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Available Sources of Food in Indonesia (for the improvement of the nutritional status of children)

by

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Abstract

Ultimately, improvement of the nutritional status of children, in especially the preschool children, can only be achieved if the daily food intake is sufficient. This will ensure in the first instance the adequate provision of energy, and secondly, the available protein in the diet will then be efficiently utilized.

Sufficient intake of food can and must be realized through the combined use of inexpensive locally available foods from the foodgroups: Cereals, Legumes and Fish, Fat, Vegetables and Fruits, according to the existing menu-pattern "4 Sehat — 5 Sempurna" (4 means healthy — 5 is excellent).

The diet therefore must not consist of rice alone. The role of fat in the diet must be stressed. The mealpattern of preschool children must be at least 3 times a day, preferably more.

Depending on the available budget and the creative imagination of the mother, a variety of inexpensive but palatable dishes can be prepared at home which will stimulate the food intake.

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I. Introduction

Protein Calorie Malnutrition in Indonesia is seen among preschool children belonging mostly to the underprivileged low-income group. From epidemiological point of view, the underlying causes of this malnutrition are wellknown as:

— poverty or low purchasing power

— ignorance of the mother in regard to the nutritional needs of the children

— recurrent infections due to poor environmental sanitation (Scrimshaw, 1971).

The result of the interaction of these 3 factors will be that the child will not get enough food every day and the food he gets is of inferior quality also.

Of the various multidisciplinary approaches needed for the improvement of this condition, nutrition education of the mother is an absolute necessity. By improving her nutritional knowledge she will be able to select the proper kind of foodstuffs, prepare it and give it in the correct amount to her children.

II. Selecting the kind of Foods

In the selection of the kind of foods to be used, the mother is limited however, to the foodstuffs which are within the buying power of the family and next to it, she will only select those foods which fit in the existing menupattern of the region. Whatever the choice may be, the foods selected, must be from each of the following groups:

I.: the cereal staples, such as rice and/or maize.

II: proteinrich foods

a) — from plant origin, such as legumes and its products

b) — from animal origin, such as fish or egg or meat.

III: edible fats and oils, such as coconut and peanut oil.

IV. vegetables, such as green leafy vegetables, "bayem" and "kangkung".

V. fruits, such as yellow "bananas" and "papaya".

III. Energy and Protein

The question which arises will be:

> In regard to the preschool child, can one reasonably estimate the correct amount and the right kind of foodstuffs, which if eaten every day will prevent malnutrition and will also have the minimum of cost?

In answering this question, it will be necessary to translate this recommended daily dietary allowances (RDDA) into the various foodstuffs, which together must form a well-balanced diet and confirm also to the existing menu pattern, so well-

known in Indonesia as "4 Sehat — 5 Sempurna" ("4 means healthy, 5 is perfect"). The RDDA for a preschool child of 2 to 3 years old, 12 kg of bodyweight, is for energy 1200 Calories, for protein 25 grams and vitamins and minerals as given (LIPI, 1968).

It is essential first to ensure an adequate level of energy intake. And this can be achieved only, if the child has a sufficient intake of food. The adequacy of energy intake must receive first consideration, otherwise part of the dietary protein will be used for the provision of energy (WHO, 1973). This is wasteful, especially for developing countries, where the protein supply is relatively marginal.

The energy need and the safe level of protein intake are usually separately expressed in terms of calories and grams of dietary protein per day. But a major advance is the recent practice of evaluating the protein value of the total daily diet as consumed in Net-Dietary protein calories % (NDpCal %).

IV. Arbitrary NDpCal % - value for diets of preschool chillren *

What is the NDpCal % - value assigned for diets of preschool children?

