

GOVERNMENT OF UGANDA

**LANDSCAPE ANALYSIS REPORT FOR THE FOOD
FORTIFICATION PROGRAM IN UGANDA**



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Executive Summary

Introduction, Objectives, and Methods

Micronutrient deficiencies are referred to as “hidden hunger” because they develop gradually over time, and their devastating impact is not seen until irreversible damage has been done. Deficiencies in essential micronutrients, such as vitamins A and D; B vitamins; and minerals such as iron, zinc, and iodine, can have devastating health consequences ranging from serious physical and cognitive disabilities to life-threatening disorders.

Micronutrient deficiencies continue to be a public health concern in Uganda. And Uganda’s favorable public and private sector environment led to its adoption of a cost-effective food fortification program, to varying degrees since the early 1990s to its current status as a key part of Uganda’s national development strategy to reduce micronutrient deficiencies. Food fortification has been a Ugandan priority since the introduction of universal salt iodization in the early 1990s, with food consumption studies and formative research trials providing strategic guidance in the selection of suitable vehicles for fortification, particularly maize and wheat flours, sugar, and edible vegetable oil.

Since 2002, the Ministry of Health (MOH) has been leading the National Working Group on Food Fortification (NWGFF), a multi-sectoral and multi-disciplinary committee composed of government ministries, departments, and agencies (MDAs); the private sector, including food industries and civil society stakeholders; academia and research institutions; partners; and donors. The NWGFF is responsible for advisory and guidance in designing and regulating the policy environment for food fortification, in addition to tracking implementation of the program.

This report shares an analysis on the food fortification landscape in Uganda, focusing on malnutrition and micronutrient status in Uganda; dietary practices and consumption; analysis of food vehicles for fortification; enabling environment; value chain; advocacy and communication; regulatory monitoring; monitoring and evaluation; and implications of calamities like COVID-19 and the war on food fortification. The study employed a mixed-methods, combining quantitative information from secondary and multiple data sources and reports and stakeholder opinions. We accessed government reports, policy papers, program briefs, and publications by previous U.S. Agency for International Development (USAID) implementing partners and projects engaged in food fortification with the Government of Uganda (GoU). We accessed publicly available data on the enforcement of the fortification mandate from the Uganda National Bureau of Standards (UNBS), and data on household consumption and expenditures from the Uganda Bureau of Statistics (UBOS). We had discussions with multiple stakeholders to document the status of the food fortification program’s various components.

Malnutrition and Micronutrient Status

The Uganda National Panel Survey (UNPS) malnutrition results at the national level shows that stunting remains relatively high at 24 percent, with low levels of wasting at 3 percent, underweight at 8 percent, overweight at 4 percent, and 0.7 percent obesity among children 0–59 months. The survey also found that 8 percent of women 15–49 years were underweight, with high levels of overweight at 19 percent, and obesity at 9 percent. While 17 percent of men 15–49 years were underweight, with moderate rates of overweight at 9 percent, and low levels of obesity at 0.9 percent at the national level. However, the moderate levels of overweight and obesity in children and the high levels in women ages 15–49 years poses a potential risk to diet-related noncommunicable diseases (NCDs). The promotion of healthy diets as part of fortification program will be critical to keep the success of fortification simultaneously with the prevention of NCDs. The UNPS biomarker results show progress in the reduction of vitamin A deficiency to only 5 percent among children 6–59 months and 0.5 percent among women 15–49 years. Folate deficiency

was not found in children or in women, and iodine deficiency remains under control thanks to the program of salt iodization. The country has a 93 percent coverage consumption rate of iodized salt. The median urinary iodine concentration among pregnant women is adequate at 197.5 micrograms per litre ($\mu\text{g/L}$) and among nonpregnant women ages 15–49 at 231.5 $\mu\text{g/L}$, which confirm that this program is operating very well. However, vitamin B12 deficiency and depletion affects 5 percent and 16 percent of preschool age children, respectively, and 9 percent and 29 percent women of child-bearing age, respectively. Although anemia prevalence still remains high (32 percent in preschool age children and 17 percent in women), it is principally due to non-nutritional causes, mainly malaria and infections, rather than iron deficiency, which was found in 14 percent children and 7 percent women (UBOS 2020). Biomarkers of other micronutrients have not been assessed.

Dietary Patterns and Consumption Monitoring

The 2019 World Food Programme report, *Fill the Nutrient Gap: Uganda National Summary Report*, found that “nearly three-quarters (73 percent) of the population cannot afford a nutritious diet, a trend that is widespread across the regions.” Dietary practices in Uganda are suboptimal, especially among children and among women of reproductive age. One-sixth of children ages 6–23 months achieved minimum dietary diversity, 5 in 10 met the requirements of minimum meal frequency, but only one-tenth received a minimum acceptable diet. This shows the likelihood that low dietary diversity contributes to the country’s micronutrient deficiencies.

Food Vehicles Used for Food Fortification

The 2018/19 UNPS reported that 99 percent of salt samples were fortified with iodine concentration ≥ 15 milligrams (mg)/kilograms (kg), 96 percent of fat samples were fortified with vitamin A (with an average content of 13.2 mg/kg), and 99 percent of edible oil samples were fortified with vitamin A (with an average content of 18.5 mg/kg). A follow-up survey in 2019/20 confirmed the same findings. (UBOS 2020; UBOS 2022). Neither wheat flour nor maize mill fortification were assessed. These results indicate that the fortification program is working but frequent and systematic monitoring is still required.

Oil producers receive significant subsidies in the form of a 25 percent waiver on import duties, which has spurred investments in the oil processing sector. These details indicate that the edible oil and fat producers are committed to fortification.

Fortification content at factories and retail stores were not available for this report, which shows that enforcement practices and dissemination of the results require improvement.

The coverage consumption rate of fortified wheat flour is 9 percent, indicating that the food vehicle would not be effective in reaching the majority of the population. However, wheat processing is centrally produced, which provides opportunities for easy and traceable regulatory monitoring. The coverage consumption rate of fortified maize flour is 7 percent. Although 42 percent of the population consume maize flour processed in commercial mills, because of the fragmented structure of the maize milling industry, the real coverage of this fortified staple is low. Adopting fortification could entail upgrading operations and purchasing fortification equipment, with the cost prohibitive for most.

Food Fortification Policy and Legal Framework

Clear laws and approved national standards, policies, and strategies guide the implementation of the food fortification program in terms of the mandatory fortification of salt, maize, and wheat flours; edible oils and fats; as well as the voluntary fortification of sugar. The country also developed a food fortification strategy that extends through 2022, which will need to be renewed for another five years. The currently adopted Ugandan standards for the four food vehicles harmonize with the

regional standards of East, Central, and Southern Africa and, therefore, both support regional trade and align with domestic food fortification regulations.

Coordination Efforts for the Food Fortification Program

The NWGFF, which provides oversight and guidance to establish, improve, and sustain food fortification programs, is coordinated by the MOH's Nutrition Division, which also serves as the secretariat. The NWGFF is chaired by the Director General Health Services at the MOH, and co-chaired by the private sector partners, the Ministry of Trade, Industry and Cooperation, the Office of the Prime Minister, and the Ministry of Education and Sports. The NWGFF's subcommittees span multiple program areas, including (1) policy and planning; (2) production and processing; (3) quality assurance and quality control; (4) marketing and promotion; (5) research and innovation; (6) monitoring, evaluation, and learning; and (7) advocacy and awareness creation.

NWGFF membership is drawn from stakeholder groups involved in food fortification, including—

- government institutions, including MDAs, such as the MOH; Ministry of Trade, Industry and Cooperation; Ministry of Agriculture, Animal, Industries and Fisheries; Ministry of Education and Sports; Ministry of Finance, Planning, and Economic Development; Ministry of Gender, Labour and Social Development; Office of the Prime Minister; UBOS and Uganda Industrial Research Institute; and regulatory bodies, including UNBS, National Drug Authority (NDA), Uganda Revenue Authority (URA)
- private sector actors, such as food vehicle industries, manufacturers and suppliers of vitamin and minerals and/or multi-micronutrient premixes, private food laboratories, industry cooperatives and associations, wholesale and retail organizations, and vendors
- academia and public and private research institutions
- donors and development partners, and civil society organizations (included on a rolling basis).

Advocacy for and Awareness of Fortified Foods

The social marketing and behavior change communication components of mandatory fortification programs encourage consumers to accept fortified products rather than promote the use of fortified products in place of unfortified alternatives—as would be the case in a voluntary food fortification program. Uganda has made considerable progress in enforcing and complying with food fortification regulations. Findings from the 2015 Fortification Assessment Coverage Tool (FACT) survey indicate low household consumption levels, with only salt surpassing the 90 percent level (GAIN 2017). The low demand for and consumption of fortified foods can be attributed to several factors, including knowledge gaps, myths, and misconceptions among priority audiences; limited access to products; and perceived high cost of fortified food products. Uganda plans to integrate messages to increase awareness of fortified foods into the behavior change communication materials promoting diversified and healthy diets. It developed a logo for fortified foods—the F-Logo—to appear on packages, containers, and sacks of fortified foods to increase visibility to consumers. The use of the F-Logo, which was created in the first half of the 2000s to identify fortified staples, is voluntary and participation rates among the fortifying industries remain low, but it is considered an effective strategy for consumers to easily identify fortified foods.

Regulatory Monitoring

Uganda's fortification program follows a system of regulatory monitoring that begins at the border and tracks the quality of raw materials and food products to the household level. The mandate for inspection and testing primarily rests with the UNBS, with the assistance of the URA at border points or ports of entry. The NDA is responsible for regulating the import, transport, and storage of premix by food producers and importers. From the 'Mapping of the regulatory monitoring processes

and systems' exercise conducted in 2022, coupled with the NWGFF key achievements, challenges, simple and low-cost actions, have been documented to strengthen regulatory monitoring for the food fortification program as highlighted in 3.7.1. Details can be found in the report.

Household Monitoring

Monitoring and evaluation (M&E) is critical to a food fortification program and should be developed during a program's design and planning stages. M&E is an opportunity to assess the quality of program implementation and delivery and the degree to which it is reaching its target households and individuals and achieving its nutritional goals. The results of M&E exercises provide program planners and policymakers with the information they need to make decisions about whether to continue, expand, replicate, or end a program (Allen et al. 2006). Uganda recognized the need for a centralized system to track such information and provide regular feedback to the various stakeholders. An M&E framework was developed to implement the food fortification strategy, to be monitored through various surveillance and survey mechanisms implemented by MDAs and the private sector. A few indicators have also been integrated into existing institutions, such as the UBOS, UNBS, MOH, URA, and the food fortifying industries. The 2018/19 UNPS assessed the household-level performance of fortified salt and edible oils, combined with biomarkers associated with micronutrient status, should continue. The country should explore how to sustain the surveys with local resources, including timely dissemination of results.

Conclusion

Uganda's food fortification program has evolved from an initial start with salt iodization to the current approach of using multiple vehicles—salt, edible oils and fats, and wheat and maize flours—to deliver micronutrients to the population. The coverage rates for iodized salt and fortified edible oils and fats are excellent. Potential reach and coverage rates of fortified wheat and maize flours are low, but wheat flour production is centralized and well-regulated, and the GoU only needs to make minor adjustments to the wheat flour fortification program. The maize flour market is fragmented, and most processors are small-scale millers, which creates financial, logistical, regulatory, and human resource challenges to the mandate that all maize flour in Uganda be fortified. One option would be to focus on large-scale maize flour millers based on a targeted approach, and then over a period of years as part of a high-level program aimed at the consolidation and real industrialization of the maize meal production. Significant subsidies in the form waiver on import tax duties has spurred investments in the fortification by the food processing entities.

The efficiency of regulatory monitoring needs to increase, which can ensure uniform quality of fortified foods, including periodic reporting and dissemination of information to track performance and impact of the food fortification program in Uganda.

The extent of micronutrient deficiencies (iron, vitamin B12) and sufficiency of some micronutrients (vitamin A, folate, iodine) uncovered by the UNPS suggests that key priorities should include addressing non-nutritional causes of anemia, with a focus on decreasing inflammation and malaria. It is, therefore, important to assess the status of other micronutrients (such as zinc, vitamin B2, and vitamin D) to determine if their deficiencies are of public health concern or not, to guide prioritization of cost-effective interventions. This information is needed to take decisions about which nutrient to prioritize and where, as well as what type of interventions to promote, that could be effective, feasible, and low cost.

Acknowledgments

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Special thanks also goes to the members of the multi-sectoral National Working Group on Food Fortification for their active participation and input during this exercise.

Acronyms and Abbreviations

A2Z	The USAID Micronutrient and Child Blindness Project
COVID-19	coronavirus disease
dL	deciliter
ECSA	East, Central, and Southern Africa
ECSA-HC	Eastern, Central, and Southern Africa Health Community
ENABLE	Expanding Nutrition Access by Building Capacity, Linking Initiatives, and Enhancing Policy
FACT	Fortification Assessment Coverage Tool
FFI	Food Fortification Initiative
FRAT	Fortification Rapid Assessment Tool
g	gram
GAIN	Global Alliance for Improved Nutrition
GoU	Government of Uganda
GMP	general manufacturing practice
JSI	JSI Research & Training Institute Inc.
kg	kilogram
L	liter
LMIC	low- and middle-income country
µg	microgram
µmol	micromole
M&E	monitoring and evaluation
MDA	ministries, departments, and agency
mg	milligram
min	minimum
ml	milliliter
MOH	Ministry of Health
MT	metric ton
NCD	noncommunicable disease
NDA	National Drug Authority
NWGFF	National Working Group on Food Fortification
pg	picograms
QA	quality assurance
QC	quality control
RBC	red blood cell
RE	retinol equivalent
SD	standard deviation
SPRING	Strengthening Partnerships, Results, and Innovations in Nutrition Globally
UBOS	Uganda Bureau of Statistics
UDHS	Uganda Demographic Health Survey
UIC	urinary iodine concentration
UNBS	Uganda National Bureau of Standards
UNPS	Uganda National Panel Survey
UNICEF	United Nations Children’s Fund
URA	Uganda Revenue Authority
USAID	U.S. Agency for International Development
VITAL	Vitamin A Field Support Project
WHO	World Health Organization

Definition of Terms

Audit (technical audit): The review of written quality control (QC) and quality assurance (QA) procedures and records at the food processors. The audit includes an observation of the fortification processes and it is a component of external monitoring.

Capacity needs: Gaps of knowledge, skills, strengths, and technology among food processors that have become barriers to their meeting food fortification standards and regulations.

Capacity needs assessment: A process of evaluating existing gaps among food processors and determining recommended actions.

Certificate of conformity: This document certifies that batches of fortified flour and premix comply with the country's fortification standard and relevant specifications.

Commercial monitoring: In the context of fortification, this is the process of collecting and analyzing product samples and reviewing product packaging at retail stores, and other food distribution sites, to confirm that the product follows specifications, such as fortificant content and labeling requirements, as outlined in the fortification standards.

Compliance: This refers to the fulfilment of technical specifications as outlined in fortification standards. Food processors typically monitor their compliance through quality control and assurance procedures. In addition, food control authorities monitor food processors for compliance.

External monitoring: These are activities carried out by the government inspectors to ensure that food processors follow specific processes to ensure that fortified foods are (a) produced in a manner that achieves the specifications of the fortification standard and (b) conforms to the other specifications mentioned in the food standard. The two components of external monitoring include technical audits and factory inspections.

Food fortification: The deliberate addition of key vitamins and minerals, such as iron, folic acid, iodine, vitamin A, and zinc to staple foods and condiments to improve the nutritional content and address nutritional gaps in a population.

Food vehicle: The foodstuff that is selected to carry added micronutrients: maize flour, wheat flour, salt, sugar, edible oils and fats, dairy products, and others.

Fortification equipment: Machinery used to add vitamins and minerals at the factory.

Fortificants/premix: The compound that contains the specified micronutrient intended to be added to a food vehicle.

Fortifiable: Any food that is industrially processed by large and formal production centers.

Import monitoring: The actions taken by government inspectors and customs personnel at border points to ensure that fortified foods entering a country adhere to labeling requirements and are fortified according to the country's fortification and food standard.

Inspection (factory inspection): Sampling and testing of foods conducted by government inspectors and laboratory personnel to verify that fortified foods comply with the specifications of the fortification standard.

Internal monitoring: The actions taken by food processors and quality management personnel to ensure that (a) foods are manufactured in a manner that should achieve the specifications of the fortification standard and (b) the final product adheres to all the other requirements mentioned in the food standard, including QC/QA procedures.

Quality assurance: The systematic activities that are necessary to ensure products or services meet defined quality standards. The performance of quality assurance can be expressed numerically as the results of quality control metric exercises.

Quality control: The techniques and assessments that are used to document compliance of food products with established technical standards using objective and measurable indicators. It includes periodic determination that the product complies with the specifications.

Regulatory monitoring: Actions taken by government inspectors to ensure that fortified foods comply with the specifications of the food standards. It includes external monitoring at food processors, import monitoring at border entry points, and commercial monitoring at retail and food distribution locations.

Standard: The technical specification(s) for foods that may include a section about fortification; this may be voluntary or compulsory by law.

Universal Salt Iodization (USI): This refers to the addition of iodine to all salt for human consumption, either used directly by the consumer (table and cooking salt) or added to processed foods.



Photo credit: USAID Advancing Nutrition Uganda. Production personnel at Mandela Millers Limited sealing a 25 kg bag of fortified maize flour.

1.0 Objectives of the Landscape Analysis

1.1 Background

Micronutrient malnutrition, a global challenge, remains unresolved in the world today, affecting both low- and middle-income countries (LMICs), as well as industrialized countries (USAID 2022), and it differs across countries. Micronutrient deficiencies are referred to as “hidden hunger” because they develop gradually over time, and their devastating impact is not seen until irreversible damage has been done. Deficiencies in essential micronutrients, such as vitamins A, D, and B; and minerals, such as iron, zinc, and iodine, can have devastating health consequences ranging from serious physical and cognitive disabilities to life-threatening disorders. These adverse effects go hand-in-hand with low productivity and net economic losses for households, communities, and nations. Yet, micronutrient malnutrition is entirely preventable.

Micronutrients are essential minerals and vitamins that enable the body to produce enzymes, hormones, and other substances vital to proper growth and development. In global public health terms, micronutrient deficiencies—such as iodine, vitamin A, and iron—were recognized as major threats to the health and development of populations worldwide in the 1990s (FAO 2014). However, today there are emerging micronutrient deficiencies, including vitamin D and folate, especially in industrialized countries; and zinc, vitamins B1, B2, B12, and B3 (niacin), especially in LMICs. Relatedly, the triple burden of malnutrition is also prevalent, with the co-existence of micronutrient deficiencies, undernutrition; also, about 1.4 billion persons are overweight or obese (WHO 2015).

The annual costs associated with childhood undernutrition are estimated at UGX 1.9 trillion (U.S.\$899 million), accounting for 5.6 percent of the national gross domestic product (VFP 2012). LMICs bear the disproportionate burden of these nutritional deficiencies.

Micronutrient deficiencies continue to be a public health concern in Uganda. This situation points to the need of the whole population to improve micronutrient intake, but most important women of reproductive age, children under five, adolescents, and the food insecure. But, Uganda’s favorable public and private sector environment led to its adoption of a cost-effective food fortification program, to varying degrees since the early 1990s to its current status as a key part of Uganda’s national strategy to reduce micronutrient deficiencies.

Food fortification is the addition of one or more essential nutrients to an industry-manufactured food, whether or not the food normally contains such nutrients, to prevent or correct a demonstrated deficiency of one or more nutrients in the population or specific population groups (FAO and WHO 2006).

Food fortification achieved through industrial processing is a high-impact and cost-effective intervention in scaling up nutrition efforts to reduce micronutrient deficiencies resulting from an inadequate intake of different micronutrients. The deficiencies can result in impaired cognitive, growth, and development; birth defects; morbidity; and mortality (Allen et al. 2006).

The intervention, when implemented under appropriate conditions, does not require significant changes in eating habits, and it could reach the greatest percentage of the population (i.e., have the

highest coverage rate) in the shortest time frame. However, food fortification should not be a stand-alone intervention—as it complements the long-term nutrition-specific and nutrition-sensitive strategies to strengthen food systems, increase nutritional diversity in people’s diets, and address nutrient deficiencies through national systems (Global Panel on Agriculture and Food Systems for Nutrition 2016).

Food fortification programming in Uganda is supported by the Food and Drug Act, 1959; the Food and Drugs (Food Fortification) Regulations, 2005; and the 2011 amendments for wheat, maize, edible oils, and fats; and the Foods and Drugs (Control of Quality) (Iodated Salt) Regulations, 1997. The existing policies and guidelines of the ministries, departments, and agencies (MDAs), including the national strategy on food fortification and standards, also support the fortification of food vehicles. See [annex table 14](#) for the list of legal and policy frameworks that support food fortification.

Since the inception of the fortification program in 1994, beginning with salt iodization, Uganda has made considerable progress enforcing and complying with food fortification regulations and standards. This has been achieved with the support of the Government of Uganda (GoU) and its various MDAs, the private sector, key civil society organizations, and international and nongovernmental agencies such as the U.S. Agency for International Development (USAID), the Global Alliance for Improved Nutrition (GAIN), and the Food Fortification Initiative (FFI).

1.2 Evolution of Food Fortification in Uganda

Food fortification in Uganda has been a priority since the early 1990s, following food consumption studies and formative research trials that provided strategic guidance on the selection of suitable vehicles for fortification (i.e., salt, cereal flours, sugar, and edible vegetable oils and fats and condiments like bouillon cubes). Over the past three decades, the GoU implemented many changes to its fortification program; some of the critical changes highlighted in this section stand out as key milestones that cumulatively resulted in the program’s current success, as evinced by the program’s coverage rate.

1.2.1 Universal Salt Iodization

In 1994, the GoU commenced implementation of its universal salt iodization strategy, and in 1997, the Ministry of Health (MOH) issued regulations mandating universal salt fortification in Uganda to ensure that only iodized salt was used for human and animal consumption in the country (Onen 2010). The Uganda National Bureau of Standards (UNBS) revised the salt standards in 1999, and the current standards revised in 2012, and harmonized with the East, Central, and Southern Africa (ECSA) regional standards. All these efforts sought to guide implementation of the strategy and ensure the quality of the iodized salt.

1.2.2 Establishment of the National Working Group on Food Fortification

In 2002, the MOH spearheaded the establishment of the National Working Group on Food Fortification (NWGFF), a multi-sectoral and multi-disciplinary committee composed of representatives from the government MDAs, which are responsible for designing and regulating the food fortification policy environment; the private sector, including the food industries implementing the regulation to fortify foods; civil society actors, who advocate for consumer access to fortified

foods; academia, which guides research and innovations; and development partners, who provide technical assistance and logistical support of supplements to foster effective implementation.

1.2.3 Feasibility and Food Consumption Studies Conducted to Scale Up Fortification of Staples

Through a joint public-private partnership, the GoU collaborated with the food processing industry and partners to establish industrial food fortification as a viable public health intervention for delivering essential micronutrients to the population. This effort involved a series of studies, including food consumption and formative research studies (see [annex table 15](#)), to inform the selection of suitable vehicles for fortification. Corresponding national regulations were developed by the GoU with MOH leadership, and standards developed by the UNBS were subsequently harmonized with the ECSCA regional standards to ensure compliance and facilitate trade.

1.2.4 Development and Amendments to Food Fortification Regulations

The Food and Drugs (Food Fortification) Regulations, 2005, expanded the fortification program to include additional food vehicles, calling for industries producing wheat and maize flours, and edible oils and fats, to voluntarily fortify their products.

To promote increased production and distribution of fortified foods, the MOH issued the Food and Drugs (Food Fortification) (Amendment) Regulations, 2011, which made fortification mandatory for different food vehicles, including edible oils, fats, and maize and wheat flours. The regulations require food processors in specified categories¹ to add vitamin and mineral premixes of verified quality to their products according to the national standards (MOH 2011). Implementation of the 2011 regulations effectively began on July 1, 2013, which allowed the private sector a two-year grace period to establish internal systems and processes to accommodate mandatory food fortification.

1.2.5 Food Fortification Standards and Certification Scheme

In 2006, the UNBS developed standards for the fortification of edible oils, fats, and maize and wheat flours. These standards were revised in 2012, 2015, and 2019 to align with the mandatory regulations and the ECSCA. They spell out the content/quantity of specific micronutrients to be added to particular foods and determine the product's compliance with regional standards at multiple levels (i.e., importation, production, and market). The UNBS also integrated food fortification into the mandatory certification scheme for food products as part of national-level efforts to institutionalize and sustain food fortification.

1.2.6 Active Private Sector Engagement with the National Fortification Program

Leveraging the enabling environment created by the public sector, the private sector has continued playing a pivotal role in the implementation of the food fortification program by investing in food fortification equipment, such as micronutrient dossiers and test kits and meeting recurrent costs for premixes, human resources, marketing of fortified food brands, and consumer awareness. As diets change toward increased consumption of processed foods, behavioral change communications promoting healthy, diversified diets will continue to be highly relevant as a complementary strategy. Private manufacturing units are certified by the UNBS, which means that

¹ These are producers of 20 metric tons of maize meal and flour, 10 metric tons of edible oils and fats, and white and brown wheat flours in 24 continuous hours in a single or multiple mill owned by the same producer or that is imported into Uganda should be fortified.

they take part in a standardized process of inspection and testing that ensures both food safety and compliance with the fortification regulations.

Current local production of fortified foods by the private sector in Uganda is contributed by a total of 33 fortifying industries across all the four food vehicles, certified by UNBS. These include 8 fortifying edible oils and fats, 14 industries fortifying wheat flour, 9 industries fortifying maize flour, and 2 industries fortifying salt. Though fortified/iodized salt was largely imported, the two salt local producers are now fortifying under the salt iodization regulation of 1997. The majority of these fortifying industries (67 percent) (22/33) are found in the Central region, and 27 percent (9/33) are found in the Eastern region, followed by the Northern region with only two fortifying industries. (USAID Advancing Nutrition 2023).

