2024 Annual Report

NAVIGATING CHANGE, MAXIMIZING IMPACT

Food Fortification Initiative
Enhancing Grains for Healthier Lives

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Photo: A rice plant growing in a field. (Mathieu Schoutteten)
Cover photo: Preparing a fortified mixture of maize flour, wheat flour, and other ingredients. (Albert González Farran/UNAMID)

The Food Fortification Initiative (FFI) champions effective grain fortification so people have the nutrition they need to be smarter, stronger, and healthier.

FFI provides unique expertise to help country leaders plan, implement, and monitor the fortification of industrially milled cereal grains. Established in 2002, we are a public, private, and civic partnership based at Emory University.

What is fortification?

Food fortification—sometimes referred to as food enrichment—is when food producers add essential vitamins and minerals missing in a population's diet to food that people eat every day.

Humans need vitamins and minerals, called micronutrients, in small amounts to function optimally. The consequences of micronutrient deficiencies can be extensive, including devastating birth defects for babies, maternal death, impaired brain development in young children, and reduced work capacity among adults.

Large-scale food fortification is a proven, cost-effective way to prevent micronutrient deficiencies, save lives, and build a better future.

Visit our website **FFInetwork.org**

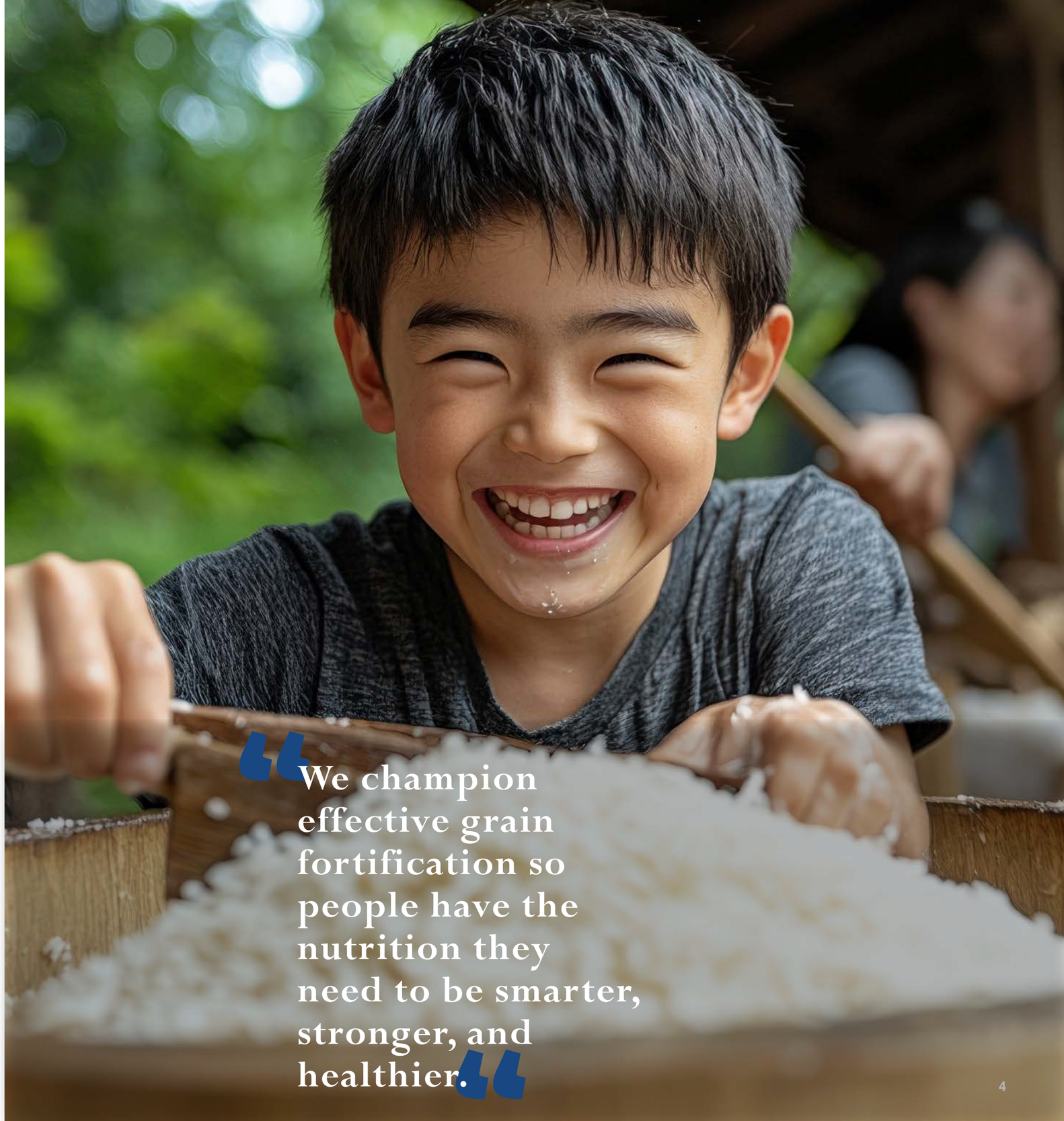
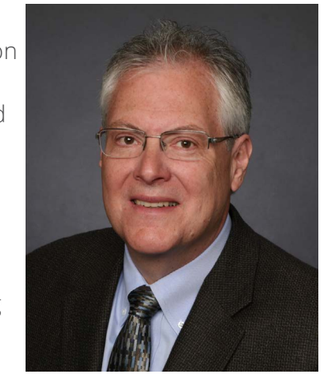


Photo: Jordi Vaque/FAO

Message from the Director

Dear Partners and Colleagues,



2024 was a year of steady, confident progress. With the 2023 World Health Assembly resolution now firmly in circulation, governments like the Philippines moved the resolution's guidance from policy paper to practice, starting work on activities like updating fortification standards to include micronutrients that will build healthier futures. Across these varied efforts the common thread is a conviction that fortification is not a peripheral add-on but an essential service that shields families, especially women and children, from the costs of micronutrient deficiency.

The advent of 2025 has brought a different challenge: sudden reductions in several large funding envelopes, including USAID's Advancing Food Fortification Opportunities to Reinforce Diets (AFFORD) program. Our response has been immediate and practical. Because FFI is an intentionally lean organization, we can swiftly direct technical assistance where it is most needed and seize emerging opportunities without losing sight of our north star. This nimbleness allows us to adapt our approach while staying true to our mission.

Even as budgets tighten, opportunities continue to open. In India, supply-chain mapping, multi-stakeholder workshops and a series of state proposals have positioned Haryana, Maharashtra and Rajasthan to fortify whole-wheat flour for distribution through the Public Distribution System and child nutrition programs, a shift that could improve tens of millions of daily meals once the final government orders are signed. Similarly, in Angola, Azerbaijan, and several other countries around the world we supported the development of the country's first large-scale food fortification strategy, and we are poised to assist governments and partners in developing national fortification standards and regulations aligned with World Health Organization guidelines.

To everyone who keeps data flowing and legislation advancing, thank you. Your resolve means that large-scale food fortification, one of the safest and most cost-effective routes to stronger economies and healthier lives, reaches millions more people. As we navigate 2025, facing leaner budgets but undiminished purpose, I am certain that our shared commitment will carry us forward and reach even more communities with the simple promise of nutritious food.

With gratitude and determination,

Scott Montgomery
Director, Food Fortification Initiative

FFI Around the World

In 2024, FFI provided technical assistance for grain fortification in 27 countries across five regions: Africa, the Americas, Asia-Pacific, Europe, and India.

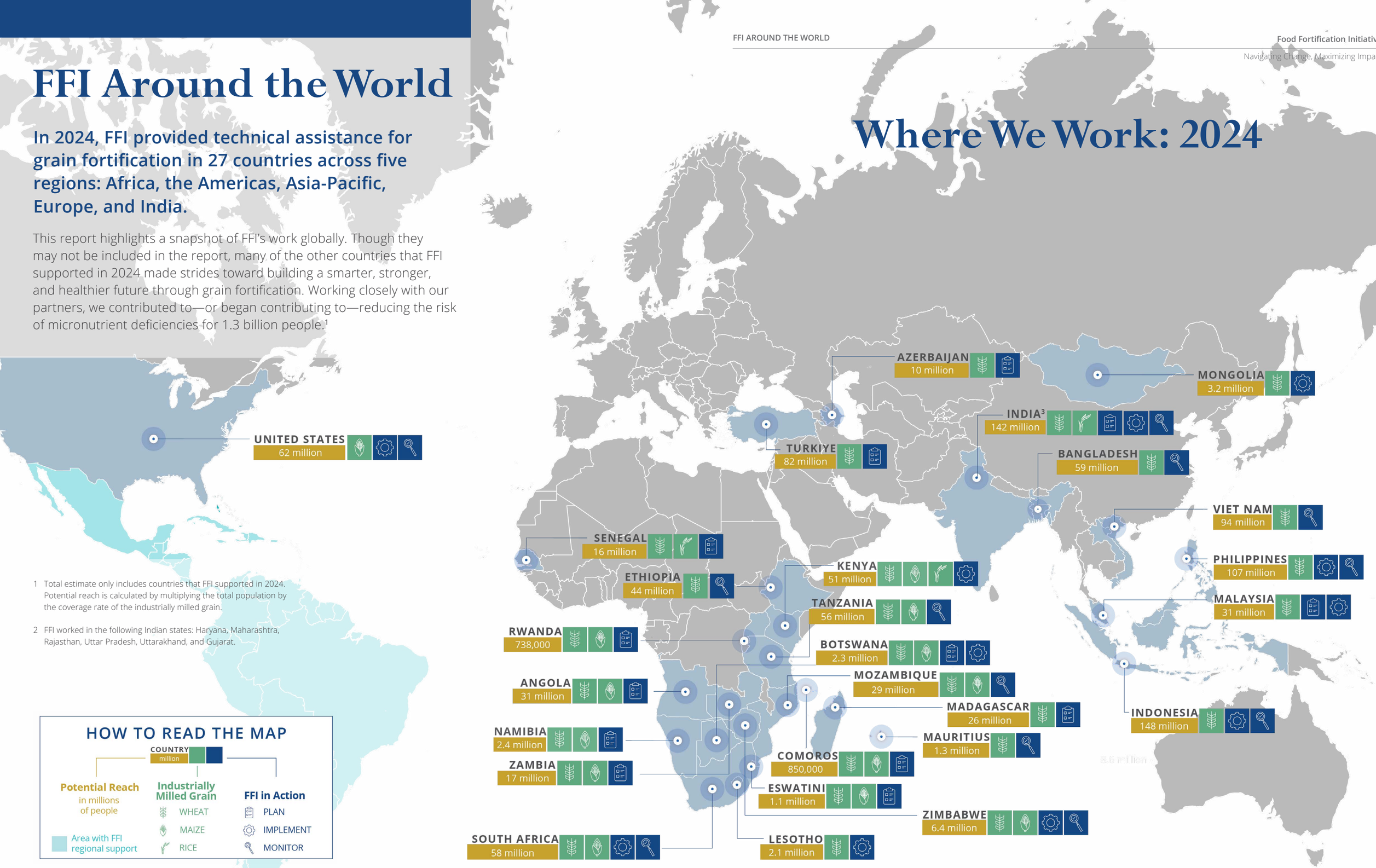
This report highlights a snapshot of FFI's work globally. Though they may not be included in the report, many of the other countries that FFI supported in 2024 made strides toward building a smarter, stronger, and healthier future through grain fortification. Working closely with our partners, we contributed to—or began contributing to—reducing the risk of micronutrient deficiencies for 1.3 billion people.[1]