The Net Dietary - protein Calories percent value of human milk is calculated to be in the range of 8.0 — 7.7% (Platt et al., 1961) that of rice is 3.9% (Lie Goan Hong et al., 1974). The significance of these values in relation to human diets, is best illustrated by quoting van Veen (1971) in full:

> "With respect to the values for NDpCal percent, it may be noted that a diet that provides less than 5 percent of the calories in the form of ultillizable protein is incapable of meeting the needs of the adult, even when consumed at a level that mets the calorie requirement. Furthermore, a diet supplying less than 8 percent of calories as utilizable protein is incapable of meeting the needs of the young infant (FAO 1965)."

It can reasonably be expected, that the NDpCal percent value of the diet for preschool children will be in

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Note: Net Dietary-protein Calories percent (NDpCal %) = Protein Cals % x NPUop.

Protein Cals %: The utilizable protein content of a diet in term of calories expressed as percentage of the total metabolizable calories.

NPUop = Net Protein Utilization value operative. This value is obtained by feeding experiments using young weanling albino rats, according to standard procedures (Miller, 1963).

between the aforementioned values of 5 and 8.As no conclusive figure is as yet existent, we have set this value arbitrarily at 6.5 as the minimum.

This means that a suitable diet for preschool children must have for example, a protein calories % of 12 and a NPU-op value of at least 55, which will give a NDpCal % value of 6.6.

The requirements for such a diet can be met from a judicious combination of foods from the groupings as mentioned previously. An example is given in table 1, indicating the quantity in grams, the cost in Rupiah, and the NDpCal % value (see table 1).

This total quantity must be consumed as food in one day by the child, will his requirement for energy and protein be met.

V. Basic Components of Various Diets

(Amounts in grams & Cost analysis in Rupiahs)

TABLE 1: *Nutritive value & Cost of a Simplified Diet*

Foodstuffs	Foodgroups	Qty gm	Energy Cals	Protein gm	Fat gm	Cost (Jakarta) Rp.
I Staple :	Rice, halfmilled	300	1080	22.5	2.3	27
IIa Legume :	Soybean, dried	30	96	10.3	5	12@
IIb Animal product :	Fish, small dried	15	30	6.5	—	9
III Edible Fat :	Coconut oil	7	61	—	7	3
IV Vegetables :	("bayam" etc.)	+	+	+	—	+
V Fruits :	("banana" etc.)	+	+	+	—	+
	T o t a l :	352	1267	40.6	14	51
Percentage of Total Calories :			100%	12.8%	10.1%	

NPUop : 55. Proteincalories % : 12.8 NDpCal % : 7.4
@ Retail price of 65 grams of fresh "tempeh".

The simplified diet above, used for the determination of the NPU-op value, can also serve as a useful guide for the selection of substitute foodstuffs the mother can use for preparing the food for her children and the whole family as well. It serves also as a basis for the computation of cost. The cost of this simplified diet is approx. Rp. 51.—. It

does not include the additional cost for preparing, cooking etc. Prices are based on the retail price in the markets of Jakarta. This means, that the minimum cost for every 1200 calories can be estimated as at least Rp. 50.— (US $ = Rp. 415.—). This cost analysis is given as an illustration to show the minimum money-value which must be allotted for the child's food in the context of the total daily family food expenditure.

Feeding experiments with young albino rats are carried out in our laboratories to determine the NPU-op values of various mixtures consisting of rice and different local legume products with and without the addition of fish. Two examples of experimental diets, with the cost analysis, are given below.

TABLE 2: *Diet A : Rice-Soy-Fat-Fish*

Components	Qty gm	Energy Cals	Protein gm	Fat gm	Cost Analysis Rp.
Rice, halfmilled	300	1080	22.5	2.3	27
Soybeans (as fresh tempe) 65 grams	30	96	10.3	5	12
F a t	7	61	—	7	3
Fish, small, dried	15	30	6.8	—	9
Vegetables & fruits	+	+	+	—	+
T o t a l	352	1267	40.6	14.3	51

Diet B : Rice-Peanut-Fat-Fish

Components	Qty gm	Energy Cals	Protein gm	Fat gm	Cost Analysis Rp.
Rice, halfmilled	300	1080	22.5	2.3	27
P e a n u t	30	160	7.8	13	9
(or: fresh "oncom" 80 gm + extra fat 9 gm)					(13)@
F a t	—	—	—	—	—
Fish, small, dried	15	30	6.8	—	9
Vegetables & fruits	+	+	+	—	+
T o t a l	345	1270	37.1	15	45

@) "Oncom" Rp. 9.— + extra fat Rp. 4.— = Rp. 13.—

The amount of legume products used are believed to be that quantity which can be consumed everyday by the child (Aykroyd et al., 1964) in combination with his usual rice-dish.

