Nutritional Considerations of Oil Seeds and Pulses in Bangladesh

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Introduction

In the diets of Bangladesh (and other developing countries) shortage of food energy is the principal impediment to better nutrition. The nutrition surveys carried out by INFS have recorded the intake figure as 2301, 2094 and 1943 kcal in 1962-64, 1975-76 and 1981-82 respectively against requirement of 2248 kcals.[1,2,3]

In 1975-76, though the national average met 93 per cent of the requirement the deficiency is far more severe. Only 41 per cent of the house holds had adequate calorie intake.[2] The situation in 1981-82 was still worse.[3] There are families which have no more than 800 kcals per capita. It is desirable that the average consumption figure should be at least about 20 per cent above the requirement value to upset the adverse effect of maldistribution.

Cereals happen to be principal source of energy (and protein) in a Bangladeshi diet. They are however, a dilute source of those nutrients compared to other items of food stuffs, nemely legumes and oilseeds (and other foods).

Fats and oils

The virtual absence of fats and oils in the diet is a cause of great nutritional handicaps which may be itemized as follows.

1. Deficit in energy supply: Fats and oils having highest caloric density holds more energy than any other constituents of the diet. Fat deficient deit has to be more bulky, and is often less palatable.
2. Fat deficient diet is often deficient in fat soluble vitamins, notably in vitamin A and E.

Deficiency of vitamin A is widespread in this country leading to different degree of blindness, from nightblindness to keratomalacia (complete blindness). It is important to point out that oarotenes which are found in coloured vegetables and fruits are not optimally converted into retinol (vitamin A) in absence of certain amount of dietary fat. It has been documented that serum levels of vitamin E amongst Bangaldesh population are very low and may contribute to the situation of anemia.[4] This must be due to the absence of fats and oils in the diet. There could exist also deficiency of essential fatty acids (such as linoleic acid, arachidonic acid) which serve various essential functions including serving as precursors of prostaglandins. Absence of essential

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fatty acids leads to hypercholesterolemic which has been implicated in coronary disease. Due to great shortage of fats and oils, the diet of small children suffer from a special disadvantage. They need diet of high caloric density, which can only be made up with generous amount of fat. At this time only 5 percent of calorie supply is met by fats and oils compared to over 40 or more percent in the diet of advanced countries. This is very consequential for Bangladesh where ohild malnutrition is so great.

We have a great caloric gap, 2250-1943-307 kcal per day per capita. Assuming that the population of this country is 100 millions the caloric gap is 30.7 billion kcal a day,

Table-1. Oil, Protein and Energy contents of some common food crops of Bangladesh

Food crops (per 100 gm)	Oil/fat content (gm)	Protein (gm)	Energy (Kcal)
Nuts and oil seeds			
Mustard *Barussica migm*	39.7	20.0	541
Peanut	40.1	26.0	567
Soybean	19.5	43.2	432
Linseed	39.7	20.0	530
Sunflower	52.1	19.8	620
Safflower *carthamus tinctorius*	26.5	13.5	356
Coconut (fresh)	41.6	4.5	444
Coconut (dry)	62.3	6.8	662
Cashewnut	46.9	21.2	596
Cereals			
Whole wheat *Triticum aestivus*		12.8	346
Rice *Oryza sativa*		7.5	346
Pulses			
Bengal gram (Dhal) *Cicer arietinum*		20.8	372
Blackgram (Mash kalai)		24.0	347
Green gram (Mug) *Phaselus aureus roxib*		24.5	334
Field bean (Makhan sim) *Dolichos lablab*		24.9	347
Lentil (Masuri)		25.0	343
Red gram (Arahar) pigeon pea *Cajanas Cajan*		22.3	335
Cow pea (Barbati) (String pea) *vigna caljang*		24.1	323
Peas *Pisum sativum*		23.0	340
Soybean *Clyoine max*		43.2	432
Roots			
Potato *Solanum tuberosum*		1.6	97
Sweet potato *Imomoea batatas*		1.2	120

equivalent to 8870 metric tons of rice/wheat or 3.410 metric tons of oils and fats. Obviously to meet the caloric gap we have to tap multiple sources.

The oil, protein and energy contents of some common food crops of Bangladsh are shown in table-1[6].