1 Total estimate only includes countries that FFI supported in 2024. Potential reach is calculated by multiplying the total population by the coverage rate of the industrially milled grain.

2 FFI worked in the following Indian states: Haryana, Maharashtra, Rajasthan, Uttar Pradesh, Uttarakhand, and Gujarat.

HOW TO READ THE MAP

Where We Work: 2024



GLOBAL HIGHLIGHTS

Partnering with UNICEF for Fortification Progress

In 2024, FFI received three grants from UNICEF to support our global fortification work, enabling us to help develop large-scale food fortification programs and provide technical guidance to public, private, and civic stakeholders. In alignment with UNICEF and FFI's missions, these programs aim to improve nutrition outcomes for children and women worldwide.

Photo: A bag of fortified wheat flour imported to the island nation of Comoros, where FFI is supporting the creation of a fortification program. (FFI)

Developing Fortification Programs in Eastern and Southern Africa

In July 2024, FFI and UNICEF's Eastern and Southern Africa Regional Office (ESARO) started a project to build the capacity of fortification programs in 10 countries: Angola, Comoros, Ethiopia, Kenya, Mozambique, Namibia, Rwanda, South Africa, Tanzania, and Zimbabwe. Through the project, which runs until December 2025, FFI will collaborate with UNICEF country offices, government stakeholders, private sector food producers, civil society advocates, and key regional partners such as the Southern Africa Development Community (SADC) and the Eastern, Central, and Southern Africa Health Community (ECSA) to support fortification programs' strategic development, design, legislation formulation, and capacity building for monitoring and regulation.

Key goals and achievements toward these goals in 2024 include:

1. Designing effective fortification programs: FFI and its partners have made significant progress in designing fortification programs in Angola, Comoros, Rwanda, Namibia, and Zimbabwe, with several outputs completed and others underway. In Angola, FFI finalized a fortification strategy to guide multisectoral fortification planning efforts. In Comoros, FFI conducted a fortification feasibility assessment that identified wheat flour and rice as fortification opportunities for the government, which is seeking to design a fortification program. In August 2024, FFI traveled to Zimbabwe to provide technical support for the development of national food fortification standards. FFI drafted a report based on findings and recommendations from this visit.

2. Strengthening regional coordination: FFI continued its outreach and collaboration with regional partners to ensure national fortification strategies and policies are harmonized.

3. Improving monitoring and regulation: Efforts to improve fortification monitoring and regulation in Ethiopia, Mozambique, South Africa, and Tanzania are ongoing, with activities planned for 2025.

While significant strides were made in 2024, efforts will continue in 2025 to ensure the successful implementation of fortification programs across the region.

Advancing Wheat Flour Fortification in Azerbaijan

Beginning in September 2024, FFI partnered with UNICEF Azerbaijan and the Azerbaijan Food Safety Agency (AFSA) to help establish a wheat flour fortification program aimed at reducing the high rates of anemia and micronutrient deficiencies in the country. A 2013 national nutrition survey found that 40% of pregnant and 38% of non-pregnant women were anemic. The survey showed that more than half of anemic women were iron deficient, and folate and vitamin B12 deficiency were also present, putting women's and children's health at risk.
To address this burden, the Azerbaijan Government initiated a policy pathway for wheat flour fortification to be mandated, established a working group of millers to start fortifying wheat flour, and sought technical assistance from UNICEF Azerbaijan and FFI to pave the way for a fortification program.

Photos: Representatives from the Azerbaijan Food Safety Agency, FFI, and UNICEF Azerbaijan visit a mill in Azerbaijan. (FFI)

Project activities, which continued through May 2025, included technical assistance to:

- Educate government representatives and millers on wheat flour fortification by facilitating a tour of an Ardent Mills wheat flour mill in Chattanooga, Tennessee
- Advise the millers' working group
- Develop national fortification standards that align with World Health Organization guidelines
- Create tailored standard operating procedures (SOPs) for millers
- Support a communications plan for public education and awareness

In September 2024, FFI staff traveled to Baku, Azerbaijan, to consult with public and private stakeholders and understand fortification needs, gaps, and context. FFI also attended the Eurasia Chapter of the International Association of Operative Millers' Annual Conference, where FFI met with Azerbaijani millers and suppliers.

Through training, stakeholder collaboration, and public education, the project seeks to ensure sustainable implementation and improved nutrition in Azerbaijan.

Reshaping Food Systems Through Large-Scale Food Fortification

A third grant to FFI supports UNICEF's efforts to integrate fortification into global food systems to address malnutrition. UNICEF reported that one in three children under five years old is not growing well due to malnutrition. To address these challenges, UNICEF's 2020-2030 Nutrition Strategy focuses on improving the quality of children's diets, food environments, and food practices—all aspects of a food system.
FFI's planned activities, which will take place

2024-2025, include the following.

- **Scoping review:** Identifying existing research and documents on food systems and fortification.
- **Key informant interviews:** Engaging experts to pinpoint gaps, challenges, and opportunities for the integration of fortification into food systems.
- **Evidence-based recommendations:** Formulating actionable strategies to integrate fortification into food systems.
- **Scoping exercise:** Mapping the global fortification landscape to identify regional and country-level opportunities.
- **Lessons learned:** Documentation of regional fortification initiatives to support evidence-based improvements and cross-country sharing

Photo: Xaume Olleros/RTI

USAID AFFORD

Advancing food fortification globally

In 2024, FFI marked significant progress under the USAID Advancing Food Fortification Opportunities to Reinforce Diets (AFFORD) program, which launched in 2022 with a five-year vision to strengthen national food fortification systems. However, unexpected foreign assistance funding cuts in 2025 brought the program to an early close, halting activities just halfway through its planned timeline. Despite this premature end, the USAID AFFORD program delivered meaningful impact in its short lifespan—catalyzing policy change, expanding technical support to countries, and deepening partnerships across sectors.

USAID AFFORD was a pioneering initiative dedicated to combating global micronutrient deficiencies, with a particular focus on groups vulnerable to poor nutrition, such as women of reproductive age and young children. TechnoServe implemented the project in partnership with FFI, Nutrition International, and ISF Advisors. USAID AFFORD took a comprehensive approach to advancing large-scale food fortification by engaging public, private, and civil society stakeholders. The project's activities aimed to create sustainable solutions for better nutrition and improved health outcomes worldwide by uniting diverse expertise and resources.

Although the USAID AFFORD project is no longer active, the resources it developed, its legacy of capacity building, and its efforts to catalyze policy change will continue to serve the fortification advocacy community and the countries in which the project worked.

Key Contributions and Project Highlights

2023

Developed a rapid zinc spot test and protocol in partnership with Brigham Young University
This test addresses a critical regulatory monitoring gap and will help food producers and regulators quickly identify zinc added to fortified foods

Conducted an in-depth, evidence-based country prioritization exercise of USAID Feed the Future countries to identify areas of greatest nutritional need and fortification opportunity

Supported large-scale food fortification opportunity assessments in target countries such as Senegal (comprehensive assessment and separate market assessment) and Haiti (comprehensive assessment, inclusive of market assessment) to evaluate large-scale food fortification landscapes and inform USAID investments

2024

Provided in-depth technical assistance in Zambia, Madagascar (comprehensive assessment, informational briefs) to identify large-scale food fortification opportunities and fill information gaps

Initiated a 5-year project to support large-scale food fortification in 15 ECOWAS member countries (cancelled due to USAID contract terminations)

Conducted a systematic review of the economic outcomes of food fortification
In collaboration with Cochrane Response and TechnoServe, FFI systematically reviewed the economic outcomes of food fortification, concluding it is highly cost-effective in most contexts. The manuscript is under peer review. In the interim, the pre-print version is available on medRxiv.

