9	0.061	0.006	Tororoimo (<i>Dioscorea batatas</i>) (Chinese Yam).	162
—	—	—	—	—	—	—	—	—	—	Udo (<i>Aralia cordata</i>) (Salad)	163
4.8	0.527	0.170	trace	0.32	0.50	1.5	3.3	0.084	0.004	Wasabi (<i>Eutremia wasabi</i>)	164
—	—	—	—	—	—	—	—	—	—	Yatsugashira (<i>Colocasia gigantea</i>)	165
7.7	0.632	0.245	trace	0.70	0.46	5.7	2.0	0.350	0.076	Yuri (<i>Lilii tigrinis radix</i>) (Lily root)	169

VEGETABLES.

5.4	0.182	0.035	0.06	0.35	0.30	3.6	1.8	néant nil	0.002	Kabocha (<i>Cucurbita moschata</i>) (Pumpkin)	194
—	—	—	—	—	—	—	—	—	—	Kikunohana (<i>Chrysanthemum sinense</i> , var. <i>hortense</i>) (Chrysanthemum flowers)	195
—	—	—	—	—	—	—	—	—	—	Kiuri (<i>Cucumis sativus</i>) (Cucumber)	196

Numéros	Nom de la denrée alimentaire	a { Déchets Waste		Eau — Water	Protéine Protein N × 6.25	Graisse — Fat	Hydrate de carbone Carbohydrate	Fibre	Cendres — Ash	Calories
		b { Comestible Edible								
197	Nasu (<i>Solanum melongana</i>) (Melongène)	{ a	5.5	87.9	1.2	0.2	3.0	0.8	0.61	23
		{ b	94.5							
199	Rakkyo (<i>Allium bakeri</i>) (Ail de Baker)		—	—	—	—	—	—	—	—
201	Shunjiku (<i>Chrysanthemum sinense</i>) (Feuilles de chrysanthème)		—	—	—	—	—	—	—	—
202	Suika (<i>Citrullus vulgaris</i>) (Melon d'eau)	{ a	36.0	61.4	0.3	0.10	2.0	0.1	0.13	1
		{ b	64.0							
204	Togan (<i>Benicasa cerifera</i>) (Courge)	{ a	27.5	81.1	0.2	0.02	1.0	0.2	0.10	5
		{ b	82.5							
205	Tomato (<i>Lycopersicon esculenta</i>) (Tomate)		—	—	—	—	—	—	—	—

FRUITS

237	Anzu (<i>Prunus armeniaca</i>) (Pruneau)	{ a	5.9	81.9	0.6	0.32	10.0	0.9	0.57	43
		{ b	94.1							
238	Banana (<i>Musa sapientium</i>) (Banane)	{ a	42.8	46.5	0.7	1.26	7.4	2.0	0.37	35
		{ b	57.2							
239	Biwa (<i>Eriobotrya japonica</i>) (Néflier du Japon)	{ a	40.7	52.8	0.2	0.07	0.5	0.2	0.21	4
		{ b	59.3							
240	Budo (<i>Vitis vinifera</i>) (Raisin)	{ a	10.0	78.0	0.4	néant nil	10.9	0.2	0.26	46
		{ b	90.0							
242	Ichigo (Fraise)	{ a	3.4	91.3	0.6	0.20	3.3	0.9	0.40	17
		{ b	96.6							
243	Ichijiku (<i>Ficus carica</i>) (Figue)		—	—	—	—	—	—	—	—
244	Kaki (<i>Disopyros kaki</i> , var. <i>domestica</i>) (Kaki)	{ a	20.0	68.7	1.0	0.07	7.5	2.4	0.33	36
		{ b	80.0							

VEGETABLES (continued).

Teneur en alcali Alkali value	Total de l'azote Total nitrogen	P ₂ O ₅	NaCl	Cendres — Ash		Alcalinité due à Alkalinity due to		CaO	Fe ₂ O ₃	Name of Food	No.
				Solubles dans l'eau Water-soluble	Insolubles dans l'eau Water- insoluble	la soude et à la potasse soda and potash	la chaux et à la magnésie lime and magnesia				
4.3	0.188	0.104	0.07	0.37	0.25	2.7	1.7	0.036	0.004	Nasu (<i>Solanum melongana</i>) (Egg plant)	197
—	—	—	—	—	—	—	—	—	—	Rakkyo (<i>Allium bakeri</i>) (Bakers' garlic)	199
—	—	—	—	—	—	—	—	—	—	Shunjiku (<i>Chrysanthemum sinense</i>) (Leaves of chrysanthemums)	201
1.3	0.045	0.005	néant nil	0.5	0.08	0.5	0.8	0.012	0.004	Suika (<i>Citrullus vulgaris</i>) (Water melon)	202
0.9	0.028	0.003	0.01	0.07	0.07	0.7	0.2	néant nil	0.001	Togan (<i>Benicasa cerifera</i>) (Gourd melon)	204
—	—	—	—	—	—	—	—	—	—	Tomato (<i>Lycoperium esculen- ta</i>) (Tomato)	205
3.7	0.084	0.006	néant nil	0.14	0.43	1.1	2.6	0.002	trace	Anzu (<i>Prunus armeniaca</i>) (Prune)	237
2.6	0.120	0.038	0.05	0.17	0.20	1.5	1.1	néant nil	0.001	Banana (<i>Musa sapien- tium</i>) (Banana)	238
1.6	0.026	néant nil	néant nil	0.08	0.13	0.8	0.8	0.012	0.001	Biwa (<i>Eriobotrya Japo- nica</i>) (Loquat)	239
3.0	0.053	0.033	néant nil	0.08	0.16	0.8	2.2	trace	0.003	Budo (<i>Vitis vinifera</i>) Grape	240
2.4	0.091	trace	néant nil	0.11	0.29	1.3	1.1	0.013	0.005	Ichigo (Strawberry)	242
—	—	—	—	—	—	—	—	—	—	Ichijiku (<i>Ficus carica</i>) (Fig)	243
3.5	0.168	0.033	néant nil	0.18	0.14	2.2	1.4	0.016	0.002	Kaki (<i>Disopyros kaki</i> , var. <i>domestica</i>) (Persimmon)	244

FRUITS, SOFT FRUITS,

Numéros	Nom de la denrée alimentaire	a { Déchets Waste		Eau — Water	Protéine Protein N × 6.25	Graisse — Fat	Hydrate de carbone Carbohydrate	Fibre	Cendres — Ash	Calories
		b { Comestible Edible								
245	Kinkan (<i>Fortunella Japonica</i>) (Cumquat)	{ a	12.5	73.7	1.1	0.18	8.4	3.2	0.45	42
		{ b	87.5							
246	Lemon (<i>Citrus medica</i>) (Citron)	{ a	36.4	58.5	0.5	0.50	3.3	0.4	0.46	20
		{ b	63.6							
247	Mikan (<i>Citrus aurantium</i>) (Mandarine)	{ a	23.6	66.5	0.7	0.19	8.3	0.3	0.29	39
		{ b	76.4							
249	Nashi (<i>Pirus serotina</i>) (Poire)	{ a	6.0	81.5	0.4	0.02	11.0	0.6	0.52	47
		{ b	94.0							
253	Natsumikan (<i>Citrus aurantium</i> subsp. <i>Sinensis</i>) (Citron chinois)	{ a	42.4	52.1	0.6	0.16	4.1	0.2	0.51	20
		{ b	57.5							
254	Oto (Cerise)	{ a	11.3	75.8	1.0	0.43	10.6	0.4	0.53	15
		{ b	88.7							
255	Pineapple (Ananas)	{ a	21.2	72.3	0.4	0.20	5.0	0.6	0.28	24
		{ b	78.8							
256	Ringgo (<i>Malus pumila</i>) (Pomme)	{ a	5.0	85.3	0.3	0.07	6.1	0.7	0.23	27
		{ b	95.0							
257	Tarugaki (Kaki conservé dans une barrique à vin)		—	—	—	—	—	—	—	—
258	Yuzu (<i>Citrus aurantium</i> subsp. <i>Funos</i>) (Cédrat)	{ a	52.7	39.2	0.9	0.09	6.0	0.8	0.36	29
		{ b	47.3							
271	Asanomi (<i>Cannabis sativa</i>) (Chênevis)		—	—	—	—	—	—	—	—
272	Ginnan (<i>Ginkgo biloba</i>) (Fruit de capillaire)	{ a	15.1	50.4	4.5	1.31	26.7	0.6	1.33	140
		{ b	84.9							
275	Kuri (<i>Castanea pubinervis</i>) (Châtaigne)	{ a	14.5	51.4	3.0	0.35	29.8	0.8	0.75	138
		{ b	85.5							
276	Kurumi (<i>Fuglans sieboldiana</i>) (Noix)	{ a	55.0	1.9	12.2	27.1	2.3	0.4	1.02	262
		{ b	45.0							

* Quand on a rejeté l'écorce.

((continued)).

Teneur en alcali Alkalifvalue	Total de l'azote Total nitrogen	P ₂ O ₅	NaCl	Cendres — Ash		Alcalinité due à Alkalinity due to		CaO	Fe ₂ O ₃	Name of Food	No.
				Solubles dans l'eau Water-soluble	Insolubles dans l'eau Water- insoluble	la soude et à la potasse soda and potash	la chaux et à la magnésie lime and magnesia				
5.3	0.166	—	trace	0.18	0.26	2.1	3.2	0.077	0.014	Kinkan (<i>Fortunella japonica</i>) (Kumquat) . . .	245
3.8	0.068	0.033	néant nil	0.10	0.36	0.6	3.2	0.034	0.007	Lemon (<i>Citrus medica</i>) (Lemon).	246
3.1	0.107	0.038	»	0.14	0.15	1.5	1.5	0.031	0.002	Mikan (<i>Citrus aurantium</i>) (Mandarin orange) . .	247
1.7	0.056	néant nil	»	0.22	0.30	0.2	1.5	0.020	0.013	Nashi (<i>Pirus serotina</i>) (Pear).	249
5.8	0.093	0.036	0.11	0.14	0.36	2.9	2.9	0.034	0.007	Natumikan (<i>Citrus aurantium</i> subsp. <i>Sinensis</i>) (Chinese citron). . . .	253
4.4	0.156	néant nil	néant nil	0.20	0.33	1.8	2.6	0.022	0.003	Oto (Cherry)	254
2.5	0.064	0.010	»	0.09	0.19	1.2	1.3	0.017	0.006	Pineapple	255
2.7	0.048	—	—	0.10	0.13	1.2	1.4	0.003	0.007	Ringo (<i>Malus pumila</i>) (Apple)	256
—	—	—	—	—	—	—	—	—	—	Tarugaki (Persimmon seasoned in wine cask).	257
5.5	0.137	—	—	0.21	0.15	3.3	2.2	0.038	0.002	Yuzu (<i>Citrus aurantium</i> , subsp. <i>Funos</i>) (Citron).	258
—	—	—	—	—	—	—	—	—	—	Asanomi (<i>Cannabis sativa</i>) (Hempseed)	271
8.6	0.717	0.311	néant nil	0.48	0.86	5.7	2.9	néant nil	0.005	Ginnan (<i>Gingko biloba</i>) (Maidenhair fruit). . .	272
7.9	0.483	0.156	»	0.27	0.48	4.2	3.7	trace	0.019	Kuri (<i>Castanea pubinervis</i>) (Chestnut)	275
—	1.961	0.050	—	—	—	—	—	0.06	0.005	Kurumi (<i>Juglans sieboldiana</i>) (Walnut).	276

¹ When peel is rejected.

FISH

Numéros	Nom de la denrée alimentaire			Eau — Water	Protéine Protein N X 6.25	Graisse — Fat	Cendres — Ash	Calories	Teneur en alcali Alkali value	Total de l'azote Total nitrogen
		a { Déchets Waste	b { Comestible Edible							
Poissons de mer.										
345	Ainame (<i>Hexagrammos otaki</i>) (Truite de roche)	{ a	50.0	39.9	8.8	0.53	0.69	41	2.2	1.399
		{ b	50.0							
346	Akaei (<i>Dasyatis akaei</i>) (Raie épineuse)	{ a	29.5	56.3	15.4	0.69	1.61	70	5.1	2.460
		{ b	70.5							
347	Amadai (<i>Latilus sinensis</i>).	{ a	19.6	62.6	14.3	1.96	1.75	77	3.1	2.229
		{ b	80.4							
349	Anago (<i>Congrellus anago</i>) (Congre).	{ a	33.3	51.2	11.8	2.94	1.10	76	3.5	1.887
		{ b	66.7							
350	Anko (<i>Lophinis selegirus</i>) (Baudroie)	{ a	38.5	52.3	7.9	0.35	0.58	36	2.3	1.256
		{ b	61.5							
351	Ara (<i>Nippon spinosus</i>)	{ a	12.3	67.3	18.2	0.87	1.30	82	5.9	2.902
		{ b	87.7							
352	Bora (Mulet gris)	{ a	37.0	44.4	12.6	4.89	0.67	97	3.7	2.016
		{ b	63.0							
353	Buri (<i>Seriola radiata</i>) (Poisson jaune)	{ a	—	73.9	22.2	2.16	1.45	111	5.1	3.555
		{ b	100.0							
354	Fugu (Tétronon)	{ a	33.0	53.4	12.5	0.28	0.91	54	3.8	1.994
		{ b	67.0							
355	Hamo (Murène cendrée)	{ a	46.7	40.6	9.5	2.96	0.69	67	1.8	1.526
		{ b	53.3							
356	Haze (<i>Acantho globius flavimanus</i>) (Gobie)	{ a	54.5	36.2	8.5	0.50	0.75	40	2.9	0.905
		{ b	45.5							
357	Hirame (<i>Paralichthys olivaceus</i>) (Flétan).	{ a	—	79.5	18.6	0.62	1.25	82	5.3	2.976
		{ b	100.0							
358	Hishiko (<i>Engraulis japonicus</i>) (Anchois).		—	—	—	—	—	—	—	—
359	Hobo (<i>Chelidonichthys kumi</i>) (Rascasse)	{ a	23.3	56.3	16.3	3.77	0.44	102	2.4	2.616
		{ b	76.7							
360	Ibodai (<i>Psenes anomalis</i>) (Ebodai).	{ a	20.2	61.1	11.2	5.52	1.25	97	4.5	1.792
		{ b	79.8							
361	Inada (<i>Seriola quinque radiata</i>) (Petit poisson jaune).	{ a	18.2	61.0	17.7	2.12	1.34	92	3.8	2.826
		{ b	81.8							

FISH

Azote soluble dans l'eau Water-soluble nitrogen	P ₂ O ₅	NaCl	Cendres — Ash		Alcalinité due à Alkalinity due to		CaO	Fe ₂ O ₃	Name of Food	No.
			Solubles dans l'eau Water-soluble	Insolubles dans l'eau Water- insoluble	la soude et à la potasse soda and potash	la chaux et à la magnésic lime and magnesia				
Sea Fish.										
—	0.286	0.13	0.29	0.40	1.0	1.2	0.070	0.005	Ainame (<i>Hexagraminos Otaki</i>) (Rock trout) . . .	345
—	0.877	0.16	0.90	0.72	3.1	2.0	0.282	0.004	Akaci (<i>Dasyatis akaci</i>) (Stingray)	346
0.683	0.446	0.31	0.46	1.29	2.1	1.1	0.475	0.004	Amadai (<i>Latilus sinensis</i>)	347
0.367	0.355	0.53	0.69	0.41	1.1	2.3	0.119	0.004	Anago (<i>Congrellus anago</i>) (Conger eel)	349
0.343	0.200	0.14	0.33	0.24	1.1	1.2	0.020	0.012	Anko (<i>Lophinis setegirus</i>) (Angler)	350
0.389	0.534	0.11	0.75	0.54	3.2	2.7	0.053	0.004	Ara (<i>Nippon spinosus</i>) . .	351
0.420	0.321	0.23	0.37	0.30	2.8	0.9	0.038	0.004	Bora (Grey mullet) . . .	352
0.548	0.692	0.61	0.74	0.83	2.5	3.1	0.253	0.006	Buri (<i>Seriola radiata</i>) (Yellow fish)	353
0.354	0.461	0.21	0.75	0.15	3.1	0.7	0.019	0.003	Fugu (<i>Tetrodon</i>) (Globe fish)	354
0.236	0.918	0.13	0.28	0.41	1.3	0.5	0.084	0.002	Hamo (<i>Mureanesox cinerius</i>)	355
0.332	0.375	0.08	0.35	0.41	1.5	1.4	0.116	0.002	Haze (<i>Acantho globius flavimanus</i>) (Goby) . .	356
1.129	0.524	0.29	0.92	0.33	3.7	1.6	néant nil	0.004	Hirame (<i>Paralichthys alivacetus</i>) (Halibut) . . .	357
—	—	—	—	—	—	—	—	—	Hishiko (<i>Engraulis japonicus</i>) (Anchovy) . . .	358
0.716	0.304	0.21	0.22	0.21	1.8	0.5	0.017	0.002	Hobo (<i>Chelidonichthys kumi</i>) (Gurnard) . . .	359
0.478	0.552	0.49	0.59	0.66	2.0	2.5	0.202	0.005	Ibodai (<i>Psenes anomalis</i>) (Ebodai)	360
0.135	0.508	0.24	0.61	0.74	2.4	1.5	0.144	0.005	Inada (<i>Seriola quinque radiata</i>) (Young yellow fish)	361

