IV MSU Food Assistance Packaging Solutions Workshop
Michigan State University School of Packaging

November 15-17 2022

The 2022 Food Assistance Sustainable Evidence-based Packaging

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.

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2023 Food Assistance Sustainable Evidence-based Packaging Agenda

The SEPA Report

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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 V 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 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.

II. Food Assistance Sustainable Evidence-based Packaging Agenda (SEPA)

Packaging sustainability was again an important theme of discussion at the 2022 food assistance packaging workshop. Different from the traditional definition of sustainability with specific focus on environmental impact, the conversation around food assistance packaging sustainability has a broader scope, emphasizing as well other areas of concern and science-based food aid packaging solutions. This broader sustainability concept 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. In this regard, the broader evidence-based packaging sustainability concept looks at multi-purpose packaging, reusability, cost, biodegradable films, packaging material recovering, recycling and the use of smart packaging technologies (Figure 1).

The SEPA 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 *SEPA,* or simply **The SEPA 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.]

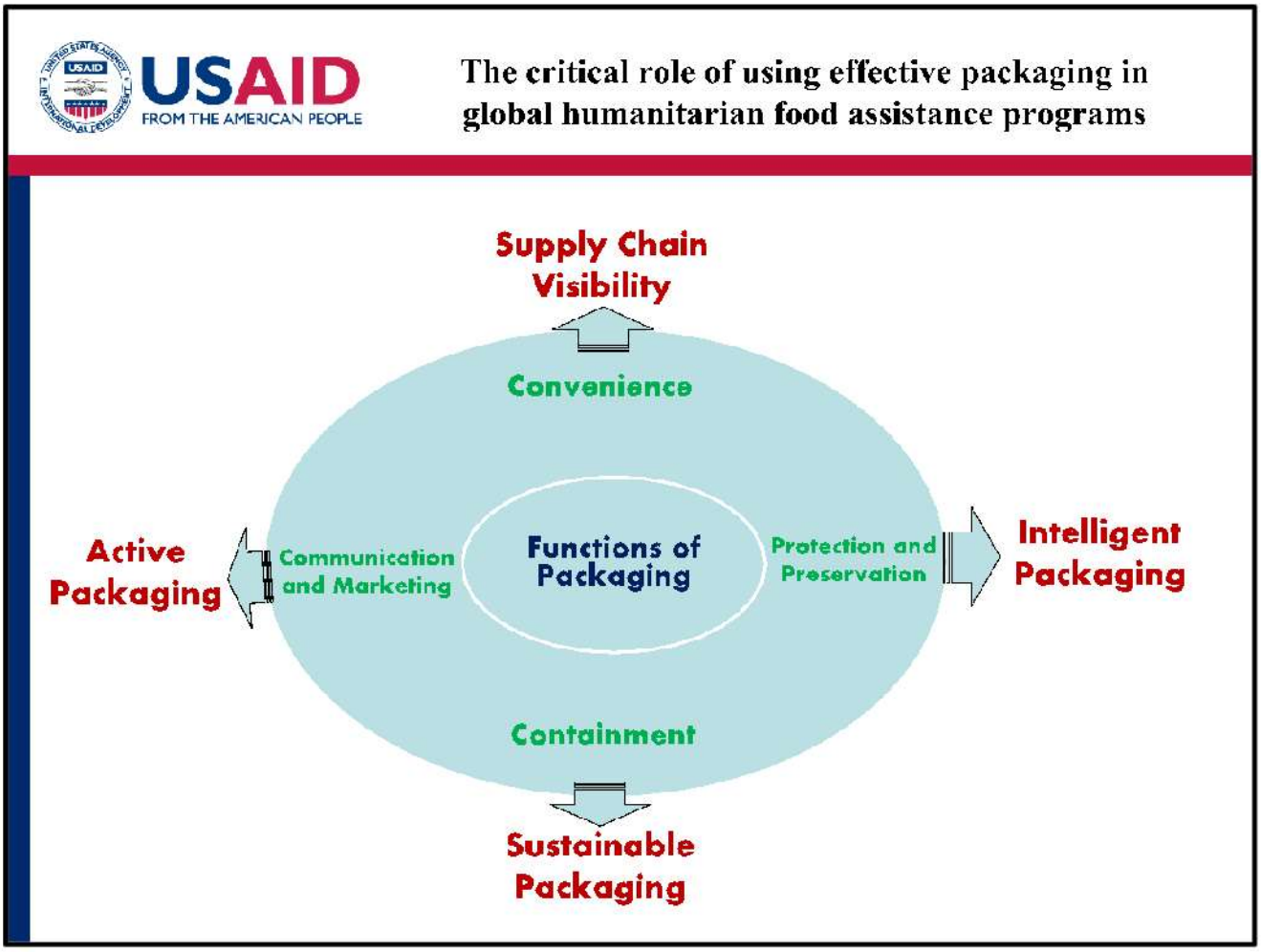


Figure 1. The critical role of using effective packaging in global humanitarian food assistance programs

