

Packaging New Paths to Global Food Security



How polymers can keep food fresh and prevent waste

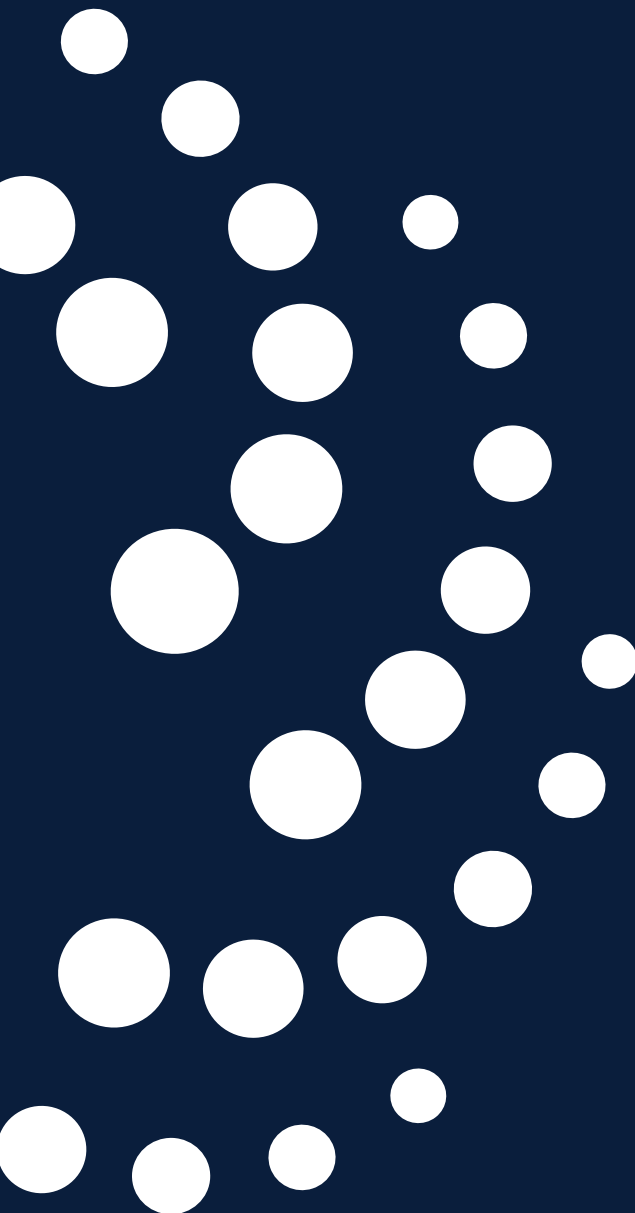


**Energy
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01

Introduction: The Food Security Challenge

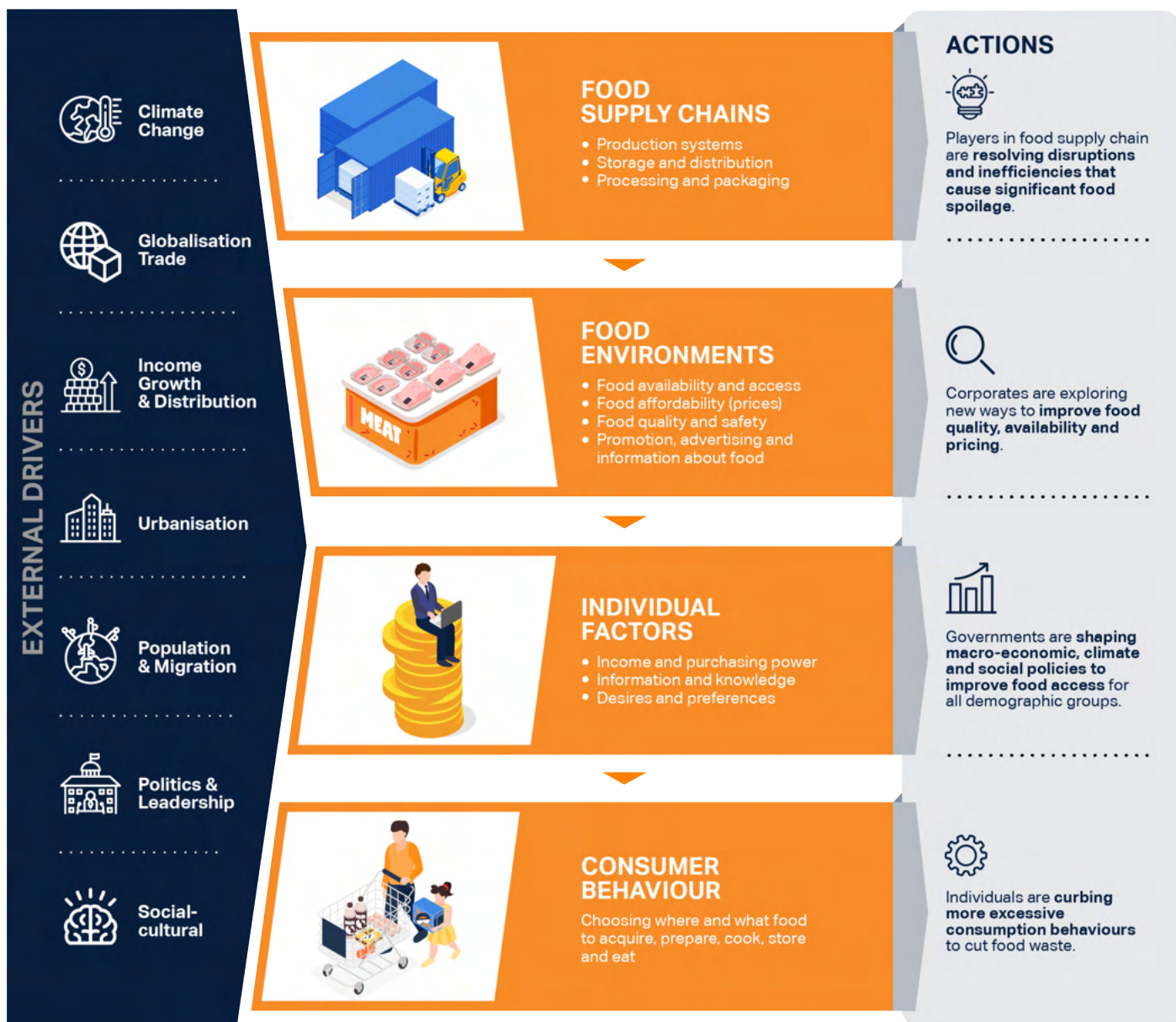
In recent years, global energy company OQ has expanded its range of quality polymer solutions to improve food security, one of the most complex global challenges of today.

