



FEED THE FUTURE

The U.S. Government's Global Hunger & Food Security Initiative



FEED THE FUTURE BUSINESS DRIVERS FOR FOOD SAFETY

Cooperative Agreement No. 720BFSI9CA00001

mSafeFood: A Mobile Learning Platform

Technical Learning Note

June 2023

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Cover picture:

A vegetable vendor using a mobile phone at a Senegalese market. Photo credit: Mariama Dieng.

About FES

Food Enterprise Solutions (FES) is a Washington DC-based company whose mission is to stimulate the global food system to better balance global needs and profits. FES works in partnership with businesses and organizations to provide safe, nutritious, and affordable food through supply chains that are commercially viable and environmentally sustainable. For more information, please visit our website: www.foodsolutions.global

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LIST OF ACRONYMS

| | |
|-------|--|
| BD4FS | Business Drivers for Food Safety |
| GFBs | growing food businesses |
| GFSI | Global Food Safety Initiative |
| FES | Food Enterprise Solutions |
| ISO | International Organization for Standardization |
| IVR | interactive voice response |
| HACCP | hazard analysis critical control points |
| PRP | prerequisite program |
| USAID | United States Agency for International Development |
| WASH | water, sanitation, and hygiene |

EXECUTIVE SUMMARY

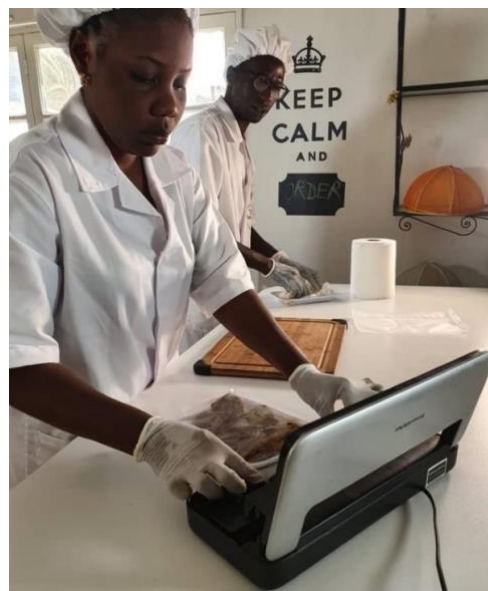
Feed the Future Business Drivers for Food Safety (BD4FS), funded by the United States Agency for International Development (USAID) and implemented by Food Enterprise Solutions (FES), seeks to strengthen the food safety culture within a country through active engagement with the business community. BD4FS partners with growing food businesses (GFBs) – enterprises that want to grow with food safety as an integral part of their business model – to upgrade their food handling practices, improve food safety, and reduce food loss, ultimately resulting in better market access and improved revenue flow. To that end, BD4FS supports GFBs with training, technical assistance, business support, access to financing, and information sharing through multi-channel communication. The different communication channels include print media, radio and television, social media, in-person training, remote webinar-based training, and mSafeFood – a mobile learning platform. BD4FS modeled mSafeFood after mHealth¹, mAgric², and mNutrition³, and it is unique from these in that its content focuses on food safety and its primary audience is food business entrepreneurs.

BD4FS initiated mSafeFood in Senegal during the COVID-19 pandemic when in-person encounters were limited. It emerged as an alternative way, along with online formal training, to remotely reach food system actors critical to ensuring that safer food reaches the end consumer. BD4FS designed mSafeFood to complement and reinforce other program components. The BD4FS food safety and communications specialists generated content and the program contracted Viamo, a global communications technology company, for their expertise in building mobile learning platforms.⁴

mSafeFood reaches food business owners and operators, frontline food handlers, and consumers with timely information through digital messaging and recorded content. Key food safety messages are distributed using interactive voice response (IVR) technology accessible through basic mobile phones as well as smartphones. By design, mSafeFood promotes user-driven food safety learning. mSafeFood consists of three components: (1) Green Line information hotline, (2) Wanji Game interactive game-based learning, and (3) Learning Activities that contain topical lessons with pre- and post-evaluations of knowledge. These are offered at no cost to participants and are available in French and three other national languages – Wolof, Pulaar, and Serer.

BD4FS engaged more than 3,000 food business entrepreneurs and other food system actors in Senegal through mSafeFood since its launch in October 2021. Consumers and youth made up 21 percent of participants – important demographics to reach for raising food safety awareness. mSafeFood conveyed nearly 30,000 key food safety messages through Green Line and 92 percent of participants reported that the information received was useful to them. The Wanji Game was particularly popular to play from the business entrepreneur perspective, with 65 percent completing the game. The Learning Activities measured an increase in knowledge by comparing the pre- and post-evaluations, with a 6.5 percent average increase in correct responses across the eight survey questions. mSafeFood successfully sparked the interest of participants as demonstrated by their high completion rates and by choosing to call back more than once.

This report describes BD4FS development and implementation of mSafeFood to date and outlines future directions for this mobile learning platform.



Gourméa production team using a vacuum packaging machine to make ready-to-eat products. Photo credit: Astou Diop.

“mSafeFood [built] capacities of my non literate employees. Actually, the availability of trainings in local languages was most helpful to me as manager of a food company. Also my employees were able to choose among multiple time slots to be trained remotely, which did not [negatively] affect the work in my business.”

- Fatim Bass, CEO of Gourméa

¹ WHO. 2018. *mHealth: Use of appropriate digital technologies for public health*. Seventy-First World Health Assembly A71/20, https://apps.who.int/gb/ebwha/pdf_files/WHA71/A71_20-en.pdf.

² GSMA. 2019. *Digitizing the agricultural last mile in Ghana: MTN's mobile money mAgric*.

<https://www.gsma.com/mobilefordevelopment/resources/digitising-the-agricultural-last-mile-in-ghana-mtn-mobile-moneys-magric/>

³ CABI. n.d. *mNutrition: Addressing hidden hunger through mobile messaging*.

<https://www.cabi.org/projects/mnutrition-addressing-hidden-hunger-through-mobile-messaging/>

⁴ Viamo is a global communications technology company that helps businesses reach target audiences via mobile, <https://viamo.io/>. BD4FS contracted Viamo's Dakar, Senegal office for mSafeFood technical support.

