



A MANUAL ON FOOD BASED NUTRITION



Integrated Agriculture and Health Based Interventions for Improved Food and Nutrition Security in Selected Districts of Southern Bangladesh

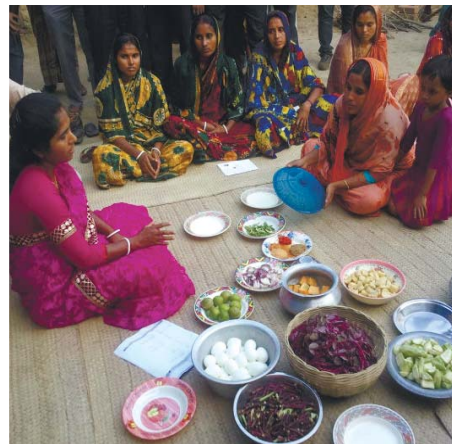


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Training of Trainer's (ToT) Manual on Food Based Nutrition for Extension Officers in Fisheries, Livestock, Agriculture and Health Sectors at District and Upazila level



March 2015

“Integrated Agriculture and Health-based Interventions for Improved Food and Nutrition Security in Selected Districts of Southern Bangladesh” (IAHBI)

To improve food and nutrition security, Food and Agriculture Organization of the United Nations (FAO) and United Nations Children’s Fund (UNICEF) are providing technical support through IAHBI, a project funded by United States Agency for International Development (USAID) under its Feed the Future initiative. The IAHBI project promotes integrated homestead food production, dietary diversity and improved knowledge and practice in nutrition through agricultural input distribution, training on the input use and an extensive nutrition education and behavior change Communication (BCC) programme under the purview of the extension services of the Government of Bangladesh.

The line ministries and relevant departments of the Government of Bangladesh collaborating with FAO and UNICEF on the IAHBI project are: Ministry of Fisheries and Livestock, notably its Department of Livestock Services and Department of Fisheries, as the project focal ministry, Ministry of Agriculture, notably its Department of Agricultural Extension, Ministry of Food, notably its Food Planning and Monitoring Unit and Directorate General of Food, Ministry of Health and Family Welfare, notably its Institute of Public Health and Nutrition and National Nutrition Services, and Ministry of Public Administration or Cabinet (through district and upazila administrations).



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ACKNOWLEDGMENTS

This manual was produced by the nutrition team of the Food and Agriculture Organization of the United Nations (FAO) in collaboration with the Ministries of Fisheries and Livestock, Agriculture, Food and Health and Family Welfare. Technical specialists of the concerned ministries contributed to the review and translation into Bangla. The Institute of Public Health and Nutrition contributed to many of the pictorial aids used in this manual.

The seasonal calendar of vegetables and fruits presented in this manual reflects the seasonal availability in the project areas of the South. This was jointly developed by the Department of Agricultural Extension, Ministry of Agriculture and supported by FAO through based on a community enquiry in each of the 5 project upazilas. This formed the basis for the selection of foods to be grown and promoted through the integrated homestead gardening and nutrition education programme.

This manual was produced under Project GCP/BGD/049/USA - “Integrated Agriculture and Health-based Interventions for Improved Food and Nutrition Security in Selected Districts of Southern Bangladesh” and would not have been possible without the financial contribution from the United States Agency for International Development.

The practical insights and contribution of the farmers, households and communities in the preparation of this manual are gratefully acknowledged.



Message

Nutrition-sensitive agriculture has the potential to narrow the 'nutrition gap' between what foods are available and what foods need to be consumed for a healthy diet. In this regard, the district and union level personnel who are engaged in programmes linking nutrition with food production activities need to have basic nutrition knowledge to become effective partners in the process of promoting better nutrition.

This manual is in line with the mandate of the agriculture component of the Integrated Agriculture and Health-based Interventions project being implemented in selected districts of Southern Bangladesh. It promotes and acknowledges the need for a multi-sectoral approach in addressing food security and nutrition issues. It is prepared as a guiding tool for Extension Workers working under the Ministries of Fisheries and Livestock, Agriculture, Health and Family Welfare at district, upazila and union levels. It informs project implementing partners in the importance of food based nutrition. The manual is also targeted to civil society organizations and NGOs implementing similar activities.

The topics in the manual are presented as modules which deal with essential themes for promoting food based nutrition. An attempt has been made to make the manual simple and user friendly while addressing each of the areas covering basics of food and nutrition, Infant and Young Children Feeding, maternal nutrition, hygiene and sanitation and food processing and preservation.

I am confident that this manual will be useful in training an extension programmes on nutrition.



২২/২/১৫

Shelina Afroza PhD
Secretary
Ministry of Fisheries and Livestock



Message

Achieving food security and nutritional wellbeing is central to the achievement of the Millennium Development Goals (MDGs). Since 1992 the prevalence of child malnutrition in Bangladesh has shown some decline. The stunting rate decreased remarkably from 71 percent in 1992 to 41 percent in 2011. Similarly the underweight rates showed a substantial decline from 61 percent in 1992 to 36 percent in 2011. Exclusive breastfeeding up to 6 months has shown remarkable improvement, from 34 percent in 2007 to 64 percent in 2011. However, the efforts have to be intensified to lift over the food security the remaining part of the population which still suffers from malnutrition.

The Government of Bangladesh strongly emphasizes that food-based approaches, which include food production, dietary diversity, nutrition education and food fortification, are sustainable strategies for improving the nutritional status of populations. Increased access to and availability and consumption of a variety of micro-nutrient rich foods not only have a positive effect on micronutrient status but also contribute to improved nutrition in general. It is obvious that continued investments in nutrition sensitive and specific measures can greatly accelerate the progress in Bangladesh which has one of the highest burden of maternal and child under-nutrition.

This manual covers the food based nutrition components of the Integrated Agriculture Interventions for Improved Food and Nutrition Security in Selected Districts of Southern Bangladesh project, which is technically supported by FAO and UNICEF and funded by United States Agency for International Development (USAID).

This manual is intended for use by district and union level extension personnel as well as others who are engaged in the challenging task of nutrition education and communication to create sustainable improvements in nutrition, especially among nutritionally vulnerable households and population groups in Bangladesh.

I trust this document is a useful resource to implement food based nutrition training by the Government, non-governmental organizations (NGOs) and different partner agencies.

Dr Shah Nawaz
Additional Director General (Admin)
DGHS and Director, IPHN
MOHFW



Preface

The food based nutrition manual has been prepared with the technical support of Food and Agriculture Organization of the United Nations (FAO) in collaboration with the Government of Bangladesh. The Ministry of Fisheries and Livestock recognizes the food-based approach among other strategies as a sustainable one to prevent and control micro-nutrient deficiencies. It promotes dietary diversification through production and consumption of a variety of micronutrient rich foods, notably fish and small livestock that provide protein and micronutrient in the diet.

This manual has been produced as part of the outputs for training under the project “Integrated Agriculture and Health-based Interventions for Improved Food and Nutrition Security in Selected Districts of Southern Bangladesh” which is implemented by the Government of Bangladesh with technical support from FAO and UNICEF, and funded by United States Agency for International Development (USAID).

I am confident that this manual will serve as a practical tool to create nutrition awareness and promote a positive behavioral change with regards to food preparation and combinations, dietary diversity, complementary feeding of infants and young children and maternal nutrition, as well as food processing, preservation, and food adulteration. Consistent nutrition messaging has been provided for all community level groups and an extension workers across sectors.

I thank those who have contributed to the final preparation of this manual. I also acknowledge those who contributed to the revisions at the validation workshop of the manual. It is anticipated that work on improving this version of the document will be continued and will result in new editions of the manual in future.

SM Golam Ali
Joint Chief
Ministry of Fisheries and Livestock
Govt. of the People's Republic of Bangladesh



Food and Agriculture Organization of the United Nations

Foreword

Malnutrition in all its forms – undernutrition, micronutrient deficiencies, and overweight and obesity – imposes unacceptably high economic and social costs on countries at all income levels. Improving nutrition and reducing these costs requires a multisectoral approach that begins with a food based approach and includes complementary interventions in public health and education.

The project on Integrated Agriculture and Health Based Intervention for Improved Food and Nutrition Security aims at improving household food security and nutritional status and strengthening synergy with health-based actions, especially focusing on mothers and young children in selected upazilas of Khulna and Barisal and Satkhira in the southern region of Bangladesh.

The project aims to develop skills of rural farmers particularly women on horticulture, livestock and poultry rearing, and aquaculture production to improve nutritional status of the families and also generate income from the excess produce. Central to the nutrition programme is nutrition education and extension and the creation of nutrition awareness to promote consumption of horticulture, fish and small livestock based foods from their own homestead farms.

This Manual is intended for use in 'Training of Trainers' on food based nutrition and to promote food based nutrition improvement through the entry points of livestock, fisheries and agriculture extension services.

Mike Robson

FAO Representative in Bangladesh
Food and Agriculture Organization of the United Nations
Bangladesh

How to use the manual ?

The manual is composed of 11 modules, each of which focuses on a different topic. The modules are briefly described below:

Module 1, “Improving Community and Family Nutrition Through Integrated Homestead Farming” introduces the idea of homestead farming and food production for home consumption. It starts by discussing the general advantages of the home garden and shows nutrient supplies from a typical home garden in Bangladesh and their contribution to covering the Recommended Dietary Allowances of children under 5 years and pregnant and lactating mothers.

Module 2, “The Role of Horticulture in Nutrition” discusses the importance of vegetables and fruits in the diet. The reader is introduced to the various important nutrients which are present in vegetables and fruits. It briefly mentions illnesses being the consequence of inadequate dietary intake of those micronutrients, and presents a calendar of seasonal availability of vegetables and fruits in Bangladesh.

Module 3, “Basic Food and Nutrition” is composed of four parts. Part one called “Food, Nutrients and Nutrition” introduces the user to the basic rules of nutrition and a healthy diet. The user will learn about the nutrients and their functions in the human body as well as the sources of those nutrients, and about the basic food classification. Part two called “Balanced Diet” uses a simplified classification of foods into 3 food groups, which is used during the field training, to explain the principles of a balanced diet. Part three called “Food Combinations and Nutritious Recipes” focuses on the rules of healthy eating and is a guideline for improving the quality of daily diets by using a diversity of foods, right food combinations and preparation methods which enhance nutrient availability from the meal. Part four, “Nutritive Value of Commonly Consumed Vegetables and Fruits of Bangladesh” shows the lists of plant sources which are rich in Vitamin A, Iron, Calcium and Vitamin C.

Module 4, “Understanding Malnutrition” explains what malnutrition is, when it occurs and what types of malnutrition exist. It discusses micronutrient deficiencies and the three micronutrients the lack of which are a public health problem in Bangladesh: iron, iodine and vitamin A. Finally, the module introduces the reader to the causes of malnutrition based on the UNICEF causal framework of malnutrition.

Module 5, “Infant and Young Children Feeding (IYCF)” is composed of two parts. The first part is on breastfeeding and it introduces the user to the basics of breastfeeding. The main advantages of breastfeeding for the infant and the mother, are listed and the right breastfeeding practices are described. The second part is on complementary feeding and it introduces the user to the importance of complementary feeding. It gives a practical tips on how to prepare complementary food, how to feed the child and, what are the hygiene related concerns. It gives detailed instructions on the frequency and types of foods which should be given to young children at different periods between 6 to 24 months.

Module 6, “Nutrition and Care for Adolescent Girls” provides a sensitization of the high dietary and nutrient needs of adolescent girls as future mothers. It explains what are the reasons for the concerns about the nutrition of adolescent girls and gives practical tips on how to reduce the risk of malnutrition at this stage of life.

Module 7, “Nutrition and Care for Pregnant and Lactating Women” introduces the user to the specific needs that women during the periods of pregnancy and lactation have. The module lists the consequences of undernourishment during pregnancy and informs about the desired weight gain during pregnancy. Further it describes specific nutritional needs of women during pregnancy and lactation. It describes antenatal and postnatal care needs and explains why it is crucial for the health of the mother and child. Finally, it gives practical tips on how to improve a woman’s diet during the periods of increased dietary needs.

Module 8, “Home Food Safety and Food Preparation Techniques” introduces the user to the key rules of food preparation which will reduce the nutrient losses during processing. Further, the module lists the most important rules of safe food preparation and hygiene of food handling and storing. The last part of the module sensitizes the user on the safety issues related to poultry handling and rearing livestock in the household.

Module 9, “Household Processing and Preservation” introduces the user to the basic methods of food preservation which can be used in a rural household. The module explains the importance of food preservation as a way of ensuring availability of nutrient-rich vegetables and fruits throughout the year. Further, it explains basic preservation methods: drying, pickling, bottling and making preserves. The module also provides recipes for preserved foods.

Module 10, “Hygiene and Health,” describes the critical points in the rural household where threats of illness transmission can occur, and advice on how to ensure hygiene and eliminate or reduce illness risk. It starts with personal hygiene emphasizing the importance of hand washing, further it discusses household hygiene and focuses on hygienic ways of storing drinking water. Finally, it discusses common illnesses and advises how to feed the sick person or child and describes some household remedies which can be used to treat mild symptoms of common cold or stomach upsets.