1.2.7 External Partnerships and Support

In addition to collaborating with the private sector, the GoU has embraced its partnership with USAID, GAIN, and other international development agencies to advance food fortification efforts in the country. See [annex table 16](#) for details on international and local partner support of and investments in food fortification in Uganda from 1993 to 2019.

1.3 Purpose of the Landscape Analysis

An examination of the current landscape of the food fortification program is essential to provide NWGFF members with an understanding of the current situation and factors that influence various aspects of the fortified foods program from production to consumption, including enforcement of and compliance with regulations and standards, scaling up production, consumption of fortified foods and products, and the sustainability of the program. Our report informs strategic decisions and actions to improve the national program and reduce micronutrient inadequacies, and, in turn, the prevalence and impact of micronutrient deficiencies in Uganda.

1.4 Objectives

This report describes the current landscape for the food fortification program in Uganda, specifically regarding current progress in key areas, such as malnutrition and micronutrient status, including biomarker results in children under five and women ages 15–49; dietary practices and consumption monitoring of fortified foods; analysis of food vehicles for fortification (wheat and maize flours, salt, edible oils and fats); the enabling environment (coordination, policy and legal frameworks, and rewards and sanctions); the value chain (supply and demand side); advocacy and communications; regulatory monitoring; population monitoring and evaluation (M&E) (household monitoring); COVID-19; and the implications of the Russia–Ukraine war on food fortification.

We collaborated with the MOH and the NWGFF for this analysis. We documented key achievements, challenges, opportunities, lessons, and strategic actions to inform future planning for the food fortification program.

2.0 Methodology

We reviewed multiple data sources in carrying out this landscape analysis. We accessed government reports, policy papers, program briefs, and publications by previous USAID implementing partners and projects engaged in food fortification with the GoU, including The USAID Micronutrient and Child Blindness Project (A2Z); Strengthening Partnerships, Results, and Innovations in Nutrition Globally (SPRING) project; the Food Fortification Initiative; and GAIN. We also accessed publicly available data on the enforcement of the fortification mandate from the UNBS, and data on household consumption and expenditures from the Uganda Bureau of Statistics (UBOS).

To document the current status of the food fortification program's various components, we held discussions with multiple stakeholders including representatives of government MDAs, private sector institutions, industries and industry associations, implementing partners, and civil society ([see annex table 17](#)). However, we did not undertake a formal survey for this desk review. The stakeholder discussions were an entry point to collect published and unpublished information about the national fortification program and to seek each stakeholder's opinion on progress made and challenges faced in their area of expertise. We employed a mixed-methods approach, combining quantitative information from secondary sources and reports with stakeholder opinions.

3.0 Findings of the Landscape Analysis

3.1 Malnutrition and Micronutrient Status in Uganda

Although reduced over the years, stunting, wasting, and underweight still persists in Uganda. On the other hand, overweight and obesity exists among the population, coupled with micronutrient deficiencies, affecting particularly women of reproductive age (15–49 years) and children ages 6–59 months (Streifel, Hamel, and Allinder 2018). The co-existence of these forms of malnutrition calls for strengthened efforts in combating the triple burden of malnutrition.

Table 1 shows the several anthropometrical parameters that respond to nutritional status of the different population groups, among other factors. Stunting remains a major nutritional, health, and social challenge, but it must be recognized that this is an indicator of intergenerational general deprivation that does not change very quickly and, hence, is not recommended as an indicator for nutrition programs. The low levels of wasting and medium burden of underweight indicates that there has been some progress in nutrition, health, and social programs in Uganda. However, moderate levels of overweight and obesity in children and its high levels in women ages 15–49 is now disturbing, especially from a fortification program perspective, as all the fortification vehicles are processed food items whose consumption should be limited. The promotion of healthy diets as part of fortification programs will be critical to the success of fortification and noncommunicable diseases (NCDs) prevention efforts.

Table 1. Nutrition Status and Anthropometry of Different Age Groups in Uganda, 2018/19

Age	Stunting (%)	Underweight (%)	Wasting (%)	Overweight (%)	Obesity (%)
Children 0–59 months	23.9	7.7	3.1	3.7	-
Children 5–9 years	16.5	-	3.4 [#]	5.9	1.2
Children 10–14 years	27.5	-	0.5 [#]	4.6	1.3
Women 15–49 years	1.2 [*]	8	-	19.3	8.6

* = short stature; # = thinness

Table 2 and Table 3 shows the status of nutrition biomarkers associated with micronutrient status in children under five and women ages 15–49, respectively.

Based on the Uganda National Panel Survey (UNPS) 2018/19 biomarker results, there is registered progress in the prevention of vitamin A deficiency, as only 5 percent of pre-school age children 6–59 months and 0.5 percent of women of reproductive age (15–49 months) were affected in 2018, with minimal folate deficiency among children and women. The median urinary iodine concentration among pregnant women is adequate at 197.5 micrograms per litre (µg/L) and among non-pregnant women 15–49 years at 231.5 µg/L, which confirms the impact of the salt iodization program

currently at 93 percent consumption coverage in reducing iodine deficiency. However, vitamin B12 deficiency and depletion affects 5 percent and 16 percent of preschool age children, respectively, and 9 percent and 29 percent women (15-49 years) of child-bearing age, respectively. Although anemia prevalence still remains high at 32 percent and children at 17 percent among women, it is principally not attributed to iron deficiency but could possibly be attributed to the high malaria among other infections, because iron deficiency was only 14 percent in children and 7 percent in women (UBOS 2020). Other micronutrient biomarker tests of interest including zinc, but B2 were not assessed.

Table 2. Nutrition Biomarkers, Inflammation, and Infection Status Among Children Ages 6–59 Months

Indicator	%
Anemia (hemoglobin <11.0 g/dL)	31.7
Malaria rapid test kit positive	16
Iron deficiency (inflammation-adjusted serum ferritin <12.0 µg/L)	13.7
Iron deficiency anemia (hemoglobin <11.0 g/dL and inflammation-adjusted serum ferritin <12.0 µg/L)	6.9
Vitamin A deficiency (inflammation-adjusted retinol binding protein <0.81 µmol/L)	25.1
Vitamin A deficiency (modified relative dose response ≥0.060)	5.4
Serum folate deficiency (serum folate <7.0 nmol/L)	1.5
Serum B12 deficiency (serum B12 <203 picograms [pg]/milliliter [ml])	4.7
Serum B12 depletion (serum B12 ≤300 pg/ml)	16.3
Inflammation (C-reactive protein [CRP] ≥5.0 milligram [mg]/L)	20.9
Inflammation (alpha-1–acid glycoprotein ≥5.0 mg/L)	38.9

Source: (UBOS 2020)

Table 3. Nutrition Biomarkers, Inflammation, and Infection Status Among Women Ages 15–49 Years

Indicator	%
Anemia (hemoglobin <12.0 g/dL)	16.7
Malaria rapid test kit positive	5.6
H. pylori rapid test kit positive	10.1
Iron deficiency (inflammation-adjusted serum ferritin <15.0 µg/L)	16.7
Iron deficiency anemia (hemoglobin <12.0 g/dL and inflammation-adjusted serum ferritin <15.0 µg/L)	7
Vitamin A deficiency (retinol binding protein <0.69 µmol/L)	0.9
Vitamin A deficiency (modified relative dose response ≥0.060)	0.5
Median urinary iodine concentration (UIC) µg/L	231.5
UIC <50 µg/L	5
Median UIC µg/L, pregnant	197.5
Serum folate deficiency (serum folate <7.0 nmol/L)	4.1
Red blood cell (RBC) folate deficiency (RBC folate <305.0 nmol/L)	1.4
RBC folate insufficiency (RBC folate <748.0 nmol/L)	18.6
Serum B12 deficiency (serum B12 <203 pg/ml)	9.4
Serum B12 depletion (serum B12 ≤300 pg/ml)	29.1
Inflammation (C-reactive protein [CRP] ≥5.0 mg/L)	7.1
Inflammation (alpha-1-acid glycoprotein ≥5.0 mg/L)	8

Source: (UBOS 2020)

3.2 Dietary Practices and Consumption Monitoring

The challenges of malnutrition in Uganda are multidimensional, including policy-related shortcomings, weak coordination, limited financing, and social and cultural challenges. The 2019 World Food Programme report, *Fill the Nutrient Gap: Uganda National Summary Report*, found that “nearly three-quarters (73 percent) of the population cannot afford a nutritious diet, a trend that is widespread across the regions.” It predicted that an increase in consumption of less nutrient-dense staple crops would likely have a negative impact on micronutrient intake (WFP, OPM, and UNICEF 2019).

3.2.1 Dietary Practices

Dietary practices in Uganda are suboptimal, especially among children and women of reproductive age. Table 4 shows that only 16.6 percent of children ages 6–23 months achieve minimum dietary diversity, 5 in 10 meet minimum meal frequency, and only 10.8 percent receive a minimum acceptable diet. This shows the likelihood that low dietary diversity contributes to the country’s micronutrient deficiencies.

The poor dietary patterns highlight the need to combine dietary interventions with a program to fortify staple foods that will reach marginalized groups with low purchasing power, which reduces their ability to afford a more diverse diet.

Table 4. Dietary Practices of Children Ages 6–23 Months and Women Ages 15–49 Years

Dietary Practices	%
Minimum dietary diversity of ≥ 4 food groups during the previous day, among children ages 6–23 months	16.6
Minimum meal frequency among breastfed and non-breastfed children ages 6–23 months	51.1
Minimum acceptable diet among children ages 6–23 months	10.8
Minimum dietary diversity for women (≥ 5 groups)	15.5

Source: (UBOS 2020)

3.2.2 Food Fortification Alignment to the Concept of Healthy Diets

With rapid urbanization and nutrition transition, dietary patterns shift from the traditional nutrient-rich foods toward more processed foods; as a result, there is growing concern over the triple burden of malnutrition—undernutrition (stunting and wasting), micronutrient deficiencies (hidden hunger), and overnutrition (overweight and obesity—which are potential risk factors for diabetes, hypertension, heart disease, and cancer among the same population).

Food fortification utilizes a food system’s existing consumption patterns and improves the nutritional quality of existing diets. This is beneficial because it does not require major behavior change communications to convince consumers to alter their buying patterns or eating habits, a notoriously difficult task even in industrialized countries (Zamora and De-Regil 2014).

While fortification can provide a safety net for the intake of essential micronutrients added to and consumed with staples and condiments, increased consumption of these foods should not be promoted based on their being fortified, nor should they be considered substitutes for the consumption of recommended portions of fruits, vegetables, legumes, and animal-source foods for a healthy diet (USAID 2022).

3.2.3 Consumption Monitoring of Food Fortification

Consumption monitoring is the periodic assessment of household-level coverage and consumption of adequately fortified foods, as well as the additional micronutrient content provided via fortified foods. It entails the ongoing collection, review, analysis, and use of information and outcomes to assess how the food fortification program is performing against predefined criteria and indicators.

Consumption monitoring of fortified foods has been conducted using independent surveys rather than incorporating micronutrient indicators into other existing surveys. Two of the main approaches used to assess population coverage rates of fortified foods and/or the population's micronutrient status in Uganda are (1) the Fortification Assessment Coverage Tool (FACT) survey, developed and supported by GAIN; and (2) the Uganda Demographic Health Survey (UDHS), developed and supported by USAID. However, neither survey has been conducted as often as required nor have they determined the micronutrient intake profile, rendering them less than ideal for regular consumption monitoring, and estimating food intakes and nutrient inadequacies.

However, Uganda has integrated some food fortification indicators on coverage and program performance into an annual national household survey—the Uganda National Panel Survey (UNPS), and not through an independent micronutrient survey as it is in other countries. Information on consumption monitoring has also been collected from the following independent sources: individual food consumption data through the 24-Hour Survey (diary, directly observed, weighed, or recall) and Food Frequency Questionnaire; the Fortification Rapid Assessment Tool (FRAT); FACT survey; Household Consumption Expenditure Surveys (HCES); Food Balance Sheets; and Industry Production Data (ECSA 2017). These generic surveys usually do not include fortified foods as an explicit item of consumption (except the FACT and FRAT surveys), but the surveys done in Uganda include a nutrition and fortification module.

Consumption monitoring of fortified foods has not been effectively rolled out in Uganda due to inadequate systems to support routine independent surveys because they are usually expensive. However, Uganda has conducted a number of surveys to advise food fortification programming, including feasibility studies that informed the choice of the fortifiable foods currently under the program. The country conducted the FRAT survey in 2002, the Uganda Food Consumption Survey in 2008, the School Surveys on Salt Consumption in 1999, and the FACT survey in 2015. See [annex table 18](#) for details of these surveys.

3.2.3.1 Fortified and Nutritious Food Program Surveillance

The surveillance of fortified and nutritious food programs entails the ongoing and systematic collection, analysis, and interpretation of data and the dissemination of trending information on the micronutrient and health status of a population with regular access to fortified and nutritious food to strengthen and sustain a fortification or nutrition program as impact indicators (Smarter Futures 2014). These use methods distinguished by their practicability, consistency, uniformity, and frequency.

Nutrition surveillance provides information for the routine monitoring of nutritional status and early warning and intervention for disaster mitigation. Some nutritional status indicators considered are biochemical, clinical, anthropometric, and dietary intake. Nutrition M&E systems are essential to measuring program performance and evaluating the impact of interventions. Fortified and nutritious food program surveillance systems range from repeated measurements of small samples of household and school-based surveys, such as sentinel site monitoring, to national-level surveys involving thousands of households, to regional and global surveillance systems. These include nutrition surveillance systems, special surveys such as the UDHS, the National Micronutrient

Surveys, and the National Nutrition Surveys, the health sector health system, the health monitoring information system, and program M&E, as well as from sentinel sites (Obare et al. 2017).

The UDHS, conducted every five years; and the UNPS, conducted every one to three years, collect information on the coverage and performance/adequacy of the fortified foods at the household level. See [annex table 18](#) for details on the surveillance systems for fortified and nutritious foods in Uganda.

3.2.3.2 Program Impact

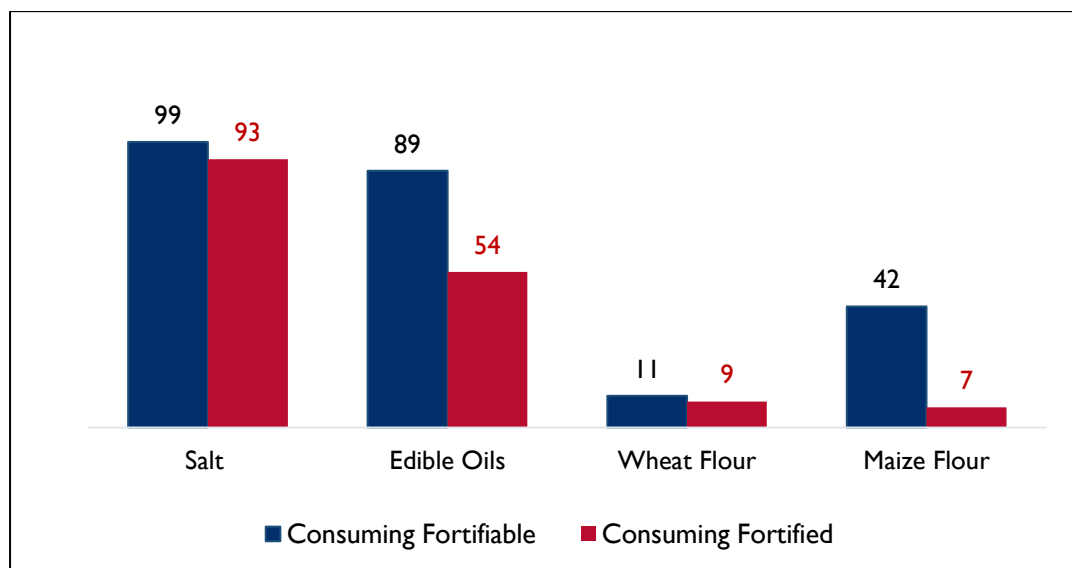
Large-scale fortification is widely recognized as a cost-effective strategy when implemented under an appropriate enabling environment and conditions, to ensure improved micronutrient intake by a population and, thereby, to improve the health and well-being of vulnerable segments. Evaluations of food fortification programs aim to determine their relevance, efficiency, effectiveness, impact, and the extent to which they have achieved their objectives (IFPRI 2016).

The impact of food fortification is expected to occur among populations with regular access to sufficient quantities of foods that are adequately fortified to meet nutritional needs. It is, therefore, imperative to monitor coverage rates of the fortification program among target populations over time (Sablak and Grant 2013). Impact indicators include fortified food reach and coverage (fortified food vehicle purchase by consumers), fortified food vehicle intake by consumers, additional micronutrient intake through food vehicles, and improved nutritional status. The program impact is assessed to establish whether there has been a change in the biological marker or health status from the pre-fortification to the post-fortification period. Examples of the biomarkers used for assessing the impact of fortified food are median UIC for iodine intake, serum retinol for vitamin A status, serum folate for folic acid intake, and serum ferritin for iron status, among others. For high-level consequences for improving the micronutrient status, the indicators include hemoglobin concentration (for estimating anemia prevalence due to multi-causal factors including nutritional causes), the prevalence of neural tube defects (that which determines the status of folate and other micronutrient deficiencies associated with these defects), night-blindness (for vitamin A deficiency), and rickets (for vitamin D deficiency) (Martorell 2015). Changes in the high-level indicators cannot be attributed to the fortification program alone because many other health interventions can change these biomarker levels.

Uganda has conducted studies to determine the current status of the food fortification program: the FACT survey 2015 (GAIN 2017) and the UNPS 2018/19. Figure 1 shows results from the FACT survey on the household coverage of fortifiable and fortified foods, with 54 percent consuming fortified oils, while 89 percent were consuming fortifiable oil; 9 percent consuming fortified wheat flour, and 11 percent consuming fortifiable wheat flour; 7 percent consuming fortified maize flour, while 42 percent were consuming purchased maize flour that was classified as “fortifiable”; 93 percent consuming fortified salt, and 99 percent were consuming fortifiable salt. The survey results also showed disparities between urban and rural areas in fortified food consumption, with 70 percent of urban households consuming fortified edible oil compared with 51 percent in rural areas;

20 percent compared with 6 percent for fortified wheat flour; and 9 percent compared with 6 percent for fortified maize flour, respectively (GAIN 2017).

Figure 1. Household Coverage for Fortifiable and Fortified Foods by the FACT



Note 1: The food sample that was subjected to laboratory testing and met the nutrient cut-off defined in the national standards (GAIN 2017).

Note 2: Regulatory standards in Uganda are set at the production level and do not apply to edible oils and fats collected at the household level.

3.3 Analysis of Food Vehicles for Fortification

This section elaborates on the current status of the fortification of edible oils, fats, salt, and wheat and maize flours, also included in the accompanying tables.

3.3.1 Fortification of Vegetable Oils and Fats with Vitamin A

Vegetable oils and fats are among the identified fortifiable foods due to their frequent consumption at the household level. Fortification of oils and fats started in 2005, and regulations were developed to support voluntary fortification. The regulations were then amended in 2011 to mandate all producers of 10 or more metric tons (MT) of edible oils and fats to fortify them with vitamin A. Vitamin A fortification in areas where deficiency is widespread can reduce the risk of childhood mortality by an average of 23 percent (Imdad et al. 2017).

The prevalence of vitamin A deficiency among children under five has decreased over time. Currently, the prevalence of low serum retinol, using the most preferred modified relative dose response (mRDR) method of testing, was determined in 5 percent in children and 0.5 percent in women 15–49 years old by the UNPS 2018/19. These results show that vitamin A deficiency is no longer a public health problem in Uganda. This prevalence of low serum retinol levels aligns with major programmatic efforts to reduce vitamin A deficiency, including the mandatory fortification of edible oils and fats, supplementation in children ages 6–59 months, and biofortification of orange-fleshed sweet potatoes. [Table 5](#) gives an overview of the fortification of edible oils and fats with vitamin A and describes the various components of the program, including standards and legislation, coverage, production-related matters (e.g., supply, capacity, and compliance), regulatory monitoring, and consumption and impact monitoring.

About half of Ugandan households consume oil fortified with vitamin A and with a content high enough to contribute with a high proportion of the daily requirements of the vitamin. The UNPS national data of 2018/19 on adequacy of fortification in oil and fat samples collected at households showed that 82.6 percent of the edible oil samples showed presence of vitamin A at the household

level with a mean retinol content of 18.5 mg/kg, which means that most samples of oil were found as fortified, and with amounts enough to provide a large contribution to the daily requirements of this vitamin A among the population. However only 38.8 percent and 42.9 percent of fortified edible oil was within the 20–40 mg/kg of the national standards, which is a criterion applicable only at the production or factory level (UBOS 2020; UBOS 2022). Retinol levels of 18.5 mg/kg would supply 92µg to 185µg of vitamin A assuming the edible oil intake is 5–10 g/day, thus contributing to 18–37 percent of the daily vitamin A requirements of an adult woman, which possibly could be the main source of vitamin A. The vitamin A intake depends on the amount of the edible oil consumed, and should be within the recommended daily intake. These results indicate that the edible oil fortification program is working; however, frequent and systematic monitoring is still required to maintain the quality of this program.

The UNPS also found that 45.9 percent of cooking fat was fortified with a mean retinol content of 13.2 mg/kg and a median of <6.0 mg/kg. However, only 9.4 percent of fortified edible oil was within the 20–40 mg/kg of the national standards, which is applicable only at the production or factory level. The limit of detection for evaluating retinol in edible oils and fats in this study was 6 mg/kg. This means that more than half (54.1 percent) of the edible fat samples were either not fortified to begin with or no longer contained detectable concentrations of vitamin A by the time it reached the household (UBOS 2020; UBOS 2022).

Fortification content at industry and retail stores were not available for inclusion in this report, which shows the need for routine information sharing and dissemination of the results of compliance results.