2024, continued

Began developing training materials for industry and government monitoring of fortification programs
FFI collaborated with TechnoServe and Nutrition International to create training materials for quality assurance, quality control, and regulatory monitoring of fortification programs. An implementation plan, gap analysis, and detailed content outline were developed to support a sustainable training model. This work was in progress at the end of the USAID AFFORD project.

Conducted a situational analysis of fortification in Eastern and Southern Africa
FFI contributed to a comprehensive analysis of the fortification landscape across 20 countries in the Southern African Development Community and the East, Central, and Southern Africa Health Community, encompassing wheat flour, maize flour, rice, oil, salt, and sugar. The analysis produced two-page country profiles for each country and a report summarizing barriers and implementation statuses for large-scale food fortification.

Developed a resource library to support a fortification knowledge hub
This work was intended to support the development of a resource library on Nutrition Links, a global multi-sector nutrition resource hub hosted by another USAID project that is no longer active. However, as a part of this effort, FFI systematically catalogued food fortification resources.

Knowledge Dissemination and Operational Support
As the knowledge management and communications lead for USAID AFFORD in year one, FFI used a knowledge management assessment to develop the project's knowledge management and communication plans. In this role, FFI also shared knowledge generated through the project both internally and externally, and contributed significantly to strengthening communication within the global fortification community.

FFI supported the creation of a Communications Working Group under the Global Fortification Technical Advisory Group (GF-TAG) to facilitate updates, amplify large-scale food fortification messages, and support advocacy efforts. In 2024, the GF-TAG Communications Working Group developed an advocacy toolkit with resources that national stakeholders can use to advance fortification. The toolkit included policy briefs, fact sheets, information about key advocacy opportunities, and communication resources.

FFI also supported key internal knowledge management resources by producing content for a Large-Scale Food Fortification 101 series that featured trainings from fortification experts. The series provided project staff with a strong, aligned technical foundation for fortification principles.

2024 FFI Publications

Resources published in 2024 by FFI staff that build the evidence base for food fortification

Research Publications

Adams, K. P., Vosti, S. A., Tarini, A., Beye, M., **Pachón, H.**, Kiselova, S., & Engle-Stone, R. (2024). The potential contributions of bouillon fortification to meeting micronutrient requirements among women and preschool children in Senegal: A modeling study using household consumption and expenditure survey data. *Annals of the New York Academy of Sciences*, 1537(1), 98–112.

Tsang, B. L., Deshpande, S., Varghese, M., Jain, S., de Romana, D. L., & Chadha, M. (2024). Introducing double fortified salt in social safety net programmes in Madhya Pradesh and Gujarat in India: Success factors, challenges and lessons learned. *Maternal & Child Nutrition*, e13646.

Tsang, B. L., Stadnik, C., Duong, M., Pachón, H., & Martinez, H. (2024). Expanding Fortification with Folic Acid: Thinking Outside the Cereal-Grain Box. *Nutrients*, 16(9), 1312.

Wagh, K., Kancherla, V., Dorsey, A., **Pachón, H.**, & Oakley, G. P. (2024). A global update on the status of prevention of folic acid-preventable spina bifida and anencephaly in year 2022. *Birth Defects Research*, 116(5).

Wessells, K. R., Manger, M. S., **Tsang, B. L.**, Brown, K. H., & McDonald, C. M. (2024). Mandatory large-scale food fortification programmes can reduce the estimated prevalence of inadequate zinc intake by up to 50% globally. *Nature Food*, 5(7), 625–637.

Qi, Y. P., Crider, K. S., Williams, A. M., Tripp, K., Mapango, C., Rhodes, E. C., Nyirenda, E., Phiri, F., Zhang, M., Jabbar, S., Pfeiffer, C. M., **Pachón, H.**, Zimmerman, S., & Williams, J. L. . (2024). Folate and vitamin B12 status and predicted neural tube defects risk among nonpregnant women of reproductive age from the Malawi National Micronutrient Survey, 2015-2016. *Birth Defects Research*, 116(3), e2329.

Technical Country-Level Reports

Food Fortification Initiative. "Corn Masa in the US: Supply Chain, Market, and Fortification". FFI: Atlanta, USA, 2024.

Food Fortification Initiative. "Corn Masa Market Assessment: Products and Fortification". FFI: Atlanta, USA, 2024.

Food Fortification Initiative. Kingdom of Eswatini Food Fortification Landscape Analysis Report. FFI: Kampala, Uganda, 2024.

Food Fortification Initiative. Kingdom of Lesotho: Food Fortification Status Assessment Mission Report. FFI: Kampala, Uganda, 2024.

Communication Materials

"Global Food Fortification Advocacy Toolkit". Global Fortification Technical Advocacy Group: Geneva, Switzerland. (2024).

Food Fortification Initiative. "Communications Toolkit: Advocating for Healthier Communities and Folic Acid Fortified Corn Masa". FFI: Atlanta, USA. (2024).

REGIONAL HIGHLIGHTS

ESWATINI

1.1 million potential reach

In 2023, FFI and the Government of Eswatini embarked on a pivotal mission to address micronutrient deficiencies that have long challenged the nation's health. Vitamin A, iron, and zinc deficiencies are significant challenges for Eswatini's population, particularly for women and children, leading to health consequences such as blindness, poor pregnancy outcomes, and increased risk of infections.

FFI's work began with a comprehensive landscape analysis of large-scale food fortification. By January 2024, the findings had been validated and shared with the government and key partners. The findings revealed that while the country has a wheat flour miller voluntarily fortifying its products using South African standards, maize flour fortification remains an untapped opportunity, mainly through school feeding programs supported by the World Food Programme. Additionally, Eswatini does not have clear fortification standards for imported edible oils and salt.

A lack of reliable, recent data on anemia and other micronutrient deficiencies further highlights the urgency of this work. Eswatini's last micronutrient survey was conducted in 2007, making its findings outdated. To fill this gap, FFI is providing the government and other partners with technical assistance as they conduct a new micronutrient survey, which is currently underway with financial support from the World Bank.

FFI's efforts have set the stage for transformative action. The findings of the landscape analysis and micronutrient survey will provide the government with a roadmap to establish mandatory fortification standards. Integrating compliance monitoring into existing structures and strengthening capacity will ensure a sustainable impact. This project marks the beginning of a healthier, fortified future for Eswatini.

Photo: Training participants with the Secretary of the Office of the Prime Minister in Lesotho. (FFI)

LESOTHO

2.1 million potential reach

Lesotho took a significant step toward addressing micronutrient deficiencies by mandating the fortification of wheat flour, maize flour, and edible oil in 2020. However, enforcing fortification standards proved to be a challenge for the country. A 2024 fortification status assessment conducted by FFI found that capacity-building training for key fortification stakeholders could strengthen the country's monitoring practices and ultimately ensure foods are fortified in compliance with standards.

In response, FFI, in collaboration with the World Food Programme, conducted a regulatory monitoring training of trainers in Lesotho from July 16 to 19, 2024. The workshop focused on internal (food producers) and external (government regulators) monitoring of fortified foods. FFI trained a total of 25 participants, including wheat and maize millers, government food inspectors, and lab technicians. These trainees are now equipped to train and serve as resources for their private and public sector colleagues. The training is a first step in strengthening private sector compliance with and government regulation of fortification standards nationwide.

A key outcome of the workshop was the recommendation to develop a national food fortification strategy for the next five years. FFI has committed to supporting this initiative and will work closely with Lesotho's national working group to prepare the technical framework.

These efforts mark a critical milestone in Lesotho's journey to strengthen fortification compliance and ensure that its population reaps the full health benefits of fortified foods.

UNITED STATES

62 million potential reach

Though many staple foods in the United States are fortified with folic acid, corn masa products—a key staple of the Hispanic community—are not. This gap in fortification contributes to Hispanic communities in the US experiencing disproportionately higher rates of neural tube defects (NTDs), serious birth defects of the brain and spine. Hispanic women are 19% more likely than non-Hispanic women to have a pregnancy affected by NTD. These birth defects can result in severe disability, miscarriage, or infant death.

In 2024, FFI published a corn masa supply chain analysis, finding that fewer than 6% of corn masa products in the US are fortified with folic acid. A subsequent market analysis conducted in collaboration with state and local partners in California and Texas found that less than 1% of ready-to-eat corn masa products such as tortillas, are fortified. The key to closing this gap lies with food producers and retailers. They hold the power to significantly improve public health by making fortified corn masa products widely available. Manufacturers can fortify products for retailers to stock, making it easier for consumers to choose foods that support their health and the health of future generations.

To support efforts to fortify corn masa products, FFI met with key US corn masa producers at the Tortilla Industry Association Convention to advocate for folic acid fortification, understand producer perspectives, and answer technical questions. FFI also developed a corn masa fortification communications toolkit aimed at raising awareness among food producers and encouraging both vendors and consumers to demand fortified products. The toolkit includes background information on fortification and folic acid, suggested social media posts and graphics for food producers and vendors, informational flyers, scientific references, and other tools. The toolkit and key advocacy messages were distributed through over ten unique outlets, including the FFI website, articles in *Abasto Magazine* and *Milling and Grain Magazine*, the nationally broadcasted podcast Health Wanted, email newsletters, FFI social media platforms, and key FFI partners who amplified the messages by sharing social media posts. FFI also led a social media campaign throughout US Hispanic Heritage Month and US Folic Acid Awareness Week in September and October 2024, during which FFI shared 68 social media messages across Instagram, Facebook, X/Twitter, and LinkedIn, collectively garnering more than 10,000 impressions.