MSAFEFood – REINFORCING AND AMPLIFYING FOOD SAFETY MESSAGES

Food Businesses as the Drivers of Food Safety

Feed the Future Business Drivers for Food Safety (BD4FS) postulates that strengthening the capacity of growing food businesses (GFBs) and other food system actors to improve their knowledge and shift their attitudes about food safety can translate into uptake of positive practices directed at reducing foodborne hazards.⁵ In this way, food businesses become the drivers of food safety. Key program objectives that align with the BD4FS theory of change are to increase food safety awareness among businesses and consumers and to improve food safety practices among key food system actors in Senegal.

BD4FS operates in three countries: Senegal, Ethiopia, and Nepal. Senegal is the first country in which BD4FS began operations and has served as the base for developing, testing, and implementing a complementary suite of project activities to test the theory of change and advance program objectives. BD4FS primarily implements activities in the Dakar region of Senegal, which has a critical mass of food businesses and serves as a national marketing and transportation hub. GFBs and less formal food businesses located outside of Dakar that function as part of the region's market channels are also part of the BD4FS scope.

mSafeFood – A Complementary Element of the BD4FS Approach

mSafeFood complements and was informed by the other core BD4FS project activities designed to support food system actors to better understand food safety and to adopt good practices. Its contents reinforce messages conveyed through BD4FS training activities and technical support and its mobile-based IVR technologies expand the program's reach geographically and socio-demographically. mSafeFood is now an integral part of the BD4FS approach.

BD4FS in-country implementation begins with information collection to better understand the food safety landscape, followed by GFB partnership building, food safety training and technical assistance, and ongoing dialogue, documentation, and dissemination. Core activities in the BD4FS approach are detailed in the [Business Drivers for Food Safety Tools and Practices](#) manual and summarized as follows.

Food Safety Situational Analysis (FSSA) – A first step in the BD4FS approach is to implement a food safety situational analysis (FSSA) in each focus country. The FSSA, designed in collaboration with USAID, in-country partners, and subject matter experts, is a targeted analysis to (1) map the food safety landscape including key actors, market channels, hazards, and risks; (2) identify principal constraints such as technology deficits and knowledge gaps; (3) explore motivators and opportunities for adopting safer practices; and (4) discover appropriate interventions at the small- and medium-sized business level. The initial [Senegal FSSA](#) focused on artisanal fisheries and BD4FS conducted additional studies to better understand the food safety landscape. For example, BD4FS completed an assessment of [Water, Sanitation, and Hygiene Conditions at Artisanal Seafood Processing Sites in Senegal](#); a [Financial Landscape Analysis](#); and a [Food Safety Assessment of Senegalese Markets using Mobile App Technology](#).

Business Engagement – BD4FS engages with businesses that work with nutrient-dense foods such as dairy, meats, fish, and fresh fruit and vegetables following completion of the FSSA. In Senegal, BD4FS began business engagement by carrying out in-person baseline food safety diagnostics of interested GFBs to determine their pre-existing level of food safety knowledge, attitudes, and practices. Subsequently, BD4FS carried out due diligence to select companies suitable for receiving

mSafeFood Reinforces Key Food Safety Messages

mSafeFood reaches food business owners and operators, frontline food handlers, and consumers with timely information about food safety through digital messaging and recorded content. It emerged as a complementary activity to other BD4FS core program activities during the COVID-19 pandemic when in-person interactions were limited. mSafeFood has grown to be an integral component as it reinforces BD4FS education, training, and technical support and expands the program's geographic and sociodemographic reach.

The mobile platform allows for greater inclusivity as it utilizes 2G and 3G technology that does not require smartphone access nor 4G connectivity. Its interactive voice response (IVR) technology and availability in several national languages are beneficial for individuals with low literacy, an important factor for sharing key food safety messages with informal business actors.

The audiences reached by mSafeFood include GFBs as well as target groups located in informal markets, in regions outside of Dakar, and those who do not have the means of communication offered by more advanced digital technologies such as computers.

⁵ While the program's focus is on the role of businesses in implementing their own food safety measures, BD4FS recognizes that in the long-term, consumer and public sector involvement are also essential for sustainable outcomes.

technical assistance. BD4FS signed memoranda of understanding (MOUs) with those GFBs that qualified and cocreated customized food safety action plans. Fifty-one (51) companies now form the core GFBs that take part fully in all BD4FS program activities. BD4FS codesigns capacity building activities with these GFBs to support the adoption of promoted practices. Activities include formal in-person and virtual training on pre-requisite programs (PRPs)⁶ modeled after global standards and practices like hazard analysis critical control points (HACCP) and International Organization for Standardization (ISO) 22000, as well as resilience practices in the face of COVID-19, and national regulations and standards.



An employee of Faral Djiguen Senegal, a national network of women's organizations and a BD4FS partner GFB, with a bowl of cornmeal for the preparation of cereal-based food. Photo credit: Rokhaya Diop.

Public-Private Dialogues – Involving the public sector is a crucial step in developing food safety standards and creating an enabling environment to support investment in safer food handling practices, as the government is responsible for enforcement. BD4FS hosts public-private dialogues among agribusiness entrepreneurs and food safety public sector professionals to facilitate conversations among these actors. For example, in conjunction with the World Food Safety Day celebration in Senegal in June 2022, BD4FS offered a workshop on stakeholders' degree of commitment to national certification of food products. BD4FS and other key food safety public sector participants, including the national Codex Alimentarius Committee, Ministry of Health, Food and Agriculture Organization of the United Nations (FAO), and World Health Organization (WHO), co-organized the event, which core GFBs and other food businesses attended. BD4FS plans to continue hosting public-private dialogues to support a national food safety verification system that meets food safety criteria and is achievable by GFBs.

BD4FS Pre-HACCP Validation Program – BD4FS established a food safety verification badge of recognition in Senegal to incentivize GFBs to adopt safer food practices. The program leads PRP trainings modeled after global standards and practices like HACCP and ISO 22000 and issues formal recognition to GFBs that comply with 60 percent of the promoted PRP practices. A list of these 19 PRPs can be found in Annex A.