Table 5. Current Status of Edible Oils and Fats

Vehicle focus	Vegetable oils and fats Source of oils/fats: palm, soybean, sunflower, and cotton															
Micronutrient deficiency focus	Vitamin A															
Requirement of vitamin A in fortified oils and fats	<table border="1" style="width: 100%; border-collapse: collapse;"> <thead> <tr> <th rowspan="2" style="background-color: #a0c0ff;">Nutrient</th> <th rowspan="2" style="background-color: #a0c0ff;">Fortificant</th> <th colspan="2" style="background-color: #a0c0ff;">Limit (as retinol) mg/kg</th> <th rowspan="2" style="background-color: #a0c0ff;">Test Method</th> </tr> <tr> <th style="background-color: #d3d3d3;">Minimum</th> <th style="background-color: #d3d3d3;">Maximum</th> </tr> </thead> <tbody> <tr> <td style="text-align: center;">Vitamin A</td> <td style="text-align: center;">Vitamin A (retinyl) palmitate</td> <td style="text-align: center;">20</td> <td style="text-align: center;">40</td> <td style="text-align: center;">AOACk 2001.13</td> </tr> </tbody> </table>				Nutrient	Fortificant	Limit (as retinol) mg/kg		Test Method	Minimum	Maximum	Vitamin A	Vitamin A (retinyl) palmitate	20	40	AOACk 2001.13
Nutrient	Fortificant	Limit (as retinol) mg/kg		Test Method												
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Vitamin A	Vitamin A (retinyl) palmitate	20	40	AOACk 2001.13												
Legislation	<p>Law: Food and Drugs Act 1959 (chapter 278)</p> <p>Policy: Food and Drugs (Food Fortification) (Amendment) Regulations, 2011. Mandates fortification with a specified premixed formulation of vitamin A for all industrial mills producing 10 MT or more of edible oil or fat in 24 continuous hours at one or more mills owned by the same producer and for all edible oils and fats imported into Uganda (MOH 2011).</p> <p>Standards: Fortified Edible Oils and Fats (Source: US_EAS_769_2019 UNBS Schedule of Standards).</p>															

Coverage	<p>Ninety percent and 32 percent of households, report consuming fortifiable edible oils and cooking fats^a, respectively. Of the 90 percent who consumed fortifiable oils, 54 percent of the samples were actually fortified. The UNPS-2018 found that 83% of oil samples and 46% of vegetable fat samples were fortified.</p> <p>^aThe food sample that was subjected to laboratory testing and met the nutrient cut-off defined in the national standards (GAIN 2017).</p>																																																
Production, supply, and utilization of edible oils and fats	<table border="1" style="width: 100%; border-collapse: collapse; text-align: center;"> <thead> <tr> <th colspan="4" style="background-color: #cccccc;">Domestic Supply 1,000 MT/year</th> <th colspan="3" style="background-color: #add8e6;">Domestic Utilization 1,000 MT/year</th> <th style="background-color: #cccccc;">Per Capita Supply</th> </tr> <tr> <th style="background-color: #cccccc;">Production</th> <th style="background-color: #cccccc;">Imports</th> <th style="background-color: #cccccc;">Exports</th> <th style="background-color: #cccccc;">Total</th> <th style="background-color: #add8e6;">Processed</th> <th style="background-color: #add8e6;">Loss</th> <th style="background-color: #add8e6;">Food</th> <th style="background-color: #cccccc;">Food/year/kg</th> </tr> </thead> <tbody> <tr> <td>153</td> <td>309</td> <td>51</td> <td>359</td> <td>-</td> <td>-</td> <td>357</td> <td>8</td> </tr> </tbody> </table> <p>Source: Food balances 2010–2019 Global, regional and country trends FAOSTAT Analytical Brief 40 (see annex table 19 for details on the trends in domestic supply, utilization, and per capita supply from Food Balance Sheet 2013 to 2018, and Food Balance for 2019).</p>	Domestic Supply 1,000 MT/year				Domestic Utilization 1,000 MT/year			Per Capita Supply	Production	Imports	Exports	Total	Processed	Loss	Food	Food/year/kg	153	309	51	359	-	-	357	8																								
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Certified fortifying industries and products/brands²	<p>Number of industries with valid certified fortified products: 11 Number of valid certified fortified products/brands: 31</p> <p>See details in annex tables 20 and 21.</p>																																																
Production capacity (installed versus actual) of fortifying industries	<p>Capacity needs assessment findings (USAID Advancing Nutrition Uganda 2022)</p> <p>Number of industries that are fortifying: 8</p> <p>Average installed capacity of fortifying industries: 458 MT/day</p> <p>Average actual capacity of fortifying industries: 309/day</p>																																																
Compliance status at factory Level	<p>Compliance data not accessible at production/factory level</p>																																																
Fortification conditions at household level	<p style="text-align: center;">Amount of vitamin A in edible oil and fats samples</p> <table border="1" style="width: 100%; border-collapse: collapse; text-align: center;"> <thead> <tr> <th rowspan="2">Survey Period</th> <th rowspan="2">Food Vehicle</th> <th>Not Fortified <6 mg/kg^a</th> <th>Fortified 6–20 mg/kg</th> <th>Fortified 20–40 mg/kg</th> <th>Fortified ≥40 mg/kg</th> </tr> <tr> <th>%</th> <th>%</th> <th>%</th> <th>%</th> </tr> </thead> <tbody> <tr> <td rowspan="2">2018/19</td> <td>Edible oils</td> <td>17.4</td> <td>42.6</td> <td>36.6</td> <td>3.4</td> </tr> <tr> <td>Edible fats</td> <td>54.1</td> <td>32.4</td> <td>6.4</td> <td>7.1</td> </tr> </tbody> </table> <p>Source: (UNPS 2018/2019)</p> <p>^a The limit of detection for evaluating retinol in edible oils and fats in the UNPS study was 6 mg/kg.</p> <p style="text-align: center;">Proportion of edible oil and fats samples fortified with vitamin A</p> <table border="1" style="width: 100%; border-collapse: collapse; text-align: center;"> <thead> <tr> <th rowspan="2">Survey Period</th> <th rowspan="2">Food Vehicle</th> <th>Fortified <20 mg/kg^a</th> <th>Fortified 20–40 mg/kg^a</th> <th>Fortified >40 mg/kg^b</th> <th>Mean Standard Deviation (SD) Retinol Content</th> </tr> <tr> <th>%</th> <th>%</th> <th>%</th> <th>mg/kg</th> </tr> </thead> <tbody> <tr> <td rowspan="2">2018/19</td> <td>Edible oils</td> <td>60.0</td> <td>38.8</td> <td>1.2</td> <td>18.5 (17.1)</td> </tr> <tr> <td>Edible fats</td> <td>86.6</td> <td>9.4</td> <td>1.4</td> <td>13.2 (23.1)</td> </tr> <tr> <td>2019/20</td> <td>Edible oil</td> <td>52.4</td> <td>42.9</td> <td>4.7</td> <td>Not Available</td> </tr> </tbody> </table>	Survey Period	Food Vehicle	Not Fortified <6 mg/kg ^a	Fortified 6–20 mg/kg	Fortified 20–40 mg/kg	Fortified ≥40 mg/kg	%	%	%	%	2018/19	Edible oils	17.4	42.6	36.6	3.4	Edible fats	54.1	32.4	6.4	7.1	Survey Period	Food Vehicle	Fortified <20 mg/kg ^a	Fortified 20–40 mg/kg ^a	Fortified >40 mg/kg ^b	Mean Standard Deviation (SD) Retinol Content	%	%	%	mg/kg	2018/19	Edible oils	60.0	38.8	1.2	18.5 (17.1)	Edible fats	86.6	9.4	1.4	13.2 (23.1)	2019/20	Edible oil	52.4	42.9	4.7	Not Available
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² See list of certified products under UNBS scheme at <https://unbs.go.ug/e-services/certified-products/>. Accessed on Dec 5, 2022

	<p>Source: (UBOS 2020 and UBOS 2022) ^a National standard as defined by the UNBS (2017). ^b Regulatory standards in Uganda are set at the production level and do not apply to edible oils and fats collected at the household level.</p> <p>Of the edible oils and fats samples collected at the household level, over 99.9 percent had vitamin A.</p>
Enabling environment characteristics	<ul style="list-style-type: none"> Oil processors were early adopters of voluntary fortification, which eased the switch to mandatory fortification of processors of 10 MT or more, creating a competitive market of unfortified products, especially for micro and small processors. Food fortification efforts are aligned with the goals of reducing the consumption of fats and oils as part of a healthy diet to prevent overweight and obesity, a predisposing risk factor to NCDs.
Value chain characteristics (supply and demand-side)	<ul style="list-style-type: none"> Oil quality impacts the stability and retention of vitamin A. Oil processors are employing various strategies to increase operational viability (e.g., automating processing technologies to ensure high output and maximize profits). Domestically based, organized farmer groups are producing high yielding oil seeds to maximize oil extraction. The reliance of some regions on unrefined and unfortified oil from local producers poses a marginal risk of vitamin A deficiency in vulnerable communities, who need to be targeted. External raw-base-importation of crude palm oil into Uganda has attracted industries to fortify edible fats. Marketing and product differentiation. It is important for marketers to distinguish their product or brand from competitors or from their own products or brands. The oil sector value chain is defined, traceable, and easy to regulate. There is an increasing trend toward processing red palm oil, especially for edible fat processing and fortification.
Regulatory monitoring	<ul style="list-style-type: none"> Uganda has built national and regional laboratory testing capacity for vitamin A (proficiency testing schemes, methods validation, and laboratory recognition schemes). Most fortified oils and fats are centrally produced, providing an opportunity for easy monitoring. Routine factory-level monitoring is a critical control point for ensuring consistency and compliance with standards, especially regarding vitamin A in oils. Import monitoring of premixes and fortified oils and fats should ensure consistent compliance with Ugandan standards.
Consumption and impact monitoring	<ul style="list-style-type: none"> The UBOS conducts measurements of vitamin A (retinol concentration), vitamin A deficiency, and the quality of fortified edible oils and fats among target groups through the UNPS, with support from donors and partners.
Main players	<p>GoU MDAs, Academia and Research Institutions Donors: USAID, Bill & Melinda Gates Foundation Implementers: National government, oil and fat producers, refiners and importers, private sector institutions and associations Partners: JSI Research & Training Institute Inc. (JSI), GAIN Projects: Vitamin A Field Support Project (VITAL); MOST; The USAID Micronutrient and Child Blindness Project (A2Z); Food Fortification Program;</p>

Achievements

The fortification of edible oils and fats has been successful. Over 82.6 percent of edible oils and fats in Uganda are fortified with vitamin A, in part because of a centralized and formal industry that is produced based on regulations and standards. High levels of coverage and a reduction in vitamin A deficiency rates illustrate the feasibility of fortifying oils and fats with vitamin A. The indicators to measure consumption of edible oils and fats, and compliance with regulations, are part of the national population and household surveys, including the UNPS.

Production-level sample testing of edible oils and fats is conducted annually under the UNBS certification scheme, though the information is not widely disseminated beyond the factory and UNBS.

Large-scale oil processors have attained operational efficiencies and are able to benefit from various product outputs from the raw material (crude oil). Such products include fortified refined oil, soap, fertilizer, plastics, and renewable energy, which renders their operations economically sustainable.

Challenges

Data on compliance of fortified foods using standards at production/factory level is not easily available to track program performance, as compliance data at household level cannot be used to ascertain compliance rates of fortified foods because the standards used is meant for testing quality and adequacy at factory level. However, testing adequacy or quality of fortified food samples at the household level indicate how much micronutrients are present to meet the daily nutrient requirement while giving an allowance of nutrient losses from production to household level and household losses due to poor storage and hygiene practices.

The reliance on unrefined and unfortified oil from local producers poses a risk of vitamin A deficiency among vulnerable communities, who should be identified and targeted with appropriate vitamin A interventions to prevent the deficiencies.

Lessons Learned

Activities, including tax incentives for purchasing manufacturing equipment and import duty waivers for fortificants/premixes; technical assistance through training; and donations of equipment, including micronutrient dossiers identified, seem to have attracted significant investments in recent years for scaling up fortification in the oil processing sector.

A significant innovation in the oil subsector is the introduction of plastic pouches/packaging of cooking oil in sizes ranging from 25–1,000 ml. This allows for price differentiation and increases the accessibility and affordability of the product to those in a lower socioeconomic stratum; it also minimizes the adulteration of oils and fats by unscrupulous traders. The use of opaque plastic pouches protects the vitamin A in oil from being oxidized by harmful ultraviolet rays.

Opportunities

The existing private sector platforms promote self-regulation of their product, leading to increased coverage of fortified oil and fats. The production of fortified oil is adequate for domestic consumption, and an opportunity exists for the exportation of the surplus to the East African regional market and beyond.

Recommendations

The fortification of edible oils and fats with vitamin A is on track. Internal monitoring of industries should be maintained to sustain compliance along the production and market value chain.

External monitoring (inspection and auditing) by the governmental institutions should be systematized to establish practical, simple, and low-cost procedures, whose results should be disseminated periodically (could be six months) for program performance tracking and real time decision-making.

3.3.2 Fortification of Salt with Iodine

Iodine deficiency has multiple adverse effects on growth and development caused by inadequate thyroid hormone production, normally termed *iodine deficiency disorder (IDD)*. Iodine deficiency leads to preventable mental retardation and increased child mortality in children under five, while women of childbearing age suffer miscarriages and stillbirths.

The UNPS 2018/19 results on adequacy of fortification in salt samples collected at households showed 99.3 percent of the samples were compliant with iodine content of >15 mg/kg at household level and this is considered adequate at household level according to the World Health Organization (WHO) because some decay of the iodine may occur (WHO 2007). The mean iodine content was at 36.1 mg/kg with 80.7 percent within the 30–60 mg/kg of the national standards, which is applicable only at the production or factory level. These results indicate that the salt iodization program is working; however, frequent and systematic monitoring is still required. The UNPS also estimates the median UIC among non-pregnant women ages 15–49 to be 231.5 µg/L, which is within the 100–300 µg/L range recently recommended by the experts' group in IDD for adequate iodine nutrition. The UIC among pregnant women is 197.5 µg/L, which is within WHO's recommended range (higher than 150 µg/L). These results show that iodine deficiency disorders are no longer a health problem in the country.

In 1994, the GoU commenced implementation of its universal salt iodization strategy, including developing and publishing standards intended to reduce the high rates of iodine deficiency and related disorders, such as goiter. In 1997, the MOH issued regulations mandating universal salt fortification to ensure that only iodized salt was consumed by humans and animals in the country (Onen 2010). In addition, the UNBS revised the salt standards in 1999 and 2012. The current standard is the (US EAS 35:2021-Fortified Edible salt specification, second edition), in an effort to guide implementation of the strategy and ensure the quality of fortified edible salt.

Salt fortification with iodine is an important food vehicle due to the high levels of its consumption in Uganda: 99.5 percent. Table 6 shows the progress of salt fortification with iodine.

Table 6 also provides an overview of salt fortification with iodine and describes the various components of the program, including standards and legislation, coverage, production-related matters (supply, capacity, compliance), regulatory monitoring, and consumption and impact monitoring.

Table 6. Current Status of Edible Salt Fortification

Vehicle focus	Salt														
Micronutrient deficiency focus	Iodine														
Requirement of iodine in salt (mg of potassium iodate per kg of salt)	<table border="1"> <thead> <tr> <th rowspan="3">Nutrient</th> <th rowspan="3">Fortificant</th> <th colspan="2">Requirement, mg/kg</th> <th rowspan="3">Test Method</th> </tr> <tr> <th colspan="2">Regulatory Levels</th> </tr> <tr> <th>Min.</th> <th>Max.</th> </tr> </thead> <tbody> <tr> <td>Iodine</td> <td>Potassium Iodate</td> <td>30</td> <td>60</td> <td>AOAC 925.56</td> </tr> </tbody> </table>	Nutrient	Fortificant	Requirement, mg/kg		Test Method	Regulatory Levels		Min.	Max.	Iodine	Potassium Iodate	30	60	AOAC 925.56
Nutrient	Fortificant			Requirement, mg/kg			Test Method								
				Regulatory Levels											
		Min.	Max.												
Iodine	Potassium Iodate	30	60	AOAC 925.56											
Legislation	<p>Law: Food and Drugs Act 1959 (chapter 278)</p> <p>Policy: Foods and Drugs (Control of Quality) (Iodated Salt) Regulations, 1997</p> <p>Standards: Fortified edible salt specification, second edition (Source: US EAS 35:2021 UNBS Schedule of Standards)</p>														
Coverage	<p>Of the 99 percent of salt that is considered fortifiable, 93 percent of household consume iodized salt.^a</p> <p>^aThe food sample that was subjected to laboratory testing met the nutrient cut-off defined in the national standards (GAIN 2017).</p>														
Micronutrient status	<p>Median urinary iodine concentration (mUIC among nonpregnant women ages 15–49 is 231.5µg/L.^a</p> <p>The median UIC among pregnant women is 197.5 µg/L.^c</p> <p>^a Median UIC (above 300 µg/L) in non-pregnant women is labeled as iodine intake “above requirements” and may pose a slight risk of more-than-adequate iodine intake.</p> <p>The WHO mUIC criteria for pregnant women classifies a mUIC between 150–249 µg/L as “adequate” iodine status for pregnant women (WHO 2016).</p>														
Certified fortifying industries and products/brands³	<p>Number of industries with valid certified fortified products: 2</p> <p>Number of industries with expired certification of fortified products: 1</p> <p>Number of valid certified fortified products/brands: 4</p> <p>Number of fortified products/brands with expired certification: 1</p> <p>See details in annex tables 20 and 21.</p>														
Production capacity (installed versus actual) of fortifying industries	<p><i>Capacity needs assessment findings</i> (USAID Advancing Nutrition Uganda 2022)</p> <p>Number of industries that are fortifying: 2</p> <p>Average installed capacity of fortifying industries: 310 MT/day</p> <p>Average actual capacity of fortifying industries: 80 MT/day</p>														
Compliance status at factory level	Compliance data not accessible at production/factory level.														

³ See list of certified products under the UNBS scheme at <https://unbs.go.ug/e-services/certified-products/>.

Fortification conditions at household level	Proportion of salt fortified with iodine						
	Survey Period	Food Vehicle	Fortified ≥ 15 mg/kg ^b	<30 mg/kg ^a	30–60 mg/kg ^a	>60 mg/kg ^a	Mean (SD) Iodine Content
			%	%	%	%	mg/kg
	2018/19	Salt (composite samples)	99.3	18.7	80.7	0.7	36.1 (8.6)
Source: (UBOS 2020) ^a Regulatory standard are set at the production level in Uganda and do not apply to salt collected at the household level. ^b Fortified salt defined as salt containing 15 mg/kg iodine is sufficient for satisfying sufficient iodine when the daily consumption of salt is 5 g/day or more.							
Enabling environment characteristics	Mandatory legislation for salt iodization has been in place since 1997; current standards were reviewed in 2021. Iodine deficiency disorders are still primarily dealt with as a vertical program separate from other fortification efforts, including regulatory monitoring.						
Value chain characteristics (supply and demand-side)	Iodized salt is largely imported in Uganda, with a short value chain that can be regulated efficiently through imports or at border points, distribution/market, and at consumption or household. Periodical assessment of UIC should continue to prevent any excessive intakes of iodine coming from other sources beyond iodized salt. Emerging salt iodization industries should produce salt with the same quality than imported product.						
Regulatory monitoring	Import monitoring is a critical control point achieved through joint monitoring by the UNBS and the Uganda Revenue Authority (URA) via the Automated System for Customs Data (ASYCUDA) World Interfere, and capacity building of government inspectors at ports of entry. Rapid test kits are used at customs for verification of imported salt quality before clearance. National and regional laboratory testing capacity has been established for iodine (proficiency testing schemes, methods validation, and laboratory recognition schemes).						
Consumption and impact monitoring	Quality and coverage monitoring for the universal salt iodization program is conducted at the household level though sample testing of specific population subgroups, such as pregnant and lactating women and children ages 6–59 months. The measurement of UIC/universal salt iodization indicators are integrated into national M&E of household-level systems to better reflect the iodine status of key target groups and subgroups; it is conducted through the UNPS and the UDHS by the UBOS, with support from donors and partners. National authorities must keep the UIC surveillance to prevent any weaknesses or risk of the program.						
Main players	GoU MDAs, Academia, and Research Institutions Donor: USAID Implementers: National governments; salt producers, importers, private sector institutions, and associations Partners: United Nations Children’s Fund (UNICEF), JSI, GAIN						

Achievements

Uganda has been recognized by the ECSA region for its successful salt iodization program, which has achieved household coverage of over 93 percent. Uganda has registered success in implementing the salt regulations, with 99.3 percent of all salt adequately fortified and 80.7 percent of iodized salt within the standard requirements. These rates may be largely attributed to the fact that the majority of the salt is imported from Kenya, facilitating compliance monitoring at points of entry/import. The local production of salt is now commencing in Uganda, with only two industries so far fortifying.

Challenges

Even with the national-level success, a reliance in some communities on unrefined salt and rock salt for human consumption poses a risk to iodine deficiency. These communities should be targeted and the appropriate interventions implemented.

Local producers of iodized salt face competition from large-scale importers of iodized salt, as they face high costs of production because all the raw materials are imported.

Lessons Learned

The harmonization of fortification standards among ECSA alliance member countries has greatly facilitated the monitoring of salt at points of entry or import, resulting in all tested salt samples containing adequate amounts of iodine.

Recommendations

Continued effective and routine regulatory monitoring at the point of entry (for imported salt) or the factory level (for local industries), has resulted in consistent quality, adequacy, and safety of salt. While the salt iodization program has been successful in Uganda, routine quality and regulatory enforcement is needed to maintain the periodic documentation of this program.

Local production of iodized salt should be studied to determine its need and viability, and incentives to reduce and promote local production, if feasible.

3.3.3 Fortification of Wheat Flour with Multiple Micronutrients

Wheat flour is among the identified fortifiable foods due to its frequent household-level consumption. The fortification regulation of wheat flour was introduced in 2011 to mandate all producers of wheat flour to fortify with the specified vitamins and minerals. [Table 7](#) provides an overview of the fortification of wheat flour with multiple micronutrients: iron, zinc, vitamin A, and B vitamins: B9 (folate), B12 (cobalamin), B1 (thiamin), B6 (pyridoxine), and B3 (niacin). It also describes the program's various components, including standards, policies, legislation, coverage, production-related matters (supply, capacity, and compliance), regulatory monitoring, and consumption and impact monitoring.

The coverage rate of wheat flour is 9 percent according to FACT, indicating that the food vehicle would not be effective at reaching the majority of the population.

Table 7. Current Status of Wheat Flour Fortification

Vehicle focus	Wheat flour																																																				
Micronutrient deficiency focus	Iron; zinc; vitamin A; B vitamins: folate (B9), cobalamin (B12), thiamin (B1), pyridoxine (B6), niacin (B3)																																																				
Requirement for levels of micronutrients in fortified wheat flour	<table border="1" style="width: 100%; border-collapse: collapse;"> <thead> <tr> <th rowspan="2" style="background-color: #a0c0ff;">Nutrient</th> <th rowspan="2" style="background-color: #a0c0ff;">Fortificant</th> <th colspan="2" style="background-color: #a0c0ff;">Limit mg/kg</th> <th rowspan="2" style="background-color: #a0c0ff;">Test Method</th> </tr> <tr> <th style="background-color: #d3d3d3;">Min.</th> <th style="background-color: #d3d3d3;">Max.</th> </tr> </thead> <tbody> <tr> <td>Vitamin A</td> <td>Vitamin A (retinyl) palmitate, spray-dried or equivalent, 75,000 µg retinol equivalent (RE)/g^a (7.5% retinol), min.</td> <td>0.5</td> <td>1.4</td> <td>AOAC 2001.13</td> </tr> <tr> <td>Vitamin B1</td> <td>Thiamine mononitrate, 81% min.</td> <td>4.6</td> <td>NA^b</td> <td>AOAC 953.17</td> </tr> <tr> <td>Vitamin B2</td> <td>Riboflavin, 100% min.</td> <td>3.3</td> <td>NA</td> <td>AOAC 970.65</td> </tr> <tr> <td>Niacin B3</td> <td>Niacinamide, 99% min.</td> <td>30</td> <td>NA</td> <td>AOAC 975.41</td> </tr> <tr> <td>Vitamin B6</td> <td>Pyridoxine hydrochloride, 82% min.</td> <td>3</td> <td>NA</td> <td>AOAC 961.15</td> </tr> <tr> <td>Folate B9</td> <td>Folic acid, 90.5% min.</td> <td>1.1</td> <td>3.2</td> <td>AOAC 2004.05</td> </tr> <tr> <td>Vitamin B12</td> <td>Vitamin B12 (water soluble), 0.1% min.</td> <td>0.01</td> <td>NA</td> <td>ISO 20634</td> </tr> <tr> <td>Zinc</td> <td>Zinc oxide, 80% min.</td> <td>40</td> <td>80</td> <td>AOAC 2011.14</td> </tr> <tr> <td>Total iron</td> <td>Total iron</td> <td>20</td> <td>NA</td> <td>AOAC 944.02</td> </tr> </tbody> </table> <p>^a 1 µg RE = 3.33 IU, RE = retinol equivalent. ^b NA = not applicable. The maximum limits are not necessary because the upper tolerance limits of these nutrients are very high.</p> <p>Note 1: Any other fortificants listed by British Pharmacopoeia, Food Chemical Codex, Merck Index, U.S. National Formulary, European Pharmacopoeia, U.S. Pharmacopoeia, or the Codex Alimentarius Commission (FAO and WHO 2006) may be used.</p> <p>Note 2: Only sodium iron (iii) ethylenediaminetetraacetate (NaFeEDTA) which contains minimum of 12.5 percent of iron, or ferrous fumarate, which contains a minimum of 32 percent iron shall be used as a source of iron so as to provide iron 20–40 mg/kg and 30–50 mg/kg respectively, for wheat flour fortification.</p>	Nutrient	Fortificant	Limit mg/kg		Test Method	Min.	Max.	Vitamin A	Vitamin A (retinyl) palmitate, spray-dried or equivalent, 75,000 µg retinol equivalent (RE)/g ^a (7.5% retinol), min.	0.5	1.4	AOAC 2001.13	Vitamin B1	Thiamine mononitrate, 81% min.	4.6	NA ^b	AOAC 953.17	Vitamin B2	Riboflavin, 100% min.	3.3	NA	AOAC 970.65	Niacin B3	Niacinamide, 99% min.	30	NA	AOAC 975.41	Vitamin B6	Pyridoxine hydrochloride, 82% min.	3	NA	AOAC 961.15	Folate B9	Folic acid, 90.5% min.	1.1	3.2	AOAC 2004.05	Vitamin B12	Vitamin B12 (water soluble), 0.1% min.	0.01	NA	ISO 20634	Zinc	Zinc oxide, 80% min.	40	80	AOAC 2011.14	Total iron	Total iron	20	NA	AOAC 944.02
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Legislation	<p>Law: Food and Drugs Act 1959 (chapter 278)</p> <p>Policy: Food and Drugs (Food Fortification) (Amendment) Regulations, 2011. Mandates fortification with a specified premixed formulation of vitamins and minerals for all white and brown wheat flours produced in 24 continuous hours at one or more mills owned by the same producer or that is imported into Uganda (MOH 2011).</p> <p>Standards: Fortified Wheat Flour (Source: US_EAS_767_2019)</p>																																																				
Coverage	<p>Of the 11 percent of the households that consume wheat flour, 9 percent use fortified wheat flour.^a</p> <p>Most Uganda households buy wheat flour products and just a few have wheat flour at the household level. Coverage of consumption of wheat flour products would be informative.</p> <p>^aThe food sample that was subjected to laboratory testing and met the nutrient cut-off defined in the national standards (GAIN 2017).</p>																																																				

Production, supply, and utilization of wheat and products

Domestic Supply 1,000 MT/year				Domestic Utilization 1,000 MT/year			Pa Supply
Production	Imports	Exports	Total supply	Processed	Loss	Food	Food/year/kg
20	472	55	356	7	14	331	7

Source: Food balances 2010–2019 Global, regional and country trends FAOSTAT Analytical Brief 40 (see [annex table 19](#) for details on the trends in domestic supply, utilization, and per capita supply from Food Balance Sheet 2013 to 2018, and Food Balance for 2019).

Uganda imports and exports wheat flour. The Annual International Trade Statistics by Country published 2020 data on November 14, 2022, shows the imports and exports information⁴:

Imports of wheat grain to Uganda in 2020:

- Russia, 33 percent share (U.S.\$50 million)
- Argentina, 28 percent share (U.S.\$43 million)
- Ukraine, 11.7 percent share (U.S.\$17.7 million)
- Germany, 6.97 percent share (U.S.\$10.5 million)
- Latvia, 4.92 percent share (U.S.\$7.47 million)
- Canada, 3.42 percent share (U.S.\$5.2 million)
- Poland, 3.37 percent share (U.S.\$5.12 million)
- Estonia, 3.35 percent share (U.S.\$5.09 million)
- Czech Republic with a share of 1.93 percent share (U.S.\$2.93 million)
- Lithuania, 1.76 percent share (U.S.\$2.67 million)

Exports of wheat flour from Uganda in 2020:

- South Sudan, 84 percent share (U.S.\$17,900)
- Kenya, 15.1 percent share (U.S.\$3,200)

Certified fortifying industries and products/brands⁵

Number of industries with valid certified fortified product: 9
 Number of industries with expired certification of fortified product: 10

Number of valid certified fortified products/brands: 28
 Number of fortified products/brands with expired certification: 26

See details in [annex tables 20 and 21](#).