III. Relevant workstreams discussed and included in 2022 SEPA

3.1 Rethinking food delivery models to reduce packaging waste

One of the biggest challenges 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 V MSU Packaging Workshop, current packaging technologies, approaches, initiatives, and strategies were discussed:

a) Bring the food manufacturer closer to the distribution point. An example was shared where in Jordan, a small bakery was installed in the refugee camp therefore only primary packaging was needed.
b) Getting the food “from the farm to beneficiaries” directly without packaging. The example of bulk delivery was mentioned (either at container level or using IBCs). It was discussed that bulk delivery is applicable for some commodities only (vegetable oil, staple food, flour) but most probably not applicable for SNF. To implement bulk deliveries, WHs will need to invest in forklifts and reverse logistic would be required in the case of IBCs.
c) Use of alternative packaging materials that are more sustainable:
    - Edible packaging
    - Leaves used as packaging
    - Regenerative packaging (such as seaweed) as an alternative to plastic
d) The group recognized that sustainable packaging materials, as they are today, would not allow to ensure a long shelf life as required for SNF products. Therefore, two options were discussed:
    - Transfer the barrier properties from the primary packaging to the secondary packaging allowing the use of sustainable packaging materials for the primary packaging
    - Define different packaging requirements depending on the context. Food purchased locally do not need to be preserved as long as food purchased internationally.
e) Deliver cooked food to distribution centers and provide reusable plates for beneficiaries to eat
f) Give more value to packaging to encourage reuse and/or take-back scheme of packaging.
g) Engage with local governments and private sectors on waste management as the humanitarian sector alone cannot implement systems.

To implement any of the solutions above, different working groups and organizations will need to be consulted such as logistic, food safety and quality, procurement, programs as well as beneficiaries. Additionally, any technology and approaches must be evidence-based, and communication campaign would be required for actors along the value chain to ensure smooth implementation and reduce risks.

Some of the approaches discussed are already part of actions taken by humanitarian actors participating in the Joint Initiative for Sustainable Humanitarian Assistance Packaging Waste Management. This USAID-funded project supports the humanitarian community to address the problem of packaging waste in a holistic way both upstream (exploring how to eliminate certain

types of packaging such as single-use plastics, how to reduce packaging or use sustainable materials) and downstream (looking at opportunities for recycling, recovery and repurposing using a circular economy approach and linking this, where possible, to local livelihoods opportunities).

The Joint Initiative aims at promoting greater coordination and standardization within the humanitarian community on packaging sustainability and acts as a platform for knowledge-sharing, by documenting humanitarian organizations' experience, successes and lessons learnt. The Joint Initiative also provides guidance on issues such as alternatives to petroleum-based plastics in packaging and on options for secondary use of packaging waste (repurposing), and advocates for effective solutions to the global waste management crisis and increased awareness of the link between packaging and climate change.

3.2 Packaging Standardization

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.

a) Addressing differences in LNS packaging dimensions and strength.

Suppliers reported on efforts on trialing at factory levels on more suitable dimensions and carton strength specs, aiming at potential adoptions of harmonized parameters. The proposed changes leading to possible standardization on LNS includes:

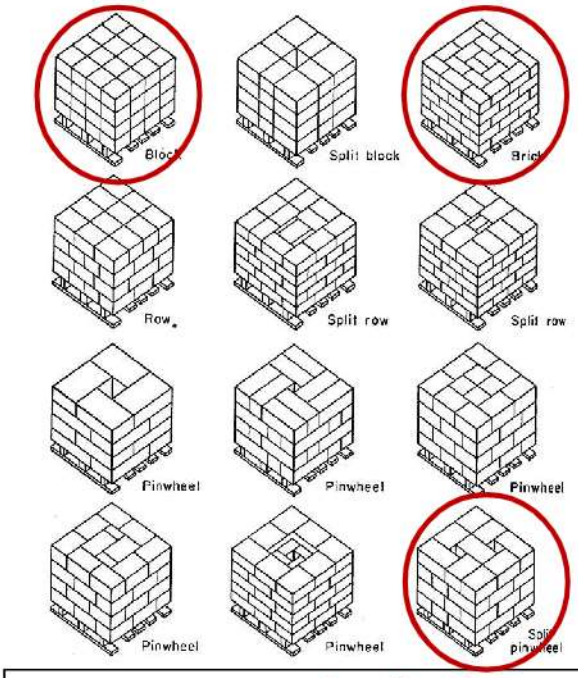
1. **Dimensions:** at carton levels, dimensions are being proposed to maintain footprint the same, and adjusting carton height by product type
    a) RUTF: 14.875"(L)x 11"(W) x 7"(H)
    b) RUSF: 14.875"(L)x 11"(W) x 8.25"(H)

Below are dimensions proposed for the range product sizes. As annotated below, the heights of cartons are still different, for which additional data is being collected by LNS suppliers.

Product Size	*Current Dim*	*New*
50g	15.25" x 10.875" x 8.875"	14.875" x 11.00" x TBD"
75g	15.25" x 10.875" x 7.8125"	14.875" x 11.00" x 7.00"
92g	15.25" x 10.875" x 7.8125"	14.875" x 11.00" x 7.00"
100g	15.25" x 10.875" x 7.8125"	14.875" x 11.00" x 8.25"

2. **Strength:** Crush test or ECT test instead of burst or Mullen Test is being proposed. A minimum 60 ECT is being proposed to align with the need to palletize products, for which the crush resistant is more indicative of the strength of the cartons to withstand extensive stacking. Additional data on the suitability of 60 ECT type for the rigor and harshness that the LNS products are subjected to is being collected.