As a result of FFI and partners' advocacy, corn masa producers are beginning to fortify more products with folic acid. By the end of 2025, FFI estimates that around 25% of corn masa flour will be fortified. FFI expects to see this trend continue to increase as more producers seek to fortify their products, just like their competitors. In addition to FFI's work with the private sector, there has been an increasing government interest in fortifying corn masa. FFI provided technical insight into California Assembly Bill 1830, which was signed into law in September 2024. The bill mandates fortification of corn masa flour, with some exceptions, and allows for voluntary fortification of corn masa products. FFI is continuing to provide technical support to other states pursuing similar mandates.

PHILIPPINES

107 million potential reach

In 2024, FFI partnered with Nutrition International to strengthen wheat flour fortification in the Philippines through the "Bridging the Fortification Gap Project," part of the QuantEdge Advantage Initiative. Supported by a two-year grant, this collaboration aims to address micronutrient deficiencies in the Philippines by updating the national wheat flour fortification standards, which have been supported by mandatory legislation since 2000, to include folic acid and restrict the allowable forms of iron to those that are most bioavailable.

Addressing this gap is crucial as both nutrients are important for improving maternal and child health outcomes. By fortifying with an iron compound that is more readily absorbed by the body, fortification can more effectively prevent iron deficiency anemia and other iron deficiency-related diseases. Folic acid fortification can reduce neural tube defects (NTDs) such as spina bifida by up to 78%. In Asia, 14 out of 18 countries with mandatory wheat flour fortification include folic acid, making the Philippines' adoption of this standard an important step in regional progress toward NTD prevention.

In 2024, FFI advocated for a proposed Governing Board Resolution to update the standards and specify the addition of 2.6 mg/kg of folic acid, as well as the restriction of allowable compounds to only ferrous fumarate and ferrous sulfate. These changes align with World Health Organization guidelines and local wheat flour consumption patterns. Advocacy efforts have focused on engaging influential leaders as well as supporting targeted campaigns to reach women of reproductive age, a population particularly vulnerable to folate deficiencies.

Despite challenges such as delays in government approvals, staffing changes, and limited resources, the project made progress in 2024. FFI strengthened relationships with stakeholders, leveraged civil society support, and coordinated efforts with influential networks. Collaborating with the Spina Bifida Support Group Foundation of the Philippines (SBSGF) has brought in the essential perspective of a local civil society organization that focuses on helping those most impacted by NTDs in the country. The partnership has fostered mutual learning opportunities and capacity building, particularly in relation to advocacy with government and the public.

Collaboration with key stakeholders is central to the initiative. Partners include the Philippines' Department of Health, the National Nutrition Council, and civil society organizations like SBSGF.

Key achievements to date include supporting the government in planning and implementing key meetings, providing technical assistance, and creating advocacy materials. FFI has also collaborated with partners to coordinate efforts for effective implementation.

Moving forward, FFI remains committed to advocating for government approval of the revised standards and engaging stakeholders to ensure timely and effective implementation of the legislation. By the end of the grant period, FFI and Nutrition International aim to secure approval for the updated fortification standards and launch training and dissemination efforts to ensure compliance and long-term sustainability. This partnership underscores the transformative power of targeted advocacy and collaboration in addressing public health challenges and advancing nutrition security.

INDIA

142 million potential reach

In the wheat-growing Indian states of Haryana, Maharashtra, and Rajasthan, daily breads such as chapati and roti are poised to deliver more than calories. For almost a decade, FFI has partnered with Indian states to make staple wheat flour more nutritious.

From April 2023 to December 2024, with support from The Rockefeller Foundation, FFI worked with state agencies to enrich whole-wheat flour with iron, folic acid, vitamin B12, and other micronutrients for low-income women and children served through the Public Distribution System (PDS), Pradhan Mantri Poshan Shakti Nirman (PM POSHAN), and the Integrated Child Development Services (ICDS).

Between December 2023 and April 2024, three multi-stakeholder workshops led by FFI in Rajasthan and Maharashtra brought together over 70 government officials, millers, and development partners to review quality-control procedures, monitoring systems, and consumer acceptability, providing a common blueprint for scaling up fortification.

In Haryana, where the distribution of fortified wheat flour through PDS had stalled, FFI began to address beneficiary concerns by listening. A perception survey conducted across five districts revealed that most households preferred high-quality fortified wheat flour over raw grain, provided millers could guarantee the correct granulation and freshness. Those insights shaped a January 2025 proposal co-written by FFI with the Haryana Food and Civil Supplies Department to restart distribution across fifteen districts. FFI partner, the Postgraduate Institute of Medical Education and Research (PGIMER) in Chandigarh, also submitted a proposal for a biomarker study to assess the impact of fortified wheat flour distributed through ICDS in the state.

Election timetables, budget squeezes, and staff turnover have slowed approvals to shift procurement from grain to wheat flour, yet pauses became openings. ICDS in Rajasthan named FFI a formal technical partner, FFI is working with Maharashtra to formalize a partnership, and PM POSHAN officers in both states joined fortification planning conversations.

Over the 18-month grant, FFI mapped wheat supply chains, analyzed the feasibility of fortification, shared findings with millers, distributors, and officials, designed monitoring frameworks, and submitted five roadmaps to state social-protection agencies.

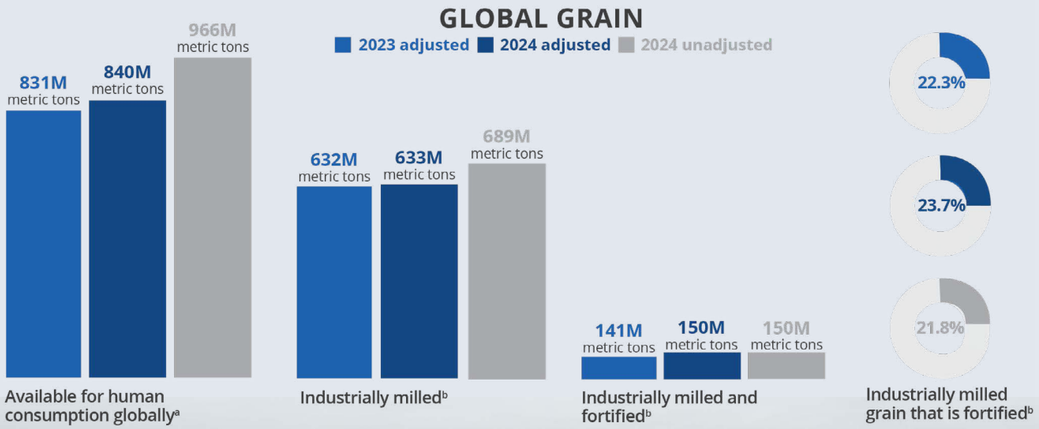
With evidence assembled, relationships secured, and advocacy poised to amplify demand, India can now move from pilot to procurement: safely, cost-effectively, and at scale, reaching millions of daily meals in the coming years and offering a replicable model for other grain-growing states.

Wheat Maize Rice

FFI estimates that 23.7% of the wheat flour, maize flour, or rice that could be industrially fortified was fortified in 2024. This represents an increase from the previously estimated 22.3% for 2023.

When looking at countries FFI deems as good opportunities for fortification of a given grain, little change was seen for wheat flour and maize flour. Global volumes of wheat, maize, and rice remained largely constant from 2023 to 2024, according to data from the Food and Agriculture Organization (FAO) of the United Nations (adjusted and unadjusted).

The proportion of industrially milled wheat flour, maize flour, and rice that is fortified increased by 1.4%, largely due to the continued scale-up of rice fortification in social support systems in India. The increases in rice fortification in India resulted in a 3% increase in the proportion of industrially milled rice that is fortified globally (adjusted). Maize flour remains



a FAO data with additional, openly available data sources.
2023 estimates: 2021 FAOSTAT, Supply Utilization Accounts, Food (element 5141) 2021 Data: https://www.fao.org/faostat/en/#data/SCL
2024 estimates: 2022 FAOSTAT, Supply Utilization Accounts, Food (element 5141) 2022 Data: https://www.fao.org/faostat/en/#data/SCL

b FFI calculations.

Photo: Xaume Olleros/RTI

the grain with the highest proportion of industrially milled, fortified flour, accounting for an estimated 38.5% of the global supply. Wheat flour comes in second at 30.7%, followed by rice at 13.2%.

While multiple countries, including Ethiopia and Mauritius, began implementing fortification of at least one grain in 2024, these changes are not yet reflected in the data available to FFI.

All FFI data on compliance comes from our global partners. Many countries lack centralized data collection systems that regularly report compliance data. Response rates for FFI's annual data collection process are consistently low, meaning that the numbers reported are accurate to the best of FFI experts' knowledge, but may not reflect the reality on the ground. In general, it is likely that the proportion of grains that are industrially processed is higher than FFI reports.

How we calculate global estimates

Measuring global progress in grain fortification through an annual survey.

Methodology

We measure global progress in grain fortification using multiple data sources. We begin with data from the Food and Agriculture Organization (FAO) of the United Nations that describes how much flour or milled rice is available in the food supply for each country.

FFI applies specific criteria to data from each country that focuses our calculations on the grain(s) that would be good candidates and excludes the grain(s) that would not be good candidates for large-scale fortification. This primarily means emphasizing grains that are widely consumed and mostly industrially processed. The methods are described in "How we calculate global estimates – opportunity."