Production capacity (installed versus actual) of fortifying industries

Capacity needs assessment findings:
 (USAID Advancing Nutrition Uganda 2022)
 Number of industries that are fortifying: 14
 Average installed capacity of fortifying industries: 264 MT/day
 Average actual capacity of fortifying industries: 181 MT/day

Compliance status at factory level

Compliance data not accessible at production/factory level.

Enabling environment characteristics

Wheat processors adopted mandatory fortification as a default practice due to the legislative requirement. This has created a leveled business environment, making enforcement simpler and no competition among food producers because all wheat flours are expected to be fortified.

⁴ See <https://trendeconomy.com/data/h2/Uganda/1001>.

⁵ See list of certified products under the UNBS scheme at <https://unbs.go.ug/e-services/certified-products/>. Accessed on December 5, 2022.

	<p>ECSA’s harmonized regional standards play a strong role in supporting regional trade, especially for the wheat industries that export across the region.</p> <p>Available tax incentives on premixes (import duty waiver) and manufacturing equipment attracts significant investments in the wheat processing sector.</p>
<p>Value chain characteristics (supply and demand-side)</p>	<p>Ugandan wheat processors primarily rely on imported wheat grains from Ukraine, Argentina, Uruguay, Estonia, Russia, among other European and South American countries, because the locally grown wheat varieties in Kapchorwa are characterized as soft due to the low wheat protein (gluten), which is not preferred for processing.</p> <p>Wheat grain imports to Uganda have been affected by the Russia–Ukraine war and partly by COVID-19. There has also been a rise in prices for some foods that is directly attributable to the war because wheat has become part of the Ugandan diet and wheat imports are largely dependent on Russia and Ukraine. In 2020, Russia represented the largest share of wheat imports to Uganda at 33 percent (approximately U.S.\$50 million). However, in the quarter ending March 2022, Uganda recorded no wheat imports from Russia, only to recover in June 2022 with imports worth U.S.\$1.3 million (Luwedde 2022).</p> <p>Coverage of fortified wheat flour for domestic consumption is adequate, and some is exported to the regional market.</p> <p>The major market is the mass urban population with wheat-based diets and fast-moving consumer goods and products like snacks. Wheat flour can only be sold and distributed as a fortified food.</p> <p>Large-scale wheat processors have attained operational efficiencies and are able to benefit from economies of scale that render their operations economically sustainable.</p>
<p>Regulatory monitoring</p>	<p>Wheat processing is produced in urbanized areas across the country, though mainly centrally produced, and this provides opportunities for easy and traceable regulatory monitoring.</p> <p>Although large-scale producers have invested in internal laboratory capacities to improve internal quality controls, some lack the internal capacity to analyze fortified food products; having access to reference laboratories is important.</p> <p>The UNBS conducts testing of wheat samples at the retail level (market surveillance) to monitor the quality of fortified wheat flour; however, this is not routinely done due to limited resources and other priorities.</p> <p>The certification scheme is a reliable source of factory-level compliance data, especially for the flour industry.</p>
<p>Consumption and impact monitoring</p>	<p>The UNPS focuses solely on wheat flour consumption; it does not include fortified wheat flour and products. Sample collection and testing has not been prioritized.</p> <p>Measuring household-level consumption of fortified wheat is complex because most households buy products such as bread, chapati, and other wheat-based foods. Many assume that because all wheat producers are required to fortify their products, all wheat flours are therefore fortified. However, this assumption does not account for compliance gaps.</p>

Main players

Government of Uganda MDAs, Academia and Research Institutions
Donors: USAID, Bill & Melinda Gates Foundation
Implementers: National governments, wheat processors, refiners and importers, private sector institutions and associations
Partners: JSI, GAIN, International Science and Technology Institute, Academy for Educational Development, Food Fortification Initiative, International Federation for Spina Bifida and Hydrocephalus, Nutrition International Projects: VITAL, A2Z, Food Fortification Program, SPRING, ENABLE, USAID Advancing Nutrition

Key Achievements

The majority of fortified wheat flour processors have large-scale central processing facilities that have embraced innovative technologies, resulting in consistent production of premium quality products that meet national standards. Mandatory wheat fortification, regardless of production capacity, has allowed for good coverage of fortified wheat flour, although compliance rates at the production level needs to be periodically measured and shared with key stakeholders.

Challenges

Ugandans consume more maize flour than wheat flour and, accordingly, fortified wheat flour reaches less than 10 percent of the population. Wheat grain is imported, most coming from Ukraine and Russia. As a result, supply chain shocks like the COVID-19 pandemic and the Russia–Ukraine war, and their high associated costs, have made it difficult to access raw grain. Data on regulatory standard compliance of fortified brands and industries of wheat flour are not available.

Lessons Learned

We find that the mandatory fortification of wheat flour has led to a consolidation of the processing industries, leading to simpler enforcement of standards with fewer production units, although this has also led to less competition, which can lead to higher prices (although they are not yet evident).

Uganda has not been able to produce substantial quality wheat grains (soft and hard wheat) to supply local wheat milling industries, even with the fertile soils. Relatedly, most wheat grains produced in the country is soft and not preferred for processing.

Opportunities

Wheat products could become a larger part of the Ugandan diet, and this could create higher demand by consumers for fortified wheat flour. This combined with the presumed good compliance by the industry could further reduce the cost of production and the burden of micronutrient deficiencies among the populations consuming wheat flour products.

Recommendations

The Russia–Ukraine war has mainly affected Uganda’s wheat grain imports, which feed directly into consumer prices. Uganda, therefore, needs to explore substantial domestic wheat grain production and seek alternative markets for its exports. An increased emphasis on routine internal monitoring and testing by the production units would be ideal. While promoting awareness about fortified wheat flour and products is critical to increasing consumption, these efforts must be made in the context of healthy diets to minimize the risk of NCDs.

3.3.4 Fortification of Maize Flour with Multiple Micronutrients

Maize flour is one of the identified fortifiable foods due to its frequent consumption at the household level. Fortification of maize flour started in the early 2000s; in 2005, standards were developed to support voluntary fortification. The regulation was enacted in 2011 to mandate all producers of maize flour processing 20 MT or more to fortify with the specified vitamins and minerals.

Table 8 gives an overview of the fortification of maize flour with multiple micronutrients: iron; zinc; vitamin A; and B vitamins: B9 (folate), B12 (cobalamin), B1 (thiamin), B6 (pyridoxine), and B3 (niacin). It also describes the program's various components, including standards and legislation, coverage, production-related matters (supply, capacity, and compliance), regulatory monitoring, and consumption and impact monitoring. The coverage rate of maize flour is 7 percent, although 42 percent of the population was estimated as consuming fortifiable maize flour produced by either micro-, small-, medium-, or large-scale millers and not processed at the household.

This gap is due to the fragmented structure of the maize milling industry, with large-scale industries that fortify maize flour concentrated in urban areas, while most maize flour is produced by small-scale millers not subject to the mandatory fortification regulations because they produce less than the required 20 MT of flour per day. To produce fortified maize flour, the millers would have to meet the Uganda national standards for fortification, which could entail upgrading operations and purchasing fortification equipment, the cost of which is prohibitive for most millers.

An economic costing study of small-scale fortification done in Uganda in 2018 looked at different scales of maize milling operations, including micro- (<5 MT/day), small- (5–20 MT/day), and medium-scale (>20 MT/day) (SPRING 2018). The incremental costs of fortifying maize flour at different scales of operation were compared to similar costs of fortifying wheat flour, which has been a long-running program. The study reported that the operating costs per MT of flour produced by micro-scale millers was U.S.\$159, for small-scale millers it was U.S.\$64, and it was U.S.\$24 for medium-scale millers. The incremental costs of fortification for micro-, small-, and medium-scale maize millers was U.S.\$11.65, U.S.\$8.97, and U.S.\$10.54 per MT, respectively. These costs were higher than the incremental costs of fortification for large-scale wheat fortification (U.S.\$3.05 per MT) (SPRING 2018).

The study concluded that the cost of milling equipment, certification, and investment in machinery upgrades present prohibitive barriers to participation by small-scale enterprises in a mandatory maize flour fortification program. It suggested that it would be cost efficient to explore targeted maize flour fortification, rather than a mandatory program supported by large-scale industries, and can be reconsidered in the future after the industries are more consolidated.

Table 8. Current Status of Maize Flour Fortification

Vehicle focus	Maize flour																																																								
Micronutrient deficiency focus	Iron, zinc, vitamins A, B vitamins: folate (B9), cobalamin (B12), thiamin (B1), pyridoxine (B6), niacin (B3)																																																								
Requirement for levels of micronutrients in fortified maize flour	<table border="1" style="width: 100%; border-collapse: collapse;"> <thead> <tr> <th rowspan="2" style="background-color: #a0c0ff;">Nutrient</th> <th rowspan="2" style="background-color: #a0c0ff;">Fortificant</th> <th colspan="2" style="background-color: #a0c0ff;">Limit mg/kg</th> <th rowspan="2" style="background-color: #a0c0ff;">Test Method</th> </tr> <tr> <th style="background-color: #d3d3d3;">Min.</th> <th style="background-color: #d3d3d3;">Max.</th> </tr> </thead> <tbody> <tr> <td>Vitamin A</td> <td>Vitamin A (retinyl) palmitate, spray-dried or equivalent, 75,000 µg RE/g (7.5% retinol), min. RE=retinol equivalent</td> <td>0.5</td> <td>1.4</td> <td>AOAC 2001.13</td> </tr> <tr> <td>Vitamin B1</td> <td>Thiamine mononitrate, 81%, min.</td> <td>3.0</td> <td>NA^b</td> <td>AOAC 953.17</td> </tr> <tr> <td>Vitamin B2</td> <td>Riboflavin, 100%, min.</td> <td>2</td> <td>NA</td> <td>AOAC 970.65</td> </tr> <tr> <td>Niacin B3</td> <td>Niacinamide, 99%, min.</td> <td>14.9</td> <td>NA</td> <td>AOAC 975.41</td> </tr> <tr> <td>Vitamin B6</td> <td>Pyridoxine hydrochloride, 82%, min.</td> <td>2</td> <td>NA</td> <td>AOAC 961.15</td> </tr> <tr> <td>Folate B9</td> <td>Folic acid, 90.5%, min.</td> <td>0.6</td> <td>1.7</td> <td>AOAC 2004.05</td> </tr> <tr> <td>Vitamin B12</td> <td>Vitamin B12 (water soluble), 0.1%, min.</td> <td>0.007</td> <td>NA</td> <td>ISO 20634</td> </tr> <tr> <td>Zinc</td> <td>Zinc oxide, 80%, min.</td> <td>33</td> <td>65</td> <td>AOAC 2011.14</td> </tr> <tr> <td>Total iron</td> <td>Total iron</td> <td>21</td> <td>NA</td> <td>AOAC 944.02</td> </tr> </tbody> </table> <p>^a 1 µg RE = 3.33 IU ^b NA = not applicable. The maximum limits for these nutrients are not necessary because the upper tolerance limits of these nutrients are very high.</p> <p>Note 1: Any other fortificants listed by British Pharmacopoeia, Food Chemical Codex, Merck Index, U.S. National Formulary, European Pharmacopoeia, U.S. Pharmacopoeia, or the Codex Alimentarius Commission (FAO and WHO 2006) may be used.</p> <p>Note 2: Only sodium iron (iii) ethylenediaminetetraacetate (NaFeEDTA) which contains minimum of 12.5 percent of Iron, or ferrous fumarate which contains a minimum of 32 percent Iron shall be used as a source of Iron so as to provide iron 10–30 mg/kg and 10–30 mg/kg respectively, for maize flour fortification.</p>					Nutrient	Fortificant	Limit mg/kg		Test Method	Min.	Max.	Vitamin A	Vitamin A (retinyl) palmitate, spray-dried or equivalent, 75,000 µg RE/g (7.5% retinol), min. RE=retinol equivalent	0.5	1.4	AOAC 2001.13	Vitamin B1	Thiamine mononitrate, 81%, min.	3.0	NA ^b	AOAC 953.17	Vitamin B2	Riboflavin, 100%, min.	2	NA	AOAC 970.65	Niacin B3	Niacinamide, 99%, min.	14.9	NA	AOAC 975.41	Vitamin B6	Pyridoxine hydrochloride, 82%, min.	2	NA	AOAC 961.15	Folate B9	Folic acid, 90.5%, min.	0.6	1.7	AOAC 2004.05	Vitamin B12	Vitamin B12 (water soluble), 0.1%, min.	0.007	NA	ISO 20634	Zinc	Zinc oxide, 80%, min.	33	65	AOAC 2011.14	Total iron	Total iron	21	NA	AOAC 944.02
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Legislation	<p>Law: Food and Drugs Act 1959 (chapter 278)</p> <p>Policy: Food and Drugs (Food Fortification) (Amendment) Regulations, 2011. Mandates fortification with a specified premixed formulation of vitamins and minerals for all industrial mills producing 20 MT or more of maize meal and flour in 24 continuous hours at one or more mills owned by the same producer or that is imported into Uganda (MOH 2011).</p> <p>Standards: Fortified Milled Maize Products (Source: US_EAS_768_2019 UNBS Schedule of Standards)</p>																																																								
Coverage	<p>Household consumption of fortified maize flour is at 7 percent out of the 42 percent who consumed fortifiable maize flour, which was either processed by micro-, small-, medium-, or large-scale millers and not processed at the household.</p> <p>The food sample that was subjected to laboratory testing and met the nutrient cut-off defined in the national standards (GAIN 2017).</p>																																																								

Production, supply, and utilization of maize and products	<table border="1"> <thead> <tr> <th colspan="4">Domestic Supply 1,000 MT/year</th> <th colspan="3">Domestic Utilization 1,000 MT/year</th> <th>Pa Supply</th> </tr> <tr> <th>Production</th> <th>Imports</th> <th>Exports</th> <th>Total Supply</th> <th>Processed</th> <th>Loss</th> <th>Food</th> <th>Food/Year/kg</th> </tr> </thead> <tbody> <tr> <td>3,588</td> <td>31</td> <td>91</td> <td>2,878</td> <td>410</td> <td>163</td> <td>2,107</td> <td>48</td> </tr> </tbody> </table>								Domestic Supply 1,000 MT/year				Domestic Utilization 1,000 MT/year			Pa Supply	Production	Imports	Exports	Total Supply	Processed	Loss	Food	Food/Year/kg	3,588	31	91	2,878	410	163	2,107	48
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<p>Source: Food balances 2010–2019 Global, regional and country trends FAOSTAT Analytical Brief 40 (see annex table 19 for details on the trends in domestic supply, utilization, and per capita supply from Food Balance Sheet 2013 to 2018, and Food Balance for 2019).</p>																																
Certified fortifying industries and products/brands⁶	<p>Number of industries with valid certified fortified products: 6 Number of industries with expired certification of fortified products: 3 Number of valid certified fortified products/brands: 7 Number of fortified products/brands with expired certification: 3</p> <p>See details in annex tables 20 and 21.</p>																															
Production capacity (installed versus actual) of fortifying industries	<p>Number of industries that are 100% fortifying: 6 Number of industries producing both fortified and unfortified maize flour: 3 Average installed capacity of 100% fortifying industries: 76 MT/day Average actual capacity of 100% fortifying industries: 60 MT/day Average installed capacity of industries producing both fortified and unfortified maize flour: Average actual capacity of industries producing both fortified and unfortified maize flour:</p> <p>Source: Capacity needs assessment findings (USAID Advancing Nutrition Uganda 2022)</p>																															
Compliance status	<p>Compliance data not accessible at production/factory level.</p>																															
Enabling environment characteristics	<p>There is an enabling policy and legal framework that supports mandatory fortification for maize processors of 20 MT per day or more. This has created an unlevel business environment, especially in terms of enforcement, because other industries produce 20 MT or more in 24 hours, but in batches under 20 MT, as guided by the regulation, leading to a competitive market and prices for fortified versus unfortified flour.</p> <p>ECSA's harmonized regional standards play a strong role in supporting regional trade, especially for the maize industry, exports across the region.</p>																															
Value chain characteristics (supply and demand-side)	<p>The current national capacity for industrial fortified maize flour production and importation may not cover the entire domestic population's consumption needs, but is primarily more accessible in the urban than rural settings.</p> <p>The quality of maize grain affects the quality and safety of fortified maize due to the high aflatoxins resulting mostly from poor post-harvest handling practices of maize grain.</p> <p>Maize grain is primarily grown domestically, as shown above in data from the Uganda Food Balance Sheet 2019, which makes it easy to access and inexpensive for industries.</p>																															

⁶ See list of certified products under the UNBS scheme at <https://unbs.go.ug/e-services/certified-products/>. Accessed on Dec 5, 2022

Regulatory monitoring	<p>Import monitoring is a critical control point, especially for maize processors still grappling with noncompliance with standards.</p> <p>Although large-scale producers have invested in laboratory capacities to improve internal quality controls, some lack the internal capacity to analyze fortified food products.</p> <p>UNBS conducts testing of fortified maize flour samples at the retail level (market surveillance) to monitor the quality of fortified maize flour; however, this is not routinely done due to limited resources and other priorities.</p> <p>The certification scheme is a reliable source of factory-level compliance data, especially for the flour industry.</p>
Main players	<p>Government of Uganda MDAs, Academia and Research Institutions Donors: USAID, Bill & Melinda Gates Foundation</p> <p>Implementers: National governments; maize processors, refiners and importers, private sector institutions and associations</p> <p>Partners: JSI, GAIN, International Science and Technology Institute, Academy for Educational Development, Food Fortification Initiative, International Federation for Spina Bifida and Hydrocephalus, Nutrition International</p> <p>Projects: VITAL, A2Z; Food Fortification Program, SPRING, ENABLE, USAID Advancing Nutrition.</p>

Achievements

As with salt, the harmonization of fortification standards among ECSCA alliance member countries has contributed to regional trade among large-scale maize flour millers. The widespread adoption of maize fortification by large-scale millers is a valuable contribution to maize flour fortification.

Challenges

Despite efforts to promote maize fortification in Uganda, production of fortified maize flour remains low across the country, largely because the sector is dominated by micro and small-scale millers operating below the thresholds of mandatory fortification, with about 46 percent operating 1–5 MT per day. The micro and small-scale millers have a number of systemic challenges, such as low adherence to good manufacturing practices, poor infrastructure, advanced technological gaps, and limited capital investment. Highlights from the desk review and data from the capacity needs assessment identify the following challenges to adopting and complying with food fortification standards faced by medium- and large-scale maize millers:

- Initial capital investments and taxes on fortification inputs are high, especially technology and fortificants/premixes.
- There is a lack of post-harvest grain-handling facilities and technical knowledge to ensure safety and quality in the entire value chain.
- The establishment of the 20 MT/day production threshold by the 2011 food fortification regulation is too low for establishing a viable maize flour fortification program.
- Operational and recurrent costs are high for most maize mills' in the country, mainly due to high power tariffs, power blackouts, and utility costs (such as for water, power, and fortificants/premixes).
- Compliance data on fortified brands and industries for maize flour are not readily available.

Lessons Learned

Large-scale maize flour processors embraced innovative and advanced technologies, which resulted in the consistent production of premium quality products that meet standards. They have also attained operational efficiencies and are able to benefit from economies of scale, rendering their operations economically sustainable. However, extending the program to small- and medium-size industries appears implausible.

Opportunities

Emerging markets for fortified flour in neighboring countries, such as the Democratic Republic of the Congo and Sudan, present opportunities for increased production of fortified maize flour. Large-scale maize processors have attained operational efficiencies and are able to benefit from economies of scale, which render their operations economically sustainable. Maize flour is a widely consumed staple in Ugandan households and highly consumed in public and private institutions, including learning institutions, hospitals, humanitarian beneficiaries, and security institutions (prisons, police, defense), which provides opportunities to address micronutrient deficiencies among the populations.

Recommendations

Explore targeted production of fortified maize flour for target consumers of the staple food, such as learning institutions, hospitals, humanitarian beneficiaries, and security institutions (prisons, police, defense), and monitor the impact. The government should explore opportunities to provide incentives and recognition of fortifying industries that comply with standards to attract the scaling up of production by eligible maize millers. Awareness creation among the population of fortified maize flour and products is critical to increase consumption coverage within healthy diets.

3.3.5 Capacity of Sugar Processors for Fortification with Vitamin A in Uganda

Fortification of sugar with vitamin A in Uganda is voluntary. Although there is a standard for sugar fortification, the food and drug regulations do not require sugar to be fortified. Despite earlier considerations as an attractive potential food vehicle for fortification from the initiation of fortification discussions in the early 1990s, the high consumption of sugar of over 95 percent by the population has been associated with risks to NCDs.

3.3.5.1 Sugar Production

Uganda is the largest producer of granular brown sugar among the three countries in the East African region (Uganda, Kenya, Tanzania), with an annual production of about 500,000 MT as of May 2017 (Philomena et al. 2017), closely followed by Kenya with 441,000 MT annual production. Most of the sugar consumed locally is from domestic production (67 percent), with the remaining 23 percent being imported mainly from South Africa and Tanzania (USCTA 2008). Sugar production in Uganda has increased over the past two decades, starting from 102,527 MT in 1998 to 197,297 MT in 2007 (USCTA 2008); and to 438,360 MT in 2014, as detailed in table 9.

Table 9. Production Capacities of Sugar Industries

Producer	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2014 ^b
Kakira	49,450	61,234	58,650	56,504	75,268	87,296	84,160	88,292	93,182	96,786	180,000
Kinyara	35,478	41,700	50,209	52,948	57,900	53,799	65,137	61,299	60,201	58,062	120,360
SCOUL	17,599	23,248	28,091	24,528	32,795	35,579	46,819	44,137	38,117	37,444	73,500
Others										5000	35,000
Sugar & Allied Industries Ltd											29,500
Total Production	102,527	126,182	136,950	133,980	165,963	176,674	196,116	193,728	191,500	197,292	438,360

Source: (USCTA 2008; Wikipedia 2016: modified in 2022)

3.3.5.2 Sugar industries

There are currently 14 functioning sugar industries in Uganda (Mufumba 2022) with Kakira Sugar Works Limited, Kinyara Sugar Works, and Sugar Corporation of Uganda (SCOUL) as the major three mills (see table 7) (USCTA 2008; Wikipedia 2022).

Table 10: Sugar Industries by District Location

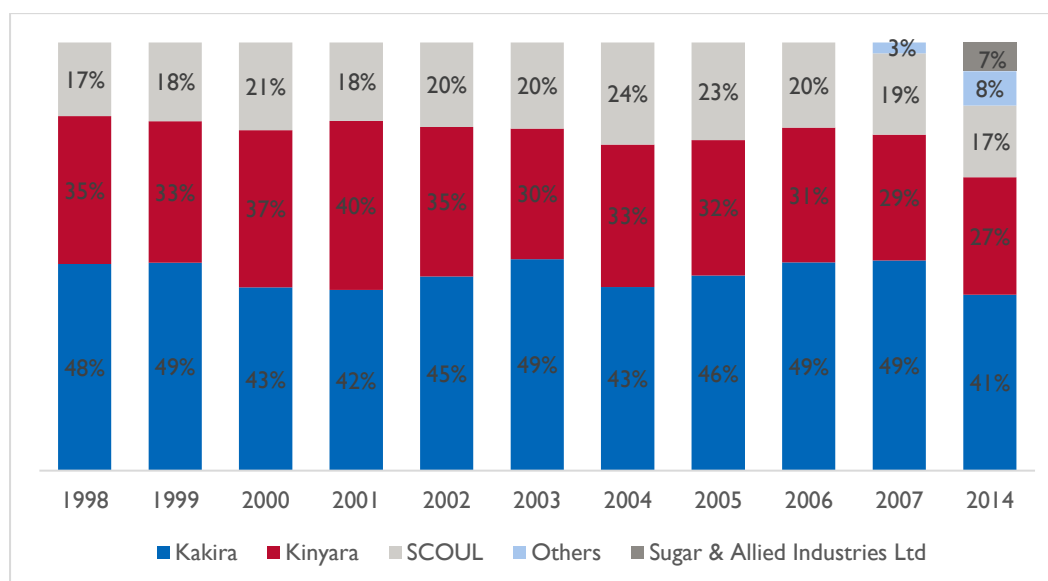
#	Name of Producer	District Location
1	Kakira Sugar Works Limited	Jinja
2	Kinyara Sugar Works Limited	Masindi
3	Sugar Corporation of Uganda Limited	Lugazi
5	GM Sugar Uganda Limited	Njeru town, Buikwe
4	Sango Bay Estates Limited	Kakuuto
6	Amuru Sugar Works Limited	Amuru
7	Atiak Sugar Factory	Amuru
8	Bugiri Sugar Factory	Bugiri
9	Buikwe Sugar Works Limited	Buikwe
10	Busia Sugar Limited	Busia
11	Hoima Sugar Limited	Hoima
12	Kamuli Sugar Limited	Kamuli
13	Kenlon Industries Uganda Limited,	Buyende
14	Kyankwanzi Sugar Works Limited	Kyankwanzi
15	Mayuge Sugar Industries Limited	Mayuge
16	Mukwano Sugar Factory	Masindi
17	Sugar & Allied Industries Limited	Kaliro

Source: (https://en.wikipedia.org/wiki/List_of_sugar_manufacturers_in_Uganda#cite_ref-Rpt2014_14-0)

3.3.5.3 Market Analysis of Sugar Produced

As reflected in figure 2, the three big sugar industries (Kakira, Kinyara, and SCOUL) still remain dominant in the market, with a total market share of over 90 percent of the total national sugar requirement despite the establishment of new sugar industries shown in table 10. (USCTA 2008; Wikipedia 2022).

