

# VI MSU Food Assistance Packaging Solutions Workshop Michigan State University School of Packaging

October 23-25 2023



**Sustainable fit-for-purpose food packaging is a critical element of food assistance programming, to ensuring the safe and timely delivery of life-saving nutritious foods. An unsuitable packaging can deem an entire food assistance program unsustainable.**

VI MSU Food Aid Packaging Solutions Workshop  
Michigan State University School of Packaging

October 23-25 2023

2023 Food Assistance Sustainable Evidence-based Packaging Agenda

The FASPA Report

Table of Contents

<b><i>I. Introduction</i></b>	<b>2</b>
<b><i>II. The FASPA Report)</i></b>	<b>2</b>
<b><i>III. Relevant workstreams discussed and included in this 2023 FASPA Report</i></b>	<b>3</b>
<b>3.1 The Broader Food Assistance Sustainable Packaging Solutions Concept</b>	<b>3</b>
3.1.1 The Joint Initiative	4
<b>3.2 Food Infestation Packaging Technologies, Management and Solutions</b>	<b>5</b>
<b>3.3 Hermetic Packaging Technologies, Trials, and Innovations</b>	<b>6</b>
<b>3.4 Improving Packaging Integrity Monitoring Technologies</b>	<b>7</b>
<b>3.5 The Packaging Standardization Project</b>	<b>7</b>
<b>3.6 The WaterSafe Packaging Project</b>	<b>9</b>
<b>3.7 Innovate for Impact Project</b>	<b>9</b>
<b>3.8 Impact of AI on Packaging Innovation as it Applies to Food Aid</b>	<b>11</b>
<b>3.9 Exhibit Session at the 2023 Food Aid Packaging Workshop Series</b>	<b>11</b>
3.9.1 2023 Sustainable Packaging Stakeholders Engagement Stations	12
<b>3.10 Reusable Oil Tin Can Functionality Improvement</b>	<b>13</b>
<b>3.11 Process Capability Systems to Prevent Leaking in LNS Packaging</b>	<b>15</b>
<b>3.12 USAID Food Assistance Sustainable Packaging Innovation</b>	<b>16</b>
<b><i>Annex I: 2023 FASPA Workplan</i></b>	<b>18</b>
<b><i>Annex II: VI MSU Food Aid Packaging Solutions Agenda</i></b>	<b>20</b>

## I. Introduction

Sustainable fit-for-purpose food packaging is a critical element of food assistance and nutrition programming, to ensuring the safe and timely delivery of life-saving nutritious foods. An unsuitable packaging can deem an entire food assistance program unsustainable. The main goal of the VI Food Assistance Packaging Workshop Series held with the support of the Michigan State University School of Packaging was to gather key food assistance stakeholders to discuss the status of food aid commodity packaging, challenges, new technological advances, potential solutions, and identify next steps in optimizing food aid packaging. The meeting held this time in-person in East Lansing, was the sixth iteration of this annual technical food aid packaging workshop. The workshop series allows for the identification and outlining of specific steps to addressing challenges, using readily available technologies, as well as research and innovation opportunities. Normally a wide spectrum of stakeholders, including but not limited to commodity suppliers, technology vendors, academia, food assistance implementing partners and research organizations, engage in discussions around specific packaging themes and topics, leading to the formation of working groups to advance an evidence-based sustainable packaging agenda, the **FASPA Report**.

## II. The Food Assistance Sustainable Evidence-based Packaging Agenda (The FASPA Report)

Packaging sustainability was again an important theme of discussion at the 2023 food assistance packaging workshop, as reflected in the agenda in Annex II. For the past decade, there has been a much more assertive effort by USAID, its partners, and stakeholders in food packaging innovation. This effort has led to the identification, trialing, and piloting of promising packaging technologies and solutions. It has included undertaking shelf-life studies of commodities, conducting packaging life cycle assessments, redesigning packaging functionalities to protect the integrity and safety of foods, and allowing for more effective and agile distribution of the foods by various food programs. Similarly, there has been recognition that creating and supporting local capacity and enabling bulk shipping of food commodities to be packaged by local partners can offer multiple benefits from both a humanitarian food assistance and a development programs standpoint. Packaging food commodities closer to where they are needed minimizes food safety and quality risks and enables more efficient programming and distribution of those commodities. It also facilitates engagement with local partners and governments, supporting local capacity building and packaging technology spillover.

To advance a sustainable food packaging agenda that benefits both humanitarian and development programs, the agency has been carrying out joint work with implementing partners. With these partners, the agency has managed to assemble packaging working groups around key areas and organize the annual food aid packaging workshops to address pressing packaging and supply chain challenges. These efforts have led to

improvements in packaging quality, functionalities, and performance throughout the supply chain.

The broader sustainability concept embraced by USAID and its partners ensures that efforts on packaging design and functionalities are not only more responsive to climate change and the environment, but also that workstreams such as minimizing food infestation, waste and losses are of high priority. It also aims at ensuring the sustainability of the food assistance programs that are meant to save lives and improve human conditions in the many deprived regions of the world where humanitarian food assistance programs occur.

### **2.1. The FASPA Report**

An important goal of each packaging workshop, and in between, is to identify collaborating opportunities among groups of stakeholders, and build a common agenda, leading to the solution of the various packaging and supply chain challenges, sustainably. That's what *FASPA*, or simply **The FASPA Report** is: a *Food Assistance Sustainable Evidence-based Packaging Agenda*, outlining steps forwards to solving major packaging challenges, sustainably. This effort shall ultimately lead to achieving more sustainable humanitarian food assistance programs.

For full access to recording and to this and other resources, presentations at the workshop, please go to the following the: [Food Aid Packaging Solutions workshop website](#).

## **III. Relevant workstreams discussed and included in this 2023 FASPA Report**

### **3.1 The Broader Food Assistance Sustainable Packaging Solutions and Systems**

A robust discussion was held around exploring options to reduce environmental impact throughout the food assistance supply chain with a focus on packaging. As a viable pathway, it is being agreed to jointly work on food and packaging waste measuring and management, including approaches that integrate reverse logistics from packaging waste back to product achieving a circular business model that ensures environmentally sustainable procurement and food distribution, connected with local and regional economies. Currently, there are very limited food and packaging waste collection services and infrastructure for waste recycling and safe disposal, which aggravates the environmental, public and climate impacts of waste.

