

CHAPTER 3

Nutritional and health issues in Bangladesh and solutions through traditional foods

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3.1 Introduction

Bangladesh is a small country of 147,570 km² with an estimated population of 164.7 million (World Data Atlas, 2018; World Bank, 2019). Almost one in four Bangladeshis (24.3% of the population) lives in poverty, and 12.9% of the population live in extreme poverty line (BBS, 2017). This indicator perceptibly affects the nutritional sketch of Bangladesh. Although starvation and famine are related to the question of the general decline of food availability, they are also linked to the entitlements and deprivations (Sen, 1981). The people of deltaic Bangladesh are exposed to various types of climatic vulnerabilities such as flood (34.48%), drought (14.80%), water-logging (13.88%), cyclone (21.31%), tornado (4.14%), storm/tidal surge (8.65%), river/coastal erosion (4.95%), landslides (0.08%), salinity (4.09%), hailstorms (11.88%),

thunderstorm (14.94%), and others (7.90%) (BBS, 2016). These further affect the agriculture production, socioeconomic status, and household status of rural Bangladesh, which is detrimental to the nutritional security of poor households. Bangladesh has emerged from being a chronic food deficit country after the war in 1971 with a broken economy, dismantled infrastructure, and repatriation of the people in the country after the liberation. The population of the country has reached more than double in the last few decades, and food such as rice and fish production have been accelerating parallel to the population growth. Bangladesh has attained food self-sufficiency at the aggregate level in attaining calorie security. The per capita calorie intake was 2318 kcal/day in 2010, which is comfortably higher than the estimated minimum requirement of 2122 kcal/day (Osmani et al., 2016). However, the nutritional situation differed recently in Bangladesh depending upon factors such as policy, disaster, and poverty level.

3.2 Nutritional and health status in Bangladesh

Nutrition and food are among the basic needs of every human being. Agriculture remains a primary source of energy and nutrients for the Bangladeshi population. The nutritional status of Bangladesh can be visualized by the food and calorie intake data of the country. Rice, vegetables, and fish are the preferred items in the daily diets of the population. Dietary diversity has improved, along with a significant reduction of rice intake from 416.01 g in 2010 to 367.19 g in 2016 (Table 3.1). Rural people consumed more rice (386.09 g/day) than urban people (316.7 g/day) in 2016 (Table 3.2). Fish intake has increased from 49.41 g in 2010 to 62.58 g in 2016, which is above the desirable dietary intake pattern (60 g; BIRDEM, 2013). Although the consumption of pulses, meat, and eggs had increased in 2016, they are still far below the desirable

Table 3.1 Food (g/person/day) intake: 2016 and 2010 HIES in Bangladesh.

Foods	HIES ^a 2016	HIES 2010
Rice	367.19	416.01
Wheat	19.83	26.09
Pulse	15.6	14.3
Vegetables	167.3	166.08
Fish	62.58	49.41
Meat	25.42	19.07
Egg	13.58	7.25
Milk	27.31	33.72
Fruit	35.78	44.8

^aHousehold Income and Expenditure Survey.

Source: BBS, 2017. Bangladesh Bureau of Statistics. Preliminary Report on Household Income and Expenditure Survey 2016. Ministry of Planning, Government of Bangladesh, 149 pp.

Table 3.2 Food (g/person/day) intake: rural versus urban people in 2016.

Foods	Rural	Urban
Rice	386.09	316.7
Wheat	17.44	26.22
Pulse	15.12	16.88
Vegetables	164.78	174.06
Fish	60.59	67.91
Meat	22.32	30.04
Egg	12.73	15.85
Milk	26.29	30.04
Fruit	32.24	45.23

Table 3.3 Calorie (kcal/capita/day) intake: rural versus urban people in 2016 and 2010.

Year	Rural	Urban	Total
2016	2240.2	2130.7	2210.4
2010	2344.6	2244.5	2318.3

Source: BBS, 2017. Bangladesh Bureau of Statistics. Preliminary Report on Household Income and Expenditure Survey 2016. Ministry of Planning, Government of Bangladesh, 149 pp.

dietary pattern. Consumption of milk has declined from 33.72 g in 2010 to 27.31 g in 2016 (Table 3.1). The intake of vegetables has increased since 2010 (166.08 g), although it is far away from the reaches of the FAO/WHO recommendations (400 g/day). The overall daily food intake by the rural people is lower than the food intake by the urban people (Table 3.2). The trends of food consumption score levels are widespread across the country.

The per capita calorie intake in 2016 was 2210.4 kcal/day, which was lower than 2010 per capita consumption (Table 3.3) and was comfortably higher than the estimated minimum requirement of 2122 kcal/day (BBS, 2017).

