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SOME ECOLOGICAL CONSIDERATIONS ON THE USE OF SAGO AS FOOD IN INDONESIA

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ABSTRACT

Di negara-negara yang sedang berkembang seperti Indonesia, sagu asal pohon sagu, sebagai bahan makanan pokok sehari-hari hanya cocok dalam lingkungan alamiahnya yang khas.

Berbeda dengan padi-padian (serealia seperti beras, jagung, gandum), sagu asal pohon sagu praktis tidak mengandung protein, tapi terutama hanya karbohidrat saja dalam bentuk pati.

Walaupun sagu tidak mengandung protein, keadaan gizi si pemakan sagu alamiah ("natural sago-eater") tidak jelek, lingkungan alam di mana si pemakan sagu hidup dan pohon sagu tumbuh secara alamiah, terdiri dari rawa-rawa dan sungai yang sangat kaya akan ikan. Keperluan tubuh sehari-hari akan protein dari si pemakan sagu dapat dipenuhi seluruhnya dengan protein ikan yang mempunyai nilai biologik tinggi. Di samping itu, untuk penduduk yang jumlahnya memang terbatas (kecil), persediaan sagu selalu ada cukup untuk memenuhi keperluan tubuh sehari-hari akan enersi.

Seandainya penduduk pulau Jawa harus mengganti makanan pokok padi-padian atau serealia seperti beras atau jagung, untuk suatu jangka waktu yang cukup lama, dengan bahan makanan sagu asal pohon sagu, diduga akan terjadi suatu penderitaan kekurangan protein. Karena di pulau Jawa sumber protein yang akan menjamin kecukupan protein sehari-hari, tidak tersedia dalam jumlah cukup dibanding dengan jumlah penduduk. Untuk penduduk pulau Jawa, sagu akan sangat berguna hanya sebagai sumber enersi tambahan saja (energy expander).

Karena sagu dalam bentuk lempeng dapat disimpan lama, maka sagu lempeng dapat dipertimbangkan sebagai makanan darurat (emergency food) dalam keadaan musibah atau bencana alam.

"Sago" (English) or "Sagu" (Indonesia, Malaysia) is the processed edible meal or flour obtained from the marrow or pith of various starch-producing palms. Starch-producing palms may be distinguished by their habitat, such as:

a) Swamp forest palms reproducing themselves by seeds or vegetatively through suckers, eg. *Metroxylon sago* and *M. rumphii* (rumbia, kirai, lapia)

b) Uphill (dryland) palms, living in solitary stands, reproducing themselves by seeds, eg.
Arenga pinnata (aren, enau)
Corypha utan (gebang)
Borassus flabellifer (lontar, siwalan).

In passing, it can be mentioned here, that the dryland palms are less important as a sago producer; they are too useful for other purposes, such as for the collection of sap (juice), for the preparation of palm sugar and therefore mostly spared by the population (Ave' 1976).

The most important sago producing palm is the aforementioned *Metroxylon* species growing massively in the wild especially in the swamp forests in the eastern part of Indonesia (Moluccas

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and Irian Jaya). According to botanists, the *Metroxylon* must have its origin here, and is propagated westwards to Celebes, Kalimantan, Peninsular Malaysia, Java and Sumatra.

SAGO AS A NATURAL STAPLEFOOD IN ITS ECOLOGICAL SETTING

Since prehistoric times the sagopalm, growing in the tropical swamp-forests has provided the sagopith as the natural staple food for the inhabitants. At present the sago as a staple food is confined to certain ethnic groups with a predominantly subsistence economy located in the Moluccas (Seram) and Irian Jaya/Papua New Guinea. As Townsend (1976) has described, the sago is harvested from the sago forest stands mainly for own use rather than for exchange. These primitive societies with a low socio-economic level are harvesters and not cultivators of sago in the modern sense of meaning.

It is important to note that the rich forests provide enough sago to meet fully the energy need of these small population groups. The daily energy need of the members of the group are always fully met, as was reported by Ellen (1976), Ohtsuka (1976), and stressed by Postmus and van Veen (1949).

In regard to the daily protein need, this must have been met from other sources of food, as sago nutritionally does not contain protein at all (See Table p.37). The staple sago is always eaten together with a liberal amount of fish. The river and the sea will provide the inhabitants their supply of fish without much difficulty, as their settlements are located on the banks of the rivers and are close to the sea.