Flour and rice available

For countries with FAO data, we use the Supply Utilization Account (SUA) food supply quantity (tons) element to determine the amount of available wheat flour, maize flour, and milled rice. If a country or territory does not have FAO data available, we use publicly available data and, as needed, extraction rates to convert grain numbers to flour available. If country-specific extraction rates are available, those are applied. Otherwise, the default extraction rate for wheat in its conversion from grain to flour is 75%. The default extraction rate for maize varies by region, with 67.5% used for Africa, 72.5% for the Americas, and 70% elsewhere. We collect data on milled, hulled, and broken rice in our estimates. As a result, it is not necessary to apply a default extraction rate to rice.

Industrially milled & percentage fortified

We then determine the amount of flour or milled rice that is industrially produced. For countries in FFI's Europe region, we assume that 100% of the wheat flour, maize flour, and rice are industrially milled. Countries in FFI's Americas region are assumed to industrially process 100% of their wheat flour.

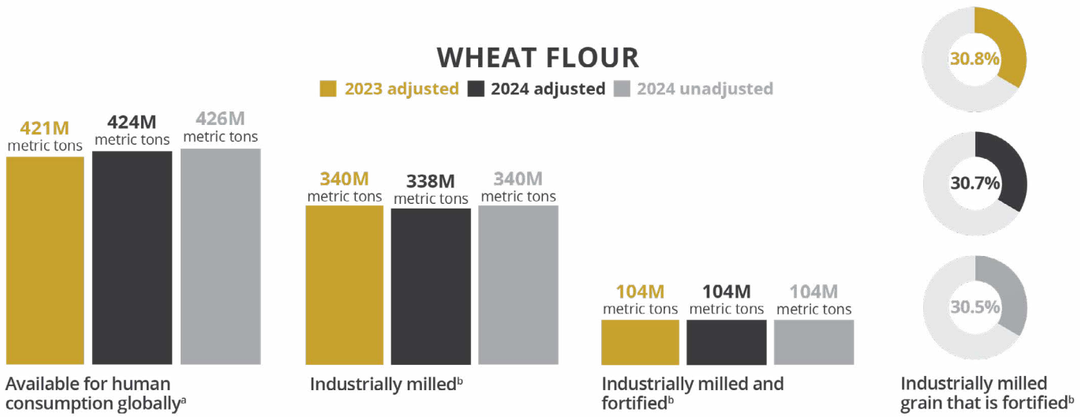
We also ask national partners in governments, milling associations, nongovernmental organizations, the private sector, and UN agencies worldwide to estimate how much of each grain is industrially processed and fortified in their country. We then compile the country figures into global estimates. It is important to note that, at times, FFI is not aware of changes to national milling infrastructure when they happen, which can cause a data lag. We provide the best estimate of global milling based on the information currently available to us.

Adjusting for fortification opportunity

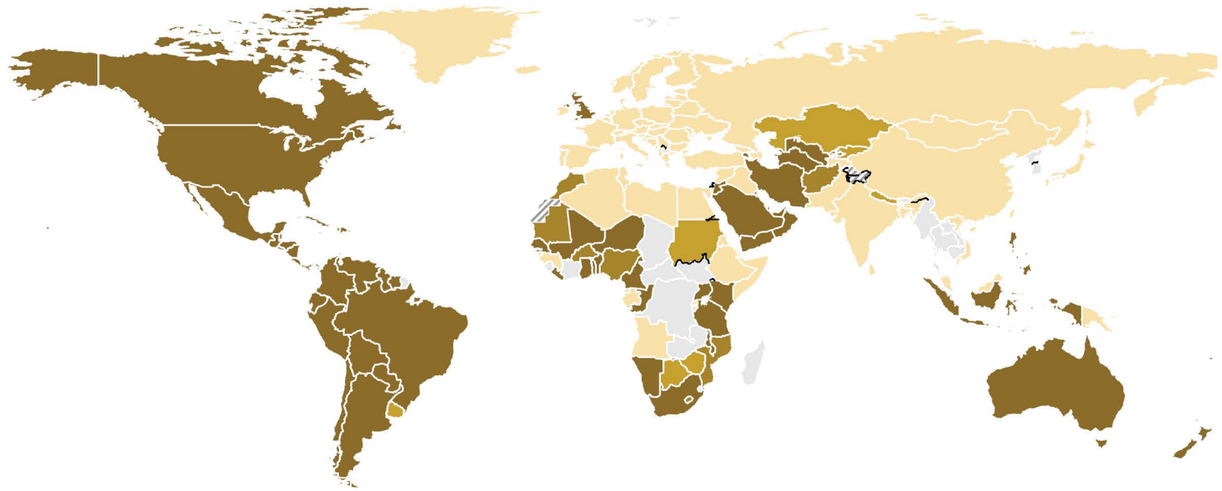
Based on these findings and calculations, FFI determines if countries could be considered a good opportunity for large-scale grain fortification. For each grain, FFI examines the grams available per person per day. If a country has more than 25 grams of wheat or more than 37.5 grams of maize or rice available per person per day, it may be a good opportunity. However, another consideration is whether one grain is much more popular than another. For example, even though the average Jordanian eats more than 37.5 grams of rice per day, they eat more than 176 grams of wheat per day. As such, rice may not be considered a priority for fortification in Jordan. Lastly, FFI is primarily concerned with large-scale fortification, meaning that grain must be primarily produced at industrial mills to be considered a good opportunity for fortifying. These factors and others, such as urbanicity, are used to determine which grain(s) may be a good opportunity for fortification in each country. When FFI calculates "adjusted estimates," we only include data from countries with a fortification opportunity.

Wheat

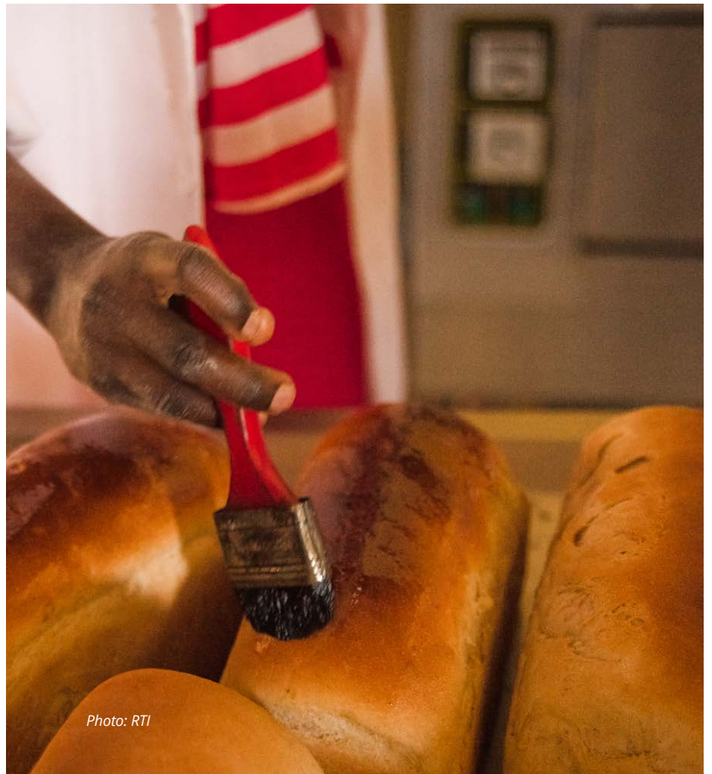
FAO data and FFI's calculations show that the adjusted amounts of wheat globally available for human consumption and of industrially milled wheat flour available largely remained static. When only considering countries FFI categorizes as good opportunities for fortification (adjusted), the percentage of industrially milled wheat flour that is fortified also decreased from 30.8% to 30.7%.



Percentage of industrially milled wheat that is fortified, adjusted for opportunity* - 2024



*See page 23 for an explanation of FFI's methodology to determine opportunity.



LEGEND

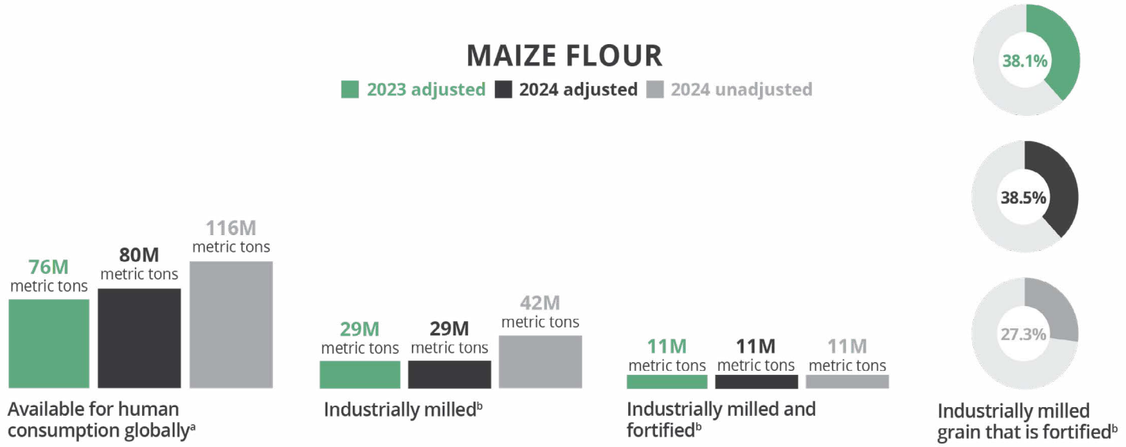
- 75-100%
- 50-74%
- 25-49%
- 1-24%
- 0-<1%
- Not an opportunity for wheat flour fortification

a FAO data with additional, openly available data sources.
2023 estimates: 2021 FAOSTAT, Supply Utilization Accounts, Food (element 5141) 2021 Data: https://www.fao.org/faostat/en/#data/SCL
2024 estimates: 2022 FAOSTAT, Supply Utilization Accounts, Food (element 5141) 2022 Data: https://www.fao.org/faostat/en/#data/SCL