Similarly, the calorie intake level is higher in rural areas than in urban areas if the consumption is estimated separately. The per capita protein intake in 2016 was 63.80 g with the consumption being higher among the urban people (65.00 g/person/day) than the rural people (63.30 g/person/day) (BBS, 2017). It is evident that rural people consume less food than urban people due to the affordability and availability of the products.

The agricultural and food systems including livestock and fisheries are being strengthened to contribute adequately and efficiently toward meeting the dietary and nutritional needs of the population. The nutrition-related activities and policies of Bangladesh have focused on the increased production on meeting the nutrition required for the growing population of the country.

On the human development index for the year 2018, Bangladesh has been placed at the 136th position among 187 countries. Bangladesh scored 0.608 on the index with 72.8 years of life expectancy at birth, multidimensional poverty index of 0.194, and \$3677 per capita gross national income (UNDP, 2019).

Bangladesh has a top-ranking position among the countries that provide free medical services to the people at the community level through various public health facilities. The primary healthcare is provided through an extensive network of health facilities extending down to the community level with upward referral linkage.

3.3 Malnutrition

Humans require energy, protein, vitamins, and minerals to reach their full physical, mental, and cognitive potential that results from consuming nutrient-rich food. Lack of awareness regarding the importance of nutrition and traditional food preparation and consumption patterns have led to decreased nutrient retention contributing to malnutrition. Children and women in Bangladesh suffer from high levels of malnutrition and micronutrient deficiencies such as low birth weight, undernutrition (underweight, stunting, and wasting), vitamin A deficiency, iodine-deficiency disorders, iron-deficiency anemia, and overweight being a significant emerging issue.

Tragically, the rates of malnutrition in Bangladesh are among the highest in the world. More than 54% of preschool-aged children, equivalent to more than 9.5 million children, are stunted, 56% are underweight, and more than 17% are wasted (FAO, 2019). All administrative divisions of Bangladesh were affected by child malnutrition. However, some differences in the prevalence of three anthropometric indicators exist. The prevalence of underweight ranged from 49.8% in Khulna to 64.0% in Sylhet, which also showed the highest incidence of stunting (61.4%) and wasting (20.9%). Despite the upper levels, rates of stunting have declined steadily over the past decade (Osmani et al., 2016; FAO, 2019).

Children of Bangladesh also suffer from high rates of micronutrient deficiencies, particularly vitamin A, iron, iodine, and zinc shortage in the body. Malnutrition among women is also extremely prevalent as more than 50% of women suffer from chronic energy deficiency. The prevalence of women with a body mass index (BMI) $<18.5 \text{ kg/m}^2$ ranged from 47.6% in Khulna to 59.6% in Sylhet (Ahmed et al., 2012). Studies suggest that there has been little improvement in women's nutritional status over the past 20 years (FAO, 2019). Poor reproductive healthcare and anemia due to no-support given after baby-birth issues are related to the malnutrition in women in Bangladesh (Ahmed, 2000).

The Government of Bangladesh has made substantial investments to improve nutrition, including the establishment of the National Nutrition Program, which provides comprehensive nutrition-specific interventions to children and women at

the community level. These include national-level infant and young child feeding counseling, food supplementation, vitamin A supplementation, and immunization programs, some of which have brought about dramatic changes in reducing vitamin A deficiencies, night blindness, and child morbidity and mortality (Yosef et al., 2015).

As an outcome of these interventions, Bangladesh has made significant progress in eliminating some forms of malnutrition including vitamin A and iodine deficiency. Bangladesh has made a considerable achievement in reducing child stunting and is commended as a success story in the global nutrition settings (Nisbett et al., 2017). The prevalence of stunting (low height-for-age) among children under five decreased from 55% in 1997 to 36% in 2014 (Osmani et al., 2016). Maternal undernutrition, as measured by “low” BMI, also declined significantly, from 52% in 1997 to 17% in 2014 (WFP, 2016). This trend has been conveyed as one of the most sustained diminutions in child undernutrition in the world (Headey et al., 2015).

The Bangladesh Government, in its 7th Five Year Plan (FY2016–20), set an ambitious target reducing 25% stunting of under 5-year children by 2020, that is, 3.8 million children, from the 5.5 million children estimated in 2014 (Fig. 3.1). As the rate of stunting-reduction has accelerated between 2012 and 2016, the World Health Assembly has targeted 3.6 million children by 2025. The current trend could support such a decrease of 4 million stunting of under 5-year children by 2025 (EC, 2017).

The underlying causes of malnutrition are multifaceted and go beyond the lack of availability and access to diverse, safe and nutritious food. Table 3.4 provides some of the drivers of malnutrition.