We quote below the contribution of different food stuffs for calories and proteins in Bangladesh.3

Table-2. Contribution of different food stuffs towards calories and protein

	Calories (intake)	Percent of total calorie intake
Cereals	1795	85.7
Other sources of plant	252	12.0
Animal	47	2.2
Total	2094	58.5

In terms of nutrients, the contribution of carbohydrate, protein and fat to the calorie content of Bangladeshi diet is as follows:

Carbohydrate	84%
Cooking fat and oils (3.3 gm)	1.4%
Protein	11%

The total fat content of the diet is 12.2 gms, with only 3 grams as cooking fat. The contribution of the total lipids in the diet is 5.2 per cent of the calorie intake.

From nutritional point of view one would desire that caloric contribution of fat in the diet be no less than 15 to 20 per- cent. At the moment it is only 5 per cent.

The bulk of additional "fat calories" needed has to come as cooking fat, while the rest, may come through the intake of other oil bearing foodstuffs such as fish, milk, eggs, nuts and fruits seeds, and the like. Incidentally pumkin seed which contains about 40 per cent oil, is not considered as an item of food though it is edible.
It is therefore essential that more edible oil be produced to make up for the (a) energy deficit, (b) to supply fat soluble vitamins. It will render the needed food less bulky and more palatable.

Amongst the edible oils in this country, the most popular item in the rural area is mustard oil. Soybean oil which is imported, is popular in the urban area. Comparatively smaller amount of peanut, linseed, coconut, safflower (Kusum) oils are used. Still smaller amounts of other oils like bherenda (Ricinus communis) are taken more or less as extender of mustard oil.

The mustard oil, although popular, may not be regarded as a nutritionally excellent oil. It has almost 48 per cent erucic acid which has been implicated as a causative factor in cardiac disorder in animals.[5] Besides it has goitrogens, popularly known as oil of mustard of which the principal constituent is allyl isothiocyanate. This is a poisonous materials. It reduces blood coagulation time and

taken in large amount, could promote thrombosis. But the oil intake is so small and the isothiocyanate which is volatile that it is mostly lost during the common cooking procedure so that the ill effect of allyl isothiocyanate has never been evident. It appears that mustard oil will continue to be the principal edible oil for some years to come. Varieties of mustard (rape seed) may be available which have less of those undesirable substances.

Peanut could be an oil seed of choice. Not only that it has 40 per cent oil, but also it has over 25 per cent protein which may be consumed directly by human. Additional advantage lies in the fact that it is a leguminous plant (unlike mustard) that enriches soil with nitrogen thus curtailing requirement of exogenous fertilizer. Although contamination with Asperigillus flavus producing the dangerous hepatotoxin, aflatoxin, is associated historically with peanut, the toxin could be present almost in all food grains including rice unless they are planted, harvested, and stored with plenty of care.

Soybean is indeed a very special plant with 20 per cent oil and 40 per cent protein- both of high biological value. The science and art of its cultivation and use may yet take some time to take roots in the life of Bangladeshi people. It should be a subject of special study and research in the long term plan. It is also a leguminous plant- and would enrion soil nitrogenously.

Other oil crops such as coconut, sunflower, safflower, linseed etc. would stay as a supplementary source of oil, and may not be considered at this tie as the principal oil seed crop. In a country where deficiency of oil is so great, efforts are to be made to augment all possible sources. Rice bran having 16.2 per oil from the rice mills which at the mount, is rejected or not used as source of obible oil should be processed to recover the oil in an appropriate manner. This oil may be used be used as edible oil.

Legumes and Protein

The nutrition survey of 1975-76 although showed a respectable figure of 58 gms daily intake, also revealed that 60 per cent of household did not most the minimum requirement, Of the 60 per cent, 30 per cent was due to indoquaoy of protein itself, and other 30 per cent was caused by caloric deficiency. It is to be noted that most of the protein come from coroals. Coroals proteins specially protein from wheat are of very low biologoal value. Of the 58 gms, only 5 gms came from animal sources (including fish). The protoin ingestedd was, therfore, of very poor quality.

Pulses are popularly known as "meat" for poor people. This is so said in view of the large amount of protoin in pulses and beans (Table-1) compared to cereals and roots. Though ceroals protein and pulse protein when biological value, they supplement each other to give a protein mix of very high bilogical value which is comparable with that of fish or meat.

Table-3 shows the protein efficiency ration (PER) of some cereals and pulses[7]

Table-3 Protein efficiency ration of some cereals and pulses

Cereals	P.E.R.	Pulses	P.E.R.
Rice	1.7	Redgram	0.7
Wheat	1.3	Bengal gram	1.1
Sorgium	0.8	Green gram	0.8
		Black gram	1.0
		Lentil	0.5

Except in the case of rice the P.E.R. of cereal legume mixture is upgraded by 30-40 per cent. In these mixes, 7 per cent protein was from cereal and 3 per cent from pulse. It is to be recalled that quantity of protein in rice (6-8%) is so indequate, although its quality is high, a rice diet needs supplementation from a legume source to make up for the quantity, if not the quality.