Module 11, “Food Adulteration” introduces the user to the terms of food adulterants and the threats which they present. Further, it describes the most commonly found food adulterants and the household methods of detection.

Module 12, “Participatory Cooking Demonstration Guidelines” illustrates the practical cooking demonstration for three selected recipes.

Example of the Nutrition Training Programme

Training of Trainers for Government Extension Officers and Implementing Partner Staff	
Day 1	
8:30 - 9:00 am	Registration and inauguration
9:00 - 9:15 am	Ice breaking and introduction
9:15 - 9:45 am	Brief of the project
9:45 - 10:00 am	Objective of the training course
10:00 - 10:15 am	Pre-test
10:15 - 10:30 am	Tea break
10:30 - 12:00 pm	Module 1 - Improving Community and Family Nutrition Through Integrated Homestead Gardening
12:00 - 13:00 pm	Module 2 - Role of Horticulture in Nutrition
13:00 - 14:00 pm	Lunch break
14:00 - 17:00 pm	Module 3 - Basics on Food and Nutrition
14:00 - 15:00 pm	Module 3 - Part 1 - Food, Nutrients and Nutrition
15:00 - 15:15 pm	Module 3 - Part 2 - Balanced Diet
15:15 - 15:30 pm	Tea break
15:30 - 16:15 pm	Module 3 - Part 2 - Balanced Diet (continued)
16:15 - 17:00 pm	Module 3 - Part 3 - Food Combinations and Nutritious Recipes
Day 2	
08:45 - 9:30 am	Recap of the previous day
9:30 - 11:00 am	Module 4 - Understanding Malnutrition
11:00 - 11:15 am	Tea break
11:15 - 15:15 pm	Module 5 - Infant and Young Child Feeding (IYCF)
11:15 - 13:00 pm	Module 5 - Part 1 - Breastfeeding
13:00 - 14:00 pm	Lunch break
14:00 - 15:15 pm	Module 5 - Part 2 - Complementary Feeding
15:15 - 15:30 pm	Tea break
15:30 - 15:50 pm	Module 6 - Nutrition and Care for Adolescent Girls
15:50 - 17:00 pm	Module 7 - Nutrition and Care of Pregnant and Lactating Women
Day 3	
08:45 - 9:30 am	Recap of the previous day
9:30 - 11:00 am	Module 8 - Home Food Safety and Food Preparation Techniques
11:00 - 11:15 am	Tea break
11:15 - 13:00 pm	Module 10 - Hygiene and Health
13:00 - 14:00 pm	Lunch break
14:00 - 15:15 pm	Module 9 - Household Processing and Preservation (theory)
15:15 - 15:30 pm	Tea break
15:30 - 17:00 pm	Module 9 - Household Processing and Preservation (practical)
Day 4	
08:30 - 9:00 am	Recap of the previous day
09:00 - 9:45 am	Module 11 - Food Adulteration
09:45 - 11:00 am	Module 12 - Participatory Cooking Demonstration: dietary diversity
11:00 - 11:15 am	Tea break
11:15 - 13:15 pm	Module 12 - Participatory Cooking Demonstration: complementary food preparation
13:00 - 14:00 pm	Lunch break
14:00 - 15:00 pm	Module 12 - Participatory Cooking Demonstration: complementary food processing
15:00 - 15:15 pm	Post-test

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Module 1:

Improving Community and Family Nutrition through Integrated Homestead Farming

Learning objectives

- To raise awareness on the importance of improving homestead food production for better nutrition and extra income.

Introduction

Because our world is changing, food production is becoming more and more complex. Some of the problems that growers face include people moving into cities, climate change, soil infertility, lack of labour, economic problems and lack of land.

Access to an adequate amount and variety of safe foods and Nutritious at all times is one of the basic rights of every individual, yet it remains difficult to attain for a significant number of families in Bangladesh. However, when households are able to complement their resources such as land and labour with improved tools and seeds and the right information, they can increase their productivity and obtain sufficient nutritious foods by fully developing their land.

Food production and rearing animals on small plots adjacent to human settlements is an age old survival strategy in the developing world. In the rural areas of Bangladesh, families often farm 500 to 1500 m² of land around their home. This area offers great potential for improving household food supplies. For the purpose of this training, this entire area will be referred to as the home garden.

The home garden can be used to raise many kinds of fruit, vegetables, staple food crops, medicinal plants, spices and also, farm animals (backyard poultry and small livestock) and fish.

It is also used as a playground for children, a work area, farm animals and fish rearing area and a place for storage of farm produce and equipment. The home garden also has an important economic function as a source of food production for sale and income generation and thereby improving the overall nutritional status of the family.

A well-developed home garden makes a vital contribution to household food and nutrition security.

Home gardens may constitute the only source of certain nutrients to less well off households and the major or only source of food between harvests or when harvest fail. They provide critical sources of energy, protein and micronutrients specially for weaning age children. Year round, readily available and continuously harvested garden production can be a source of nutritious pesticide free vegetables and fruits for the poorest families who may otherwise have no access to them. Daily harvest from gardens can enhance intake of essential nutrients and ensure fresh produce.

The household also needs the right food in all seasons of the year. Food production is often lowest from the middle of the dry season to the middle of the rainy season. The start of the rainy season is also the time when illness in young children is most common and they need foods rich in vitamins and minerals for protection. A well-developed home garden can provide food in all seasons.

A well-developed home garden fosters economic security.

Gardens generate income through the marketing of surplus produce and from the savings created by producing items that were formerly purchased. The small amounts of cash income that household gardens provide can make the vital difference between relative well being and hardship, crippling debt and starvation in cash poor societies.

Income from the home garden also contributes to the household food supply. Some crops, animals, fishes or products made in the home garden (e.g. handicrafts, pickles, other preserved items) can be sold or exchanged for food or other things needed for the well-being of the family (e.g. education, health care, clothing).

A well-developed home garden generates employment for women.

Limited access to resources means that land poor women are more likely to be under employed. Home gardens offer women an important means of earning income without overtly challenging cultural and social restrictions on their activities. Since women are frequently the principal providers for family diets, enhancing their purchasing power and food production capacity has a direct impact on household nutrition and health.

A well-developed home garden protects the environment.

Household gardens can be ecologically sound land management systems. Multi cropping prevents depletion of soil nutrients; the combination of tress, shorter plants, creepers and tubers enhances soil conservation. An advantage of poly cropped, intensively managed gardens planted with locally adapted species is their primary reliance on cultivation practices rather than toxic chemicals to control weeds, pests and diseases. Household food production in agro chemical - intensive field based agriculture. Traditional style household gardens are also crucial repositories of diverse plant genetic resources.

A well-developed home garden can significantly contribute to the daily intake of macro and micronutrients.

Vitamin A deficiency is a public health problem in Bangladesh. Lasting, long term solution to improve the vitamin A levels in the country rests on increasing the availability of vitamin A rich foods to the most vulnerable groups. Anaemia also remains a widespread problem with estimates that anaemia among infants could be as high as 90 percent and that over a third of non-pregnant and almost half of pregnant women are anaemic. Household cultivation of vegetables and fruits (86% of the vitamin A intake in Asia comes from plant sources) and growing leafy vegetables, poultry and eggs has proved to be the most effective solution.

Well-developed home gardens can be found on a walk through most villages. These households have the ideas, skills and resources to produce all year many different staple crops, roots, vegetables, fruits, livestock and sometimes fish.

Many layers of plants can be seen in a well-developed home garden. Tall plants are combined with shorter plants. Plants grown together mature at different times. Animals consume plants from the home garden and return manure to the soil.



Source: Ministry of Agriculture

Pict 1. Pictorial demonstration of a home garden in Bangladesh

The home garden is the major supplier of daily food. The combination of foods from crops, livestock and fish gives a good diet in terms of energy, protein and micronutrients. So in short, support to small scale family food production can confer enormous health and economic benefits to the most deprived areas in Bangladesh at a relatively low cost while safeguarding the environment.

The role of extension staff in improving community and family nutrition

Extension staff is usually trained to promote the production of food, cash crops, fisheries, and animals but are rarely given the training required to promote better diets and nutritional practices. By virtue of their direct access to rural farm families, extension staff are well placed to promote improved household food supplies and nutritious diets through support in the development of home gardening.

When and where appropriate, extension workers from various ministries can provide guidance and encourage the community to produce, not only for sale, but also for home consumption. It is a valuable investment in human resource development to orient extension workers and train them to provide support to improve crop, fish and animal production and consumption leading to improved food security, balanced diets and nutritional outcomes.

Nutrient supply, availability and intake estimates from a typical home garden in Bangladesh

Vegetables, fruits, leafy vegetables, poultry, livestock and fish based production in home gardens are an important aspect of the project. The nutritional contribution of all the produce from integrated homestead farming was assessed and yield information was collected from plots that are less than < 0.50 hectares categorized as landless farmers by GoB. For fruits, other vegetables and leafy vegetables, information on varieties that are available around the year was collected. The most commonly reared fishes in ponds that are around 10 decimal size in home gardens and households rearing a minimum of 2 goats and 7 chickens in healthy conditions have been considered for calculations of nutrient supply.

The yield supply per person was calculated using an average family size of five persons per household. The table below shows the monthly average household production and per capita availability (post selling) of vegetables, fruits, leafy vegetables, fish and produce from small poultry and livestock from their home gardens. The difference between supply and consumption is calculated as the produce sold in rural markets for income generation. The table has been prepared based on estimates by rural farmers and project specialists. On an average the per capita consumption of a rural household is as below;

- 75 g of leafy vegetables
- 75 g of other vegetables
- 45 g of fruits
- Small livestock (goats/sheep) reared mainly as a source of livelihood asset and sold in times of financial crisis.
- 30 g of poultry and its produce
- For egg, calculations are based on 7 healthy chickens who on an average can produce three eggs per day (40 g each)
- 50 g of fish

Considering that the eating habits are part of a country's cultural identity and as such have evolved over time, it is encouraging to see that food consumption is diversifying in Bangladesh. The table below shows that a typical home garden in Bangladesh meets a substantial part of the Recommended Dietary Allowances for micronutrients like Iron, Folate, Calcium, Vitamin A and C for groups with special needs like children under 5, pregnant and lactating women. The consumption of micronutrient rich foods like fruits, vegetables, milk, eggs and other animal based food products is much lower than the recommended amounts. Investments in fisheries, livestock and horticulture need to be scaled up in order to raise production and productivity and encourage farmers to diversify their production and consumption.

The per capita daily micronutrient supply from home garden produce has been displayed in table 1.

Table 1. Estimates of the nutrient supply and intake* from a typical home garden in Bangladesh

Nutrient Supply and Intake-Estimates from a Typical Homegarden in Bangladesh													
Season		Common food items available throughout the year in an typical home garden of Bangladesh											
Land size		Landless category			# of family members								
SI No	Food items	Production /Availability per month (g)	Consumption per month (g)	Consumption per person (g/day)	Energy (kcal)	Protein (g)	CHO (g)	Fat (g)	Iron (mg)	Folate (mcg)	Calcium (mg)	Vit-A (Retinol)	Vit C (mg)
Horticulture													
Leafy vegetables													
1	Lal shak (Red amaranth leaves)	5000	3000	20	6.4	0.9	0.10	0.06	1.2	17.0	51.2	317.3	8.4
2	Pui shak (Indian Spinach)	10000	5000	33	8.3	0.8	0.70	0.1	0.73	46.7	37.0	338.3	17.3
3	Lau shak (Gourd leaves)	5000	3000	20	5.2	0.5	0.12	0.06	0.62	14.6	18.8	79.0	9.5
4	Drumstick leaves	2000	500	3.3	2.4	0.2	0.15	0.06	0.03	6.8	14.7	2193.3	7.3
	Sub Total	22000	11500	73	20	2	1	0	3	78	107	735	35
Other vegetables													
1	Begun (Brinjal)	5000	2500	17	4.0	0.3	0.3	0.0	0.1	5.7	3.5	1.25	0.22
3	Lau (Bottle gourd)	15000	6000	40	13.6	0.4	2.7	0.0	0.3	2.4	10.4	1.13	3.5
3	Data (Stream)	10000	5000	33	9.7	0.8	0.8	0.0	0.3	20.7	23.3	12.6	3.2
4	Marich (Green Chilli)	500	500	3	225	14	30	1	8	50	110	95.8	512
5	Pepe (Papaya)	6000	4000	27	12	0	2	0	0	0	6	1.2	7
	Sub Total	36500	18000	77	248	15	33	1	9	73	144	110	518
Fruits													
1	Pepe (Papaya)	2500	500	17	5.5	0.1	1.1	0.0	0.1	9.7	4.8	20.0	10.3
2	Kola (Banana)	5000	2500	33	31.7	0.4	6.4	0.3	0.1	6.7	3.7	1.2	0.3
3	Lemon (Lebu)	1500	300	10	5.6	0.1	1.0	0.1	0.0	1.7	6.5	0.8	4.6
	Sub Total	9000	3300	43	43	1	7	0	0	8	10	2	5
Small livestock and backyard poultry													
Small livestock													
1	Goat (2/hh)												
Backyard poultry													
1	Poultry (chicken)	7000	3500	23	49	10	0	1	0.2	3	7	25	0
2	Egg	3600	1000	7	38	3	0	3	0	12	14	213	0
	Sub Total	10600	4500	30	130	14	0	4	1	15	21	238	0
Fisheries													
1	Rui	2500	2000	13	12.00	2.75	0.00	0.35	0.13	0.00	86.7	3.0	0.00
2	Catla	2500	2000	13	79.31	2.65	0.00	0.35	0.08	0.00	69.7	3.0	0.00
3	Mrigel	2500	2000	13	13.60	2.48	0.00	0.40	0.24	2.27	87.3	11.0	0.00
4	Silver carp	2500	2000	13	16.40	2.33	0.00	0.80	0.20	0.00	2.9	0.0	0.00
5	Tilapia	2500	2000	13	14.67	2.77	0.00	0.40	0.07	3.20	2.5	2.0	0.00
	Sub Total	12500	10000	53	136	13	0	2	1	5	163	16	0
	Grand total			277	577	45	41	7	12	180	445	1100	558
Recommended Dietary Allowance (RDA)													
Under 5 children					1250	17	-	30	6.3	200	600	450	30
Pregnant women (Rural sedentary worker - 3rd trimester)					2455	64	-	-	11.3	600	1200	800	55
Lactating mother (0-6 months)					2655	69	-	-	15	500	1000	850	70

* Cereals and lentils have not been included in the estimation.