VI. NDpCal % values and Cost in Rupiah

The experimental diets are practically isocaloric, providing approx. 1250 Calories, 14 grams of total fat and a total protein in the range of 34 - 40 grams. This amount of protein is well above the set level of 25 grams of dietary protein needed. Expressed in percentage of total calories, the total fat is approx. 10%, protein is 13% and the rest is carbohydrate. This ratio is close to the provisional target we have set for fat in the Indonesian diet (see graph 2). The quantity of 300 grams will already contribute 22.5 grams of dietary protein, which is only 2.5 grams below the recommended allowance.

This deficit of 2.5 grams of protein can easily be met from the consumption of say, 10 grams of soybeans or about 20 grams of fresh "tempeh". But the problem is, the quality of the protein mixture in this diet will not yet meet the arbitrarily set NDpCal % value of 6.5. As can be seen from table 3 and graph 1, rice alone has a NDpCal % value of

TABLE 3: *NDpCal % Values and Costs in Rupiah of various mixtures (the diets provide approx. 1250 Calories and total protein in the range of 35 - 42 gm). US$. 1.00.— = Rp. 415,—*

Mixture: (total dry weight approx. 350 gm)	Protein content of Mixt. (Nx5.85) %	Average NPUop (Rats) %	Protein Calories %	(NDpCals) Net-Dietary-protein Calories %	Total Cost (Jakarta retail price) Rp.
1. Rice alone	6.7	52	7.5	3.9	31
2a. Rice + "Tempeh" + Fat	10.2	56	10.8	6.0	42
2b. Rice + "Tempeh" + Fat + Fish	12.2	58	12.8	7.4	51
3a. Rice + Peanut	10.1	42	10.7	4.5	36
3b. Rice + Peanut + Fish	12.0	49	12.6	6.2	45
4a. Rice + "Oncom" + Fat	10.2	41	10.7	4.4	40
4b. Rice + "Oncom" + Fat + Fish	12.2	48	12.7	6.1	49

"Tempeh" : fermented Soy product.
"Oncom" : fermented Peanut-presscake product.

3.9. When the rice is supplemented with 10% of its weight by soy (30 grams) or equivalent to 65 grams of fresh "tempeh", (diet 2 a) the NDpCal % value increases to 6.0 (Lie Goan Hong et al., 1974). This value is still below the level of 6.5 as set for diets of preschool children. Peanut and "oncom" are lower in quality than soy.

If they are added to rice in equal protein amount, (30 gm peanut or 80 gm fresh "oncom") they will only 3.9 (rice alone) to 4.5 and 4.4 (diet 3a & 4a) (see table 3 and graph 1).

In fact, this characteristic can be predicted already, if one calculates in advance the chemical (protein) score of the mixture. An example of such calculation is given in the addendum. To obtain a higher protein value (or NDpCal %), all the mixtures of rice and legumes have to be extra supplemented with foods from animal origin, such as fish or eggs or meat. This extra supplementation with 5% by weight of 15 grams of small dried fishes, i.e. Stolephorus spp. (25 pieces, head-tail length 5 cm), will increase the NDpCal % if the rice/fat/"tempeh" mixture from 6.0 to 7.4, which is now well above the set level of 6.5 for preschool children (diet 2 b). The same favourable effect is also seen in the rice/peanut and rice/fat/"oncom" mixtures, but the increases are from 4.5 to 6.2 and 4.4 to 6.1 only, still below 6.5 however (see diet 3b and 4b). To reach the value of 6.5, the amount of fish has to be increased with at least 60%, which will make a total of 25 grams. But this will also increase the cost of the mixtures with Rp. 6.— The total cost of the rice/peanut/fish mixture will be Rp. 51.— and of the rice/fat/"oncom"/fish mixture Rp. 55.—. It will therefore be obvious that the rice/fat/"tempeh"/fish micture with a total cost of Rp. 51.— only is the best of all mixtures with the lowest cost.

