Fortified Edible Oils: Enhancing Health and Nutrition for a Better Future

BETTER NUTRITION FOR ALL

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Global Target of Nutrition

Stunting

TARGET: 40% reduction in the number of children under-5 who are stunted

Anaemia

TARGET: 50% reduction of anaemia in women of reproductive age

Low birth weight

TARGET: 30% reduction in low birth weight

Childhood overweight

TARGET: No increase in childhood overweight

Breastfeeding

TARGET: Increase the rate of exclusive breastfeeding in the first 6 months up to at least 50%

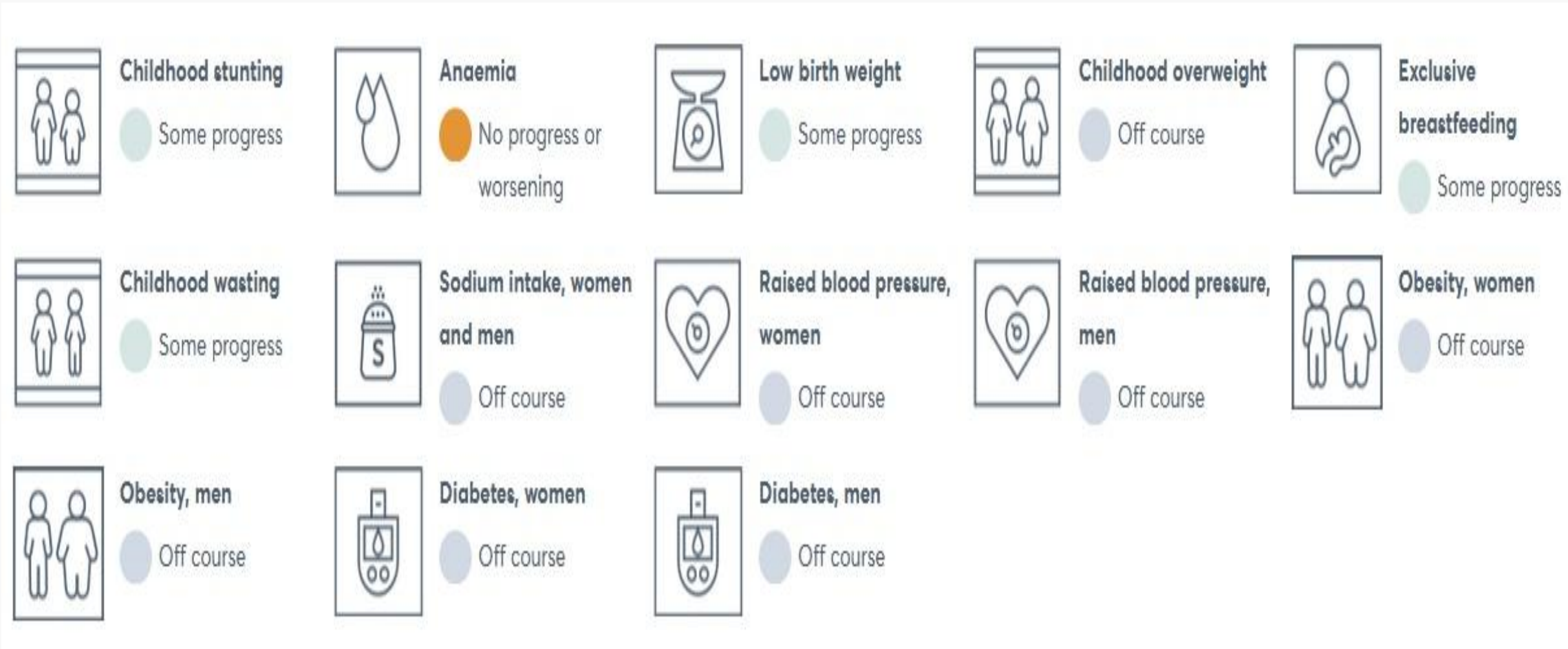
Wasting

TARGET: Reduce and maintain childhood wasting to less than 5%

https://www.who.int/teams/nutrition-and-food-safety/global-targets-2025

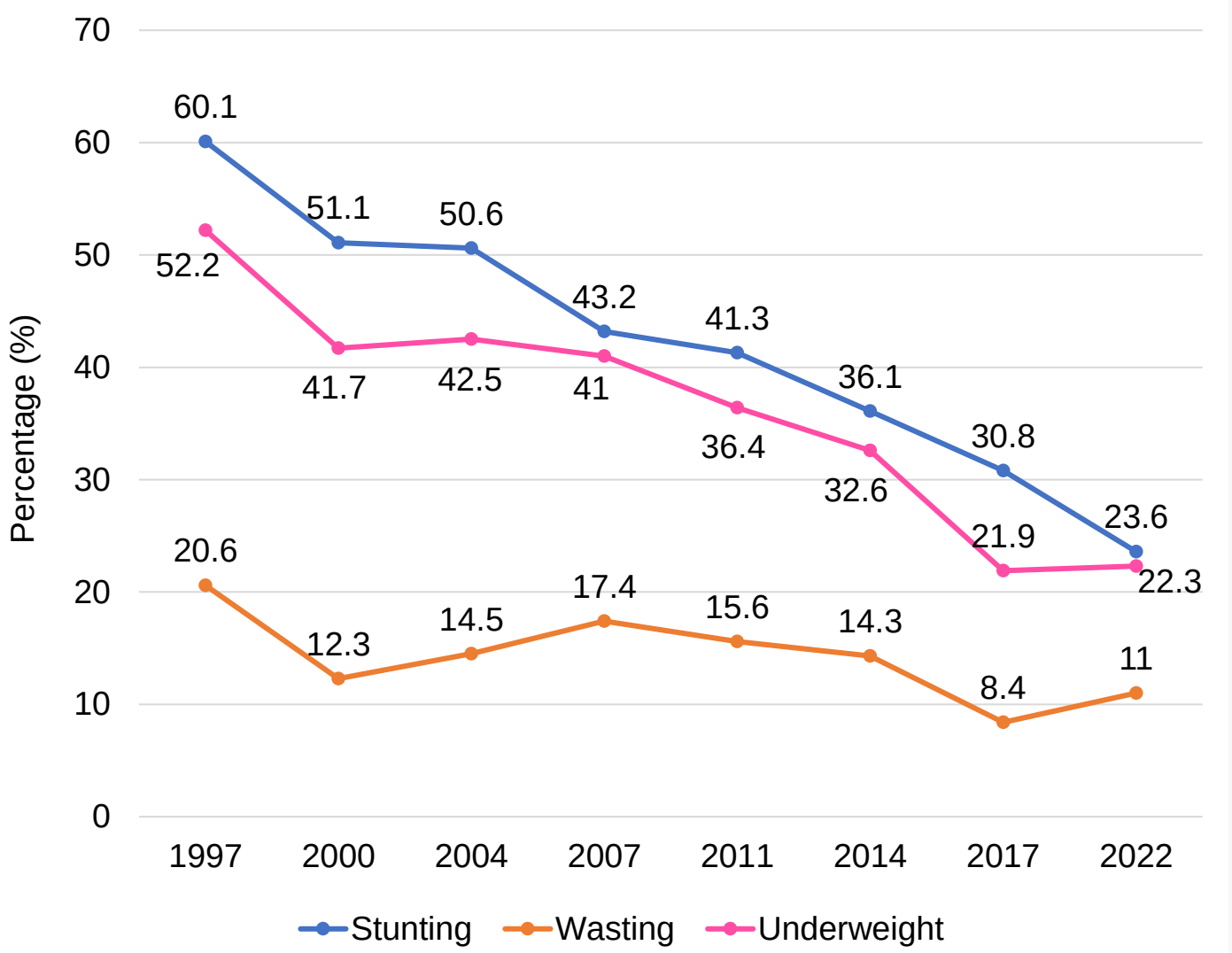
Global Nutrition Status

NUTRITIONAL STATUS IN BANGLADESH



Trends in child undernutrition in Bangladesh

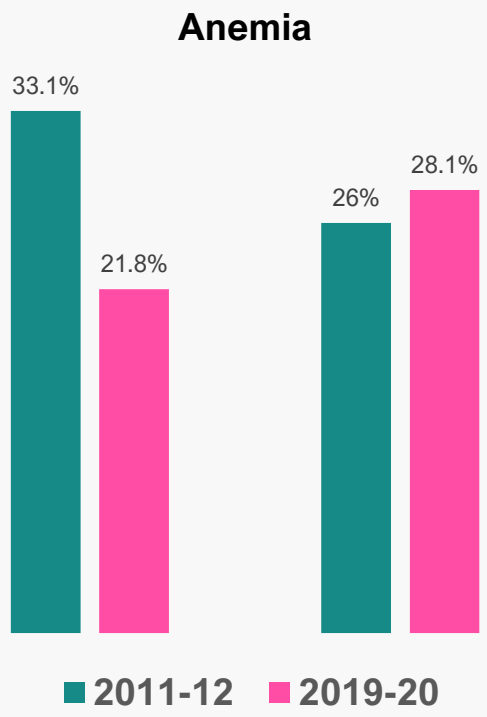
According to the Bangladesh Demographic and Health Surveys (BDHS), stunting among children under five declined from 60% in 1997 to 23.6% in 2022 (NIPORT & ICF, 2023). However, despite improvements between 1997 and 2017, the incidence of underweight in this age group rose from 21.9% in 2017 to 22.3% in 2022 and wasting from 8.4% to 11%. Factors such as **suboptimal feeding practices**, inadequate access to healthcare, low socio-economic conditions, and environmental influences contributed to these increases. The impacts of COVID-19 further affected food security and undernutrition between 2020 and 2022, putting children at higher risk of developmental delays or death.