Module 2

Role of Horticulture in Nutrition

Learning objectives

- To understand the role of horticulture in nutrition
- To highlight the importance of inter sectoral approach for promoting nutrition via horticulture
- To be aware of the seasonality in leafy vegetables, other vegetables and fruits commonly grown and consumed in the three planting seasons of Bangladesh.

Introduction

Bangladesh is endowed with diverse soil and weather conditions, comprising of several typical agro ecological zones. Due to this wide and rich diversity in the agro climatic zones, a large variety of horticulture crops grow in the country in the different seasons. For horticulture crops, there are three main planting seasons in Bangladesh which are as follows:

- Kharif 1 (Summer) - March 16th to 30th June
- Kharif 2 (Rainy) - 1st July to 15th October
- Rabi (Winter) - 16th October to 15th March

The southern region of Bangladesh comes under the coastal area which represents a typical agro climate and physiography that promotes abundance in vegetable plantation and crops like other vegetables, green leafy vegetables and fruits. In the lean season, when traditional staple foods are in short supply, then fresh leafy vegetables, other vegetables and fruits can be cultivated, so that the diets are better balanced.

Horticulture development is one of the recent approaches that is widely used for combating nutritional deficiencies among rural populations. Horticulture consists of fruits, other vegetables, leafy vegetables, roots and tubers, mushrooms, floriculture, medicinal and aromatic plants, and cashew nut that have emerged as products for best diversification in land utilization. Bangladesh also produces a wide variety of spices like black pepper, cardamom, ginger, garlic, turmeric, chilli, seed and tree spices. The horticulture sector has established its credibility in improving productivity of land, generating employment, improving economic conditions of the farmers and entrepreneurs and above all providing nutritional security.

Seasonal availability of fruits and vegetables has been extended to all the year round. Vegetables including roots and tubers are indispensable as cereal substitutes. Adaptation of high yielding variety and hybrids, improved production technologies, better infrastructure, quality seed production and supply policy, and participation of all entrepreneurs have largely contributed to the higher production of vegetables and fruits in Bangladesh.

Role of horticulture crops in nutrition

Micronutrient deficiencies are major problems in all developing countries. Around three fourth of a population is affected with micronutrient deficiencies. Ill effects are manifested through low birth weights, high infant mortality, anaemia due to iron deficiency, blindness in children due to vitamin A deficiency, high maternal mortality rate, goiter and cretinism due to iodine deficiency. These micronutrients (vitamins and minerals) which are needed only in small amounts, must be obtained from foods since the human body cannot produce them. A lack of sufficient micronutrients in the diet will result in deficiency diseases which may even endanger people's life.

Dietary diversification through horticulture inputs is one of the sustainable approaches to combat micronutrient malnutrition. The dietary deficiencies are mainly due to lack of knowledge of what makes up a proper balanced diet. Promotion of local foods that are rich sources of micronutrients is important where a sizeable population lives below the poverty line. Hence, training and nutrition education would encourage people to make better use of existing food sources and to plan their diet.



Pic. 2: Woman harvesting spinach in her home garden

Bangladesh is blessed with a wide array of leafy vegetables which are nutritionally rich as well as the cheapest sources of natural foods. Moreover, during rainy season a variety of leaves like ipomoea and colocasia leaves grow easily and abundantly.

The commonly available leafy vegetables like spinach, amaranth, bengal gram leaves, drumstick leaves, jute leaves, and colocasia leaves are rich sources of micronutrients like vitamin A, vitamin C, iron, calcium, phosphorous, magnesium and iron. Vitamin A is also present in some other vegetables like bean, cowpea, bitter gourd, and pumpkin, sweet potato and carrot. Citrus fruits like lemon, pomelo, guava and orange and Indian gooseberry, emblica are rich sources of Vitamin C.

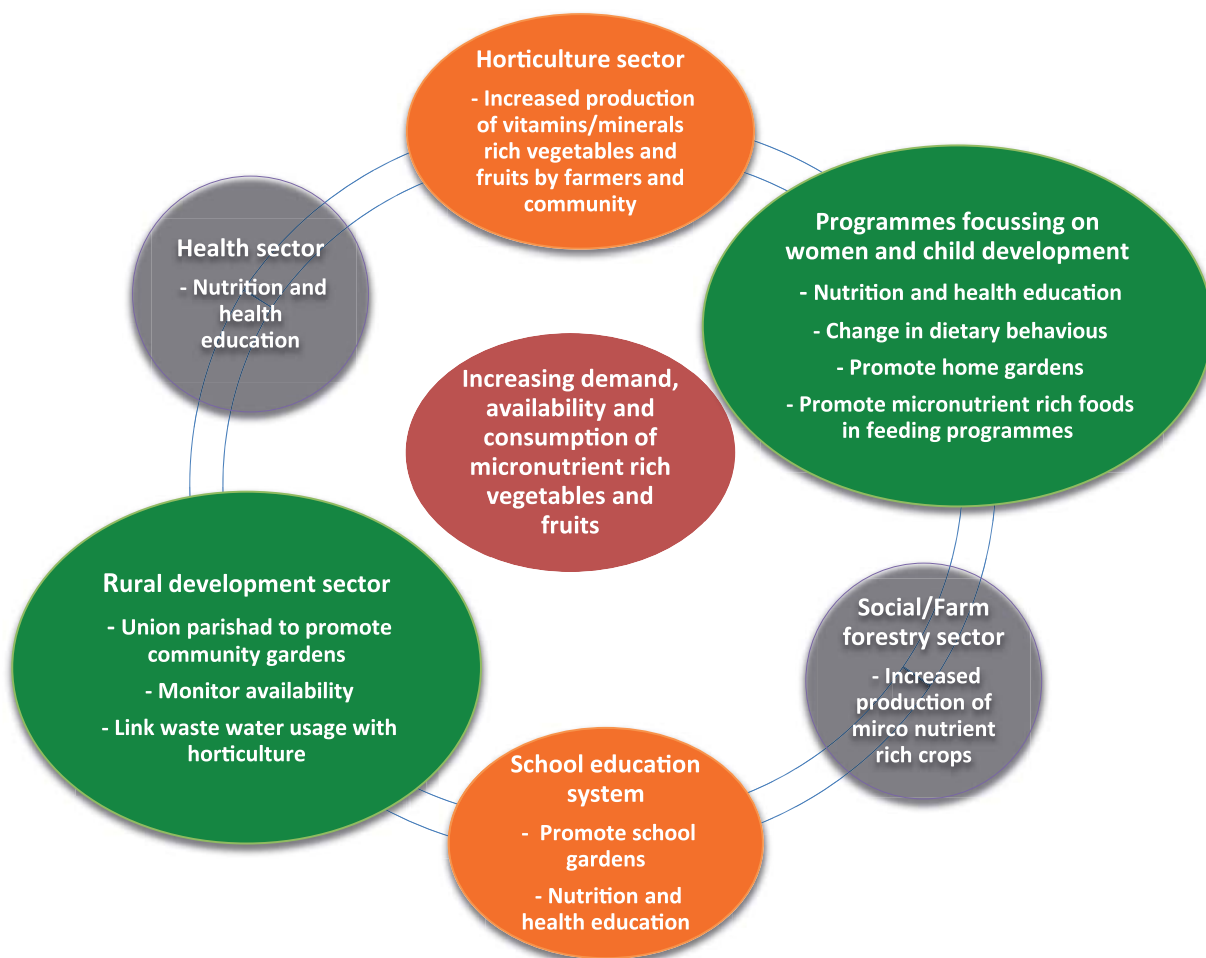
Micronutrient dense leafy and other vegetables may reduce the prevalence rates of these deficiency for e.g. iron deficiency anaemia. Micronutrient deficiencies can be prevented by consuming leafy and other vegetables like amaranth, beans, cowpea, etc daily in sufficient quantities. Night blindness (vitamin A deficiency) - which is common among children and pregnant mothers in the rural area) can be prevented, if dark green leafy vegetables (DGLV) are taken daily in adequate quantities (at least one cup cooked leafy vegetables).



Pic. 3: Woman in her home garden

Multisectoral approach

A multisectoral approach to develop horticulture along with the agriculture sector should be an essential step for the production of micronutrient dense local vegetables and fruits. Updated Information, Education and Communication (IEC materials) can help disseminate technical knowledge of improved production technology, motivation and sensitization of all concerned.



Adapted from: Chakravarty I. 2001. *The role of horticulture in nutrition*. A manual for the Community and Panchayat. All India Institute of Hygiene and Public Health, Government of India, Ministry of Health and Family welfare, Directorate General of Health Services. Kolkata.

Figure 1. Main stakeholders and their role in improving consumption of micronutrient rich vegetables and fruits

Promoting Horticulture in Bangladesh

All over the country, there is a higher level of production and consumption of cereal crops (mainly rice) than the horticulture crops. Horticulture crops are not popular, as farmers are interested in cash crops for its profit. They also are not aware of the nutritional importance of horticulture crops. These crops may help to improve the economic status of farmers if the per capita consumption is increased by extending the seasonal availability of vegetables and fruits to all round the year. The two most common strategies that can be promoted in Bangladesh for growing horticulture produce are as follows:

1. Centrally developed nurseries: This needs to be prepared and maintained by the villagers. Hybrid or high yielding variety seeds, improved technologies for planting etc. can be used for production of leafy and other vegetables to improve their availability. Some plants, which are brought from outside can be cultivated in nurseries to save on costs.



Pic. 4 Women working in the village nursery

2. Home gardening: Home garden is an area around the home where different vegetables and fruits are grown throughout the year to meet the family's nutritional requirements. The chief characteristic of nutrition oriented garden is that the choice of crops to be grown would be based on an awareness of dietary needs in the community or family. In rural areas, the population consists mostly of poor, landless people who work mainly outside the homes as farmers, share croppers and day laborers. The work of managing the garden can be done by individual family members mainly by women who are primarily responsible for household food preparation. If women become involved in the home gardening, it will inevitably increase her involvement in family nutrition which, in turn, will increase the livelihood of family members benefiting from the availability of the garden produce.

High cost of inputs (such as seeds, seedlings, fertilizers and pesticides), which are important elements in agriculture production, is a constraint for the landless and marginal families. Hence, a good vegetable production cycle can be maintained using low cost inputs and technology: compost, local fencing materials, biological/mechanical methods of pest control. Many types of vegetable seeds can be produced locally in the garden. It is possible to produce a large number of good local varieties of vegetables: red amaranth, green amaranth, spinach, radish leaves, coriander leaves, drumstick leaves, and a large number of other nutritionally important vegetables like pumpkin, sweet potato, bottle gourd and field beans. Therefore, a well-developed home garden, which has a complete farming system can:

- Provide nutritionally rich food
- Provide direct means of supplying families with most of the non-staple foods that are needed around the year
- Provide fresh garden material
- Generate income from the sale of home garden produce (after using for the family)
- Promote important farm development activities



Pic. 5: Woman with leafy vegetables harvested in her garden

Seasonal Calendar for leafy, other vegetables and fruits

Varieties of vegetables and fruits can be grown during the year. There is an optimum time for sowing/planting and harvesting different horticulture produce but with proper management, some vegetables can be grown for a longer time to give better yield. Seasonal calendars are important from a programmatic point of view as they give us realistic information on (a) foods available; (b) 'foods' being consumed; and (c) diversity of foods available in the community. A clear and precise list of horticulture produce consumed in the communities can support the upcoming program on planning interventions like the preferred seed distribution, recipe planning for complementary feeding/dietary diversity and appropriate BCC messages oriented as per the availability of food items and preference of the communities.

Table 2 shows the sowing/planting of leafy vegetables, other vegetables and fruits commonly grown and consumed in the southern coastal region of Bangladesh.