The ratio of the components rice, fat, legume and fish by dry weight is generally stated as 100 : 2½ : 10 : 5. For more information on the role of legumes in human diets, the reader is referred to the excellent monograph of Aykroyd (1964).

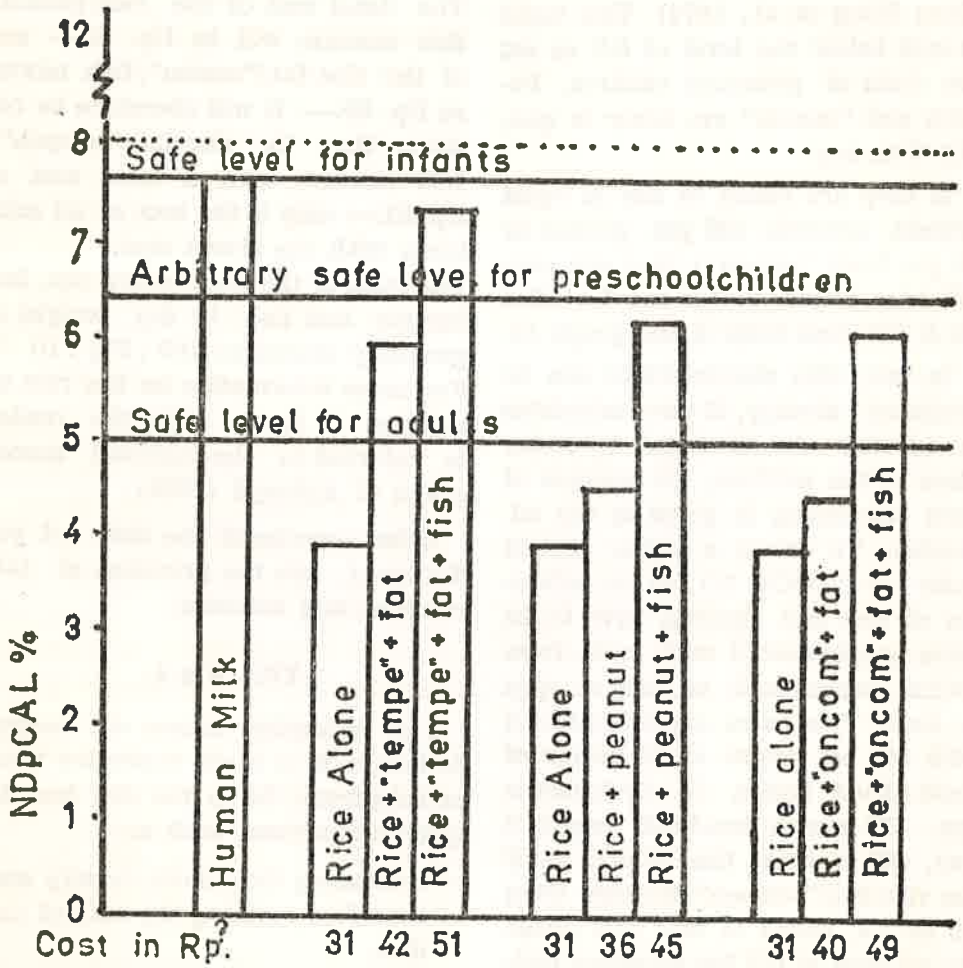
Other aspects of the diet, not yet discussed, are the provision of fat, vitamins and minerals.