3. **Palletization**: A common size of pallet, and one that has been recommended as a standard for industry, is the 40" by 48" type, which is the required by USAID. However, many other sizes are currently in use. For each size, a number of pallet patterns, or ways of stacking individual cartons or containers on the pallet, have been assessed by suppliers. Pallet size and modular packaging box dimensions must be determined concurrently if the pallet-package sub-system is to be most effectively designed. For the sake of standardization, and for 40"x48" pallets, single pallet height recommended is 43.8" for a container 89" height of pallet stacked at 87.6" height. This dimensions and pallet design fitting 45 cases per pallet with first three (3) layers in column or blocks, with the remaining in brick or interlock, maximizes 20-ft container loads at 900 cases each for RUTF and RUSF.



Source: U. S. Navy Bureau of Supplies and Accounts

b) WFP developed a best practice document for LNS palletizing, and shared at the workshop and reported below:

a) Type of pallet used must align with international standards (e.g., ISPM 15).
b) Pallets must be in good conditions and suitable for the load to be transported (e.g. EUR-EPAL).
c) Pallet layout must be optimized to maximize container loading.
d) No overhang: Overhanging exposes freight to damage and decreases a pallet's strength. Pallet overhang can reduce top to bottom compression up to 30%.
e) Stretch film: stretch film must be of good quality
   - recommended: 23mic blown PE stretch – width 500 mm
   - resistant to long storage period up to 30°C)
   - containment force must be optimized to maintain the load, it can be influenced by:
     i. stretch up to 250-300% to obtain 6mm film thickness
     ii. number of film layers around the pallet
   - The stretch film must be locked on the pallet.
   - Breathable stretch film must be used for bagged commodities.
f) Ensure proper stowage so that there is minimum free movement of commodities during transit • Stack cartons well aligned on the top of each other
g) Depending on the type of commodity, supplier might need to add pallet corner or to strap the load. The use of slip sheet on the pallet before stacking cartons might also be required to avoid compression strength deprivation. On wooden pallets, spaces between decks can be up to 4 inches, which results in no support of the boxes' bottom. The use of slip sheet on the pallet before stacking bags are required to avoid direct contact between bags and wooden pallet.
h) WFP recommends that at least the 3 first bottom carton layers must be placed as column stacking the rest is recommended to be interlocked (cross stacking) for load stability.
i) Maximizing 20-ft container loads at 900 cases each, for both RUTF and RUSF, with single pallets stacking 45 cases.

c) Addressing differences in Super Cereal Plus packaging dimensions and strength.

A. Primary Packaging

a) A 1.5kg Super Cereal primary packaging must not exceed 5% headspace. While geometry of the bag is not critical since overall volume should be the same, if 5% headspace compliance is achieved.

b) Only gusseted bag shapes are allowed, while vacuum-packaging is not accepted, since caking and clustering is very likely, and will impact product final reconstitution. Larger bags (larger volumes) will lead to overfilling of secondary packaging (cartons), creating uneven and unstable pallets. Any deviation from this requirement must be approved by the contracting agency.

(1) Per lot, the product shall not, on average, be less than the nominal quantity.
(2) A deviation of no more than + or – 2% of the net weight shall be allowed per individual bag.
(3) Bag filling must be nitrogen or carbon dioxide-flushed to replace maximum amount of headspace/inner air.

c) SC+ shall be packed in new uniform strong multilayer metalized plastic bags, such as polypropylene bags, that are heat-sealed and fit for export and multiple handlings.

(1) The primary packaging shall consist of a multilayered metalized film such as: PE60/Met polyester 12. The bag may be re-closable. The characteristics of the 12 Metalized layer will be:

Specification	12 Metalized	Method
Specific Weight	1.4 g/cm^3	
Thickness base film	12.0 microns	
Yield	59.5 m^2/kg	
Tensile Strength at break	21.0 kg/mm^2	ASTM D882
Elongation at break	100%	ASTM D882
Shrinkage	2.0%	ASTM D1204
Shrinkage (150°C 30')	0.2%	ASTM D1204
Optical Density	2.2	
Permeability O^2 (38 °C -45%RH)	1.5 cc/m^2/24h (0.14 cc/in^2/24h)	ASTM D1484
Permeability Vapour (38 °C - 90%RH)	1.5 cc/m^2/24h	ASTM E96
Melting Point	260°C	

(2) The use of recycled materials can be considered providing that the performance requirements are met, and the material used is compliant with the FDA regulation for food contact.

B. Secondary Packaging

a) 1.5 kg pouches shall be packaged in corrugated fiberboard boxes, holding ten (10) 1.5-kg pouches each, for a total of 15-kg net weight boxes.