Figure 2. Annual Market Share in Sugar Production



Source: (USCTA 2008; Wikipedia 2022)

3.3.5.4 Cost Implications of Sugar Fortification

Studies on the cost comparison of providing 100 percent estimated average requirement of vitamin A annually for each individual was more expensive for sugar fortification (assessed at the Ugandan national standard or 15 mg/kg and ECSA standards of 10 mg/kg at the production level) when compared to oil fortification (fortified with vitamin A at a standard of 35 mg/kg at production level). The higher cost of sugar fortification results from a more expensive type of encapsulated powder form of vitamin A. Sugar fortification will require a larger, yet necessary, investment as detailed in table II. However, table II shows that both types of fortification are economically feasible, because the price increase of the fortified products is relatively low with 0.26 percent for oil and 0.74–1.06 percent for sugar (Fielder et al. 2010).

Table II. Cost Comparison of Edible Oil and Sugar Fortification in Uganda

Parameter	Edible Oils	Sugar	
		Uganda Formula	ECSA Formula
Annual cost per person	U.S.\$0.030	U.S.\$0.135	U.S.\$0.09
Cost per metric ton of food	U.S.\$4.84	U.S.\$10.79	U.S.\$7.50
Annual production in the country	100,000 MT	200,000 MT	200,000 MT
Total cost for the country	U.S.\$0.48 million	U.S.\$2.2 million	U.S.\$1.50 million
Food price per kilogram in 2008	U.S.\$1.88	U.S.\$1.02	U.S.\$1.02
Increase in price due to fortification	0.26%	1.06%	0.74%
Initial investment in equipment per factory ¹⁶	U.S.\$19,050	U.S.\$120,000	U.S.\$120,000

¹⁶These amounts are for 10 years of operation.

Source: (Fortification of vegetable oil and sugar with vitamin A [2009]: progress, issues, costs and prospects).

3.3.5.5 Fortification Prospects of Sugar in Uganda

Sugar is a commonly consumed staple in Uganda with the potential as a good food vehicle for fortification. Fortification of sugar in the country is possible; however, when compared with edible oil, vitamin A fortification of edible oil is 4.6 times more cost effective than vitamin A sugar fortification (John and Ronald 2010). However, this program should be considered cautiously for not promoting sugar consumption as at-risk factor for NCDs like diabetes mellitus, which is on the rise in Uganda.

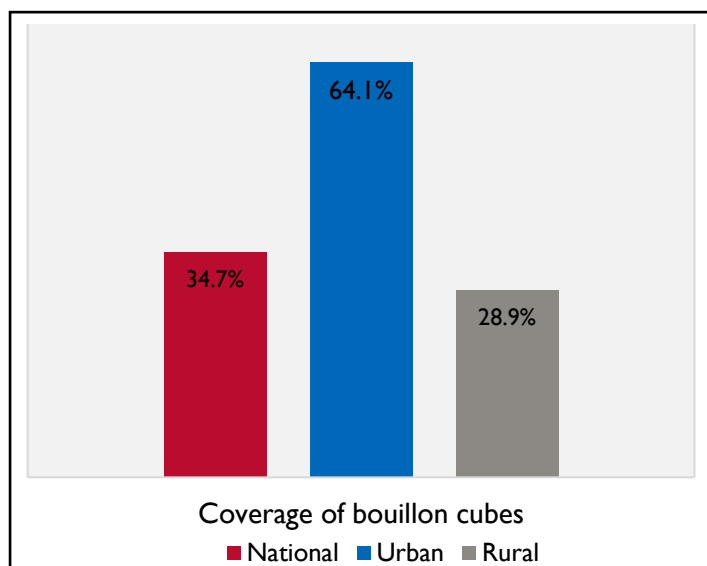
3.3.6 Fortification Prospects of Bouillon Cubes in Uganda

Bouillon cubes are mainly imported to Uganda from South Africa by UNILEVER Uganda Limited, and they contain salt, spices and flavors, vegetables, and/or hydrolyzed vegetable protein, and are used to enhance the flavor and taste of home-made meals.

3.3.6.1 Coverage of Bouillon Cubes

Given the increasing consumption of bouillon cubes across income classes, and both urban and rural populations, these condiments may be an integral part of the system, as concluded in text box 1. According to the FACT survey 2015 (GAIN 2017), the national coverage of households consuming fortifiable bouillon cubes was at 34.2 percent, with 64.1 percent in urban households and 28.9 percent in rural households (see figure 3).

Figure 3: Showing Household Coverage of Bouillon Cubes



Source: (GAIN 2017)

Conclusion: Overall, bouillon cubes, though not currently mandatory for food fortification in Uganda, are a suitable vehicle for food fortification following the high household coverage, especially in the urban centers. The bouillon cubes in Uganda are said to include iodized salt and are fortified with iron, though further analysis and documentation should be done to verify this information.

3.4 Enabling Environment for the Food Fortification Program

The enabling environment is necessary for effective public-private sector engagement for sustained scaling up, access, coverage, and consumption of fortified foods in Uganda. This section provides updates on the policy and legal framework and coordination efforts related to food fortification.

3.4.1 Policy and Legal Framework

Uganda has successfully developed relevant laws, policies, standards, regulations, and strategies that support voluntary and mandatory food fortification to which enforcement is anchored. The country elected for the mandatory fortification of salt, wheat and maize flours, edible oils and fats, and the voluntary fortification of sugar. ECSA's regional standards were adopted for the food vehicles.

Uganda has the following policy and legal frameworks in place:

- Food and Drugs Act 1959
 - Foods and Drugs (Control of Quality) (Iodated Salt) Regulations, 1997
 - Food and Drugs (Food Fortification) Regulations, 2005
 - Food and Drugs (Food Fortification) (Amendment) Regulations, 2011
 - Food Fortification Strategy, 2017–22
 - Food Fortification Standards
 - Uganda Nutrition Action Plan II 2022–27
 - Other supportive documents: National Development Plan III; Vision 2040; Food and Nutrition Policy; Nutrition Advocacy and Communication Strategy 2011–17; National Drug Policy and Authority Act, 1993; Public Health Act, 1964; Health Sector Strategic Plan 2020/21–24/25; Agricultural Sector Policy; and Trade Policy SUN Business Strategy (draft)
- Noted: Updated details of the policy and legal frameworks are found in [annex table 14](#).

Achievements

Clear laws and appropriate national standards, policies, and strategies guide the implementation of the food fortification program in terms of the mandatory fortification of salt, maize and wheat flours, and edible oils and fats, and the voluntary fortification of sugar. The country also developed a food fortification strategy that extends through 2022, which will need to be renewed for another five years. The currently adopted Ugandan standards for food vehicles harmonize with the regional standards of ECSA, and therefore both support regional trade and align with domestic food fortification regulations. Mandatory fortification has also led to sustainable health impacts, and we've seen in the Uganda salt and edible oils and fats fortification programs that they are certainly contributing to the reduction of iodine and vitamin A deficiencies, respectively.

Tax incentives, including import duty at 0 percent rate and no charge on infrastructure levy on fortificants/premixes and fortification machinery, apply to all food vehicles. However, the 18 percent value added tax (VAT) is still charged on premixes and other inputs that support food fortification, though most industries are not aware this can be recovered.

Gaps and Challenges

The regulations spell out the key responsibilities of MDAs, but there are overlapping roles related to regulatory monitoring and enforcement among institutions, and unsupportive institutional structures,

systems, and laws for effective implementation. The regulations focus on large-scale fortification with guidance on the capacity of producers mandated to fortify; for example, maize producers with a daily production capacity of 20 MT or more and oil and fat producers of 10 MT or more create a significant obstacle to entry for micro-, small-, and medium-scale processors.

In addition, the landscape analysis shows a gap and limited knowledge of existing regulations and standards, especially among non-fortifying food industries.

Recommendations

The enabling environment includes the policy and legal framework that can support the public and private sector in implementing the fortification program, but that remains flexible to changes in policies, rules, and regulations, as may be required based on an analysis of M&E data. Some recommendations to ensure a smooth enabling environment include—

- Review existing policy and legal frameworks, including the food fortification regulations and strategy, after incorporating new findings from global research, characterization of the conditions, and evidence from Uganda’s fortification program.
- Align food fortification programs with efforts to reduce overconsumption of processed foods associated with overweight and obesity, a predisposing risk factor for NCDs.
- Maintain the GoU engagement in cross-regional coordination and harmonization of standards, policies, and guidelines that support food fortification to foster cross-regional trade and increase the market for fortified foods.
- Explore targeted fortification of maize flour if possible, versus mandatory. Contrary to the recommendation to review the current regulations, based on observations and experience with the product certification program, regulatory bodies, such as UNBS, contend that small-scale food processors are a long way from being able to adapt to and meet recommended general manufacturing practices and other quality requirements, making universal fortification untenable, especially for maize flour.
- To inform effective programming, standardize and harmonize definitions and understanding of the business practices of micro-, small-, medium-, and large-scale processors with national regulations from the Ministry of Trade, Industry and Cooperation and international guidelines, such as the USAID large-scale food fortification guidelines.
- Promote procurement of fortified maize flour in target public and private institutions, such as schools, hospitals, security agencies, and humanitarian and emergency groups.

3.4.1.1 Rewards and Sanctions

Sanctions and Penalties Linked to Food Fortification

The existing food fortification regulations and standards support food fortification and provide for sanctions and penalties for noncompliant industries. Noncompliance with national food fortification standards, for example, can lead to a failure to attain product certification by UNBS because food fortification requirements are integrated in the certification scheme.

Food and Drugs (Food Fortification) (Amendment) Regulations, 2011, and the Foods and Drugs (Control of Quality) (Iodated Salt) Regulations, 1997 require the fortification of foods, with sanctions for noncompliance (see table 12).

Additionally, imported products (wheat and maize flours, edible oils and fats, and food-grade salt) can be impounded without a certificate of conformity to food fortification standards.

There are no direct rewards for fortifying industries; however, increasing consumer awareness to consume fortified foods would motivate industries to fortify.

Table 12. Sanctions and Penalties in the Food Fortification Regulations

Excerpted from the regulations

Subsection	Sanction/Penalty
In the first schedule, section 9, subsection 4 under Quality Assurance and Quality control (Food and Drugs [Food Fortification] Regulations, 2005, p. 10)	An authorized officer may impound; stop the manufacture, packing, selling, and transporting or any activity related to fortified foodstuffs, where these regulations have not been followed.
Offenses and penalties (Food and Drugs [Food Fortification] Regulations 2005, p. 11)	A person who contravenes a provision of these regulations commits an offence and shall be liable on conviction to imprisonment not exceeding three months and shall have the items in contravention impounded. The court may order the items to be fortified, destroyed, or disposed of in a manner prescribed by the minister.

Challenges

Weak enforcement systems for monitoring food fortification hampers the applications of sanctions for noncompliant industries. For example, no database profiles industries that meet the requirements for the fortification mandate but are not fortifying their products. Noncompliant industries are inaccessible to key stakeholders for corrective action.

In addition, due to competing priorities and limited resources, routine market surveillance does not prioritize food fortification but rather focuses on product safety unless additional funding is provided for market surveillance focused on fortified products, which is not sustainable.

Industry-level internal control systems are weak, and feedback on testing results are delayed because UNBS has only one centralized testing center. Access to reference laboratories should be considered.

There are challenges around premix quality and capacity gaps for factory- and import-level premix testing. Penalizing industries, who blame noncompliance of fortified foods to noncompliant fortificants and premixes has proved difficult and has resulted in overdosing during processing, especially with vitamin A edible oils.

Recommendations

Establish reference laboratories to be accessed both by the industry and governmental authorities. The process would need to be streamlined through existing government and private sector structures, for example, by using recognized laboratories, such as the Uganda Industrial Research Institute. This could reduce turnaround times for feedback on results from UNBS and other regulators. In addition, respondents emphasized the need for the NDA to test fortificants and premixes as part of regulatory monitoring to ensure conformity.

Support a whole-of-business approach to providing incentives, including supporting internal monitoring, creating linkages and access to business plans and capital, and recognizing and marketing

of brands, while considering economies of scale, compliance of fortifying industries, and public health benefits.

Regularly profile industries through existing MDA databases and private sector platforms to keep tabs on evolving industries for inclusion in food fortification, especially those eligible but are not fortifying.

Emphasize strengthening the capacity of regulatory institutions for the effective enforcement of the regulations and standards and implementation of regards, as well as sanctions and penalties for compliant and noncompliant industries, respectively.

3.4.2 Coordination Efforts for the Food Fortification Program

This section looks at how national governments—the private sector, including the food industries, stakeholders, and partners—are involved in the food fortification program. The section also discusses the achievements or successes, challenges, opportunities, and recommendation for effective coordination of multi-sectoral and multi-stakeholder groups in food fortification.

3.4.2.1 Stakeholders Involved in Food Fortification

Food fortification efforts require public-private partnerships, with the private sector fortifying the products and the public sector guaranteeing the quality and coverage of the fortified foods, and documentation of the impact. The partnerships involve multi-sectoral and multi-stakeholder players for effective oversight, critical to the delivery of intended health outcomes. It is, therefore, of paramount importance that institutional structures, systems, roles, and responsibilities among the public and private sector are established and functional in order to realize impact. Institutional roles and responsibility are detailed in [Annex table 22](#).

These stakeholder groups include—

- government institutions, including MDAs such as the MOH; Ministry of Trade, Industry and Cooperation; Ministry of Agriculture, Animal, Industries and Fisheries; Ministry of Education and Sports; Ministry of Finance, Planning, and Economic Development; Ministry of Gender, Labour and Social Development; Office of the Prime Minister; UBOS and Uganda Industrial Research Institute; and regulatory bodies, including UNBS, National Drug Authority (NDA), and URA
- private sector actors, such as food vehicle industries, manufacturers and suppliers of vitamin and minerals and/or multi-micronutrient premixes, private food laboratories, industry cooperatives and associations, wholesale and retail organizations, and vendors
- academia and public and private research institutions
- civil society organizations
- donors and development partners, supporting the national efforts as they are able and allowed to do.

3.4.2.2 National Working Group on Food Fortification

In 2002, to effectively coordinate the diverse stakeholder group, Uganda established the NWGFF, a national alliance that includes the above-mentioned stakeholder groups.

The NWGFF, which provides oversight and guidance to establish, improve, and sustain food fortification programs, is coordinated by the MOH's Nutrition Division, which also serves as the secretariat. The NWGFF is chaired by the Director General Health Services at the MOH and co-chaired by the private sector, the Ministry of Trade, Industry and Cooperation, the Office of the Prime Minister, and the Ministry of Education and Sports. The NWGFF also draws its membership and subcommittees from these above-mentioned stakeholder groups. The NWGFF's subcommittees span multiple program areas, including (1) policy and planning; (2) production and processing; (3) QA/QC; (4) marketing and promotion; (5) research and innovation; (6) monitoring, evaluation, and learning; and (7) advocacy and awareness creation. [Annexes table 22](#) and [table 23](#), details the NWGFF member institutional mandates and responsibilities and roles of NWGFF subcommittees respectively.

Achievements

The NWGFF has emulated the multi-sectoral approach and fostered joint planning and implementation across all stakeholder groups for effective programming. Advocacy efforts in Uganda have brought food fortification to the forefront of national and international nutrition agendas, including the National Development Plan II and the Uganda Nutrition Action Plan II, to respond to the scaling up nutrition efforts and the Sustainable Development Goals. Partners are present to foster and support NWGFF engagements and implementation of government and private sector priorities.

NWGFF advocated for the Ministry of Finance, Planning and Economic Development to waive import duties on fortificants/premixes and technology that supports food fortification.

Gaps and Challenges

While there are supportive policy frameworks and a national food fortification strategy, including the NWGFF, meetings and routine engagements are largely partner-supported. There are limited engagement efforts by MDAs in monitoring and enforcement of the regulations and strategies, making it difficult to track performance and impact of the food fortification program.

Opportunities

Key stakeholders have a high level of commitment and engagement to support the food fortification program. The public and private sector have existing platforms and systems for integrating food fortification activities.

Recommendations

The NWGFF needs to advocate for the prioritization and allocation of resources into institutional annual plans and budgets to fund food fortification activities, including coordination for sustained impact.

The GoU needs to strengthen the capacity of the MDAs for effective enforcement of the regulation and strategy and provide technical assistance, when required, to the private sector entities to

strengthen compliance through implementation of self-regulation strategies. Details of the food industry capacity needs from the capacity needs assessment is in [text box 1](#).

Text Box 1. Summary of the Capacity Needs of Food Processors

- Train food processors on food fortification application/processes, standards, regulations, and internal testing.
- Increase access to efficient food testing services and reduce sample testing fees.
- Increase access to affordable modern/advanced technology fortificants and premixes.
- Increase linkages and access to regional markets.
- Create linkage to capital grants to invest in food fortification.
- Advocate and attract local manufacturers of fortificants and premixes.
- Provide food processors with standard operating procedures on food fortification.
- Support industries in accessing handling services for quality and safety of maize grain raw materials.
- Waive all taxes on fortificants and premixes and imported input equipment.
- Provide subsidies on power/energy to reduce operation costs.
- Fast-track fortificant and premix verification.
- Update standards for inclusiveness of all small and medium producers.

The GoU should fast-track implementation of capacity strengthening efforts for the NWGFF and the subcommittee and expand the engagement of regional platforms and systems for effective coordination and monitoring of food fortification efforts at all levels.

Coordination should be strengthened between the NWGFF and key stakeholders, taking a systems-thinking evaluation approach to the food fortification program that will inform strategic direction while integrating new global developments for food fortification.

3.5 Value Chain for Food Fortification

3.5.1 Value Chain (Supply and Demand)

Understanding the food fortification value chain from production to food processing to consumption is critical to addressing any supply chain or demand issues that could affect food fortification.

Regional technical committees and working groups (e.g., the ECSA Inspection and Enforcement Working Group and the ECSA Laboratory Working Group) provide technical guidance to countries to inform the regional value chain.

The East Africa Free Trade Agreement and Inter-Continental Free Trade Area have provided access to regional markets for raw materials, inputs, and fortified foods.

Achievements

Legislation on the mandatory fortification of industrially produced maize and wheat flours, edible salt, and edible oils and fats is being increasingly accepted and promulgated by the food industries since the UNBS adopted it into its certification scheme.

Challenges

Uganda does not encourage the promotion or scaling up of sugar fortification. Because there are many alternative sources of vitamin A fortification (wheat and maize flours, edible oils and fats), which have contributed a reduction in vitamin A deficiency, the fortification of sugar with vitamin A

might not be necessary under the Ugandan context. However, other micronutrients and other food vehicles, including sugar, may be considered for analysis and discussion.

Recommendations

Identify potential sources of additional nutrients that are identified as inadequate in the Ugandan diet, including other fortification vehicles and specific food groups.

Simplify processes to make all components of the food fortification program permanent and locally sustainable.

3.5.2 Value Chain for Fortification Inputs

Accessible, affordable, appropriate technology and quality premixes are key to the fortification value chain. The section highlights the value chain characteristics of premixes and technologies that support food fortification in Uganda.

Noncompliance can also be attributed to addition less amounts of fortificant/premix than recommended at production due to technological or other factors that could affect the outcome of quality assurance and quality control measures.

3.5.2.1 Fortification Technology/Equipment

Through URA, Uganda waived import duties and the VAT on manufacturing and industrial equipment and machinery used in the fortification process, including premix dossiers, hammers technology, and roller milling machines (URA 2021). There is no manufacture or fabrication of local technology or machines to support food fortification in the country.

3.5.2.2. Fortificants and Micronutrient Premixes

Uganda, like most countries, is a net importer of micronutrient premixes for wheat and maize flours, edible oils and fats, and salt. At its inception, food fortification was voluntary, and premix was donated to the pioneer industries by donors and partners, including USAID and GAIN, including appropriate technologies, such as micronutrient dossiers. However, at the start of mandatory food fortification in 2011/2013, industries included premix in their procurement processes, which made fortification an additional cost of production.

The majority of the large fortifying food industries usually import premix directly from the manufacturers, while a few industries source fortificants/premix from in-country distributors who serve as local agents or suppliers of international manufacturers. International manufacturers, like Prime Merchantile, are exploring establishment of a manufacturing plant for local production of premixes.

At the start of mandatory food fortification in 2011/2013, the NDA audited and approved four or five authorized premix manufacturers, which created an enabling environment to routinely analyze the current access and distribution channels of premix to increase accessibility of premix in the country. Those efforts have not been sustained. The NDA, according to the provisions of the food fortification regulation, is delegated to undertake premix producer certification, monitoring imports of fortificants and their supply. However, the NDA legal framework only supports regulatory monitoring of drugs and medicines, which has limited the NDA's legal capacity to institutionalize and regulate manufacturers and suppliers of fortificants/premix and the quality of fortificants. This has resulted in non-conforming premix on the market, affecting the compliance of fortifying food

industries to the fortification standard. In addition, importers are required to source fortificants from the NDA-approved list of manufacturers with authorization evidenced by a general manufacturing practice certificate that covers a three-year validity period.

Fortificants/premix brands and suppliers in Uganda

A regional inspection of premix storage facilities in Uganda by the NDA in 2022, with support from USAID Advancing Nutrition, highlighted a number of international companies supplying the local fortifying food industries in Uganda. BASF-Germany and Nutrifix Technologies-South Africa exhibited equal and dominant market share compared to other international suppliers (see table 13). In addition, the results indicated that existing local sources (agents) for supply of fortificants account for 50 percent of the Ugandan market share with Amesi (K) Limited supplying the majority of local producers of fortified foods.

Table 13. Local and International Premix Suppliers in Uganda

Food Vehicle	Premix Manufacturer	Local Supplier (agents)	# Industries Using the Premix	Premix Brand Name
Edible Oil	BASF - Germany/DSM -SA	None	2	BASF
	BASF Germany	None	2	BASF
	Hexagon Nutrition (India)	None	1	Hexagon,
	Hexagon Nutrition (India)	None	1	Retinyl Palmitate
Maize	Nutrifix Technologies	Amesi (K) Ltd	1	Nutrifit
	Mir pain Gida San Ve	Bakers Best Investment Ltd	1	Mirpain Premix
	DSM South Africa	None	2	Nutrivit MF
	DSM South Africa	None	1	Fortitech Premixes
	Hexagon Nutrition (India)	None	1	Hexagon
	Mirpain Gida San Ve	None	1	Mirpain Premix
	MuhlenChemie - Germany	Prime Merchantiles Limited	2	Elcovit
Nutrifix Technologies SA	Amesi (K) Ltd	2	Nutrivit MF, Nutrivit WF	
Wheat	BASF Germany	None	1	Nutrivit WF
	Hexagon (Germany)	None	1	Hexagon
	Hexagon Nutrition (India)	None	1	Foatvit
	Mirpain Gida San Ve	None	1	Supplevit
	MuhlenChemie - Germany	None	4	Elcovit
	Nutrifix Technologies SA	Amesi (K) Ltd	4	Nutrivit WF
Salt	Calibre Chemicals Pvt Ltd (India)	None	2	Potassium Iodate

Achievements

Through the Ministry of Finance Planning and Economic Development and URA, Uganda zero-rated the 25 percent import duty for fortificants and premixes, an incentive greatly appreciated by the food industries.

Uganda has multiple suppliers and importers of premixes for all the fortifiable foods.

Challenges

Uganda still has gaps in accessibility, affordability, and ensuring the quality of fortificants and premixes.

Audits have slowed down in recent years, and only one supplier has renewed the three-year tenure with NDA, which compromises the quality of premixes, and potentially the quality, of fortified foods. [Annex table 24](#) provides details on premix suppliers and manufacturers.

Micronutrient premixes are among the most significant recurring input costs for fortification programs (Fiedler and Afidra 2010). The cost of premixes has previously been cited by 75 percent of respondents as one of the top three barriers to ensuring fortification quality and compliance (the highest percentage of all barriers reported) (Luthringer et al. 2015). This cost is transferred to the price of the fortified product.

Recommendations

The NDA should share a verification/prequalified list of suppliers of fortificants, premixes, and advanced technology that supports food fortification while promoting and attracting local and international companies to establish local plants for premix manufacturing.

Regular supervision of delegated entities by the MOH is recommended to address gaps in the regulatory monitoring of fortificants. In the interim, it is further proposed that UNBS supports the MOH to sample and test fortificants/premixes for quality verification against national standards using a risk-based approach for cost effectiveness.

Training of industries on standardized documentation for QA/QC protocols and relevant food fortification monitoring data, like premix reconciliation, provides a quick indication of successful fortification processes. This data may prove useful for tracking performance and is easy to apply in industrial settings as a verification step.

Consider adapting lessons from the engagement of large multinational corporations, primarily in the manufacture of micronutrient premixes for fortifying staples, mainly for reasons of economies of scale, safety, and quality control. Where appropriate, premix supply systems should be put in place (including transparent procurement mechanisms based on a competitive tendering process) so premix suppliers are forced to compete with one another on quality and price, thereby preventing premix suppliers from monopolizing the supply of micronutrient fortification in a given context (Garrett, Luthringer, and Mkambula 2016; Guinot et al. 2012).

Strengthen the access to test premixes, which is critical to ascertaining the quality of imported premixes—other than relying on the supplier's certificate of conformity; and invest in training on proper handling and storage to address noncompliance with standards.

Advocate with the government for industry incentives for fortification, such as tax exemption for equipment and fortificant import, fortificant procurement mechanisms, and supportive regulations on nutrient claims.

3.6 Advocacy and Communication

Uganda has made considerable progress in enforcing and complying with food fortification regulations. Moreover, food fortification is based on the unnecessary changes in consumer behavior. Nevertheless, some investments in awareness creation for both producers and consumers of fortified foods is still needed.

3.6.1 Advocacy

Advocacy programs are key to creating and maintaining a high level of interest in critical policy initiatives, resource mobilization, and accountability for reducing malnutrition at all levels. Advocacy for the integration of fortified foods into the procurement of food for schools through the school feeding policy, for example, would increase awareness of fortified maize and wheat flours as well as edible oils and fats. Other potential stakeholder beneficiaries include humanitarian groups, security agencies (prisons, police, and defense), and hospitals.