VII. Fat

Fat is another source of energy. Although it is more expensive than carbohydrate, fat in the diet has its specific functions, such as:

— increasing the calorie density and therefore reducing the bulk of the diet,
— improving the palatability of the diet, leading to a higher food consumption,
— carrier of the fat-soluble vitamins, and
— source of unsaturated fatty acids.

Graph 1. NDpCAL VALUES & COSTS IN RUPIAH OF VARIOUS MIXTURE



Although until present, any allowance for fat in the diet is not yet specifically recommended, it will not be unlikely that in the future this will be set up, probably for delineating the safe or recommended maximum and minimum levels in human diets.

It is observed that fat consumption in the population increases with

higher income (WHO, 1973). In Western diets, fat contributes about 40% of the total calories, while in the Indonesian rice-diet, it is reported to be about 10% (LIPI, 1968). The LIPI-NAS workshop on Food (1968) considers this very low fat content of the diet as a serious problem (LIPI, 1968). A recent survey of preschool children in 2 villages in the mountains of West Java, carried out by participants of the SEAMED Nutrition Course (1973 - 1974), revealed that the total fat in the children's diet constitutes only 3% of the total energy intake, which was not even met yet! This is very low, as the fat from the staple rice alone will already contribute about 2%. That the fat content in a diet must be given indeed a serious consideration, will be obvious from graph 2, which illustrates the fat content of various foodstuffs and diets as percentage of total calories (see graph 2).

Planners and decisionmakers on national food and nutrition policy must take in consideration efforts towards increasing the fat intake, for the meantime, at least for the preschool children in general.

VIII. Vitamins and Minerals

One may speculate by saying, that if the fat consumption in this group of preschool children can be increased, even if only marginally, then very probably the incidence of vitamin A deficiency, so prevalent among this group, will be reduced significantly. This may probably be so as there will be not only a better resorption of carotenes, but also a higher consumption, as green leafy vegetables will become more palatable by preparation with oil, coconut milk ("santen") or peanut sauce, such as in "gado-gado" (Indonesian salad).

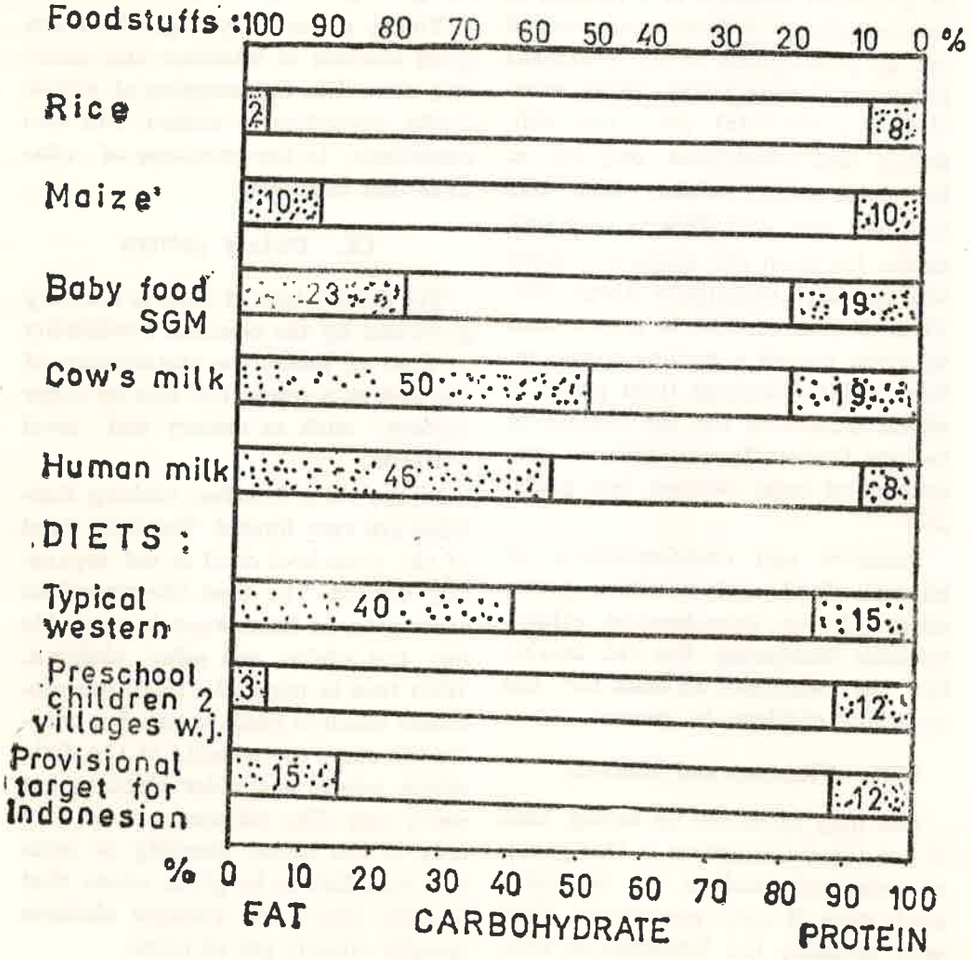
Young green leafy vegetables are good sources of vitamins and minerals also. The consumption of yellow fruits, according to season, will also contribute to the provision of vitamins and minerals.