One of the biggest challenges to implementing sustainable packaging is to find a balance between environmentally sensitive packaging materials and the ability of packaging technologies to ensure adequate shelf life and appropriate protection of food integrity.

At the VI MSU Packaging Workshop, under the environmental sustainability of food aid packaging, strategies and challenges related to reducing environmental impact throughout the supply chain were discussed, particularly focusing on packaging within humanitarian contexts. Initiatives such as Waste Management and Measuring, Reverse Logistics, Environmentally Sustainable Procurement and Transport, and Circular Economy principles were highlighted.

Persistent challenges include limited waste collection services, which might lead to improper disposal methods such as dumping and burning. The Global Logistics Cluster's Waste and Emissions Reduction (WREC) project, which USAID funds and its partners participate, aims to address these challenges by increasing awareness and supporting best environmental practices. The circular economy approach prioritizes waste prevention and sustainable packaging, emphasizing the need for access to recycling and proper disposal methods. Challenges include the lack of access to energy recovery and treatment/disposal options. Discussions at the MSU VI food aid packaging workshop raised questions about the continuum of waste management programs and the need to establish a globally supported Food and Packaging Waste Management Cluster, leveraging the learning from specific case studies such as the Cox's Bazar Refugee Settlement in Bangladesh.

Further discussions explored various potential solutions, including investing in repurposing packaging materials, involving communities in waste management plans, incentivizing green suppliers, and implementing waste collection programs. Proposed solutions range from establishing collection programs at the community level to developing reusable packaging options and training programs for waste disposal. An agreed approach to addressing food and packaging waste related to humanitarian food assistance programs and beyond is the ***Circular Food Assistance*** model, which involves turning waste into useful products while providing skills development and income opportunities for program participants. Overall, it emphasizes the importance of collaboration across sectors and stakeholders to address environmental challenges in humanitarian supply chains.

### **3.1.1 The Joint Initiative (JI) for Sustainable Humanitarian Packaging Waste Management**

The Joint Initiative (JI), a USAID-coordinated global effort comprises 26 humanitarian stakeholders, investing jointly on reducing the environmental footprint of humanitarian food assistance programs, using a holistic approach and fostering information and knowledge sharing, globally. Reducing packaging is crucial due to recycling challenges. Packaging can be reused or repurposed through innovative designs, but improper handling can be harmful. Collaboration among humanitarian organizations, donors, governments, and private waste management entities is essential.

**Scope of work.** Understanding the quantity and types of packaging used by humanitarian organizations is essential. An assessment revealed that in 2021, 6.77 million metric tons (MT) of food and non-food items (NFIs) were procured by 12 humanitarian organizations. This procurement resulted in 33,000 tons of primary and 35,600 tons of secondary packaging, totaling approximately 3 billion packaging units. The findings showed that, by weight, 50% of packaging consisted of cardboard boxes, 32% plastics, 10% tin cans, and 8% sachets. Notably, 43% of the packaging weight comprised vegetable oil, followed by ready-to-use therapeutic foods (RUTFs) at 14%, lipid-based nutrient supplements (LNS) at 13%, rice at 6%, and other items at 24%.

**Progress Report.** The JI created a Packaging Baseline Assessment tool and a Working Group (WG) focused on metalized laminated sachets, which represented 13% of all primary packaging. The WG aims to address packaging waste challenges through collaboration with organizations and suppliers.

**Reuse, Repurposing, and Recycling.** The initiative developed a decision tree to guide appropriate packaging waste management methods in humanitarian operations based on material, country context, and the 5 Rs (reduce, reuse, recycle, recover, and redesign)

These resources and more are published on the [Joint Initiative webpage](#), and the discussion can be joined on [LinkedIn](#).

### **3.2 Food Infestation Packaging Technologies, Management and Solutions**

As an addition to the food infestation packaging discussion at the VI Packaging Workshop, the commercial pet food industry was discussed and applicable strategies to prevent food infestation in food assistance programs, emphasizing the importance of understanding insect behavior and implementing proper storage practices. Various packaging technologies, including hermetic storage and insecticide-treated bags, were explored for their potential to mitigate food infestation in humanitarian settings. Challenges include diverse situations, commodities, and supply chains, highlighting the need for more effective integrated pest management systems. While significant progress on incident reporting, investigation, management, and compliance has been achieved, still food infestation remains a major issue.

Current most common incidents include low performing packaging, stitching issues allowing for pest entrance and infestation, delamination of paper, product leakage, and damage canned food such as oil. In 2023, incidents comprised 24% foreign matter and 29% infestation.

### 3.3. Hermetic Packaging Technologies, Trials, and Innovations

As part of the VI MSU meeting, a robust discussion was sustained around hermetic packaging as a viable approach to reduce infestation. For the purpose of this report, hermetic packaging is defined as heat-sealable flexible packaging hermetic to the entrance of pest but with gas-exchange breathability sufficient to allow appropriate stacking, rapid equilibrium with external atmosphere and resilient enough to withstand puncture and rough handling throughout the supply chain.

A specific prototype of hermetic packaging technology discussed was the GrainPro Packaging. The GrainPro, technology, however, offers airtight storage, which does not fit the definition of “breathable hermetic packaging”, with the capability of protecting commodities from insects, molds, and oxidation without the need for chemicals or fumigants. USAID and partners have agreed to pilot some of the most suitable GrainPRO packaging, including:

**Hermetic Bags:** Provide protection from initial packaging to final consumption, with a capacity range from 33 lbs to 220 lbs. These multilayered bags offer superior airtightness compared to conventional plastic bags.

**TranSafeliner:** Ensures protection from port to port, with a multilayered PE construction and various installation methods. Ideal for safeguarding cargo against temperature fluctuations, humidity, infestation, and mold.

**Cocoon and Gas Hermetic Fumigation:** Offers warehouse and field-level protection with a flexible, high-resistance PVC construction. Demonstrated effectiveness in trials, with significant decreases in oxygen levels leading to reduced infestation.