(1) Carton must not show any sign of puffiness, as it will result in uneven and unstable pallets. However, headspace in secondary packaging must be as tight as possible, to prevent weak pallets.
(2) The corrugated containers shall be sized to minimize headspace and optimize space utilization. Design of such secondary packaging maximizing space must be proposed to contractor for approval, indicating level of optimization.
(3) Carton construction is for export 350BC (42-26-42-26-42) with WPA (water-proof adhesive) to be constructed directly with US standard carton erector, as per the SCP CRD specification for SCP secondary packaging.SC+ containers shall be palletized.
(4) The stacking pattern shall preserve the strength of the boxes throughout transport and storage and be as compact as possible to allow high space utilization.

C. Palletization and containerization

a) For 40' containers (to optimize container space) without heavy weight permits, it is recommended to fill 19 pallets with the single pallet being the one in the head of the trailer and 18 straight in, using 9x2 design. This design leaves about 4 inches of room at the back of the container, which can be used for additional empty cartons.

b) For pallet design, a maximum of 9 layers high and 7 cases per layer is recommended. First 6 layers are column (or block) stacked and last 3 layers rotate each layer (pinwheel as above). For pallet wrapping, a minimum 20" wide, 55 gauge stretch film is required with at least 6 wraps top, 6 wraps bottom, and 3 wraps middle.

c) Palletization and containerization optimization will ultimately be trialed using USAID warehousing system in Houston, testing before a final standard is published. There may be a better pallet design that could be easily provided once the carton size has been finalized.

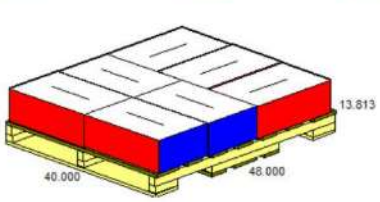
D. Heat-sealability Standard Operating Procedure: Primary hermetic packaging is required. To assess packaging performance, at least the following parameters are required:

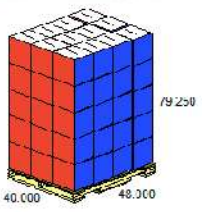
(1) At least 0.75 second dwell time, top seal at 213 degrees, vertical seal, 198 degrees
(2) Visual inspection is also required, and record must be kept.
(3) A validated, pressurized submersion bubble emission testing chamber system is required, and data must be part of the process capability system, with cPk over 1.33

E. **Residual dust on any packaging surface is unacceptable**: If packaging materials are exposed to flour dust, or if during filling dust settles over any surface (i.e., primary packaging, liner, secondary packaging, wrapping plastic or pallets) it is highly likely that the entire product will undergo infestation. Insects only need residual flour on any surface to grow when exposed to high moisture and temperature at any point in the supply chain. Suppliers will be held liable if residual flour dust leads to infestation of product at any point throughout the supply chain.

F. **Food grade containers.** For super cereal plus, which is considered a ready to eat food, at least a Grade B, or Cargo-worthy (CWC) container must be used. A CWC means that the shipping container condition is deemed suitable for food cargo transportation. It also means that the container meets all the standards set in its original specification. Typically, it also implies that the container has a valid CSC plate, which is a safety approval tag that containers use for international transport and ensure:

- Guaranteed an IICL 5 (5th Edition of the Institute of International Container Lessors) with a valid CSC Plate.
- Used containers fall into this category.
- Box interior will be a minimum of 50% mark free, with some scuffing or scratching and minor surface rust.
- The floor of your box will be stained or marked and may have minor delamination.
- The exterior may have more prevalent corrosions and dents.
- Container may have a small number of previous repairs.





3.3 Commodity Fumigation Process/Improvement

BHA also went through extensive discussions in a diverse range of working groups on Food Aid Commodity Fumigation Processes and Practices, also accessible in the event's website. In 2022, these working groups supported the BHA's efforts to improve fumigation processes and practices throughout the supply chain. Major recommendations and actions related to improving commodity fumigation practices were presented and discussed, with the goal of identifying implementation paths, responsibilities, objective records, transparency, accountability and trackability of such practices. Most recommendations and calls for next steps include the following:

a. Continue the engagement with stakeholders, aiming at the consolidation of recommendations on fumigation of warehouses, shipping, and containerization
b. Agree on Methyl Bromide use, clearly summarizing national and international regulations
c. Assessing main factors to consider measuring efficacy of fumigation
d. Reinforce transparency and verification – did the fumigation actually take place, how appropriately? Especially overseas recipients
e. Are there standard operating (validated) procedures to establish fumigation rates and concentrations?
f. Does the SOP include information regarding the appropriateness and grade of polypropylene tarp for fumigation
g. Understanding the history of grains at purchase point. Aging grains are more sensitive to infestation. Transparency regarding quality and age of grain at purchase point is critical.
h. Agree on grain protecting measures and controls, especially sensitive grains such as sorghum and yellow split peas
i. Ensuring best practices and systematic management of warehouses/Containers prior to being used for grain storage and transportation
j. Ensuring warehouses go through appropriate audits and inspections, and follow appropriate commodity receiving protocols
k. Data sharing, track-and-trace systems to improve visibility and responsiveness throughout the entire supply chain.