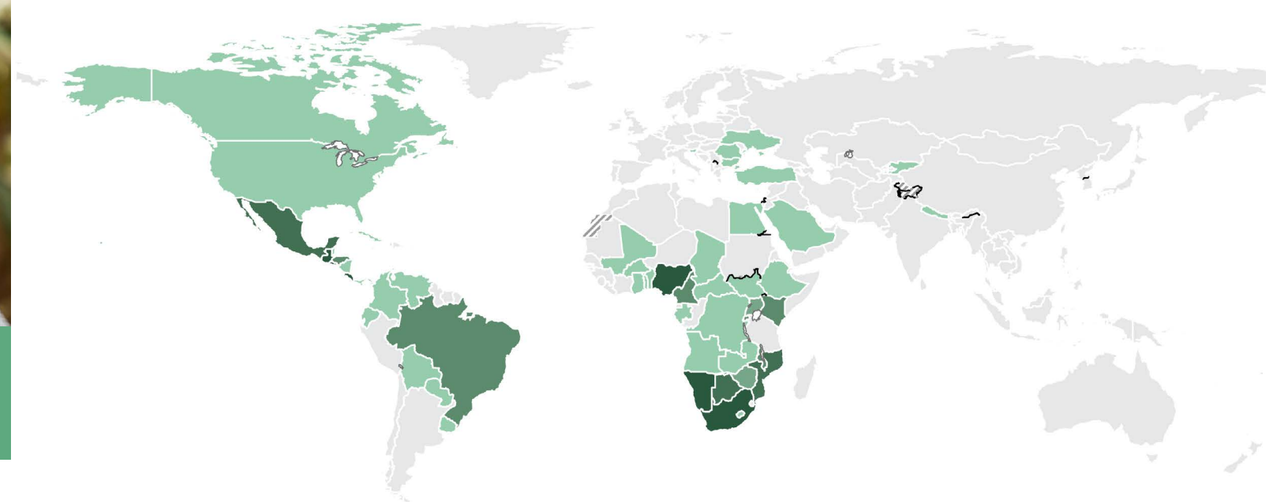
b FFI calculations.

Maize

When focusing on countries that FFI considers a good opportunity for maize flour fortification (adjusted), the supply of maize increased by 3.9 tons (5%), but only a slight portion of that supply (0.5%) was industrially processed. There was no change in the proportion of fortified maize flour, but when compared to the volume of fortified maize flour in 2023, there was a slight increase of 0.4%.



Percentage of industrially milled maize that is fortified, adjusted for opportunity* - 2024



*See page 23 for an explaination of FFI's methodology to determine opportunity.

LEGEND

- 75-100%
- 50-74%
- 25-49%
- 1-24%
- 0-<1%
- Not an opportunity for maize flour fortification

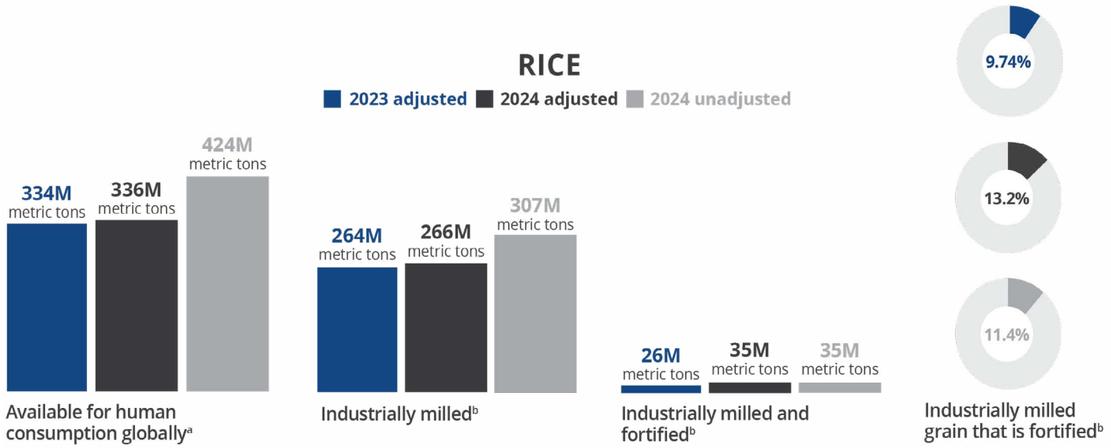
a FAO data with additional, openly available data sources.
2023 estimates: 2021 FAOSTAT, Supply Utilization Accounts, Food (element 5141) 2021 Data: https://www.fao.org/faostat/en/#data/SCL
2024 estimates: 2022 FAOSTAT, Supply Utilization Accounts, Food (element 5141) 2022 Data: https://www.fao.org/faostat/en/#data/SCL

b FFI calculations.

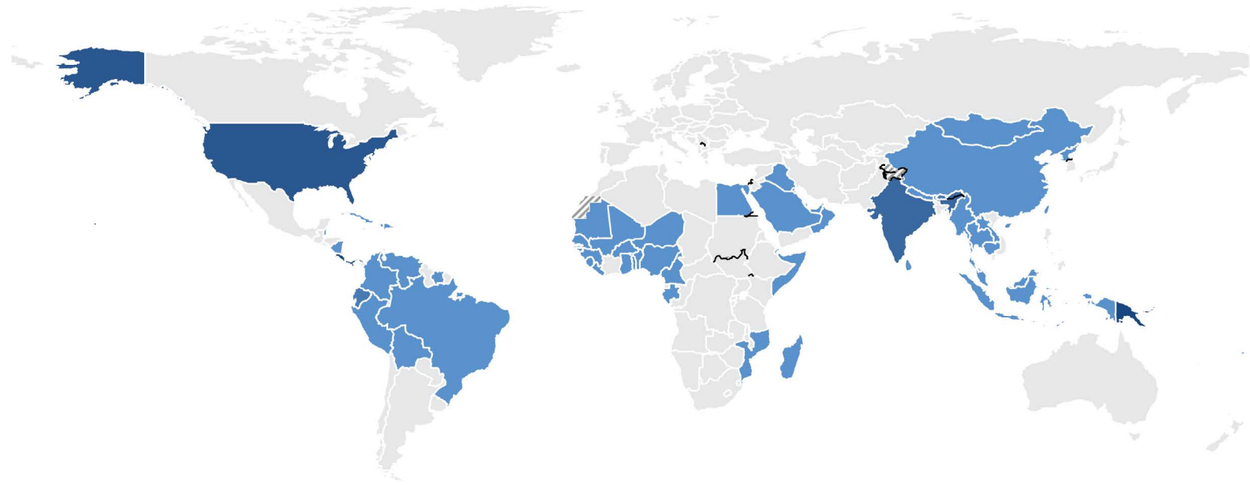
Photo: Tran Thi Hoa/World Bank

Rice

The 2024 adjusted volume of rice available for human consumption and the volume of industrially milled rice slightly increased from 2023. However, largely due to the Indian Government's continued effort to fortify rice distributed through social protection programs, there was a 36% increase in the amount of fortified rice available. This increase of nearly 10 million tons of fortified rice results in an estimated 11.4% of the global industrially processed rice supply being fortified (unadjusted). When considering only countries with a good opportunity for rice fortification (adjusted), FFI estimates that 13.2% of industrially milled rice is fortified, up from 9.7% last year.



Percentage of industrially milled rice that is fortified, adjusted for opportunity* - 2024



*See page 23 for an explanation of FFI's methodology to determine opportunity.

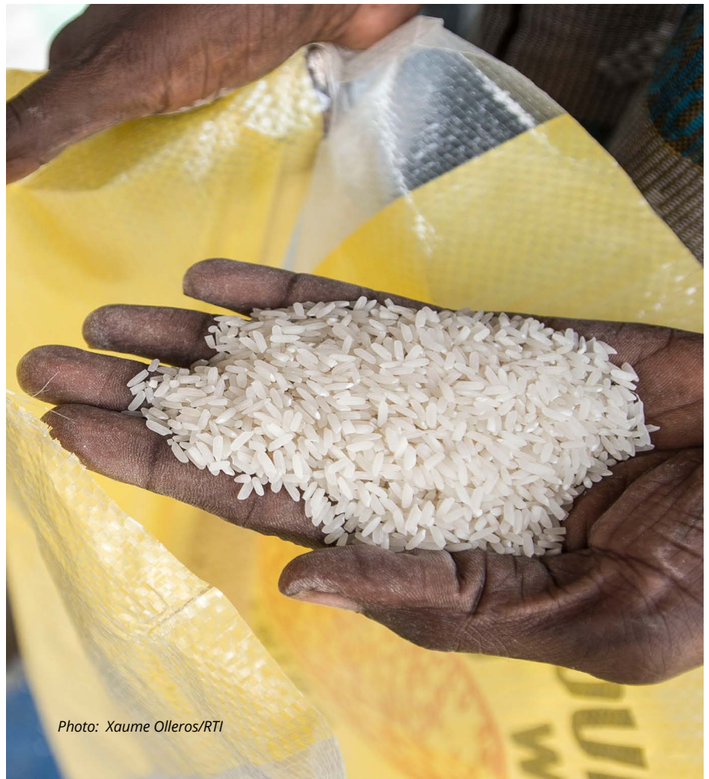


Photo: Xaume Olleros/RTI

LEGEND

- 75-100%
- 50-74%
- 25-49%
- 1-24%
- 0-<1%
- Not an opportunity for rice fortification

a FAO data with additional, openly available data sources.
2023 estimates: 2021 FAOSTAT, Supply Utilization Accounts, Food (element 5141) 2021 Data: https://www.fao.org/faostat/en/#data/SCL
2024 estimates: 2022 FAOSTAT, Supply Utilization Accounts, Food (element 5141) 2022 Data: https://www.fao.org/faostat/en/#data/SCL

b FFI calculations.