Uganda has developed advocacy briefs with the support of USAID Advancing Nutrition, which will be rolled out to these groups for consideration. The demand from consumers will potentially contribute to the increased production and supply of fortified foods.

3.6.2 Communication

The social marketing and behavior change communication components of mandatory fortification programs encourage consumers to choose fortified products in cases where there are both fortified and unfortified products, like the case of maize flour and edible oils and fats.

Uganda plans to integrate messages to increase awareness of fortified foods into the behavioral change materials promoting diversified and healthy diets. It developed a logo for fortified foods—the F-Logo—which was created in the early 2000s for consumers to identify the fortified commodities to appear on packages, containers, and sacks of fortified foods and thereby increase visibility to consumers. The use of the logo is voluntary and participation rates among the fortifying industries remain low, but it is considered an effective strategy for consumers to easily identify fortified foods. The MOH, as the custodian of the logo, should streamline its use and effectiveness to increase awareness of the available fortified food brands.

3.6.3 Sales and Marketing with the Private Sector

The NWGFF; Ministry of Trade, Industry and Cooperation; the MOH, and private sector associations championing efforts to sensitize food producers and corporations/associations on the value proposition of producing fortified foods is key to scaling up the production of fortified foods.

The harmonization of standards across East Africa has enhanced regional integration and emerging markets for fortified products in neighboring countries, such as the Democratic Republic of the Congo. This also presents an opportunity for market expansion of fortified foods, which is envisaged to further drive demand and production of fortified foods, especially maize flour.

Industries cited trade shows and customer referrals as alternative mediums for marketing and increasing product sales. Product distribution strategies have proven to be powerful market drivers and have been widely adopted globally to increase the uptake of fortified foods, primarily because they markedly increase product availability in market spheres.

3.7 Monitoring and Evaluation

Critical to a food fortification program, M&E should be developed during a program's design and planning stages. M&E provides an opportunity to assess the quality of program implementation and delivery and the degree to which it is reaching its target households and individuals and achieving its nutritional goals. The results of M&E exercises provide program planners and policymakers with the information they need to make decisions about whether to continue, expand, replicate, or end a program (Allen et al. 2006).

Uganda, through the National Panel Survey (now the Uganda Harmonized Integrated Household Survey), implemented by UBOS with the technical assistance from CDC/IMMPaCt, USAID and other partners, collects and provides information on micronutrient biomarkers, consumption coverage of food fortification, and adequacy or quality of fortified foods at household level, among other indicators.

Uganda recognized the need for a centralized system to track such information and provide regular feedback to the various stakeholders. A complementary M&E framework was developed to implement the food fortification strategy (2017–2022), to be monitored through various surveillance and survey mechanisms implemented by MDAs and the private sector. A few indicators have also been integrated into existing institutional information systems, such as the UBOS, UNBS, MOH, URA, and food fortifying industries. However, the comprehensive integration and implementation of M&E food fortification activities, including data linkages and accessibility through a centralized system across the different MDAs and private sector mechanisms, has not been effective.

[Annex table 25](#) illustrates the current requirements for food fortification data as harmonized from the Uganda food fortification strategy M&E framework, and [annex 2](#) and [annex figure 4](#) illustrates the WHO guidance for M&E of such programs.

3.7.1 Regulatory Monitoring

Regulatory monitoring is the continuous collection and review of information at key delivery points to ensure that fortified foods meet national standards. Food fortification coverage and compliance can be triangulated from a variety of data sources that track mandatory fortification programs. According to World Health Organization (WHO) guidance on regulatory monitoring—data collected during regulatory monitoring activities—should be collated, analyzed, and interpreted to inform fortification stakeholders about the program's performance status and progress over time. Thus, the primary aim of regulatory monitoring is to ensure that the fortified foods meet the nutrient, quality, and safety standards set prior to program implementation and that government regulatory monitoring systems are able to ensure adequate fortification or detect under-fortified products (Allen et al. 2006).

Uganda's fortification program follows a system of regulatory monitoring that begins at the border and tracks the quality of raw materials and food products to the household level. The mandate for inspection and testing primarily rests with the UNBS, with the assistance of the URA at border points or ports of entry. The NDA is responsible for regulating the import, transport, and storage of premix by food producers and importers.

A mapping of the regulatory monitoring processes and systems exercise conducted in 2022, with support from USAID Advancing Nutrition, highlights key achievements, challenges, and simple and low-cost actions to strengthen regulatory monitoring for food fortification, as shown below:

Achievements

Some of the key achievements to date in the regulation of the food fortification program include—

Commitment of close coordination and shared duties between multiple agencies, such as the UNBS, URA, and NDA, with mandates to ensure compliance across the three areas of regulatory monitoring; borders, production, and marketing/retail.

The regulatory system has developed effective food regulations and standards under existing legal frameworks, such as the UNBS Act.

The UNBS and URA are government agencies with established infrastructure and institutionalized roles in monitoring and enforcement. Their roles include inspection and auditing protocols, information sharing, and laboratory testing. For example, the UNBS and URA offer joint custom verification of certificates of conformity for imported fortified edible oils and fats at border points.

A national fortification alliance exists in the form of the NWGFF as recommended by WHO. Every agency in the regulatory system has well-defined, designated roles in enforcement and monitoring of food fortification.

There is a direct link between the monitoring of government agencies and the internal monitoring carried out by the food processors through the process of site inspections and technical audits.

Food producers have internal food quality assurance systems that the UNBS audits bi-annually.

The UNBS has carried out market surveillance and testing focused on fortified oils and fats at the retail level, although this is not a regular activity due to limited resources.

The UNBS developed manuals for standard operating practices, good manufacturing practices, and good hygiene practices. Furthermore, to guide daily monitoring, the UNBS helped industries implement hazard analysis critical control point plans at their manufacturing units.

Challenges

The program is constrained by limited financial and human resources that have led to antecedent weak enforcement and regulation of fortificants.

Weak information sharing and data linkage between agencies has inhibited informed decision-making.

Weak institutionalization of food fortification regulatory mandates. For example, the MOH delegated the NDA to regulate fortificants, and premixes; however, this is not institutionalized by NDA creating a gap in ensuring quality along the fortification value chain.

Penalties for producers who do not comply with the regulations do not serve as a deterrent, so defaulters are not adequately penalized. At the same time, producers have no incentive to comply with the regulation.

From the perspective of some small- or medium-scale industries, the costs of fortification is high, especially the fees for testing and certification of the premixes and products, including an 18 percent VAT on the former.

Recommendations

Policy Actions

- The government of Uganda should commit funding support for designated MDAs to carry out their duties. MDAs should appropriate resources in annual plans and budgets for regulatory monitoring.
- Link data collection and results reporting to policy and program implementation decision-making. For example, data digitization and linkages are needed in regulatory institutions to ease data and information dissemination and utilization among stakeholders.
- Expertise is needed in synthesis and interpretation of fortification data within regulatory institutions to allow for the dissemination of regulatory data and results to key decision-making institutions within the NWGFF.
- Like other areas with resource constraints, the national and regional laboratory capacity for testing micronutrients needs to be increased to reduce the currently long turnaround time for sample testing. This will help both the regulatory agency and industry partners.
- Involve research institutions in the program to partner with MDAs in a monitoring system to foster ownership, utilization, and advocacy for the food fortification program.

Monitoring of Import, Storage, Production, and Sales by Regulatory Agencies

- The NDA needs to address its resource shortfall to strengthen the monitoring system of the import, transport, and storage of fortificants, which requires regular testing and data collection.
- Integrate and link systems for data collection, aggregation, sharing, and utilization. A centralized data and or resource repository for food fortification, in addition to a data repository, would increase access to fortification data to inform food fortification programs. Compliance monitoring should be integrated into existing management information systems, such as the Uganda Electronic Single Window.
- The GoU needs to introduce a system where joint external monitoring by two or more regulatory agencies can improve the efficiency of the inspection and testing regime if their area of operations is the same (e.g., a manufacturing unit).
- Consider supporting reference laboratories to distribute the workload to geographic areas closer to the manufacturing units, thus making this service more accessible to the food industry and governmental inspection institutions.
- More strongly enforce the regime of penalties for noncompliance with regulations and standards, and complement with a system of positive rewards (incentives to those who comply).

Internal monitoring by industry

- Knowledge sharing and combined training and mentorship of QC/QA personnel may strengthen the industry's internal monitoring system.
- Industries can use electronic platforms like FortifyMIS, which is a management information system for sharing internal monitoring data either between industries or between an industry and regulatory agencies.

Note: Refer to the Mapping of Regulatory Monitoring Processes and Systems Report for simple and low-cost actions in regulatory monitoring.

3.7.2 Household Monitoring

Household monitoring focuses on assessing whether or not a program is providing appropriately fortified products in sufficient amounts and at affordable prices to the target population. It is generally assumed that once it has been established through regulatory monitoring that a fortified product is of the required quality at the retail store level, the same product will be of similar quality (although possible with lower micronutrient contents due to the natural losses along the value chain) by the time it reaches households and individuals.

Monitoring the consumption of fortified foods by the target population is also important if both fortified and nonfortified foods are available locally, especially when unfortified foods are cheaper or more accessible.

The UDHS assesses the coverage of salt by the population every five years, and the 2018/19 UNPS assessed household-level compliance and quality of fortified edible salt, oils, and fats. The 2015 FACT survey (GAIN 2017) assessed the consumption coverage of wheat and maize flours, edible oils and fats, and salt at the household level, as previously discussed in section 3.2.2.

While the quality of salt and edible oils was assessed during 2018/19 UNPS, the regulatory standards used for Uganda are set at the production level and do not apply to edible oils and fats collected at the household level, which calls for interpretation and synthesis of results from an epidemiological and dietary impact, rather than a compliance lens.

The primary objective of food fortification programs is to improve the nutritional status of the target population. Impact evaluations of food fortification efforts is part of M&E and it has been performed in Uganda partly through the UDHS and the UNPS, which are currently referred to as the *Uganda Harmonized Integrated Survey*.

Recommendations

It is essential that additional parameters for household monitoring be integrated into the M&E framework and implementation, and the frequency of the UNPS, and sustainability using local resources.

Consider integrating complementary impact evaluation indicators into existing and/or different platforms or surveys as no single reporting system, survey, or database can provide answers to all questions on the process, outcome, and impact on fortification programs and, thereby, spare the cost of a separate impact survey. Integrating the biomarker indicator into the UNPS is a good starting point; however, a further analysis on the contribution of food fortification interventions to the micronutrient status is needed.

3.8 Implications of COVID-19 and the Russia–Ukraine War on the Food Fortification Program in Uganda

The COVID-19 pandemic caused devastating health and socio-economic consequences across the world, including Uganda. The Russia–Ukraine war has also had far-reaching effects on the grain supply as Russia and Ukraine are the primary exporters of wheat to the global community and to Uganda (see [table 7](#)). An assessment in early 2021 of the impact of COVID-19 on food fortification in Uganda shows that even with COVID-19-induced lockdowns, staffing shortages, and supply chain issues, almost all wheat flour, 90 percent of oil, and 6 percent of locally produced maize flour continued to be fortified based on national standards. However, producers experienced a myriad of operational challenges due to the pandemic, including a reduced workforce and physical distancing requirements (FFI 2022).

A post-COVID-19 capacity needs assessment of food processors by USAID Advancing Nutrition in Uganda in mid-2022 indicates that 76 percent of food processors experienced shifts in production as a result of COVID-19 disruptions to transportation in the country and across the globe. Relatedly, delayed freight and imports clearance further limited access to fortificants and premixes, which resulted in a reluctance to comply with and adopt food fortification. Access to other inputs, such as maize grain, which experienced significant shifts in availability and affordability, affected the industry. COVID-19 also affected regulation enforcement because the industries were delayed in the submission of their samples for testing, alongside increased testing costs and resultant delays in the UNBS returning the test results to the submitting industries (USAID Advancing Nutrition Uganda 2022). In addition, the capacity needs assessment also found that 79 percent—11 of the 14 fortifying wheat industries that were interviewed—reported reduced production of fortified foods, mainly due to the reduced and delayed importation of wheat grain during COVID-19.

The lead time for the shipment of fortificants increased by three to six months, altering the industries' routine operational processes. Relatedly, results from the capacity needs assessment report revealed that some large-scale wheat flour processors had suspended operations due to the scarcity of wheat grain, while importers of crude oil reported an upward shift in prices from Malaysia. In addition, the turnaround time for centralized services, such as the testing of fortified foods, increased due to the scale-down of human resource levels based on the COVID-19 standard operating procedures of the MOH and WHO.

Further consultations with food industry representatives indicate that the escalated fuel prices caused by the Russia–Ukraine war disrupted the global supply chain, which then had a ripple effect on prices of imported raw materials, particularly wheat grain and crude palm oil. An example is the increased price of crude palm oil from Malaysia, from U.S.\$1,200 to about U.S.\$2,000 per MT; while shipment costs for crude palm oil increased from U.S.\$85 to about U.S.\$170 per MT.

Food fortification is a safety net intervention for times of crisis like the COVID-19 pandemic. It is critical for key stakeholders—including the government, private sector, donors, and civil society partners—to sustain their efforts to ensure uninterrupted production, distribution, equitable access, and consumption of adequately fortified staple foods; to mitigate delays and disruptions in food chains; and to ensure that people can access food packed with nutrients rather than low-nutrient foods during times of food insecurity.

4.0 Conclusion

Uganda's food fortification program has evolved from an initial start with salt iodization to the current approach of using multiple vehicles—salt, edible oils and fats, and wheat and maize flours—to deliver micronutrients to the population. The coverage rates for iodized salt and fortified edible oils and fats are excellent. Potential reach and coverage rates of fortified wheat and maize flours are low, but wheat flour production is centralized and well-regulated. The GoU only needs to make minor adjustments to the wheat flour fortification program. The maize flour market is fragmented, and most processors are small-scale millers, which creates financial, logistical, regulatory, and human resource challenges to the mandate that all maize flour in Uganda be fortified. One option would be to focus on large-scale maize flour millers based on a targeted approach, and then, subsequently, over a period of years as part of a high-level program aimed to the consolidation and real industrialization of the maize meal production. Significant subsidies in the form of waivers on import tax duties, has spurred investments in the fortification by the food processing entities.

There is also a need to increase the efficiency of regulatory monitoring to ensure uniform quality of fortified foods, including periodic reporting and dissemination of information to track performance and impact of the food fortification program in Uganda.

The extent of micronutrient deficiencies (iron, vitamin B12) and sufficiency of some micronutrients (vitamin A, folate, iodine) uncovered by UNPS suggests that key priorities should include addressing non-nutritional causes of anemia, with a focus on decreasing inflammation and malaria. It is also important to assess the status of other micronutrients to determine other potential micronutrient deficiencies. This information is needed to make decisions about which nutrient to prioritize and where, as well as what type of interventions to promote that could be effective, feasible, and low cost.

5.0 Annexes

Annex I: Tables

Table 14. Existing National Policy and Legal Frameworks Relevant to Food Fortification

Implementing Law	Scope/Area of Food Fortification	Responsible Agency	Other Factors/Updates
Vision 2040	Emphasizes improving the nutritional status of the population, especially young children and women of reproductive age, as a health improvement strategy. It also advocates for developing a school feeding policy.	Ministry of Finance, Planning and Economic Development; National Planning Authority	
National Development Plan III 2020–25	The plan clearly presents strategies for improving health and nutrition through human capital development and agro-industrialization programs, including dietary diversification, food, fortification, and school feeding.		<p>Although the two programs have food fortification interventions, enforcement for the four food vehicles at all levels was not captured by the responsible MDAs (UNBS; NDA; MOH; URA; Ministry of Trade, Industry and Cooperation; Uganda Industrial Research Institute; academia; Ministry of Agriculture, Animal, Industries and Fisheries; and Ministry of Education and Sports) into the program implementation action plan, which affected funding allocation.</p> <p>The MDAs responsible for food fortification programming are encouraged to integrate fortification activities into existing interventions, annual work plans, and budgets.</p> <p>They are also encouraged to prioritize food fortification in the National Development Plan IV.</p>

Implementing Law	Scope/Area of Food Fortification	Responsible Agency	Other Factors/Updates
Uganda Scaling Up Nutrition Business Network Strategy (2022–30)—Draft	<p>Goal: Improved nutrition status of children under five, school-age children, adolescents, pregnant and lactating women, and other vulnerable groups by 2025.</p> <p>Mission: To mobilize business actors to trade, invest, and innovate in sustainable actions to improve the consumption of diverse, safe, and nutritious foods for all people in Uganda.</p> <p>SUN Business Network objectives:</p> <ul style="list-style-type: none"> • Drive business action in nutrition. • Strengthen business accountability in nutrition action. • Improve the enabling environment. 		The SUN Business Network Strategy is in the final stages of development.
The Uganda Nutrition Action Plan II 2020–25	<p>Goal: Improved nutrition status by 2025 among children under five, school-age children, adolescents, pregnant and lactating women, and other vulnerable groups.</p> <p>The plan adopted food fortification of staple foods as a high impact intervention to reduce micronutrient deficiencies, fortifying the products in collaboration with the private sector, with the public sector guaranteeing the quality and coverage of the fortified foods.</p>	All MDAs	Implementation is in progress while awaiting final approval.
Food Fortification Strategy, 2017–22	<p>The goal of the strategy is to contribute to the reduction of micronutrient deficiencies using a multi-sectoral approach to food fortification in Uganda. Strategic objectives:</p> <ul style="list-style-type: none"> • Increase and sustain coverage, access, and consumption of industrially fortified foods in Uganda. • Support the scale-up of the food fortification program to include additional food vehicles. • Strengthen the enforcement of mandatory food fortification regulations. 	MOH	The emphasis was on the need to review the strategy to include new developments in food fortification, as the strategy expires in 2022.

Implementing Law	Scope/Area of Food Fortification	Responsible Agency	Other Factors/Updates
	<ul style="list-style-type: none"> Strengthen advocacy and create awareness among the general population on the benefits of consuming fortified foods. 		
Food Fortification Standards 2012–19	<ul style="list-style-type: none"> Fortified edible oils and fats (Source: US_EAS_769_2019 UNBS Schedule of Standards) Fortified wheat flour (Source: US_EAS_767_2019) Fortified milled maize products (Source: US_EAS_768_2019 UNBS Schedule of Standards) Iodized food-grade salt (Source: US_EAS_35_2012 UNBS Schedule of Standards) 	UNBS Food industry Suppliers/manufacturers of fortificants/premix	Food fortification standards have been adopted based on ECSA standards. Regional standards need to be harmonized across Africa to increase cross-border and regional trade and grow the market for fortified foods.
The Nutrition Advocacy and Communication Strategy, 2011–17	Promotes the use of the fortification logo—a large blue “F”—in communications.	Office of the Prime Minister	There was slow progress in the implementation of the NACS, which is currently under review to align with the Uganda Nutrition Action Plan II.
The Food and Drugs (Food Fortification) (Amendment) Regulations, 2011	<p>Mandatory legislation, derived from the Food and Drugs Act Cap. 278, for the fortification of maize and wheat flours, edible oils, and fats. Implementation commenced in 2013.</p> <p>The regulations mandate that all wheat producers must fortify their products.</p> <p>The regulations mandate that only maize producers with a capacity of 20 MT or more, and edible oil and fat producers with a capacity of 10 MT or more in 24 continuous hours in a single or multiple mill owned by the same producer, are mandated to fortify.</p>	MOH	<p>Due to the thresholds of 20 MT and 10 MT for maize and edible oils/fats, respectively, the fortifying industries recommend mandatory food fortification regardless of production capacity in order to promote fair trading within the same market.</p> <p>However, inclusion of the micro and small-scale producers to fortify introduces barriers to their ability to access advanced technologies/inputs, and to comply with general manufacturing practices and standards.</p> <p>The regulations need to clearly define the roles of key institutions in enforcement and regulatory monitoring within their mandates to address overlapping roles.</p> <p>In addition, the regulations do not mention the National Working Group on Food</p>

Implementing Law	Scope/Area of Food Fortification	Responsible Agency	Other Factors/Updates
			Fortification, considering its multi-sectoral nature, as the committee to ensure earmarked commitments and funding to guarantee sustainability.
The Food and Drugs (Food Fortification) Regulations, 2005	<p>A regulation that support voluntary fortification supported by the Food and Drugs Act, Cap. 278 of maize and wheat flours, edible oils, and fats.</p> <p>The regulations specify the conditions under which fortified foods for human consumption are domestically processed, put on the market, or imported into the country. They also include a requirement to use approved standards pertaining to specified fortified commodities and a specific logo to identify fortified foods, hence the fortification logo (F-Logo). The regulations informed the development of the standards for each food vehicle.</p>	MOH	<p>The regulations further empower the Prime Minister or delegated authority to provide QA, monitoring, and enforcement activities pertaining to fortified foods, whether locally manufactured or imported.</p> <p>Since the regulations empower the Prime Minister to delegate any responsibility, the foregoing and the administration of the logo have been delegated to the UNBS, while regulation of fortificants and premixes, including premix manufacturers and suppliers, has been assigned to the NDA.</p> <p>While the 2005 regulations were initially useful in terms of regulating and streamlining the food fortification process following the food fortification program’s official launch in 2004, it was later discovered that they were not providing for fair trading. Fortifying industries were incurring extra costs of procuring fortificants and premixes, and competition with the nonfortifying industries within the same market platforms.</p>
The Food and Nutrition Policy, 2003	The overall objective of the policy was “to promote the nutritional status of all the people of Uganda through multi-sectoral and co-coordinated interventions that would focus on food security, improved nutrition and increased incomes.” Specific objectives	Ministry of Agriculture, Animal Industry and Fisheries; MOH	The current policy is under review to incorporate new developments in nutrition and to align with the Uganda Nutrition Action Plan II.

Implementing Law	Scope/Area of Food Fortification	Responsible Agency	Other Factors/Updates
	<p>of the policy include “to eliminate micro-nutrient deficiency disorders with particular emphasis on vitamin A deficiency; iodine deficiency disorders; and, iron deficiency anemia.”</p> <p>One of identified strategies for addressing the above specific objective was: “... fortifying some commonly-used foods with recommended micro-nutrients.”</p>		
The Foods and Drugs (Control of Quality) (Iodated Salt) Regulations, 1997	In response to the high incidence of iodine deficiency disorders, the regulation requires that all salt intended for human or animal consumption be iodized. The regulation informed the development of standards for the iodization of salt.	MOH	<p>Enforcement of these regulations have been successful for years; iodized salt has been primarily imported from Kenya, which makes it easier to monitor quality at the point of entry.</p> <p>Local production of iodized salt commenced in 2019.</p>
The Constitution of the Republic of Uganda 1995, as amended.	<p>Recognizes the importance of food and nutrition in the development of human capital. National Objective XXII states that, “The State shall—</p> <ul style="list-style-type: none"> ● take appropriate steps to encourage people to grow and store adequate food; ● establish national food reserves; ● and encourage and promote proper nutrition through mass education and other appropriate means in order to build a healthy State.” 	All MDAs	
Food and Drugs Act 1959	<p>The Food and Drugs Act Cap. 278. supports the fortification of fortifiable foods through which the regulatory framework for food fortification was derived. The law defines the following terms relevant to fortification:</p> <p>“Food” is defined as drinks, chewing gum, and other products of a like nature and use, as well as articles and substances used as ingredients in the preparation of food or drink or of such products. The law does not include in its definition water, live animals, or birds; fodder or feeding stuffs for animals, birds, or fish; or</p>	MOH; National Drug Authority	The definition of “Food” in the law poses a question to the NWGFF as to whether fortificants and premixes are classified as food or could possibly be an active pharmaceutical ingredient, which qualifies it to be zero rated for the 18 percent VAT by the URA—a key incentive to reduce the high costs of fortificants and premixes incurred by food processors.