Table 2. Seasonal calendar of vegetables and fruits in the southern coastal region of Bangladesh

Foods	Kharif 1 (Summer) March 16 th to 30 th June	Kharif 2 (Rainy) 1 st July to 15 th October	Rabi (Winter) 16 th October to 15 th March
Leafy vegetables			
Drumstick leaves	√	√	
Bottle gourd leaves		√	
Data shak	√	√	
Indian spinach	√	√	
Red amaranth			√
Ipomoea	√	√	
Green amaranth	√		√
Corrainder leaves			√
Radish leaves			√
Thankooni leaves	√	√	√
Black arum leaves	√	√	
Helencha leaves	√	√	
Jute leaves	√	√	
Mayalu	√		
Vegetables			
Tomato	√		√
Drumstick	√	√	
Bottle gourd		√	√
Sweet gourd	√		
Ridge gourd	√	√	√
Snake gourd	√	√	
White gourd		√	
Ash gourd	√		√
Bitter gourd	√	√	√
Teasle gourd	√	√	
Pointed gourd	√	√	
Cucumber	√	√	√
Kochu		√	
Green chillies	√	√	√
Brinjal	√	√	√

Foods	Kharif 1 (Summer) March 16 th to 30 th June	Kharif 2 (Rainy) 1 st July to 15 th October	Rabi (Winter) 16 th October to 15 th March
Okra	√	√	√
Yard long bean	√	√	
Carrot			√
Beet			√
Kholrabi		√	√
Turnip			√
Cabbage			√
Potato			√
Sweet potato	√		
Pumpkin	√	√	√
Cauliflower			√
Radish			√
Cowpea	√		√
Fruits			
Sapota		√	
Kul/Jujube/Boroi			√
Banana	√	√	√
Guava		√	
Lemon	√	√	
Papaya	√	√	√
Hog plum	√	√	
Coconut	√	√	√
Mango	√	√	
Amloki		√	
Olive		√	
Jackfruit	√	√	
Pineapple	√	√	
Litchi	√		
Black berry	√		
Custard apple	√		
Pomelo		√	
Wood apple	√		
Watermelon	√		

Table 3. List of leafy vegetables and other vegetables which can be easily grown in a home garden or a central nursery in the southern coastal region of Bangladesh.

Leafy vegetables	Other vegetables
Drumstick leaves	Drumstick
Bottle gourd leaves	Bottle gourd
Pumpkin leaves	Pumpkin
Red amaranth	Papaya
Green amaranth	Bitter gourd
Indian spinach (Pui sak)	Cow pea
Cauliflower leaves	Cauliflower
Cabbage	Brinjal
Carrot leaves	Carrot
Radish leaves	Radish
Turnip leaves	Turnip
Spinach	Green chilli
Ipomoea	Cucumber
Bengal gram leaves	Long yard beans
Coriander leaves	Okra
Halencha leaves	Peas

Module 3

Basics on Food and Nutrition

Part 1: Food, Nutrients and Nutrition

Learning objectives

- To define the basic terms in food and nutrition
- To identify and describe the different foods that provide essential nutrients needed to maintain health

Introduction

Why do we need to eat healthy foods?

The consumption of healthy foods leads to a healthy, active and economically productive life. Eating a variety of foods can provide sufficient energy to be active; help the body grow and repair the wornout cells, and strengthen the immune system against disease.

Food and Nutrients

What is Food, Nutrient and Nutrition?

- Food is defined as “any substance, which is consumed in fresh, cooked, raw or processed form. It does not include drugs.” Food is needed to perform various functions in the body and keep it healthy. The foods that we eat daily like rice, fish, pulses, vegetables and fruits are made up of a number of natural chemical components called nutrients.
- Nutrients: Natural chemical components or substances which are used by the human body for maintaining its metabolism and proper functioning.
- Nutrition is the process of nourishing or being nourished; it is the process by which the body assimilates food and uses it for growth and maintenance. The study of foods (nutrients) and knowledge on how our body uses them is known as "nutrition". Knowledge about food and nutrition helps us to know the kinds and amount of foods to be eaten, and how food is important for growth energy, regulatory and protective functions.

Good meals

Eating good food, especially with family, is one of the pleasures of life. People who eat healthy, balanced diets are likely to have:

- plenty of energy to work and enjoy themselves;
- adequate growth
- fewer infections and illnesses.

Children who eat well usually grow well. Women who eat well are likely to produce healthy babies. That is why it is important to know which food combinations and foods make good meals and what are the different food needs of family members.

Essential nutrients for the body

All foods contain one or more nutrients in varying amounts. No single food provides all of the nutrients needed for normal functions. Each type of nutrient has a specific function and the nutrients work together in an interrelated way. Therefore, it is important to consume a wide variety of foods on a daily basis for growth and to maintain optimal health.

There are many different nutrients. We divide them into:

- **Macronutrients** that we need in large amounts. These are:
 - o carbohydrates (starches, sugars and dietary fibre);
 - o fats – (solid - fat, liquid - oil)
 - o proteins – (plant and animal proteins).
- **Micronutrients** that we need in small amounts (measured in milligrams or micrograms). There are many of these but the ones most likely to be lacking in the diet are:
 - o minerals – iron, iodine, zinc, calcium, sodium, potassium, phosphorus
 - o vitamins – vitamin A, vitamin D, B-complex vitamins (including folate) and vitamin C.

The best way to ensure that we get enough of each nutrient is to eat variety of different foods. Table 4 lists the various sources of nutrients and key functions.

Table 4: Sources and role of various nutrients in the body

Macro nutrients		
Nutrients	Sources	Main use in the body
Carbohydrates	Corn, wheat, rice; Potatoes and sweet potatoes; Sugars; Jaggery	Provides energy for breathing, movement and warmth, and for growth and repair of tissues.
Fats	Vegetable oils; Ghee; Butter; Whole milk	Provides a concentrated source of energy and fats needed for growth and health. Fat aids the absorption of some vitamins (e.g. vitamin A)
Protein	Breast milk; Milk; Eggs; Meat and fish; Beans, peas, chick peas dal, soya bean	Build cells, body fluids, antibodies and other parts of the immune system. Sometimes used for energy.

Micro nutrients		
Nutrients	Sources	Main use in the body
Vitamin A	Liver; Egg yolk; Breast milk (particularly colostrum); Milk fat, butter and cheese; Orange vegetables, e.g. carrots and pumpkins; Mangoes and papayas; Yellow/orange sweet potatoes; Dark green leafy vegetables	To prevent infection and to keep the immune system working properly, to keep the skin, eyes and lining of the gut and lungs healthy, to see in dim light.
Vitamin D	Exposure to sunlight Fish liver oils, fatty fish, egg yolk	Supports bone and muscle health, regulates of immune function, regulates cell growth and revents cancer
Vitamin B	Bananas, potatoes, lentils, whole grains, chilli peppers, green vegetables, eggs, dairy products, meats and liver.	Help the body to use macronutrients for energy. To help the nervous system to work properly
Vitamin C	Fruits, e.g. guava, citrus fruits and oranges; Fresh vegetables, e.g. green leaves, tomatoes and peppers; Breast milk; Fresh animal milk	Helps to destroy harmful molecules in the body and to heal wounds. Aids absorption of iron.
Iron easily absorbed	Meat and fish; liver , heart and kidneys;	Helps to make haemoglobin, the protein in red blood cells that carries oxygen to the tissues. Allows the muscles and brain to work properly.
Iron poorly absorbed*	Eggs, Wholegrain cereals; legumes; dark green leafy vegetables, dates, molasses	
Calcium	Milk, Curd, Paneer, Fish, Sesame seeds, Almonds, Soya bean	Make strong and healthy bones and teeth. Helps in blood clotting.
Iodine	Fish, shell fish, iodised salt	Important for the brain development and to produce thyroid hormones
Zinc	Meat and fish. Milk and curd, groundnuts, beans, pulses, wholegrain cereals, potatoes, pumpkin seeds	Support growth and normal development, and helps to keep the immune system functional.
Folate	Beans, pulses and groundnuts; Fresh vegetables, particularly dark green leaves; Liver; Breast milk; Eggs	To make healthy red blood cells and to prevent abnormalities in the foetus.
* Unless eaten with meat, fish or foods containing Vitamin C		
Water: Makes fluids such as tears, sweat and urine and to enable chemical processes in the body		

Different types of food

Around the world foods are categorised in various ways. One such categorization is detailed below:

Staple foods

Staple foods make the a basis of our diet. Usually these are the cheapest and most widely available foods rich in starch, which is a source of energy for body. Staple foods are also a source of protein, some micronutrients (especially some of the B-complex vitamins) and dietary fiber in our diet. However, this is commonly associated with the high amounts of this foods consumed rather than their high content of those nutrients.

Table 5. Examples of starchy foods available in Bangladesh

Cereals	Starchy Roots And Fruits
Rice (Chal)	Potato (Alu)
Wheat (Gom)	Sweet Potato (Misti alu)
Rice Flakes (Chira)	Colocasia (Kochu)
Semolina (Suji)	Cassava (Shimul alu)
Millet (Kaon)	Raw banana (Kacha kola)
Sago (Sagudana/Sabundana)	Turnip (Shalgam)
Maize / Corn (Vutta)	
Barley (Jab)	

Below are presented pictorial examples of some foods presented in the table 5.



Starchy roots



Yam (Matey alu)



Colocasia (Kochu)



Potato (Alu)



Sweet potato (Misti alu)

Legumes, nuts and oilseeds

Legumes, nuts and oilseeds are characterized by high content of protein, fat and minerals.

Legumes are a good source of protein and some minerals, especially iron, zinc and calcium.

Nuts and oilseeds are rich in protein and fat and they are also a good source of minerals, especially iron, zinc and calcium.

Table 6. Examples of legumes, nuts and oilseeds available in Bangladesh

Low fat legumes	High fat legumes	Oilseeds	Nuts
Lathyrus (Kheshari dal)	Soybean	Pumpkin seeds (Misti kumra bichi)	Ground nut (China badam)
Lentil (Mosur dal)		Sesame seeds (Til)	Coconut (Narkel)
Split chickpeas (Buter dal)			
Green gram (Moong dal)			
Black gram (Mashkalai dal)			
Chickpeas (But dal)			

Below are presented pictorial examples of some foods presented in the table 6.

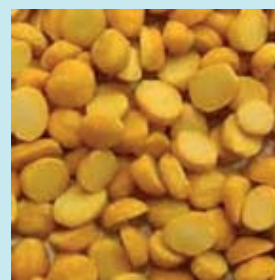
Low fat Legumes



Lentil (Mosur dal)



Green gram (Mug dal)



Split chickpeas (Buter dal)



Chickpeas (But)



Lathyrus (Khesheri dal)

Oilseeds and nuts



Sesame seeds (Til)



Pumpkin seeds (Misti kumrar bichi)



Ground Nut (China Badam)

Milk, egg, poultry, fish and meat

Breast milk supplies all the nutrients needed for the first six months of life and some proportion of the nutrient needs up to at least 2 years of age.

Milk and milk based products such as curds, yoghurt and local cottage cheese (channa), are excellent sources of high quality protein, fat and micronutrients, such as calcium (but not iron).

Eggs are a good source of high quality protein, fat and micronutrients like zinc, iodine, vitamin A.

Meat, poultry, fish and offal from these foods are excellent sources of high quality protein and often of fat. They are the best dietary source of iron (especially red meat and red offal) and zinc. They supply also many other micronutrients including some B-complex vitamins. Liver of all types is a very rich source of iron and vitamin A. Heart and kidneys are good sources of iron and zinc as well. Some small indigenous fish species, especially Mola and Dela are particularly rich in vitamin A and calcium.

Table 7. Examples of animal-source foods available in Bangladesh

Milk	Meat, Offal, Poultry and Fish
Fresh Cow Milk (Garur dudh)	Beef (Garu gosh)
Curds (Dadhi/Doi)	Goat (Sagaler gosh)
Cottage cheese (Paneer, Channa)	Sheep (Veraar gosh)
Butter milk (Ghol)	Chicken (Murgi gosh)
	Liver (Kalija)
	Fish (Mach)
	Small indigenous fish species (Mola, Dela)
	Dried Fish (Sutkhi)
	Eggs (Dim)

Below are presented pictorial examples of some foods presented in the table 7.

Milk and Eggs



Milk
(Dudh)



Butter Milk
(Ghol)



Curd
(Dai)



Cottage Cheese
(Paneer)



Eggs
(Dim)

Meat, Poultry and Fish



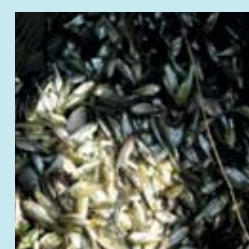
Chicken
(Murgir Gosh)



Beef
(Garur gosh)



Fish
(Mola mach)



Fish
(Dhela mach)

Fats, oils and sugar

Fats and oils are concentrated sources of energy. One spoon of cooking oil or fat and gives two times more energy than one spoon of sugar. Fats contain fatty acids, some of which are needed for growth and functioning of our cells and internal eyes. Other good sources of fats are nuts, oilseeds, cheese, fatty meat and sea fish.

Sugar gives only energy and no other nutrients. It imparts a sweet taste to a food and improves appetite, for instance during illness. Sweet, sticky foods, such as ice-lollies (sweet ice water, sharbat, kulfi) or snacks and pastries prepared with plenty of sugar can be harmful to health. It can lead to dental decay and has implications for chronic diseases in later life.