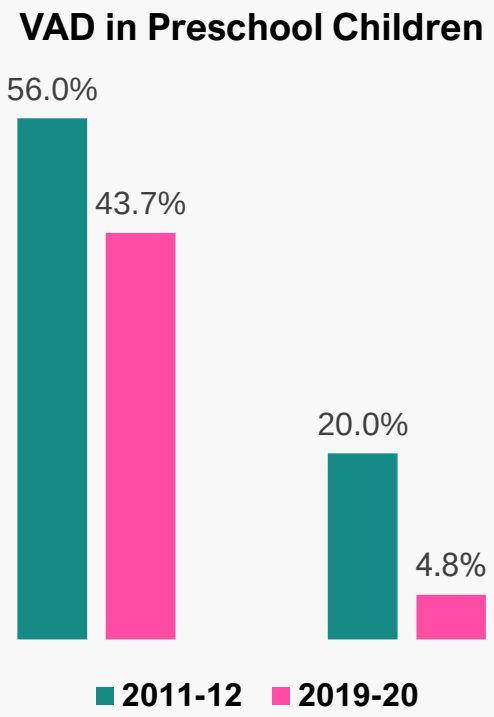


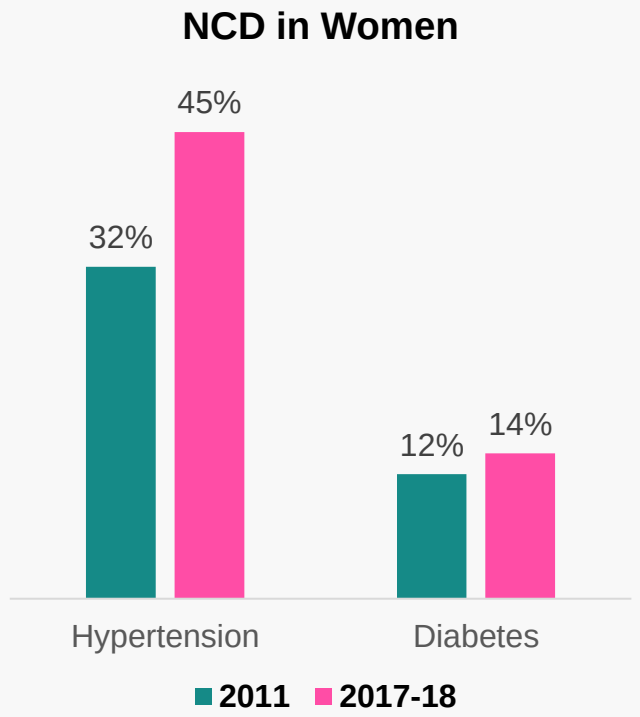
Women of Reproductive age:

- **Women's nutritional status also demonstrated a mixed picture.**
- **While chronic energy deficiency (CED) among women dropped from 52% in 1997 to 12% in 2017 (NIPORT & ICF, 2020),**
- **Whereas, obesity among women has increased: 32% classified as overweight or obese in 2017 with urban women being more affected than rural women (33% and 23%, respectively).**
- **Bangladesh has successfully reduced VAD which was previously a major public health issue.**
- **A national supplementation program, launched in 1973, along with fortified foods and social safety nets, has helped lower the prevalence of mild and moderate VAD among preschool children by around 12% (ICDDRB, 2014 and ICDDRB, 2021).**
- **The prevalence of anemia among infants and children has also significantly declined, although it remains a concern among women – with rates increasing from 26% in 2011-12 to 30.1% in 2019-20.**
- **The country has also made progress in combating IDD, although access to adequately iodized salt remains low in some pockets in rural areas.**

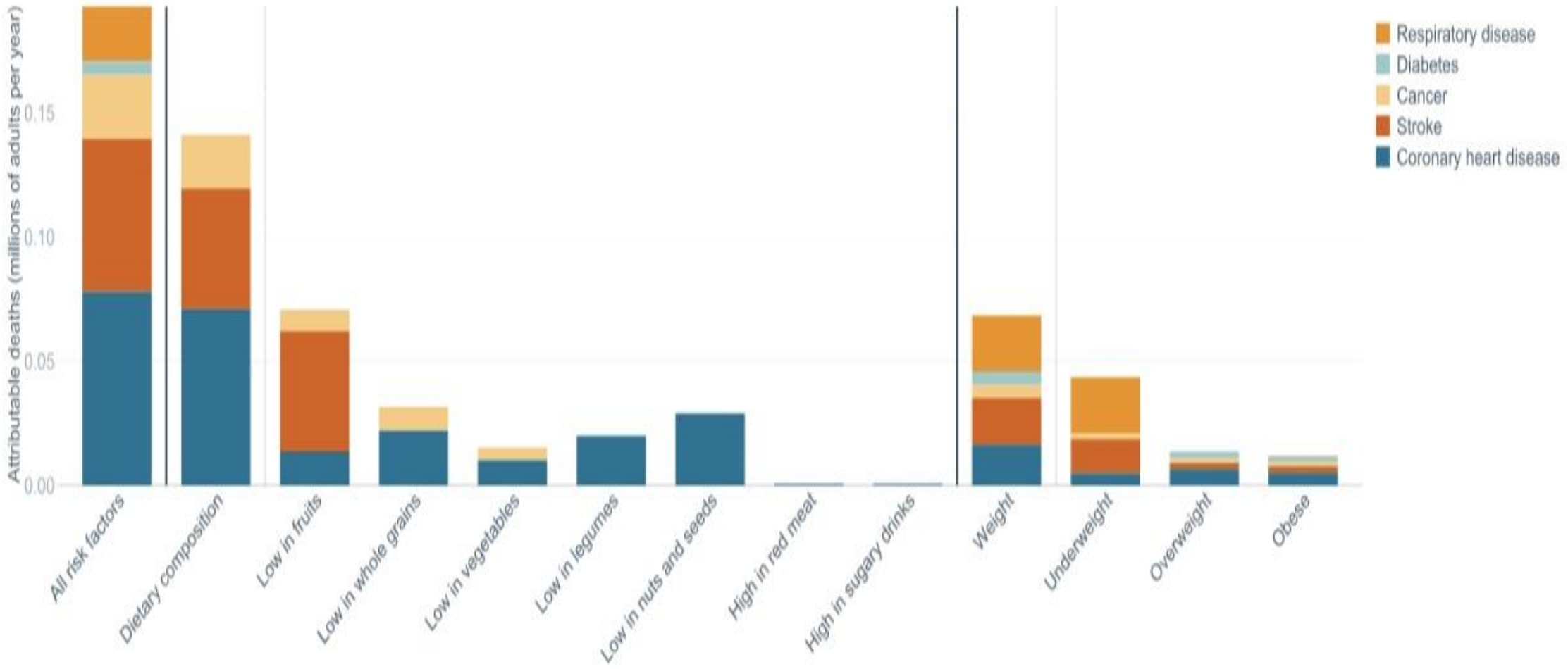
Trends in some nutritional problems in Bangladesh







Mortality attributable to dietary composition and weight



LEGISLATION

বাংলাদেশ গেজেট

অতিরিক্ত সংখ্যা
কর্তৃপক্ষ কর্তৃক প্রকাশিত

বৃহস্পতিবার, এপ্রিল ২৮, ২০১৬

Government of the People's Republic of Bangladesh

Ministry of Food

NOTIFICATION

Dated the 17 April 2016

S.R.O. No. 98-Law/2016—In exercise of the powers conferred by section 89 of the Food Safety Act, 2013, the Government is pleased to publish the following English translation of the Act to be called the Authentic English Text of the Act, and it shall be effective from the date on which the Act comes into force under sub-section (2) of section 1 of the Act :

The Food Safety Act, 2013

(Act No. 43 of 2013)

[10th October, 2013]

An Act to make provisions for the establishment of an efficient and effective authority and for regulating, through coordination, the activities relating to food production, import, processing, stock, supply, marketing and sales, so as to ensure the rights toward access to safe food through appropriate application of scientific process, upon repealing and reenacting the existing laws connected thereto.