To meet his safe level of daily protein intake, an adult man of 50 kg bodyweight must obtain daily about 50 X 0.5 g = 25 g of reference protein (in terms of egg or milk protein) (FAO/WHO *Energy and Protein Requirements* 1973). This 25 grams of reference protein is equivalent to 150 – 200 grams of fresh fish a day.

In the hinterlands and more farther off from the coast, additional hunting of games will add to the protein supply of the daily diet.

The fat so necessary in the daily food, is not only provided by the consumption of fresh fish, but also by the sago worms or grubs, harvested from the rotting stumps. In the hills, coconut is an additional source of fat (Postmus and van Veen 1949).

In this kind of ecological setting, characterised by a low population density and a generally low socio-economic level, but with Nature helping in providing an abundant supply of energy and protein of good quality, the sago as a natural staple food is not detrimental to the nutritional health of the members of the population group.

CHANGEOVER FROM SAGO TO CEREAL (RICE AND MAIZE)

According to historians, in prehistoric times sago and tuber (yam, *Colocasia)* must have been the staple food of the people living in the islands of insular South East Asia, Java included.

The present usage of the vernacular words "sangu" (West Java) and "sego" (Central Java) for cooked rice or "nasi" (Indonesia) may be used as an indication to support this hypothesis (Ave' 1976).

Rice was introduced into Indonesia some 35 centuries ago (about 1500 B.C.) by the Deutero-Malays migrating southwards from the southern part of the Asian Continent (Grist 1959). The introduction of the wet rice culture must have displaced the starch producing palms from their original habitat. Through the centuries the harvesters of sago in Java have now become cultivators of rice. The cultivation of rice and the changeover to rice as a staple food in the island of Java must have had a tremendous impact on the whole way of life of the population, making it possible to achieve the existing high civilisation of today.

Nutritionally, rice as a staple food is far superior to sago, being higher in protein and therefore demanding less supplementary protein. With every 1000 calories obtained from rice, an amount of about 20 grams of rice protein is also obtained (See Table on page 37).

Another cereal, also high in protein like rice, if not higher, is maize, which has its origin in the New World and was for the first time introduced

into Africa and later into Asia by the Portuguese explorers of the 16th century. Maize is a plant which possesses remarkable adaptability and versatility, flourishing under the most varied climatological conditions (FAO 1953).

Maize is now widely cultivated in the various islands of Indonesia, especially in areas where the climatic and soil conditions for rice cultivation are less favorable. This new cereal, maize, has replaced the uphill sago producing palms *(Corypha utan* = gebang) as the primary source of staple food (Ave' 1976) in the dry and hilly regions of the Nusa Tenggara Islands (Timor, Flores and Sumba).

SAGO AND CASSAVA AS A RESERVE FOOD

In times of scarcity of rice and maize, sago continues to be a reserve food in regions only, where sago producing palms are still available, such as in limited parts of Sumatra, Kalimantan and Sulawesi. But with the disappearance of the sagopalms, the role of sago as a reserve food is totally replaced by the cassava *(Manihot utilissima),* a plant imported in Indonesia in the 19th century from Brazil. The cassava-root has indeed become the reserve food in the island of Java in times of scarcity. This is especially the case in the Southern limestone hill region of Central Java, well known as the Gunung Kidul region. Due to deforestation and subsequently heavy erosion (Postmus and van Veen 1949, Bailey 1961), this region has become dry and arid, so that only cassava will grow on the poor soil albeit with a low yield. As Bailey (1961) pointed out, the agricultural impoverishment has led to economical impoverishment of the population. In this region, dried cassava ("gaplek") from being first a reserve food only, has now become almost a daily staple by necessity. Dried cassava ("gaplek") just like sago has almost no protein. (See Table on page 37). Use as a daily staple by the poor subsistence farmer and his family, who are not able to afford even sufficient food, let alone to buy enough protein rich foods, this "cassava-diet" has indeed a deleterious effect on the nutritional health of the population (See also Lie 1979).

PROSPECT OF THE RETURN TO SAGO AS A STAPLE FOOD

The malnutrition resulting from the poor man's "cassava-diet" will be an example of what may also happen with the sago-diet, if these natural sago-eaters because of one or some other reason will not be anymore able to ful-fil their protein requirement. Also, having this in mind, sago being very low in protein, should not be recommended as a substitute staple for the rice and maize eating population groups who have already difficulties in meeting their daily protein need. The effect will otherwise be the same as the effect of the aforementioned "cassava-diet". For the same consideration, it is also hoped that cassava as a staple food may soon disappear from the gunung kidul region. This can be expected as since many decades the Government has launched a massive program for improvement in said region.