Table 8. Examples of fats, oils and sugars available in Bangladrsh

Fats	Oils	Sugar
Butter (Makhon)	Coconut oil (Narkel tel)	Sugar (Chini)
Ghee (Ghee)	Sunflower Oil (Surjumukhi tel)	Honey (Modhu)
	Groundnut Oil (Badam tel)	Jaggery (Gur)

Below are presented pictorial examples of some fats, oils and sugars in the table 8.



Vegetables and fruits

Vegetables and fruits are valuable sources of micronutrients and dietary fibre but the amounts vary between different types of vegetables and fruits:

- Orange vegetables such as orange sweet potato and carrots, and orange fruits such as mango and papaya (but not citrus fruits like oranges and lemons) are good sources of vitamin A;
- Dark green and red leafy vegetables supply iron, folate and vitamin A;
- Sour fruits like lemons, star fruits, indian gooseberry and fresh vegetables provide vitamin C;
- Many other vegetables (e.g. tomatoes, onions) contain micronutrients that protect against chronic diseases such as heart disease, cancer and degenerative eye disease.

The best way to make sure we get enough of each micronutrient and enough fibre is to eat a variety of vegetables and fruits every day. The most commonly available fruits and vegetables in Bangladesh are listed in the table 9.

Table 9. Common vegetables and fruits available in Bangladesh

Vegetables	Fruits	Leafy Vegetables
Tomato (Tomato)	Mango (Aam)	Spinach (Palong shak)
Pumpkin (Misti kumra)	Pawpaw (Pepe)	Fenugreek leaves (Methi)
Carrot (Gajar)	Orange (Komola)	Red Amaranth (Lal shak)
Pointed gourd (Potal)	Pineapple (Anaras)	Cabbage(Badha kopi)
Eggplant/ Brinjal (Begun)	Banana (Kola)	Colocasia leaves (Kochu shak)
Okra (Dherosh)	Dates (Khejur)	Mint (Pudina)
Bottle gourd (Lau)	Jackfruit (Kathal)	Radish leaves (Mula shak)
Ridge gourd (Jinga)	Sapota (Sofeda)	Cauliflower leaves (Fulkopi pata)
Ash gourd (Jali kumra)	Wood apple (Bel)	Sarisa shak (Mustard)
Snake gourd (Chichinga)	Aonla (Amloki)	Bottle gourd leaves (Lau shak)
String bean (Barbati)	Jambu (Jamrul)	Amaranth leaves (Data shak)
Cauliflower (Fulkopi)	Guava (Peyara)	Drumstick leaves (Shajna shak)
Beans (Sheem)	Hog Plum (Amra)	Indian Spinach (Pui shak)

Below are presented pictorial examples of some foods (table 9).



Condiments and flavorings

The most common flavoring present in foods is salt. Salt is used during cooking, and is present in large amounts in processed foods. Consuming too much salt is harmful, and can result with high blood pressure and lead to other diseases. Universal salt iodization is a strategy mandated in all countries including Bangladesh. Iodized salt is essential for the body due to its critical role in growth, cognitive and mental development.

Herbs, spices, garlic and onions are examples of condiments and other flavoring foods. Their role is to make the meal tastier and increase appetite. They also contain compounds which stimulate digestion and absorption of food, have antibacterial properties and many other positive effects on the organism. Some condiments are also rich in micronutrients and used in large amounts can become an important source of them. However, using extensive amounts of condiments, especially eating very spicy foods, can harm the digestive tract and cause irreversible changes which can result with limited ability to digest and absorb food.

Water

Our body requires about eight to ten glasses of water each day to function properly. It needs even more during hot weather, hard physical work, fever or diarrhea. Apart from drinking water, we get water from juices, soups, tea, coffee, fruits and vegetables.

Part 2: Balanced Diet

A balanced diet provides the correct amounts of energy and nutrients needed during the day to cover the dietary requirements of the person eating it. A balanced diet must include a variety of different foods from different food groups so that it contains all the macronutrients and micronutrients that a person needs.

Learning objectives:

- To define what is a balanced diet
- To understand the basic food groups and their functions in the body
- To know about the three food groups that contribute to a balanced diet

Introduction

A healthy and balanced diet:

- Provides energy to perform work and other functions such as breathing, digesting food, and keeping warm
- Is essential for growth
- Protects the body against illness (keep healthy)

To have a balanced diet that meets all the nutrient requirements, you should have a combination of foods from the basic food groups that are classified according to their function:

- Energy giving foods
- Body building foods
- Protective foods

Note: This classification can be used during community based demonstrations for Women Farmer Groups (WFGs) and Farmer Field Schools (FFSs) as it is one of the most simplest ways to explain the concept of balanced diet to the community. If many food groups are presented, it may become difficult to understand the concept of food combinations and balanced recipes.

The three different food groups that contribute to a balanced diet are:

1. Energy giving foods

Energy foods enable the body to maintain vital organs, maintain physical activities and enhance the child's growth. This group includes foods rich in carbohydrates like cereals, roots and tubers, sugar and fat, oils, butter and ghee. Some local sources are listed in table 10.

Table 10: Energy giving foods commonly eaten in Bangladesh

Cereals	Roots and Tubers	Fats/Sugar
Rice (Chal)	Potato (Alu)	Ghee (Ghee)
Maize / Corn (Vutta)	Sweet Potato (Misti alu)	Butter (Makhon)
Millet (Kaon)	Beetroot (Beet)	Oil (Tel)
Wheat (Gom)	Turnip (Shalgam)	Sugar (Chini)
Barley (Jab)	Yam (Matey alu)	Jaggery (Gur)
Sago (Sagudana)		Coconut (Narikel)
Rice Flakes (Chira)		
Semolina (Suji)		

2. Body building foods

This group includes foods which provide proteins that are important for growth, tissue building and maintaining these tissues and cells throughout life. There is wear and tear of tissues and cells as we perform our daily work and use energy. Foods that play an important role in formation of new cells both for growth and repair of the damaged tissues are rich in proteins and known as 'body-building foods'.

Foods belonging to this group also contribute to energy, vitamin A, vitamin B complex and minerals. These foods are: pulses and legumes, nuts and oilseeds and animal products. Examples of body building foods commonly eaten in Bangladesh are shown in table 11.

Table 11: Body building foods commonly eaten in Bangladesh

Pulses and legumes	Nuts and oilseeds	Milk and Products	Flesh foods
Lathyrus (Khesari)	Groundnut (Badam)	Milk (any)	Chicken (Murgi)
Chick pea (But)	Sesame (Til)	Curd (Dadhi/Doi)	Meat (Mangso)
Green gram (Moong)	Pumpkin seed (Misti khumra bichi)	Cheese (Paneer)	Fish (Mach)
Lentils (Masur)		Buttermilk (Borhani)	Egg (Dim)
Chickpea (Buter dal)		Ghee	Beef
Black Gram (Mashkolai dal)			

3. Protective foods

Foods belonging to the group of protective foods are a source of micronutrients which have a role in protecting the body from illnesses by strengthening its immunity and also help maintain body functions. Those foods are fruits and vegetables which are rich in Vitamin C and A, but they contain as well many compounds which have antioxidant and regulatory roles.

A person should consume 400g of vegetables and fruits every day.

Some examples of vegetables and fruits which make the group of protective foods and are commonly eaten in Bangladesh are shown in table 12.

Table 12: Protective foods commonly eaten in Bangladesh

Vegetables	Fruits	Leafy Vegetables
Tomato (Tomato)	Mango (Aam)	Spinach (Palong shak)
Pumpkin (Misti kumra)	Pawpaw (Pepe)	Fenugreek leaves (Methi)
Carrot (Gajar)	Orange (Komola)	Red Amaranth (Lal shak)
Pointed gourd (Potol)	Pineapple (Anaras)	Cabbage (Badha kopi)
Eggplant/ Brinjal (Begun)	Banana (Kola)	Colocasia leaves (Kochu shak)
Okra (Dherosh)	Dates (Khejur)	Kangkong (Kalmi shak)
Bottle gourd (Lau)	Jackfruit (Kathal)	Radish leaves (Mula shak)
Ridge gourd (Jinga)	Sapota (Sofeda)	Cauliflower leaves (Fulkopi pata)
Ash gourd (Jali kumra)	Wood apple (Bel)	Sarisa shak (Mustard)
Snake gourd (Chichinga)	Aonla (Amloki)	Bottle gourd leaves (Lau shak)
String bean (Barbati)	Jambu (Jamrul)	Amaranth leaves (Data shak)
Cauliflower (Fulkopi)	Guava (Peyara)	Drumstick leaves (Shajna shak)
Beans (Sheem)	Hog Plum (Amra)	Indian Spinach (Pui shak)
		Coriander leaves (Dania pata)
		Mint (Pudina)



Pic. 6: Three functional food groups presented in the festoon which is used in the field training

Foods from the three food groups can be combined and numerous recipes can be prepared as listed in the table 13.

Table 13. List of recipes that can be prepared from the combination of three food groups

Energy giving foods	Body building foods	Protective foods	Final recipe
Rice	Dal	Palang shak	Pousti khichuri
Rice	Dal + egg/fish/meat	Vegetables	Dim/ Mangsaw/ Mach Khichuri
Rice flour + coconut	Moong dal	Yellow and orange vegetables	Rice hopper/Pita
Whole wheat flour	Chana flour (besan)	Dark green leafy vegetables	Pousti roti
Wheat flour + jaggery	Chana flour (besan) + groundnuts	Carrot + lau	Ladoos
Rice puffed +Potato	Roasted chana + groundnuts	Carrot + tomato + onion + green chili	Jhal moori
Rice flakes	Soaked moong + groundnuts	Carrot + tomato + coriander	Cheera upma
Rice flakes + potato	Roasted chana + groundnuts	Carrot + tomato + onion + green chili	Poushti cheera
Roti + sugar	Milk	Banana/Mango/Papaya	Dudh roti
Rice	Milk	Banana	Dudh bhat
Rice	Fish	Green papaya + dark green leafy vegetables	Mach bhat
Roti	Fish	Vegetables	Mach ruti
Wheat flour	Bean + eggs	Onion + cabbage	Pousti omlette
Wheat flour/rice flour	Bean	Vegetables	Niramish omlette
Potato	Egg	Green Papaya + pointed gourd (potol) + snake gourd+ sweet +pumpkin yard long beans + leafy vegetables (pui and lal shak)	Mixed vegetable egg soup
Rice	Pulses like dried beans + egg	Leafy vegetable + drumstick leaves + tomatoes	Sobuz Bhat
Flour	Egg	Drumstick leaves + tomato + coriander leaves	Drumstick leaves omelette
Potato	Roti (made of mixed dal)	Vegetables (onion + tomato+ spinach)	Dal sabji ruti

All recipes should be cooked with adequate amount of oil and with iodised salt.

Food combinations

- There is a need to include varied food groups in day to day diet. As cereals and pulses provide a major source of most nutrients, it would be beneficial to combine them with dark green leafy vegetables and other vegetables and fruits.
- A common rule would be to combine grains, grams and greens in proportions of 3:1:2.
- Addition of sugar, molasses, oil and nuts will help to bridge some energy gaps .
- Addition of locally preferred spices such as ginger, chillies, pepper will add to the palatability.
- Inclusion of little meat/egg/fish (30g) along with dark green leafy vegetables will help utilization of iron from the vegetables.
- Use of milk and milk products (curds/homemade cottage cheese or chana) along with dark green leafy vegetables will improve the dietary quality of the meal and add to good quality protein, calcium as well as some Vitamin A.

To increase nutritive value of foods, other recipes can also be prepared using a combination of cereals, pulses and vegetables in innovative food preparations as shown below:

- Take equal amounts of green gram (moog dal), chick peas (cholar dal), black gram (mashkoloji dal), soak in just enough water for about 4 hours. Add washed and cut dark green leafy vegetables to it. Grind, add salt, spices and prepare a batter. Prepare pan cakes and serve as a nutritious snack.
- Mix wheat, rice flour and beans in equal amounts and make roties. Add dark green leafy vegetables while preparing/kneading the dough.

Use germinated pulses

- Soak moong, chola and any other available whole pulses or legumes together in equal proportions for 4 hours in water.
- Tie them in a wet cheese cloth². Let it remain for 12 hours. The germ will sprout.
- Cook and eat with rice or roti or as ghughni along with potatoes, tomatoes and other vegetables.

Make locally appropriate fermented items

- Mix rice and black gram (mashkoloji dal) in 2/3 or 1/3 proportions. Soak them in water for 6 hours. Grind them and let it remain for 12 hours. The mixture will get fermented. Add cabbage or spinach, salt and spread it on a plate (stainless steel plate) and steam. The preparation can be eaten as a nutritious and tasty snack.
- Soak mashkoloji dal for 6 hours. Grind well, add a pinch of cumin (jeera), green chillies and salt and keep for about 8 hours. Allow the mixture to get fermented. Prepare small rounds (bodis) of the mixture and sundry for 2 - 4 days. The bodis can be used in dal and vegetable (sabji) preparations, providing nutritive value, variety and palatability to the diet.

² A loosely woven cotton cloth used in making cottage cheese/channa.