A Bangladeshi diet which traditionally is a mix of cereal, pulse and a vegetable gives a high protein value as shown below:

Protein source	P.E.R.
Skim milk	2.57
Rice+ C.Gajan+amaranth	2.47
Wheat+C.Gajan+amaranth	2.35

Cereal provided 6, legumd, 3 and leaf 1 per cent protein.[7]

The amount of legumes in the Bangladeshi diet is not declining but vanishing. It was 28 gm in 1962-65, 23.8 gm in 1975-76 and 8 gms in 1981-82. This steep drop in the intakes of pulses would be of dangerous consequence. We also find that the total intake of protein in 1975-76 was 58 grams and that in 1981-82 it amounted to 48 grams. In our study during 1962-65 on the children of Bangladesh it was found that with decrease in the intake of pulse, there were increasing incidence of protoin calorie malnutrition amongst them leading to higher morbidity and mortality, the latter for 0-5 yr. Children having been 26 per cent.[1]

With regard to choice of an appropriats legume, it seems that lentil (Lens esculenta) is more used than others. This pulse is however of very low biological value. 0.5 against 1.1 of Bengal gram and 1.0 of black gram (Mash Kalai, Phasoolus mungo). The cooking procedure of lentil is considered to be simpler than in the case of other legumes.

There is another pulse known as Khesari (Lathyrus sativus) which has been a subject of controvery. There is absolutely no doubt that this legume which is reportedly produced with least amount of effort and cost bears highly toxic substances giving rise to crippling condition of the lower limbs of people if they eat the same as the principal item of their diet continuously for a period 1 to 3 months. It cannot be removed by any process of cooking in practics or suggested so far. Recent evidenoes, however, show that presence of genorous amount of vitamin C in the diet of Kheasari eating population would protect them from toxic effect

of the Lathyrus sativus. The protective value of vitamin C is a proven fact so far as experimental animals are concerned and it would need further confirmation before applying the same on human population groups eating substantial amount of Khesari. Therapeutic value of vitamin C in the treatment of lathyrism patient is now a proven fat.[8] It would not be prudent to encourage production of Khesari.

In order of nutritional value black gram (mash kalai), Bengal gram, green gram (mug of Ph. radiatus), peas (Pisum sativum) and then lentil would deserve consideraton. The field bean (Dolichos lablab) is a good source of protein as well as energy. But outside the districts of Chittagong, and parts of Noakhali and Sylhet this bean is not usually allowed to mature its goods and the immature pods are eaten as green vegatables. It is grown in most instances in the backyard of homesteads. It would be appropriate to include an educational program so that the seeds are allowed to mature and develop the full measure of its protein and appropriate varieties bearing bigger and more proteinous seeds should be searched and encouraged.

We have earlier mentioned the high nutritional values of soybean (40 per cent high class protein and its 20 per cent of oil). We have also mentioned that peanut has 40 per cent oil and 26 per cent protein, Production of peanut, provided the protein is rotrieved, may proved to be both nutritionally and economically worthwhile proposition.

Discussion

The present review is based on information published from different sources, and it deals with the two most nutritionally important foodcrops (pulses and oil seeds) of the country. The intakes of these two crops are not only diminishing but vanishing. Bangladesh agriculture has witnessed several programs such as the line sowing line transplanting method of cultivation, grow more food campaign, Green revolution, 'Swanirvor' (self reliance) etc. during the past three decades. All these programs aimed at raising the production of cereals more particularly rice and its production has, indeed, increased manifold compared to 1960's. The production of pulses as well as oil seeds (nutritionally the two most important food crops) however, did not receive attention of the agricultural policy planners. This has resulted in less diversified agriculture and therefore provided less varied diet to the people. This has severe nutritional consequences as evidenced from the review. In order to provide balance diet to the people, Bangladesh Agricultural policy should incorporate in it the programs of diversified agricultural production with emphasis on growing more pulses and oil seeds.

Summary

This paper provides a review of the present consumption levels of pulses and oil seeds in Bangladesh, analyses the nutritional consequences of the low intake of these foods and

emphasizes the need for their increased intake to address same prooloms of hunger and malnutrition of the country. Bangladesh agriculture to this end, needs now thinking for increased production of these crops. Priority is placed on research needs to make these crops economically competitive with cereals and certain other issues related to the nutritional improvement of the people.

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