Whereas it is necessary to ensure the rights toward access to safe food for the protection of human health and life; and

রেজিস্টার্ড নং ডি এ-১

"জাতির পিতা বঙ্গবন্ধু শেখ মুজিবুর রহমানের
জন্মশতবার্ষিকী উদ্‌যাপন সফল হোক"

বাংলাদেশ গেজেট

অতিরিক্ত সংখ্যা
কর্তৃপক্ষ কর্তৃক প্রকাশিত

সোমবার, ফেব্রুয়ারি ১৪, ২০২২

[বেসরকারি ব্যক্তি এবং কর্পোরেশন কর্তৃক অর্থের বিনিময়ে জারীকৃত বিজ্ঞাপন ও নোটিশসমূহ]

গণপ্রজাতন্ত্রী বাংলাদেশ সরকার
বাংলাদেশ নিরাপদ খাদ্য কর্তৃপক্ষ

প্রজ্ঞাপন

তারিখ : ২৬ শ্রাবণ, ১৪২৮ বঙ্গাব্দ/১০ আগস্ট, ২০২১ খ্রিষ্টাব্দ

এস,আর,ও, নং ২৭৩-আইন/২০২১।—নিরাপদ খাদ্য আইন, ২০১৩ (২০১৩ সনের ৪৩ নং আইন) এর ধারা ৮৭, ধারা ১৩ এর উপ-ধারা (২) এর দফা (ঘ), (ঙ) ও উপ-ধারা (৪) এবং ধারা ৩০ এর সহিত পঠিতব্য, তে প্রদত্ত ক্ষমতাবলে বাংলাদেশ নিরাপদ খাদ্য কর্তৃপক্ষ, সরকারের পূর্বানুমোদনক্রমে, নিম্নরূপ প্রবিধানমালা প্রণয়ন করিল, যথা :—

১। **শিরোনাম ও প্রবর্তন**।—(১) এই প্রবিধানমালা নিরাপদ খাদ্য (দূষণকারী জীবাণু নির্ধারণ ও নিয়ন্ত্রণ) প্রবিধানমালা, ২০২১ নামে অভিহিত হইবে।

(২) ইহা অবিলম্বে কার্যকর হইবে।

২। **সংজ্ঞা**।— (১) বিষয় বা প্রসঙ্গের পরিপন্থি কোনো কিছু না থাকিলে, এই প্রবিধানমালায়—

(ক) **"অণুজীব (Microorganisms)"** অর্থ আণুবীক্ষণিক অকোষীয়, এককোষী বা বহুকোষী জীব;

(খ) **"আইন"** অর্থ নিরাপদ খাদ্য আইন, ২০১৩ (২০১৩ সনের ৪৩ নং আইন);

(গ) **"কর্তৃপক্ষ"** অর্থ আইনের ধারা ২ এর দফা (১) এ সংজ্ঞায়িত বাংলাদেশ নিরাপদ খাদ্য কর্তৃপক্ষ;

(ঘ) **"তফসিল"** অর্থ এই প্রবিধানমালার কোনো তফসিল;

ভোজ্যতেলে ভিটামিন 'এ' সমৃদ্ধকরণ আইন, ২০১৩

(২০১৩ সনের ৬৫ নং আইন)

[২৭ নভেম্বর, ২০১৩]

ভোজ্যতেলে ভিটামিন 'এ' সমৃদ্ধকরণ ও ভিটামিন 'এ' সমৃদ্ধ ভোজ্যতেল বিক্রয়, সংরক্ষণ, সরবরাহ, বিপণন বা বাজারজাতকরণ বাধ্যতামূলককরণ এবং অন্যান্য আনুষঙ্গিক বিষয়ে বিধানকল্পে প্রণীত আইন

যেহেতু গণপ্রজাতন্ত্রী বাংলাদেশের সংবিধানের অনুচ্ছেদ ১৮ মোতাবেক জনগণের পুষ্টির স্তর উন্নয়ন ও জনস্বাস্থ্যের উন্নতি সাধন করা রাষ্ট্রের অন্যতম কর্তব্য; এবং
যেহেতু জনসাধারণের পুষ্টির স্তর উন্নয়ন ও জনস্বাস্থ্যের উন্নতি সাধনের লক্ষ্যে ভিটামিন 'এ' এর অভাবজনিত সমস্যা প্রতিরোধের উদ্দেশ্যে ভোজ্যতেলে ভিটামিন 'এ' সমৃদ্ধকরণ ও ভিটামিন 'এ' সমৃদ্ধ ভোজ্যতেল বিক্রয়, সংরক্ষণ, সরবরাহ, বিপণন বা বাজারজাতকরণ বাধ্যতামূলককরণ এবং অন্যান্য আনুষঙ্গিক বিষয়ে বিধান প্রণয়ন করা সমীচীন ও প্রয়োজনীয়;
সেহেতু এতদ্বারা নিম্নরূপ আইন প্রণয়ন করা হইলঃ-

সংক্ষিপ্ত শিরোনাম ও প্রবর্তন

১।(১) এই আইন ভোজ্যতেলে ভিটামিন 'এ' সমৃদ্ধকরণ আইন, ২০১৩ নামে অভিহিত হইবে।

(২) ইহা অবিলম্বে কার্যকর হইবে।

সংজ্ঞা

২। বিষয় বা প্রসঙ্গের পরিপন্থী কোন কিছু না থাকিলে, এই আইনে-

(১) "এ্যাক্রেডিটেশন সনদ" অর্থ বাংলাদেশ এ্যাক্রেডিটেশন আইন, ২০০৬ (২০০৬ সনের ২৯ নং আইন) এর অধীন প্রদত্ত এ্যাক্রেডিটেশন সনদ;

(২) "তফসিল" অর্থ এই আইনের তফসিল;

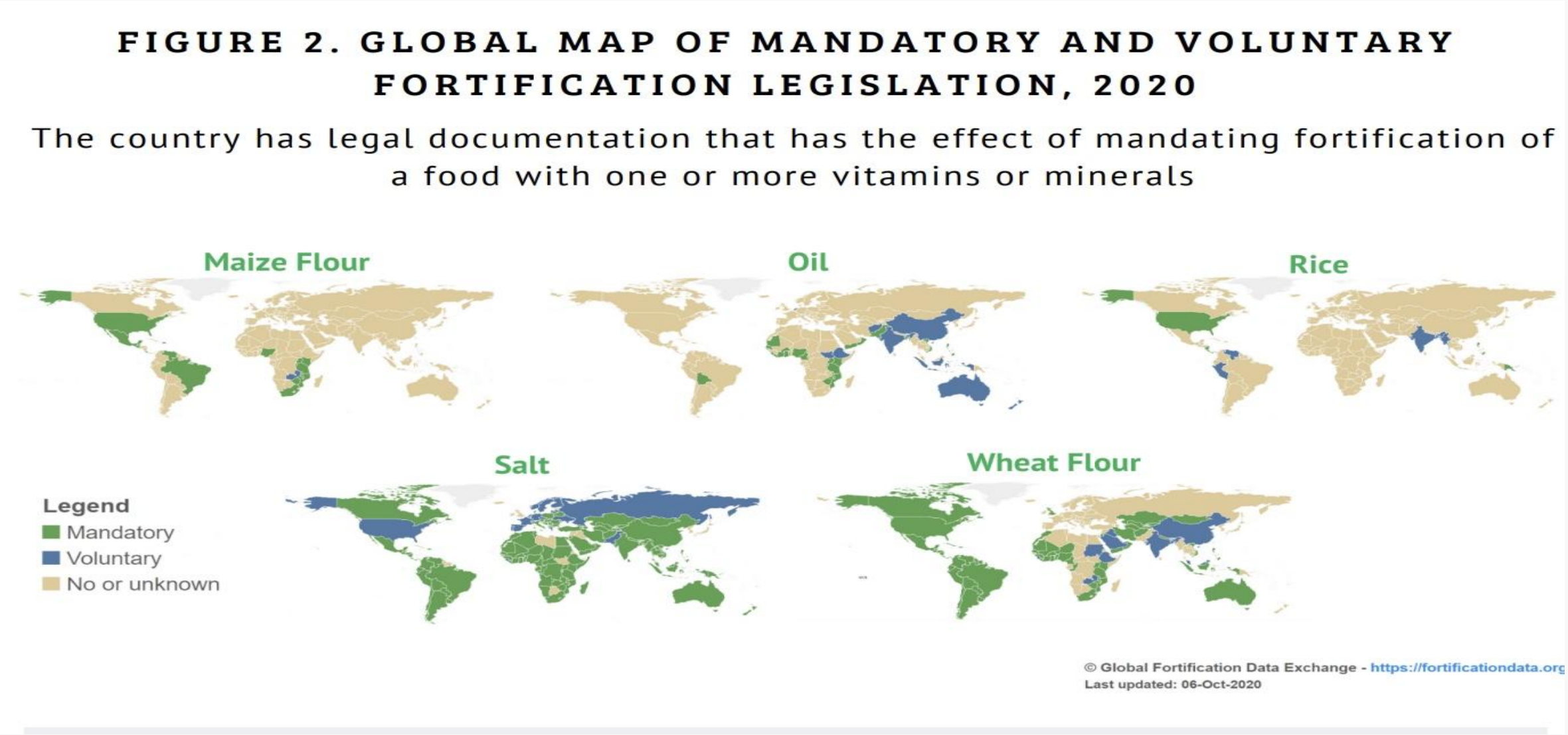
(৩) "ব্যক্তি" অর্থ কোনো কোম্পানী, সংস্থা, প্রতিষ্ঠান, অংশীদারি কারবার, সমিতি, সংঘ, সংগঠনও, নিবন্ধিত হউক বা না হউক, অন্তর্ভুক্ত হইবে;