- Fermentation of milk to form curd or doi is also very nutritious. The fermentation process increases the shelf-life of the product, while enhancing the taste and improving the digestibility of milk. It is a simple process in which milk should be warmed (not too much) and cooled. In a bowl add starter culture (1/2 tea spoon curd) to the warmed milk and stir well. Place it in a warm place for overnight or for 5-6 hours. Curd can be consumed with cheera/ moori with addition of seasonal fruits. Sour curd can also be consumed with rice along with some vegetables. The fermentation process results in production of functioning beneficial bacterial that are helpful for the gut.

Encourage families to use

- Several groups of foods at each meal;
- Different vegetables and fruits at meals because the amounts of different micronutrients vary between types of vegetables and fruits;
- Meat, poultry, fish at least twice per week (if non vegetarian) and peas, beans, chickpeas or lentils daily if possible because these foods are the best sources of protein, iron and zinc which are often lack in diets, especially in the diets of young children and women.

It is good to eat fruits with a meal or in between meals and to drink plenty of water during the day.

Avoid drinking tea or coffee until 1-2 hours after a meal as these reduce the absorption of iron from food.

To improve the diet, as a snack take milk, buttermilk, curd, roasted groundnuts/chana, dates, fruits of fresh vegetables.

Iron from meat, liver and other offal, poultry, fish and breast milk is well absorbed in the gut. Iron from other milks, eggs and all plant foods is poorly absorbed, but other foods in the same meal affect the absorption of this type of iron.

Meat, fish and vitamin C-rich foods (fresh fruits and vegetables) increase the absorption of this type of iron so more is absorbed.

Some foods, such as tea, coffee and wholegrain cereals, contain 'anti nutrients' (e.g. phytate) that decrease the absorption of this type of iron.

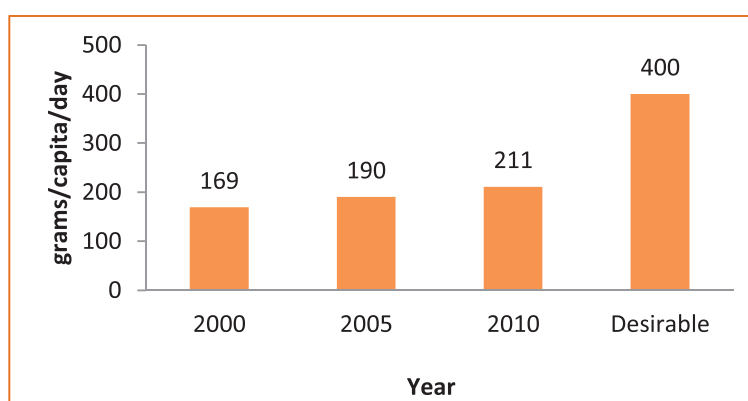
Part 4: Nutritive Value of Commonly Consumed Vegetables and Fruits of Bangladesh

Learning objectives:

- To raise awareness on the Vitamin A, Vitamin C, Iron and Calcium content of the locally available indigenous foods most commonly consumed in Bangladesh.

Introduction:

Vegetables and fruits are a vital part of a balanced diet. They add color, variety and taste to our meals. Above all, vegetables and fruits are a natural store house of vitamins and minerals (micronutrients) which are required in our daily diet. Bangladesh is fortunate in having a variety of vegetables and fruits available throughout the year. However, available information indicates that vegetables and fruits are consumed to a limited extent by the population.



*Source: Bangladesh Bureau of Statistics. Desirable Dietary Pattern (BIRDEM)
400g desirable intake is recommended by WHO/FAO (2003).*

Figure 2. Trends in the intake of vegetables and fruits (grams/capita/day) in Bangladesh

There is need to popularize the usage of a variety of vegetables and fruits in the daily diet.

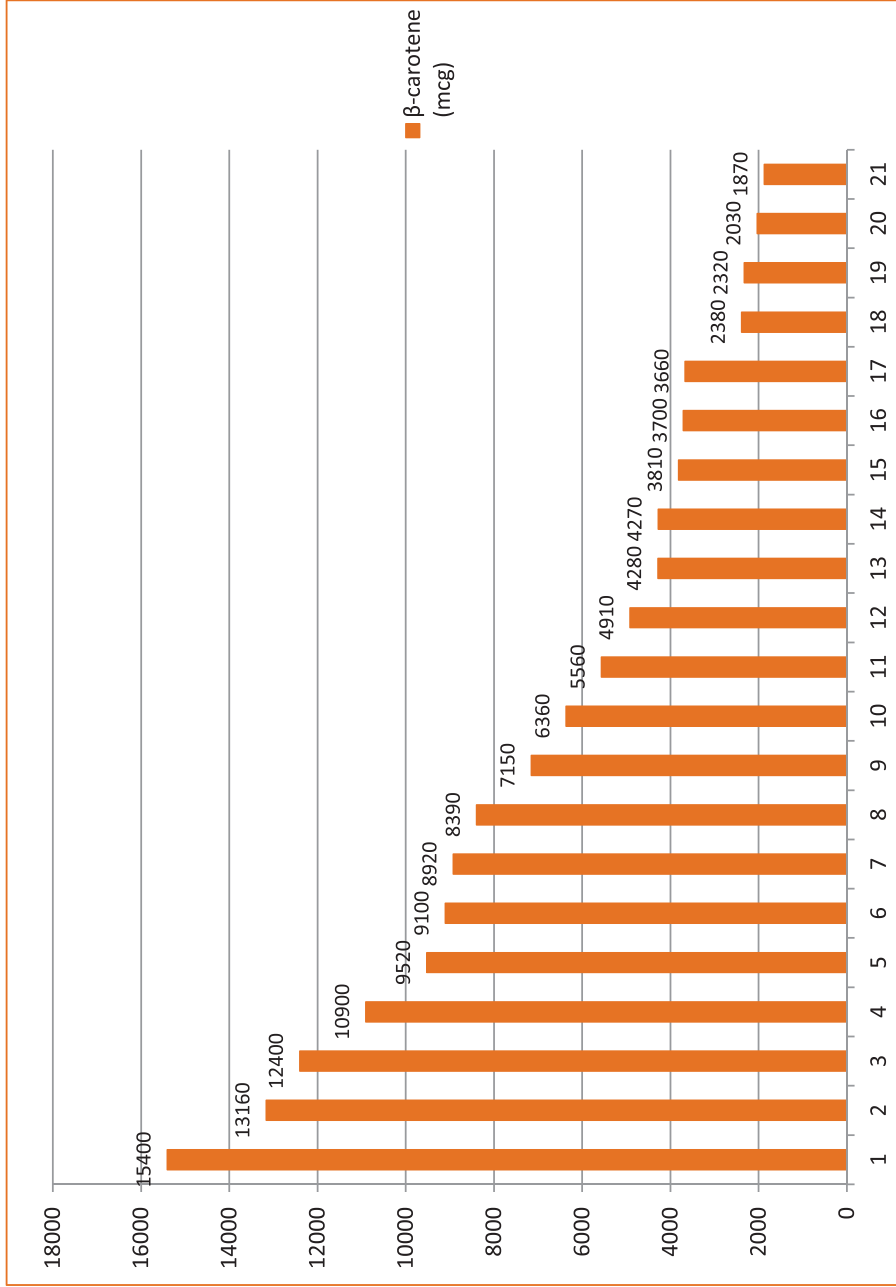
It is also important to use appropriate food preparation methods so that there is minimal cooking loss and maximum retention of the nutrients.

Correct food combinations should also be used to improve the nutrient quality of food preparations and enhance the overall quality of the meal.

Vitamin A rich vegetables and fruits

Table 14. Vitamin A rich leafy vegetables available in Bangladesh

Sl No	Leafy vegetables	β-carotene (mcg/100g)
1	Bok ful shak (Agathi)	15400
2	Sajna Shak (Drumstick leaves)	13160
3	Note Shak (Slender amaranth leaves)	12400
4	Kanta note shak (Amaranth leaves, spiney)	10900
5	Lal shak (Amaranth leaves red)	9520
6	Methi Shak (Fenugreek leaves)	9100
7	Data Shak (Amaranth leaves green)	8920
8	Kalo kachu Shak (Colocasia leaves)	8390
9	Shobuj kachu shak (Colocasia leaves)	7150
10	Helench Shak (Water cress)	6360
11	Beet Shak (Beet green leaves)	5560
12	Palang Shak (Spinach)	4910
13	Korola Shak Bitter gourd leaves)	4280
14	Shimul alu shak (Cassava leaves)	4270
15	Bat bitta Shak (Bengal dayflower leaves)	3810
16	Misti alu Shak (Sweet potato leaves)	3700
17	Pat Shak (Jute leaves)	3660
18	Kolmi Shak (Water spinach)	2380
19	Lau shak (Bitter gourd leaves)	2320
20	Pui Shak (Indian Spinach)	2030
21	Mula Shak (Radish leaves)	1870

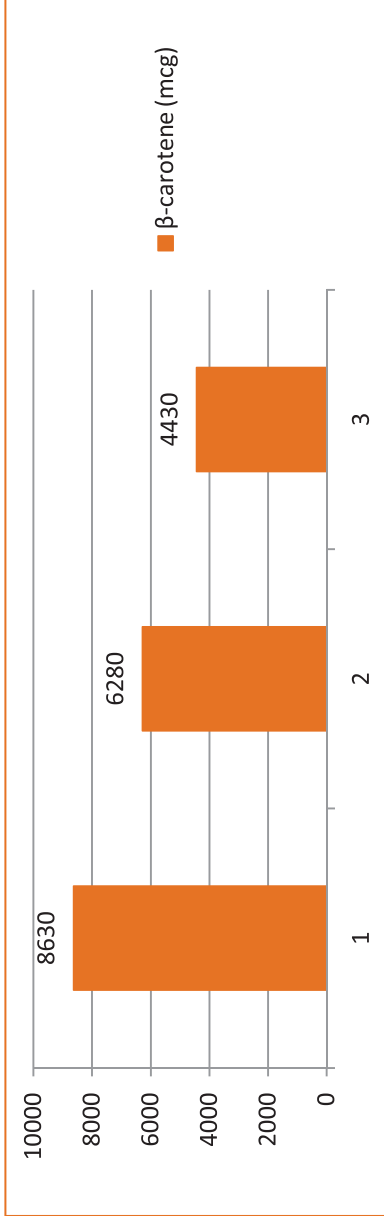


Source: This graph has been prepared based on food composition table for Bangladesh, INFS, University of Dhaka

Figure 3. β-carotene content of vitamin A rich leafy vegetables available in Bangladesh (per 100g of edible portion)

Table 15. Vitamin A rich orange and yellow vegetables available in Bangladesh

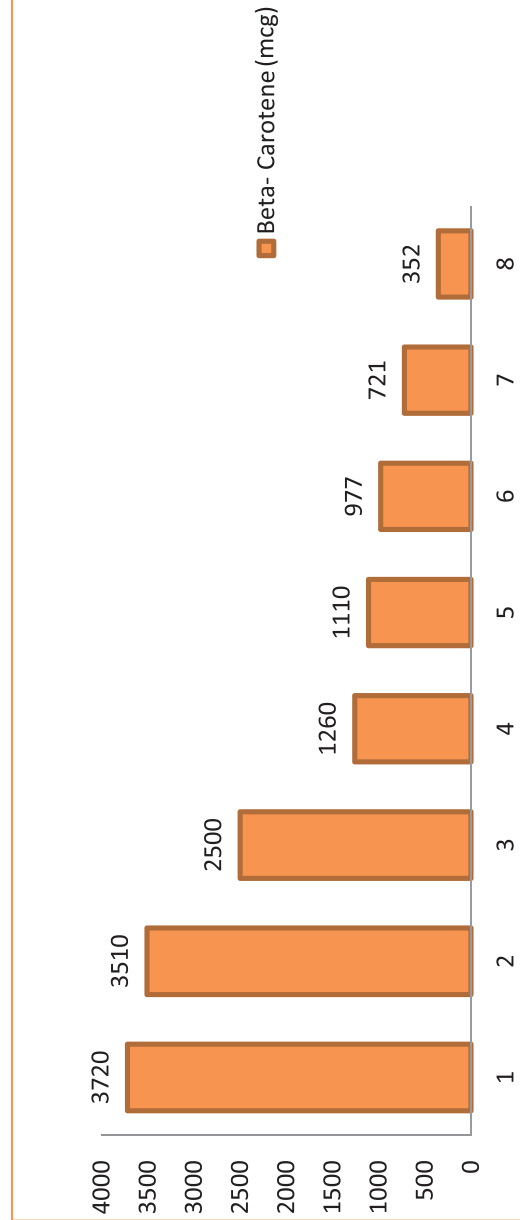
Sl. No	Orange and yellow vegetable	β -carotene (mcg/100g)
1	Orange flesh sweet potato (Misti alu, Komola Sundori)	8630
2	Gajor (Carrot)	6280
3	Sweet pumpkin (Misti kumra)	4430



Source: This graph has been prepared based on food composition table for Bangladesh, INFS, University of Dhaka
Figure 4. β -carotene content of vitamin A rich orange and yellow available in Bangladesh (per 100g of edible portion)