Malnutrition in early life has long-lasting and adverse effects on overall growth, which are influenced by cross-cutting and underlying socioeconomic, cultural, and political factors at the community and national levels.

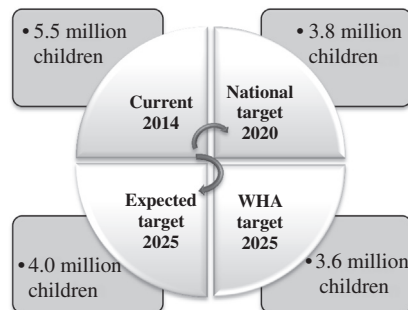


Figure 3.1 Current and projected plans for reducing stunting under 5-year old children. EC, 2017. European Union. Country Profile on Nutrition, Bangladesh. European Commission, July 2017. https://ec.europa.eu/europeaid/sites/devco/files/2017_country_profile_on_nutrition_-_bangladesh.pdf (accessed 10.04.19).

Table 3.4 Root cause of malnutrition.

-
- Household food insecurity
 - Inability to grow or purchase a nutritionally adequate amount and variety of foods
 - Lack of dietary diversity
 - Inappropriate knowledge of healthy diet and practices
 - Inadequate maternal and childcare
 - Lack of access to safe water and sanitation facilities
 - Inadequate access to quality health services
-

Source: FTF, 2018. Feed the Future. Global Food Security Strategy: Bangladesh Country Plan 2018. <<https://www.usaid.gov/documents/1867/global-food-security-strategy-gfss-bangladesh-country-plan>> (accessed 04.04.19.).

3.4 Traditional beliefs and practices: food and health

Traditional beliefs refer to the knowledge that has been embedded in a society's cultural and spiritual belief system and has been passed on from generation to generation. Most communities are characterized by an intertwined set of specific beliefs and practices related to food and health including ways that food can be produced and prepared, which food could be prohibited, and better health can be maintained.

3.4.1 Food taboos versus food allergy

Dietary practices often take the form of rules stating which foods should not be eaten, that is, food proscriptions or taboos. In some cases the persistence of cultural beliefs and practices in the areas of food and health presents an obstacle to the improvement of food and nutrition outcomes.

There are a number of taboos found among rural and even urban people in Bangladesh. People avoid eating *shim* (green beans), *begoon* (brinjal), *chal kumra* (Hairy gourd), *boal fish* (freshwater shark, *Wallagonia attu*), and *gojar fish* (Great snakehead, *Channa marulius*), and *gura-chingri* (small freshwater shrimp) is forbidden for kids, old, and rural people for allergic reactions at certain periods of time. Every year during the rainy season, some people die by having pufferfish (*Tetraodon cutcutia* and *Tetraodon potoca*) curry due to its toxicity.

Several food taboos are prevalent in pregnant women who inadvertently deprive them of some vital nutrients. Among the rural women in Bangladesh, food such as ripe papaya, grape, and pineapple are avoided during pregnancy with the belief that such foods could cause abortion, placental disruption, difficult labor, and many others. The use of herbal remedies is considered culturally in Bangladesh, for promoting healthy deliveries of the gestational woman for a good intention but may medically cause anemia and hemorrhagic-related complications (Choudhury and Ahmed, 2011).

Food allergy represents a substantial health problem. Despite eating traditional food items, few foods have been identified as allergic to consumption. These are yams and

vegetables such as leaf, stem, and root of *maan kochu bhorta* (Giant taro), *kochur mukhi* (Taro corms), and *maan kochu* (root of giant taro). Food allergies may increase stress and impact on both the quality and quantity of food choices resulting in inadequate intake of nutrients.

3.4.2 Traditional wisdom: *Khanar Bachan*

Culturally, many traditional beliefs exist in the country and in every household. Bangladesh has a long history of traditional food products related to agriculture or local products. The traditional knowledge goes back to the early civilization of Bengal. A poetess and legendary astrologer named Khana of ancient Bengal composed many small verses in the form of rhyme known as “Khanar Bachan” (Khana’s verses) on agricultural and health-related topics between the 9th and 12th centuries CE. The existence of her sayings is observed reflecting in the then Bengali lifestyle, agriculture practices, health and nutrition, weather prediction, food habit and cooking, plantation, and animal husbandry (Nawaz, 1989).

Her verses were the basic guidelines for traditional agriculture practices, especially the time of sowing seeds, harvesting, and seasonal adaptation in Bangladesh. Her humongous influences are also used in modern agriculture advancement. Table 3.5 details some of the Khana’s health and food-related remarkable quotes.

Table 3.5 Khana’s Bachan on food and health.