In discussing the historical aspects of sago, Ave' (1976) pointed out: (quote) "It is striking that throughout insular South East Asia, sago eating peoples shift from sago to rice. This transition may seem irrational..... but it continues and appears inevitable." (end quote).

On the Moluccan sago-eaters of today, Sastrapradja and Mogea (1976) commented that many sago consumers who became familiar with rice tend to change their preference to the latter.

Cereals, like rice and maize will remain the predominant staple in South East Asia. And sago as an archaic staple food, will be strictly confined to the natural population groups, living within the resources of the riverine and lake-swamps.

OTHER USES OF SAGO

Although sago under the present condition is not suitable as a staple food for the population at large, yet it is still very valuable as an emergency food and more importantly as an energy expander, so needed to alleviate the food energy crisis Indonesia is facing today. Therefore the immense potential of the *Metroxylon sago* palms in the Eastern part of Indonesia should be exploited for its sago and ways and means found to

Table. Average figures for the Proximate Principles of Sago, Cassava, Rice and Maize for Comparison.

Foodstuff :	Moisture %	Energy Cals.	Crude Protein %	Fat %	Total Carbohydrate by difference %	Crude Fibre %	Ash %
Sago products :							
"Sago lempeng"	16	325	1.0	0.2	80	1.0–3.0	1.6
Sago flour	11	355	0.5	0.1	88	0.7	0.1
Cassava products :							
"Gaplek"	16	325	1.0	0.4	80	2.0–3.5	1.7
Tapioca flour	10	355	0.5	0.1	89	0.2	0.1
Cereals :							
Rice, milled	12	350	6.5	0.7	80	0.3	0.6
Maize, whole kernel	12	365	9.0	3.9	73	2.3	1.4

Source : Nutrition Research Unit Diponegoro, National Institute for Health Research and Development, Ministry of Health, Jakarta. (determined for this paper).

increase the use of the sago products. Just to mention for example, traditionally prepared "sago lempeng" might be used as an instant, ready for consumption emergency food especially in times of disaster. Due to its very high keeping quality, it can be stockpiled and it can be kept as an iron stock in selected regions of Indonesia. To keep the iron stock in suitable condition, part of it must be regularly replaced. The replaced part may be sold in the free market, not necessarily in the Moluccas and Irian Jaya, but probably in Java, in regions where the demand for a cheap energy expander is the greatest. To make it cheap within the reach of the general population as targeted, it has most probably to be subsidized. It will be obvious that for this kind of program a special mechanism must be developed if the Government is going to embark upon such a program. In setting up this mechanism, one should however always keep in mind that it is also one of the objectives to increase the income and buying power of the natural inhabitants of the sago regions. This can be achieved by favoring traditional harvesting and preparation of sago products to be stockpiled.

Another product, the sago biscuit (bagea manis and bagea ternate), also with a high keeping quality but for the preparation demanding more technical skill although still traditional, is sold as a highly appreciated snack in the eastern part of Indonesia. The demand for this product could be broadened into the western part through better sales promotion.

Reports on any existence of large scale exploitation, using modern technology, of the immense sago forests in Irian Jaya for its starch, are not available to us. Most probably it has not yet been undertaken. Investors may be more attracted towards exploiting the tropical forests in Kalimantan, Sulawesi and the Moluccas for its timber than for its sago.

Refined sago flour with a very low fibre content may find its use in the modern food, paper and-textile industry etc as a substitute for tapioca (cassava) starch, if the price is competitive. The potential use of sago as a basic material

for the production of alcohol to be used as fuel for the engines of the motorcars may give a new impetus towards large scale exploitation.

As the possibility of large scale exploitation of the immense sago forests of eastern Indonesia is probably not far away, one must from the very start therefore be aware of the possible danger of disturbing the whole ecosystem through unrestricted exploitation, which may damage and ruin forever the natural stands. The preservation of this precious ecological equilibrium must have been observed already by the natural sago-eaters through a certain management of the sago resources (Townsend 1976), although they are not yet even equipped with scientific knowledge. This management must have been by way of restrictions imposed by customs ("adat") or rituals (taboos) in selecting the palms for felling (Townsend 1976).

Another serious problem which can be expected and must be avoided, is the rise of social conflicts with the natural inhabitants who may claim their rights on the sago forests.

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