#### The following field-pilot efforts were discussed:

- **Pilot 1:** Utilizes TranSafeliner and compares with Hybrid Bag and Double Bagging for commodities such as rice, sorghum, peas, and yellow split peas.
- **Pilot 2:** Introduces GrainPro Hermetic 50 kg Bags with a focus on commodities like rice, sorghum, peas, and yellow split peas, including a training program.
- **Pilot 3:** (USAID Programming): Implements GrainPro 50 MT Cocoons in Nigeria, Djibouti, and Tanzania, monitoring infestation and moisture content.
- **Pilot 4:** (McGovern Dole Food for Ed): Deploys 1 MT GrainPro GrainSafe units at various locations, focusing on rice, sorghum, peas, and yellow split peas, with KPIs including infestation and moisture content.

### 3.4. Improving Packaging Integrity Monitoring Technologies

There is an ever more need for effective packaging, preventing costly packaged food failures in the field. There are tensions in the market regarding shelf life, the demand for artificial chemical-free products, and the growing focus on food and packaging waste and sustainability. Leaks in packaging can be categorized as either holes (pores) or capillaries (channels), representing structural defects that unintentionally allow the passage of gas or liquid. The concept of being "leak tight" depends on the specific requirements and boundaries of the packaging's purpose. Effective and operationally feasible packaging leak detection equipment beyond the traditional bubble testing can lead to more effective packaging and preventive approaches in reducing packaging failures throughout the supply chain. Various leak detection equipment exists, with effectiveness influenced by testing environments (e.g., lab versus manufacturing settings). The traditional bubble testing, while common, has several drawbacks, including being non-universal, requiring high attention, being destructive in nature, and lacking reproducibility.

A prototype technology was exhibited and presented at the VI MSU Packaging meeting, a Non-Destructive Vacuum Decay testing system. This method allows for lower pressure testing, enabling the identification of microleaks in packaging without causing rupture. It's non-destructive, digitally archived, and suitable for testing various types of packaging. Presented testing data comparing the vacuum model with the bubble chamber shows that while bubble tests didn't detect leaks, lowering pressure significantly uncovered leaks, demonstrating the efficacy of non-destructive methods.

**Challenges with Larger Packaging:** Larger packaging sizes pose challenges for low-level pressurization, suggesting a need to expand instrument portfolios to accommodate such sizes based on market demand.

The INFICON Helium Leak Detection Model: this helium-based technology options for leak testing, including outside-to-inside and inside-to-outside testing, mass spectrometers, and optical emission spectrometers for gas analysis, might prove to be expensive and not suitable for humanitarian foods.

### 3.5. The Packaging Standardization Project

Lack of standardization of humanitarian food packaging sizes and shapes has led to significant challenges throughout the supply chain. It includes issues with stackability in warehouses, traceability, containerization, handling, and challenges during final distribution at the last mile. Examples include the packaging of both Super Cereal Plus (SCP) and Ready to eat Therapeutic/Supplementary foods (RUTF and RUSF). At 2022 MSU packaging annual meeting, progress on packaging standardization was reported for two commodities: LNS and SCP.



The Packaging Standardization Project, led by a group of suppliers, aims to standardize flour blend packaging such as Super Cereal Plus (SCP) and Lipid-based Nutrient Supplements (LNS) like RUTF to improve the efficiency of humanitarian supply chains. However, challenges persist in achieving this standardization, including varied approaches tested by suppliers, stackability issues, and compliance hurdles. Key aspects discussed at the VI MSU Packaging meeting included reporting on the results of standardizing primary and secondary packaging design and quality, reducing headspace, implementing inert gas flushing for consistency, optimizing pallet design and product release, and streamlining containerization processes for uniformity across the supply base.

David Silver from Didion Milling reported on company progress on SCP Packaging standardization efforts, outlining progress and focusing on key areas outlined in the 2022 FASPA report. Recommendations included minimizing headspace in primary packaging, ensuring bag weights are within 2% of net weight, implementing oxygen displacement with inert gas, and improving package sealability. Of the 16 recommendations in the 2022 FASPA report, 13 have been completed and compliant, with ongoing efforts primarily addressing challenges in headspace reduction. Efforts to mitigate residual dust on packaging surfaces and comparisons between USAID and WFP carton specifications are also largely accomplished. Ongoing trials by Didion include addressing residual oxygen levels, conducting trials with the Inficon Contura for leak testing technology, and exploring equipment applicability for different packaging sizes. Additionally, internal trials simulating overseas transport conditions aim to further optimize packaging design and material reduction.

Jennifer Phillips from Edesia presented a case study on packaging standardization for LNS, based on the 2022 FASPA recommendations. Trial #1 focused on proposed dimensions and carton composition changes to 60 ECT, resulting in crushed boxes and excessive headspace. Trial #2, with modified height and reinforced carton composition, showed no crushing. Next steps involve repeating trials on a larger scale, conducting external testing, and adding a field observation component. Lessons learned emphasize maximizing dimensions on US pallets, the sufficiency of 60 ECT strength, and the need for standardization in height to address supply challenges upstream. Considerations of standardization's impact on the current process were highlighted by Jennifer for future joint work, which should include piloting the agreed packaging standardization protocol.

With progress reports from trials undertaken by both SCP and LNS suppliers, a Packaging Standard for SCP and LNS Protocol will be issued by USAID, which initially will be integrated in solicitations documentation of the commodities, for its transition and implementation, followed by its referencing in the specification of both commodities. A trial will be carried out by USAID at preposition warehouse levels to further assess the suitability of the protocol before full integration of the requirements into the specifications.