Khana’s Bachan	Interpretation
<i>Kochi patha, buro mesh, Dodhir aag, gholer shesh</i>	Ingest young goat, mature bull, and drink top creamy layer of yogurt, and bottom part of milk-shake
<i>Tal, tetul, doi, Boiddo boley ooshud koi?</i>	Toddy palm (<i>Borassus flabellifer</i>), tamarind, and yogurt can spoil the action of medicine in the body
<i>Mangsey mansho bridhe, Ghreetey bridhe bol, Dudhey birjo bridhe, Shakey bridhe mol</i>	Meat helps in developing body muscles while ghee (melting butter) increases energy, and milk improves sperms while leafy vegetable promotes feces
<i>Tok, tita, chukka, jhal, Ei char purusher kal</i>	Men do not like four things—higher bitterness, sourness, saltiness, and spicy-hot in food
<i>Tel tamakey pittoo nashto, Jodi hoy ta baro maash</i>	Oily food and smoking for years can result in health havoc
<i>Jol khaey fol khaey, Jom boley aye aye</i>	Eating fruit after having a glass of water is not suitable for health
<i>Baro mashey baro fol, Na kheley jay rosatol</i>	Twelve types of seasonal fruits during the 12 months and become healthy
<i>Alo haowa bedhona, Rog e voge moriona</i>	Do not obstruct light and air into the house to avoid suffering from the diseases

Source: Nawaz, A., 1989. *Khanar Bachan Krishi-O-Bangalee Sanskriti* (Khana’s Quotes for Agricultural and Bengali Culture). Bangladesh Agricultural Research Council, Dhaka, Bangladesh, 320 pp. (in Bengali).

Table 3.6 Traditional beliefs and some common food items of health benefits.

Bengali term	English name	Traditional beliefs and uses
Lal shak	Red amaranth	For the anemic patient to recover hemoglobin level
Kolmi shak	Water spinach	To regain mineral and vitamin loss of the body
Kacha kola	Green banana	To recovery of taste from the loss of appetite and fever
Korola	Bitter gourd	Fresh juice for diabetic patient, and fry for an appetizer
Misti alu	Sweet potato	Source of carbohydrate for the patients after the fever
Shuji payesh	Rice pudding	Used as food supplements for the infant
Sajina torkari	Drumstick	Curry to overcome diseases such as chickenpox and others
Kakrol	Spiny gourd	Deep frying used as an appetizer and improves the taste
Kacha pepe	Green papaya	Cooked with a meat curry and help digestion
Kolar thor	Banana flower	Mashed that treats for infections, and premature aging.
Singh machh	Sting catfish	Mild curry/soup for recovering from illness
Magur machh	Catfish	Mild curry/soup for the sick patient
Rui machh	Rui fish	Fry used for celebration and offering to the bridal party
Ilish machh	Hilsa shad	Fried ilish served in traditional ceremonies
Shidol	Fish paste	Fermented fish paste used as a protein supplement
Chepa sutki	Punti fish	Paste for the protein supplement

Most Bangladeshi populations relate to agriculture directly or indirectly. Khana's verses pertinent to agriculture are verbal folk communication and the resource that poor farmers rely on for wisdom to apply in their daily life for ages. They are still being integrated into modern agriculture practices.

3.4.3 Common food items of traditional beliefs

In Bangladesh, some traditional food items are believed to achieve many of the nutritional and health benefits. Some selected plants and fish food used in traditional beliefs are listed in [Table 3.6](#).

3.5 National guidelines for food intake

The nutrients including protein, energy, carbohydrates, fats and lipids, a range of vitamins, and a host of minerals and trace elements are essential to lead a healthy and energetic life. People can select nutritionally rich diets from a variety of available and affordable foods. A food-based dietary guideline is developed to improve the nutritional status of the Bangladeshi population and prevent nutrient deficiencies and diseases ([Nahar et al., 2013](#)). The guidelines are a set of advisory statements providing principles and criteria of good dietary practices to promote social well-being ([Table 3.7](#)).

Table 3.7 Food-based dietary guidelines in the Bangladesh context.

-
- Eat a well-balanced diet with a variety of foods at each meal
 - Use in moderation foods high in fat and minimize fats and oils in food preparation
 - Limit salt intake and condiments and use only iodized salt
 - Take less sugar, sweets or sweetened drinks
 - Drink plenty of water daily
 - Consume safe and clean foods and beverages
 - Maintain desired body weight through a balanced diet and regular physical activity
 - Adopt and follow appropriate preparation and cooking practices with good eating habits
 - Eat supplementary food and take extra care during pregnancy and lactation
 - Practice exclusive breastfeeding for the first 6 months of life, introduce and continue complementary feeding along with breastfeeding up to 2 years
-

Source: Nahar, Q., Choudhury, S., Faruque, M.O., Sultana, S.S.S., Siddiquee, M.A., 2013. Dietary Guidelines for Bangladesh. FAO Research Grant from National Food Policy Capacity Strengthening Programme (NFPCSP) Phase II to Bangladesh Institute of Research and Rehabilitation in Diabetes, Endocrine and Metabolic Disorders (BIRDEM), Dhaka, Bangladesh, 53 pp.