Game-Based Learning – BD4FS employs game-based learning to educate youth and involve them in promoting a culture of food safety. In Senegal, BD4FS supported the development and release of two mobile learning applications – [Samba, the Fisherman](#) and [SSAQUIZZ](#) – through a competition designed to inspire the creativity of youth app developers. The competition, initiated in 2021 with Virginia Tech's Feed the Future Senegal Youth in Agriculture program, called on Senegalese youth entrepreneurs (30 years old or younger) to develop a mobile app to raise awareness about food safety. The app competition is described in the FES brief, [Game-Based Learning Apps Win in Youth Competition](#).

MSAFEFood DESIGN AND DEVELOPMENT

Building Out the Subscriber Database

BD4FS identified target audiences and developed a database of contacts to invite to participate in mSafeFood. The primary audiences include BD4FS partner GFBs as well as non-GFB actors in the Dakar region of Senegal. The mSafeFood database of subscribers thus consists of GFB staff, especially those with lower formal literacy, as well as members of professional organizations, processing groups, women's associations, and consumers. The database of subscribers includes name, business sector, occupation, mobile number, and key demographic information such as age and gender for each contact.

Identifying Key Food Safety Messages

BD4FS drew on the GFB in-person food safety diagnostics that the program carried out during initial business engagement to assess baseline knowledge and information needs of this audience. The program conducted a mobile-based survey among the other food system actors to understand their baseline knowledge. The mobile survey made it possible to reach interested participants who did not have the means to participate in the conventional, in-person diagnostic conducted for the GFBs.

⁶ According to ISO 22000 (2018), PRPs are “basic conditions and activities that are necessary within the organization (3.31) and throughout the food chain (3.20) to maintain food safety” (<https://www.iso.org/standard/65464.html>).

BD4FS identified several broad food safety themes to emphasize on the mSafeFood platform to address knowledge gaps revealed from these baseline knowledge assessments – with some lessons tailored for GFBs and some for the non-GFB audience. The program’s food safety specialists provided technical input and communications experts translated content to short, digestible key messages around these themes.

mSafeFood Technologies

BD4FS, with the support of its technical partner Viamo, designed the mSafeFood mobile learning platform to effectively reach its target audiences. mSafeFood utilizes GSM (global system for mobile communication) and 2G and 3G technologies to account for the low usage of smartphones and 4G technologies in Senegal. The platform creates an engaging learning environment by delivering information using IVR technologies. IVR is an automated interactive voice response system where the caller listens to the system menu, responds by pressing a key on their phone, and the system reacts accordingly. Once the mSafeFood mobile platform was created, Viamo input the BD4FS key food safety messages into its three components and used the subscriber database to invite participants. Incorporating a mobile learning agenda with audio lessons is particularly important for maximizing BD4FS’ reach as it provides remote learning opportunities and is accessible to target actors who are minimally literate.

Interactive Mobile Learning Components

mSafeFood is comprised of three mobile-based learning components available to participants through two toll-free lines (Figure 1):

1. **Green Line** – An information line that participants can call at any time to listen to up-to-date food safety learning material to inform and motivate changes in food handling practices.
2. **Wanji Game** – An interactive scenario-based game that allows callers to take on roles according to their learning objective. When callers select a role, they are required to follow the instructions and respond according to the scenarios described by the game's narrator.
3. **Learning Activities** – Interactive lessons that allow beneficiaries to dynamically learn about food safety standards and regulations (Learning Activity 1) and PRPs (Learning Activity 2). Each lesson begins and ends with a brief survey to measure changes in knowledge.

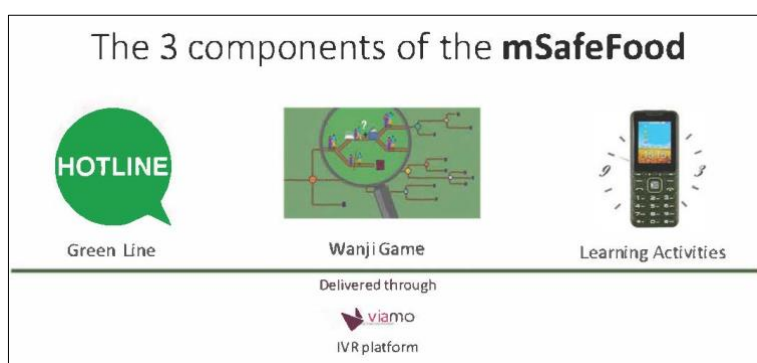


Figure 1. mSafeFood three mobile learning components.

The mSafeFood platform uses basic audio to provide interactive and educational learning; and is available in French as well as the three national languages mainly spoken in Senegal: Wolof, Pulaar, and Serer. This allows a geographically remote and low-literate audience to access information in their own language.

Recruiting Participants

BD4FS promoted mSafeFood as follows:

- Audio and text reminders – mSafeFood regularly sent out invitation messages to subscribers about upcoming new information, games, or free food safety training; and sent audio and text reminders to new prospective subscribers.
- Event promotion – BD4FS staff shared the mSafeFood toll-free numbers during events related to food safety such as SIAGRO⁷, International Food Safety Day, and scientific days.
- Email blasts – BD4FS sent out emails about the mSafeFood program to partner organizations to share with interested individuals, companies, organizations, and associations.
- Viral promotions – BD4FS sent a promotional video to different WhatsApp groups that deal with food issues.

⁷ SIAGRO (Salon International des Industries et Techniques Agro-alimentaires) is an international agribusiness conference held in Dakar, Senegal in 2022.

MSAFEFood IN ACTION

BD4FS mSafeFood conveyed key food safety messages and lessons to over 3,000 individuals (61 percent men and 39 percent women) from its 51 partnering GFBs, database of food system actors, and through broader promotion of the platform. Through this multi-targeted recruitment, BD4FS reached formal food businesses located in Dakar, food system actors operating in less formal markets, food processors located outside of Dakar, and consumers. Consumers and young people, important demographics to reach for raising food safety awareness, made up 21 percent of participants. They were motivated to participate by their own interest in the content and ability to access the platform.