(৪) "বিএসটিআই" অর্থ The Bangladesh Standards and Testing Institution Ordinance, 1985 (Ordinance No. XXXVII of 1985) এর অধীন প্রতিষ্ঠিত Bangladesh Standards and Testing Institution;

(৫) "বিধি" অর্থ এই আইনের অধীন প্রণীত বিধি;

(৬) "ভোজ্যতেল" অর্থ মানুষের আহার্য পরিশোধিত (Refined) বা অপরিশোধিত (Crude) কোনো উদ্ভিজ তেল (vegetable oil), যেমন সয়াবিন তেল (soyabean oil), পাম তেল (palm oil), পাম অলীন (palm olein), ইত্যাদি কিংবা আন্তর্জাতিকভাবে ভোজ্যতেল হিসাবে স্বীকৃত অন্য কোনো উদ্ভিজ তেল, তবে সরষার তেল, নারিকেল তেল কিংবা অলিভ অয়েল, ইত্যাদি উহার

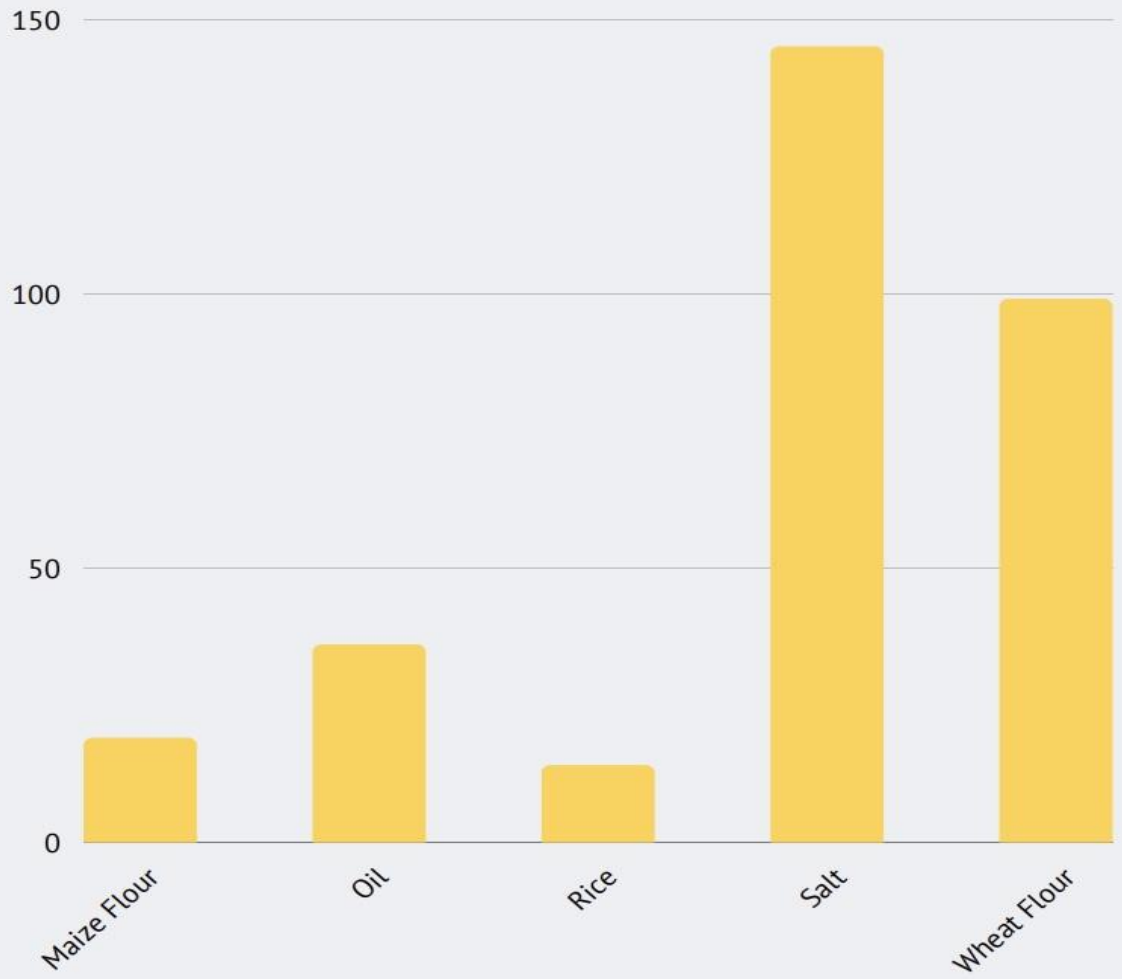
Food Fortification: Global



www.FortificationData.org

Number of Countries with Mandatory or Voluntary Fortification

- In 2019, 161 countries had mandatory or voluntary legislation of at least one of the foods.
- Salt is the most widely fortified food with 145 countries having mandatory or voluntary legislation.
- Regionally, the Americas had the highest proportion of countries with fortification legislation of one of the foods, with all 35 countries fortifying wheat flour.



NUTRIENTS IN STANDARDS

Food standards are legal documents that define criteria for food in a country – fortification standards refer to the nutrients specified for addition to a food, the amount, and nutrient compounds that can be used. A country can have a fortification standard and not have mandatory fortification legislation. The following are some nutrients and food vehicles that are used in fortification globally:

17

countries have standard for niacin

32

countries have standard for vitamin A

91

countries have standard for iron

13

countries have standard for thiamin

137

countries have standard for iodine

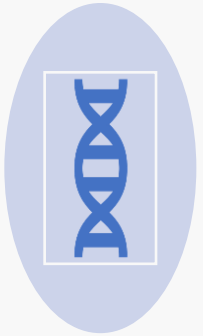
Food Fortification: Bangladesh

Universal Fortification

Nutritional Aspect of Edible Oil: Importance for health

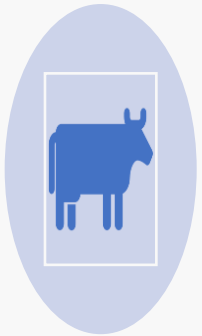
Condense source of energy

Carrier of fat-soluble vitamins



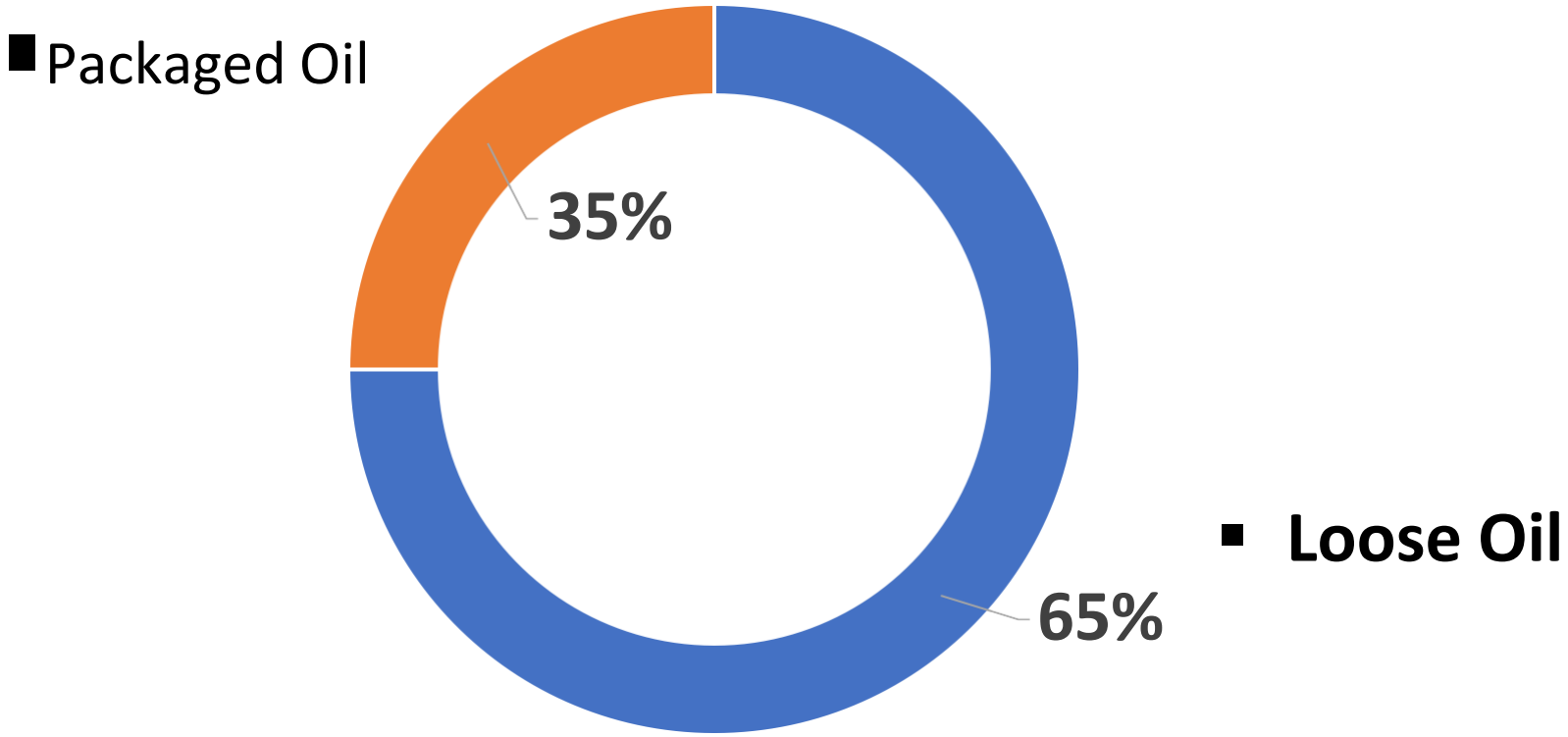
Important constituent of cell membrane

Act in insulation and protection



Production and regulation of hormones

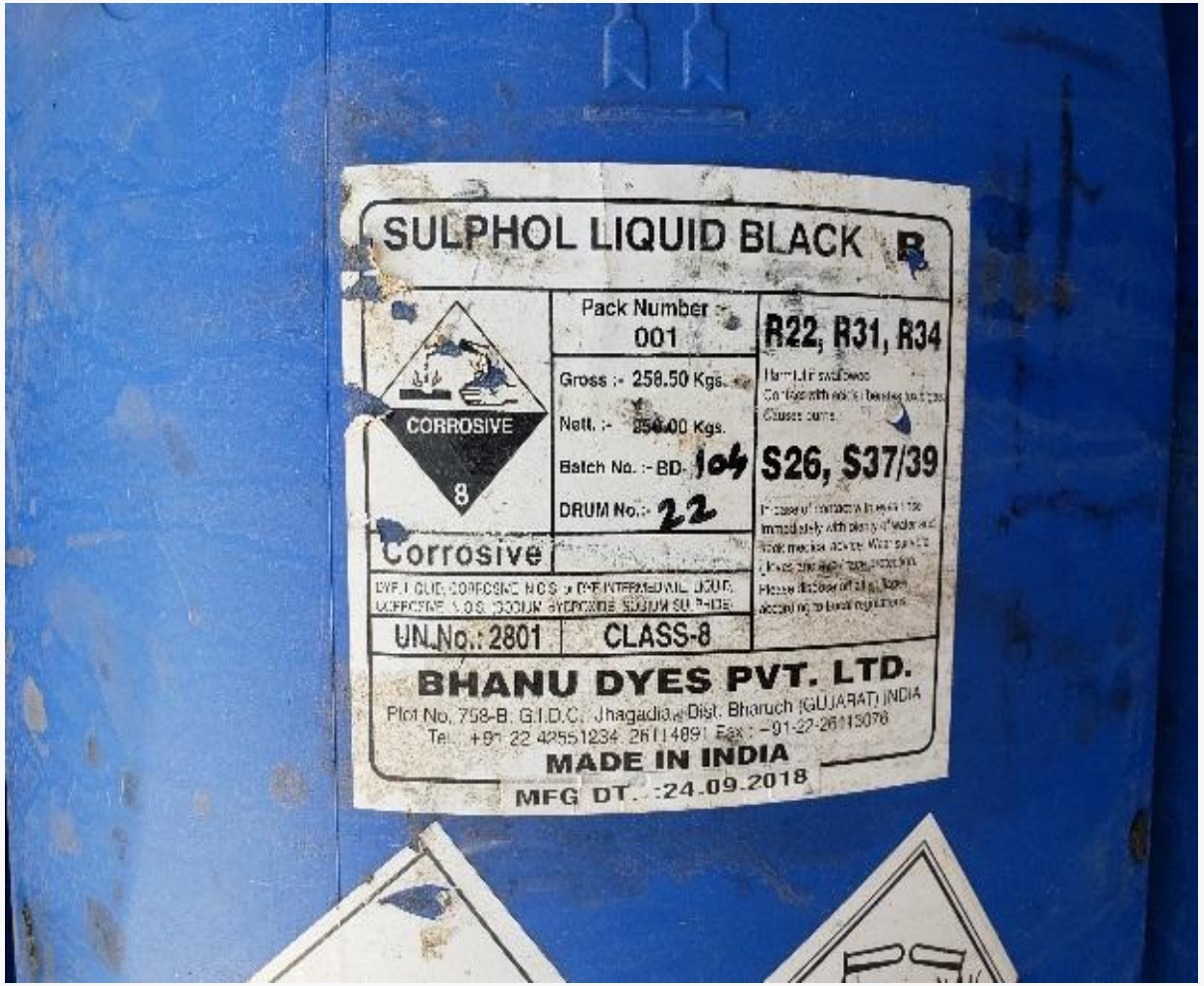
Market share of Edible Oil



MARKET SURVEY 2017-18 (GAIN & ICDDR,B WITH MOIND): ASSURANCE OF QUALITY & FORTIFICATION

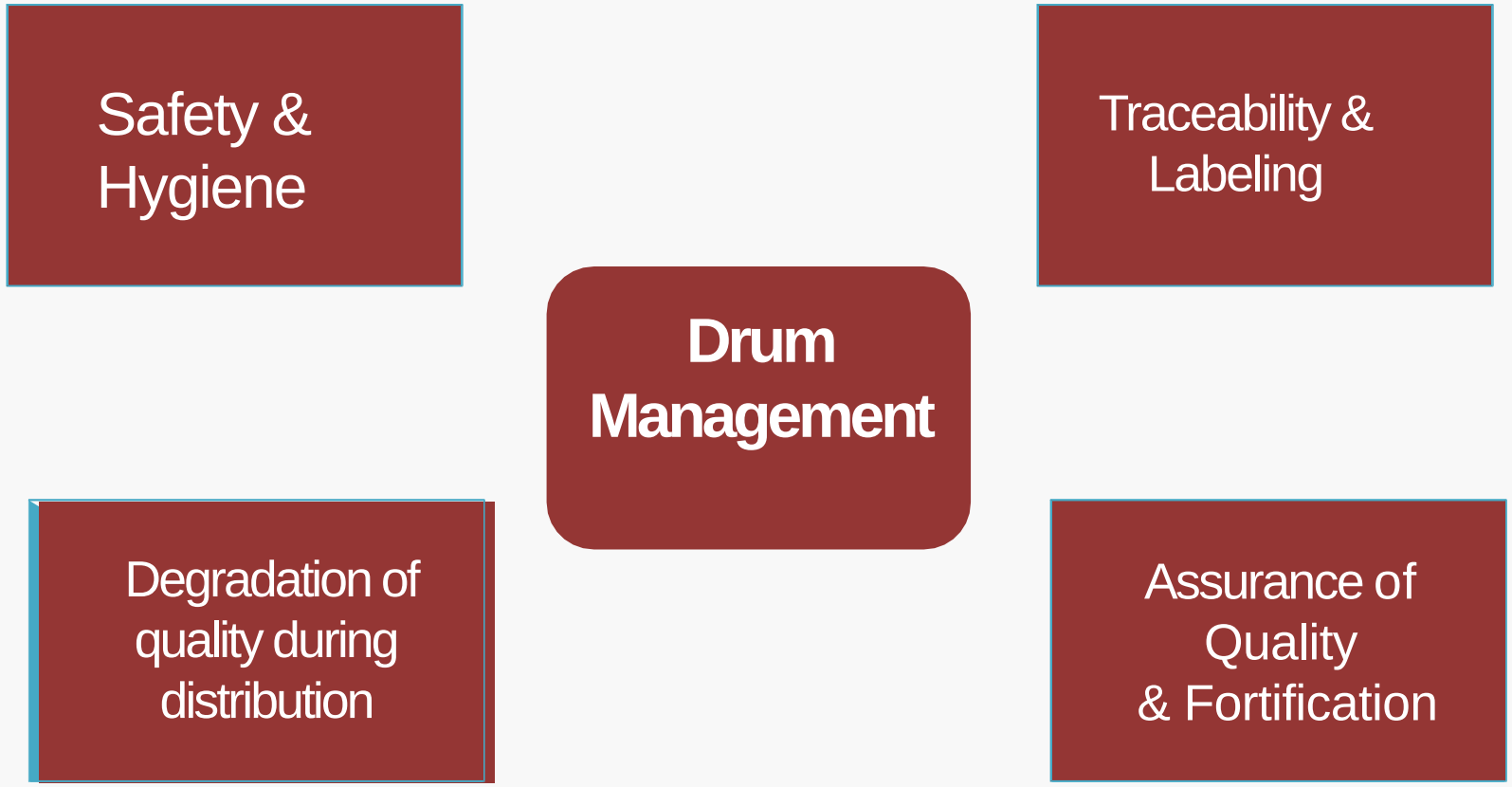
Packaged oil and bulk oil in drums represented about 35% and 65% of the total edible oil market volume (2,600,000 MT) respectively

IS IT SAFE FOR CONSUMPTION?