Numéros	Nom de la denrée alimentaire			Eau — Water	Protéine Protein N x 6.25	Graisse — Fat	Cendres — Ash	Calories	Teneur en alcali Alkali value	Total de l'azote Total nitrogen
		a { Déchets Waste	b { Comestible Edible							
	Poissons de mer (suite).									
362	Isaki (<i>Parapristi pomum trilineatum</i>)	{ a	28.8							
		{ b	71.2	51.1	15.3	3.33	1.13	94	5.1	2.444
363	Ishimochi (<i>Sciæna schlegli</i>)	{ a	20.8							
		{ b	79.2	63.3	10.5	4.22	0.46	82	1.7	1.669
364	Itoyori (<i>Nemipterus sinensis</i>)	{ a	41.2							
		{ b	58.8	46.0	10.5	1.58	0.72	58	2.5	1.675
365	Iwashi (<i>Clupea melanosticta</i>) (Sardine)	{ a	39.6							
		{ b	60.4	46.7	12.0	0.88	1.41	57	3.3	1.914
366	Kamasu (<i>Sphyrana japonica barraçudas</i>)	{ a	—							
		{ b	100.0	67.9	21.9	5.00	4.88	136	18.3	3.505
367	Kanagashira (<i>Lepidotrigla alata</i>)	{ a	64.0							
		{ b	36.0	27.5	7.1	1.04	0.77	39	2.9	1.854
368	Katsuo (<i>Katsuwonus pelamis</i>) (Bonite)	{ a	29.5							
		{ b	70.5	42.8	18.3	7.78	1.12	147	3.3	2.920
370	Karei (<i>Karenis bicoratus</i>) (poisson plat)	{ a	5.8							
		{ b	94.2	70.6	17.4	4.20	4.53	114	3.4	2.785
371	Kawahagi (<i>Monocanthus cirrhifer</i>)	{ a	63.6							
		{ b	36.4	28.6	7.4	0.16	0.55	32	1.3	1.175
372	Kisu (<i>Sillago japonica</i>)	{ a	—							
		{ b	100.0	80.9	17.0	1.11	1.17	80	4.2	2.270
373	Koaji (<i>Trachurus japonicus</i>)	{ a	21.7							
		{ b	78.3	59.7	15.0	2.29	2.06	83	3.1	2.240
374	Kochi (<i>Platycephalus indicus</i>) (Tête plate indienne)	{ a	49.5							
		{ b	50.5	39.7	10.2	0.35	0.87	50	3.0	1.630
375	Kodai (<i>Pagrus major</i>) ("Porgy", de la famille des sparidæ)	{ a	24.4							
		{ b	75.6	57.3	14.5	4.80	1.57	104	6.0	2.311
376	Konoshiro (<i>Konosirus punctatus</i>) (Alose)	{ a	22.8							
		{ b	77.2	63.0	12.3	0.69	1.19	57	2.2	1.968
377	Kurodai (<i>Sparus latus</i>) (Daurade)	{ a	57.8							
		{ b	42.2	30.6	8.7	2.19	0.68	56	2.4	1.388
378	Maguro (<i>Thynnus orientalis</i>) (Thon)	{ a	—							
		{ b	100.0	51.9	19.3	26.20	3.50	341	8.6	3.081

(continued).

Azote soluble dans l'eau Water-soluble nitrogen	P ₂ O ₅	NaCl	Cendres — Ash		Alcalinité due à Alkalinity due to		CaO	Fe ₂ O ₃	Name of Food	No.
			Solubles dans l'eau Water-soluble	Insolubles dans l'eau Water- insoluble	la soude et à la potasse soda and potash	la chaux et à la magnésie lime and magnesia				
Sea Fish (continued).										
0.444	0.623	0.16	0.51	0.62	2.7	2.4	0.112	0.005	Isaki (<i>Parapristsi pomum trilineatum</i>)	362
0.546	0.399	0.24	0.32	0.13	1.4	0.3	0.044	0.003	Ishimochi (<i>Sciæna schlegli</i>)	363
0.366	0.265	0.14	0.34	0.38	1.7	0.8	0.066	0.008	Itoyori (<i>Nemipterus sinensis</i>)	364
0.387	0.289	0.04	0.92	0.49	2.1	1.2	0.132	0.008	Iwashi (<i>Clupea melanos- tilca</i>) (Sardine)	365
0.709	1.022	3.22	3.53	1.35	1.1	17.2	0.539	0.003	Kamasu (<i>Sphyryana Japo- nica barracudas</i>)	366
0.372	0.292	0.09	0.18	0.59	0.7	2.2	0.219	0.001	Kanagashira (<i>Lepido- trigla alata</i>)	367
0.549	0.641	0.36	0.53	0.59	0.8	2.5	0.164	0.004	Katsuo (<i>Katsuwomus pe- lamys</i>) (Bonito)	368
0.847	0.512	2.33	4.20	0.33	2.5	0.9	0.092	0.003	Karei (<i>Karems bicoratus</i>) (Flat fish)	370
0.315	0.199	0.09	0.32	0.23	0.4	0.9	0.038	0.002	Kawahagi (<i>Monocanthus cirrhifer</i>)	371
0.546	0.527	—	0.47	0.70	1.7	2.5	0.174	0.004	Kisu (<i>Sillago Japonica</i>) .	372
0.734	0.834	0.38	0.59	1.47	2.0	1.1	0.549	0.001	Koaji (<i>Trachurus Japo- nicus</i>)	373
0.307	0.393	0.09	0.35	0.52	1.5	1.5	0.140	0.003	Kochi (<i>Platycephalus in- dicus</i>) (Indian flathead)	374
0.438	0.457	0.95	1.09	0.48	2.7	3.3	0.061	—	Kodai (<i>Pagrus major</i>) (Porgy)	375
0.253	0.519	0.45	0.63	0.56	1.2	1.0	0.133	0.005	Konoshito (<i>Konosirus punc- tatus</i>) (Hickory Shad) .	376
0.234	0.159	0.17	0.39	0.29	1.6	0.8	0.042	0.003	Kurodai (<i>Sparus latus</i>) (Gilthead)	377
1.250	0.812	0.84	1.34	1.16	5.6	3.0	0.373	0.007	Maguro (<i>Thynnus orien- talis</i>) (Tunny)	378

Numéros	Nom de la denrée alimentaire			Eau — Water	Protéine Protein N x 6.25	Graisse — Fat	Cendres — Ash	Calories	Teneur en alcali Alkali value	Total de l'azote Total nitrogen
		a { Déchets Waste	b { Comestible Edible							
	Poissons de mer (suite).									
379	Managatsuo (<i>Pseudo clennius percoides</i>)	{ a	14.6							
		{ b	85.4	63.3	15.5	4.63	1.68	106	4.9	2.475
380	Mebaru (<i>Sebastes schlegelii</i>)	{ a	53.5							
		{ b	46.5	36.0	9.8	0.76	0.67	47	3.1	1.562
381	Mutsu (<i>Scombrops. cheilodiptroides</i>) (Maquereau)	{ a	28.8							
		{ b	71.2	54.3	13.2	2.86	0.82	81	3.8	2.103
383	Nishin (<i>Clupeis harengus</i>) (Hareng).	{ a	39.1							
		{ b	60.9	45.1	9.6	5.10	0.80	87	2.2	1.546
384	Okoze (<i>Minious Adamsi</i>).	{ a	65.6							
		{ b	34.4	28.0	5.8	0.12	0.41	35	1.8	0.938
385	Saba (<i>Scomber Japonicus</i>) (Grand maquereau)	{ a	2.2							
		{ b	97.8	72.2	16.0	8.40	1.10	145	4.6	2.563
386	Samma (<i>Cololabis saino</i>) (Espèce de brochet)	{ a	14.9							
		{ b	85.1	54.7	17.5	10.70	2.55	172	4.4	2.810
388	Sama (<i>Lamna cornubica</i>) (Requin).	{ a	—							
		{ b	100.0	62.4	13.4	24.20	0.85	280	3.9	2.145
389	Sawara (<i>Cybiium niphonicum</i>).	{ a	—							
		{ b	100.0	65.6	22.4	9.16	2.48	187	5.7	3.582
390	Sayori (<i>Hyporamphus sayori</i>) (Demi-bec) (Poisson de la famille des "Hemiramphidæ")	{ a	29.2							
		{ b	70.8	62.3	13.2	1.49	1.31	68	4.4	2.095
391	Shitabirame (<i>Rhinoplagusia Japonica</i>) (Sole).	{ a	20.2							
		{ b	79.8	63.0	13.9	1.46	1.61	70	4.2	2.234
392	Shirauo (<i>Salagichthys microdon</i>) (Blanchaille).	{ a	—							
		{ b	100.0	84.5	13.3	1.13	1.29	65	3.0	2.133
393	Suzuki (<i>Lateolabrax Japonicus</i>)	{ a	27.1							
		{ b	62.9	48.3	12.1	1.91	1.36	67	4.1	1.923
394	Tachiuo (<i>Griechinurus Japonicus</i>) (Poisson-sabre)	{ a	16.0							
		{ b	84.0	53.8	13.9	15.30	1.09	199	4.3	2.233
396	Takasago	{ a	65.3							
		{ b	34.7	27.4	6.7	0.35	0.47	31	1.7	1.072
397	Tara (<i>Pollachinus brandli</i>) (Morue)	{ a	—							
		{ b	100.0	74.7	21.7	0.91	1.41	98	5.0	3.477
398	Tobiuo (<i>Cypelurus agoo</i>) (Poisson volant)	{ a	33.3							
		{ b	66.7	51.9	13.5	0.22	0.85	55	4.7	2.160
399	Wakasagi (<i>Hypomesus olidus</i>) (Eperlan)	{ a	—							
		{ b	100.0	77.8	17.1	2.90	3.03	97	6.9	2.740

ontinued).

Azote soluble dans l'eau Water-soluble nitrogen	P ₂ O ₅	NaCl	Cendres — Ash		Alcalinité due à Alkalinity due to		CaO	Fe ₂ O ₃	Name of Food	No.
			Solubles dans l'eau Water-soluble	Insolubles dans l'eau Water- insoluble	la soude et à la potasse soda and potash	la chaux et à la magnésie lime and magnesia				
Sea Fish (continued).										
0.566	0.731	0.90	1.26	0.42	3.0	1.9	0.011	0.004	Managatsuo (<i>Pseudo clennius percoides</i>)	379
0.322	0.356	0.12	0.38	0.28	1.7	1.4	0.031	0.002	Mebaru (<i>Sebastes schlegeli</i>).	380
0.303	0.422	0.10	0.41	0.41	2.1	1.7	0.053	0.004	Mutsu (<i>Scombrops cheilodipteroïdes</i>) (Mackerel)	381
0.261	0.392	0.18	0.39	0.41	1.4	0.8	0.087	0.003	Nishin (<i>Clupeis harengus</i>) (Herring)	383
0.190	0.195	0.14	0.25	0.16	1.0	0.8	0.039	0.001	Okoze (<i>Minious Adamsi</i>).	384
0.352	0.138	0.30	0.46	0.62	2.3	2.3	0.117	0.013	Saba (<i>Scomber Japonicus</i>) (Spanish mackerel)	385
1.006	0.517	1.76	1.97	0.53	2.4	2.0	0.193	0.009	Samma (<i>Cololabis saino</i>) (Skipper)	386
0.592	0.385	0.30	0.52	0.33	2.6	1.3	0.038	0.006	Same (<i>Lamna cornubica</i>) (Shark)	388
0.982	0.751	1.48	1.94	0.54	4.8	0.9	0.110	0.007	Sawara (<i>Cybiu niphonicum</i>)	389
—	0.421	0.66	0.79	0.52	1.2	3.2	0.122	0.008	Sayori (<i>Hyporampus sayori</i>) (Half-beak).	390
0.452	0.777	0.30	0.52	1.09	2.0	2.2	0.416	0.005	Shitabirame (<i>Rhinoplagusia Japonica</i>) (Sole).	391
0.812	—	0.06	0.31	0.98	1.5	1.5	0.254	0.004	Shirauo (<i>Salagichthys microdon</i>) (Whitebait)	392
0.458	0.327	0.65	0.72	0.64	2.6	1.5	0.238	0.003	Suzuki (<i>Lateolabrax Japonicus</i>)	393
0.410	0.416	0.55	0.67	0.42	2.6	1.7	0.108	0.005	Tachiuo (<i>Griechinurus Japonicus</i>) (Hairtail)	394
—	0.247	0.08	0.27	0.20	1.1	0.6	0.045	0.002	Takasago	396
0.761	0.596	0.50	0.58	0.83	2.7	2.3	0.220	0.006	Tara (<i>Pollachinus brandti</i>) (Cod)	397
—	0.460	0.15	0.58	0.27	1.4	3.3	0.066	0.006	Tobiuo (<i>Cypelurus agoo</i>) (Flying fish)	398
1.106	1.554	0.11	0.41	2.62	2.2	6.1	1.055	0.007	Wakasagi (<i>Hypomesus olidus</i>) (Surf smelt)	399

Nombres	Nom de la denrée alimentaire	a { Déchets Waste		Eau — Water	Protéine Protein N x 6.25	Graisse — Fat	Cendres — Ash	Calories	Teneur en alcali Alkali value	Total de l'azote Total nitrogen
		b { Comestible Edible								
Poissons de rivière.										
402	Dojo (<i>Misgurnis anguill-</i> <i>candatus</i>) (Loche) . . .	{ a	—	—	—	—	—	—	—	—
		{ b	100.0	79.8	14.8	1.24	3.28	72	9.7	2.365
403	Funa (<i>Carrasius auratus</i>) (Carpe crussienne) . . .	{ a	63.0	—	—	—	—	—	—	—
		{ b	37.0	29.4	6.2	1.08	0.48	35	1.7	0.995
404	Koi (<i>Cyprinus carpio</i>) (Carpe)	{ a	14.1	—	—	—	—	—	—	—
		{ b	85.9	56.7	20.5	8.93	1.29	167	4.9	3.291
405	Namazu (<i>Parasiburo sa-</i> <i>rotus</i>) (Loup de mer) . .	{ a	64.0	—	—	—	—	—	—	—
		{ b	36.0	27.8	6.6	0.81	0.49	35	1.8	1.054
406	Tanago (<i>Acheilognathus</i>) .	{ a	28.7	—	—	—	—	—	—	—
		{ b	71.3	55.4	13.0	1.17	1.80	64	5.4	2.090
407	Unagi (<i>Anguilla Japo-</i> <i>nica</i>) (Anguille)	{ a	35.0	—	—	—	—	—	—	—
		{ b	65.0	30.3	8.7	25.3	0.55	276	1.8	1.380
408	Yatsume Unagi (<i>Lampe-</i> <i>tro Japonica</i>) (Lam- <i>proie</i>)	{ a	22.9	—	—	—	—	—	—	—
		{ b	77.1	52.1	10.1	14.6	0.57	177	2.5	1.611
Poisson séché ou salé.										
N ^{os} 410-418 inclusive-										
ment (sauf n ^o 416) :										
La composition chimi-										
que de ces poissons au										
moment de leur achat est										
la même qu'au moment de										
leur utilisation.										
La plupart de ces den-										
rées alimentaires sont mi-										
ses en conserves après que										
l'on a enlevé les arêtes.										
Dans le cas des petits										
poissons, dont on n'enlève										
pas les arêtes, le poisson										
tout entier est utilisé										
comme denrée alimen-										
taire.										
416	Shiojake (<i>Oncorhyncus</i> <i>keta</i>) (Saumon chien de mer)	{ a	8.5	—	—	—	—	—	—	—
		{ b	91.5	52.4	25.3	6.7	6.7	160	7.0	4.05

(continued).

Azote soluble dans l'eau Water-soluble nitrogen	P ₂ O ₅	NaCl	Cendres — Ash		Alcalinité due à Alkalinity due to		CaO	Fe ₂ O ₃	Name of Food	No.
			Solubles dans l'eau Water-soluble	Insolubles dans l'eau Water- insoluble	la soude et à la potasse soda and potash	la chaux et à la magnésic lime and magnesia				
River Fish.										
0.497	1.587	néant nil	0.23	3.05	1.5	8.2	0.913	0.012	Dojo (<i>Misgurnis anguilli- candatus</i>) (Loach) . . .	402
0.133	0.225	trace	0.13	0.35	0.7	1.0	0.080	0.002	Funa (<i>Carrasius auratus</i>) (Crussian carp)	403
0.543	0.712	0.15	0.68	0.61	2.7	2.2	0.087	0.006	Koi (<i>Cyprinus carpio</i>) (Carp)	404
—	0.250	0.02	0.29	0.20	1.1	0.7	0.030	0.003	Namazu (<i>Parasiburo saro- tus</i>) (Cat fish)	405
0.394	0.970	0.19	0.26	1.54	1.3	4.1	0.563	0.003	Tanago (<i>Acheilognathus</i>) .	406
—	0.364	0.11	0.19	0.36	0.9	0.9	0.066	0.004	Unagi (<i>Anguilla Japo- nica</i>) (Eel)	407
0.371	—	—	0.23	0.34	1.0	1.5	0.025	0.005	Yatsume Unagi (<i>Lampe- tro Japonica</i>) (Eel) . .	408
Fish, Dried or Salted.										
Numbers 410-418 inclu- sive (except No. 416) : Composition as pur- chased is the same as composition as used. Most of these foods are preserved after removal of the bones. In the case of small fish, in which the bones remain, the whole material is used as food.										
—	0.705	6.00	6.06	0.62	4.6	2.4	0.125	0.006	Shiojake (<i>Oncorhyncus keta</i>) (Dog salmon) . .	416

Appendix I.

LITERATURE RELATING TO THE CHEMICAL AND PHYSICAL PROPERTIES OF THE FOOD OF JAPAN

The references are grouped according to subject-matter and are arranged in each section in alphabetical order of authors' names and numbered consecutively.

The List of Authors will be found on page 126.