Implementing Law	Scope/Area of Food Fortification	Responsible Agency	Other Factors/Updates
	<p>articles or substances used only as drugs.</p> <p>“Substance” includes liquids.</p> <p>“Drug” includes medicine for internal or external use by a person; cosmetics, shampoos, soaps, dusting powders, essences, and unguents for use by a person; and disinfectants, germicides, antiseptics, and preservatives for any purpose.</p> <p>“Preparation” is defined as manufacturing and any form of treatment of food in addition to “preparation for sale,” which includes packaging.</p> <p>“Human consumption” includes use in the preparation of food for human consumption.</p> <p>Section 41 (Regulation) 1 a), supports development and approval of regulations: “The Minister may make regulations for any of the following purposes— (a) requiring, prohibiting or regulating the addition of any specified substance, or any substance of any specified class, to food intended for sale for human consumption or any class of such food, or the use of any such substance as an ingredient in the preparation of such food, and generally for regulating the composition of such food.”</p>		
Other laws that support food fortification	National Drug Policy and Authority Act, 1993; Public Health Act, 1964		
Other policy frameworks that support food fortification	Health Sector Strategic Plan 2020/21–24/25, Agricultural Sector Policy, Trade Policy		

Table 15. Food Fortification Consumption Monitoring in Uganda

Survey Type	Responsible Institution	Purpose	Methodology	Findings
Fortification Rapid Assessment Tool Survey 2002	Makerere University	<p>To establish the food consumption level of sugar and vegetable oil among population subgroups.</p> <p>To determine the consumption of vitamin A.</p>	From a sample of 1,102 households in Kamuli District, eastern Uganda, clusters were randomly selected as a representative sample of communities consisting of women ages 16–45 and children ages 12–36 months.	Out of the 1,102 households interviewed, women of reproductive age consumed sugar and cooking oil at a coverage of 88 percent in the week preceding the survey.
Uganda Food Consumption Survey 2008	USAID and implementing partners, including Harvest Plus and A2Z, and other partners (GAIN, World Food Programme, Academy for Educational Development, Uganda, NWGFF, Uganda Chartered Healthnet)	<p>To determine dietary patterns of Ugandan children ages 24–59 months and women of reproductive age (15–49 years) in three regions of Uganda: Central/Kampala, South-West, and North.</p> <p>To provide baseline figures for strengthening Uganda’s food fortification program.</p>	<p>The survey was carried out in 7,421 households with 38,543 individuals residing in one urban and two rural regions of Uganda in 2008 to more fully characterize the dietary patterns of children ages 24–59 months and women of reproductive age (15–49 years).</p> <p>The three regions included in the survey were purposefully selected; within each region, districts, and then households were randomly selected in a two-stage process that provided representative samples of that region.</p> <p>Food consumption was measured using the seven-day recall method with duplicate measurements on a subset of the sample to allow estimation of usual intake. A total of 61 food items were used.</p>	<p>The findings confirm a substantial variation in usual food and micronutrient intake across the regions of Uganda in 2008. The diet in the rural southwest provided larger amounts of most nutrients and had the lowest prevalence of inadequate intakes.</p> <p>Despite higher overall levels of wealth in Kampala, mild inadequacies of B complex vitamins were found, such as B1, B2, niacin, and folate. This may well be due to the limited access urban inhabitants have to natural sources of these micronutrients and their reliance instead on products with low micronutrient density, such as refined flours, sugar, oils, and fats.</p> <p>Dietary patterns in the north were restricted, with dependency on food aid, thus inadequacies of vitamin B2 and B6, in addition to vitamin A, vitamin B12, iron, zinc, and calcium, affected this population.</p>

Survey Type	Responsible Institution	Purpose	Methodology	Findings
				Ninety percent of oil consumed in Uganda is fortified.
School Surveys on Salt consumption October 1999	MOH, Makerere University, UNICEF	<p>To determine goiter prevalence in the country.</p> <p>To establish the proportion of the household population consuming adequately iodized salt.</p> <p>To determine the levels of iodine intake using urinary iodine excretion.</p>	<p>This was a descriptive cross-sectional point prevalence population survey based in primary schools. The districts were separate geographic units of study and so was the country. Hence, each study district constituted “a sampling universe” according to indications of assessing iodine deficiency disorder status. In October 1999, a sample was studied of 2,880 school-age children (6–12 years) from 72 primary schools in six districts of Uganda.</p> <p>As recommended by WHO, 50 urine and 50 salt samples were collected from each district. These were divided equally among the school clusters. Forty pupils were systematically selected to get a subsample of those to give a spot sample of urine and the pupils were also sent home for a salt sample that was used for cooking the previous day’s meal.</p>	<p>Some districts (e.g., Hoima and Kisoro) are lagging because of poor coverage of iodized salt. The proportion of households consuming adequately iodized salt is still moderately low at 64 percent. Moreover, some areas in the country still do not receive iodized salt at all. Such areas are still very goitrous and partly exaggerate the overall district and country picture.</p> <p>Median UIC levels in all study districts and in the country overall were above the WHO recommended level of 100 µg/L, indicating abnormally high iodine intake by the population. Iodine nutrition in Uganda was considered “excessive,” with a median UI of 310µg/L (11.9) reported in 1999.</p> <p>The WHO considered iodine nutrition in Uganda as “at risk of adverse health consequences” (WHO 2004).</p>
FACT survey—September 2015 (GAIN 2017)	MOH, Makerere University, Uganda National Working Group on Food Fortification, Centers for Disease Control and Prevention, Food Fortification Initiative, Bill &	Aimed at obtaining information on the coverage, utilization, and potential contribution of fortified foods to the micronutrient intake of the population; identify program barriers; and recommend	A cross-sectional cluster national household survey was representative by urban and rural stratification. It targeted households and women of reproductive age (15–49 years) with a sample size of 489, consisting of women of reproductive age per stratum, 526 households per urban	The national coverage of maize flour consumption is 91.8 percent, fortifiable maize flour is 42.4 percent, and fortified maize flour is 6.5 percent. In terms of urban and rural coverage of maize flour, consumption of maize flour is 95.2 percent for

Survey Type	Responsible Institution	Purpose	Methodology	Findings
	Melinda Gates Foundation	<p>potential ways to address them.</p> <p>Assessed the quality of fortified foods to determine the adequacy of fortification levels at the household level independent of routine monitoring activities.</p>	<p>stratum, and 575 households per rural stratum. A two-stage stratified random sampling strategy was applied:</p> <ul style="list-style-type: none"> • The first stage of sampling selected 35 Primary sampling unit, per stratum, by probability proportional to size. • The second stage of sampling selected 15 or 16 households per Primary sampling unit by random selection. 	<p>urban areas and 91.2 percent for rural areas, fortifiable maize flour is 73 percent for urban areas and 36.3 percent for rural areas, and fortified maize flour is 8.6 percent in urban areas and 6.1 percent in rural areas.</p> <p>There is a high national coverage rate of fortified salt and oil and the potential for significant contributions to dietary intake of iodine and vitamin A.</p> <p>Fortification of household samples of maize flour are adequate at 3.4 percent nationally compared with 2.6 percent in the rural areas and 3.6 percent in the urban areas.</p>

Table 16. Summary of Food Fortification Investments by Various Partners

Organization/ Project	Year	Achievement
USAID/VITAL	1993	Provided support to assess clinical vitamin A deficiency and subclinical deficiency among vulnerable populations in Uganda.
UNICEF	1993	Carried out a rapid nutrition study in 37 of the 39 supported districts, which found high levels of vitamin A deficiency, iodine deficiency disorders, and anemia in the country.
	1997	With UNICEF's support, through the MOH, established the Universal Salt Iodization Program.
USAID/ Micronutrient Operational Strategies and Technologies Project	2000–05	Supported feasibility and consumption studies, as well as formative research and communication strategies focused on fortification of staples (vegetable oil, maize and wheat flours, and sugar).
		Supported the GoU in strengthening three strategies: control of nutritional anemia; vitamin A capsule supplementation; and dietary diversification through the introduction of the vitamin A-rich orange-fleshed sweet potato.
		Conducted successful sugar fortification trials at Kakira Sugar Works Ltd. in Jinja.

Organization/ Project	Year	Achievement
		Supported national food fortification efforts and collaborated with the Eastern, Central, and Southern Africa Health Community (ECSA-HC) to support the ECSA Fortification Initiative.
USAID/A2Z	2005–11	Engaged in capacity building for QA and control of fortified foods, advocacy and awareness creation, monitoring, evaluation, and research.
MOH/GAIN Project	2007–11	Supported the MOH in implementing the voluntary food fortification program in a five-year multi-sectoral project with five components: (1) program management, (2) production and industry, (3) regulatory enforcement, (4) M&E, and (5) and social marketing and awareness creation.
USAID/SPRING	2012–17	Consolidated gains from predecessor USAID projects and strengthened the GoU's ability to implement the mandatory regulation on food fortification.
GAIN/ENABLE	2017–19	<i>Premix Gap Analysis Report</i>
USAID Advancing Nutrition	2021-2023	<p>Increased the capacity of the public sector to enforce and private sector to comply to the food fortification regulation and standards</p> <p>Strengthened partnerships and stakeholder coordination in food fortification through the NWGFF</p> <p>Raised awareness on the benefits of scaling production and consuming fortified foods</p>

Table 17. Stakeholders and Industries Consulted to Inform the Landscape Analysis

Institution	Key Informant/Division/Department
MOH	Nutrition Division
	National Drug Authority
	Policy and Planning Division
	Division of Health Information System
Office of the Prime Minister	Department of Strategic Coordination
Ministry of Trade, Industry and Cooperation	Directorate of Micro-Small and Medium Scale Enterprises Industry
Uganda National Bureau of Standards	Departments of certification, market surveillance, laboratory, standards, and administration
Ministry of Education and Sports	Basic, secondary, and higher education school feeding and school health focal points
Uganda Revenue Authority	Customs Department
Uganda Industrial Research Institute	Chemistry Laboratory
Uganda Bureau of Statistics	Projects and Methodology Department

Institution	Key Informant/Division/Department	
Private Sector Foundation Uganda	Department of Business Registration	
Associations	Grain Council of Uganda	
National Planning Authority	Human Capital Development Program	
Academia	Makerere University (School of Food Technology, Nutrition and Bio-Engineering)	
	Uganda Christian University (Department of Food Science and Technology)	
The Public Procurement and Disposal of Public Assets (PPDA)	PPDA departments	
Ministry of Agriculture, Animal, Industries and Fisheries	Food and Nutrition Security Division	
Ministry of Local Government	Local Governments and Lower Local Governments	
Civil society organization	Uganda Consumers Protection Association_	
Premix supplier representative	Prime Merchantiles International Ltd.	
BIDCO	Fortifies edible oils and fats	
Aponye Uganda Ltd.	Fortifies maize and edible oils	
Nile Agro Industries Ltd.	Fortifies edible oils and wheat	
Kampala Salt	Fortifies salt	
Industries that Participated in the Focus Group Discussions		
Food Vehicle	Industry Name	Region
Maize flour	Aponye Uganda Ltd.	Central
	Afro Kai Ltd.	Central
	Kabana Grain Millers Ltd.	Eastern
	SMA Millers U Ltd.	Central
	Grainpulse Ltd.	Central
Wheat flour	Bakhresa Grain Milling (Uganda) Ltd.	Central
	SMA Millers U Ltd.	Central
	King Millers Ltd.	Central
	Engaano Millers Ltd., Jinja	Eastern

	Master Grain Milling Ltd.	Eastern
	Nile Agro Industries Ltd.	Eastern
	Kengrow Industries Ltd.	Eastern
Edible oils and fats	Mukwano Industries Uganda Ltd.	Central
	MMP Agro Industries Ltd.	Northern
	Mount Meru Group	Northern
	Aponye Uganda Ltd.	Central
	Nile Agro Industries Ltd.	Central

Table 18. Fortified and Nutritious Food Program Surveillance in Uganda

Survey Type	Responsible Institution	Purpose	Methodology	Findings
<p><i>Uganda Demographic and Health Survey</i> 1988/89, 1995/96, 2000/01, 2004/05 (restricted), 2006, 2009, 2011, 2016</p>	<p>MOH, ICF, International United Nations Population Fund, SPRING/USAID, Centers for Disease Control and Prevention, UBOS, UNICEF</p>	<p>To monitor and evaluate population health and nutrition programs and provide policymakers with information for future decision-making.</p>	<p>For the 2016 survey, 18,506, women ages 15–49; and 5,336 men, ages 15–54 were successfully interviewed from 19,588 households. Anthropometry measurements were conducted for all consenting respondents, and blood tests were conducted for the presence of malaria, anemia, and vitamin A deficiency (children ages 6–59 months), and anemia (all consenting men and women).</p>	<p>The data show that 29 percent of children under five are considered short for their age or stunted (below -2 standard deviation (SD), and 9 percent are severely stunted (below -3 SD). Stunting is slightly higher among male children (31 percent) than among female children (27 percent). Stunting is more common among children in rural areas (30 percent) than urban areas (24 percent). Fifty-three percent of children ages 6–59 months suffer from some degree of anemia; and 32 percent of women ages 15–49 are anemic.</p>
<p>2018/19 UNPS—Wave VII</p>	<p>UBOS</p>	<p>To provide the necessary data for M&E nutritional status and interventions, a nutrition module was established within the existing UNPS.</p> <p>It includes an assessment of nutritional status, including several micronutrients; an infant and young child feeding program; micronutrient-delivery</p>	<p>The survey was carried out over 12 months (a “wave”) to accommodate the seasonality associated with the composition of and expenditures on consumption in a nationally representative sample.</p> <p>The survey was conducted in two visits to better capture agricultural outcomes</p>	<p>See details of data in section 3.2.</p>

Survey Type	Responsible Institution	Purpose	Methodology	Findings
		<p>interventions with a focus on food fortification; and chronic disease conditions.</p> <p>The nutrition module was intended to increase the availability of timely, high-quality performance and impact data for large-scale, nutrition-specific programs in the country to improve the program, policymaking, accountability, advocacy, and global reporting.</p> <p>Implementation of the nutrition module began with the 2018 /19 UNPS (Wave VII). Specific objectives were to—</p> <ul style="list-style-type: none"> • assess anthropometry for all household members (length/height and weight) • assess central adiposity (waist circumference and sagittal abdominal diameter) and hypertension (blood pressure) in men and women ages 15 and older • assess recommended program indicators for infant and young child feeding, maternal and child health, and dietary diversity in children under five and women ages 15–49 • assess anemia and malaria status among children ages 6–59 months and women ages 15–49 • assess micronutrient status, specifically: 	<p>associated with the country’s two cropping seasons. The survey interviewed each household twice in one year at visits approximately six months apart. The dual visits enabled the splitting of the four-part questionnaire and reduced respondent fatigue.</p> <p>For each cluster, approximately half the households were randomly selected to complete the full interview during visit one, which consisted of a household roster, a household questionnaire, a women’s questionnaire, and—if applicable—an agricultural questionnaire. The remainder of the households completed only the household roster and the agricultural questionnaire, if applicable, during visit one.</p> <p>During visit two, about six months later, households from the first group completed only the household roster and the agricultural questionnaire, if applicable, while the second group completed the full interview.</p> <p>The nutrition module was included during the visit when the full interview was administered. Thus, half the households completed the nutrition module during visit one and the other half during visit two. Across the 12-month period of data collection (February 2018–February</p>	

Survey Type	Responsible Institution	Purpose	Methodology	Findings
		<ul style="list-style-type: none"> – children 6–59 months: iron, vitamins A and B12, and inflammation – women ages 15–49: iron, iodine, vitamins A, B12, and folate, inflammation, and Helicobacter pylori (H. pylori) • collect household fortifiable food samples to assess iodine (salt) and vitamin A (edible fats and oils) content. 	<p>2019), approximately 1 in 12 of the households completed the nutrition module every month.</p> <p>Of the 3,242 households eligible to take the survey, 3,176 completed the full interview.</p>	

Table 19. Uganda Food Balance Sheet and Food Balances

Food Vehicle	Period	Domestic Supply 1000 MT				Domestic Utilization 1000 MT			Pa Supply
		Production	Imports	Exports	Total Supply	Processed	Loss	Food	Food/Yr/kg
W heat & Products	2013	20	442	60	402	-	13	387	12
	2014	22	528	52	499	-	16	477	14
	2015	22	469	31	460	-	14	443	13
	2016	22	569	35	556	-	17	532	15
	2017	22	689	32	679	-	20	643	17
	2018	23	657	34	646	-	19	616	16
	2019	20	472	55	356	7	14	331	7
Veg. Oils	2013	103	228	24	307	-	-	307	9
	2014	108	268	10	380	-	-	379	11
	2015	103	268	12	372	-	-	372	11
	2016	111	307	12	414	-	-	414	11
	2017	113	339	10	446	-	-	446	12
	2018	110	343	6	455	-	-	455	12
	2019	153	309	51	359	-	-	357	8
Maize & Products	2013	2,745	1	96	2,839	395	138	1,802	54
	2014	2,646	1	113	2,661	365	124	1,710	50
	2015	2,811	2	283	2,745	346	131	1,806	51
	2016	2,482	1	226	2,404	327	120	1,566	43
	2017	2,767	3	347	2,564	295	122	1,732	46
	2018	2,773	1	462	2,470	284	122	1,733	45
	2019	3,588	31	91	2,878	410	163	2,107	48

Source: (Uganda Food Balance Sheet 2013–2018, and Food Balances 2010–2019)

Table 20. Industries with Fortified Products by Food Vehicle and Status of Certification

Food Vehicle and Industry	Number of Industries with Expired License	Number of Industries with Valid License	Total Number of Industries
Edible oils and fats		11	11
Aponye Uganda Ltd.		1	1
Bajaber Millers Ltd.		1	1
Best Ingredients Africa Ltd.		1	1
Bidco Uganda Ltd.		1	1
Jonisa Investments Ltd.		1	1
MMP Agro Industries Ltd.		1	1
Mount Meru Millers (Uganda) Ltd.		1	1
Mukwano Industries Uganda Ltd.		1	1
Nile Agro Industries Ltd.		1	1

Food Vehicle and Industry	Number of Industries with Expired License	Number of Industries with Valid License	Total Number of Industries
Tasco Industries Ltd.			
Vegol Ltd.			
Maize flour	3	6	9
Afro-Kai Ltd.			
Aponye Uganda Ltd.			
Grainpulse Ltd.			
Kabana Grain Millers Ltd.			
Mandela Millers Ltd.			
Pan Afric Impex (U) Ltd.			
Reco Industries Ltd.			
SMA Millers U Ltd.			
Sunrise Commodities and Millers Uganda Ltd.			
Salt	1	2	3
Herbal Salt Plus Ltd.			
Rukman International Ltd.			
The Kampala Industries and Infrastructure Development Ltd.			
Wheat	10	9	19
Ahmed Raza Foods Industries Ltd.			
Alfil Millers (U) Ltd.			
Bajaber Millers Ltd.			
Bakhresa Grain Milling (Uganda) Ltd.			
Dei Industries International Ltd.			
Engaano Millers Ltd., Jinja			
Kengrow Industries Ltd.			
Kiddawalime Millers Ltd.			
King Millers Ltd.			
Maganjo Grain Millers Ltd.			
Mandela Millers Ltd.			
Master Grain Milling Ltd.			
Miheret Grain Milling (U) Ltd.			
Mt. Elgon Millers Ltd.			

Food Vehicle and Industry	Number of Industries with Expired License	Number of Industries with Valid License	Total Number of Industries
Nile Agro Industries Ltd.		1	1
Ntake Bakery and Company Ltd.		1	1
Pan Afric Commodities Ltd.	1		1
SMA Millers U Ltd.	1		1
Wheatco Industries Ltd.	1		1
Total	14	28	42

Table 21. Certified Fortified Brands per Industry by Food Vehicle and Status of Certification

Food Vehicle and Industry	Number of Industries with Expired Brands	Number of Industries with Valid Brands	Total Number of Industries
Edible oils and fats	1	31	32
Aponye Uganda Ltd.		1	1
Bajaber Millers Ltd.		3	3
Best Ingredients Africa Ltd.		1	1
Bidco Uganda Ltd.	1	8	9
Jonisa Investments Ltd.		1	1
MMP Agro Industries Ltd.		2	2
Mount Meru Millers (Uganda) Ltd.		4	4
Mukwano Industries Uganda Ltd.		5	5
Nile Agro Industries Ltd.		2	2
Tasco Industries Ltd.		2	2
Vegol Ltd.		2	2
Maize flour	3	7	10
Afro-Kai Ltd.	1		1
Aponye Uganda Ltd.		1	1
Grainpulse Ltd.		2	2
Kabana Grain Millers Ltd.		1	1
Mandela Millers Ltd.		1	1
Pan Afric Impex (U) Ltd.		1	1
Reco Industries Ltd.	1		1
SMA Millers U Ltd.		1	1

Food Vehicle and Industry	Number of Industries with Expired Brands	Number of Industries with Valid Brands	Total Number of Industries
Sunrise Commodities and Millers Uganda Ltd.	1		1
Salt	1	4	5
Herbal Salt Plus Ltd.		1	1
Rukman International Ltd.	1		1
The Kampala Industries and Infrastructure Development Ltd.		3	3
Wheat	26	28	54
Ahmed Raza Foods Industries Ltd.		4	4
Alfil Millers (U) Ltd.	2		2
Bajaber Millers Ltd.		2	2
Bakhresa Grain Milling (Uganda) Ltd.	2	4	6
Dei Industries International Ltd.	4		4
Engaano Millers Ltd., Jinja	3		3
Kengrow Industries Ltd.		2	2
Kiddawalime Millers Ltd.	1		1
King Millers Ltd.		2	2
Maganjo Grain Millers Ltd.	2		2
Mandela Millers Ltd.	2	4	6
Master Grain Milling Ltd.	2		2
Miheret Grain Milling (U) Ltd.	2		2
Mt. Elgon Millers Ltd.		2	2
Nile Agro Industries Ltd.	1	4	5
Ntake Bakery and Company Ltd.		4	4
Pan Afric Commodities Ltd.	1		1
SMA Millers U Ltd.	2		2
Wheatco Industries Ltd.	2		2
Total	31	70	101

Table 22. NWGFF Member Institutional Mandates/Responsibilities

MOH	Nutrition Division	<p>Food Fortification Secretariat</p> <ol style="list-style-type: none"> 1. Oversee/coordinate the food fortification program. <ul style="list-style-type: none"> - Convene food fortification meetings to facilitate planning, budgeting, and implementation (institutionalize food fortification into sector work plans and budgets). 2. Conduct supportive supervision on the implementation of the food fortification program by private and public sector actors at border points, factories, and the market level. 3. Develop, update, and disseminate policy framework documents, including strategy, guidelines, regulations, protocols, and manuals. 4. Engage the parliamentary committee on health and nutrition to advocate for food fortification. 5. Conduct a regulatory impact assessment of food fortification, exploring iodized salt, coordination mechanisms, public institutions and private entities procurement systems, and threshold for mandatory regulations, and vitamin A fortificant levels. 6. Convene activities to develop fortification-related policy statements, briefs, position papers, and advocacy tools. 7. Conduct M&E. 8. Update the food fortification M&E framework. <ul style="list-style-type: none"> - Integrate food fortification indicators into national survey tools. - Conduct food fortification dissemination activities. - Recognize best-performing food fortification stakeholders. 9. Build capacity. 10. Mobilize resources.
	Regional Referral Hospitals (nutritionists)	<ol style="list-style-type: none"> 1. Oversee the implementation of the MOH’s community nutrition interventions, including regional-level food fortification. 2. Conduct supportive supervision on the implementation of the food fortification program by private and public sector actors at border points, factories, and the market level. 3. Disseminate learning. 4. Conduct stakeholder capacity building at border points, factories, and the market level.
	Health information	<ol style="list-style-type: none"> 1. Develop food fortification reporting templates. 2. Integrate and track food fortification progress through the Health Information Management System and the District Health Information System.
	Adolescent and School Health Division	Support the integration of food fortification and nutrition into school health programs.
	Reproductive Health Division	Promote interventions for adolescent and maternal health using the life-cycle approach, which includes prevention and management of anemia and other conditions.

	Inspection Hygiene and Sanitation Division	<ol style="list-style-type: none"> 1. Develop a framework to ensure that the premises of food business operators comply with general manufacturing practices (GMP) or suitability of premises for food fortification. 2. Integrate food fortification into inspection protocols. 3. Provide food fortification reports as part of inspection reports.
	Health Promotion and Education Division	<ol style="list-style-type: none"> 1. Review food fortification marketing strategies and promotional materials. 2. Disseminate food fortification messages.
	Pharmacy Division	<ol style="list-style-type: none"> 1. Provide guidance on procurement, distribution, and utilization of fortificants and premixes. 2. Ensure that food fortificants and premixes are appropriately classified as drugs.
	Planning Department	<ol style="list-style-type: none"> 1. Support the planning and budgeting processes. 2. Consider integration of food fortification indicators into community information management system. 3. Support in the review of the food fortification regulations.
	National Drug Authority Inspectorate Department	<ol style="list-style-type: none"> 1. Enforce regulations on the manufacturing, procurement, distribution, storage, and utilization of fortificants and premixes. 2. Conduct site inspection to verify adherence to GMPs by premix manufacturers, premix dealers, and producers of fortified foods. 3. Implement the pre-export verification of conformity policy. 4. Review the records of prequalified importers, manufacturers, and distributors. 5. Verify certificate of conformity of fortificants and fortification mixes at border points and at the industry level. Periodically share reports on complaints from field activities, post marketing surveillance, GMP compliance, and certificates of suitability of premises. 6. Ensure regulation compliance of fortified products and fortification inputs (premix and equipment) at customs.

Food Business Operators	Maize and wheat millers; oil processors; dealers in fortificants and premixes; salt packers, importers, and clearing agencies	<ol style="list-style-type: none"> 1. Implement the food fortification regulations. 2. Submit samples for analysis.
Office of the Prime Minister	Department of Policy Analysis	<ol style="list-style-type: none"> 1. Coordinate the multi-sectoral framework for nutrition. 2. Ensure the integration of food fortification into government MDAs planning frameworks and development plans (e.g., National Development Plan, Uganda Nutrition Action Plan, District Nutrition Action Plan).
	Department of Disasters Preparedness	<ol style="list-style-type: none"> 1. Integrate food fortification into disaster preparedness and emergencies in the Office of the Prime Minister. 2. Verify compliance of relief supplies to national standards and regulations. 3. Update relief/humanitarian guidelines to mandate the procurement of fortified foods. 4. Engage with humanitarian agencies to comply with national standards and regulations.
Ministry of Finance, Planning and Economic Development	Ministry of Finance, Planning and Economic Development	<ol style="list-style-type: none"> 1. Allocate resources for food fortification across different sectors. 2. Provide tax incentives for fortification inputs (premixes and equipment).
	URA	<ol style="list-style-type: none"> 1. Ensure regulation compliance of fortified products and fortification inputs (premixes and equipment). 2. Identify fortification inputs (premixes and equipment) that require tax exemptions. 3. Identify consignments fortificants, and premixes that need to be verified by the NDA for compliance. 4. Provide tax-related guidance. 5. Identify consignments fortificants and premixes for verification by the NDA to address issues of premix quality and compliance to standards. 6. Analyze customs clearance data (volume and source of fortified products) to establish trends in the importation of food fortification commodities. 7. Provide reports on the volume and source of fortified products and inputs. 8. Analyze customs clearance data (volume and source of fortified products) to establish trends in the importation of food fortification commodities. 9. Provide reports on the volume and source of fortified products and inputs.
Ministry of Trade, Industry and Cooperation	Micro-, Small-, and Medium-Scale Enterprises Division	<ol style="list-style-type: none"> 1. Ensure a transparent, motivating, and enabling regulatory environment for the food industry. 2. Provide supportive supervision on food fortification to micro-, small-, and medium-scale enterprises. 3. Verify production levels of fortifiable food manufacturers. 4. Profile industries producing fortifiable food vehicles.