3.5.1 Proportion of food in a healthy diet

The proportion of food items (in percent) for a healthy lunch is proposed by the food plate method (Nahar et al., 2013) that could be met through traditional food items in Bangladesh.

According to the benchmarks, 53% will be rice or wheat or any carbohydrate like mashed potato. Mixed vegetables are 15% while leafy vegetables are 15%. Many options are available in preparing this menu. Meat or fish could account for 6%, and plant protein lentil accounts for 4% of the prescribed diet. The remaining 7% is for fruits of seasonal origin.

3.5.2 Food guide pyramid

A complete dietary guideline for Bangladesh was developed by Nahar et al. (2013) with a food pyramid showing different types of foods to be taken. For Bangladeshis, the bottom of food pyramids exerts eating rice or wheat, fruits, and vegetables in the diets liberally. The middle zone of the pyramid is composed of fish, meat, and eggs, which are suggested for eating moderately. The top-notch of the pyramid is limited to sugar as well as fats and oils in the diet (Fig. 3.2).

3.5.3 Physical exercise

Physical exercise is not commonly practiced among the general population of Bangladesh. Socially, men go to work, and wives remain in households. There is a growing concern about overweight among the children and housewives in Bangladesh. Among the 17% of the overweight or obese adults in Bangladesh,

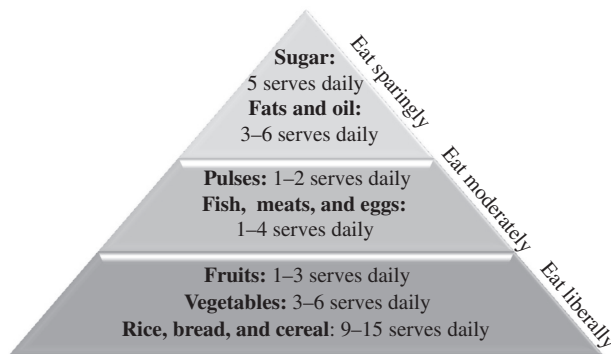


Figure 3.2 Food pyramid in a Bangladesh context.

Table 3.8 Guidelines for regular physical activity.

- Maintain ideal body weight by balancing food consumption through physical activity
- Take 30–45 min of daily physical activity such as walking, running, jogging, cycling, and household works
- Maintain body mass index (BMI: 18.5–23.0)
- Avoid the risk of obesity-related metabolic complications (waist circumference >90 cm for male and >80 cm for female)
- Maintain healthy waist-hip ratios (male 0.9: female 0.8)
- Engage in light activity such as household chores and walk after the meal

Source: Nahar, Q., Choudhury, S., Faruque, M.O., Sultana, S.S.S., Siddiquee, M.A., 2013. Dietary Guidelines for Bangladesh. FAO Research Grant from National Food Policy Capacity Strengthening Programme (NFPCSP) Phase II to Bangladesh Institute of Research and Rehabilitation in Diabetes, Endocrine and Metabolic Disorders (BIRDEM), Dhaka, Bangladesh, 53 pp.

4% were obese, and obesity rates in Bangladesh are increasing at a slower pace. Obesity rates in adults grew from 2% to 4%, and rates in children and adolescents remained at about 1.5% from 1980 to 2013 (Stewart and Persaud, 2014). The prevalence of overweight and obesity is found to be higher in girls than in boys among children and adolescents, and prevalence rates are higher in females than in males in the adults where it is also higher in urban people compared with rural people living in Bangladesh (Banik and Rahman, 2018). A guideline provided by Nahar et al. (2013) recommended engaging individuals with adequate levels of physical activity throughout their lives to achieve overall physical, mental, social, and spiritual health. Table 3.8 presents key messages from the guideline regarding physical activities.

Maintaining the desired body weight through regular physical exercise and a balanced food improves oxygen utilization, lowers blood glucose, and increases working capacity.