3.4 Reusable Oil Tin Can Functionality Improvement

One of the flagship commodities for USAID Tittle II food assistance programs has historically been vegetable oil. As a premier energy provider, as well as a valuable cooking aid and a component of a range of specialized food formulas, vegetable oil is of great relevance for USAID mission of fighting hunger and poverty around the world. Over the years though, the Bureau of Humanitarian Assistance (BHA) and its implementing partners, have been wrestling with field challenges, due mainly to the unique nature of humanitarian food operations and the harsh conditions typically encountered throughout the food supply chain. Major challenges include:

a. Meeting the right functionality of the packaging to allow oil pourability by end users
b. Achieving packaging standardization (primary packaging, secondary packaging, palletization, and containerization)
c. Achieving appropriate package construction and design to minimize leaking and oil waste
d. Achieving long-lasting shelf-stability to minimize micronutrient oxidation and allow for adequate nutrition delivery

BHA, in partnership with USDA, veg oil suppliers and technology vendors, have made progress in all fronts. As an immediate next step, a field trial is underway, in partnership with Catholic Relief Services (CRS). The field trial seeks to test beyond laboratories, several improvements and additions made and lab-tested, particularly tin can lid functionality to improve oil pourability. The design includes the current central opening to allow for the filling of the can using current oil packaging line with minimum retooling, as well as a side/edge pull-up septum, intended to be used for pouring by end users. Besides improving the ability of end-users to vacate the oil, the new lid design also seeks to reduce physical damage to the can beyond using the pouring septum, which would allow reusability of the can. To encourage reusing of the cans, once the oil has been vacated, a plastic detachable lid cap is being added to the packaging, which will allow end-users to reutilize tin cans for the storage of cooking ingredients or other household uses. The detachable lid-cap is also expected to offer strength and resilience to the tin can boxes, leading to more stable and protective stacking.

Improved Vegetable Oil Tin Can Research Questions:

- 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?

- 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?
- What kind of packaging improvement can be made to veg oil containers resulting in the least processing/filling line retooling and restructuring?
- 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?

3.5 Hybrid Bag Infestation-Resilience and Reusability Assessment

Hybrid bags or high performing paper-nylon bags have been trialed by USG, with flour suppliers, and is currently being assessed as a potential solution for fortified rice packaging. Main attributes of this high-performing bags include: **a)** resilient material to minimize package breakage and food waste; **b)** heat-sealable bags to ensure hermeticity of packaged food and so minimize infestation; **c)** appropriate gas exchange profile allowing for its use in different commodities with different water or moisture contents, allowing for adequate protection of food integrity while minimizing spoilage (i.e. molding, rancidity and micronutrient oxidation).

Assessing high-performing bag resilience to infestation.

For this phase of the project, BHA has partnered with US Army DEVCOM Soldier Center (SC) in Boston, through an Inter-Agency Agreement (IAA). During MSU Packaging meeting, the SC provided a presentation that included an overview of the Army's functional objectives with respect to packaging, current and future packaging efforts, laboratory capabilities, and an update on the newly formed IAA between USAID and DEVCOM SC. Current research efforts underway at DEVCOM SC that were presented include Alternative High Barrier Packaging Materials, Reduction of Packaging in Rations, and Energy Harvesting Packaging. DEVCOM SC also provided a high-level review of their testing capabilities, highlighting mechanical and permeability testing equipment and methods. To conclude, an overview of the IAA scope of work was presented with a focus on insect infestation studies that are planned with the United State Department of Agriculture (USDA) – Center for Grain and Animal Health Research.

3.6 End2End Traceability

Results Sharing: Participants re-emphasized the desire for and impact of results-sharing from all developments and future pilots. Data, insights, and best-practice sharing fits within the broader goals of the traceability system development, of breaking down siloes and enabling easier and faster

communication across supply chain stakeholders, to then enable greater visibility and traceability within the broad food assistance supply chain.

ID Aggregation and System Integration: Commodity, and therefore unique identifier, aggregation was discussed with regards to both how the work/burden of tracking could be reduced via aggregation, and how tracking could be effectively integrated with existing tools/systems, and eventually across partner systems. Associating carton IDs with a single pallet ID enables the tracking of a single identifier through association within the system, and that notion continues on to pallets within a container. Existing container tracking systems are being investigated for integration to fill visibility gaps when commodities and their identifiers cannot be seen/accessed, and more broadly integration with partner warehouse systems are seen to be a logical next step to leverage the new data collection.

Long-Term Potential of Traceability App: The long-term potential of the traceability app was emphasized, particularly in terms of enabling ease of data collection beyond production both domestically and internationally. The group recognized that particular stakeholders may be interested in leveraging their own systems for data centralization, but the desire for the app's continued development and roll-out within the supply chain was well received.

Reporting Anecdotes vs. Comparable Data: The question arose regarding how to gain broader loss/damage insights, from single reports within particular contexts. The group brainstormed on which elements of data collection within the mobile application could support more standardized data for comparison, and more broadly talked through the potential to build beyond the location/routing/timing insights from traceability to bring in sensor-based data collection (ex. transit shock/vibe, storage temp/humidity) to make damage reports more comparable across diverse contexts and operations.

Near-Term Traceability 'Wins': Although discussion often looked forward to where this system could eventually reach, or which further innovations could be integrated, the group also was clear that even in the near-term this type of data collection and centralization could have significant impact, providing faster insights on any commodity issues to enable stakeholders to dive into the why's/causes of issues.