Photo: Travelwayoflife/Flickr

Legislation Update

No additional country adopted mandatory cereal grain fortification legislation in 2024.

Globally, 94 countries have legislation to mandate fortification of at least one industrially milled cereal grain. Of these, 93 countries mandate the fortification of wheat flour alone or in combination with other grains. One country—Papua New Guinea—has a mandate only for rice fortification.

When FFI was founded in 2002, only 38 countries mandated the fortification of wheat flour, maize flour, or rice.

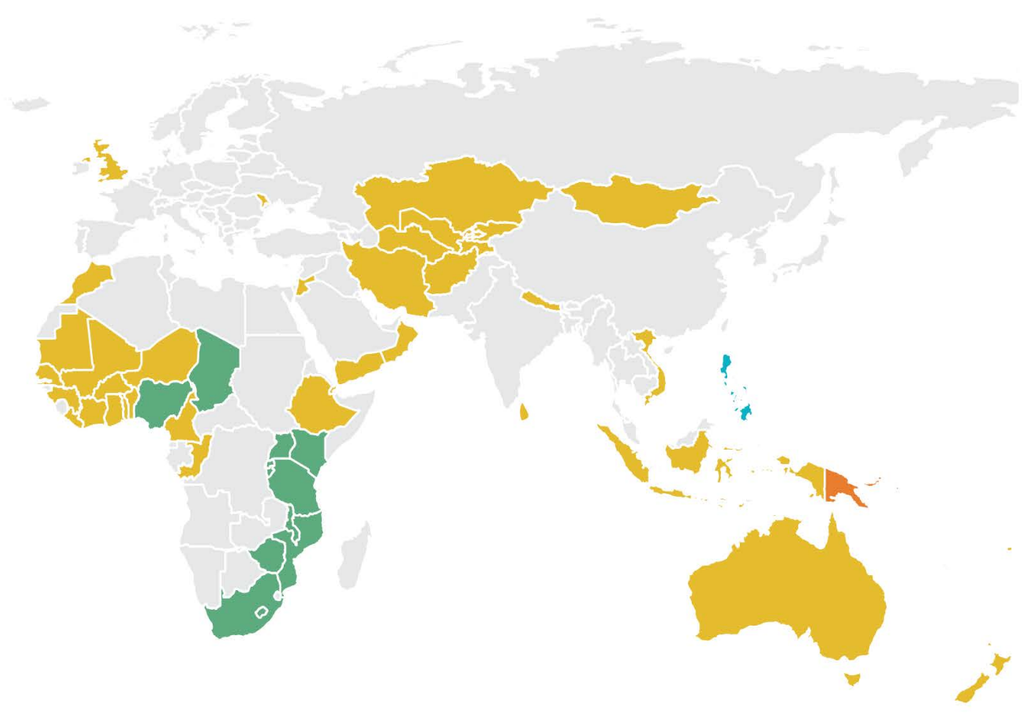
Mandatory Cereal Grain Fortification Legislation, 2023

LEGEND

- Wheat flour alone – 69 countries
- Rice alone – 1 country (Papua New Guinea)
- Wheat flour and maize flour – 17 countries
- Wheat flour and rice – 5 countries (Nicaragua, Panama, Peru, Philippines, Solomon Islands)
- Wheat flour, maize flour, and rice – 2 countries (Costa Rica and the United States)
- No mandatory fortification legislation or data not available

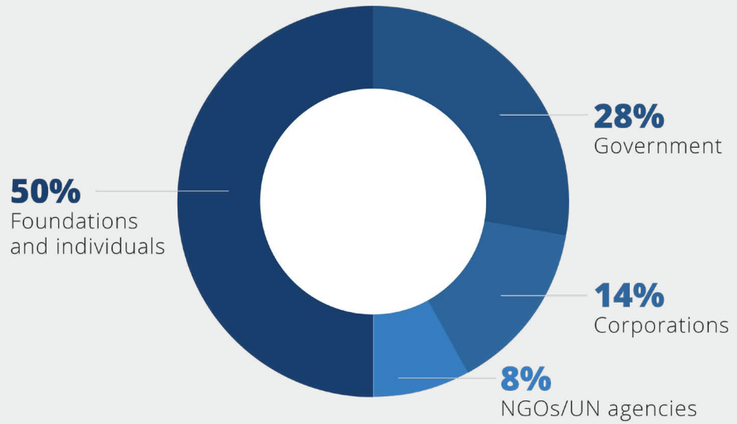
Legislation has effect of mandating grain fortification with at least iron or folic acid.

Legislation status from the Food Fortification Initiative (www.FFInetwork.org) November 2023.



Gift Profile

We are grateful to the individuals and donors who support our work. Contributions for 2024 were US $1.5 million.



How to contribute

Your gift will make a difference by reducing the debilitating effects of anemia, preventing thousands of serious birth defects a year, and strengthening immune systems to prevent premature death in children and adults alike. Join us and donate to FFI.

Photo: Working a rice field. Xaume Olleros/RTI

Executive Management Team

An Executive Management Team (EMT) representing global leaders in the public, private, and civic sectors provides FFI's strategic direction.

Markus Lotsch, EMT Chair
President, Health and Wellness
Archer-Daniels-Midland Company

Troy Anderson
Vice President, Operations
Ardent Mills

Jeff Zyskowski
Vice President, Supply Chain
Ardent Mills

Jane Friedrich *(former member as of May 2024)*
Vice President, Global Core R&D
Cargill, Inc.

Reynaldo Martorell
Woodruff Professor of International Nutrition (Emeritus)
Senior Advisor, Global Health Institute
Emory University

Florencia Vasta
Program Lead, Large Scale Food Fortification
Global Alliance for Improved Nutrition

Melinda Farris
CEO
International Association of Operative Millers

Sylvia Roozen
Secretary General
International Federation for Spina Bifida and Hydrocephalus

Homero Martinez
Senior Technical Advisor
Nutrition International

Manpreet Chadha
Nutrition Specialist - Food Systems for Children
United Nations Children's Fund (UNICEF)

In addition to our EMT members, leaders from the CDC and WHO are EMT observers, including:

Jenny Williams
Team Lead, Neural Tube Defects Surveillance and Prevention Team, Division of Reproductive Health - National Center on Birth Defects and Developmental Disabilities
Centers for Disease Control and Prevention

Juliawati Untoro
Scientist, Multisectoral Action in Food Systems
World Health Organization

Ruth Petersen ***(former member as of February 2025)***
Director, Division of Nutrition, Physical Activity, and Obesity - National Center for Chronic Disease Prevention and Health Promotion
Centers for Disease Control and Prevention

Photo: Richard Munckton

Staff and EMT Updates

In 2024, FFI welcomed one staff member, Mica Jenkins; two new EMT members, Manpreet Chadha and Florencia Vasta; and a new EMT observer, Juliawati Untoro.

Mica Jenkins, Nutritional Epidemiologist, FFI

Mica Jenkins joined FFI in June 2024. As a nutritional epidemiologist, she has supported FFI's research on nutrition and large-scale food fortification and served as a data steward for the Global Fortification Data Exchange.

Mica holds a PhD in Nutrition and Health Sciences and a Master of Science in Health and Human Development. She has over a decade of experience in public health programs with an emphasis on dietary intake assessment and food-based approaches to micronutrient malnutrition. Before joining FFI, her work as a doctoral fellow at the US Centers for Disease Control and Prevention (CDC) focused on dietary diversity indicators as proxies of nutrient adequacy in adolescents in diverse food environments. She is based in Atlanta, Georgia, US.

Juliawati Untoro, Scientist, World Health Organization (WHO)

As a scientist at the Multisectoral Action in Food Systems Unit within the Department of Nutrition and Food Safety at World Health Organization (WHO) Headquarters in Geneva, Switzerland, Dr. Juliawati Untoro provides technical support to regions and countries, builds partnerships and networks, and strengthens capacity for implementing policies related to healthy food environments, with a particular focus on food fortification and the elimination of trans-fats.

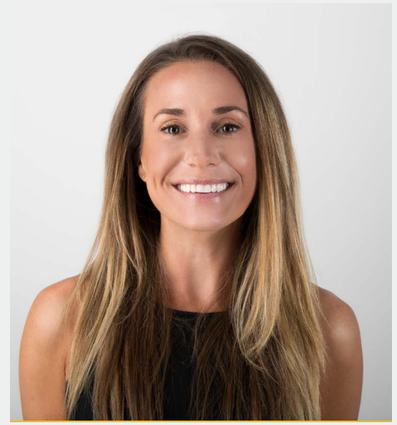
She has over 25 years of global experience in nutrition and public health programming with numerous multilateral agencies, including WHO, UNICEF, the World Bank, Nutrition International, and the Southeast Asian Ministers of Education Organization's Regional Center for Food and Nutrition at the University of Indonesia. Her career has included postings across the world, from Indonesia and Canada to the US, Kenya, and the Philippines. She holds a PhD in Human Nutrition from Wageningen University in the Netherlands. Juliawati is based in Geneva, Switzerland.

Manpreet Chadha, Nutrition Specialist, United Nations Children's Fund (UNICEF)

Manpreet Chadha is a public health and nutrition professional with more than 20 years of experience. As a nutrition specialist at UNICEF, she contributes to thought leadership and evidence generation, promoting evidence-informed decision-making within the broader context of food systems, with a focus on integrating food fortification.