3.6 Solutions through traditional foods

Food-based approaches focusing on dietary diversification are an active pathway for reducing micro- and macronutrient deficiencies in malnourished populations (FAO, 2010). In Bangladesh, rice is the leading cereal food consisting of two-thirds of the traditional dietary habits providing 69% of food energy although it is low in fat, essential amino acids, and micronutrients (FAO, 2007). Animal source foods, which contain high-quality protein and bioavailable iron and vitamin A, make up less than 2% of total energy intake (FPMU, 2009). Rice is accompanied by some vegetables, a little amount of pulses, and small quantities of fish. Milk and milk products and meat are consumed occasionally and in minimal amounts. Consumption of fruits is seasonal although banana and papaya are available throughout the year. The traditional dietary habits often do not meet good nutritional outcomes due to lack of inadequate nutrition information and requirement.

On the other hand, food preparation methods result in significant nutrient losses. Minerals and vitamins, especially B-complex vitamins, are lost (40% of thiamine and niacin) even during the washing of rice before cooking. Boiling rice and then discarding the water results in even more nutrient losses. The manner of washing and cooking vegetables leads to considerable losses of vitamin C and B-complex vitamins (FAO, 2007).

Dietary diversification approaches combine homestead gardening, backyard animal rearing, and pond-based aquaculture practices, which are uniquely well suited to reducing hidden hunger and malnutrition in Bangladesh. There have been many rice varieties, chicken, ducks, oxen and cows, goats, wild bulls, pigeons, rabbits, 265 species of inland fish, and more than 60 species of shrimps, lobsters, and crabs to feed the Bangladeshi population. Besides, more than 100 species of medicinal plants are available from the forest and homestead gardens (Hasan et al., 2014). All these traditionally consumed local food plants and animals contribute substantially to the local availability of nutrient-rich foods.

Most traditional foods of Bangladesh are also recognized as functional foods because of the presence of functional components such as body-healing chemicals, antioxidants, dietary fibers, and probiotics. These functional molecules help in weight management and blood sugar level balance, and they support the immunity of the body (Sarker et al., 2015). The functional properties of foods are further enhanced by processing techniques such as sprouting, malting, and fermentation (Hotz and Gibson, 2007).

The fertile alluvial soil and subtropical climate of Bangladesh make it ideal for growing a diverse range of horticultural crops and are considered a significant source of the vitamins and minerals that are essential for human nutrition. Vegetables are a substantial part of daily food intake along with rice that makes a balanced diet.

Consumption of green leafy vegetables contributes to meet the nutritional requirement and overcome micronutrient deficiency at minimum cost. *Lal shak* (Red amaranth), *kolmi shak* (Water spinach), *begoon* (brinjal), *dherosh* (Okra), and *kochu* (Taro) are now the preferred vegetables growing in the rural areas.

There is growing evidence of additional health benefits from a range of phytonutrients such as carotenoids in pumpkin, which is widely available throughout the year in Bangladesh. The carotenes help to slow the aging process, reduce the risk of certain types of cancer, improve lung function, and reduce complications associated with diabetes (Plant and Food Research, 2018). Potato is one of the mainstream crops in Bangladesh, containing higher levels of carbohydrate and provides higher energy.

Taro is a perennial, tropical plant primarily grown as a root vegetable for its edible starchy corm, and as a leaf vegetable (Fig. 3.3). In Bangladesh, taro is a popular vegetable known as *kachu*. It is usually cooked with small prawns or the ilish fish into a curry, although some dishes are cooked with dried fish. Its green leaves (*kachu pata*) and stem (*kachu*) are also eaten. Taro stolons (*kachur loti*) are favored by Bangladeshis, and are cooked with shrimps, dried fish, or the head of the ilish fish. Taro benefits include its many nutrients, including magnesium, iron, fiber, potassium, manganese, zinc, copper, and phosphorus. It contains good amounts of antioxidants, as well as vitamins A, B₆, C, and E (Li and Siddique, 2018).



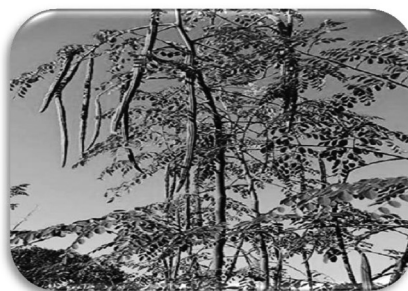
Giant taro stem and corm



Taro stolon



Shapla stem



Sajina trees with pods

Figure 3.3 Some minor vegetables of nutrition and health benefits. www.google.com.