Unit Level Tracking and Secondary Applications: Beyond what is be tested in the near-term, including traceability of secondary packaging (cartons), the group talked through the potential for and impact from tracing communities at the primary packaging, or even distribution unit, level. Beyond the potential further traceability insights, members also discussed what secondary-applications these two- dimensional barcodes could be used for by beneficiaries and community members post-distribution. Further discussion would revolve around how this

dual functionality could work, while preserving the primary functionality of scanning unique identifiers within the traceability application.

3.7 Packaging Aid Expectation Document

A primary objective of this workstream is to provide guidelines to procure safe products of consistent quality that meet or exceed end-users' expectations. The Packaging Supplier Quality Expectations Document is intended to help current or potential food assistance commodity suppliers meet this objective. It will be the responsibility of current or potential food commodity suppliers to meet these expectations to ensure foods produced for humanitarian programs are safe and satisfy quality standards. All suppliers and foods produced for food assistance must comply with all regulatory requirements, Codes of Practices, and Standards of the location where the products are produced and the destination to which products may be delivered. The document is being structured to reflect the most updated ISO 22000 Standard as well as FDA Regulations, which should aid implementation. The main body of the Expectations is designed to give an overview of appropriate programs necessary to fulfill food assistance requirements for food safety and quality.

3.8 Process Capability Systems to Prevent Leaking in LNS Packaging

Ready to eat therapeutic foods and ready to eat supplementary foods (RUFs) are a critical addition to the humanitarian food basket, particularly in the management and treatment of acute malnutrition. However, RUFs are very specialized viscoelastic pastes made of peanut and legumes, dairy protein, and plant oil. Oil represents over 30% w/w of the formula, which makes it particularly challenging to achieve stability throughout the supply chain. Therefore, both hermetic packaging and stable product (not oil segregation) is critical. Although huge effort has been invested into perfecting the formula and improving packaging, still a great deal of challenges resulting in leaking and packaging staining exist.

Since the 2021 Packaging meeting, a consulting service (Pearl Services) was contracted to develop an Excel-based Statistical Process Control (SPC) tool for application in the manufacturing of Ready-to-Use Therapeutic Foods (RUTF) and Ready-to-Use Supplementary Foods (RUSF). The Excel tool has been designed to support receiving, in-process and final inspection for both continuous and discrete data sets. This will in turn allow food suppliers to perform real-time data analysis and process control of each product. The Excel tool will also allow users to filter data within specified data subgroups to further identify trends and root causes of out-of-control (OOC) or out-of-specification (OOS) events. Additionally, the Excel tool has been designed to include Process Capability charting and analysis (Cp, Cpk, etc) and Process Performance metrics

to further support process control of each product with respect to its specifications.

To support the pilot program for this product, Pearl Services has met on-site and virtually with five suppliers (Didion Inc., Edesia Nutrition, Mana Nutrition, Ariel Foods, Henry Broch Foods) to identify Key Performance Indicators (KPIs) for each product line and determine the needs and expectations of each manufacturer with regard to process control. Test and inspection data sets from these KPIs were then used in development of the Excel tool to allow the design to support various types and formats of data as well as the needs of each respective supplier. Currently, a beta version of the Excel tool has been completed and is under design review. Following this review, the Excel tool, along with a supplementary SOP and on-site/virtual training will be developed and distributed to each of the suppliers in the pilot program, and beyond.

3.9 Fortified Rice Shelf Life and Packaging Improvement

The accelerated fortified rice shelf-life research conducted by Kansas State University concluded in 2022 and recommendations were shared both at MSU Packaging workshop and at stakeholders meeting in Houston. The discussion focused on main outputs from the shelf-life research and implementation actions. Researchers presented results of the completed accelerated shelf-life study and an update on the ongoing subsequent field study. Suppliers and stakeholders discussed implementation of new bags and bag sizes, rollout timeline and updating specifications to optimize shelf life, as well as specific actions on how to scale up the products and next steps for operationalizing recommendations. Complete report is available at MSU Food Aid Packaging Portal Food Aid Packaging Solutions workshop website.

Having the accelerated fortified rice shelf life finished, WFP reported on ongoing real-time field study of FR and FRK phase, to understand micronutrient retention and related shelf-life estimation in different packaging options in foods stored in the field under conditions frequently experienced within the humanitarian supply chain. The packaging options are:

- **Fortified Rice** (WFP PP woven bag, PP woven bag w/ PE inner liner (optional), USAID hybrid bag (laminated (nylon/PE) paper bag)
- **Fortified Rice Kernel** (Paper bag + PE inner liner and Metallized laminate: PET12 /ink/metallised PET12/PE140 or equivalent)

The field study will continue to January 2024 with the results published by end of Q1 2024. Samples packed in 10 kg bags are being stored in India at a designated warehouse where temperature and humidity will be monitored. The

samples will be tested at regular intervals for all micronutrients as per WFP specification, uncooked as well as cooked. The results from the field study in real time/ storage conditions conducted by WFP will lead to recommendations for packaging of fortified rice with a robust shelf-life meeting minimum nutrient retention target.