Where not otherwise stated, the literature referred to is in Japanese. The following abbreviations have been used :

- Journ. Chem. Soc. Tokyo*¹, for *Journal of the Chemical Society of Tokyo*.
Journ. Sci. Agric. Soc. Japan, for *Journal of the Scientific Agricultural Society of Japan*.
Journ. Chem. Soc. Japan, for *Journal of the Chemical Society of Japan*.
Journ. Agric. Chem. Soc. Japan, for *Journal of the Agricultural Chemical Society of Japan*.
Bull. Agric. Chem. Soc. Japan, for *Bulletin of the Agricultural Chemical Society of Japan*.
Inst. Phys. Chem. Tokyo, for *Scientific Papers of the Institute of Physical and Chemical Research, Tokyo*.
Progress Science Nutrition, T.S.L.N., for *Report to the League of Nations on the Progress of the Science of Nutrition in Japan*, by Tadesu SAIKI.
Bull. Gov. Exp. Fish. Stat. Chosen, for *Bulletin of the Government Experimental Fishery Station of Chosen*.
Rep. Coll. Fish. Tokyo, for *Reports of the College of Fisheries, Tokyo*.
Journ. Fish. Inst. Japan, for *Journal of the Imperial Fisheries Institute of Japan*.
Bull. Coll. Agric. Kagoshima, for *Bulletin of the Kagoshima Imperial College of Agriculture and Forestry*.
Journ. Coll. Agric. Hokkaido, for *Journal of the College of Agriculture of the Imperial University of Hokkaido*.

Example of entry :

Journ. Chem. Soc. Tokyo, 1915, 36, 1153-1168; meaning : *Journal of the Chemical Society of Tokyo*, Volume 36, pages 1153 to 1168 inclusive, published in the year 1915. (See footnote below regarding the change in the name of this society.)

¹ In the year 1921, the Tokyo Chemical Society was transformed into the Chemical Society of Japan, and the title of the journal altered accordingly.

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Appendix II.

FOOD MATERIALS AND THE PLANTS AND ANIMALS SERVING AS SOURCES OF FOOD IN JAPAN

A. — INDEX OF NAMES : LATIN — JAPANESE — ENGLISH

Latin	Japanese	English	Reference pages
<i>Acanthogobius flavimanus</i> .	Haze.	Goby.	82, 104.
<i>Acheilognathus</i> .	Tanago.		86, 110.
<i>Allium Bakeri</i> .	Rakkyo.	Baker's garlic.	70, 100.
— <i>cepa</i> .	Tamanegi.	Onion.	20, 23, 35, 68, 72.
— <i>Nipponicum</i> .	Nobiru.	Japanese garlic.	
<i>Amorphophalluc konyac</i> .	Konniaku.	Elephant foot.	78, 123.
<i>Ananus sativus</i> .	Pineapple.	Pineapple.	76, 102.
<i>Andropogon sorghum</i> .	Morokoshi.	Great millet.	58.
<i>Anguilla Japonica</i> .	Unagi.	Eel.	22, 86, 110.
<i>Arachis hypogæa</i> .	Rakkasea.	Pea-nut or ground nut.	21, 23, 35, 38, 66, 78, 114, 123.
<i>Aralia cordata</i> .	Udo.	Salad.	68, 98.
<i>Arca inflata</i> .	Akagai.		88.
<i>Arctium Lappa</i> (Composit.).	Gobo.	Burdock.	20, 23, 68, 96, 123.
<i>Armillaria edodes</i> (Fungi).	Matsudake.		72, 119-120.
<i>Asteromæa Indica</i> .	Yomena.		
<i>Balanoptera Physalus</i> , Linn.	Kujira.	Whale.	21, 82.
<i>Benicasa cerifera</i> .	Togan.	Gourd melon.	72, 100.
<i>Beta vulgaris</i> , var. <i>Rapacea</i> .	Tensai.	Beet (sugar).	78.
<i>Brassica campestris</i> (Crucifér)	Tsukena; syn. <i>Abu- rana</i> , <i>Natane na to na</i> .		20, 70.
<i>Brassica campestris</i> var. <i>Ra- pifera</i> .	Kio na; syn. <i>Kabu</i> , <i>Kabura</i> , <i>Kabu- rana</i> , <i>Maru</i> , <i>Kabu</i> .	Turnip.	10, 20, 23, 25, 27, 28, 68, 70, 96.
<i>Brassica Chinensis</i> .	<i>Mikawashimana</i> ; syn. <i>Komatsuma</i> .		20, 23, 70.
<i>Cannabis sativa</i> .	Asanomi.	Hempseed.	76, 102.
<i>Cardium papyraceum</i> .	Torigai.	Cockle.	22, 90.
<i>Carrassius auratus</i> .	Funa.	Crussian carp.	86, 110.
<i>Castanea pubinervis</i> (Fagac).	Kuri.	Chestnut.	76, 102.
<i>Chelidonichthys kumu</i> .	Hobo.	Gurnard.	22, 84, 104.

Latin	Japanese	English	Reference pages
<i>Chrysanthemum coronarium.</i>	Shujaku; syn. Shun-jiku kikuna.	Chrysanthemum.	70, 72, 98, 100.
— Sinense.	Kikunohana.	Chrysanthemum flower.	70, 98.
<i>Citrullus vulgaris</i> (Cucurbit.).	Suikatame.	Water-melon.	20, 23, 72, 76, 100, 123.
<i>Citrus aurantium</i> , sub-species <i>Agar.</i>	Daidai.	Seville orange.	21, 23.
<i>Citrus Junos.</i>	Yuzu.	Citron.	21, 76, 102.
— nobilis.	Mikan.	Mandarin orange.	21, 23, 74, 102, 124.
— sinensis.	Natsu mikan.	Chinese citron.	21, 76, 102.
— var. <i>Decumana.</i>	Zabon.		21.
— —	Karin.		
— medica, sub-species <i>Limonum.</i>	Lemon.	Lemon.	21, 74, 102.
<i>Clupea melanostica.</i>	Iwashi.	Sardine.	21, 24, 84, 106.
<i>Clupus harengus.</i>	Nishin.	Herring.	21, 22, 23, 24, 84, 108.
<i>Cololabis saino.</i>	Samma.	Skipper.	21, 22, 24, 35, 84, 108.
<i>Colocasia antiquorum.</i>	Sato imo.	Taro.	16, 20, 23, 26, 39, 68, 96, 123.
— —			
— gigantea.	Akakuki imo.		68, 98.
<i>Congrellus anago.</i>	Yatsugashira.	Conger eel.	22, 82, 104.
<i>Corbicula læna.</i>	Anago.		90.
<i>Cortinellus shutake</i> (Fungi).	Shijima.		72, 119-120.
<i>Cryptotæma canadensis</i> , var. <i>Japonica.</i>	Shutake.	Trefoil.	70.
<i>Cucumis sativus.</i>	Mitsuba.		
— melo.	Kiuri.	Cucumber.	20, 23, 70, 72, 98, 123.
<i>Cucurbita Moschata</i> , var. <i>Toonas</i> (Cucurbitac.).	Makuwauri.	Musk melon.	20.
	To nasu.	Pumpkin.	20, 23, 70, 98, 123.
<i>Cucurbita Lugenaria.</i>		Gourd.	20, 23, 78.
<i>Cybium nipponium.</i>	Sawara.		22, 86, 108.
<i>Cydonia vulgaris</i> (Rosac.).	Marumero; syn. Marume, Onimero, Marameru, Kama-kura-kaido.	Quince.	
<i>Cyprinus carpio.</i>	Koi.	Carp.	22, 86, 110.
<i>Cypelurus agoo.</i>	Tobiuo.	Flying-fish.	22, 86, 108.
<i>Dasyatis akagei.</i>	Akaei.	Sting-ray.	82, 104.
<i>Daucus carota.</i>	Ninjin.	Carrot.	20, 23, 35, 68, 96, 123.
<i>Dioscorea Batatas.</i>	Tororo Imo.	Chinese yam.	68, 98, 123.
— —	Nagaimo.	Chinese yam, cultivated.	68, 96.
— Japonica.	Jinenjo.	Japanese yam.	39, 68, 96, 123.
<i>Diospyros Kaki</i> , var. <i>Domes-tica.</i>	Kaki.	Persimmon.	21, 23, 74, 76, 100, 102, 117, 118, 124.
<i>Dolichos Lablab.</i>	Fugimame.	Hyacinth bean.	

Latin	Japanese	English	Reference pages
<i>Ecklonia cava</i> (Alg.)	Arame; syn. Anroku, Kajime, Aburame, Amoto, Amada, Inuta.		72.
<i>Engraulis Japonicus.</i>	Hishiko.	Anchovy.	21, 22, 24, 104.
<i>Enteromorpha compressa</i> (Alg.)	Aonori; syn. Ito aonori, Ito aosa aoba.		21, 72.
<i>Equisetum arvense.</i>	Tsukushi.	Field horsetail.	
<i>Eriobotrya Japonica</i> (Ros.)	Biwa.	Loquat.	21, 74, 100.
<i>Erythronium dens canis</i> , var. <i>Japonicum.</i>	Katakuri.	<i>Vide</i> Dempum Katakuri, Starch	78.
<i>Eutrema Wasabi.</i>	Wasabi.		68, 98.
<i>Fagopyrum esculentum.</i>	Soba.	Buckwheat.	35, 58, 60, 115.
<i>Ficus Carica.</i>	Ichigiku.	Fig.	74, 100.
<i>Fortunella Japonica.</i>	Kinkan.	Cumquat.	74, 102.
<i>Fuglans Sieboldiana.</i>	Kurumi.	Walnut.	76, 102.
<i>Gagopyrum esculentum.</i>	Soba.	Buckwheat.	60.
<i>Gelidium Amansii.</i>	Kanten.	Agar.	74.
<i>Ginkgo biloba</i> (Ginkgoac.)	Ginnan; syn. Icho.	Fruit of maidenhair.	76, 102, 122.
<i>Glycine hispida</i> , Maxim.	Awodaizu.	Green soya bean.	9, 21, 23, 25.
— Soja.	Edamame.	Soy bean.	25, 48, 64.
<i>Gracillaria confervoides</i> (Alg.)	Ogonori; syn. Ugonori.		74.
<i>Grichiurus Japonicus.</i>	Tachiuo.	Hairtail.	86, 108.
<i>Haliotis gigantea.</i>	Awabi.	Earshell.	22, 90, 119.
<i>Hexagrammos otakii.</i>	Ainame.	Rock trout.	82, 104.
<i>Hordeum sativum.</i>	Omugi.	Barley.	9, 12, 13, 14, 18, 25, 26, 27, 28, 31, 33, 35, 40, 42, 45, 46, 58.
<i>Hypomesus olidus.</i>	Wakasagi.	Pond or surf smelt.	22, 86, 108.
<i>Hyporamphus sayori.</i>	Sayori.	Halfbeak.	86, 108.
<i>Ipomæa Batatas</i> , var. <i>Edulis.</i>	Satsuma imo.	Sweet potato.	16, 20, 23, 26, 35, 39, 68, 98, 123.
<i>Kareius bicoratus.</i>	Karei.	Flat fish or sole.	21, 24, 84, 106.
<i>Katsuwonus pelamys.</i>	Katsuo.	Oceanic bonito, Bonito.	10, 21, 22, 24, 84, 106.
<i>Konosirus punctatus.</i>	Konoshiro.	Hickory shad.	22, 84, 106.
<i>Lactaria Hatsudake</i> (Fungi).	Hatsudake.		72.
<i>Laminaria cichorioides</i> (Alg.)	Tororo kombu; syn. Chijimi kombu, Arame kombu, Koise, Gatsugara kombu.		21, 23, 72, 74.
— Japonica.	Kombu.		21, 23, 74.
<i>Lamma cornubica.</i>	Same.	Shark.	21, 22, 24, 84, 86, 108.
<i>Lampetro Japonica.</i>	Yatsume unagi.	Eel.	22, 86, 110.
<i>Lateolabrax Japonicus.</i>	Suzuki.		86, 108, 119, 124.

Latin	Japanese	English	Reference pages
Latilus sinensis.	Amadai.		82, 104.
Latuca scariola, var. Sativa.	Chisa.	Lettuce (<i>vide</i> salad).	70.
Lepidotrigla alata.	Kanagashira.	Small-winged scaly mullet.	84, 106.
Leucopsarion Petersi.	Shirauo.		88.
Lithodes Camtschatica.	Kani.	Ground crab.	22, 88, 118.
Liliufan tigrinum.	Yuri.	Lily (root).	16, 20, 26, 39, 68, 98.
Lophius setegirus.	Anko.	Sea-devil.	82, 104.
Lycopersicum esculentum (Solanac.).	Tomato.	Tomato.	20, 72, 100.
Mactra suleantenea.	Bakagai.		22, 90.
Malus pumila.	Ringo.	Apple.	21, 23, 76, 102, 117.
Mesogloia decipiens (Alg.).	Mozuko.		74.
Minous Adamsi.	Okoze.		84, 108.
Misgurnus anguillicandatus.	Dojo.	Loach.	86, 110.
Momordica charandia.	Kiuri.		20, 23, 26, 70.
Monocanthus cirrhifer.	Kawahagi.		84, 106.
Muraesox cinereus.	Hamo.		82, 104.
Musa sapientum.	Banana.	Banana.	74, 100.
Nelumbo nucifera.	Renkon.	Lotus.	16, 20, 26, 39, 68, 96, 123.
Nemipterus sinensis.	Itoyori.		84, 106.
Neomysis Japonica.	Ami.		
Niphon spinosus.	Ara.		82, 104.
Octopus membranaceus.	Idako.	Octopus.	21, 24, 90.
— Ocolopodia.	Tako.		21, 24, 90.
Cenanthe linearis.	Seri.	Parsley.	70.
Ommastrephus Sloani Pacificus.	Ika.	Cuttlefish.	21, 22, 90.
Oncorynchus keta.	Shiojake.	Dog salmon.	21, 22, 24, 88, 110.
Orca gladiator.	Schachi.	Swordfish.	
Oryza sativa.	Kome.	Rice.	9, 10, 12, 17, 25, 27, 29, 31, 35, 43, 56, 60.
— —	Mochigome.	Mochi rice, glutinous rice.	58.
Osmunda regalis, var. Japonica.	Zenmai.		70.
Ostrea gigas.	Kaki.	Oyster.	21, 24, 90, 118.
Pagrus major.	Kodai.	Porgy.	22, 84, 106.
Palinurus Japonicus.	Ise ebi.	Spiny lobster.	22, 88.
Panicum miliaceum.	Kibi.	Millet.	26, 58.
Panicum frumentaceum.	Hiye.	Sawa millet.	58.
Paralichthys alivaceus.	Hirame.	Halibut.	22, 84, 104.
Parapristipomum trilineatum.	Isaki.		84, 106.
Parasiburus arotus.	Namazui.	Catfish.	86, 110.
Peneus Joyneri.	Shiba ebi.	Lobster.	22, 88.
Perilla Nankinensis (Labiata)	Shiso.	Beefsteak plant.	
— Ocimoides.	Shiso.		
Petasites Japonica.	Fuki.		70.

Latin	Japanese	English	Reference pages
<i>Phaseolus Mungo.</i>	Azuki.	Small red bean.	21, 35, 66, 114
— —	Dainagon.	Large variety.	125.
— radiatus.	Yacnari.	Small green bean.	66.
— vulgaris.	Ainumame.	French bean.	21, 23.
— —	Uzuramame.	French bean, spotted.	21, 64.
— —	Shiroingen.	French bean, white.	21, 23, 66.
<i>Phyllostachys.</i>	Takenoko.	Bamboo.	21, 23, 68.
<i>Physeter macrocephalus.</i>	Kujira.	Sperm whale.	16, 20, 23, 26,
<i>Pirus serotina.</i>	Nashi.	Pear.	68, 72, 98,
<i>Pisum sativum.</i>	Endo, Acendo.	Green pea.	123.
<i>Platycephalus Indicus.</i>	Kochi.	Indian flathead.	21, 82, 119.
<i>Platycodon grandiflorum.</i>	Kikio.	Large-flowered flatbell.	21, 23, 76, 102,
<i>Pollachius Brandti.</i>	Tara.	Cod.	124.
<i>Porphyra tenella (Alg.).</i>	Asa kusanori; syn. Murasa kinori, Amanori shibanori	Laver.	84, 106.
<i>Pridacna gigas.</i>	Shako.	Squill, Giant shrimp.	39.
<i>Prunus Armeniaca.</i>	Anzu.	Prune.	21, 22, 24, 86,
— domestica (Rosac.).	Sumomo.	Nectarine.	88, 108.
— mume.	Ume.	Plum.	21, 72.
— Persica.	Momo.	Peach.	21, 74.
<i>Psenes anomalus.</i>	Ibodai.		84, 104.
<i>Pseudoblennius percoides.</i>	Managatsuo.		84, 108.
<i>Pteridium aquilinum</i> (Filices).	Warabi.	Common brake (bracken)	70.
<i>Pueraria hirsuta (Leguminos).</i>	Kuzu.	Pomegranate.	
<i>Punica granatum (Lunicac.).</i>	Zakuro.	Japanese giant radish.	10, 16, 20, 23,
<i>Raphanus sativus.</i>	Daikon.		25, 27, 29,
<i>Rhinoplagusia Japonica.</i>	Shitabirame.	Sole.	35, 68, 96,
<i>Ropilema esculenta.</i>	Kurage.	Meduse.	123.
<i>Salagichthys microdon.</i>	Shirauo.		86, 108.
<i>Sagittaria sagittifolia, var. Longiloba.</i>	Natakoa.	Chinese arrowhead.	20, 68, 96.
<i>Sagittaria sagittifolia, var. Sinensis.</i>	Kuwai.	Arrowhead.	20, 39, 68, 96,
<i>Sciæna Schlegeli.</i>	Ishimochi.		123.
<i>Scomber Japonicus.</i>	Saba.	Spanish mackerel.	84, 106.
<i>Scombrops cheilodiptroides.</i>	Mutsu.	Mackerel.	21, 22, 24, 84,
<i>Sebastes Schlegelii.</i>	Mebaru.		108.
<i>Seriola quinqueradiata.</i>	Inada.	Buri, Yellow-fish.	84, 108.
<i>Sesamum Indicum (Pedaliac.).</i>	Goma.	Sesame.	21, 22, 24, 82,
<i>Setaria Italica.</i>	Awa.	Italian millet.	84, 104, 117.
<i>Siler divaricatum.</i>	Bofu.		38, 76, 78, 122.
			58, 60, 115.