Green Line - An Information Hotline

Green Line is a menu-driven information line that provides accurate and up-to-date information on food safety issues identified during the baseline survey (Figure 2). Participants access the line through a toll-free number and can select food safety messages related to the following themes: personal hygiene and clothing, biological and chemical contamination of cooked foods, the importance of clean water, food preservation, and hygiene of premises and equipment (Annex B).

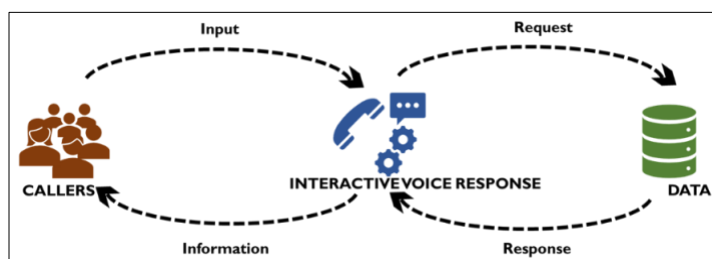


Figure 2. A diagram of how Green Line uses IVR technology to provide information to callers.

Green Line Provides Useful Information

Green Line was accessed 3,224 times by 2,532 unique individuals. This means that some participants called the information line more than once. Participants received 28,934 key food safety messages and were particularly interested in the personal hygiene and clothing information theme (selected by 27 percent of callers), followed by food preservation, and biological and chemical contamination (each selected by 20 percent of callers); see Figure 3.

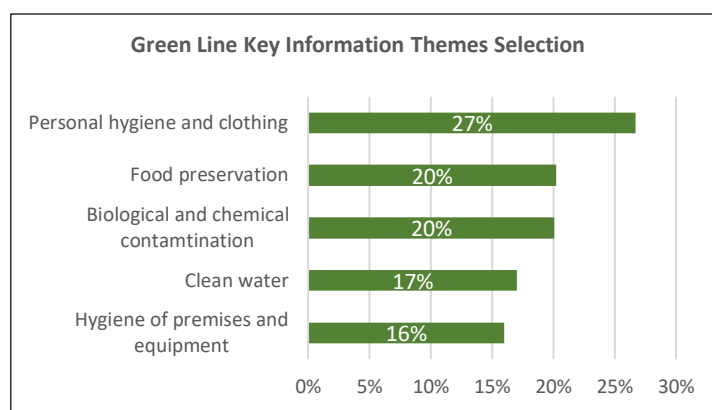


Figure 3. Participant selection of food safety information themes from the Green Line menu (N = 3,224).

Most participants (92 percent) reported that the information received was useful to them, when asked at the end of the call (N = 1,823 respondents). BD4FS conducted a survey among Green Line participants one year after completion, and 87 percent correctly answered questions related to the key food safety messages.

Wanji Game – Interactive Game-Based Learning

The Wanji Game was designed for food system actors, including consumers, to understand select PRPs (Annex C) through game-based learning. The game presents interactive stories that participants can choose and repeat as desired (Figure 4). At the beginning of the game, participants select the role they wish to play - entrepreneur, seller, or customer. Participants are walked through a story where they select choices that represent good or bad practices related to the purchase, sale, and handling of food products. The Wanji Game provides immediate feedback and informs participants if they choose a bad practice so they can then correct their answer. The Wanji Game design, where participants are prompted to correct their response, promotes behavior change. In this way, it reinforces the BD4FS PRP training by having participants put lessons learned into practice.

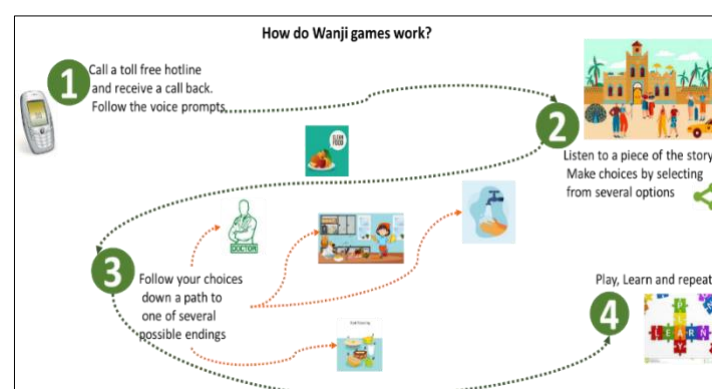


Figure 4. Diagram of the mSafeFood Wanji Game. BD4FS image, adapted from PVInternational.

Wanji Game Engages Participants

The Wanji Game was accessed 1,378 times by 1,103 unique individuals. Combined, they heard 4,382 key food safety messages through their participation. Playing the game from the entrepreneur role was most popular, selected by 593 participants (43 percent), followed by the seller role selected by 457 participants (33 percent) and the customer role selected by 328 participants (24 percent); see Figure 5.

Most participants completed the game (over 60 percent); and there was a particularly strong propensity to finish the game path if the participant played the role of the entrepreneur, with a completion rate of 65 percent. The popularity of playing the game from the entrepreneur role and the high completion rate demonstrate interest in this virtual practice game by these beneficiaries.

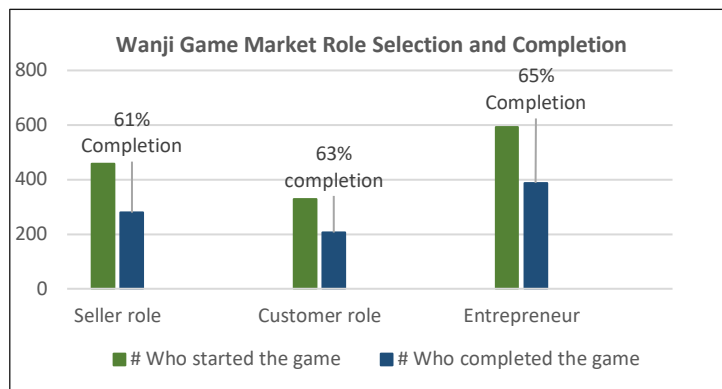


Figure 5. The number of participants who selected each market role (in green) and the number who completed the game (in blue; N = 1,378).

Learning Activities – Structured Lessons

BD4FS designed two mSafeFood Learning Activities around two themes: (1) food safety regulations and standards, and (2) PRPs. The activities are composed of three main parts: a baseline knowledge assessment, an educational lesson, and an endline knowledge assessment. In turn, each lesson has three parts: an introduction of content and objectives, lesson narrative containing two to three key messages, and a conclusion.