3.10 USAID Food Assistance Sustainable Evidence-based Packaging Innovation Lab (USAID FASEPIL).

Sustainable, fit-for-purpose evidence-based food aid 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. Thus, USAID and its partners are ever more committed to investing in research and innovation to contribute to packaging solutions that both, allows for the global community to continue fighting against malnutrition and doing so while joining partners in an international climate-sensitive food aid packaging agenda.

The USAID's 2014-2025 Multi-Sectoral Nutrition Strategy[1] is the first of its kind at USAID. It is aligned with the 2025 World Health Assembly Nutrition Targets and reaffirms both USAID's commitment to global nutrition, and our role as a major international partner in the fight against malnutrition. The USAID's USAID Climate Strategy[2] that guides the agency's work through 2030, which aims at joining partner governments and local actors to set the global trajectory toward agency's vision of a resilient, prosperous, and equitable world with net-zero greenhouse gas emissions.

To support research and innovation to enable the identification and implementation of food aid science-based sustainable packaging solutions, more resourceful partners such as academia and research organizations shall play a more active and proactive role in this effort. Given the wide range of workstreams, the need to pilot-test and field trial packaging solutions that fit the humanitarian world, the concept of a USAID Food Assistance Sustainable Evidence-based Packaging Innovation Lab (USAID FASEPIL) is being developed.

The USAID Feed the Future Innovation Labs draw on the expertise of top U.S. universities and developing country research institutions to tackle some of the world's greatest challenges in agriculture and food security. Led by U.S. universities, these Innovation Labs are central to advancing novel solutions that

[1] USAID's 2014-2025 Multi-sectorial Nutrition Strategy: https://www.usaid.gov/sites/default/files/2022-05/USAID_Nutrition_Strategy_5-09_508.pdf

[2] USAID 2030 Climate Strategy: https://www.usaid.gov/sites/default/files/2022-11/USAID-Climate-Strategy-2022-2030.pdf

support the agency's goals to reduce global hunger, poverty, and undernutrition, sustainably.

Next Steps: Main focus in 2023 for this workstream include:

a) The crafting of a concept note, framing the long view, long term goals and specific deliverables
b) Identify strategic stakeholders and partners, committed to a balanced agenda around sustainable science-based packaging, research, and innovation
c) Seek public information through a request for information and interest

IV. 2022 SEPA Workplan

Themes	Projects/Next Steps		Focus Group Lead/Members
1. Packaging Sustainability Global Joint Initiative	• The Joint Initiative on Packaging Waste • Identify Research opportunities • Implement Knowledge, evidence-Sharing Activities		**Leads**: Greg Rulifson (USAID), Carole Manceau (WFP) **Other Group Members:** Odile Caron (MSF), Rafael Auras (MSU)
2. Packaging Standardization	• Packaging Size Standardization (i.e. oil cans, LNS and SCP Cartons, rice bags, etc.) • Pallet Standardization • Headspace • Containerization		**Leads:** Ruffo Perez, Andrew Greenfield **Other Group Members:** (USAID), Mr. Brett Mears (Palmer Logistics), Odile Caron (MSF), Carole Manceau
3. Commodity Fumigation and Shipping Processes and Practices /Improvement	• Continue assessing fumigation practices and offer implementable recommendations • Identification of main reason leading to current fumigation practices		**Leads**: Paul Vicinanzo (USAID) **Other Group Members:** Anuj Copra, Jamie Fisher (USAID), WFP Supply Chain
4. Improved Sustainable Oil Tin Cans/ Field Trial	• Implement field trial to assess performance of new improved tin can lids • Utilize field trial to further develop track and trace App • Monitor reusability/sustainability of newly improved tin cans		**Leads:** Steve Mihm (Reynold Services) and Ruffo Perez (USAID) **Other Group Members:** Rafael Aureas (MSU), Dan Webber (USDA), Carole Danielle Froio-Brumsack
5. High Performing Bag Infestation Testing Project	• Intentionally infest most promising packaging bags to assess their resilience against infestation		**Leads:** Danielle Froio-Brumsack and Ruffo Perez (USAID) **Other Group Members: Danielle** Rafael Aureas (MSU), Dan Webber (USDA), Danielle Froio-Brumsack
6. End2End Traceability	• Intelligent dashboard development • QR & IFRD Piloting		**Leads:** Kevin Tusatig (USAID), Megan Richardson (MIT), Troy Hickerson (MANA Nutrition) and Jennifer Esterle (Edesia)

7. Packaging Expectation Document	• Development of SOP for packaging quality monitoring • Incorporate language in specification to allow enforceability		**Leads:** Ruffo Perez, Andrew Greenfield (USDA), Odile Caron (MSF), Carole Manceau (WFP)
8. Process Capability Systems to Prevent Leaking in LNS Packaging	• Development of auditable process capability SOP for LSN focused on packaging performance and product stability		**Leads:** Ruffo Perez (USAID), and Nicholas Vena (Pearl Auditing Services) Other members: Peter JAKOBSEN (UNICEF), Davor JANJATOVIC (WFP and Odile Caron (MSF), David Todd (MANA Nutrition) and Jennifer Esterle (Edesia), Odile Caron (MSF)
9. Fortified Rice Shelf Life and Packaging Improvement	• Field Shelf-Life Trial (Fortified Rice and Rice Kernels), led by WFP		**Leads:** Deblina SARKAR (WFP),, Paul Alberhine (USDA) and Ruffo Perez (USAID)
10. Food Assistance Sustainable Packaging Innovation Lab (FASPA IL): A White Paper.	• Develop a Concept Paper defining the larger scope of humanitarian food assistance sustainable packaging		**Leads:** Ruffo Perez (USAID) **Other Group Members:** Greg Rulifson (USAID), Carole Manceau (WFP)