Latin	Japanese	English	Reference pages
<i>Sillago Japonica</i> .	Kisu.		84, 106.
<i>Solanum melongena</i> .	Nasu.		20, 23, 70, 100, 123.
— <i>tuberosum</i> .	Jago imo.	Potato.	9, 16, 19, 20, 23, 25, 27, 28, 35, 39, 68, 96, 123.
<i>Sparus latus</i> .	Kurodai.	Gilthead.	84, 106.
<i>Sphyrana Japonica</i> .	Kamasu.	Barracuda.	22, 84, 106.
<i>Spinacia oleacea</i> .	Horensa.	Spinach.	70.
<i>Stichopus Japonicus</i> .	Namako.	Sea-cucumber.	21, 22, 90.
<i>Tapes Philippinarum</i> .	Asari.		21, 24, 88.
<i>Tetrodon</i> .	Fugu.		82, 104.
<i>Thea Japonica</i> .	Tsubaki.	Camelia.	78.
<i>Thynnus Orientalis</i> .	Maguro.	Tunny.	22, 24, 35, 84, 106.
<i>Torreyia nucifera</i> .	Kaya.		78.
<i>Trachurus Japonicus</i> .	Koaji.		84, 106.
<i>Tresus Nuttali</i> .	Mirugai.	Otto shell.	90.
<i>Triticum vulgare</i> .	Mugi.	Wheat.	9, 11, 12, 13, 14, 15, 18, 25, 26, 27, 29, 31, 35, 40, 58.
<i>Tricholoma Shimeji (Fungi)</i> .	Shimeji.		82.
<i>Trionyx Japonica</i> .	Suppon.	Snapping turtle.	74.
<i>Turbinaria fusiformis (Alg.)</i> .	Hijiki; syn. Hijiki-kimo nagahijiki. Chosen : Hijiki, Michihijiki, Neiri.		
<i>Undaria pinnatifida</i> .	Wakame.		21, 23, 25, 74.
<i>Vicia faba</i> .	Soramame.	Broad bean, Horse bean.	21, 23, 25, 27, 64, 66.
<i>Vitis vinifera</i> .	Budo.	Grape.	21, 74, 76, 100.
<i>Viviparus malleatus</i> .	Tanishi.	Pond snail, Mud snail.	90.
<i>Zea Mays</i> .	Tomorokoshi.	Indian corn.	26, 58.
<i>Zingiber officinale</i> .	Shoga.	Ginger.	16, 20, 68, 98, 118.
— <i>Mioga (Rosac.)</i> .	Myoganoko.	Mioga ginger.	20.

B. — INDEX OF NAMES : JAPANESE — LATIN — ENGLISH

Japanese	Latin	English	Reference pages
Aburage.		Bean curd, Tofu fried in sesame or other vegetable oil.	37, 66.
Aburana.		<i>See</i> Tsukena.	70.
Ainame.	Hexagrammos otakii.	Rock trout.	82, 104.
Ainumame.	Phaseolus vulgaris.	A variety of French bean.	21, 64.
Akaei.	Dasyatis akaei.	Sting-ray.	82, 104.
Akagai.	Arca inflata.		83.
Akamiso.		Red paste made from black soy bean. The black pigment turns red in acid medium. <i>See also</i> Miso.	40, 66.
Amadai.	Latilus Sinensis.		82, 104.
Amakuri.		Sweetened chestnut (<i>Marron glacé</i>).	64.
Amanatto.		Sweetened red bean, much used in Japanese cakes.	62.
Amanin yu.		Linsced oil, used in cooking.	78.
Amazake.		Rice preparation (fluid).	92.
Ame.		Jelly-like preparation made by the action of germinated barley or rice. <i>See also</i> Mizu ame.	64.
Ami.	Neomysis Japonica.		
Anago.	Congrellus anago.	Conger eel.	22, 82, 104.
Anko.	Lophius setegirus.	Sea devil.	82, 104.
Anpan.		Pastry containing sweetened red bean.	62.
Anzu.	Prunus Armeniaca, var. Ansu.	Apricot.	21, 74, 100.
Aoendo.	Pisum sativum.	Green pea.	21, 66.
Aonori.	Enteromorpha compressa (Alg.).	An edible green seaweed.	21, 72.
Ara.	Nippon spinosus.		82, 104.
Arame.	Ecklonia cava.	Edible seaweed.	21, 72.
Asakusanori; syn. Amanori shibanori, Murasikinori.	Porphyra tenella (Alg.).	Laver, Purple laver, an edible seaweed gathered naturally and also cultivated; much prized for its texture and delicate flavour. It receives its name from a suburb of Tokyo (Asakusa).	21, 72.
Asanomi.	Cannabis sativa.	Hempseed. Used for flavouring cakes and vegetables, either whole or after crushing.	76, 102.
Asari.	Tapes Philippinarum.	Tapes.	21, 24, 88.
Awa.	Setaria Italica.	Italian millet.	58, 60, 115.
Awabi.	Haliotis gigantea.	Earshell, Abalone, Awabi. Are also dried and exported.	22, 90, 119.

Japanese	Latin	English	Reference pages
Awodaisu. ^e Azuki.	Glycine hispida, Maxim. Phaseolus Mungo.	Green soy bean. Small red bean, next to soy bean the variety most extensively used in Japan. Japanese cakes for the most part have a basis of red bean.	9, 21, 23, 64. 21, 35, 66, 114, 125.
Bakagai.	Mactra sulcantenea (Mollusc.).		22, 90.
Banana.	Musa sapientium.	Banana.	74, 100.
Ba niku.		Horseflesh.	26, 82.
Biwa.	Eriobotrya Japonica (Rosac.).	Loquat.	21, 74, 100.
Bofu.	Siler divaricatum.		
Bora.		Grey mullet.	22, 82, 104.
Boru.		A riceflour cake.	62.
Budo.	Vitis vinifera (Vitac.).	Grape.	21, 74, 76, 100.
Buntan.			74.
Buri.	Seriola quinqueradiata.	Yellow-fish, Yellow-tail, Buri fish.	21, 22, 24, 82, 84, 104, 117.
Chichi; syn. Nyu.		Milk.	10, 24, 25, 26,
Chichirui.		General term for milk foods.	27, 28, 33,
Chichi seihin rui.		Milk products.	35, 36, 39, 80, 119.
Chickiwabu.		Wheaten preparations.	60.
Chisa.	Lactuca scariola, var. Sativa.	Lettuce, Salad.	70.
Chomiryo.		Condiments and beverages.	20, 92, 116.
Daifuku mochi.		Pastry made of mochi rice, including paste of sweetened red bean.	62.
Daikon.	Raphanus sativus.	A giant radish. It constitutes an essential part of the Japanese diet, being used fresh, dry or pickled. It is credited with powerful digestive properties (amylase). It is possibly inseparable from the rice regime. See Hoshi daikon and Takuan.	10, 16, 20, 23, 25, 27, 29, 35, 68, 96, 123.
Dainagon.	Phaseolus Mungo.	Small red bean, but larger than azuki bean.	21, 66.
Daizu.	Glycine soja.	Soy bean. The chief bean food of Japan, a large proportion being imported from China. The bean is hard and must be soaked over twenty-four hours before use. Chiefly used in making bean curd (tofu) and bean paste (miso) and bean sauce (shoyu), all products in daily use.	9, 10, 11, 15 16, 19, 21 23, 25, 26 27, 29, 32 35, 39, 45 48, 64, 66

Japanese	Latin	English	Reference pages
Daizu yu.		Soy-bean oil. One of the chief sources of fat in Japan, where animal fat has but little employment. The oil is derived from the bean either by expression or solvent action; the residue or soy cake is mostly wasted as manure. The vitamins appear to be left in the cake.	78.
Dashi nyu. Dempum. — katakuri. — kuzu.		Skimmed milk. Starch. Starch from katakuri. Starch from kuzu.	80. 78. 78. 78.
Dobutsusei shokuhin.		Animal foods and food products, <i>i. e.</i> , foods of animal origin.	21, 22, 24, 80 <i>et seq.</i>
Dobutsusei yu rui. Dojo.	Misgurnus anguillincandatus.	Animal oils or fats. Loach.	82. 86, 110.
Edamame Endo Endomame Fett	Glycine soja. Pisum sativum.	The fresh soy bean in pod. Green pea. Peas roasted and salted. Fat.	25, 48, 64. 9, 21, 66. 64. 28, 32, 34, 36, 39, 82.
Fu		Preparation from wheat of high protein content. It resembles a very light form of bread.	40, 60.
Fugimame. Fugu Fuki	Dolichos Lablab. Tetrodon. Petasites Japonica (Composit.).	Hyacinth bean. Globe-fish. Japanese plant with broad leaves; the stem is the edible part.	82, 104. 70.
Funa Fu nyu	Carrasius auratus.	Crussian carp. Milk powder; more commonly called. Kona milk (flour milk). Fu Nyu is Chinese.	86, 110. 40, 80.
Furoretto. Gammadoki.		Confectionery. Fried bean curd (tofu) containing chopped vegetables, herbs or seaweed.	64. 32, 37, 40, 66.
Gemmai.		Unpolished (of cereals).	28, 35, 38, 56, 58, 121.
Genjimame. Ginnan.	Ginkgo biloba (Ginkgoac.).	Sweetened pea-nut. Fruit of maidenhair.	64. 76, 102, 122.
Gobo.	Aretium Lappa (Composit.).	Burdock.	20, 23, 68, 96, 123.
Gomame. Goma.	Sesamum Indicum.	Dried herring. Sesame.	21, 22, 24, 86. 38, 76, 78, 122.

Japanese	Latin	English	Reference pages
Goma yu.		Sesame oil used in cooking.	78.
Gyu niku.		Beef.	24, 26, 35, 82.
Hachimitsu.		Honey.	64.
Hakkakashi.		Peppermint (confectionery).	64.
Hakumai.		Polished (of cereals).	35, 38, 56, 58, 121, 122, 125.
Ham.		Ham.	82.
Hamaguri.		Bivalve mollusc.	90.
Hamo.	<i>Murænesoæ cinereus.</i>		82, 104.
Hanpen.		Fish preparation.	88.
Hararago.		Roe of grey mullet.	88.
Hato.		Pigeon.	82.
Hatsudake.	<i>Lactaria Hatsudake</i> (Fungi).		72.
Haze.	<i>Acanthogobius flavimanus.</i>	Goby.	82, 104.
Hidara.		Dried cod.	86.
Hijiki; syn. Hijikimo; Chosen: Hijiki, Neiri.	<i>Tubinaria fusiformis</i> (Alg.).	Spindle-shaped bladder leaf (edible seaweed).	74.
Hikiwari.		Ground barley, coarse bar- ley flour.	60.
Hirame.	<i>Paralichthys alivaceus.</i>	Halibut.	22, 84, 104.
Hishiko.	<i>Engraulis Japonicus.</i>	Anchovy.	21, 22, 24, 104.
Hitsuji niku.		Mutton.	26.
Hiye.	<i>Panicum frumentaceum.</i>	Sawa millet.	58.
Hobo.	<i>Chelidonichthys kumu.</i>	Gurnard.	22, 84, 104.
Horagai.		Confectionery.	64.
Horenso.	<i>Spinacia oleracea.</i>	Spinach.	70.
Hoshi anzu.		Dried prune.	76.
— ayes.			86.
— budo.		Raisin (dried grape).	76.
— ebi.		Dried lobster.	22, 88.
— gaki.		Dried persimmon.	76.
— ichijiku.		Dried fig.	76.
— udon.		Japanese macaroni.	40, 60. 84, 104.
Ibodai.	<i>Psenes anomalus.</i>		21, 74, 100.
Ichigo.		Strawberry.	74, 100.
Ichigiku.	<i>Ficus carica.</i>	Fig.	21, 24, 90.
Iidako.	<i>Octopus membranaceus.</i>	Octopus.	21, 22, 90.
Ika.	<i>Omastrephus Sloani</i> Pacificus.	Cuttlefish.	21, 22, 90.
Imogara.	<i>Colocasia antiquorum</i> (dried stalk of).	Dried stalk of Akakuki imo.	20, 23, 68.
Inada.	<i>Seriola quinqueradiata.</i>	Yellow-fish, Buri fish (young).	21, 24, 84, 104.
Indyo.		Non-alcoholic beverages.	92.
Isaki.	<i>Parapristipomum trilineatum.</i>		84, 106.
Ise ebi.	<i>Palinurus Japonicus.</i>	Spiny lobster.	22, 88.
Ishimochi.	<i>Sciaena Schlegeli.</i>		22, 84, 106.
Itoyori.	<i>Nemipterus Sinensis.</i>		84, 106.
Iwashi.	<i>Clupea melanostica.</i>	Sardine.	21, 24, 84, 106.

Japanese	Latin	English	Reference pages
Jago imo.	<i>Solanum tuberosum.</i>	Potato.	9, 16, 19, 20, 23, 25, 27, 28, 35, 36, 39, 68, 96, 123.
Jinenjo.	<i>Dioscorea Japonica.</i>	Japanese yam.	39, 68, 96, 123.
Jinzo butter.		Margarine.	82.
Kabocha, syn., Tonas.	<i>Cucurbita moschata, var. Toonas (Cucurbitac.).</i>	Pumpkin.	20, 23, 79, 98, 123.
Kabu.	<i>Brassica campestris, var. Raoufera Netz.</i>	Turnip.	10, 20, 23, 25, 27, 28, 68, 70, 96.
Kabu no ha.		Turnip-tops (leaves).	70.
Kaki.	<i>Diospyros Kaki.</i>	Persimmon.	21, 23, 74, 76, 100, 102, 117, 118, 124.
Kaki.	<i>Ostrea gigas.</i>	Oyster.	21, 24, 90, 118.
Kako seihin.		Cooked products.	62, 66, 88.
Kakosezaru seihin.		Raw products.	60, 66, 88.
Kamaboko.		Fish preparation.	88.
Kamasu.	<i>Sphyrana Japonica Baracudas.</i>		22, 84, 106.
Kamo.		Wild duck.	26, 82.
Kampio.	<i>Cucurbita Lugenaria.</i>	Dried shavings of rind of gourd melon.	20, 23, 78.
Kanagashira.	<i>Lepidotrigla alata.</i>	Small-winged scaly mullet.	84, 106.
Kani.	<i>Lithodes Camtschatica.</i>	Crab.	22, 88, 118.
Kanten.	<i>Gelidium Amansii.</i>	Agar, Agar-agar.	74.
Karasumi.		Roe of mullet.	88.
Karei.	<i>Kareius bicoratus.</i>	Flat-fish resembling sole.	21, 24, 84, 106.
Karin.	<i>Citrus aurantium, var. Decumana.</i>		
Kashi rui.		Cakes and confectionery.	62, 64.
Katai kudamono rui.		Nuts and seeds.	76.
Katapan.		A wheaten biscuit.	62.
Katsuo.	<i>Katsuwonus pelamys.</i>	Oceanic bonito, Bonito.	21, 22, 24, 84, 106.
Katsuboshi.		Dried bonito, much used in Japan for soup-making.	22, 86.
Kawahagi.	<i>Monocanthus cirrhifer.</i>		84, 106.
Kawaita mame rui.		Pulses.	66.
Kaya.	<i>Torreya nucifera (Conifer.).</i>	Torreya.	78.
Kaya yu.		Torreya oil.	78.
Kazunoko.		Herring roe.	117, 119.
Kei niku.		Flesh of fowl, chicken.	10, 24, 25, 26, 27, 28, 82, 119.
Kiabetsu.		Cabbage.	20, 23, 70.
Kibi.	<i>Panicum miliaceum.</i>	Millet.	26, 58.
Kikio.	<i>Platycodon grandiflorum.</i>	Large-flowered flatbell.	39.
Kikione.		Root of kikio.	39, 68, 96.