BD4FS tailored this component of mSafeFood for food companies that have already benefited from the direct technical assistance of BD4FS – with the first activity intended for GFBs and the second activity for less formal food business actors. BD4FS also included participants from partner projects of the Feed the Future initiative such as Youth in Agriculture, Nafoore Warsaji, and Dekkal Geej.

Learning Activity 1: Understanding Food Safety Regulations and Standards

The mSafeFood Learning Activity 1 aims to increase GFB knowledge of standards and regulations to prepare them for the food safety certification process. This was designed in response to demand and to build on previous BD4FS in-person and webinar-based training. BD4FS has maintained ongoing dialogue with GFBs to confirm mSafeFood content is relevant to them; and is establishing strategic partnerships with the Codex Alimentarius Commission in Senegal and the Senegalese Association for Standardization to ensure the information on standards and regulations is current and accurate. BD4FS concurrently adapts the content of its training activities and mSafeFood accordingly.

Among BD4FS partnering GFBs, 517 unique participants completed all three lessons of the mSafeFood Learning Activity 1. A comparison of the baseline and endline evaluations revealed an average of 6.5 percent increase in correct responses to the eight survey questions (Figure 6). While this increase in knowledge may appear low, it is noteworthy that many of the participants had received prior BD4FS training and started the activity with a high level of food safety knowledge (with an average of 85 percent correct baseline responses); and they chose to participate in the entire activity even with this high baseline. It is also useful to look at individual questions to understand which key messages participants recalled at the end, and notably, 13 percent of participants learned that there is a difference between food regulations and food standards.

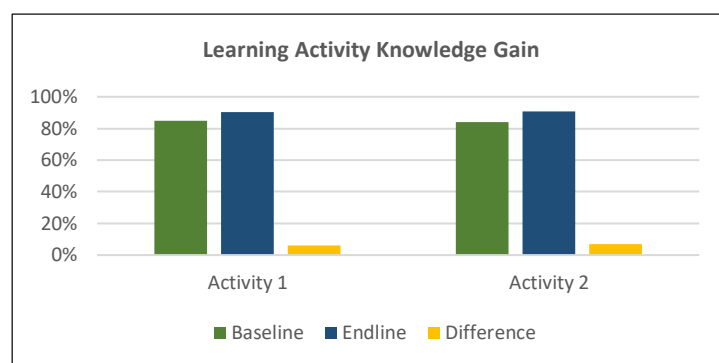


Figure 6. Percent of survey questions answered correctly before each lesson (baseline, in green), after each lesson (endline, in blue), and the difference (in yellow) for Learning Activity 1 (N = 517) and 2 (N = 891).

Learning Activity 2: Food Safety Prerequisite Programs (PRPs)

The mSafeFood Learning Activity 2 is primarily intended for non-GFB food processors from associations, processing sites, women's groups, and others that may be informal and small-scale in nature but have linkages to companies supplying larger markets. Activity 2 lessons include content on PRPs, corresponding with information needs identified by these actors.

Processing businesses present distinct characteristics depending on their activity, size, and location; and BD4FS considered their varying needs when developing lessons. Training these supporting actors in PRPs can improve supply-side food safety, contributing to GFBs' ability to comply with food safety standards.

To reach a wide audience, the project disseminated an mSafeFood phone number through which willing participants could access the platform directly. Out of 2,000 people contacted, 891 completed the entire Learning Activity. Among the participants, 220 women food processors had already benefited from BD4FS on-site training. BD4FS compared the baseline and endline evaluations and found an average of 7 percent increase in correct responses to the eight survey questions (Figure 6). Like Activity 1, participants started with a high baseline knowledge and on average answered 84 percent of the survey questions correctly. The largest improvement in knowledge was related to fish processing where 16 percent of participants learned that it is not safe to eat fish that has spoiled before salting, drying, or smoking.

CONSISTENT MESSAGING ACROSS CHANNELS



Senegalese woman using a mobile phone at a market.
Photo credit: Mariama Dieng

As a multi-channel effort, BD4FS deploys its complementary suite of training and learning activities to improve food safety knowledge and promote safer practices among food businesses and supporting actors (Table 1). BD4FS delivers structured course materials to GFB participants through in-person training and virtually trains various target groups (businesses, informal actors, processing sites, associations) through webinars. In-person and computer-based learning are appropriate for more formally educated GFB leaders in terms of the structure and duration of the training as well as breadth and depth of materials covered. Alternatively, the mSafeFood mobile learning platform proved to be more suitable for less formally educated and geographically distributed actors. The mobile platform's 2G and 3G technologies enable individuals who lack computers, internet, and smartphones to access important food safety information. The IVR technology that provides messages by audio in national languages allows less educated and non-French speaking actors to understand the information. mSafeFood has thus enabled BD4FS to promote learning for target groups that are difficult-to-reach through more traditional training activities.

In addition to expanding BD4FS' audience reach, mSafeFood reinforces learning from BD4FS training activities and technical assistance by presenting consistent messaging across channels. The mSafeFood technical content for its three components - Green Line, Wanji Game, and Learning Activities - was developed considering content and lessons learned from other program activities. Green Line key food safety messages draw on findings from BD4FS' initial business engagement survey. The first Learning Activity includes lessons that directly support training that BD4FS held previously with GFBs on food safety standards and regulations. This is a topic that was identified as a high priority need by public and private sectors alike. The in-person training and this mSafeFood component aim to increase GFB knowledge of standards and regulations and to prepare them for BD4FS food safety validation (badge). This badge serves as an incentive for businesses to adopt food safety practices because it can improve the marketability of their products. The focus of the Wanji Game and the second Learning Activity coincide with BD4FS webinar-based training on PRPs. These components thus reinforce PRP messages for supporting food business actors who have already worked with the program and introduce this information to new audiences.