Manpreet has extensive international experience working with regional and national governments and other stakeholders. Before representing UNICEF on FFI's EMT, Manpreet represented Nutrition International on the EMT from 2018 to 2023. She is based in Brussels, Belgium.

Florencia Vasta, Program Lead, Global Alliance for Improved Nutrition (GAIN)



Florencia Vasta is the program lead for large-scale food fortification at the Global Alliance for Improved Nutrition (GAIN). There, she leads a portfolio of food fortification programs and supports various cross-sector GAIN country initiatives. Previous to GAIN, she worked at the Gates Foundation as a program officer for nutrition in the Global Development Division.

For more than a decade, her work has spanned diverse roles in both upstream and downstream international public health research at universities, international nonprofit organizations, as well as the donor community, with a focus on countries in Africa, Asia, and Latin America. She is committed to the use of evidence-based and innovative solutions to address global nutrition challenges and to the development of strategic partnerships to achieve global health commitments.

She holds a master's degree in international health, human nutrition, from the Johns Hopkins University Bloomberg School of Public Health (JHSPH) and is a doctoral candidate in the implementation science concentration at JHSPH. Florencia is based in Seattle, Washington, US.

Photo: Abbas Farzami/Rumi Consultancy/WorldBank

FFI's Unique Contributions

to Global Grain Fortification

Expertise

FFI's in-house leadership and technical expertise enable us to apply a data-driven approach to program planning, implementation, and monitoring.

Rigor

FFI operates through a unique model, bringing together voices from the public, private, and civic sectors through our Executive Management Team and our technical assistance to make sustainable change.

FFI conducts supply chain analyses for any given grain to discover and act on opportunities to advance fortification.

FFI documents and publishes up to 196 countries' annual potential and progress toward successful cereal grain fortification.

Focus

FFI is the only global group that focuses exclusively on large-scale fortification of the three most consumed grains: wheat flour, maize flour, and rice.

Inspired by the Good to Great model by Jim Collins

How We Work

FFI's strategic approach to scaling grain fortification, based on two decades of experience conducting research and providing on-the-ground assistance, offers a replicable method to building and strengthening fortification programs.

FFI chooses countries, regions, states, and provinces through rigorous research. We take a holistic, objective approach with the goal to help eliminate micronutrient deficiencies in every country where industrially milled cereal grain is commonly consumed. FFI does not have a predetermined set of countries it will support; instead, it relies on data to identify where the needs and opportunities are greatest.

Photo: Neil Palmer/CIAT

Before FFI begins working in a country, we use data to determine two essential requirements: demonstrated need for fortification and the potential to make a positive impact on health through fortified food. Our data comes from several sources and through varied methods including consumption and milling analyses, nutrition needs assessments, market analyses, political readiness assessments, systematic reviews, and partner interviews. Once an opportunity for fortification is determined, FFI uses a four-stage phased approach to help countries plan, implement, and monitor a fortification program that can generate and sustain large-scale impact.

Plan

PHASE 1: EXPLORE AND ENGAGE

- Engage private sector
- Engage birth defects groups, neurosurgeons, and consumer associations
- Identify key challenges and opportunities
- Identify fortification champion(s) within the government
- Determine what it will take to move forward

MILESTONE

Once the government expresses permission and willingness to move forward, FFI will move to the next phase of planning: map the context.

PHASE 2: MAP THE CONTEXT

- Conduct a thorough supply chain analysis
- Assess industry structure, including readiness and reach of mills
- Assess monitoring structure and needs
- Map the legislative process
- Assess budgetary needs (initial investment by sector and annual recurring costs) to ensure commitment and sustainability
- If necessary, conduct a cost-benefit analysis making the case for fortification's impact on national health and economic indicators

MILESTONE

At this stage, FFI gives a formal presentation to government stakeholders to recommend effective staples and market channels based on diagnostic results. Once the government expresses permission and support for the plan, FFI will move to the next phase: implement - design and develop.

Implement

PHASE 3: DESIGN AND DEVELOP

- Draft recommended standards
- Identify miller, regulatory inspector, and laboratory training needs
- Support the premix procurement process
- Engage the legislative process
- Develop a communication and education strategy
- Integrate realistic fortification monitoring into an existing framework

MILESTONE

Clear budget and implementation plan.

- Train millers on quality assurance/quality control practices
- Train regulatory monitoring inspectors and lab staff; map agency responsibilities
- Facilitate the passage of legislation
- Develop a National Guideline for Fortification document and national logo, as necessary

MILESTONE

The fortification program is implemented and ready to scale.

Monitor

PHASE 4: MONITOR FOR COMPLIANCE AND IMPACT

- Support collection of monitoring data
- Ensure monitoring data is shared with relevant stakeholders
- Augment government monitoring partnerships with civic entities
- Ensure action is taken to improve program performance based on monitoring data

MILESTONE

Ensure program reaches intended population

- When applicable, partner with stakeholders to measure impact

Why Fortify?

Nutrition can be a matter of life and death. More than two billion people globally suffer from vitamin and mineral deficiencies.[1]

One in two preschool-aged children and two in three women of reproductive age worldwide suffer from at least one vitamin or mineral deficiency, increasing their vulnerability to infectious disease and compromising child growth and development.[1] Fortifying grains to prevent these micronutrient defeciencies can strengthen the health of individuals, populations, and countries' economies.

Micronutrient defeciencies affect an estimated:[1]

2B+ people worldwide

56% of preschool-aged children

69% of women of reproductive age

Photo: Xaume Olleros/RTI

Anemia is often caused by deficiencies of micronutrients including iron and zinc. Children, pregnant women, and women of reproductive age (15-49 years) who are unable to include enough micronutrients in their diet are at risk for anemia. Pregnant women with severe anemia are twice as likely to die during or shortly after pregnancy than non-anemic women.[2] Globally, nearly 250 million women of reproductive age are affected by iron deficiency anemia; if they stood head to toe, they could reach the moon and circle it.[3]

Iron deficiency in childhood stunts cognitive development, which hinders academic performance and future earnings potential as adults.[4]

Zinc deficiency adversely affects children and adults by weakening immune systems, increasing rates of childhood diarrhea and pneumonia, and contributing to increased rates of childhood stunting. Globally, zinc deficiency contributes to 116,000 child deaths per year—a number that would be much higher if researchers were able to count the number of deaths caused by preterm births in zinc-depleted mothers.[5]

Anencephaly and spina bifida are birth defects of the brain and spine that can be prevented by consuming enough folic acid, also known as vitamin B9. About 75% of children born with brain and spinal birth defects die before their fifth birthday.[6] Though spina bifida has varying degrees of severity, it often leads to life-long disability and enormous costs for healthcare systems. Anencephaly is always fatal.

Vitamin B12 benefits children, adults, and the elderly by maintaining functions of the brain and nervous system.[7] Consuming adequate amounts of vitamin B12 can reduce the risk of developing chronic diseases including heart disease, stroke, dementia, Alzheimer's disease, and Parkinson's disease.[7]

Fortification with micronutrients, including iron, zinc, folic acid, and other B vitamins, benefits individuals at every point in life—from conception to aging.

Photo: Thomas Cristofoletti/Ruom for RTI

A call to action

Research published using FFI data credited fortification with preventing 63,520 brain and spine birth defects globally in 2022 for an average of 174 healthier babies a day.[8] Yet according to estimates, an additional 76% of birth defects of the brain and spine[8] and 34% of anemia[9] could still be prevented globally through adequate intake of iron and folic acid. That's why FFI's mission to build high-impact, self-sustaining fortification programs is so important. **By improving nutrition, we can create a smarter, stronger, and healthier world.**

Photo: World Bank/Sarah Farhat

Photo: Yamanaka Tamaki

1 Stevens, G. A., et al. Micronutrient deficiencies among preschool-aged children and women of reproductive age worldwide: a pooled analysis of individual-level data from population-representative surveys. *The Lancet Global Health*. 2022.

2 Daru, J., et al. Risk of maternal mortality in women with severe anemia during pregnancy and postpartum: a multilevel analysis. *The Lancet Global Health*. 2018.

3 World Health Organization. The global prevalence of anemia in 2011. 2015.

4 Horton, S. and J. Ross. The economics of iron deficiency. *Food Policy*. 2003.

5 Black, R., et al. Maternal and child undernutrition and overweight in low-income and middle-income countries. *The Lancet*. 2013.

6 Blencowe, H., et al. Estimates of global and regional prevalence of neural tube defects for 2015: a systematic analysis. *Annals of the New York Academy of Sciences*. 2018.

7 Beckett, E., et al. Reduced plasma homocysteine levels in elderly Australians following mandatory folic acid fortification: a comparison of two cross-sectional cohorts. *Journal of Nutrition and Intermediary Metabolism*. 2017.

8 Wagh, K., et al. A global update on the status of prevention of folic acid-preventable spina bifida and anencephaly in year 2022. *Birth Defects Research*. 2024.

9 Keats, E., et al. Improved micronutrient status and health outcomes in low- and middle-income countries following large-scale fortification: evidence from a systematic review and meta-analysis. *American Journal of Clinical Nutrition*. 2019.

Suggested citation: Food Fortification Initiative. 2024 Annual Report. FFI: Atlanta, USA 2025. Accessed at: https://www.ffinetwork.org/annual-reports

NAVIGATING CHANGE THROUGH THE POWER OF PARTNERSHIP, WE CAN TRANSFORM CHALLENGES INTO OPPORTUNITIES AND NOURISH COMMUNITIES.

Food Fortification Initiative
Enhancing Grains for Healthier Lives

Photo: Charlotte Kesl/World Bank