Table 16. Vitamin A rich fruits available in Bangladesh

Sl No	Fruits	β -carotene (mcg/100g)
1	Dewa (Monkey jack)	3720
2	Amm (Mango)	3510
3	Taal (Palmyra Palm)	2500
4	Futi (Melon)	1260
5	Kalojam (Jambolan)	1110
6	Gab (Persimmon)	977
7	Pape (Papaya)	721
8	Tarmuj (Water melon)	352

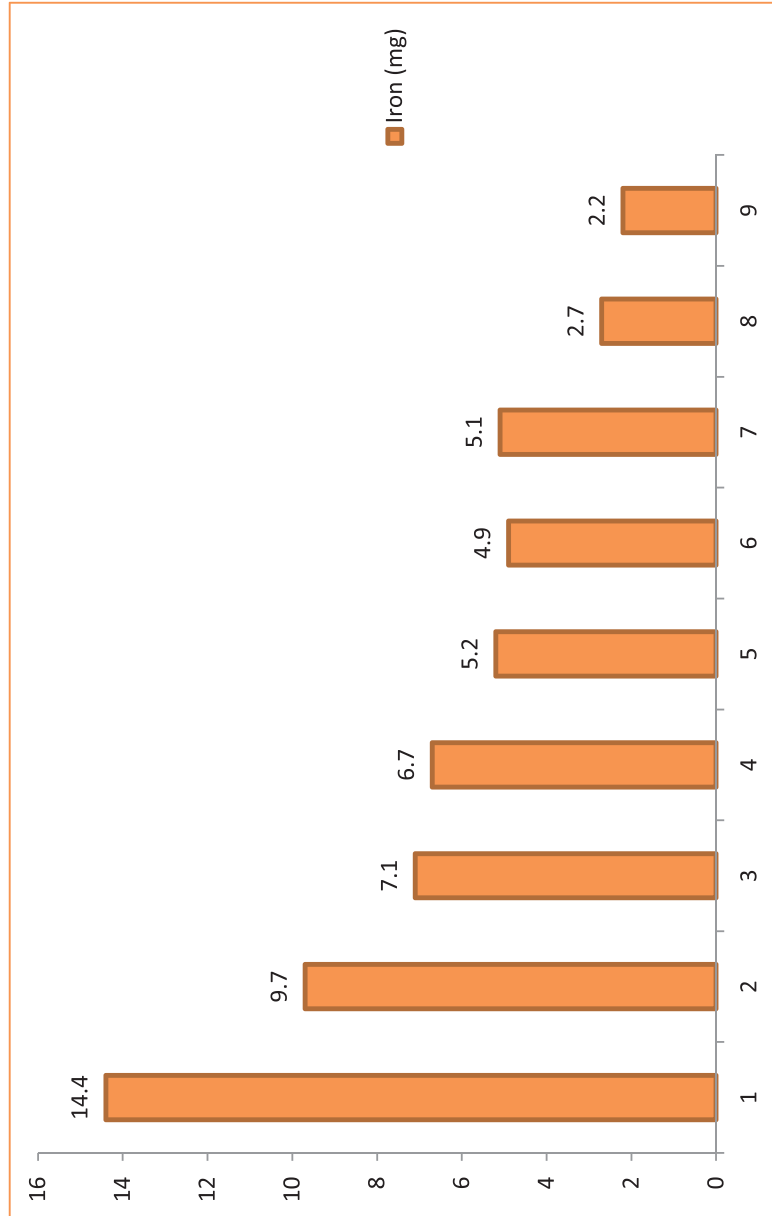


Source: This graph has been prepared based on food composition table for Bangladesh, INFS, University of Dhaka
Figure 5. β -carotene content of vitamin A rich fruits available in Bangladesh (per 100g of edible portion)

Iron rich vegetables and fruits

Table 17. Iron rich leafy vegetables available in Bangladesh

Sl No	Leafy vegetables	Iron (mg/100g)
1	Lal Shak (Amaranth red)	14.4
2	Pat Shak (Jute Leaves)	9.7
3	Bat battia Shak (Bengal dayflower leaves)	7.1
4	Chukai Shak (Dock leaves)	6.7
5	Korola Shak (Bitter gourd leaves)	5.2
6	Shimul Alu Shak (Cassava leaves)	4.9
7	Borboti pata (Cowpea leaves)	5.1
8	Misti Alu Shak (Pumpkin leaves)	2.7
9	Pui shak (Indian Spinach)	2.2

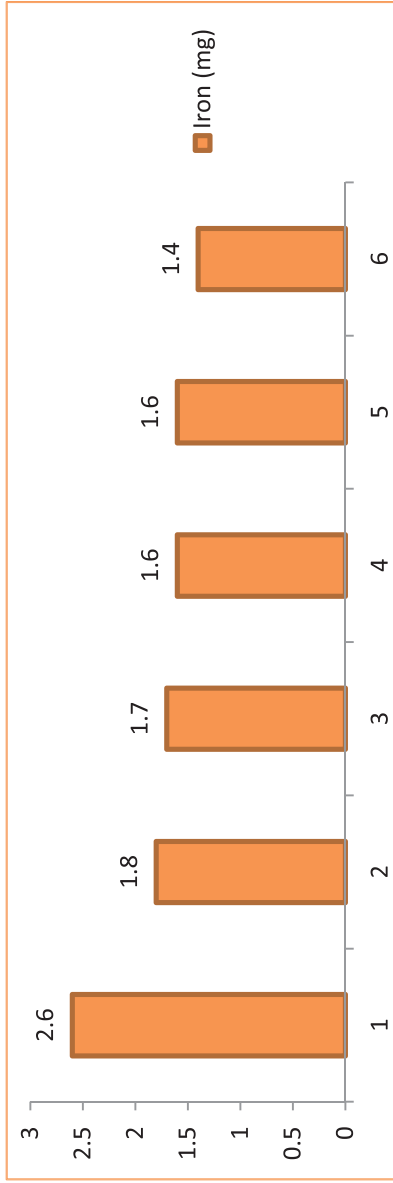


Source: This graph has been prepared based on food composition table for Bangladesh, INFS, University of Dhaka

Figure 6. Iron content of iron rich leafy vegetables available in Bangladesh (per 100g of edible portion)

Table 18. Iron rich non-leafy vegetables available in Bangladesh

Sl No	Vegetables	Iron (mg/100g)
1	Kakrol (Gourd teasle)	2.6
2	Korola (Bitter gourd)	1.8
3	Potol (Pointed Gourd)	1.7
4	Motorshiti (Peas)	1.6
5	Marich (Chilli)	1.6
6	Makhon Shim (Broad Beans)	1.4

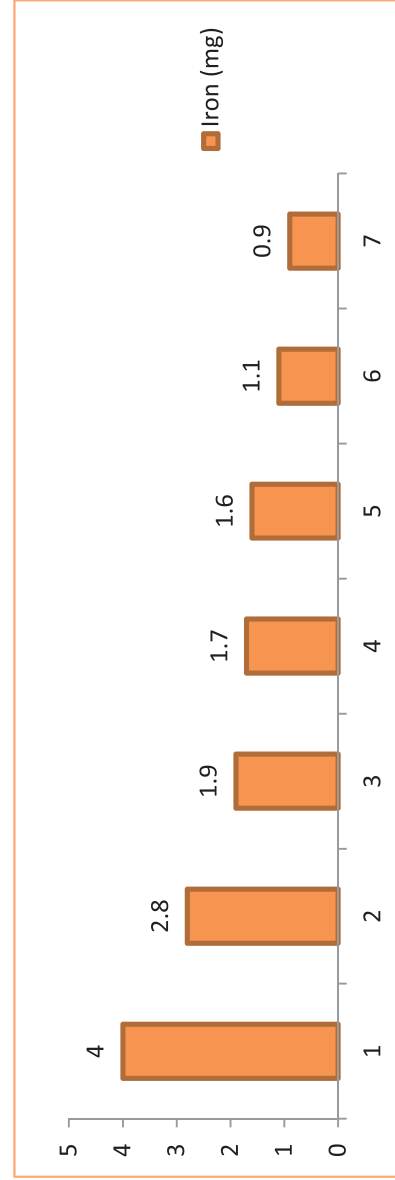


Source: This graph has been prepared based on food composition table for Bangladesh, INFS, University of Dhaka

Figure 7. Iron content of iron rich non-leafy vegetables available in Bangladesh (per 100g of edible portion)

Table 19. Iron rich fruits available in Bangladesh

Sl No	Fruits	Iron (mg/100g)
1	Tetul (Tamarind)	4
2	Amra (Hog pulm)	2.8
3	Khejur (Dates)	1.9
4	Taal (Plamyra palm)	1.7
5	Anaros (Pineapple)	1.6
6	Dumur (Fig)	1.1
7	Amloki (Emblic)	0.9



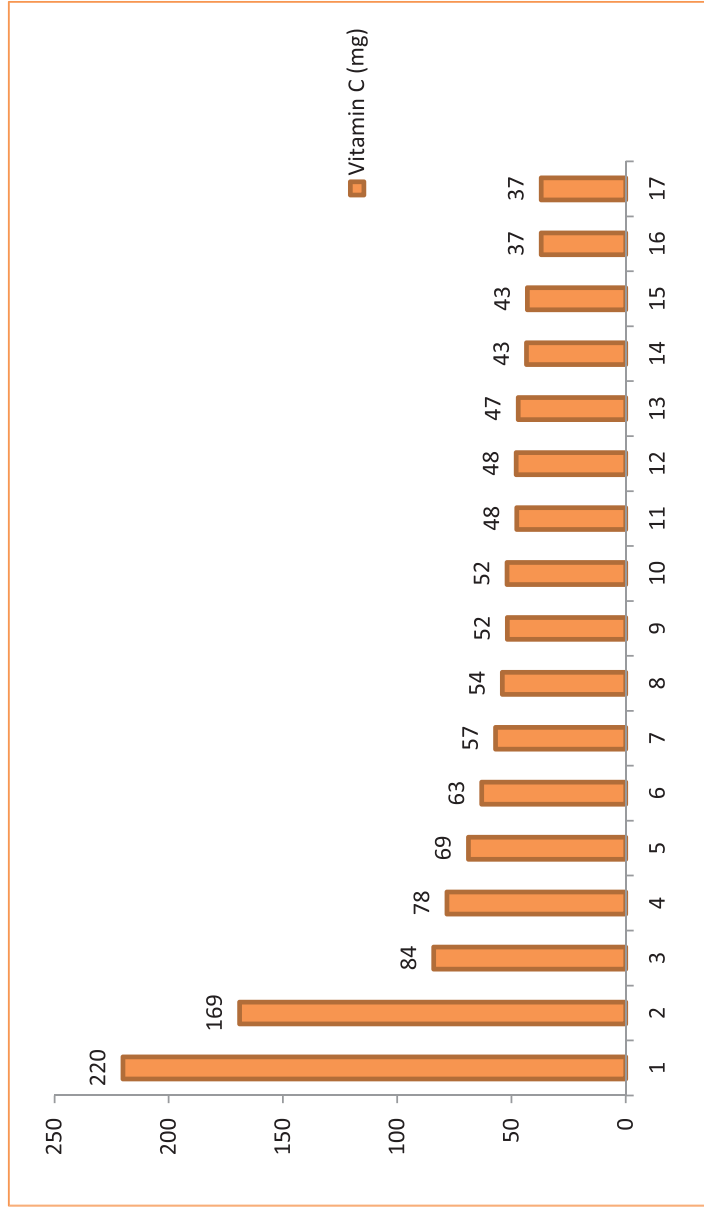
Source: This graph has been prepared based on food composition table for Bangladesh, INFS, University of Dhaka

Figure 8. Iron content of iron rich fruits available in Bangladesh (per 100g of edible portion)

Vitamin C rich vegetables and fruits

Table 20. Vitamin C rich leafy vegetables available in Bangladesh

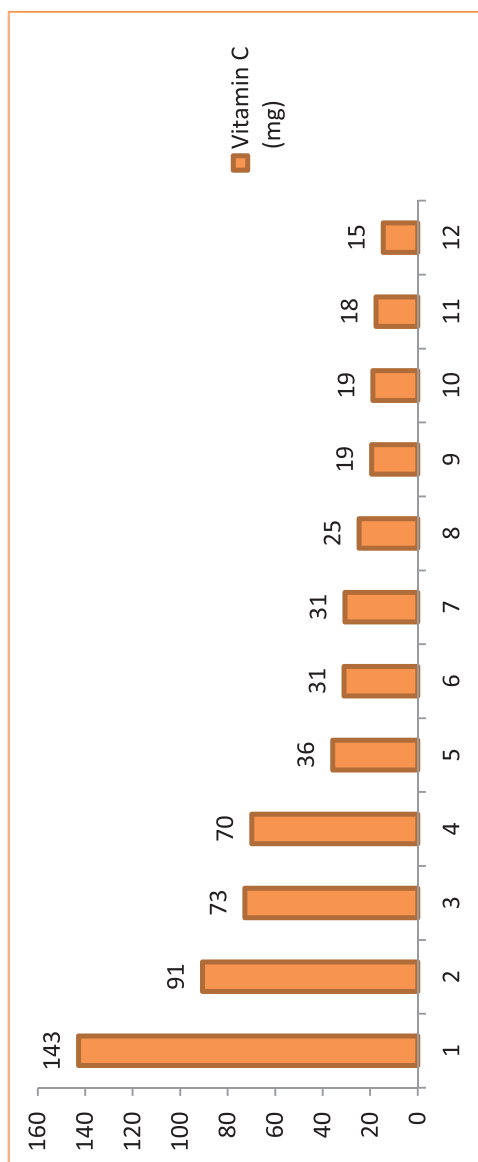
Sl No	Leafy vegetables	Vitamin C (mg/100g)
1	Sajna shak (Drumstick leaves)	220
2	Bok fui shak (Agathi)	169
3	Note Shak (Slender Amaranth)	84
4	Korola Shak (Bitter leaves)	78
5	Mula shak (Radish leaves)	69
6	Kalakachu Shak (Colocasia leaves)	63
7	Borboti pata (Cowpea leaves)	57
8	Pat shak (lute leaves)	54
9	Pui shak (Indian spinach)	52
10	Methi shak (Fenugreek leaves)	52
11	Lau shak (Amaranth leaves)	48
12	Shobuj kochu shak (Colocasia green leaves)	48
13	Beet Shak (Beet shak)	47
14	Kanta note shak (Amaranth leaves)	43
15	Lalshak (Amaranth leaves red)	43
16	Data shak (Amaranth leaves green)	37
17	Mistikumra shak (Pumpkin leaves)	37