BULK OIL

SYSTEM CHANGE TO ADDRESS CRITICAL AREAS OF BULK OIL



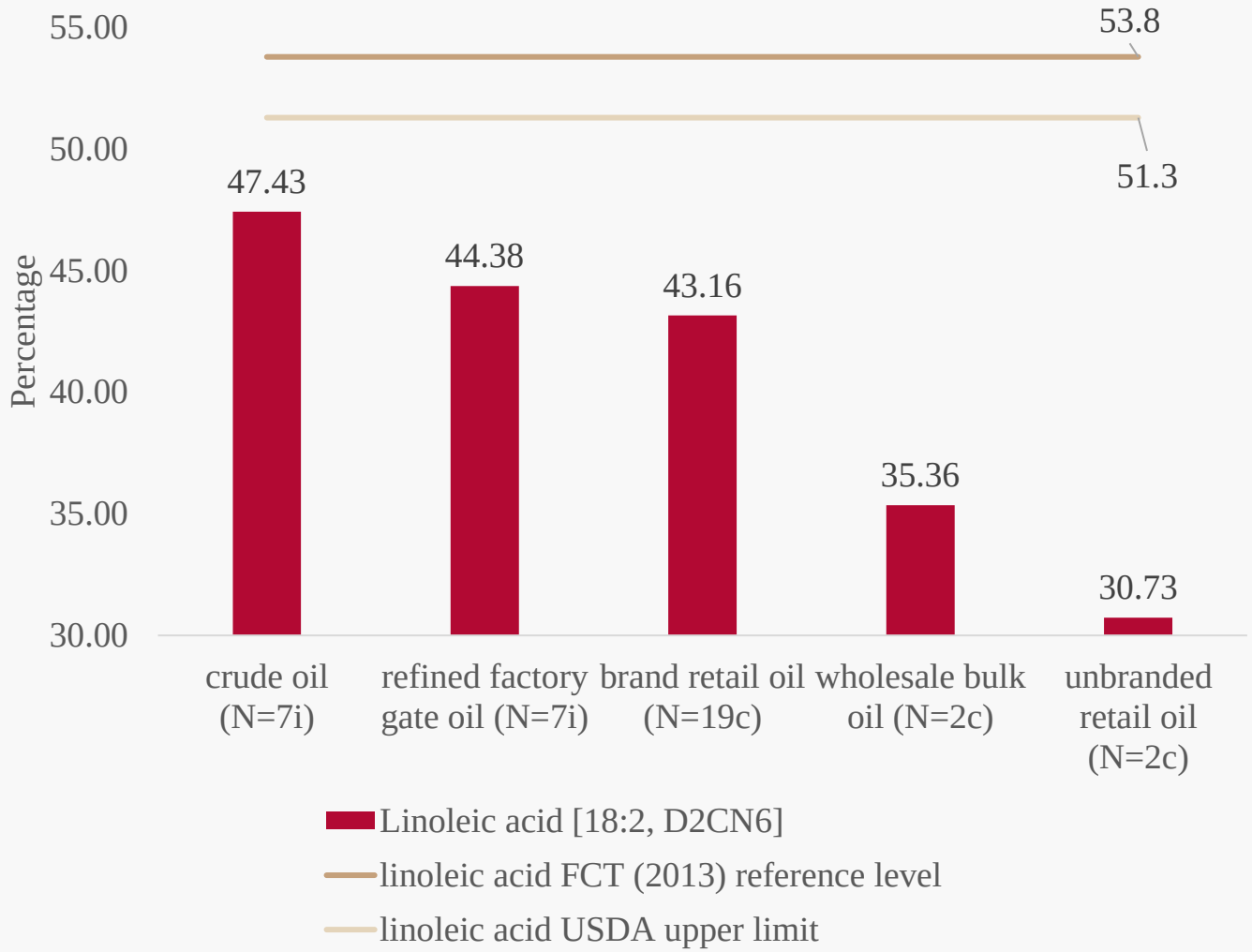
Assessment of the food safety characteristics and risks associated with edible oil

Containers for oil storage

Peroxide Value (meqO2)		
Oil type	**Category**	**Mean**
Soybean	crude oil (7)	6.89
	refined factory gate oil (7)	6.55
	brand retail refined oil (19)	27.97
	wholesale open refined oil (16)	44.40
	unbranded retail refined oil (33)	43.55

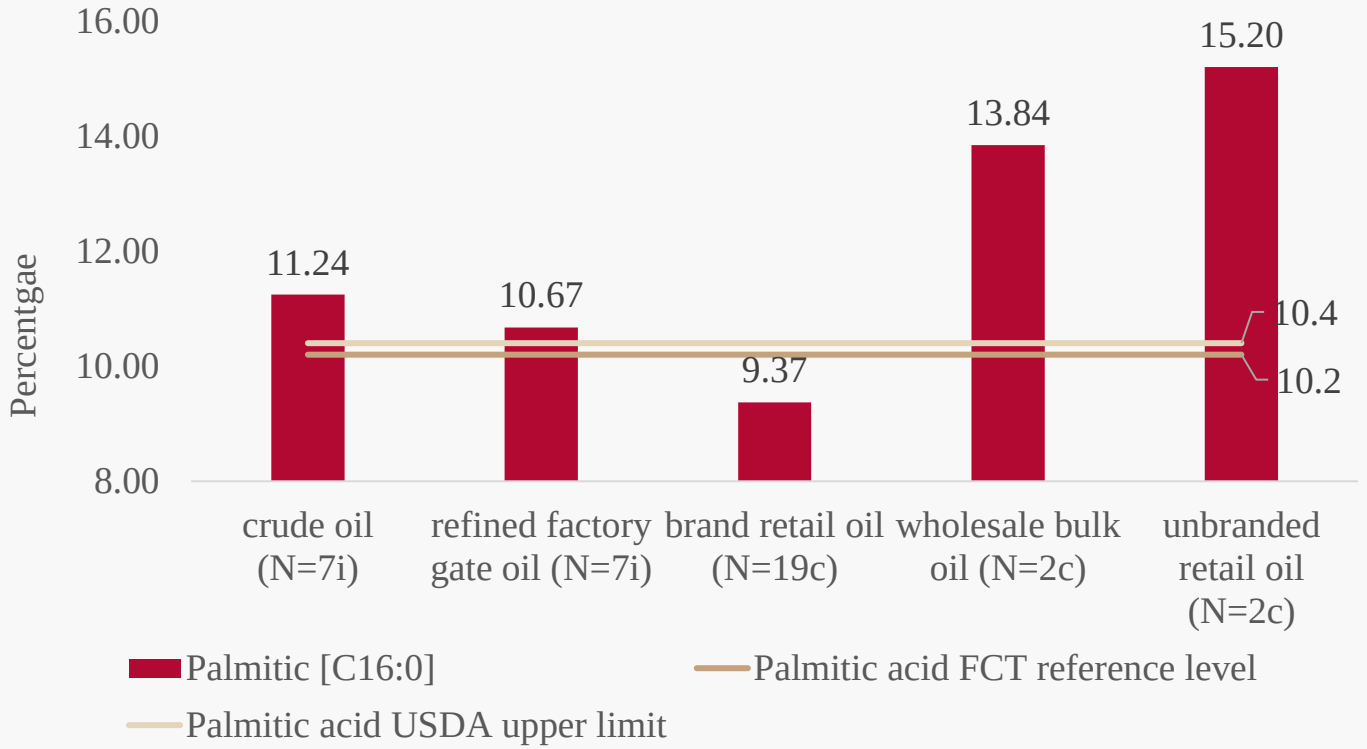
Linoleic acid (%) in soybean oil sample

- Linoleic acid is one of the major fatty acid of soybean oil.
- According to FCT reference value, total linoleic acid in soybean oil should be 53.8%.
- In the unbranded retail oil samples the value was found to be low (30.7%) which is 43% less than the FCT value, which indicates adulteration of soybean oil with palm oil