Sajina (*Moringa oleifera*) is another inexpensive, eco-friendly, and socially beneficial alternative, especially for the socially neglected population, suffering from poverty and malnutrition. This promising food source in Bangladesh is full of the leaf at the end of the dry season when other foods are typically scarce (Fig. 3.3). Sajina is universally called the “miracle plant” or “the tree of life” with enormous potentials. Various parts of the plants such as leaves, roots, seeds, barks, fruits, flowers, and immature pods attributed to multiple health effects, including cardiac and circulatory stimulants, possess antipyretic, antioxidant, antiepileptic, antiinflammatory, and antiulcer (Pal et al., 1995; Gupta et al., 2018). Sajina is said to provide 7 times more vitamin C than oranges, 10 times more vitamin A than carrots, 17 times more calcium than milk, 9 times more protein than yoghurt, 15 times more potassium than bananas, and 25 times more iron than spinach (Rockwood et al., 2013). That is why it is being called a superfood. Food and Agricultural Organization of the United Nations recognized Moringa as the September 2014 traditional crop of the month (Alegbeleye, 2018).

Many wild vegetables such as Shapla stem (*Nymphaea stellata*), Kalmishak (*Ipomoea aquatica*), and Helecha (*Enhydra fluctuans*) are traditionally consumed with staple food in both rural and urban areas in Bangladesh. These wild vegetables are rich in vital minerals such as Na, K, Ca, and Mg and essential trace elements such as Fe, Cu, and Zn, which are sufficient to fulfill the recommended dietary allowances by FAO/WHO (Satter et al., 2016).

The tropical fruits of Bangladesh are an excellent source of antioxidant vitamins such as vitamin C, β -carotene, and antioxidant minerals such as zinc, copper, and manganese iron (Shajib et al., 2013). Varieties of mangoes grown seasonally are rich sources of vitamin C, fiber, and essential minerals and provide sustainable health benefits (Ara et al., 2014).

The star gooseberry, monkey jack, pineapple, and golden apple are very rich in antioxidant vitamins and minerals; mango, blackberry, jackfruit, and carambola are also rich, whereas melon and java apple are insufficient in antioxidant vitamins and minerals.

People could meet up their vitamin C requirements with magic fruits such as amra (*Spondias mombin*), kamranga (*Averrhoa carambola*), guava (*Psidium guajva*), and amloki (*Phyllanthus emblica*), as these are available throughout the year in Bangladesh (Fig. 3.4). Amra contains twice the vitamin C contents than oranges. It is rich with antioxidant properties and makes the blood pure, prevents aging and sunburn, and manages hair fall problem. Amloki helps fight common cold and infections. Its high fiber content helps prevent constipation while various antibacterial and astringent properties help stimulate the immune system of the body (Hasin, 2018). Kamranga with its sweet and sour flavor contains pantothenic acid, potassium, and copper, which help to cure headaches and treat sore eyes. Guava, another favorite fruit, contains several vital vitamins and minerals, and the antioxidant poly-phenolic compound help to prevent cancer, antiaging, and immune booster (Hasin, 2018).

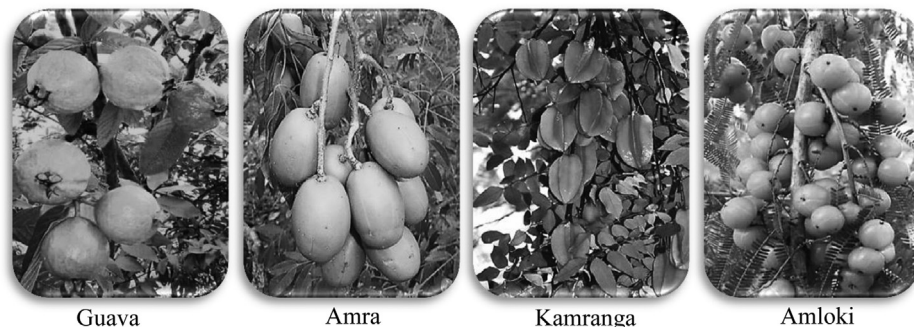


Figure 3.4 Some vitamin C rich fruits in Bangladesh. www.pinterest.com.au.

Underutilized or minor fruits can be used as alternative sources to combat hidden hunger such as vitamin A deficiency (Bioversity International, 2004). Nowadays, increased minor or underutilized fruits are contributing substantially to overcome the malnutrition in Bangladesh (Rahim et al., 2008). Minor fruits such as bel (*Aegle marmelos*) contains 65 mg/100 g, Kalojaam (*Syzygium cumini*) contains 25.65 mg/100 g, and Payla (*Flacourtia jangomas*) contains 25.64 mg/100 g, which are higher amounts of vitamin C than jackfruit (11 mg/100 g) and mango (*Mangifera indica*, 10.88 mg/100 g) (FAO-NFPCSP, 2010).