Japanese	Latin	English	Reference pages
Kiku.	<i>Chrysanthemum coronarium.</i>	Chrysanthemum.	70, 72, 98, 100.
Kikunohana.	<i>Chrysanthemum Sinese, var. Hortense.</i>	Flowers of chrysanthemum.	70, 98.
Kinako.		Soy-bean powder (the whole bean).	40, 66.
Kingyobu.		Protein preparation from wheat, resembling Fu.	40, 60.
Kinkan.	<i>Fortunella Japonica (Rutac.).</i>	Cumquat.	74, 102.
Kinoko rui.		Mushrooms.	72.
Kio na; syn. Kabu, Kabura, Maru kabu, Kabura na.	<i>Brassica campestris, var. Rapifera.</i>	Turnip.	10, 20, 23, 68, 70, 96.
Kiriboshi.		Dried daikon.	92.
Kisu.	<i>Silago Japonica.</i>		84, 106.
Kiuri.	<i>Cucumis sativus.</i>	Cucumber.	20, 23, 70, 98, 123.
Koaji.	<i>Trachurus Japonicus.</i>		84, 106.
Kochi.	<i>Platycephalus Indicus.</i>	Indian flathead.	84, 106.
Kodai.	<i>Pagrus major.</i>	Porgy.	22, 84, 106.
Koi.	<i>Cyprinus carpio.</i>	Carp.	110.
Koku rui.		Cereals.	22, 86, 110.
— seihin.		Cereal products.	9-17, 25, 27, 28, 40, 43, 44, 45, 60.
Kokoku rui.	Crustacea.	Crustacea.	60.
Kombu.	<i>Laminaria Japonica (Alg.).</i>	One of the chief edible seaweeds of Japan.	88.
Komatsuna.	<i>Brassica Chinensis.</i>		21, 23, 74.
Kome.		Rice, Brown rice.	20, 23, 70.
— gemmai.			9-19, 25-42, 43, 44, 56, 58, 121-122.
— hakumai.		Unpolished rice, Paddy.	35, 56, 58.
Kona.		Polished rice, White rice.	35, 38, 56, 58.
Konnaiku.	<i>Amorphophallus konjac.</i>	Flour (wheaten).	33, 60.
Konoshiro.	<i>Konosirus punctatus.</i>	Elephant foot.	78, 123.
Konowata.		Hickory shad.	22, 84, 106.
Konsai rui.		Entrails of namako, salted.	90.
		Roots, root vegetables.	10, 16, 19, 20, 23, 25, 27, 28, 35, 40, 68, 96, 98.
Kori dofu.		Meaning iced tofu, a compact form of tofu prepared by exposing the curd of the soy bean to become naturally frozen in winter. During freezing, water is expressed from the spongy mass and the residue is readily dried.	40, 66, 113, 120.
Kujira.	<i>Physeter macrocephalus.</i>	Sperm whale.	11, 21, 82, 119.

Japanese	Latin	English	Reference pages
Kurage. Kuri.	<i>Rhopilema esculenta.</i> <i>Castanea pubinervis</i> (Fagac.).	Medusa (salted). Chestnut.	90? 76, 102.
Kurodai. Kuro daizu. Kuro goma. Kurumi. Kuwai.	<i>Sparus latus.</i> <i>Glycine soja.</i> <i>Fuglans Sieboldiana.</i> <i>Sagittaria sagittifolia</i> <i>Sinensis.</i>	Gilthead. Black soy bean. Black sesame seed. Walnut. Arrowhead.	84, 106. 66. 76. 76, 102. 20, 39, 68, 96, 123.
Kyabetsu. Lemon.	<i>Citrus medica</i> , subsp. <i>Limonium.</i>	Cabbage. Lemon.	70. 21, 74, 102.
Lard. Maguro.	<i>Thynnus Orientalis.</i>	Lard. Tunny.	82. 22, 24, 35, 84 106.
Makuwauri. Mame rui.	<i>Cucumis melo.</i>	Musk melon. Legumes.	20. 10, 11, 15, 16, 19, 21, 23, 25, 26, 27, 28, 32, 35, 37, 39, 45, 48, 64-66, 113-114, 118.
— seihin. Managatsuo.	<i>Pseudoclennius per-</i> <i>coides.</i>	Bean products.	40, 66-68. 84, 108.
Marumero; syn. Marume, Onimero marumero, Kama- kura kaido.	<i>Cydonia vulgaris</i> (Risac.)	Quince.	
Matsudake.	<i>Armillaria edodes</i> (Fungi).		72, 119-120. 84, 108.
Mebaru. Menzai. Mikan.	<i>Sebastodes Schlegelii.</i> <i>Citrus aurantium</i> , subsp. <i>Nobilis.</i>	Polishings from rice. Mandarin orange.	11, 60. 21, 23, 74, 102, 124.
Mikwashimana; syn. Tsukena, Tona. Mirin.	<i>Brassica Chinensis.</i>	Named after a Tokyo suburb. Product of fermented rice containing about 30 per cent carbohydrate.	20, 23, 70. 92.
Mirugai. Misozuke. Mitsuba.	<i>Tressus Nuttali.</i> <i>Cryptotania Canadensis</i> , var. <i>Japonica.</i>	Otto shell. Rice gruel. Trefoil.	90. 92. 70.
Mizu ame. Mochi.		Ame, containing a large proportion of water. A preparation made at the New Year by pounding rice in a mortar, after steaming it. The material has a gummy consistency, and is esteemed as a delicacy.	64. 60.

Japanese	Latin	English	Reference pages
Mochi gome	<i>Oryza sativa.</i>	A natural variety of rice, Mochi rice.	58.
Momo.	<i>Prunus Persica (Rosac.)</i>	Peach.	21, 74.
Morokoshi.	<i>Andropogon sorghun.</i>	Great millet.	58.
Mozuku.	<i>Mesogloia decipiens (Alg.)</i>	An edible seaweed.	74.
Mugio	<i>Triticum vulgare.</i>	Wheat.	9, 11, 12, 13, 14, 15, 18, 25, 26, 27, 28, 31, 35, 40, 58, 125.
Mushiyokan.		Paste of sweetened red beans compressed to a cake.	62.
Mutsu.	<i>Scombrops cheilodipteroides.</i>	Variety of mackerel.	21, 22, 24, 84, 108.
Myoganoko.	<i>Zingiber Mioga.</i>	Bud of Mioga ginger.	20.
Nagaimo.	<i>Dioscorea batatas.</i>	Cultivated Chinese or Japanese yam.	39, 68.
Namaage.		Tofu slightly fried in vegetable oil.	40, 66.
Namako.	<i>Stichopus Japonicus.</i>	Sea-cucumber.	21, 22, 90.
Namano mame ru.		Fresh legumes.	64.
Namazu.	<i>Parasiburo sarotus.</i>	Catfish.	86, 110.
Nashi.	<i>Pirus serotina.</i>	Pear.	21, 23, 76, 102, 124.
Nasu; syn. Nasubi.	<i>Solanum melongena.</i>	Egg-plant.	20, 23, 70, 100, 123.
Nataikoa.	<i>Sagittaria sagittifolia, var. Longiloba.</i>	Chinese arrowhead.	20, 68, 96.
Natane yu.	<i>Brassicæ campestris oleum.</i>	Oil of rape-seed.	78.
Natsume.		Sweetened dried prunes.	64.
Natsu mikan.	<i>Citrus aurantium, subsp. Sinensis.</i>	Chinese citron.	21, 76, 102.
Natto.		Fermented soy bean. The beans, after steaming, are fermented at 38° C. by bacterium natto (<i>Sawamura</i>) isolated from rice straw. The preparation becomes viscid and develops an odour which is found agreeable.	66, 113, 114, 116.
Neimo.		Malt of Eguimo, <i>Colocasia antiquorum</i>	
Negi; syn. Nebuka hito moji.	<i>Allium fistulosum.</i>	Leek.	20, 23, 70.
Nezumizame.	<i>Lamma cornubica.</i>	Shark.	21, 22, 24, 84, 86, 108.
Niboshi.		Dried fish meat. There are many varieties, such as Namaribushi, Tudukani, some of which are flavoured with soy.	88.

Japanese	Latin	English	Reference pages
Niku rui, Niku.		Meat foods, meat.	10, 15, 19, 25, 26, 27, 28, 36, 37, 39, 82.
Ninjin.	Daucus carota.	Carrot.	20, 23, 35, 68, 96, 123.
Nishin.	Clupus harengus.	Herring.	21, 22, 23, 24, 84, 108.
Nobiru. Nuka.	Allium Nipponicum.	Japanese garlic. Rice bran.	11, 60, 121, 124.
Ogonori. Okoshi.	Gracillaria confervoides.	Sea grass. Sweetened Italian millet pressed into the form of a cake.	74.
Okoze. Olive yu. Omugi.	Minous Adamsi. Hordeum sativum.	Olive oil. Barley.	84, 108. 78. 9, 12, 13, 14, 18, 25, 26, 27, 28, 31, 33, 35, 40, 42, 45, 46, 58.
Oshirugi. Oto. Pan. Pineapple. Rakkasei.	Ananus sativus. Arachis hypogæa.	Barley flour. Cherry. Bread. Pineapple. Pea-nut or ground nut.	60. 21, 76, 102. 35, 62. 76, 102. 21, 23, 35, 38, 66, 78, 114, 123.
Rakkasei yu. Rakkyo. Rokugan. Renkon.	Allium Bakeri. Nelumbo nucifera.	Pea-nut oil. Bakers' garlic. Confectionery. Root of Indian lotus.	78. 70, 100. 62. 16, 20, 26, 39, 68, 96, 123.
Ringo.	Malus pumila.	Apple.	21, 23, 76, 102, 117.
Saba.	Scomber Japonicus.	Spanish mackerel, Chub mackerel.	21, 22, 24, 84, 108. 10, 15, 16, 19, 21, 22, 24, 25, 26, 27,
Sakana. Sakana no rui.		Fish. The group of fish	28, 32, 37, 38, 39, 40, 49, 53, 82- 90, 104-110, 117, 118-119.
Sake.		Japanese wine made from rice, somewhat resembling weak whisky but with a characteristic odour, somewhat like acetone.	10, 16, 92, 114- 115, 116.
Sake rui.		A term used in Japan for wine in general.	10, 16, 92, 114.

Japanese	Latin	English	Reference pages
Same.	<i>Lamna cornubica.</i>	Shark.	21, 22, 24, 84, 86, 108.
Samma.	<i>Cololabis saino.</i>	Skipper.	21, 22, 24, 35, 84, 108.
Sarashian.		A flour made from the small red bean (azuki bean).	66.
Satoimo.	<i>Colocasia antiquorum.</i>	Taro, lit. sweet root.	16, 20, 23, 26, 39, 68, 96, 123.
Satsumaimo.	<i>Ipomœa Batatas, var. Edulis.</i>	Sweet potato.	16, 20, 23, 26, 35, 39, 68, 98, 123.
Sawara.	<i>Cybium niponicum.</i>	Halfbeak.	22, 86, 108.
Sayori.	<i>Hyporampus sayori.</i>	Univalve mollusc.	86, 108.
Sazae.		Biscuit of rice.	90.
Senbei.		Parsley.	62.
Seri.	<i>Enanthe linearis.</i>	Swordfish.	70.
Shachi.	<i>Orca gladiator.</i>	Squill, Giant shrimp, or Prawn.	22.
Shako.	<i>Pridacna gigas.</i>	Lobster.	21, 22, 24, 88, 119.
Shiba ebi.	<i>Peneus Joyneri.</i>		22, 88.
Shijimi.	<i>Corbicula læna (Mollusc.)</i>		90.
Shimeji.	<i>Tricholoma Shimeji (Fungi).</i>		
Shiojake.	<i>Oncorhynchus keta.</i>	Dog salmon (salted).	21, 22, 24, 88, 110.
Shiokara.		Plasma of Ika, salted.	90.
Shirako.	<i>Oncorhynchus keta.</i>	Sperm of dog salmon.	88.
Shirasuboshi.	<i>Leucoparsion Petersi.</i>	Shirauo dried.	88.
Shirauo.	<i>Salagichthys microdon.</i>	Whitebait.	86, 108.
Shiro daizu.	<i>Glycine soja.</i>	White soy bean.	9, 21, 23, 25, 45, 48.
— goma.	<i>Sesamum Indicum.</i>	White sesame.	76.
— ingen.	<i>Phaseolus vulgaris.</i>	White French bean.	21, 66.
— miso.		White soy-bean paste.	66.
— sato.		White sugar.	10, 19, 25, 27, 28, 78, 120.
Shiso.	<i>Perilla ocimoides, var. Crispa vel purpurea (Labiata).</i>	Beefsteak plant. The leaves are dried and used as powder on account of the odour, which is considered agreeable.	
Shitabirame.	<i>Rhinoplagusia Japonica.</i>	Sole.	86, 108.
Shoga.	<i>Zingiber officinale (Rosac.).</i>	Ginger.	16, 20, 68, 98, 118.
Shokubutsusei rui.		Plant-food materials <i>i.e.</i> , foods of plant origin.	20, 21, 23, 25, 27, 28, 41, 56-79, 94-103.
Shokupan.		Bread.	35, 62.
Shoyu.		Soy-bean sauce.	38, 92, 114.
Shungiku; syn. Shujaku Kikuna.	<i>Chrysanthemum coronarium.</i>	Edible chrysanthemum, leaves.	72, 100.
Shutake.	<i>Cortinellus Shutake (Fungi).</i>		72, 119-120.

Japanese	Latin	English	Reference Pages
Soba. Sobako. Sobamai.	<i>Fagopyrum esculentum.</i>	Buckwheat. Buckwheat flour. Buckwheat rice or decorticated buckwheat. Pastry of buckwheat flour enveloping paste of sweetened beans.	35, 58, 115. 60. 60.
Somen.		Japanese macaroni made from wheat.	40, 60.
Soramame.	<i>Vicia faba.</i>	Broad bean, Horse bean.	21, 23, 25, 27, 64, 66.
Suika.	<i>Citrullus vulgaris</i> (Cucurbita).	Water-melon.	20, 23, 72, 100, 123.
Suikatame kuro. Suikatame shiro. Sumomo.	<i>Prunus domestica</i> (Rosac.).	Seeds, black, of melon. Seeds, white, of melon. Nectarine.	76. 76.
Suppon. Surume. Suzuki.	<i>Trionyx Japonica.</i> <i>Omastrephus Pacificus.</i> <i>Lateolabrax Japonicus.</i>	Snapping turtle. Sagittated calamary. Perch.	82. 88. 86, 108, 119, 124.
Tachiuo. Takenoko.	<i>Griechiurus Japonicus.</i> <i>Phyllostachys mitis.</i>	Hairtail. Bamboo shoots.	86, 108. 16, 20, 23, 26, 68, 72, 98, 123.
Tako. Takuan. Tamago.	<i>Octopus oolopodia.</i>	Pickled radish (daikon). Egg.	21, 24, 90. 92. 10, 11, 24, 25, 26, 27, 28, 35, 80.
— Shanghai. Tamanegi.	<i>Allium cepa.</i>	Chinese eggs, Shanghai eggs. Onion.	80. 20, 23, 35, 68, 72.
Tanago. Tanishi. Tara.	<i>Acheilognathus.</i> <i>Viviparus malleatus.</i> <i>Pollachius Brandti.</i>	Pond snail, Mud snail. Cod.	86, 110. 90. 21, 22, 24, 86, 88, 108.
Tarako. Tarugaki.		Codfish eggs, Cod roe. Persimmon seasoned in wine cask.	88. 76, 102.
Tensai.	<i>Beta vulgaris</i> , var. <i>Rapifera.</i>	Sugar beet.	78.
Tensaito. Tobiuo. Tofu.	<i>Cypelurus agoo.</i>	Beet sugar. Flying-fish. Bean curd. This is the chief meat substitute with rice-eating people; a spongy preparation rich in protein prepared from soy bean as follows; Hot boiled soy-bean milk is treated with about 2 per cent by volume of the concentrated liquor obtained	25, 27, 28, 78. 22, 86, 108. 32, 35, 37, 38, 40, 60, 113, 120.

Japanese	Latin	English	Reference pages
		in the manufacture of salt from seawater. The protein-rich material thus precipitated is strained, pressed and cut into cakes.	
Tofu Kasu.		Residue obtained in the manufacture of bean milk. <i>See To nyu.</i>	40, 68.
Togan. Tomato.	<i>Benicasa cerifera.</i> <i>Lycopersicum esculentum</i> (Solanac).	Large white gourd melon. Tomato.	72, 100. 20, 72, 100.
Tomitsu.		Brown sugar, Molasses.	10, 19, 25, 27, 28, 78, 120.
Tomorokoshi. Tona syn. tsukena.	<i>Zea Mays.</i> <i>Brassica campestris</i> (Crucifer.).	Indian corn.	26, 58. 20, 70.
Ton niku. To nyu.		Pork. Bean milk. Steamed soy beans are ground with water to yield a paste, which is pressed or kneaded with water in a barrel. The milky liquid is To nyu. The residue is Tofu kasu.	24, 26, 35, 82. 40, 68.
Torigai.	<i>Cardium papyraceum</i> (Mollusc.).	Cockle.	22, 90.
Tororo kombu.	<i>Laminaria cichorioides</i> (Alg.).	Edible seaweed.	21, 23, 74.
Tsubaki yu.	<i>From Thea Japonica</i> (Thead.).	Camelia oil.	78.
Tsukena; syn. Aburana, To na natana.	<i>Brassica campestris</i> (Crucifer.).		20, 70.
Tsukushi.	<i>Equisetum arvense.</i>	Field horsetail.	68, 98.
Udo.	<i>Aralia cordata.</i>		21, 92.
Ume.	<i>Prunus Mume</i> (Rosac.).	Plum.	92.
Umeboshi.		Pickled plum.	15-16, 19, 21, 22, 24, 25, 27, 28, 82- 86, 104-108.
Umio sakana rui.		Sea-fish.	25, 27, 28, 72, 74.
Umikusa rui.	Algæ.	Algæ.	10, 21, 23, 24, 25, 27, 28, 72, 74.
Unagi.	<i>Anguilla Japonica.</i>	Eel.	22, 86, 110.
Uni.		Sea-urchin eggs, salted.	90, 119.
Usagi niku.		Rabbit meat.	
Uzuramame.	<i>Phaseolus vulgaris.</i>	Spotted French bean, the colour resembling that of a quail (uzura).	21, 23, 66.
Wakame; syn. Nijime Menoha, Oshikime.	<i>Undaria pinnatifidia</i> (Alg.).	Lobe-leaved edible seaweed.	21, 23, 25, 74.
Wakasagi.	<i>Hypomesus olidus.</i>	Surf smelt, Pond smelt.	22, 86, 108.