IX. Dietary pattern

The total intake of food is not only governed by the absolute availability of food at home, the tastefulness of the diet as a whole, but also by other factors, such as dietary and meal patterns.

In the rural families, cooking facilities are very limited. The daily food of the preschool child is not separately cooked. The food the preschool child gets, is from what is available for the adults and older children. With this in mind, the diets for preschool children must be basedon exactly the same components of the diets which adults and older children eat every day. The difference is in fact only in the higher quantity of legumes and fish to be given above that amount which the younger children usually already get at home.

Graph 2. PERCENTAGE OF TOTAL CALORIES DERIVED FROM FAT, CARBOHYDRATE AND PROTEIN FROM VARIOUS FOODSTUFFS AND DIETS



Mothers must be taught to prepare or cook delicious sidedishes based on the said components, which will be liked by all the family members, including the young.

In fact, with these same components, i.e. rice, legume product, fish or meat, additional fat, and vegetables, mothers can also prepare soft diets or transitittional diets as weaning foods, so wellknown as "bubur nasi" or "nasi tim". The NDpCal % value will be the same as stated before, if for the components the same ratio by weight is observed. The search for suitable weaning foods, such as "nasi tim" etc. has been stimulated by Van Veen many years ago and also stressed again recently (Lanzing et al., 1939).

X. Meal pattern

In general, the meal pattern also of the preschool child is the same as for the adult population, consisting of 2 main meals perday and a light snack as breakfast. For preschool child, the situation may be worse, as occasionally a snack may sometimes be considered already as a main meal. It must be admitted, that such situations do not occur often (Tan et al., 1970). Many investigators doubt seriously whether the preschool child can meet his energy and protein needs if he follows the common adult eating pattern of two main meals per day (Nicol, 1971; Abu Nain et al., 1974). His total food intake will then not be sufficient.

To have a sufficient food intake, children must have at least three full meals a day, preferably more. In between snacks may be needed by physically active children. It is said, that rice- diets are bulky. They have a low caloric density, as they are low in fat. Moreover, the stomach of the young child is of limited capacity.

The frequency of meals or feeding may not be overlooked, not only for the breastfed infants, but also for the preschool children. Deficiency of both calories and protein is synonymous with lack of food. How many of the underprivileged childlren are "going hungry" or are suffering from "hidden hunger"? And only through an adequate food intake can deficiency of both calories and protein be corrected and prevented.

In conclusion, it is hoped that all these findings, not fully realized by all nutrition workers and less by the nutritionally ignorant mothers, will be included as useful materials for Nutrition Education for the benefit of the preschool children.