### 3.6. The WaterSafe Packaging Project

The WaterSafe Packaging Project, presented by Hari Kumar and David Fischer from FPS, addressed the critical need for safe water dispensation in nutrition programs, recognizing the World Bank's statistic linking 80% of illnesses in developing countries to unsafe water. FPS's patented WaterSafe backpack design, developed in 2012 and donated to the public, has been distributed in over a dozen countries, notably in Kenya where water insecurity is rampant. The project emphasizes a three-step framework focusing on access, transportation, and storage/dispensing of water, with particular attention to the often-overlooked aspects of transportation and storage. WaterSafe's tailored design ensures safe transportation, storage, and dispensation of water, boasting features such as easy carrying, flexible storage, user-friendly dispensing, and hygiene maintenance through removable liners. Remarkably, after its distribution, WaterSafe packs replaced other water storage sources in 99.35% of households, resulting in reduced health issues and back pain. FPS aims to impact the lives of 25 million people by 2025, leveraging key learnings such as the crucial role of clean water programs in nutritional interventions and the necessity of engaging women and children, who bear the brunt of water-fetching responsibilities. In response to questions as to what realistic next-steps would be scale-up the technology, FPS discussed the possibility of reusing bags used by organizations like WFP/USAID, highlighting the potential of recycling hubs to mitigate transport costs and exploring adaptations for different food items within the liners. Additionally, FPS expressed interest in future partnerships to sponsor schools and extend the project's reach.

### 3.7. Innovate for Impact Project: Transformative Packaging Solutions for Last mile of Humanitarian Food Assistance Supply Chain

In humanitarian food assistance programs, the last mile poses unique challenges requiring innovative solutions. By thinking creatively and by encouraging critical thinking on packaging innovation, we can design packaging solutions that address long-term underlying issues such as food safety and quality, transportation, preserving nutritional quality of packaged foods, promoting sustainability, protecting the dignity of beneficiaries, and alleviate hardships in remote communities. The innovate for impact approach, focuses on three transformative streams of work which might lead to long-term solutions, aimed at significantly contributing to the improving the delivery of humanitarian aid in remote communities:

#### 1. Concept No.1: The AID Recycler:

- **Objective:** Develop a low-energy consumption, or ideally solar-based packaging waste recycling and repurposing system.
- **Approach:** Utilize heat to soften plastic and metalized materials, followed by molding or extrusion to create useful artifacts such as building blocks, benches, bricks, or art pieces. This approach should lead to a reverse-logistics business model that allows using packaging waste reconversion back to product and feeding into sustainable local circular economies.

- **Impact:** Reduces environmental impact, create economic activities, promotes sustainability, and empowers communities by transforming waste into valuable resources.

## 2. Concept No.2: The AIDPacker:

- **Objective:** Design multipurpose backpack solutions for food rations and water transportation.
- **Approach:** Create ergonomic backpacks that enable pregnant and lactating women and men to transport food rations and carry water for their children simultaneously.
- **Impact:** Enhances efficiency, reduces physical strain, and promotes gender equality by providing practical solutions tailored to the needs of community members.

## 3. Concept No. 3: The AIDispenser:

- **Objective:** Develop or examine an existing portable liquid pumping device for oil pouring into beneficiary containers.
- **Approach:** Design or trial an existing, user-friendly, liquid pouring and dosing device that simplifies the process of pouring and measuring oil for food aid beneficiaries in remote last mile sites where food assistance is distributed.
- **Impact:** Improves food preparation, minimizes waste and food safety risks, and enhances nutritional intake by ensuring safe and accurate quantifies oil distribution.

### 3.7.1 Implementation Strategy:

1. **Collaborative Partnerships:** Forge partnerships with local communities, NGOs, government agencies, and technology vendors to co-create and implement innovative solutions.
2. **Pilot Programs:** Conduct pilot programs in select remote communities to test the feasibility and effectiveness of proposed solutions.
3. **Community Engagement:** Prioritize community engagement and participatory approaches to ensure that solutions are culturally appropriate and meet the specific needs of the target populations.
4. **Capacity Building:** Provide training and capacity-building initiatives to empower community members to maintain and replicate the implemented solutions.
5. **Monitoring and Evaluation:** Establish robust monitoring and evaluation mechanisms to track the impact of the interventions and identify areas for continuous improvement.

### 3.7.2 Next Steps

Packaging Innovate for Impact exemplifies a proactive and critical approach to addressing food and packaging waste challenges at the last mile of humanitarian food assistance supply chain. By harnessing the power of packaging innovation and collaboration, and allowing ourselves to think out of the box, we can create transformative solutions that not only alleviate immediate hardships but also pave the way for sustainable change and resilience in remote communities.

Therefore, a next step include incorporating the **Innovate for Impact** concept as part of a potential USAID Feed the Future Food Aid Packaging Innovation Lab or equivalent effort, to provide the resources to pilot prototype technologies such as: **a)** Reverse Logistic, Packaging Waste back to product technologies; **b)** Portable multi-functional water sanitation and transportation backpacks for rural women to cope with both food and household-related needs at the last mile of humanitarian food programs; and **c)** customize packaging sizes and functionalities to allow proper distribution and use at food distribution sites.

### 3.8. Impact of AI on Packaging Innovation as it Applies to Food Aid

For the first time, at the 2023 annual food aid packaging meeting, artificial intelligence as a tool was discussed as it relates to packaging design and improvement. Dr. Euihark Lee from MSU school of packaging provided an update on the transformative impact of Artificial Intelligence (AI), specifically Machine Learning (ML), on packaging innovation within and its potential applicability to food aid. Contrasting traditional packaging innovation processes with ML approaches, it elucidates how ML might facilitate pattern recognition and anomaly detection, enabling enhanced packaging evaluation processes. Through examples such as box compression strength evaluation and consumer attention prediction, the new AI tools show ML's applicability in addressing packaging challenges in terms of quality improvement and optimization. Dr. Lee also shared knowledge on Web-Based Intelligent Packaging Evaluation (WIPE), showcasing the integration of ML techniques for comprehensive packaging assessment. As of today though, despite opportunities presented by ML, challenges including data quality and defining acceptable failure rates persist. AI can only do as much as the amount and quality of data is available to effectively triangulate all sources of resources and generate valuable outputs. Nevertheless, current advancement on AI underscores ML's potential to drive efficiency, safety, and beneficiary satisfaction in food aid packaging, while also calling for collaborative efforts to address remaining challenges and promote innovation in the field of food assistance packaging.