Japanese	Latin	English	Reference pages
Warabi.	<i>Pteridium aquilinum</i> (Filices).	Common brake or bracken.	70.
Warasa.	<i>Seriola quinqueradiata.</i>	Yellow-fish (old).	21, 22, 24, 82, 104.
Wasabi. Yaenari. Yasai rui.	<i>Eutrema Wasabi.</i> <i>Phaseolus radiatus.</i>	Very small green bean. Vegetables.	68, 98. 21, 23, 10, 16, 19, 20, 23, 25, 27, 28, 38, 39, 40, 49, 70.
Yashi yu. Yatsugashira. Yatsume unagi. Yawarakai kudamono rui.	<i>Colocasia gigantea.</i> <i>Lampetro Japonica.</i>	Coconut oil. Variety of taro. Eel. Fresh soft (fleshy) fruits.	78. 68, 98. 22, 86, 110. 21, 23, 25, 27, 28, 35, 74, 76, 100, 102.
Yomena. Yuba.	<i>Asteromæa Indica.</i>	A protein- and fat-rich material made by boiling and skimming the pellicle which forms on soy bean milk.	68, 113.
Yuri.	<i>Lilii tigrini radix.</i>	Root of lily (edible).	16, 20, 26, 39, 68, 98.
Yuzu.	<i>Citrus aurantium</i> , subsp. <i>Junus.</i>	Citron.	21, 76, 102.
Zabon.	<i>Citrus aurantium</i> , subsp. <i>Sinensis</i> , var. <i>Decumana.</i>		21.
Zenmai.	<i>Osmunda regalis</i> , var. <i>Japonica.</i>		70.
Zeribinzu.		Confectionery.	64.

English	Japanese	Reference pages
Ash low value of, in Japanese green foods. — special character of, in rice. Autolysis in food. Autolytic ferments.		39. 39, 56. 117. 117.
Baker's garlic. Bamboo shoots.	Rakkyo. Takenoko.	70, 100. 16, 20, 23, 26, 68, 72, 98, 123.
Banana. — cake.	Banana. Banana cake.	74, 100. 64.
Barley. — production of, in Japan. — naked. — distribution of, in Japan. — comparison of protein. — with rice of protein. — composition of. — cost of, compared to rice. — flour.	Omugi. Hada kamugi.	9, 12, 13, 14, 18, 25, 26, 27, 28, 31, 33, 35, 40, 42, 45, 46, 58, 60, 113. 45, 47. 45, 46. 28, 31, 40. 58. 40.
Barracuda.	Hikiwari, Oshimugi.	60.
Beans.	Kamasu. Mame rui.	22, 84, 106. 9, 10, 11, 15, 16, 19, 21, 23, 25, 26, 27, 28, 32, 35, 37, 45, 48, 64-66, 113- 114, 118.
— broad.	Soramame.	21, 23, 25, 27, 64, 66.
Bean curd.	Tofu.	32, 35, 37, 38, 40, 66.
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LEAGUE OF NATIONS

Health Organisation

PERMANENT COMMISSION ON STANDARDISATION
OF SERA, SEROLOGICAL REACTIONS
AND BIOLOGICAL PRODUCTS

MEMORANDA

ON

Cardiac Drugs, Thyroid Preparations,
Ergot Preparations, Filix Mas,
Suprarenal Preparations, Vitamins,
Pituitary, Salvarsan, Oil of Chenopodium,
Insulin

By

Professor E. KNAFFL-LENZ

(VIENNA)

Publications of the League of Nations

III. HEALTH ✓
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INTRODUCTION

The Memorandum by Professor Knaffl-Lenz deals with the results of two International Conferences on the biological standardisation of certain remedies, held in July 1923 at Edinburgh and in September 1925 at Geneva; and also of a subsidiary Conference, with more restricted membership, held in Frankfurt in May 1928, with the object of reviewing the principal recommendations made by the Geneva Conference, in the light of the further experience which had accumulated in the interval, and of presenting them in suitable form for adoption by the Permanent Standards Commission, then meeting at Frankfurt. Professor Knaffl-Lenz reviews in some detail the course of the discussions at the different Conferences, the data obtained in the various investigations undertaken in different countries as the outcome of these discussions, and the recommendations which finally resulted. It may be appropriate to use the opportunity afforded by the publication of his memoranda for a more general survey of the principles which seem to have emerged from the discussions, and from the experience of those who have participated during the past five years in this international work.

When the Health Committee of the League of Nations decided to summon the Conference which met at Edinburgh in 1923, they acted on experience, already gained, as to the possibility and value of international agreement with regard to the standardisation, by biological methods, of certain sera and bacteriological re-agents. Historically, also, it was to certain antitoxic sera that the measurement of potency by biological methods had first been successfully applied. The success and the general acceptance of such methods, for the assay of the diphtheria and tetanus antitoxins in particular, had naturally given rise to the suggestion that certain potent drugs and organ extracts, of which the active principles, for one reason or another, were not accessible to chemical determination, should similarly be assayed by biological tests. Practical effect had been given to this suggestion in many different directions, and the results of a large volume of ingenious investigation, by numerous workers in different countries, was available for study. The problems, however, which faced the members of the first Conference when they assembled at Edinburgh, appeared to be at once more numerous, more varied and more indefinite than those which had been presented to the Serological Conferences previously held under the same auspices.

It was necessary, in the first place, to recognise clearly the fact that two separate problems are involved in the construction of a method of real standardisation: (1) the definition and preparation of a stable standard of reference, and (2) the discovery of a specific and accurate biological method of comparison with that standard. In the case of sera, such as the diphtheria and tetanus antitoxins, this dual requirement had early been appreciated. Stable, arbitrary standards of such sera had been prepared and preserved in suitable centres, and methods of sufficient accuracy had been devised for comparative testing, so that the potency of any preparation could be indicated in units, defined in terms of the relevant permanent standard. From time to time, methods differing in detail, and even in principle, had been introduced, but the standards had remained permanent. The first and most obvious task of international action with regard to these sera had accordingly been to compare the different national standards which had come into existence, and to secure for each serum the general adoption and international recognition of one common standard, and of a common unit defined in terms thereof.

In the work which had been done on drugs and hormones, on the other hand, there had been no clear recognition of these two separate factors of successful standardisation. The principle of using stable standards of reference had not been generally accepted. Various efforts had, indeed, been made to introduce a notation of units of activity; but these, in the case of such drugs as digitalis, or, to take a more recent example, of the hormone insulin, had actually been defined in terms of some animal reaction. Accordingly, the large volume of writings on the standardisation of substance of this mixed group had concerned itself chiefly with the rival merits, whether of ease or of accuracy, of the different biological methods which various investigators had devised and advocated. This material formed the basis of the initial discussions of the Edinburgh Conference. Even in the case of a remedy of such recent introduction at that date as insulin, the members of the Conference found themselves involved in a consideration of the respective merits of two different suggested units, one based on the reaction of rabbits, the other on that of mice, without any common basis of reference which would enable the relation of the two suggested units to one another to be expressed with any precision. The difficulty of securing agreement on such questions of method soon became obvious by the attempt to persuade an investigator, with long experience and confidence in one technique, to abandon it in favour of another which he knew and trusted less. It further became clear that, in many cases, the definition of a unit in absolute terms of some animal reaction would give no sufficient guarantee of its uniform measurement in different countries. Even if such

difficulties could have been overcome, there would have remained the doubt whether an attempt to secure uniformity, by adopting and stereotyping a method, would have been justifiable on scientific grounds. By such considerations the Edinburgh Conference and its successors were led, in dealing with each of the more important of the remedies which have come under their notice, to regard it as their primary task to define a stable standard of activity; to make arrangements for the standard to be prepared and to be kept in some suitable central institute on behalf of the League of Nations Health Organisation; and to define, where necessary, a suitable unit of activity, in terms of a weight of the standard.

When, as the result of the discussions at Edinburgh, this general principle of action became clear, arrangements were made for the experimental production of stable standards for digitalis, insulin, and the pituitary posterior lobe. In the following two years, these provisional standards were circulated among investigators in numerous countries, with a view to collecting evidence, from as wide a range of experience as possible, as to the acceptability of these standards for international adoption. At this stage, the investigations necessarily involved the trial of different methods of biological comparison with the standard. The use of a common standard by so many independent workers provided, indeed, an opportunity, previously lacking, of direct comparison between the results obtained by the application of different methods of biological measurement to the same remedial agent. Such comparisons, again, gave rise to useful and interesting subsidiary discussions on points of detail. These investigations served the further purpose of emphasising the conditions which a method must satisfy, in order to be regarded as appropriate for biological measurement; namely, that it shall be capable of giving a sufficient degree of quantitative accuracy and that the active constituent, which it measures with such adequate precision, shall be the therapeutically important one. Such conditions, as thus stated, appear self-evident; but the wide literature of the subject gives abundant evidence of the possibility that they may be forgotten. The mode of their application, and their relative importance, show interesting differences in the case of the three important remedies above mentioned.

In the case of insulin, no doubt arose as to the specific nature of the effect, which was measured by the different methods under investigation. On the other hand, it was a practical therapeutic necessity that this specific action should be determined with the greatest possible accuracy. The result was to show that several of the methods proposed would give identical results, within satisfactorily small limits of error, when applied in relation to the common standard. The needs

of the situation were therefore met by the adoption, by general agreement, of the provisional standard and the definition of one common unit in terms of it, in place of the various units previously current and qualified as "physiological", "clinical", "rabbit", or "mouse" units. Several of the existing methods of measurement were recognised as suitable, and the opportunity for the introduction of new or improved methods was left freely open.

? In the case of digitalis, on the other hand, there was uncertainty as to whether the active principles measured by the different methods were the same and, further, as to which, if any, of the methods measured that active constituent which was therapeutically desirable and important. Much work was accordingly devoted to the evaluation of different samples by several methods in comparison with a common standard, and, at a later stage, to the endeavour to ascertain whether the relations of activity displayed by any of the methods would hold good for the relative therapeutic activities as determined by the use of the same specimens of the drug in the treatment of selected human patients. To this last question no clear and decisive answer was obtained; but the failure was attributable, not to the inaccuracy of the laboratory methods of assay — any one of which, indeed, would give reasonably concordant results in the hands of different investigators — but to the highly variable results obtained in the clinical trials. From the point of view of a scientific decision, such an outcome was unsatisfactory. From another point of view, however, it was reassuring, since it indicated that the requirements of clinical practice for uniformity of dosage could be adequately met by the use, in conjunction with the standard, of any of the principal biological methods of assay which had been brought under this organised investigation. Again, therefore, the principle emerged that the proper aim of international action was the acceptance of a common, stable standard, with provision for the central preservation and ultimate renewal of the same. As regards the methods of assay, on the other hand, approval could be recorded of those which the organised international trials had shown to be adequate, without compromising in any way the freedom of scientific work directed to the improvement of these, or the development of new and better ones.

The methods used for measuring the activity of pituitary (posterior lobe) preparations, in comparison with the suggested standard, presented again a different problem. Three methods were advocated, based on three quite different physiological reactions, and there was evidence that any of them, in expert hands, could be made to give sufficiently accurate and self-consistent measurements. Each of them, moreover, was clearly and directly related to one of the three important, and

equally distinct, therapeutic uses of the extract. On the other hand, the Conferences were faced with a conflict of evidence on the important question as to whether the three types of activity represented three distinct active principles of three aspects of the action of one common principle. The Geneva Conference of 1925 therefore recommended the international adoption of the proposed stable standard, which had been widely tested in the interval and found satisfactory, and defined a unit of activity in terms of the standard ; on the other hand, they recognised any of the proposed methods of biological measurement as satisfactorily equivalent. Since that date, the position has been cleared by the production of definite evidence that two, at any rate, of the chosen physiological actions are due to distinct and chemically separable principles. As regards these two principles, there is satisfactory evidence that they maintain their normal relative proportions in different samples of the standard, prepared in accordance with the accepted process. Any preparation, therefore, can be assayed by comparison with the standard, using the biological method appropriate to its therapeutic purpose ; and its activity in the chosen direction can still be expressed in units corresponding to the activity of the chosen, arbitrary weight of the standard. With this new evidence before them, the members of the Technical Committee, which met in May 1928 at Frankfurt, were able to confirm the recommendations of the Geneva Conference with regard to the adoption for international use of the proposed stable standard, and of the unit defined in terms thereof. As regards methods, on the other hand, uniformity was not merely difficult, but inadmissible : it had to be recognised that different methods of assay must be used in relation to the different therapeutic uses of this potent extract.

The case of the arsenobenzene group (salvarsan and its analogues and derivatives) first came under consideration at the Geneva Conference of 1925. The problem was again a different one. There was no question here of measuring a variable activity and expressing it in units. What was needed was a guarantee that no sample of a particular preparation should have a toxicity significantly greater, or a therapeutic potency significantly less, than that of a good, average preparation of the compound which it claimed to represent. After prolonged discussions of the possibility of laying down standard methods of testing and securing their international adoption, the Conference found themselves again driven back upon the principle of setting up stable standards of reference for the various compounds included in the group, and leaving latitude of choice with regard to the methods of comparison used to determine the conformity of samples with these, both as regards toxicity and potency. The subsequent meeting at Frankfurt reaffirmed these recommendations on the basis of

experience, with such modifications as would define more precisely the permissible limits of variation, while widening yet further the range of acceptable modifications in the methods used.

In the case of some other remedies, such as *Filix mas*, it was not considered practicable, or necessary, to prepare a basic standard of reference, and the different Conferences contented themselves with recognising, as an adequate guarantee of activity, the determination of the dilution in which the preparation produced a characteristic biological effect. In general, however, it may be said that the decisions with regard to remedies of major importance, requiring biological standardisation, resulted in an ever clearer recognition of the fact that the principal aim of international action in this connection should be the creation of permanent stable standards of reference, and that the main object of international agreements should be the acceptance of such standards and of arbitrary units defined in terms of them. Standards, in the nature of the case, should be permanent, and the object of further action with regard to them should be, not to change them, but to ensure that they do not change. Methods, on the other hand, must be open to progressive modification and improvement, in accordance with the teaching of experience and research. If the International Conferences on the biological standardisation of drugs and hormones had had no other result than to bring the practice with regard to these remedies thus into line with the traditions long established in the standardisation of sera, they would have justified all the work which so many experienced investigators in different countries have contributed to the common stock and have put before their colleagues in a series of fruitful discussions.

I may take this opportunity, as Chairman of the more recent meetings, of expressing my personal thanks to all who have so generously co-operated in this important international work. Those who still remain would, I am sure, desire that I should also express, on behalf of us all, our deep sense of the irreparable loss to science, and to our circle of international friendship, occasioned by the deaths of two of those who were among the most prominent and effective in our earlier discussions — Professor Cushny, of Edinburgh, who presided with genial tact over the technical part of our Conference at Edinburgh, and Professor Magnus, of Utrecht, who undertook the heavy work and responsibility involved in the preparation of one of our most important standards. None contributed more than they to whatever of solid worth has resulted from our meetings and our investigations, or to that atmosphere of genuine and friendly co-operation that has happily attended our activities.

H. H. DALE.

I. CONFERENCES HELD AT EDINBURGH 1923 AND AT GENEVA 1925.

CARDIAC DRUGS

(DIGITALIS, STROPHANTHUS, SCILLA).

DISCUSSION AT THE EDINBURGH CONFERENCE

On the question of the assay of digitalis, which, in spite of a decade of work, has not yet been satisfactorily settled, reports were received at the Conference at Edinburgh from Professor CUSHNY and Professor MAGNUS.

Professor CUSHNY first dealt with the methods for which frogs, or the isolated hearts of frogs, are used. The isolated heart reacted not only to the digitalis glucosides but also to the therapeutically inactive saponins, and it was preferable to use a method which determined the minimal lethal dose for an intact frog. As a standard he suggested dried digitalis leaves instead of the usual strophanthin.

Professor MAGNUS dealt with the use of cats for the assay of digitalis according to a modification of the method of HATCHER and BRODY. The original method depended on the observation that, if a given quantity of a solution of *g. strophanthin* were slowly infused intravenously into a narcotised cat, in the course of 90 minutes, the cat's heart stopped beating. If digitalis were infused first, less strophanthus was necessary. From the deficit, the strength of the digitalis preparation could be calculated in strophanthus units.

STORM VAN LEEUWEN, SLUYTERS, and particularly DE LIND VON WYNGAARDEN, have shown in a series of detailed investigations from the Pharmacological Institute in Utrecht that the modification of ROWNTREE and MACHT (in which they determined the quantity of digitalis necessary to stop the heart unassisted by strophanthus) allows greater accuracy to be attained.

Professor MAGNUS discussed the method used in the Institute at Utrecht and the results obtained with some hundreds of cats and showed that with three or four cats the mean error amounted to only 6.5 per cent, and that the error was seldom more than 10 per cent.

According to Professor MAGNUS, this method had the great advantages over the various frog methods that the result was independent of the time of year, that the experiment was quickly performed without the use of a standard, and that an unconcentrated 0.5 per cent watery infusion could be used. Finally, it did not necessitate the assumption that the mammalian heart responded to digitalis in the same way as the heart of a frog.

After Professor KROGH had spoken of the researches of Mrs. Marie KROGH in which an isolated frog's heart was used, the Conference acknowledged the advantages of the modification of HATCHER'S method, but expressed the view that this method was then unpracticable in many countries because of the cost and that the frog methods provided a sufficiently accurate test.