Incorporating an interactive and personalized teaching approach along with more structured lessons can meet varying learning-styles. mSafeFood appeals to audiences in a unique way compared to in-person and webinar-based training activities. The IVR technology presents user-driven learning experiences where participants can select exercises and repeat them as desired. The game-based learning approach of the Wanji Game has parallels to the BD4FS food safety mobile learning apps designed by youth entrepreneurs and to reach youth. Both the apps and Wanji Game aim to teach audiences about food safety in a fun and interactive way. Encouraging participants to follow the mSafeFood mobile learning components according to their pace and to self-assess gives them time to digest information and retain that knowledge.

Therefore, BD4FS reaches audiences through different delivery channels which often intersect and reinforce each other. mSafeFood has amplified the effects of in-person and virtual training by deepening participant understanding and expanding audience reach. Thus, synergies are created between BD4FS' different activities with a single vision of strengthening the food safety culture. Educating both GFB professionals and individual actors on food safety practices underpins the BD4FS approach which is supported by the belief that with knowledge and motivation, food businesses can be the drivers of food safety within the national food system.

Table 1. Primary beneficiaries, technical content, related BD4FS activities, and complementary points for the three mSafeFood mobile learning components.

| mSafeFood Components | Green Line | Wanji Game | Learning Activities |
|--|--|--|--|
| Beneficiaries | Growing agribusinesses Other non-formal agribusiness actors Consumers Community opinion leaders Youth | Other non-formal agribusiness actors Consumers Community opinion leaders Youth | Activity 1: Growing Food Businesses Activity 2: Other non-formal agribusiness actors |
| Technical content | Key food safety messages – see Annex B | PRPs – see Annex C | Activity 1: Food safety standards and regulations Activity 2: PRPs |
| Related activities completed by BD4FS | Global communication for food safety awareness deployed on traditional media and social networks | Training on the required in-person programs (individual or group) Mobile food safety learning apps – designed by and intended for youth | In-person and webinar-based training and technical assistance delivered in a customized way to GFBs Public-private dialogues on food safety standards and regulations |
| Complementary points | Green Line covers food safety information in greater depth than traditional media and allows participants to select among several themes | Food system actors who cannot attend training on the PRPs can learn through mobile-based scenarios at their convenience | Technical assistance is continued on a mobile platform where participants can self-assess and repeat courses |

STRENGTHENING THE CULTURE OF FOOD SAFETY

Food safety culture, according to the Global Food Safety Initiative (GFSI)⁸, is defined as: “A set of shared values, beliefs and standards that affect the food safety mindset and behavior of food within an organization, and organization-wide.”⁹ Promoting food safety culture is an integral part of BD4FS' strategy. mSafeFood aims to influence good food safety practices among businesses by providing accurate and up-to-date information— a key element to adopting food safety practices. In Senegal, mSafeFood allows BD4FS to reach intended audiences with food safety information in fun and easily accessible ways. This delivery maintains their interest in the topic and can inspire them to make safer food handling choices.

From a business perspective, strengthening the culture of food safety begins with businesses understanding the requirements to meet the minimum level of safety. To that end, BD4FS initiated a public-private dialogue about the feasibility of local validation of food safety practices among small and medium food businesses. Lack of knowledge of food safety requirements and about affordable practices to bring companies into compliance were top deficiencies identified in the dialogue. mSafeFood has been an effective technical assistance tool to address these deficiencies. In particular, the workforce development of employees, many of whom are minimally literate, was cited as a major benefit to food businesses.

Coinciding with mSafeFood mobile learning, BD4FS implemented on-site, in-person training among food processing businesses in the informal sector active in various parts of the country. Through this activity, BD4FS reached 3,527 people (including 3,029 women and 1,006 young people) through 71 on-site training sessions held between May and August of 2022. Surveys of training participants showed that 69 percent of them remembered the key messages delivered during the training, and that approximately 90 percent had adopted at least one good food safety practice or technology. Though assessed differently, food safety retention was high through both digital learning and on-site training.

⁸ The GFSI is a private organization that has established a “universal gold-standard” for their food safety audit and certification criteria.

⁹ Cascelli, M. 2021. Sécurité sanitaire des aliments : quels sont les nouveaux enjeux liés à La Food Safety Culture (FSC) ? (Food safety: what are the new issues related to Food Safety Culture (FSC)? <https://www.blog-qhse.com/secureite-sanitaire-des-aliments-quels-sont-les-nouveaux-enjeux-lies-a-la-food-safety-culture-fsc>)

In coordination with in-person and digital training, BD4FS conducts applied research, publishes manuals, and takes initiatives that support and incentivize businesses to adopt food safety practices and technologies. For example, BD4FS developed and distributed a manual of 100 Affordable Food Safety Technologies for GFBs, which identifies readily available tools and techniques that GFBs can adopt to safely process, handle, transport, and store foods. To raise awareness about the business costs of food loss, BD4FS developed and tested protocols to measure food loss among Senegalese GFBs. This study, [Measuring Food Loss and Waste among Senegalese Growing Food Businesses](#), builds the connection between following food safety standards and product quality and value. Additionally, with the goal of motivating businesses to comply with food safety standards, BD4FS is currently implementing a pre-HACCP food safety badge program to validate GFBs that effectively implement PRPs.



Focus group discussion at Senegalese fish processing site.
Photo credit: Dr. Babacar Sene.

BD4FS has ongoing dialogue with GFBs and supporting food system actors to ensure the content and delivery of mSafeFood and other program activities are relevant and accessible to them. The program is also establishing strategic partnerships with the Codex Alimentarius Commission in Senegal and the Senegalese Association for Standardization to ensure the technical information on standards and regulations remain current and accurate. BD4FS concurrently adapts the content of its training activities and mSafeFood accordingly. Increased food safety knowledge and application of that knowledge are critical building blocks of the culture of food safety.

“Our community of fish processors is composed of illiterate women. The FES BD4FS mSafeFood tools, particularly the Green Line and the Wanji Game are adapted to this constituency.”

- Diaba Diop, General Secretary of Pencuum Senegal Women Fish Processors Association

MSAFEFOOD KEY FINDINGS AND NEXT STEPS

In its first nine months of operation, conducted from October 2021 to July 2022, mSafeFood achieved substantial geographic, demographic, and linguistic reach in Senegal with its delivery of interactive audio messages accessible on basic mobile phones and smartphones. The subscriber database that BD4FS used to invite participants included people located throughout the national territory and the mSafeFood content was available in French and the three main national languages spoken in Senegal: Wolof, Pulaar, and Serer.