### 3.9. Exhibit Session at the 2023 Food Aid Packaging Workshop Series

The Packaging Stakeholders Exhibit Session at the 2023 Food Aid Packaging Workshop Series provided tremendous valuable insights and opportunities for networking and knowledge exchange among suppliers and other food aid partners.

Attendees emphasized the importance of exhibits as they offered a platform for sharing and showcasing products and technologies, fostering stronger relationships and partnerships among participants. Unlike traditional networking, the exhibits provided tangible insights into various food products and packaging technologies as they relate to food assistance programming.

The session facilitated informal discussions, allowing participants to address specific questions and issues. A food tasting as part of the exhibit provided firsthand experience with product preparation and testing, demonstrating practical applications, and encouraging replication of technologies for specification purposes.

Overall, the Food Aid Packaging and Product Exhibit Session served as a dynamic venue for knowledge sharing, collaboration, and showcasing innovative solutions, underscoring the importance of packaging in ensuring the effectiveness and impact of food aid programs. It is expected that an even more comprehensive exhibit will be available for the 2024 MSU Food Aid Packaging Workshop Series.

### 3.9.1 2023 Sustainable Packaging Stakeholders Engagement Stations

No.	Stakeholder Details	Area of Work and Pertinence
1	<b>JohnPAC Packaging Company</b> <b>POC:</b> Taylor Gray,	JohnPAC has been a packaging supplier (Polywoven Bags) for the US Government for several decades and collaborates on packaging trialing and packaging quality improvement. Currently, JohnPAC is working with USAID on developing alternative packaging bags that would allow heat-sealing and hermetic packaging.
2	<b>GrainPRO</b> <b>POC:</b> Diego Lara Lavarreda, Vice-President, US/ Canada & Europe Division.	GrainPRO is a US Government partner working with USAID on sustainable hermetic packaging technologies, including cocoons, liners and individual bags. Currently GrainPRO is supporting hermetic packaging trials at USAID Preposition Warehouse in Houston and in Cameroon.
3	<b>INFICON Americas</b> <b>POC:</b> Bill Burnard, Sales & Business Development Manager - Package Integrity,	A packaging technology Company supporting USAID in finding solutions for in-line packaging integrity testing.
4	<b>Flexible Industrial Packaging, FPS.</b> <b>POC:</b> Tony Black Business Development Director; and David Fischer.	USAID has been in discussions with FPS, a flexible plastic solutions company, to explore the ways to develop multifunctional water backpacks. FPS has designed a prototype backpack for the safe transportation, storage and dispensing of water.
5	<b>Didion Milling</b> <b>POC:</b> David Silver	<ul style="list-style-type: none"> <li>• SCP, Cornmeal, CSB Plus Supplier</li> </ul>

		<ul style="list-style-type: none"> <li>• Working on Hermetic, heat-sealable packaging for fortified flour blends</li> <li>• Packaging integrity monitoring standard operating procedures.</li> <li>• Head-space management, secondary packaging optimization, palletization design, and containerization</li> <li>• Sustainable packaging.</li> </ul>
6	<b>Edesia Nutrition.</b> POC: Jennifer Phillips,	<ul style="list-style-type: none"> <li>• LNS Supplier</li> <li>• Working on primary and secondary packaging design realignment</li> <li>• Packaging integrity monitoring standard operating procedures.</li> <li>• Head-space management, secondary packaging optimization, palletization design, and containerization</li> <li>• Sustainable packaging.</li> </ul>
7	<b>United Nations World Food Program (WFP)</b> POC: Carole Manceau	Major USG Implementing Partner doing significant part of food assistance on behalf global donors, worldwide. It is the world's largest humanitarian organization and the leading provider of school meals. WFP Partners with the USG in finding and trialing sustainable packaging solutions to improve the effectiveness of humanitarian food assistance programs.
8	<b>Sustainable Packaging USAID-led Joint Initiative (JI)</b> POC: Gregory Rulifson	The Joint Initiative (JI), a USAID-coordinated global effort comprises of 25 humanitarian stakeholders, investing jointly on reducing the environmental footprint of humanitarian food assistance programs, using a holistic approach and fostering information and knowledge sharing, globally.

### 3.10 Reusable Oil Tin Can Functionality Improvement

A progress report and next steps on the oil tin can improvement project were offered by Dr. Ruffo Perez during the 2023 Food Aid Packaging Workshop. The project aims to address research questions related to packaging functionality, resilience to harsh humanitarian food aid field conditions, and improvements to facilitate pourability and reuse of cans after oil consumption. As part of the overall effort, the project also includes standardizing packaging and pallets, as well as reducing residual oil, minimizing leaking, and enhancing traceability. The effort so far has involved designing cans for shape, size, and durability, considering manufacturing limitations, logistic challenges, and costs, and conducting lab testing and field trials. In 2023, a field test prototype with a pull tab design was conducted in Ethiopia, showing significant quantitative improvement and ease in oil pourability, allowing for increased and steadier flow of oil from the newly redesigned cans as opposed to the single-septum traditional can, which still shows significant challenges to vacate the entire oil content from the cans.

Next steps discussed at the 2023 MSU workshop included increasing trial quantity, gathering more meaningful information on the benefits of detachable plastic lids, assessment, and testing of the plastic lids for functionality and end use, and exploring sustainability through the use of steel cans. Additionally, efforts are underway to manufacture additional ends for broader distribution and larger sample sizes. As of the time of writing this report, two countries, Kenya and DRC, have been identified as new sites for the next and last trial in 2024. Overall, the Oil Tin Can Improvement Project highlights the tremendous benefits of joint ongoing efforts to enhance packaging for food aid, balancing functionality, sustainability, and practicality to better serve beneficiaries and optimize resource utilization.

### 3.10.1 Improved Vegetable Oil Tin Can Original Research Questions

- a) Which packaging attributes are most relevant to improve packaging functionality that would lead to increase resilience of the packaging throughout the supply chain, while minimizing leaking and waste?
- b) What kind of design changes can be made to prep-package veg oil containers which would improve both pourability of the packaged oil, as well as increasing the likelihood that the empty container can be of further use once the oil has been vacated?
- c) What kind of packaging improvement can be made to veg oil containers resulting in the least processing/filling line retooling and restructuring?
- d) What are key opportunities on traceability and trackability of pre-packaged veg oil that can be explored in a field trial using real humanitarian food distribution scenarios?