V. V MSU Food Aid Packaging Solutions Agenda

V 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 and Ruffo Perez: ruperez@usaid.gov

IT Support: Betsy Braid: 810-730-1815 (call/text) ; braidbet@msu.edu

Day 1, Nov 15 2022			
Time (US EDT)	**Topic**		**Speakers/ Organizations**
8:05-8:15am	**Welcome, Introduction, expectations, review of the agenda**		**Matthew Daum,** **Director MSU School of Packaging** **Greg Olson,** **Deputy Office Director, BHA/FARO** **U.S. Agency for International Development** **Ruffo Perez** **Sr. Food Technology Advisor** **USAID**
8:15 – 9:00	**The critical role of using effective packaging in global humanitarian food assistance programs** 1. Protecting the food and its nutritional value 2. Adding functionalities and enhancing end-user efficiency and satisfaction		**Icebreaker Presentation** • **Ruffo Perez (USAID/BHA)** • **Eadaoin Quinn, MARS Sustainable Packaging Senior Manager – America**
Environmental Sustainability Across the Food Packaging Supply Chain. **Moderated by: Greg Rulifson, USAID**			
9:00– 10:15	**The Broader Food Assistance Sustainable Packaging Solutions and Systems**		• **Greg Rulifson,** ICF on behalf of USAID - Moderator • **Alyssa Harben,** Sustainable Packaging Coalition • **Russel Reed,** Sway • **Catholic Relief Services**
10:15 – 10:30. Virtual Café and networking Breakout rooms will be set up for virtual cafés between participants wishing to chat with specific fellow participants and colleagues. Participants will have the opportunity to switch rooms.			

10:30 -12-00	**Joint Initiative for Sustainable Packaging Waste Management**		**Fiona Cook, Samantha Brangeon, Amro El Zoubi, Jaime Capron, Joint Initiative Coordinating Team** **Carole Manceau, WFP** Joint Initiative Implementing Partner Representatives
12:00 – 12:40. Virtual Lunch			
12:40 -1:50	**Packaging, Plastics, and Greenhouse Gas Emissions**		**Fiona Cook,** ICF, Joint Initiative **Sonja Schmid,** Climate Action Accelerator Joint Initiative Implementing Partner Representatives
1:50-2:00	**Wrap up First Day**		

Day 2, Nov 16 2022			
Updates on Streamworks under the Humanitarian Food Sustainable Packaging Agenda			
8:00-8:05am	**Second day overview and Expectations**		**Ruffo Perez/Cimberly Weir**
8:05-9:20	**Packaging Standardization Project: The case of Super Cereal Plus and Lipid-Based Therapeutic Foods**		**Moderated by: Ruffo Perez, USAID/BHA** • LNS: Jennifer Phillip, Edesia Foods • SCP: Edan Antonetti, VP Business Development Henry Broch Foods. • Carole Manceau (WFP) and The Mondi Group
9:20-9:40	**Increasing Functionality of Packaging: messaging, education, reusability.**		**Moderated by Ruffo Perez, USAID/BHA** • Edan Antonetti, VP Business Development, Henry Broch Foods • Alison Fleet, Technical Specialist (Nutrition) | Medicines and Nutrition Center, UNICEF Supply Division, Copenhagen, Denmark
9:40-10:20	**Oil Packaging Improvement** • Prepackaged Oil • Bulk-Oil Packaging Trial		**Moderated by: Dan Webber, USDA/AMS** **Steve Mihns, Reynolds Services, Inc.** **David Pagemorris (WFP)**
10:20 – 10:40. Virtual Café and networking Breakout rooms will be set up for virtual cafés between participants wishing to chat with specific fellow participants and colleagues. Participants will have the opportunity to switch rooms			
10:40-11:50	**Fumigation and Supply Chain Optimization Processes** • **Containerization/Ensuring Compliance** • **Palletization Improvement** • **Fumigation Processes** • **Pest Control** • **Reviewing Transportation Modes**		• Moderated by Paul Vicinanzo, Division Chief, Transportation Office Acquisition and Assistance • Anuj Copra, Co-founder & CEO ESPplus LLC
11:50-12-10	**Packaging Infestation Project**		**Danielle Froio-Blumsack, The Natick Lab DEVCOM Soldier Center**
12:10-12:30	**Warehousing Expectation and Auditing**		**Donna Burke-Fonda, Chief Audit Service, USDA/AMS**
12:30 – 1:10 Virtual Lunch			
1:10-1:50	**USAID Supplier Packaging Quality Expectation Document**		**Ruffo Perez, USAID/BHA**
1:50-2:00	**Wrap up Second Day**		

Drafted by Ruffo Perez, Senior Food Technology Advisor
USAID/BHA/TPQ/NUT
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