The versatile and personalized nature of mSafeFood enabled food business actors to receive relevant key food safety information through games and lessons at their convenience. BD4FS reached over 3,000 unique individuals, conveyed 33,316 key food safety messages, and taught targeted lessons to GFBs and other supporting food system actors. The breakdown of participants by component was as follows:

- Green Line – 2,532 individuals called 3,224 times and received 28,934 key messages.
- Wanji Game – 1,103 individuals called 1,378 times and received 4,382 key messages.
- Learning Activity 1 – 517 participants completed the entire activity and achieved an average increase of 6.5 percent in knowledge.
- Learning Activity 2 – 891 participants completed the entire activity and achieved an average increase of 7 percent in knowledge.

The initial phase of mSafeFood implementation demonstrated clear advantages of this mobile learning platform as a complementary addition to the BD4FS core program activities. The platform operated as a reinforcing learning tool for GFBs as it covered food safety information provided through BD4FS’ more formal training activities. It also supported large-scale awareness raising among less formal businesses connected to the GFB supply chains. mSafeFood allowed BD4FS to reach actors located outside of the Dakar region and who did not have smartphones, lacked computer tools and skills, and that were not educated in French. Through mSafeFood, BD4FS expanded its reach to consumers and youth who comprised 21 percent of mSafeFood participants.

BD4FS effectively developed the mSafeFood learning platform to be interesting and engaging. The technical content for each component was tailored to be relevant for the intended audiences and the interactive platform to create a personalized experience. Green Line successfully conveyed relevant key food safety information to its participants with 92 percent reporting the information was useful to them. The Wanji Game user-driven scenarios that provided immediate corrective

feedback encouraged participants to see the lesson through, with 63 percent playing the game to completion. The targeted content of the Learning Activities kept participants' interest, with 517 GFB participants completing Learning Activity 1 in its entirety and 891 other food system actors completing Activity 2. Interest and engagement in all three components were evident by the number of calls received by the server, which greatly exceeded the number of individual subscribers. This indicates that participants called back to learn more information from Green Line, to play the Wanji Game from a different role, and to participate in additional Learning Activity lessons.

With a goal of increasing food safety knowledge and awareness, BD4FS incorporated mechanisms to measure learning from mSafeFood components. mSafeFood did in fact increase knowledge about food safety among participants. Learning Activity 1 reached GFBs and included content to reinforce previous BD4FS training activities on food safety standards and regulations. Comparison of the pre- and post-evaluations revealed an increase in knowledge of 6.5 percent which is notable among GFBs who started with a high baseline knowledge. Green Line participants demonstrated a high degree of food safety knowledge one year after implementation, with 87 percent correctly answering survey questions related to the BD4FS key food safety messages.

In this iteration, mSafeFood was free to all participants and costs were paid by BD4FS. Moving forward, BD4FS is designing mSafeFood 2.0 that seeks to be self-financed through subscriber fees, company memberships, and advertising. BD4FS will also adapt and build on content so it continues to be relevant and interesting to GFBs and other food system actors.

GLOSSARY

Pulaar: Pulaar is a Sudanese language of the West Atlantic group used by the Fulani population groups from Senegal to Cameroon and Sudan. As is natural for a language spoken over such a large area, Fulani has many dialects.¹⁰

Serer: Serer is the language of the Atlantic branch of the Niger-Congolese languages spoken in Senegal and Gambia. Decree No. 75-1025 of October 10, 1975, on the spelling and separation of words in Serer gives this language the status of a national language.¹¹

Wolof: Mostly used in Senegal, the Wolof language finds its origins in the heart of the Atlantic branch of the Niger-Congolese languages. Wolof is the most widespread language in Senegal along with French (the official language). The Wolof ethnic group represents 40 percent of the population. It should be noted that Wolof is also part of the national languages of Mauritania¹² and Gambia¹³.

PRPs: Prerequisite programs (PRPs) are the basic conditions and activities required to sustain food product hygiene and a clean, hygienic environment throughout the food chain. The prerequisites and procedures are necessary to ensure the safety of food operations. In developing PRPs, growing food businesses (GFBs) should consider relevant information, including regulatory and legal requirements, official instructions, national and international standards, guidelines, and the codes of practice in the Codex Alimentarius'. Prerequisites are applicable for the delivery, production, handling, packaging, and transportation of food products. PRPs are at the center of the food safety management system.¹⁴ See Annex A for a list of the specific PRPs that BD4FS promotes through in-person and online training.

Key Message: A key message is a piece of content that contains important information that can lead to a change in behavior in the listener. A key message has information in its content that raises awareness or educates the listener. Through mSafeFood, a caller can listen to multiple key messages during a call in the interactive voice system.

HACCP: Hazard Analysis and Critical Control Points, or HACCP, is a systematic preventive approach to food safety against biological, chemical, and physical hazards in production processes that can render the finished product unsafe and designs measures to reduce these risks to a safe level.

GFB: A Growing Food Business is a small- to medium-sized enterprise that seeks to expand by adopting a business model that incorporates food safety practices. To be systematic and efficient in enlisting GFBs, BD4FS defined minimum inclusion criteria as follows:

- Be a growing company with a significant growth potential
- Be an autonomous company
- Have a brand name or respected products in the market
- Have minimum qualifications or a ready, willing, and able to learn.
- Be in the targeted zone of influence¹⁵
- Have linkages with value chain actors (at various levels of production, processing, distribution, and marketing)
- Young businesses with good potential for growth (in terms of volumes, and innovation, among others).
- Well-established small or medium-sized firms engaged in the food sector that have branded food products with a good reputation locally.

¹⁰ Centre National des Ressources Textuelles et Lexicales, CNRTL. <https://www.cnrtl.fr/definition/peule>.

¹¹ DAFF, Reutner et Al. 2017. *Sénégal in Manuel des francophonies*, (Senegal in the Manual of Francophonies), page 554.

¹² Cavrois, B. (2009). *Approche de la langue wolof, de sa lexicologie, ainsi que de ses particularités. Morphologiques et syntaxiques. Linguistique*. (Approach to the Wolof language, Its Lexicology, As Well As Its Morphological and Syntactic Particularities. Linguistic). Dumas-00401487.