**Improving oil pourability of tin can and developing track and trace systems**



1. Meeting the right functionality of the packaging to allow oil pourability by end users
2. Maintain strength of packaging to minimize leaking
3. Promote reusability of tin cans to contribute to a more sustainable packaging
4. Develop track and trace system (App) to allow for a more responsive supply chain

### **3.11 Process Capability Systems to Prevent Leaking in LNS Packaging**

Nick Vena presented on the USAID-funded Statistical Process Control (SPCAID) software development and implementation. The tool, intended to be an open-source resource supporting suppliers on process capability and preventive real-time quality monitoring, including packaging integrity, serves as a valuable tool for reviewing random variation in process outputs and identifying non-random variations using statistical rules. SPCAID is recommended for use at various stages such as raw materials, in-process, and finished products, as well as packaging filling lines, offering benefits like real-time analytics, process capability studies, yield estimation, and increased productivity.

SPCAID, like common statistical sampling, requires parameters such as confidence level, margin of error, standard deviation, and population size. Establishing process control limits based on data, including mean and upper/lower control limits, is crucial. Control charts like I-MR, Xbar-R, and Xbar-S monitor subgroup values over time to detect out-of-control processes. SPCAID, an open-source Excel-based tool, enables real-time data analysis, distinguishing between active and passive data collection on key quality indicators. The tool facilitates SPC piloting by LNS/SCP companies, offering master and customized templates tailored to individual company needs. Future work includes tool expansion to other USAID suppliers and sectors, with training provided for software usage.

### **3.12 USAID Food Assistance Sustainable Evidence-based Packaging Innovation Lab (USAID FASEPIL).**

For the first time, during the V MSU Food Aid packaging workshop, the concept of a food aid packaging Feed the Future Innovation Lab was presented by USAID. As a context, for the past decade, there has been a much more assertive effort by USAID, its partners, and stakeholders in food packaging innovation. This effort has led to the identification, trialing, and piloting of promising packaging technologies and solutions that the agency is supporting in one way, or another as stated above in this report. It has included undertaking shelf-life studies of commodities, conducting packaging life cycle assessments, redesigning packaging functionalities to protect the integrity and safety of foods, and allowing for more effective and agile distribution of the foods by various food programs. Similarly, there has been recognition that creating and supporting local capacity and enabling bulk shipping of food commodities to be packaged by local partners can offer multiple benefits from both a humanitarian food assistance and a development programs standpoint. Packaging food commodities closer to where they are needed minimizes food safety and quality risks and enables more efficient programming and distribution of those commodities. It also facilitates engagement with local partners and governments, supporting local capacity building and packaging technology spillover.



To advance a sustainable food packaging agenda that benefits both humanitarian and development programs, the agency has been carrying out joint work with implementing partners. In line with the objective of revamping ongoing packaging efforts across the agency, addressing humanitarian food assistance needs, supporting capacity building through food packaging investment as a value-chain enabler, and contributing to broader efforts to boost local food systems for development, USAID is in the process of developing the terms of reference and scope of work to fund an associate award specifically focused on sustainable packaging research and innovation.

### **3.13 Main objective of a potential overhauling packaging research and innovation**

The primary aim of the USAID-funded overhauling research and innovation project is to finance an agency-wide initiative for sustainable packaging research and innovation. This effort, integrated into the Feed-the-Future Food System Nutrition Innovation Lab, seeks to revamp current and future packaging initiatives. The overarching goal is to enhance support for humanitarian food assistance and development programs through strategic advancements in packaging practices.

#### **3.13.1 Specific Objectives:**

- a) Lead and promote collaborative efforts in identifying suitable prototype packaging technologies and solutions, supporting USAID and its partners in preserving food integrity, nutritional quality, and food safety and quality, that ultimately contributes to a more effective and agile supply chain.
- b) Collaborate with stakeholders from food assistance and development programs to integrate various ongoing sustainable packaging research and development workstreams. Facilitate their progress to implement the most promising packaging technology prototypes.
- c) Establish linkages and ensure work continuity with current and future stakeholders, whether academic, technology vendors, or suppliers involved in sustainable packaging research and innovation initiatives relevant to USAID and its partners.
- d) Lead and integrate various ongoing and future stakeholder convenings, such as suppliers, academic and technology vendor workshops, colloquiums, community of practices, and ad hoc meetings to discuss the agency's sustainable packaging agenda.
- e) Support USAID's efforts in capacity building for sustainable packaging as a value-chain enabler and as part of broader local food system strengthening initiatives.

- f) Support the identification, development, and piloting of reverse logistics packaging waste reversion technologies, leading to their local adoption, scale-up, and optimization.
- g) Support the identification, development, piloting, and local adoption of water sanitation packaging technologies, allowing for their use and access in partnership with local businesses and communities.
- h) Support the development of packaging material testing standard operating procedures and packaged finished food testing for integrity and functionalities.
- i) Support efforts in packaging standardization, packaging artwork, labeling, specification, and guidelines relevant to the agency and its partners.
- j) Support shelf life and infestation resilience trials of particularly sensitive packaged food, leading to the optimization of packaging.
- k) Support the agency's efforts in identifying and promoting climate-sensitive and sustainable food packaging solutions.