Dr. DALE stated that, according to the experience of Dr. BURN and Sir THOMAS LEWIS, it appeared that the cat method and the frog method measured different active principles in digitalis, and Professor MEYER proposed that the values obtained by the two methods should be compared with values obtained by the colorimetric method of KNUDSON and DRESBACH. After further discussion, the Conference agreed to the following proposal :

“ The Conference holds the opinion that the activity of digitalis, strophanthus, scilla and apocynum, and of other heart tonics of this group and of their preparations, can be determined with reasonable accuracy, either by the lethal dose method on frogs, with injection into the lymph-sac, or by the lethal dose method on the cat, with slow intravenous infusion. The members of the Conference have not sufficient evidence before them with regard to the relation between the activities determined for the same preparation by the two methods, or as to the relation between the activity determined by either method and the potency of the preparation as a therapeutic agent in human medicine. The Conference accordingly holds the opinion that for the present the choice of method should be determined by the experience of the individual worker or by the variation of local conditions. It considers, however, that further investigation should be promoted, with a view to determining the relation between values obtained by the two methods, and of both to therapeutic activity.

“ The Conference recommends the establishment of a unit of activity, for each of the remedies of this class,

as highly desirable. In view of the multiplicity of methods and the possible variation of the experimental animals, it regards it as desirable that the unit should be defined in terms of a definite weight of some standard preparation, and not in terms of lethal effect upon a species of animal. It recommends the investigation of the possibility of using, as a standard for digitalis, a specially prepared sample of dried digitalis leaves, preserved with precautions against access of moisture or oxygen, and accepts the offer of Professor Magnus to prepare such an experimental standard in Utrecht. By comparison of the determinations made on this sample by different methods and in different centres, it hopes that a basis may ultimately be provided for the definition of an international unit, in terms of a definite weight of such a standard preparation.

“As standard for strophanthus and its preparations, the Conference recommends the adoption of the pure crystalline *Gratus-strophanthin* (*g. strophanthin, ouabain*).”

ARRANGEMENTS FOR THE COMBINED TEST.

To enable the resolutions of the Conference to be carried out, Professor MAGNUS made and assayed three different preparations of dried digitalis leaves by his method, using cats, and placed the samples in their order of potency.

After these preparations had again been tested in London by DR. BURN and DR. DALE they were sent out to a number of investigators without any information as to the results of the tests already completed.

These investigators were also given directions for the making of the tests, together with the detailed memorandum of DR. DALE and DR. KNAFFL-LENZ, which contained a review of all the work which had so far appeared on the biological testing of digitalis, and a critical discussion of the methods of preparing extracts and making the tests. The directions which were intended to enable comparable results to be obtained in the different institutes were as follows :

1. The three samples of dry digitalis leaves, labelled “Standard”, “A” and “B” respectively, should be standardised by the cat method in institutes having the requisite facilities, the method described by MAGNUS being used, with the watery infusions recommended by him, or with extracts made by exhaustion with absolute alcohol.

2. For any of the frog methods, it is recommended that only complete extracts, made with absolute alcohol, should

be used. These should be suitable, after replacement of alcohol by saline solution, for either the lethal dose, injection methods, or perfusion methods.

3. For the frog methods based on determination of the lethal dose, with injection into the lymph-sac, it is suggested that, in addition to determinations by the one-hour and twelve-hour methods, which will be made in institutes favouring the one or the other limit, some workers should provide, for comparison, data obtained with an intermediate three-hour limit.

4. It is suggested that all results obtained on frogs by the minimal lethal dose methods should, to facilitate comparison, be expressed in milligrammes of drug, represented in the extract, per gramme of frog.

5. It is requested that full details, such as species of frog, temperature, date, etc., may be given in all records of experiments on frogs.

6. It is suggested that as many investigators as possible shall make, with each extract used for biological assay, a parallel colorimetric determination by the picrate method, following the indications given by KNUDSON and DRESBACH.

SUMMARY OF THE RESULTS.

The method using cats and the method using frogs both gave results which agree well among themselves. While the test on frogs showed (taking the mean of all the results) that powder A has only 50 per cent of the activity of the Standard, and that powder B has the same activity as the Standard or slightly less, the tests on cats and guinea-pigs gave the result that B had slightly more activity than the Standard, and that A had about 60 per cent of the activity of the Standard. The results obtained by different workers with the proposed and other methods are, on the whole, quite satisfactory. They have shown that concordant results can be obtained in different countries both with cats and with frogs. But the relative values obtained by the two methods are not quite identical. When cats were used, preparation B appeared, on the average, about 15 per cent stronger than the Standard, while the experiments with frogs showed, with one exception, that it was weaker. Also preparation A appeared weaker on frogs than on cats.

RESULTS OF TESTS ON FROGS.

Considering that the conditions of the tests on frogs, and particularly the methods of preparing the extracts, were quite uniform, the differences in the results are not great.

Table I. — Ordinary Test.

Investigator	Minimal lethal dose per gramme of frog.			Relative potency		
	Standard (mg.)	A (mg.)	B (mg.)	Standard	A	B
JOACHIMOGLU	0.55	1.15	0.60	100	47.8	91.6
STRAUB	0.51	1.12	0.52	100	45.5	98.0
(Soxhlet)	[0.58]					
ROST	0.64	1.08	0.68	100	59	94
DALE and BURN	0.70 1.25	1.80	1.00 1.25	100 100	38.8	70.0
PICK	0.66	1.15	0.60	100	57.4	110.0
Mean	0.72	1.26	0.73		49.9	93.9
Mean deviation from the mean	±0.16	±0.21	±0.22		± 6.8	±7.3
Mean deviation per cent.	±22.2	±16.7	± 28		±13.6	±7.8

In this connection it should be noted that the tests in which extracts were injected into the lymph-sac of *R. temporaria* were carried out in the spring. With the exception of PICK (who used the two-hour method), all the investigators used the so-called "timeless" method. As regards the preparation of the extracts, DALE and BURN and JOACHIMOGLU extracted the preparations with ethyl alcohol for 24 hours in a soxhlet and, after boiling off the alcohol, took up the residue in Ringer solution. STRAUB and ROST, on the other hand, digested the powders for 24 hours with 96 per cent alcohol and then heated them for half-an-hour with a reflux condenser, boiled off most of the alcohol, and, by adding Ringer's solution, prepared an emulsion containing 20-25 per cent alcohol. PICK digested the powders for 24 hours with 25 per cent alcohol in the cold.

Neglecting the divergent results obtained by DALE and BURN, the average deviation is 10-20 per cent. The mean values for the lethal doses in mg. per gramme of frog would then be : for the Standard, 0.61 ; for A, 1.12 ; and for B, 0.68. From the protocols it was evident that the method of ROST, who used

for each test six frogs, of which at least five must die, gave the most regular results. The values he gives are almost identical with the means for the whole series. The assays of CUSHNY are not included in the table, because they must have been carried out on unsuitable frogs. This explains also the divergent results he obtained (Standard, 2 mg. ; A, 2.5-3 mg. ; B, 0.8 mg.).

Table II. — Some Special Tests.

Investigator	Minimal lethal dose per gramme of frog			Relative strength		
	Standard (mg.)	A (mg.)	B (mg.)	Standard	A	B
GARCIA, GUEVARA and JIMINEZ (Manila)	0.26	0.56	0.24	100	46.5	108.3
HEYMANS (<i>Rana esculenta</i>)	1.51	1.72	1.05	100	87.9	144.8
SMITH and McCLOSKEY	0.48	0.90	0.50	100	52.8	96
KNAFFL-LENZ and STERN (<i>Rana esculenta</i>)	0.80	1.80	0.90	100	44.5	88.9
KROGH, isolated heart of <i>Rana esculenta</i> .				100	41.0	96.0

In this table it is to be noted that GARCIA and his co-workers extracted the leaves for 60 hours in Soxhlet's apparatus and, after boiling off the alcohol, took up the residue in Ringer's solution. About 200 frogs (*Rana tigrina*) were used for the three tests at a temperature of 27°C. The high temperature would account for the low lethal doses observed. SMITH and McCLOSKEY have shown that increase of the temperature greatly increases the toxicity of digitalis glucosides, as it does that of strophanthin (SOLLMANN, MENDELHALL, STINGLE and BAKER). When the temperature is increased by 10°, the toxicity is about doubled. The results recorded in Table I, which were obtained with temperatures of 15-20°, are thus in good agreement with GARCIA's results, as regards the absolute toxicity of each of the samples.

SMITH and McCLOSKEY injected into the skin vein of *Rana pipiens*, which leads directly to the heart, solutions made up

with pure water, since solutions containing alcohol were in themselves more toxic by this method. As the minimal lethal dose, they took the dose which stopped the heart of a decerebrate frog in one hour. KNAFFL-LENZ and STERN also employed this method, but used *R. esculenta*, since in this species the skin vein is well adapted for injections. The method of SMITH and McCLOSKEY had the advantage over the other methods employing frogs that the seasonal variation in the sensibility of the frogs is less. Errors due to differences in rate of absorption are eliminated. Hence the one-hour method gives reliable values after intravenous injection.

Since the values obtained by HEYMANS with *Rana esculenta* for A and B are almost identical with those of KNAFFL-LENZ and STERN, while the lethal dose observed by HEYMANS for the standard is abnormally high, it is assumed that some mistake has occurred.

M. KROGH has shown that the isolated heart of *R. temporaria* is unsuitable for assays, because the digitalis glucosides cannot be washed out of it, and the effect of a solution of given concentration is therefore dependent on the time for which it acts. On the other hand, digitalis can be washed out of the heart of *R. esculenta*, and the action is accordingly independent of the time and is directly proportional to the concentration, so that STRAUB'S preparation of the heart of this frog may be used for assays. The relative values obtained are about the same as those obtained by SMITH and McCLOSKEY with *R. esculenta*.

RESULTS OF TESTS ON CATS.

As has been mentioned already, the relative values obtained with the modification of HATCHER'S method used in the Utrecht Institute were not identical with those established by the use of frogs. Powder B appeared to have a stronger effect than the Standard on cats when a watery infusion was used, but the same effect when the solutions were prepared from alcoholic extracts. The difference in the method of preparation appears to be responsible for the difference in the relative activities. The results obtained on cats are given below :

Table III.

Investigator	Minimal lethal dose, c.cm. per kg. of cat			Relative potency		
	Standard	A	B	Standard	A	B
<i>With 0.5 Per Cent Watery Infusion</i>						
HEYMANS (Gand)	18.02 18.86	31.88 28.58	17.11 14.8	100 100	57.0 65.7	105.0 127.4
GARCIA, GUEVARA and JIMINEZ (Manila)	20.90	39.00	19.20	100	53.6	108.8
DALE and BURN (London)	(18.11 20.40)	34.50	16.80 15.45	100 100	52.5	107.8 132.0
JOACHIMOGLU (Berlin)	22.34 20.51	32.40 36.01	19.50 18.86	100	68.9	111.5
McFARLANE and MASSON (Edinburgh and Lon- don)	21.34 20.80					
MAGNUS (Utrecht)	18.11 18.65 17.99 17.06 17.61	29.43 30.54	15.41 16.02	100 100	61.2 61.1	112.0 116.4
Mean	19.33	32.78	17.04		60.00	115.1
Mean deviation from the mean	+1.39	+2.78	+1.47		+4.8	+7.5
Mean deviation per cent	+6.97%	+8.68%	+8.63%		8.0%	6.5%
CUSHNY (Edinburgh)	23.5 +3.3	36.7 +1.4	21.8 +0.6	100	64	108
<i>With Alcoholic Extracts</i>						
SMITH and McCLOSKEY (Washington)	18.80	25.50	19.4	100	73.7	96.9
DALE	18.50	30.90	17.74	100	59.8	104.5
GARCIA	16.30	34.40	14.60	100	47.5	111.6
JOACHIMOGLU	19.39	28.46	21.74	100	68.1	89.2
Mean	18.25	29.81	18.37	100	62.3	100.5
Mean deviation from the mean	+0.97	+2.89	+2.37		+8.7	+7.5
Mean deviation per cent	+5.31%	+9.69%	+12.90%		+14.1	+7.4

RESULTS OF TESTS ON GUINEA-PIGS.

Table IV.

Investigator	Minimal lethal dose, mg. of drug per 100 gm. of guinea-pig.			Relative potency		
	Standard	A	B	Standard	A	B
<i>With Watery Infusions</i>						
KNAFFL-LENZ	19.0	39.9	17.5	100	49.9	108.6
	±0.8	±0.2	±0.3			
	±4.4%	±0.5%	±1.7%			
<i>With Alcoholic Extracts</i>						
KNAFFL-LENZ	19.8	37.2	18.8	100	53.2	105.4
	±0.7	±1.8	±0.5			
	±3.6%	±4.9%	±2.7%			
Mean	19.4	38.6	18.2	100	51.5	107.0

From this summary it is evident that MAGNUS' modification of HATCHER's method gives very consistent results in different countries. When a 0.5 per cent watery infusion is used, the mean deviations from the mean value do not exceed 10 per cent. DE LIND VAN WYNGAARDEN has shown, on the basis of experiments on 573 cats, that in 95 per cent of cases the deviation from the mean is less than 10 per cent, and that, in general, the strength may be measured by using three or four cats. If the mean error is not to exceed 6 per cent, the number of estimations must be such that the mean of the percentage deviations from the mean of the results is less than $6.67 \sqrt{n-1}$ (n is the number of cats used), results being neglected which differ from the mean of all the results by more than 20 per cent. An exception to the consistency of these results is provided by those obtained in Edinburgh by CUSHNY, and later by MCFARLAN and MASSON. The absolute values obtained by CUSHNY (the values given in the table are the arithmetic mean of 10 results with the Standard, 4 with A, and 3 with B) are,

on the average, higher, and the differences between the individual tests are actually greater than those obtained in other places. In the case of the Standard, they exceed 70 per cent (the volume injected was in one case 29.7 c.cm. and in another 17.5 c.cm.). Further tests showed that, after atropinisation of the cats, the results were lower and more concordant. MCFARLANE and MASSON, in detailed investigations with the standard preparation on 55 cats, showed that the differences in sensitivity of the Edinburgh cats do not depend on the sex, or on the diet, or on differences in the tone of the vagus, but that there are two classes of cat, one class being more sensitive to digitalis than the other. These differences were lessened, but not abolished, by atropine. On the basis of observations made by these authors on 16 London cats, they suggest that the class of cat which is more resistant to digitalis is rarer in London than in Edinburgh.

KNAFFL-LENZ has carried out investigations to determine whether the cheaper and more easily procurable guinea-pig was not as suitable as the cat for assays by HATCHER'S method. He found that by using guinea-pigs weighing between 550 and 800 grammes, which had been kept on a constant diet, the assay could be made as effectively as by the use of cats. As the heart of the guinea-pig is about twice as resistant to digitalis as the heart of the cat, the 0.5 per cent watery infusion is too weak. 1.5 to 2 per cent infusions are used, so that not more than 1.5 c.cm. per 100 grammes of guinea-pig is infused. The lethal dose is taken as that which renders the heart unexcitable by mechanical means after opening the thorax. Especial care must be given to the artificial respiration and to the amount of ether administered, since guinea-pigs are easily killed by an excess of ether.

As can be seen from the table, the observed relation between the strengths of the standard and preparation B is about the same as that found when cats are used, but preparation A, with which in nearly all the investigations divergent results were obtained, appeared stronger than in the tests on cats.

Further investigations on guinea-pigs in Vienna have shown that the deviations of individual determinations from the mean are seldom as large as 10 per cent, and that three guinea-pigs are usually sufficient for a test. In experiments on 21 guinea-pigs by J. H. Gaddum (National Institute for Medical Research, Hampstead, London) the standard deviation of a single observation from the mean was 12.5 per cent, so that the amount of variation was about the same as that of the 573 cats used by DE LIND VON WYNGAARDEN.

MRS. KROGH'S TWO METHODS.

1. *Isolated Heart.*

In addition to these biological tests, there is the test of MRS. KROGH, who, as already stated, used the heart of *Rana esculenta*, with which the action is proportional to the concentration, since there is no accumulation of the glucosides in the heart such as occurs with *R. temporaria*. With the heart of the latter species the action depends not only on the concentration but also on the total quantity present and the time for which it is allowed to act.

The test is carried out as follows :

Two isolated esculenta hearts (STRAUB'S preparation) were tested with solutions, one of which was presumably too strong and the other too weak. This was repeated with pairs of hearts until a concentration was found which was just sufficient to stop the ventricular contraction for at least a minute, at a temperature of 18-20°, within 1½ hours. An "esculenta unit" was defined as the activity contained in 1 c.cm. of this solution. By the use of 8 to 12 hearts, the assay can be carried out with an accuracy of 10 per cent.

2. *Mice.*

M. KROGH also investigated the use of young mice weighing from 18 to 20 grammes for the assay of digitalis — and strophanthus — preparations.

As mice are particularly resistant to cardiac drugs, very concentrated solutions are necessary for the production of marked toxic symptoms or death. According to M. KROGH, after adequate doses, death occurs in from one to three days with increasing ventricular spasm and not through paralysis of the respiration. With sub-lethal doses, toxic symptoms appear more slowly, persist for a day or more, and then gradually disappear.

In carrying out a test, concentrated solutions were injected into several series of mice to determine : (1) the largest dose which produced no effect ; (2) that which produced slight symptoms — disturbances of gait ; (3) that which produced marked symptoms — the inability to run or to rise from the recumbent position ; (4) the smallest dose which produced death.

By comparing the quantities of the different preparations required to produce these effects, their relative potencies are estimated. With these methods, MRS. KROGH has found that the Standard and preparation B have equal potency and that preparation A has 45 per cent of the potency of the Standard.

Both methods, however, give significant results only if qualitatively similar solutions are used.