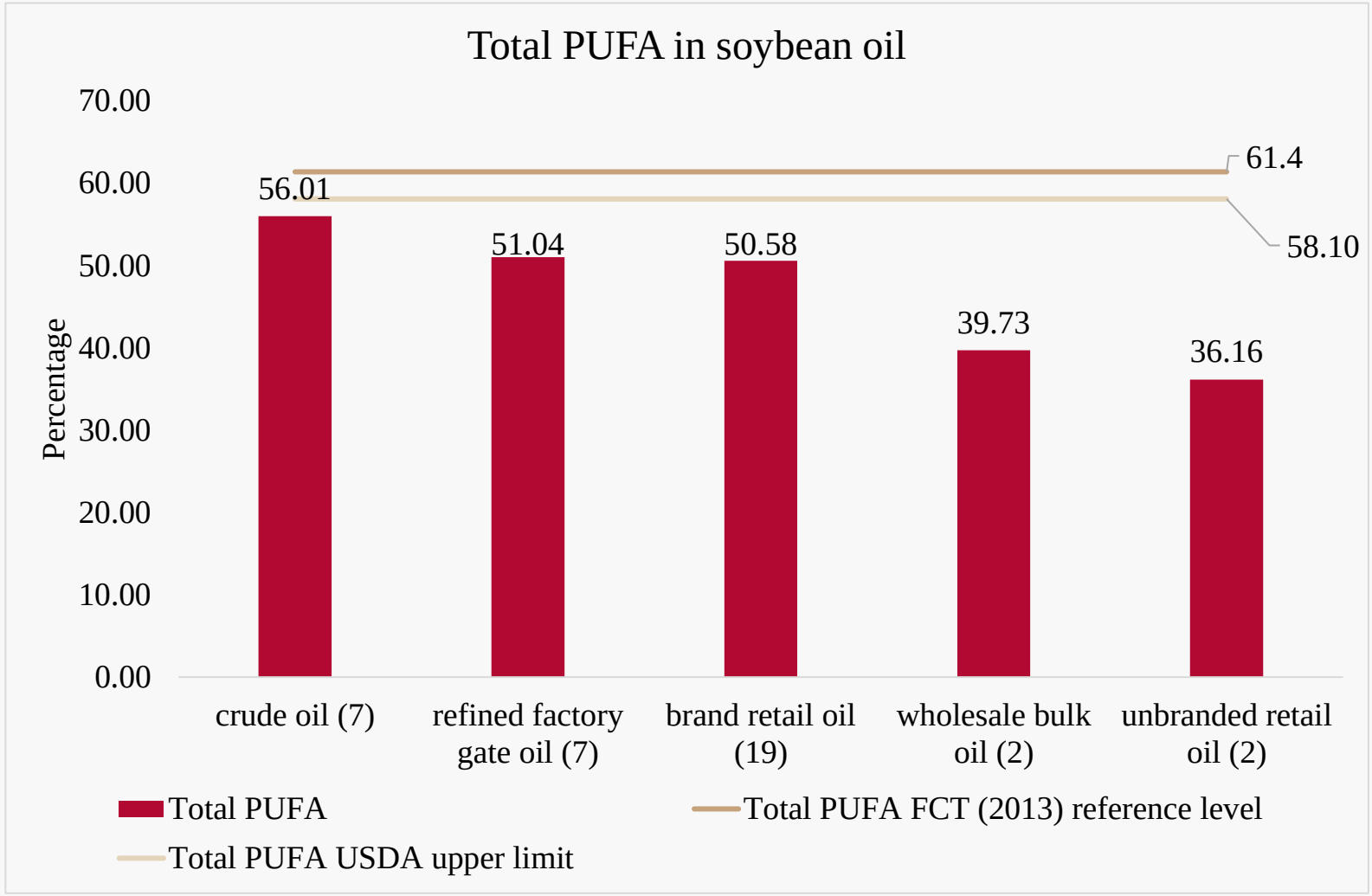


Palmitic acid (%) in soybean oil

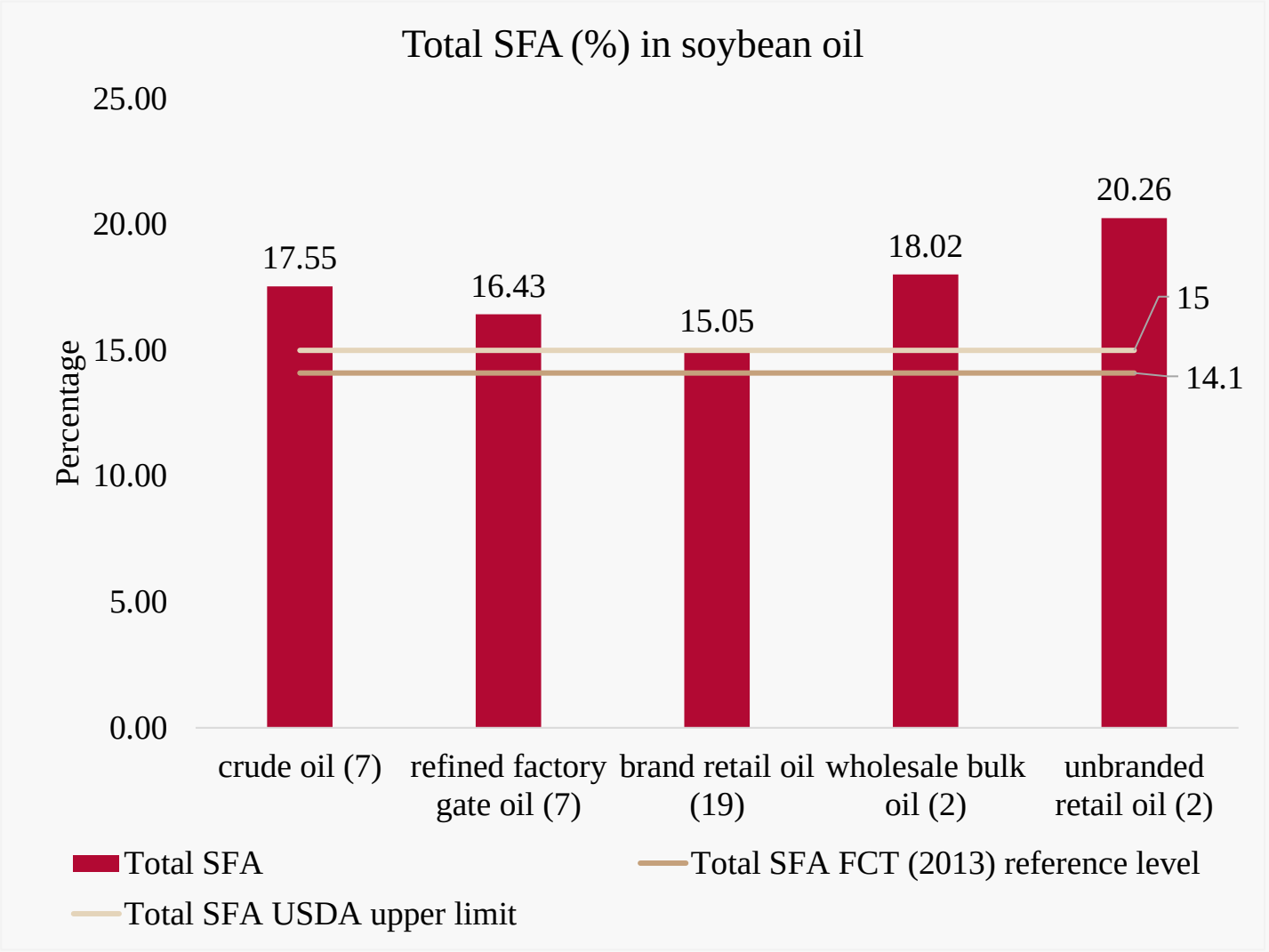
- Total palmitic oil in soybean oil should be 10.2%.
- It was considerably high in unbranded retail soybean oil (15%)
- It indicates adulteration of soybean oil with palm oil.



- Total PUFA in oil samples were lower than the FCT reference value (64.1%).
- Total PUFA was considerably low in unbranded soybean oil (36.16%).



- Total SFA levels in bulk retail soybean oil samples were higher (20.26%) than the FCT reference value (14.1%).



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Fatty acid profile emphasizing trans-fatty acids in commercially available soybean and palm oils and its probable intake in Bangladesh

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ABSTRACT

The study aimed to determine the trans-fat content in branded and unbranded soybean oil (SBO) and palm oil (PO) in nationally representative samples of Bangladesh. To our knowledge, this is the first comprehensive study reporting the Trans fatty acid (TFA) content in commonly consumed SBO and PO in Bangladesh. 106 composites (SBO 67, PO 39) were analyzed by GC–MS using Association of Official Analytical Chemists (AOAC) Method-ology 996.06. According to the study, TFA (>2 %) was detected in 66.7 % of branded and 24.5 % of unbranded

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Measurement of Heavy Metals in Commercially Available Soybean and Palm Oils and Relevant Health Risk Assessment in Bangladesh

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Background: Soybean and palm oils are widely consumed in Bangladesh.

Objective: The study aimed to investigate the levels of heavy metals and estimate their health risks in nationally representative samples of branded and unbranded soybean and palm oils sold in retail stores in Bangladesh.

Methods: A total of 1,521 soybean and palm oil samples were collected from eight administrative divisions. National composites of branded oil were prepared by combining at least 12 samples for each brand. In the case of unbranded oil, composites were prepared for each administrative division. A total of 44 composite samples, including 23 soybean oil samples (19 branded and 4 unbranded) and 21 palm oil samples (13 branded and 8 unbranded), were tested. Twenty-five individual samples (11 crude and 14 refined) collected from the refineries were also analyzed to trace the origin of the heavy metals. Market samples were analyzed for arsenic (As), cadmium (Cd), chromium (Cr), and lead (Pb) and only mercury (Hg) in both market and refinery samples using various atomic absorption spectrophotometric techniques. The possible adverse health effects of exposure to heavy metals content in edible oil were estimated using the tools of daily exposure (D_E) and noncarcinogenic risk assessment hazard quotient (HQ).