## Annex I: 2023 FASPA Workplan

Themes	Projects/Next Steps	Focus Group Lead/Members
<b>1. Packaging Sustainability Global Joint Initiative</b>	<ul style="list-style-type: none"> <li>• The Joint Initiative on Packaging Waste</li> <li>• Identify Research opportunities</li> <li>• Implement Knowledge, evidence-Sharing Activities</li> </ul>	<p><b>Leads:</b> Greg Rulifson (USAID), Carole Manceau (WFP)</p> <p><b>Other Group Members:</b> Odile Caron (MSF), Rafael Auras (MSU)</p>
<b>2. Packaging Standardization project</b>	<ul style="list-style-type: none"> <li>• Heat-sealing and Packaging Integrity SOP</li> <li>• Headspace and residual Oxygen</li> <li>• Pallet Standardization</li> <li>• Containerization</li> </ul>	<p><b>Leads:</b> Ruffo Perez</p> <p><b>Other Group Members:</b> (USAID), Mr. Brett Mears (Palmer Logistics), Carole Manceau, SCP and LNS Suppliers</p>
<b>3. Improved Sustainable Oil Tin Cans/ Field Trial</b>	<ul style="list-style-type: none"> <li>• Implement of second and last field trial to assess performance of new improved tin can lids</li> <li>• Kenya and DRC as sites for a larger trial</li> <li>• Monitor reusability/ sustainability of newly improved tin cans</li> </ul>	<p><b>Leads:</b> Steve Mihm (Reynold Services) and Ruffo Perez (USAID)</p> <p><b>Other Group Members:</b> <b>Greg Rulifson (USAID)</b>; Danielle Froio-Brumsack</p>
<b>4. High Performing Bag Infestation Testing Project</b>	<ul style="list-style-type: none"> <li>• Intentionally infest most promising packaging bags to assess their resilience against infestation</li> </ul>	<p><b>Leads:</b> Danielle Froio-Brumsack and Ruffo Perez (USAID)</p> <p><b>Other Group Members:</b> <b>Danielle Rafael Aureas (MSU)</b>, Dan Webber (USDA), Danielle Froio-Brumsack</p>
<b>5. Food Assistance Sustainable Packaging Innovation Lab (FASPA IL): A White Paper.</b>	<ul style="list-style-type: none"> <li>• Consolidating a range of food aid packaging research, innovation, and piloting initiatives</li> <li>• Support field trials of prototype technologies and solutions</li> <li>• Sustain a network of collaborators and stakeholders</li> </ul>	<p><b>Leads:</b> Ruffo Perez (USAID) and Jaime Fischer (USAID).</p> <p><b>Other Group Members:</b> Suppliers, academia, technology vendors.</p>

<p><b>6. Process Capability Systems to Prevent Leaking in LNS Packaging</b></p>	<p>Development of auditable process capability SOP for LSN focused on packaging performance and product stability</p>	<p><b>Leads:</b> Ruffo Perez (USAID), and Nicholas Vena (Pearl Auditing Services)</p> <p>Other members: Davor JANJATOVIC (WFP and Odile Caron (MSF), David Todd (MANA Nutrition) and Jennifer Esterle (Edesia), Odile Caron (MSF), David Silver (Didion).</p>
<p><b>7. Innovate for Impact Project</b></p>	<p>Transformative Packaging Solutions for Last mile of Humanitarian Food Assistance Supply Chain</p> <p>Packaging Innovate for Impact exemplifies a proactive and critical approach to addressing food and packaging waste challenges at the last mile of humanitarian food assistance supply chain.</p>	<p><b>Leads:</b> Ruffo Perez (USAID)</p> <p><b>Other Group Members:</b> Suppliers, academia, technology vendors.</p>
<p><b>8. The Piloting and Trialing of Hermetic Packaging Technologies</b></p>	<ol style="list-style-type: none"> <li>1. <b>Pilot 1:</b> Implements GrainPro 50 MT Cocoons in Nigeria, Djibouti, and Tanzania, monitoring infestation and moisture content</li> <li>2. <b>Pilot 2:</b> Introduces GrainPro Hermetic 50 kg Bags with a focus on commodities like rice, sorghum, peas, and yellow split peas, including a training program.</li> <li>3. <b>Pilot 3:</b> Utilizes TranSafeliner and compares with Hybrid Bag and Double Bagging for commodities such as rice, sorghum, peas, and yellow split peas.</li> <li>4. <b>Pilot 4:</b> Deploys 1 MT GrainPro GrainSafe units at various locations, focusing on rice, sorghum, peas, and yellow split peas, with KPIs including infestation and moisture content.</li> </ol>	<p><b>Leads:</b> Diego Lara (GrainPRO); Ruffo Perez (USAID); Paul Vicinanza (USAID)</p> <p><b>Other Group Members:</b> Mr. Brett Mears (Palmer Logistics), Carole Manceau (WFP)</p>

## Annex II: VI MSU Food Aid Packaging Solutions Agenda

### VI MSU Food Aid Sustainable Packaging Solutions Workshop Michigan State University School of Packaging, November 15-17 2022

Registration Portal: <https://www.canr.msu.edu/packaging/events/FoodAidPKG/>  
Main Contacts: Cimberly Weir: [cimberly@msu.edu](mailto:cimberly@msu.edu) and Ruffo Perez: [ruperez@usaid.gov](mailto:ruperez@usaid.gov)  
IT Support: Betsy Braid: 810-730-1815 (call/text) ; [braidbet@msu.edu](mailto:braidbet@msu.edu)

Day 1, October 23, 2023		
Time (US EDT)	Topic	Speakers / Organizations
9:00-9:10 a.m.	Welcome,	Matthew Daum, Director, MSU School of Packaging
	Introduction, Expectations, Review of the Agenda	Ruffo Perez, Sr. Food Technology Advisor, USAID
9:10-10:10 a.m.	Food that is not safe is not food, food that is not packaged effectively is not safe.	A panel moderated by Rufino Perez, PhD.
	1. Packaging, food safety, health and nutrition: Recent Incidents in the Humanitarian Supply Chain	Ruffo Perez, USAID Sr. Food Technologist
	2. Packaging and supply chain management	Bahar Aliakbarian, Sr., R&D Director, Associate Professor, Axia Institute – Michigan State University
10:10-10:20 a.m.	Coffee / Tea Break	
<b>The Broader Food Assistance Sustainable Packaging Solutions and Systems</b>		
10:20-12:00 p.m.	The Material Neutrality of Food Packaging	A Series of Panels Moderated by: Greg Rulifson, USAID
	1. Sustainable materials management	Rafael Auras, Professor, MSU
	2. Sustainable packaging science	Nicole Unger, Life Cycle Assessment Specialist, MONDI
	3. Revisiting green packaging from a cost perspective	Caroline James DeLoach, Director of Sustainability, Atlantic Packaging
	4. Methodology to perform lifecycle assessment in the humanitarian context	Greg Rulifson, USAID
12:00 p.m. - 12:30 p.m.	The Joint Initiative for Sustainable Humanitarian Assistance Packaging Waste Management	Led by Greg Rulifson, USAID
		Greg Rulifson, USAID Amro El-Zoubi, Environmental Consultant