KNAFFL-LENZ and STERN, as the result of their investigations, came to the conclusion that the minimal lethal dose of digitalis preparations for mice cannot be determined. With preparations of average strength the lethal dose by intraperitoneal or intravenous injection (2-6 mg. of leaf per gramme of mouse) is so large that it cannot be attained without exceeding the permissible volumes of fluid. The low solubility of digitoxin makes it undesirable to use more concentrated infusions or solutions. The quantity necessary to kill mice of identical weight within one or two hours varies by 100 per cent. In general, it has been observed that those mice which do not die in the first two hours after intravenous injection will, in spite of the appearance of severe toxic symptoms, generally recover after a few days if they are kept warm. The deaths which occur within one or two hours are due, however, not to the action of digitalis on the heart but to asphyxia following complete paralysis of the body musculature. The breathing becomes severely affected in the later stages and ceases without the appearance of appreciable asphyxial convulsions, while the heart continues to beat for some time longer. Late deaths (after two or three days) are the result of general weakness — the cold paralysed animals decline to take food.

PROFESSOR MANSFELD'S METHOD.

Finally the method proposed by Professor MANSFELD (Pécs, Hungary) must be mentioned. The suitability of this method can only be gauged when further comparative tests have been made. The assay is carried out as follows :

Strips of the sinus of *R. Esculenta* are suspended in small vessels filled with Ringer's solution saturated with oxygen. Every ten minutes the number of contractions is counted and the solution changed. The lowest concentration of strophanthin which will arrest four such strips in 60 minutes is determined. The same method is then applied to the digitalis preparation and the potency expressed in milligrammes of strophanthin.

EXTRACTION.

To the old question whether the extraction of the active glucosides is best effected by water or alcohol, the above-mentioned researches give no conclusive answer.

STRAUB has shown that a cold-water extract contains gitalin and digitalin, but no digitoxin. On the other hand, hot-water extracts contain digitoxin, but only a part of the gitalin, which is destroyed by boiling.

JOACHIMOGLU showed that with a Soxhlet apparatus (and alcohol) about 25 per cent more of active substance can be extracted than with water alone — a result which should be confirmed.

Professor MAGNUS, on the other hand, as a result of investigations carried out in his institute, held the view that a 0.5 per cent watery infusion carried out according to the directions in the Dutch pharmacopœia is exhaustive; all but 0.4 to 1 per cent of the active principles are extracted, and the method gives constant results. On the other hand, the action of alcohol is said to cause an inconstant and often considerable increase in activity, for which the digitalin fraction (STRAUB) is said to be responsible.

DE LIND VAN WYNGAARDEN has shown that, when powdered leaves, dried at 15° C., are treated with hot alcohol vapour, the increase in activity may be 58 per cent, but that this increase does not occur with all leaves, and is not constant in amount with any one sample. Professor MAGNUS therefore rejected extraction by alcohol, because it is subject to the influence of inconstant factors. This increase of activity is suggested as the reason for the fact that the Soxhlet extracts prove to be stronger. Thus, for example, the activity of the powder B showed the following changes;

1. Normal	12.1
2. Treated with alcohol vapour	14.6
3. Alcohol, Soxhlet extract of, 1.	14.6
4. " " " " 2.	14.2

The treatment with alcohol vapour produces the same increase of activity as does Soxhlet extraction. If a comparison is made of the results obtained in tests on the cat by JOACHIMOGLU, on the one hand, with Soxhlet extracts, and, on the other hand, with watery infusions, it is found that the former were 11-15 per cent more potent. The mean activities obtained in all the investigations with alcoholic extracts of the Standard and A were about 9 per cent greater than those obtained with watery infusions. In the case of B, on the contrary, they were 9 per cent weaker. These differences are of the order of the mean deviation from the mean. In the experiments with guinea-pigs, the difference is less than the error of the method. The deviations from the mean shown by the results of the different workers with alcoholic extracts is about the same as that shown with watery infusions, so that the inconstancy of the action of alcohol appears to be absent in the case of these three preparations. In general, although the results which seem to indicate a greater strength for the alcoholic than for the watery extract are in the majority, there are examples in the other direction, and the significance of the

apparent difference is in any case open to doubt. The stabilisation of the leaves with alcohol vapour producing irregular increments of activity, which DE LIND has investigated, is carried out as follows :

Ten grammes of powdered leaf is spread evenly on linen stretched over a porcelain jar on the bottom of which is a beaker with 50 c.m. of 96 per cent alcohol. The jar is not completely sealed by its lid, and it is put in a water bath and the drug is thus exposed for two hours to the hot alcohol vapour. If there is some liquid left and it is stained green, the alcohol is evaporated off and the residue rubbed up with the leaves. If the linen is stained green, it is extracted with alcohol and the extract is similarly treated.

This process of "stabilisation" is really an incomplete extraction with alcohol. If the treated leaves are extracted with water, the effect must be similar to that of extracting the leaves first with alcohol and then with water, and then taking up the alcoholic residue with water. Further investigation should show whether the leaves whose potency is increased by treatment with alcohol can be completely extracted with water alone without this treatment, and whether the double extraction with alcohol and water is not the cause of the increase in potency.

The question whether alcoholic extraction or watery infusion is the more suitable method is thus still undecided. The still unexplained increase in potency described by MAGNUS may be urged against the former; the destruction of gitalin (as described by STRAUB) against the latter.

From the collected results of the assays on cats, it may be concluded that the difference between the figures obtained by different methods of extraction has no practical importance.

COLORIMETRIC METHOD.

KNUDSON and DRESBACH's method of assay in which the brown colour given by digitalis infusions on the addition of basic picrate solution is compared with that given by an ouabain or potassium-chromate standard gives the relative potencies fairly well. The Standard and preparation B appeared of about equal strength, while A appeared definitely more potent than would have been expected from the results of the biological tests. On the other hand, all three preparations appeared about 2 to 2.5 times as potent as they did on cats. As the colour is produced by the sugar in the glucoside, it may be assumed that it is given not only by the intact glucosides but also by the sugar, which is always split off from the glucosides by fermentation before the leaves are dried. Thus, the colorimetric methods gives a measure of the original content of glucoside and not of the quantity actually present when the estimation is made. It would then be necessary to

assume that preparation A had once contained a larger quantity of active glucosides, but that these had been partly destroyed by storing the leaves.

The following table gives the results obtained by the chemical method :

Table IV.

Investigator	Mg. per "cat unit" = 0.1 mg. of ouabain			Relative strength		
	Standard	A	B	Standard	A	B
SMITH and McCLOSKEY	44.8	57.0	46.8	100	78.6	95.7
KNUDSON, the same alcoholic extracts as the above	46.8	63.7	52.5	100	78.5	95.2
DALE and BURN, alco- holic extract	69.0	108.0	65.0	100	63.9	106.1
Watery infusion	46.3	51.5	47.0	100	89.0	98.4
GARCIA, Soxhlet	41.5	43.0	32.5	100	96.5	127.6
Infusion	36.5		34.0	100		107.3
EDMUNDS (compared with potassium chro- mate)				(100)	(104)	(140)
Mean	47.5	64.6	46.3	100	81.3	105.05
				(100)	(85.1)	(110.0)
	<i>Comparisons with the standard.</i>					
GARCIA, Soxhlet	100	110	76.5	100	90.4	130.7
Infusion	100	108	89.5	100	92.1	111.7
DE LIND, 0.5 % infusion				100	70	120.0
Mean of all cat results	19.94 18.25	32.44 29.81	16.81 18.37		60.48 62.3	116.9 100.5

KNUDSON and DRESBACH's assumption that it is possible, knowing the results of the biological assay of digitalis and ouabain on cats, to use the same ouabain as a standard for the colorimetric assay of digitalis and to express the result in cat-units, appears to be erroneous, since the potencies as measured by KNUDSON and DRESBACH's method differ very widely from the results of the biological tests. Thus, the colorimetric method appears to be unsuitable for measuring the potency in

absolute units, but to give a good indication of the relative strengths of leaves collected and stored under identical conditions.

THE VALUE OF DIFFERENT METHODS.

Professor EDMUNDS sent some very instructive information on the subject of the relative values of the different methods. In order to determine which of the biological methods should be adopted in the new edition of the *American Pharmacopœia*, three tinctures of digitalis were sent out to nine different laboratories, and the different methods gave the following divergencies :

	Test 2	Test 3
Guinea-pigs M.L.D. (subcutaneous injection)	2.8-5%	5-5.5%
"Timeless" frog method	9%	4%
One-hour frog method	13-30%	3-21.8%
Hatcher method with cats	5.1-13%	5.7-32.6%

From these results it was concluded that the tests using guinea-pigs and frogs were superior to that using cats, and that the "timeless" frog method gave more satisfactory results than the one-hour method. Nevertheless, for practical reasons, the one-hour method was proposed for the *Pharmacopœia*, and ouabain was chosen as a standard.

DISCUSSION AT THE CONFERENCE AT GENEVA.

On the basis of these results, Professor MAGNUS read a paper at the Second International Conference in Geneva in which he concluded that the tests on cats had given in different laboratories very consistent relative and absolute values which, on the average, did not differ from the mean by more than 10 per cent. The only exception was the assay carried out by Professor CUSHNY, who found the three preparations less toxic than did the other laboratories. It was finally shown that the cause of this was that there are two kinds of cat in Edinburgh of which one is more than usually resistant to digitalis. Where this difference did not occur, the use of a standard was unnecessary as the tests had given (the same) absolute values in other countries.

On the proposed tests with other warm-blood animals, no final judgment can yet be passed, as the material is inadequate. In any case it is risky to use concentrated alcoholic solutions, as MRS. KROGH proposes to do on mice.

A systematic trial with more material must also be made before judgment can finally be passed on the test worked out by KNAFFL-LENZ on guinea-pigs; in particular, it should be determined whether infusions stronger than 0.5 per cent contain all the active principles of the leaves.

Should these methods survive the test, they would replace the cat method where it is difficult to obtain cats.

Against the frog method it may be objected that the sensitivity of frogs varies, and is different in summer from what it is in winter, and that the relative effects of the individual glucosides is not the same on frogs as on men; that, for most frog methods, an alcoholic extract is necessary and that this introduces uncontrolled sources of error. The results of the other assays on frogs showed large variations.

As regards the preparation of the extract, alcohol is to be avoided, as DE LIND VAN WYNGAARDEN has shown that the treatment of digitalis leaves with alcohol introduces irregular uncontrollable increases in activity, while the 0.5 per cent watery infusion of the *Dutch Pharmacopœia* gives regular results and is practically a complete extract.

The chemical method gives qualitative agreement with the cat method, but quantitatively the agreement is poor and the method should only be used in preliminary work.

The clinical results obtained on patients by DR. KENNEDY with the three preparations are not numerous enough for any conclusions to be drawn from them.

Professor MAGNUS was therefore of the opinion that the cat method is superior to the other methods, and that they should be removed from the pharmacopœias, and that digitalis leaves dried at 55-60° and kept under conditions suitable to the preservation of their potency should be used as a standard instead of ouabain. Such a standard powder might be one 17.5-20 c.cm. of which would contain the lethal dose for a kilogramme of cat by slow intravenous injection in 0.5 per cent watery infusion.

In the discussion which followed, Professor CUSHNY said that justice had not been done to the result of the tests on frogs, and that, as the researches of Professor ROST had shown, by standardising the conditions, it was possible to obtain very reliable results with frogs.

After Professor KROGH had remarked in this connection that the relative toxicity of the isolated glucosides was different for different species of animals and that this made it difficult to compare preparations which differ qualitatively from one another, a sub-committee was appointed to study the different proposals and report to the general meeting.

The Sub-Committee, after a thorough consideration of the foregoing facts, came to the conclusion that even now it was not possible to decide whether the cat method or the frog

method, or this or that method of extraction was preferable, but that good comparative results could be obtained with any well-worked-out method, provided that the standard and the tested preparation received the same treatment.

The Sub-Committee formulated the following proposals, which were adopted unanimously by the Conference :

“1. That, as an international standard, a dry, powdered preparation of the leaves of *digitalis purpurea* shall be made by Professor Magnus, on behalf of the Health Organisation of the League of Nations, of the same strength ($\pm 10\%$) as the experimental standard powder, prepared in accordance with the decision of the First International Conference on Biological Standardisation (Edinburgh 1923), and forming the basis of the various reports presented to this Conference. This standard shall be prepared by the mixture of ten different powders, made from leaves properly dried at 55-60° C., shall be adjusted by biological assays, carried out by Professor Magnus (who will use the method of assay on cats), and shall be distributed for international use. The permanence of its activity shall be annually controlled by Professor Magnus. If it should deteriorate, or if the supply should be nearly exhausted, a new standard preparation shall be prepared by the same method, and of exactly equal activity.

“The preparation shall be distributed in sealed ampules of brown glass. These shall be placed at the disposal of the different countries, for the assay of their own national standard preparations.

“2. That, according to present knowledge, no particular method of extraction (infusion, cold alcohol, warm alcohol) can be recommended as the only correct one. It is necessary, however, for the purpose of assay, that the preparation to be tested and the standard preparation shall be extracted by the same method.

“3. As methods of biological assay, the following can at present be recommended as sufficiently accurate :

“(1) *The frog method, with a period of observation of at least 4 hours.*

“A. *Preparation of an extract of digitalis leaves with absolute alcohol.*

“One gramme of digitalis leaves, coarsely powdered (B. 20 = mesh of about 0.75 mm.) and dried to constant weight over sulphuric acid, is allowed to stand for 24 hours at room temperature with 25 c.cm. of absolute alcohol, with occasional shaking in a closed spherical flask of about

100 c.cm. content. The mixture is then boiled for 30 minutes with a reflux condenser on a sand-bath over the smallest possible flame, and, while still hot, is filtered through a plain filter of about 9 cm. diameter. The residue is washed with absolute alcohol on the filter until the filtrate becomes colourless. The combined filtrates are slowly evaporated in a thin-walled tared watch-glass on a boiling-water bath to 5 c.cm. (about 4.5 gm.), the drying of any portion being carefully avoided.

"The concentrated extract, while still hot, is transferred with the aid of distilled water to a graduated flask, and made up to 25 c.cm. with distilled water. By this procedure one obtains an emulsiform greenish solution in weak watery alcohol. This must be used immediately for the test.

"B. Assay of the extract, obtained as described under (a), on frogs, by determination of the minimal lethal dose by the so-called unlimited-time method.

"For the test only healthy male frogs must be used (grass frogs, *Rana temporaria* or *Rana pipiens*), kept under constant conditions and weighing up to 40 gm. each. The body-weight of the frogs, kept for several hours in the laboratory in a moist glass case, is determined immediately before the injection to an accuracy of 0.5 gm., after drying the skin and expressing the urine.

"The extract prepared as above described is injected into frogs, through the mouth, into the breast lymph-sac, with a syringe graduated in hundredths of a c.cm. Larger quantities than 0.3 c.cm., or with weakly active preparations 0.5 c.cm., should not be injected into the breast lymph-sac; if necessary, the injections are to be made, in such cases, also into one or both of the lymph-sacs of the thighs.

"The following signs of intoxication appear: within $\frac{1}{2}$ to 2 hours after the injection, restlessness, air-hunger, formation of froth, paralysis and, in the course of four hours, stoppage of the heart. The criterion for the determination is that the stoppage is either systolic or rapidly transformed into systole.

"The orientating tests are carried out as follows: doses differing by 20 per cent per gramme of frog are injected, one or two frogs being used for each dose.

"The final determination can be made by the following procedure:

"The mean between the smallest active and the greatest inactive dose is the first approximation. By further more exact determination, with four to six frogs on each dose, the final value can be obtained with an accuracy of 10 per cent. The determination is completed when, of two doses

differing by 10 per cent, the higher kills a majority of the frogs injected, the lower a smaller number.

“ The value is expressed as a percentage of the standard preparation, which is tested at the same time and in the same manner. Only such leaves shall be passed for issue as differ from the standard preparation by not more than 25 per cent.

“ The assay of digitalis tinctures is made in the following manner :

“ 10 c.cm. of the official tincture (=1 grm. of leaves) are concentrated on the water bath at temperatures not above 60°C. to 5 c.cm. volume, washed into a measuring flask with distilled water and made up to 25 c.cm. The assay is made according to the same method as described above for digitalis leaves.

“ (2) *The cat method, as modified by Magnus from that of Hatcher.*

“ For biological standardisation on the cat the $\frac{1}{2}$ per cent infusion of the digitalis leaves is used, prepared according to the indications of the *Dutch Pharmacopœia*, and then made isotonic by the addition of NaCl; in preparing this infusion, the temperature of 90°C. is not to be exceeded, and the extraction is to be continued for 15 minutes after this temperature has been attained. Cats are used with a body-weight between 1.7 and 2.7 kilograms. The cat is anæsthetised with ether, a tracheal canula is inserted, and, with the help of artificial respiration, a moderate anæsthesia with ether is maintained. The infusion runs at a regular rate from a graduated burette, arranged as a Mariotte's bottle, through a wide canula into the femoral vein. The rate of infusion is so adjusted that the duration of the experiment amounts to about forty minutes; minimum 30 minutes, maximum 55 minutes. If, as a result of the first determination, it appears that the preparation is especially potent, the infusion is suitably diluted, and the first experiment is not included in the calculation.

“ The dose is determined which is necessary to produce stoppage of the heart; this is recognised by inspection and palpation of the thorax, by the asphyxial convulsions, and often also by the interrupted flow of the fluid into the vein: it is further confirmed by opening the chest. If the animal is found to be ill (pneumonia) or pregnant, the result obtained with it is rejected.

“ In this manner one determines the lethal dose of the 0.5 per cent infusion “on n cats” and continues the determination until the mean percentage deviation of the