Source: This graph has been prepared based on food composition table for Bangladesh, INFS, University of Dhaka
Figure 9. Vitamin C content of vitamin C rich leafy vegetables available in Bangladesh (per 100g of edible portion)

Table 21. Vitamin C rich non-leafy vegetables available in Bangladesh

Sl No	Vegetables	Vitamin C (mg/100g)
1	Kakrol (Gourd teasle)	143
2	Korola (Bitter gourd)	91
3	Badakopi(Cauliflower)	73
4	Sajne data (Drumstick pods)	70
5	Data (Amaranth stem)	36
6	Chalkumra (Ash Gourd)	31
7	Tomatos (Tomato)	31
8	Salgam (Turnip)	25
9	Potal (Pointed gourd)	19
10	Chichinga (Snake gourd)	19
11	Dherosh (Okra)	18
12	Beet (Beet root)	15

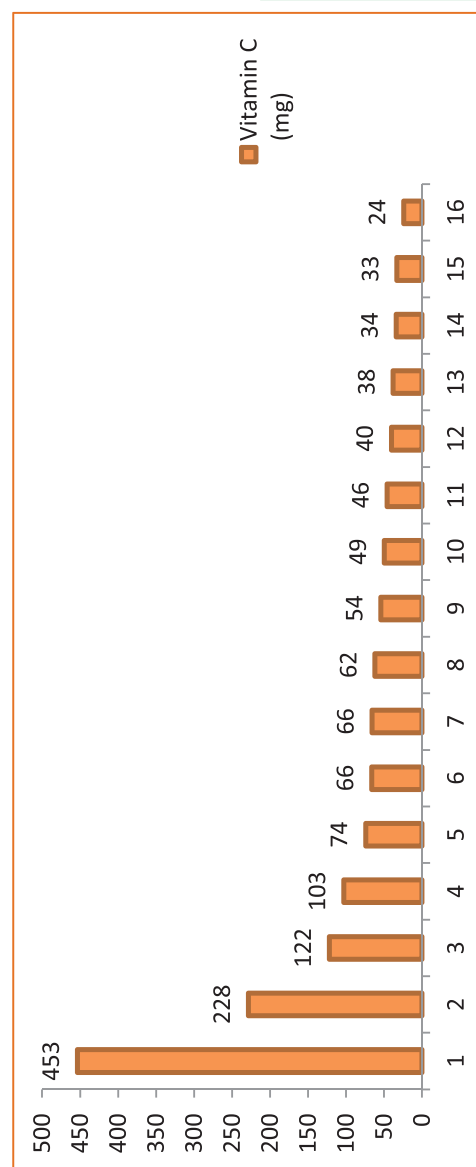


Source: This graph has been prepared based on food composition table for Bangladesh, INFS, University of Dhaka

Figure 10. Vitamin C content of vitamin C rich non-leafy vegetables available in Bangladesh (per 100g of edible portion)

Sl No	Fruits	Vitamin C (mg/100g)
1	Amloki (Emblic)	453
2	Payara (Guava)	228
3	Zambura (Pomelaw)	122
4	Amm (Mango)	103
5	Kalojam (Jambolan)	74
6	Boroi (Jujube)	66
7	Dewua (Monkey jack)	66
8	Paka pepe (Ripe papaya)	62
9	Komoal (Orange)	54
10	Kamranga (Carambola)	49
11	Lebu (Lemon)	46
12	Golapiam (Java Apple)	40
13	Atafal (Custard apple)	38
14	Anarosh (Pineapple)	34
15	Futi (Melon)	33
16	Tarmuz (Water melon)	24

Table 22. Vitamin C rich fruits available in Bangladesh



Source: This graph has been prepared based on food composition table for Bangladesh, INFS, University of Dhaka

Figure 11. Vitamin C content of vitamin C rich fruits available in Bangladesh (per 100g of edible portion)

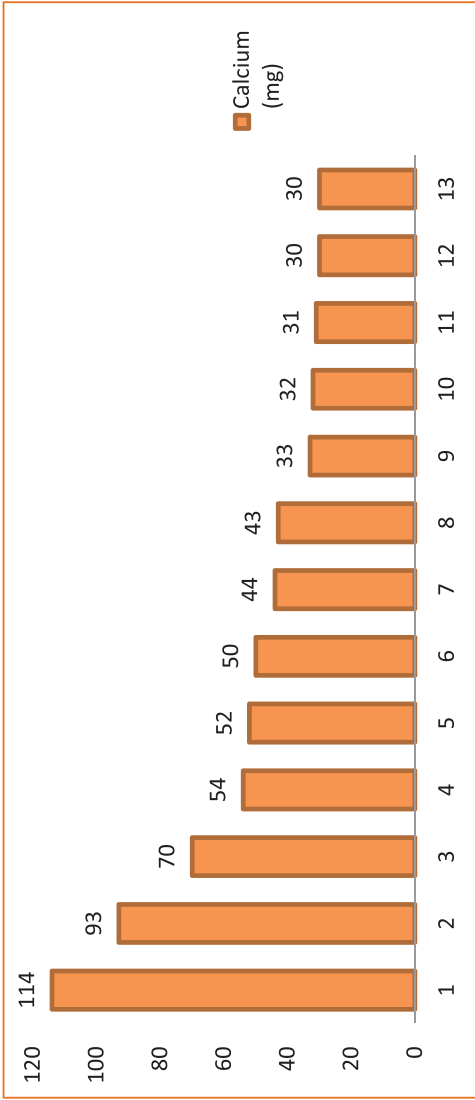
Calcium rich vegetables and fruits

Table 23. Calcium rich non-leafy vegetables available in Bangladesh

Sr No	Vegetables	Calcium (mg/100g)
1	Amaranth stem (Data)	114
2	Ladies finger (Dherosh)	93
3	Bean, seeds and pods (Shim)	70
4	Cowpea (Borboti)	54
5	Pumpkin (Mistikumra)	52
6	Broad beans (Makhon shim)	50
7	Bean, scarlet runner (Shim)	44
8	Peas (Motorshuti)	43
9	Cauliflower (Fulkopi)	33
10	Turnip (Shalgom)	32
11	Snake gourd (Chichinga)	31
12	Cabbage (Badhakopi)	30
13	Ash gourd (Chalkumra)	30

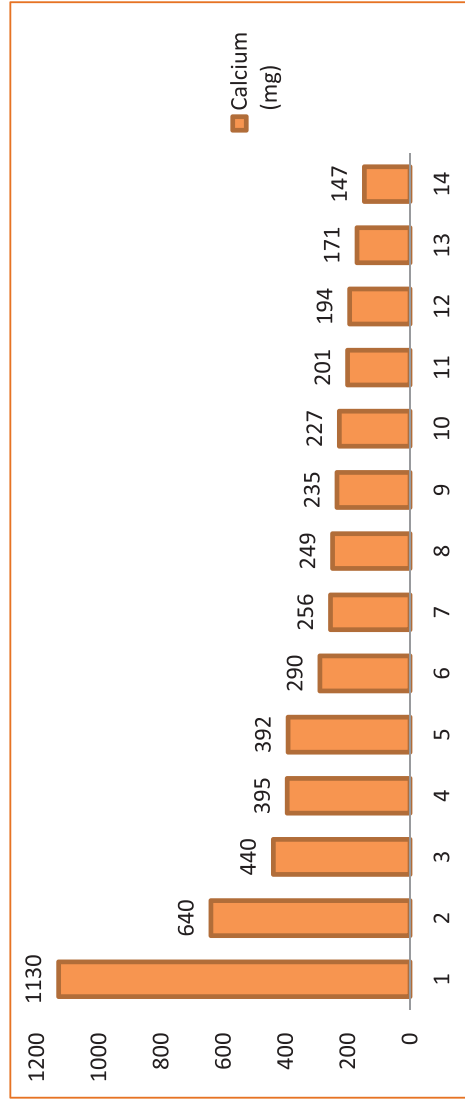
Table 24. Calcium rich leafy vegetables available in Bangladesh

Sr No	Leafy vegetables	Calcium (mg/100g)
1	Agathi (Bok tul shak)	1130
2	Amaranth spiny (Kanta notey shak)	640
3	Drumstick leaves (Sajna pata)	440
4	Fenugreek leaves (Methi shak)	395
5	Colocasia leaves (Kalo kochu shak)	392
6	Cowpea leaves (Borboti pata)	290
7	Amaranth red (Lal shak)	256
8	Beet leaves (Beet shak)	249
9	Colocasia leaves green (Shobuj kochu shak)	235
10	Slender amaranth leaves (Notay shak)	227
11	Cassava leaves (Simei alu shak)	201
12	Sweet potato leaves (Misti alu shak)	194
13	Amaranth green (Data shak)	171
14	Radish leaves (Mula shak)	147



Source: This graph has been prepared based on food composition table for Bangladesh, INFS, University of Dhaka

Figure 12. Calcium content of calcium rich non-leafy vegetables available in Bangladesh (per 100g of edible portion)

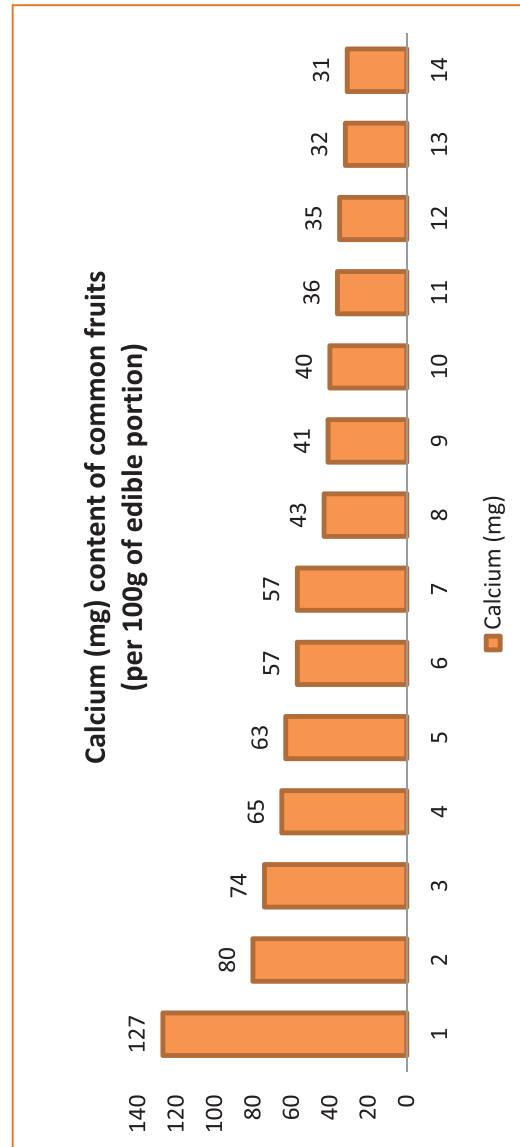


Source: This graph has been prepared based on food composition table for Bangladesh, INFS, University of Dhaka

Figure 13. Calcium content of calcium rich leafy vegetables available in Bangladesh (per 100g of edible portion)

Table 25. Calcium rich fruits available in Bangladesh

Sr No	Fruits	Calcium (mg/100g)
1	Tamarind pulp (Tetul)	127
2	Fig (Dumur)	80
3	Elephant apple (Kodbel)	74
4	Lemon (Lebu kagoji)	65
5	Dates (Khejur)	63
6	Hog plum (Amra)	57
7	Monkey jack (Dewa)	57
8	Palmyra palm (Kochi taal)	43
9	Wood apple (Bel)	41
10	Breadfruit (Madar)	40
11	Pomelo (Zambura)	36
12	Sweet lime (Mushambee)	35
13	Emblic (Amloki)	32
14	Orange Malta (Malta)	31



Source: This graph has been prepared based on food composition table for Bangladesh, INFS, University of Dhaka

Figure 14. Calcium content of calcium rich fruits available in Bangladesh (per 100g of edible portion)