Micronutrient-rich small fish species are providing poor and vulnerable households in Bangladesh with a source of food and nutrition security. Mola (*Amblypharyngodon mola*), darkina (*Esomus danricus*), and dhela (*Ostreobrama cotio cotio*) have the potential to meet the nutritional needs of the Bangladeshi people (Thilsted and Wahab, 2014). Small fish, fresh or dried, are also made into *bhortas* and eaten with rice and vegetables, which are tasty, well-liked, and rich in micronutrients. Table 3.9 presents the amount of fish meat required to meet the daily requirements of vitamin A for Bangladeshi people.

People can grow these traditional food items to fight malnutrition and to achieve nutritional security compliant to the Sustainable Development Goals 2, 3, and 12 of the United Nations.

3.7 Future outlooks

Bangladesh is the largest delta on earth. Agriculture is the most important economic sector and a powerful driving force in providing foods and incomes, supporting livelihoods alleviating poverty and contributing to the overall economy. Agriculture can sustainably contribute to improving dietary diversity and nutrition outcomes. The population growth in Bangladesh is projected at 218 million by 2050 and could stabilize at around 260 million in the middle of the next century (UN, 1998). This highly

Table 3.9 Intake of vitamin A from fish meat (g/day) in the Bangladesh population.

Age group	Vitamin A requirement ^a ($\mu\text{g RAE}^b$)		Required fish meat per day (g) ^c						
	Male	Female	Mola	Dhela	Taki	Koi	Ilish	Rui	Catla
Less than 1 year	375	375	15.0	40.8	269.8	127.1	1875.0	2884.6	1704.5
1–3 years	400	400	16.0	43.6	287.8	135.6	2000.0	3076.9	1818.2
4–6 years	450	450	18.0	49.0	323.7	152.5	2250.0	3461.5	2045.5
7–9 years	500	500	20.0	54.5	359.7	169.5	2500.0	3846.2	2272.7
10–18 years	600	600	24.0	65.4	431.7	203.4	3000.0	4615.4	2727.3
19–65+ years	600	600	24.0	65.4	431.7	203.4	3000.0	4615.4	2727.3
Pregnancy		800	32.0	87.1	575.5	271.2	4000.0	6153.8	3636.4
Lactation		850	34.0	92.6	611.5	288.1	4250.0	6538.5	3863.6

^aFAO/WHO (2001) and Nahar et al. (2013).

^b $\mu\text{g RAE}$ – retinol activity equivalent.

^cBogard et al. (2015).

dense population will play a crucial role in constricted agricultural landscapes against all the odds of climate change vulnerabilities to augment the food production and to feed the growing population (Streatfield and Kara, 2008).

Rice continues to be the dominant crop in Bangladesh and has evolved significantly over the last 5 years, as demonstrated by Bangladesh's marked improvement in rice production and increased exports of rice and vegetables (World Bank, 2016; FTF, 2018). However, challenges to agricultural-led growth remain. The small size of farm plots, limited diversity and adaptive capacity, healthy agroecosystems, and weak local governance have made the region one of the adversely affected countries on the planet (Chowdhury, 2019).

The geopolitical situation on transboundary rivers, rising sea levels, dryness in the northern barind highlands, and increases of salinity in the southern part of Bangladesh restrict crop and fish production that requires a technological shift to alternative food production. Long-term planning is essential for facing the upcoming challenges and needs of the growing population, nutritional requirements, survival of traditional food crops and their conservation, and maintaining a sustainable consumption.

3.8 Conclusion

Inhabitants, farmers, and fishers have developed different locally adapted agricultural techniques for traditional farming and harvesting since ancient times. These traditions have resulted in a vibrant mixture of sociocultural, ecological, and economic support to humankind. Unfortunately, these agrarian practices are threatened by many influences including climate change, population pressure, pollution, invasive species, modern agricultural practices, and increased competition for harvesting natural resources that have resulted in the loss of traditional farming practices and many endemic species.

Despite having considerable progress toward reducing malnutrition in recent years, Bangladesh needs a more significant climate-smart agriculture. Diversifying farms and farming landscapes in horticulture, livestock, poultry, and fisheries together with more robust rural nonfarm enterprise development are required to foster future growth, reduce poverty, and improve food and nutrition security.

Promoting a mass awareness of nutrition education to enhance the regular intake of minor fruits and wild vegetables could help alleviate common dietary deficiency diseases from Bangladesh. Increased use of minor fruits and veggies would also help to grow imitativensness for cultivation to protect them from extinction and to maintain biodiversity.

Nationwide research is suggested to scientifically document the health benefits of traditional foods across various regions to create a database for the preservation of knowledge on food composition and dietary guidelines. This endeavor could contribute to health, nutrition, and food policy program planning for future endeavors and benefit the Bangladeshi and international communities.

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