¹³ Author's note.

¹⁴ Food Enterprise Solutions. 2022. *Food Safety Pre-HACCP Training Course for Growing Food Businesses*, P.4

¹⁵ Geographic area targeted by Feed the Future interventions.

ANNEXES

Annex A. Prerequisite Programs (PRPs)

BD4FS provides training activities that cover the following 19 food safety PRPs (each is supply/value chain specific):

- Module 1: Cleaning and Disinfection Procedures
- Module 2: Preventing Cross-Contamination
- Module 3: Personal Hygiene and Employee Facilities
- Module 4: Equipment Cleaning and Maintenance
- Module 5: Waste Disposal
- Module 6: Utilities: Clean Water, Air and Energy
- Module 7: Premises and Workspaces
- Module 8: Design and Construction of Establishments
- Module 9: Supplier Management
- Module 10: Pest Control
- Module 11: Reprocessing
- Module 12: Withdrawal and Recall of Products
- Module 13: Warehousing and Storage
- Module 14: Product Information
- Module 15: Food Defense, Vulnerability and Threats
- Module 16: Cold Chain Technology, Heat Treatment Technology, Food Formulation
- Module 17: Allergens Control
- Module 18: Control of Foreign Bodies
- Module 19: Document Management

Annex B. Key Food Safety Messages

| Themes | Topics | Messages |
|--|-------------------------------|---|
| 1. Personal hygiene and clothing | Hand Washing | To avoid illness, wash your hands with clean water and soap. To avoid illness, wash your hands with clean water and soap at the following key times: <ul style="list-style-type: none"> • Before eating; • Before preparing food; • Before feeding children or breastfeeding; • After using the toilet; • After changing or washing your child's diapers; * After handling garbage; * After handling chemicals (including cleaning products); * After playing with pets; |
| | Hygiene/Behavior | People who handle food should avoid behaviors that could lead to contamination of food, for example: - smoking; - to spit; - chew or eat; - sneezing or coughing near unprotected food. Employees should not wear personal effects such as dress clothes, dress shoes, jewelry, watches, pins, or other items, or bring into food preparation and handling areas if they pose a threat to health safety and food safety. |
| | Health | If you have a common cold or skin disease, you should not handle food. When suffering from viral hepatitis A (jaundice) - gastrointestinal infection (diarrhea) - vomiting - fever - sore throat with fever - visibly infected skin lesions (boils, cuts, etc.) - discharge from the ear, eyes, or nose, it must be reported to your employer for exclusion from food production areas. |
| 2. Biological and chemical contamination of cooked food | Food protection | To reduce the risk of food contamination, ingredients must be protected during transport and during storage. |
| | Bacterial transmission vector | Keep insects, rodents, and other animals away from food and food production areas. |
| | Cross contamination | Separate raw foods from cooked foods. <ul style="list-style-type: none"> • Separate raw meat, poultry, and fish from other foods • Do not reuse equipment and utensils such as knives and cutting boards that you just used for other foods for raw foods • Store foods in closed containers to avoid any contact between raw foods and ready-to-eat foods Hands should always be washed with soap and water before manipulating food. Work clothes reserved for this sole use. Jewelry, watches, and phones should not be touched while working. Wash utensils with soap before putting food in them. Separate the utensils according to their uses. Always separate raw and cooked products |
| 3. The importance of clean water | Clean water | If the water comes from a supply point such as rivers, ponds, backwaters, and springs and is not treated, it can transmit diseases. Use clean water or treat it in such a way that there is no risk of contamination. |
| 4. Food preservation | Food protection | Food must be stored in a designated place. Store correctly by separating dry food from wet food avoiding placing it directly on the floor. Protect food in a closed, clean container. |
| | Storage of perishable foods | <ul style="list-style-type: none"> • Do not leave cooked food for more than two hours at room temperature • Refrigerate all cooked food and perishables quickly (preferably below 5 ° C) • Keep cooked food very hot (above to 63 ° C) until ready to serve • Do not keep food too long even in the refrigerator |

| | | |
|---|------------------------|---|
| | | <ul style="list-style-type: none"> • Do not thaw frozen food at room temperature * Food that has been frozen and thawed should never be frozen again. <p>Avoid placing hot foods directly in the freezer as you will raise the temperature, which can affect other foods. Cool foods before freezing.</p> |
| | Pesticide spraying | Pest infestations must be dealt with immediately and without compromising the safety and suitability of food. Chemical, physical, or biological treatment |
| 5. Hygiene of premises and equipment | Cleaning | <p>The purpose of cleaning equipment and utensils is to eliminate most of the dirt and microorganisms present on their surfaces. The dirt carried to the sewer are so many nutrients in less for the microbial multiplication. If, moreover, the surfaces are dried after this cleaning, multiplication will be impossible.</p> <p>Must be implemented in such a way as to eliminate the risk of intoxication for the consumer.</p> |
| | Disinfection | Disinfection is used to remove dirt and destroy microorganisms present in devices and packaging. In some cases, these operations must be carried out on the products themselves soiled by soil, microorganisms or pesticide residues. |
| | Regularity of cleaning | Each type of manufacturing and/or material requires determining the number of times cleaning and disinfection operations will be necessary, within a given period of time. The frequency of the operation depends on the nature of the food product used and, on the technology, used during the sterilization of the milk in exchangers or during the concentration of certain vinasses. Very often the cleaning takes place every day; this is the case in the meat industry, in canneries, in bakeries, or in bottling stations for processing drinks. |

Annex C. Wanji Game PRPs

- Module 1: Cleaning and Disinfection Procedures
- Module 2: Preventing Cross-Contamination
- Module 3: Personal Hygiene and Employee Facilities
- Module 4: Equipment Cleaning and Maintenance
- Module 5: Waste Disposal
- Module 6: Utilities: Clean Water, Air and Energy
- Module 7: Premises and Workspaces
- Module 9: Supplier Management
- Module 10: Pest Control
- Module 13: Warehousing and Storage
- Module 16: Cold Chain Technology, Heat Treatment Technology, Food Formulation