Results: The median values of As, Cd, Cr, Pb, and Hg content in soybean and palm oil respectively ranged between 6.9 and 8.8 μg/kg (As), 4.3 and 6.9 μg/kg (Cd), 12.3 and 42.3 μg/kg (Cr), 19.4 and 27.8 μg/kg (Pb), and 1.73 and 5.11 mg/kg (Hg). The differences in heavy metal contents between branded and unbranded oils were not statistically significant. Except for Hg, all other metal concentrations were within national and international standard limits. The estimated D_E of Hg through edible oil represented a considerable risk for noncarcinogenic health effects (HQ > 1). The ranking orders of HQ for the oil samples were as follows: unbranded soybean oil (3.99) > branded soybean oil (3.50) > branded palm oil (2.61) > unbranded palm oil (1.69).

Discussion: The present study evaluated the level of heavy metal contamination in soybean and palm oils and conducted risk assessments associated with their consumption in Bangladesh. It appears that the source of this contamination is the imported crude oil. Strong and effective monitoring infrastructure is needed to regulate the import of safe crude oils for refineries. https://doi.org/10.1289/JHP1072

Introduction

Edible oil from plant sources is an indispensable part of the normative diet all over the world. Given its versatile functions in providing essential fatty acids, fat-soluble vitamins, and health-promoting phytosterols, vegetable oil is acknowledged as a safe and wholesome source of dietary fat.[1] Vegetable oils are also preferred over animal fat for their absence of cholesterol.[2] According to a recent report, worldwide consumption of vegetable oil was 210.30 million metric tons in 2022–2023.[3] National surveys have reported that in Bangladesh, vegetable oil consumption increased from 20.7 g/d in 2010 to 27.0 g/d in 2016,[4] with soybean and palm oils being the two most widely consumed edible oils in the country. According to the UN Food and Agriculture Organization (FAO), soybean and palm oils respectively account for 20% and 70% of edible oil consumption in Bangladesh.[5] A more recent study also reported soybean and palm oils to be the predominant edible oils in Bangladesh.[6] Edible oil in Bangladesh is distributed either in labeled containers as branded oil or as bulk oil in unlabeled large containers or drums, which is considered to be unbranded oil. A previous study reported that unbranded oil accounts for ∼65% of the overall edible oil market share and is consumed by more than two-thirds of the population, primarily because of its affordability.[5]

A specific concern about vegetable oils is that they readily react with substances such as oxygen and heavy metals.[2] Therefore, it is important to analyze the presence of various heavy metals as part of the assessment of edible oil quality with respect to freshness, tolerability, rancidity, and toxicity. Heavy elements, such as arsenic (As), cadmium (Cd), chromium (Cr), lead (Pb), mercury (Hg), and nickel (Ni), are known to be toxic. Being nonbiodegradable, and in the absence of an adequate mechanism of elimination, they accumulate in various parts of the body, particularly in adipose tissue.[7] The long biological half-lives of these elements and their ability to persist in human tissues without degradation, leading to gradual accumulation over time, render them especially harmful.[8] Accumulated toxic heavy metals have been implicated in cancer, cardiovascular, kidney, neurological, and bone diseases.[9]

Previous studies have reported that heavy metals can enter the food supply chain via contaminated water, soil, and fertilizer and accumulate in various parts of plants.[10] A study in southern Nigeria reported the bioaccumulation of metals in palm oil.[11] The study emphasized the correlation between soil metal accumulation and their presence in palm oil, specifically

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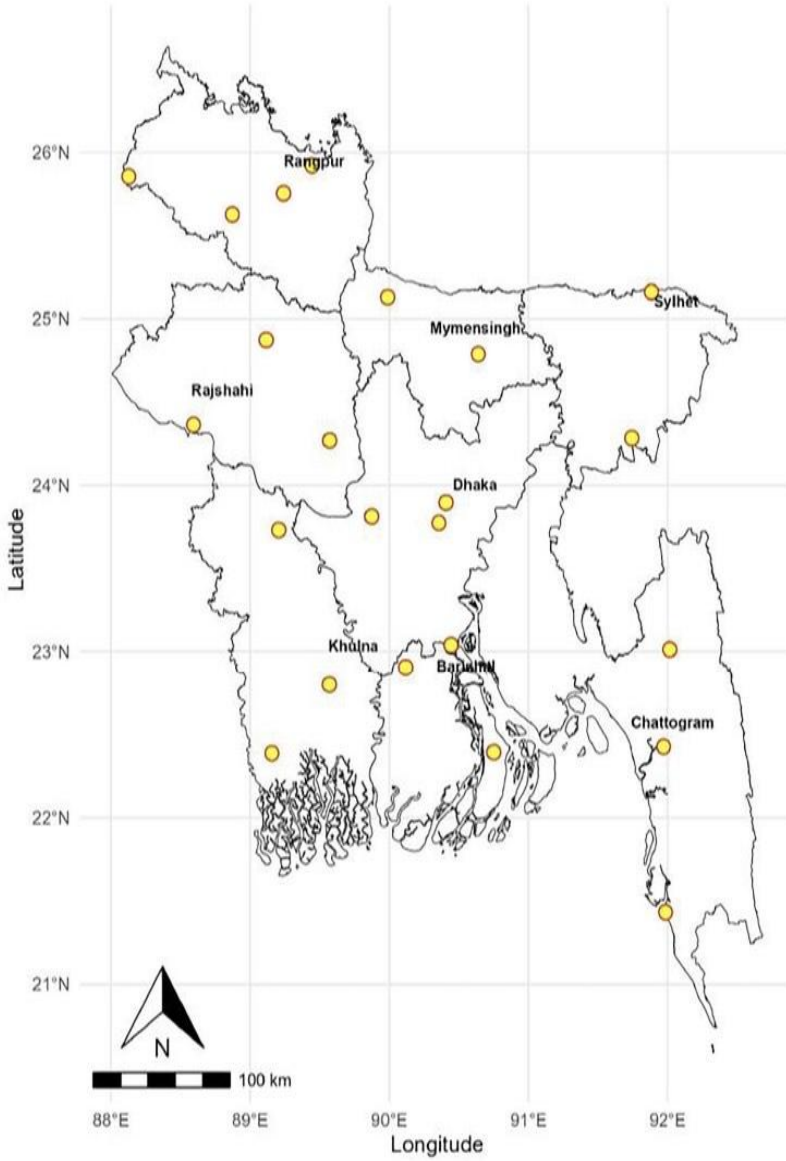

Figure 1. Map showing the districts ($n = 23$) from where edible oil samples were collected. This map was generated by plotting GPS points of the data and sample collections spots in a map of Bangladesh [R software (R version 4.1; R Development Core Team)]. The map was obtained from an open source and no permission is required. Note: GPS, global positioning system.

Nutritional indices of branded and unbranded soybean oil

Packaging variation was also observed:

The findings suggest that branded SBO samples had significantly ($p<0.001$) lower AI and TI compared to unbranded SBO (branded vs. unbranded AI: 0.13 vs. 0.24; TI: 0.27 vs 0.45).

Additionally, the branded SBO showed a significantly ($p<0.001$) higher PUFA/SFA, HPI, HFI, and HH than the unbranded SBO.

Indices	Branded (18)	Unbranded (49)	p value
Index of atherogenicity (AI)	0.13±0.02	0.24±0.11	0.000
Index of thrombogenicity (TI)	0.27±0.04	0.45±0.2	0.000
Ratio of w3 to w6 fatty acid (W3/W6)	0.11±0.05	0.13±0.1	0.505
The ratio of polyunsaturated to saturated fatty acid (PUFA/SFA)	3.37±0.27	1.98±0.76	0.000
Health-promoting index (HPI)	7.89±2.06	4.78±1.69	0.000
Healthy fatty index (HFI)	5.42±0.42	4.29±0.82	0.000
Hypocholesterolemic to hypercholesterolemic ratio (HH)	7.83±1.79	4.75±1.63	0.000
Sum of eicosapentaenoic acid and docosahexaenoic acid (EPA+DHA)	0.08±0.14	0.11±0.12	0.430

BULK OIL PHASE OUT ACTIVITY

Legislation

** The Ministry of Industries issued an Executive Order to phase out bulk Soybean oil from 31 July 2022 and bulk Palm oil from 31 Dec 2022

Dissemination

** Media campaign (TV & Online) aired to disseminate the phase out order and disadvantages of bulk oil

Action

** The regulatory agencies are punishing the defaulters
e.g. BSTI seized 4 trucks carrying 45 MT bulk oil

BSTI | BFSA | DNCRP

Proposed Packaging Solution

Oil Tanker

Oil Cylow

Oil Container

- প্রস্তাবিত পরিবেশ বান্ধব এবং সাশ্রয়ী প্যাকেজিং
- বাল্ক ডেলিভারির মাধ্যমে ট্রেসেবিলিটি নিশ্চিত করা

Auto Dispenser Machine


Thank You

Any Questions?

Edible oil value chains in Bangladesh.