TABLE 4 : *Essential Amino Acids in mg per gram of Nitrogen from Selected Foodstuffs*
Source : *Food Composition Table for Use in East Asia. U.S. Dept. HEW — FAO. Dec. 1972.*

Foodstuff	Moisture g %	Protein g %	N g %	Isole	Le	Ly	Total S-c (Me+Cy)	Total Arom (Ph+Ty)	Th	Tr	Va	Total E.A.A.	Total A.A.	Chem Score	Lim a.a.
Rice, brown, halfmilled	13.5	7.6	1.27	285	536	248	245	639	243	78	403	2677	6448	73	Ly & Th
Maize, who kernel dried.	13.6	9.1	1.46	319	777	213	195	417	263	44	347	2632	6474	63	Ly & Tr
Wheatflour, 60-70% ext.	12.0	9.2	1.61	247	440	139	210	477	165	70	277	2025	6014	41	Ly & Th
Soy, whole seed, dried	11.3	34.2	5.99	290	494	391	165	506	247	76	291	2460	6148	75	S-c
„Tempe dried"	5.4	48.7	8.52	333	529	370	171	475	245	77	332	2532	5938	78	S-c
„T a h u"	86.7	7.9	1.38	261	448	333	156	490	170	96	264	2218	5440	68	Th
Soybean milk	91.4	2.8	0.49	330	470	330	132	550	310	85	360	2567	6327	60	S-c
Peanut, dried	7.3	23.4	4.29	201	350	210	116	417	188	69	314	1865	5718	52	S-c
Mungbean, -whole seed	10.6	22.9	3.66	257	439	586	156	496	202	118	269	2523	5513	71	S-c
-sprouts	90.1	4.2	0.67	256	369	500	106	569	300	144	375	—			
Coconut flour, defatted	3.8	14.2	2.68	259	405	254	181	303	188	-	313	1903	—	75*	Ly
Cashewnut, dried	4.0	18.4	3.47	250	400	306	125	381	250	100	369	2181	5563	57	S-c
Cassava leaves, fresh	31.0	6.9	1.10	325	656	444	132	431	319	91	425	2823	—	60	S-c
Fish, small, fresh	7.9	18.5	2.96	338	563	598	291	532	321	83	366	3092	6622	⩾100	—
Provisional Amino-Acid Pattern: F A O / W H O 1973				250	440	340	220	380	250	60	310	2250			

* excluded tryptophan.

TABLE 6 : *Computation of Chemical Score of Simplified Indonesian Diet (Rice, Soy and Fish)*

Food Commodity (E.P.)	Qty gm	Energy Cals	Protein (Nx5.85) gm	N gm	Isole	Le	Ly	Total S-c (Me+Cy)	Total Arom (Ph+Ty)	Th	Tr	Va	Total E.A.A.
Rice, half milled	300	1.080	22.5	3.85	1097	2064	955	943	2460	936	300	1552	10.307
Tempeh	65	98	12.0	2.05	683	1084	759	351	974	502	158	681	5.192
Coconut oil	7	61	—	—	—	—	—	—	—	—	—	—	—
Fish, small, dried	15	30	6.8	1.16	392	635	694	338	617	372	96	425	3.587
Vegetables + Fruits	—	—	—	—	—	—	—	—	—	—	—	—	—
Total A.A. for :													
— Without Fish	—	1239	34,5	5,90	1780	3148	1714	1294	3434	1438	458	2233	15.499
— mg per g N a) Amino acid pattern of diet :					302	533	291	219	582	244	77	378	2.626
b) Provisional Amino Acid Pattern :					250	440	340	220	380	250	60	310	2.50
Chemical Score % $= \frac{a}{b}$					—	—	85%	—	—	98%	—	—	—
— With Fish :	—	1269	41.3	7.06	2172	3801	2408	1632	4051	1810	554	2658	19.086
— mg per gm N a) Amino acid pattern of diet :					308	538	341	231	574	256	78	376	2.702
b) Provisional Amino Acid Pattern :					250	440	340	220	380	250	60	310	2.250
Chemical Score % $= \frac{a}{b}$					—	—	100%	100%	—	100%	—	—	—

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