<b>12:30-1:30 p.m.</b>	<b>Lunch on your own; the MSU International Center or campus dining halls are available, or Woody's Oasis on Trowbridge are good places and close!</b>	
<b>1:30-2:50 p.m.</b>	<b>Packaging Technologies and Food Infestation</b>	
	1. The pet food industry case study	Fernando Petri, Royal Canin Global Quality & Food Safety in Market and Distribution Coordinator, Mars
	2. Innovations in human food supply chain	Carole Manceau, WFP
	3. Incident management at WFP and packaging quality controls at WFP	Nasir ADEPOJU, WFP Packaging Specialist
<b>2:50-3:30 p.m.</b>	<b>Implementation of Key Performing Indicators (KPIs) for Packaging Quality Monitoring</b>	
		Jennifer Phillips, Director of Operation, Edesia Nutrition Randy Kleiboer, Director of Quality Assurance, Henry Broch Foods Nick Vena, President, Pearl International, Inc.
<b>3:30-3:40 p.m.</b>	<b>Coffee / Tea Break</b>	
3:40-4:25 p.m.	Hermetic Packaging Technologies, Trials, and Innovations	Jordan Dey and Diego Lara, GrainPro Sustainable Technologies
4:25 - 5:00	Sustainability: How Opposing Market Forces Lead Food Producers to Innovative Solutions – A Case Study on Shelf Life and Quality.	Bill Burnard, Inficon
5-5:30 p.m.	Wrap-up First Day	
<b>6:00 - 8:00 p.m.</b>	<b>Group Dinner and Keynote Speaker : SPONSORED BY: Mana Nutrition, FPS</b>	
	The Story of MANA Nutrition	Mark Moore, MANA Nutrition
<b>Day 2, October 24, 2023</b>		
<b>Time (US EDT)</b>	<b>Topic</b>	<b>Speakers / Organizations</b>
<b>Updates on Streamworks under the Humanitarian Food Sustainable Packaging Agenda</b>		
<b>8:00-8:05 a.m.</b>	<b>Second day overview and Expectations</b>	
		Ruffo Perez, USAID Cimberly Weir, MSU
<b>8:05-9:05 a.m.</b>	<b>Packaging Standardization Project: The Case of Super Cereal Plus and Lipid-Based Therapeutic Foods</b>	<b>Moderated by: Ruffo Perez, BHA/TPQ/PHN</b>
		SCP: David Silver, Didion Milling LNS: Jennifer Phillips, Edesia
<b>9:05 -10:30 a.m.</b>	<b>Packaging Research Areas with Application to Food Aid</b>	<b>Led by Ruffo Perez</b>

	<ol style="list-style-type: none"> <li>1. Climate Change-responsive technologies</li> <li>2. Adding Value to Packaging Waste</li> <li>3. Multiaxis, the next Frontier of Distribution Testing</li> </ol>	<p>Tony Black, Flexible Packaging Solutions (FPS)</p> <p>Joseph A. Klatt, Precious Plastic Solutions</p> <p>Amin Joodaky, Assistant Professor, MSU School of Packaging</p>
<b>10:30-10:40 a.m.</b>	<b>Coffee / Tea Break</b>	
<b>10:40 am. - 12:40 p.m.</b>	<b>Sustainable Packaging Stakeholders Engagement Stations</b>	<b>Packaging Exhibit Areas at MSU School of Packaging Hallway</b>
	<ol style="list-style-type: none"> <li>1. Flexible Packaging Solutions (FPS)</li> <li>2. Sustainable Packaging Joint Initiative (JI)</li> <li>3. GrainPRO Hermetic Packaging Technologies</li> <li>4. United Nations World Food Program (WFP)</li> <li>5. The Didion Milling Company</li> <li>6. INFICON Americas Packaging Integrity Testing</li> <li>7. Edesia Nutrition-Packaging Improvement</li> <li>8. JohnPac Grain Packaging Technology</li> </ol>	
	<b>9. MANA Nutrition-Packaging Improvement</b>	
<b>12:40-1:40 p.m.</b>	<b>Lunch Break (MSU International Center food court)</b>	
1:40-2:40 p.m.	Impact of Artificial Intelligence on Packaging Innovation, as it Applies to Food Aid	Euihark Lee, Assistant Professor, MSU School of Packaging
<b>2:40 -3:40 p.m.</b>	<b>MSU School of Packaging Laboratory / Packaging Testing Facility Visit / Tour</b>	<b>MSU School of Packaging Graduate Students</b>
<b>3:30-4:15 p.m.</b>	<b>MSU Dairy Store Break</b>	
<b>4:15-5:00 p.m.</b>	<b>Wrap-up main technical part of the meeting</b>	<b>Ruffo Perez, USAID</b>
<b>Day 3, October 25, 2023</b>		
<b>Time (US EDT)</b>	<b>Topic</b>	<b>Speakers / Organizations</b>
<b>9 a.m. - 12:00 p.m. (With break at 10 a.m.)</b>	<b>Group 1 Room 120 - Ternes Outreach Room. Options to Reduce Environmental Impact throughout the Supply Chain with a Focus on Packaging</b>	<b>GROUP 1 Leads: Greg Rulifson, USAID and Carole Manceau, WFP</b>
	<b>Group 2 Somerville Conference. Ongoing Discussion on Packaging Trial/Pilot Project</b>	<b>GROUP 2: Leads USAID/WFP/Suppliers Dan Webber, Mary Florence Ngima</b>
	<ol style="list-style-type: none"> <li>1. Hermetic packaging</li> <li>2. Oil and flour repackaging</li> <li>3. Food for Education</li> </ol>	
<b>12:10-12:30 p.m.</b>	<b>Wrap-up and end of Workshop. Adjourn</b>	<b>Ruffo Perez, USAID &amp; Cimberly Weir, MSU School of Packaging</b>