	International trade	Implement World Trade Organization notifications (new) and publications (revised) of regulations related to food fortification.
UNBS	Food and Nutrition Standards Division	<ol style="list-style-type: none"> 1. Develop and promote food fortification standards. 2. Update and harmonize food fortification standards. 3. Provide updates to relevant stakeholders on the development of food fortification standards.
	Certification Division	Provide updates on findings from the certification process related to food fortification to the MOH for action.
	Testing Division	Provide updates on findings from testing related to food fortification to the NWGFF for action.
	Inspection (market and border posts surveillance)	Provide updates on findings from surveillance related to food fortification to the NWGFF for action.
Private Sector Foundation Uganda		<ol style="list-style-type: none"> 1. Advocate for a conducive and sustainable business environment for enterprise growth. 2. Support members build their competitiveness capacity at the national, regional, and global levels.
Uganda Industrial Research Institute	Uganda Industrial Research Institute	<ol style="list-style-type: none"> 1. Research and provide training on food product development. 2. Provide updates on findings from testing related to food fortification to the NWGFF for action. 3. Provide technical advisory services, technical backstopping, and food fortification technology transfer to industries.
Ministry of Education and Sports	National Curriculum Development Center	Integrate nutrition and food fortification in curricula at all levels of education.
	Educational Institutions	Promote knowledge on good nutrition practices in schools, colleges, and training institutions.
	Universities	Participate in food fortification research (development of research protocols, ethical approvals, implementation, development of policy briefs, and dissemination).
Ministry of Agriculture, Animal, Industries and Fisheries	Division of Food and Nutrition Security	Coordinate nutrition-related activities within the sector.
	Department of Crop Inspection and Certification	<ol style="list-style-type: none"> 1. Oversee safety, QA, and enforcement for plants and plant products—conduct statutory inspections and control imports and exports. 2. Build capacity of key stakeholders on trade requirements for national and regional cereals and cereal products.

		3. Provide food fortification advice in relation to regulatory controls on cereals and cereal products.
	Department of Agriculture Investment and Enterprise Development	Provide support in areas of agribusiness, value addition, and small-scale processing.
	National Agricultural Research Organization	Provide guidance on and coordination of all agricultural research activities.
Academia		Build capacity for food fortification research: <ul style="list-style-type: none"> - Develop an agenda and strategy for food fortification research capacity building. - Develop standard operating procedures for food fortification research (impact evaluation, food analysis). - Conduct applied research and technology transfer on food fortification. - Disseminate research findings.
Partners	USAID, FAO, WHO, UNICEF, World Food Programme	Provide technical and logistical support.

Table 23. Roles of NWGFF Subcommittees

Subcommittee Roles	Responsible Institutions
Policy and Planning	
<ol style="list-style-type: none"> 1. Provide technical guidance on the integration of food fortification into government MDA planning frameworks and development plans (e.g., National Development Plan, Uganda Nutrition Action Plan, District Nutrition Action Plan). 2. Develop, update, and disseminate policy framework documents, including strategy, guidelines, regulations, protocols, and manuals. 3. Monitor and evaluate the implementation of the food fortification program. 4. Mobilize resources. 5. Participate in the development, revision, and harmonization of food fortification standards at the national, regional, and global level. 6. Participate in the development of survey and research protocols. 7. Review reports by implementers of key components of the food fortification program. 8. Align the research and innovation agenda with government MDAs and partners. 	<p>MOH; Office of the Prime Minister; National Planning Authority; Ministry of Trade, Industry and Cooperation; Ministry of Agriculture, Animal, Industries and Fisheries; URA, NDA</p> <p>UNBS; representatives of relevant millers, processors, and traders; relevant development partners</p>

Subcommittee Roles	Responsible Institutions
Quality Assurance and Quality Control	
<ol style="list-style-type: none"> 1. Ensure the availability of up-to-date specifications and standards. 2. Review enforcement reports and make recommendations to the NWGFF for action. 3. Participate in the development, simplification, translation, and dissemination of standards for food fortification. 4. Support the tracking of prequalified importers, manufacturers, and distributors of fortificants and premixes. 5. Review food fortification compliance reports and findings from field activities, post marketing surveillance, and testing. 6. Share sector-related information to guide the planning, resourcing, and tracking of food fortification policies and programs. 7. Update the secretariat on— <ol style="list-style-type: none"> a. current list and status of suppliers of fortificants and premixes b. compliance status for each of the food fortification vehicles c. key issues arising from inspections (good manufacturing, production audits, import verification, and market surveillance implementation). 8. Develop recommendations to improve compliance with the food fortification regulations. 	<p>UNBS; NDA; Uganda Industrial Research Institute; district local governments; MOH; Ministry of Trade, Industry and Cooperation; Private Sector Foundation Uganda</p>
Production and Processing	
<ol style="list-style-type: none"> 1. Provide a platform for technical assistance related to food fortification. 2. Provide stakeholder liaisons/linkages with production/processing (value chain) actors. 3. Participate in the profiling of industries that produce fortifiable food vehicles. 4. Support industry access to appropriate food fortification commodities. 	<p>Uganda Industrial Research Institute; Ministry of Trade, Industry and Cooperation; Ministry of Agriculture, Animal, Industries and Fisheries; NDA; UNBS</p>
Advocacy and Demand Creation	
<ol style="list-style-type: none"> 1. Advocate for safe, quality, and affordable fortified foods. 2. Update food fortification demand creation messages for consumers and food business operators. 3. Update food fortification demand creation materials. 4. Disseminate food fortification demand creation messages and materials. 	<p>MOH, Private Sector Foundation Uganda, Media, Uganda Manufacturing Association, Uganda Consumer Protection Authority, The Grain Council Uganda, Spina Bifida and Hydrocephalus Association of Uganda, Industries</p>
Research and Innovation	
<ol style="list-style-type: none"> 1. Coordinate food fortification research interventions (food analysis, biomarker analysis, and dietary practices). 2. Identify researchable areas and problems, including viable fortifiable food vehicles. 3. Determine mandatory food fortification thresholds and develop context- 	<p>Academia; MOH; UBOS; Ministry of Trade, Industry and Cooperation;</p>

Subcommittee Roles	Responsible Institutions
specific fortificants. 4. Integrate food fortification into existing academic curricula. 5. Conduct an evaluation on the use and impact of fortified foods in Uganda.	National Agricultural Research Organization (NARO)
Monitoring, Evaluation, and Learning	
1. Update and review the food fortification monitoring framework. 2. Generate reports and policy briefs related to food fortification. 3. Disseminate and share food fortification learning.	Academia; MOH; UBOS; Ministry of Trade, Industry and Cooperation; NARO

Table 24: Premix Suppliers

Food Vehicle	Premix Supplier	Name of Premix Used	
Cooking oil/fats	BASF - Germany/DSM -SA	BASF	
	BASF Germany	BASF	
	Hexagon Nutrition (India)	Hexagon	Retinyl Palmitate
Maize	Amesi (K) Ltd	Nitrifit	
	Bakers Best Investment Ltd	Mirpain Premix	
	DSM South Africa	Fortitech Premixes	Nutrivit MF
	Hexagon Nutrition (India)	Hexagon	
	Mirpain Gida San Ve	Mirpain Premix	
	MuhlenChemie - Germany	Elcovit	
	Nutrifix Technologies SA	Nutrivit MF	Nutrivit WF
Wheat	BASF Germany	Nutrivit WF	
	Hexagon (Germany)	Hexagon	
	Hexagon Nutrition (India)	Foatvit	
	Mirpain Gida San Ve	Supplevit	
	MuhlenChemie - Germany	Elcovit	
	Nutrifix Technologies SA	Nutrivit WF	

Table 25. Food Fortification Program Data Requirements

Type of Data	Indicator	Frequency	Source
Compliance	<ul style="list-style-type: none"> Proportion of brands being fortified versus the number of industries fortifying all their brands 	Annually	Industry
	<ul style="list-style-type: none"> Number of certified industries 	Annually	UNBS
Production	<ul style="list-style-type: none"> Amount of fortified food produced in the country 	Annually	Ministry of Trade, Industry and

			Cooperation
Import	<ul style="list-style-type: none"> Percentage of imported fortified food brands that conform to national standards (based on certificate of conformity at point of entry) 	Six months	UNBS
	<ul style="list-style-type: none"> Percentage of premix samples that conform to national standards (certificate of conformity) 	Six months	NDA
	<ul style="list-style-type: none"> Amount of fortified food imported into the country (brands, food vehicle, and country of origin) 	Six months	URA
	<ul style="list-style-type: none"> Amount of exported fortified food products, disaggregated by brand and food vehicle 	Six months	URA
Market	<ul style="list-style-type: none"> Number of brands labeled as fortified food on the market, disaggregated by food vehicle Percentage of brands of fortified food that are adequately fortified according to the national standard 	Annually	Food fortification program to mobilize resources for the activity
Access and consumption	Consumption coverage at household (GAIN 2017)	Partner-supported, not routine	
Impact	Percentage of children with anemia (Hg levels below 12g/dl)	Annually	UNPS and UDHS
	Vitamin A deficiency in children (ages 6–59 months)	Every two years	UNPS and UDHS
	Vitamin A deficiency in women of reproductive age	Annually	UNPS and UDHS
	Iron deficiency	Annually	UNPS and UDHS
	Iron deficiency anemia	Annually	UNPS and UDHS
	Anemia	Annually	UNPS and UDHS
	Stunting	Annually	UNPS
	Folate deficiency	Every two to three years	UNPS
	Serum-folate deficiency	Every two to three years	UNPS
	Zinc deficiency	Every two years	UNPS
Urinary iodine concentration	Every two to three years	UNPS	

	Household consumption data		UNPS and UDHS
Dietary diversity	Proportion of women with adequate dietary diversity	Annually	UNPS
	Minimum acceptable diet: (1) Proportion of children with adequate meal frequency (2) Proportion of children with the required dietary diversity	Annually	UNPS

Annex 2: WHO Basic Definitions of Monitoring and Evaluation in the Context of Food Fortification

Excerpted from Allen et al. 2006.

WHO basic definitions of monitoring and evaluation in the context of food fortification:

Monitoring in the context of food fortification refers to the continuous collection, review, and use of information on program implementation activities for the purpose of identifying problems such as noncompliance, and for informing corrective actions. The ultimate purpose of monitoring a fortification program is to ensure that the fortified product is of the desired quality, is made available, and is accessible to consumers in sufficient amounts.

Evaluation is used to refer to the assessment of the effectiveness and impact of a program on the target population. In the case of food fortification, evaluations are undertaken with the aim of providing evidence that the program is indeed reaching its nutritional goals, be this an increase in the intake of a fortified food or of specific nutrients, or an improvement in the nutritional status, health, or functional outcomes of the target population.

Program evaluation should not be undertaken until a program has been shown—through appropriate monitoring—that it has been implemented as planned and is operating efficiently. A poorly implemented program is unlikely to achieve its desired impact and, thus, resources should not be wasted in undertaking evaluations until program operational inefficiencies have been corrected.

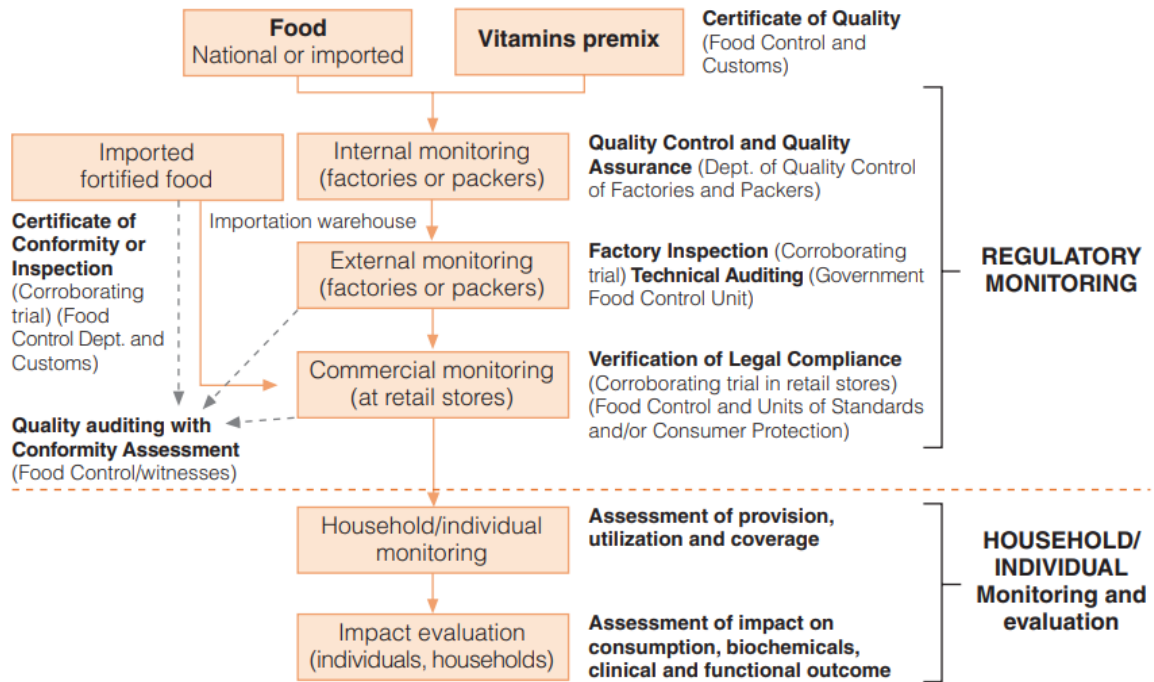
A WHO schematic representation of a model monitoring and evaluation system for fortification programs is shown in [Figure 4](#) provides a framework for the various monitoring and evaluation activities, and the model distinguishes two main categories of monitoring: *regulatory monitoring* and *household/individual monitoring*.

Regulatory monitoring encompasses all monitoring activities conducted at the production level (factories, packers), as well as monitoring at customs warehouses and retail stores, by concerned regulatory authorities and by producers as part of self-regulation programs. Production-level regulatory monitoring includes both internal and external monitoring; regulatory monitoring at the retail level is referred to here as *commercial monitoring*. The primary aim of regulatory monitoring is to ensure that the fortified foods meet the nutrient, quality, and safety standards set prior to program implementation.

While, *household/individual monitoring*, as its name implies, involves households and their members; it has the following objectives: (1) to ensure that target individuals and households have access to the fortified food and that the fortified food is of the expected quality (i.e., to measure service provision); (2) to ensure that target individuals and households purchase and consume the fortified food (i.e., to monitor service utilization); (3) to ensure that target individuals and households consume the fortified food in appropriate amounts and frequency (i.e., to measure coverage) (Habicht, Victora, and Vaughan 1999). Once regulatory

and household monitoring have demonstrated that the program is operating in a satisfactory manner, evaluation of the program at the household and individual level can be undertaken to assess its impact.

Figure 4. An M&E System for a Food Fortification Program



Source: Allen et al. 2006.

References

- Allen, Lindsay, Bruno de Benoist, Omar Dary, and Richard Hurrell, eds. 2006. *Guidelines on Food Fortification with Micronutrients*. Geneva: World Health Organization. <https://www.who.int/publications/i/item/9241594012>.
- ECSA (East, Central, and Southern Africa). 2017. *Consumption Monitoring and Program Impact Evaluation Training Workshop Concept Note*. August 24–25, 2017, Kigali, Rwanda.
- FAO (Food and Agriculture Organization of the United Nations). 2014. *The State of Food and Agriculture 2014: Innovation in Family Farming*. Rome: FAO.
- FAO (Food and Agriculture Organization of the United Nations). 2021. *FAOSTAT: Food Balances (2010-2019)*. Rome: FAO. Cited February 2022. <https://www.fao.org/faostat/en/#data/FBS>
- FAO (Food and Agriculture Organization of the United Nations and WHO (World Health Organization)). 2006. *Codex Alimentarius International Food Standards: General Principles for the Addition of Essential Nutrients to Foods*. Revised Version." Geneva, Switzerland: WHO and Rome; Italy: FAO: https://www.fao.org/fao-who-codexalimentarius/sh-proxy/en/?lnk=1&url=https%253A%252F%252Fworkspace.fao.org%252Fsites%252Fcodex%252FStandards%252FCXG%2B9-1987%252FCXG_009e_2015.pdf
- FFI (Food Fortification Initiative). 2022. "Uganda: Despite Challenges Food Producers Continue to Fortify Food." Food Fortification Initiative, April 12. <https://www.ffinetwork.org/ffimedia/uganda-despite-challenges-food-producers-continue-to-fortify-food>.
- Fiedler, J.L., and R. Afidra. 2010. "Vitamin A Fortification in Uganda: Comparing the Feasibility, Coverage, Costs, and Cost-Effectiveness of Fortifying Vegetable Oil and Sugar." *Food Nutr Bull* 31: 193–205.
- GAIN (Global Alliance for Improved Nutrition), Makerere University, and Centers for Disease Control and Prevention. 2017. *Fortification Assessment Coverage Tool (FACT) Survey in Uganda, 2015*. Geneva: Global Alliance for Improved Nutrition.
- Garrett, G.S., C.L. Luthringer, and P. Mkambula. 2016. "Improving Nutritious Food Systems by Establishing National Micronutrient Premix Supply Systems." *Sight & Life Magazine* 30 (1): 62–8.
- Guinot et al. 2012. "GAIN Premix Facility: An Innovative Approach for Improving Access to Quality Vitamin and Mineral Premix in Fortification Initiatives." *FNB Dec* 33 (4 Suppl): S381–89.
- Habicht, J.P., C.G. Victora, and J.P. Vaughan. 1999. "Evaluation Designs for Adequacy, Plausibility and Probability of Public Health Programme Performance and Impact." *International Journal of Epidemiology* 28: 10–18.
- IFPRI (International Food Policy Research Institute 2016). *Global Nutrition Report 2016: From Promise to Impact: Ending Malnutrition by 2030*. Washington, DC: IFPRI. <http://ebrary.ifpri.org/utis/getfile/collection/p15738coll2/id/130354/filename/130565.pdf>.
- Imdad, A., E. Mayo-Wilson, K. Herzer, and Z.A. Bhutta. 2017. "Vitamin A Supplementation for Preventing Morbidity and Mortality in Children from Six Months to Five Years of Age." *Cochrane Database Syst Rev.* 3 (3): CD008524. doi: 10.1002/14651858.CD008524.pub3. Update in: *Cochrane Database Syst Rev.* 2022 Mar 16;3:CD008524. PMID: 28282701; PMCID: PMC6464706.
- Luthringer, C.L., L.A. Rowe, M. Vossenaar, et al. 2015. "Regulatory Monitoring of Fortified Foods: Identifying Barriers and Good Practices." *Glob Health Sci Pract*; 3: 446–61.

Luwedde, Justine. 2022 “How Russia–Ukraine War is Impacting Uganda’s Agriculture and Transport Sectors.” October 5. Kampala: Economic Policy Research Centre. https://eprcug.org/eprc-highlights/how-russia-ukraine-war-is-impacting-ugandas-agriculture-and-transport-sectors/?utm_source=rss&utm_medium=rss&utm_campaign=how-russia-ukraine-war-is-impacting-ugandas-agriculture-and-transport-sectors.

Martorell, R., Melany Ascencio, Luis Tacsan, et al. 2015. “Effectiveness Evaluation of the Food Fortification Program of Costa Rica: Impact on Anemia Prevalence and Hemoglobin Concentrations in Women and Children.” *Am J Clin Nutr* 101 (1): 210–17.

Micronutrient Initiative. 2009. *Investing in the Future: A United Call to Action on Vitamin and Mineral Deficiencies*. Ottawa: Micronutrient Initiative.

MOH (Ministry of Health). 2011. *The Food and Drugs (Food Fortification) (Amendment) Regulations, 2011*. Kampala: MOH.

Obare, Linet, Esther Adede, Hezbourne Ong’elleh, and Felistus Mutambi. 2017. *Assessment of Consumption Monitoring Systems, Fortified and Nutritious Foods in the ECSA Region—Final Report*. Washington, DC: USAID (USAID/GAIN/ECSA-HC-2017). <https://www.gainhealth.org/sites/default/files/publications/documents/gain-usaid-assessment-of-consumption-of-monitoring-systems-fortified-and-nutritious-foods.pdf>

Office of the Prime Minister Uganda. 2013. *Reducing Malnutrition in Uganda: Summary of Uganda PROFILES 2013 Estimates to Support Nutrition Advocacy*. Kampala: Office of the Prime Minister Uganda.

Onen, Geoffrey. 2010. *Revision of the Salt Iodisation Regulations and Standards for Iodised Salt in Uganda: Final Report*. Kampala: Uganda National Bureau of Standards.

Philomena Matsiko, Maryanne Gicobi, Emmanuel Onyango and Johnson Kanamugire (10 May 2017). “Why price of refined sugar has surged across East Africa”. *The East African*. Nairobi.

Sablah, Mawuli, and Fred Grant. 2013. *Food Fortification in Africa Progress to Date and Priorities Moving Forward*. Dakar: Helen Keller International.

Scott, P. *Global panel on agriculture and food systems for nutrition: food systems and diets: facing the challenges of the 21st century*. *Food Sec.* 9, 653–654 (2017). <https://doi.org/10.1007/s12571-017-0678-y>

Smarter Futures. 2014. “FORTIMAS: An Approach for Tracking the Population Coverage and Impact of a Flour Fortification Program.” *Smarter Futures*. <http://www.smarterfutures.net/fortimas>.

SPRING (Strengthening Partnerships, Results, and Innovations in Nutrition Globally). 2018. *Cost of Maize Flour Fortification in Uganda: Results from an Economic Modeling Analysis*. Arlington, VA: SPRING.

Streifel, Cathryn, Reid Hamel, and Sara M. Allinder. 2018. *Improving Nutrition in East Africa’s Bread Basket* Center for Strategic and International Studies. Rhode Island Avenue NW, Washington, DC. https://csis-website-prod.s3.amazonaws.com/s3fs-public/publication/181011_USNutrition_Investments_Uganda.pdf.

UBOS (Uganda Bureau of Statistics). 2020. *The Uganda National Panel Survey 2018/19, Wave VII Report*. Kampala: The Republic of Uganda: UBOS Retrieved from https://www.ubos.org/wpcontent/uploads/publications/11_202110_2021UNPS_Report_wave7_report.pdf

UBOS (Uganda Bureau of Statistics). 2022. *Uganda National Panel Survey (UNPS) 2019/2020—Edible Oil and Fat Fortification*. Kampala: UBOS.

- UBOS (Uganda Bureau of Statistics) and African Development Bank Group. 2020. *Uganda Food Balance Sheets Report. 2013–2018*. Kampala: UBOS.
- UBOS (Uganda Bureau of Statistics) and ICF International Inc. 2016. *Uganda Demographic and Health Survey (UDHS)*. Kampala: UBOS.
- URA (Uganda Revenue Authority). 2021. *A Guide on Tax Incentives/Exemptions Available to the Investors in Uganda. 5th ed*. Kampala: URA.
- USAID (U.S. Agency for International Development). 2022. *Large-Scale Food Fortification Programming Guide: Supporting Food Fortification at a Country Level and on a Global Scale*. Washington, DC: USAID. <https://agrilinks.org/post/usaaid-large-scale-food-fortification-programming-guide-supporting-food-fortification-country>.
- USAID Advancing Nutrition Uganda. 2022. *Capacity Needs Assessment for Food Processors of Maize and Wheat Flours, Salt, and Edible Oils and Fats in Uganda*. Arlington, VA: USAID Advancing Nutrition Uganda.
- USAID Advancing Nutrition. 2023. *Profiling and Industry Categorization of Fortified and Fortifiable Foods in Uganda*. Arlington, VA: USAID Advancing Nutrition Uganda.
- USCTA (Uganda Sugar Cane Technologists' Association). 2008. "Tenth Annual Report for Calendar Year 2007." Kampala: USCTA.
- WFP (World Food Programme). 2012. *The Cost of Hunger Study in Uganda*. Rome: WFP.
- WFP (World Food Programme), OPM (Office of the Prime Minister, Government of Uganda), and UNICEF (United Nations Children's Fund). 2019. *Fill the Nutrient Gap: Uganda National Summary Report*. Rome: WFP. https://docs.wfp.org/api/documents/WFP-0000108062/download/?_ga=2.130971471.1594892390.1632866234-1022257996.1628870164.
- Wikipedia. 2016. "List of Sugar Manufacturers in Uganda." Last modified November 5, 2022 https://en.wikipedia.org/wiki/List_of_sugar_manufacturers_in_Uganda#cite_ref-Rpt2014_14-0.
- World Health Organization (WHO) 2004. *Iodine status worldwide – WHO Global Database in Iodine Deficiency*. Geneva.
- WHO (World Health Organization). 2007. *Assessment of Iodine Deficiency Disorders and Monitoring their Elimination: A Guide for Programme Managers, 3rd ed*. Geneva: WHO. <https://apps.who.int/iris/handle/10665/43781>
- WHO (World Health Organization). 2015. "Obesity and Overweight." Fact Sheet 311. Geneva: WHO. <http://www.who.int/mediacentre/factsheets/fs311/en/>.
- WHO (World Health Organization). 2016. *WHO recommendations on antenatal care for a positive pregnancy experience*. Geneva: WHO. Available at: www.who.int/reproductivehealth/publications/maternal_perinatal_health/anc-positive-pregnancy-experience/en/
- Zamora, G., and L.M. De-Regil. 2014. "Equity in Access to Fortified Maize Flour and Corn Meal." *Ann N Y Acad Sci* 1312: 40–53.



Photo Credit: A USAID Advancing Nutrition: A woman pours fortified maize flour in a saucepan of hot water to prepare maize bread, as she prepares a lunch meal for her household in Ndejeje village, Wakiso district.