With the world experiencing surging food consumption amid global population growth – as 1.5 million people¹ are added every week – demand for food will more than double by 2050².

Food production is struggling to keep pace with this growth,

exacerbated by rising costs of water, arable land, fertiliser and fuel as urbanisation accelerates. Conflict, weather and economic shocks have further escalated food insecurity, which reached a five-year high³ during the pandemic.

There are a wide range of factors that affect food security and global food systems (see infographic). All hands are needed on deck to tackle this multi-faceted problem.



1 www.pwc.co.uk/issues/megatrends/rapid-urbanisation.html

2 www.un.org/press/en/2009/gaef3242.doc.htm

3 www.wfp.org/news/acute-food-insecurity-soars-five-year-high-warns-global-report-food-crises

Smart Solutions: The Right Packaging

Among the solutions available to improve food security, using the right packaging is a vital component. Be it improving food logistics, food environments or consumption behaviour, harnessing

high-performing polymer solutions to produce smart packaging can offer benefits for food security, such as extending the shelf life of food products.

Indeed, the prudent use of the right packaging is critical to supporting food security.

Packaging can greatly cut down food waste and loss, which accounts for one-third of all food produced worldwide, and over 8 percent of global carbon emissions. Food waste is also prevalent across other parts of the food value chain, as seen in the graphic below.



Those who wonder about the environmental impact of plastic packaging may be surprised to find out that the amount of plastic needed to keep food safe is actually quite miniscule compared to its benefits. For instance, about 1kg of salt requires less than 10g of flexible packaging⁴, which translates to a pack-to-product ratio of just 1 percent.

Hence, the key to enhancing food security lies not in doing away with all packaging. Rather, it is about harnessing the right polymer solutions to create new packaging that minimises environmental impact while maximising food security.

⁴ www.business-standard.com/content/b2b-plastics-polymers/enhancing-food-security-through-sustainable-packaging-116021100146_1.html



02

The Power of High-Performance Polymers

OQ has stepped up to the plate to develop polypropylene (PP) and polyethylene (PE) solutions that can make a difference for food security, at every stage of the food consumption journey from farm to fork.

Food Production

Polymers are used in numerous products that support better agricultural practices to boost food supply.

For instance, OQ's Luban LLDPE solutions (DFDA-7047) can be used in agricultural films like greenhouse covers and mulch films. These films can improve crop yield by as much as 72 percent in some cases⁵ while reducing water consumption, thanks to improved thermal and humidity control.

Silage films are used to wrap hay or other food for livestock. By reducing oxygen transmission, it ensures that the hay retains a higher nutritional content and spoils less easily, so farmers can get more milk or meat from the livestock that are fed on this form of silage compared to dry hay.

In the category of packaging, polymers such as OQ's Luban High-density PE solutions are used in products that ensure crop protection. These include durable bottles that safely store and transport agricultural raw materials.

Food Transportation

Substantial food losses can occur at this stage without the right packaging that ensures food is kept intact for longer periods. This enables more food to reach a greater number of consumers, even

in remote locations where food insecurity tends to be rampant.

For instance, fresh produce packaged in the traditional burlap (jute) bags in Sri Lanka experienced between 22 and 28 percent loss en route to the market as bottom bags were crushed in transit, one study found. By using crates to stack the produce, food loss was reduced to 5 percent⁶.

Such preventable food loss racks up costs for food suppliers, who often pass them on to consumers. Lightweight plastic packaging requires less truck trips compared to heavier glass packaging, which cuts down fuel use and emissions.

Rigid packaging offers a cost-effective way to address this issue. These include plastic crates, boxes or bottles that allow product to withstand rough roads and potholes, are easy to stack, durable and water-resistant to protect their food contents. They are designed to be reused multiple times, contributing to cost reduction and sustainability efforts.

OQ's Luban HDPE and ICP portfolio of solutions are used in making crates and pallets to ensure food integrity while reducing shipping costs. This is increasingly important as global e-commerce and cargo shipments drive more food across the globe.

Meanwhile, stretch hoods offer exceptional load stability and holding force for pallets, protecting food carried over bumpy roads.

5 www.ncbi.nlm.nih.gov/pmc/articles/PMC5890387

6 www.food-safety.com/articles/3805-packaging-for-enhanced-food-security

Food Storage and Preservation

A wide range of packaging applications are used to protect the nutritional content of the food and ensure that it reaches the consumer looking its best.

Rigid packaging is ideal for ensuring food integrity, especially for softer foods. Grapes, for instance, used to be sold in loose bunches on an open tray and were easily damaged by consumers. This food waste is reduced 20 percent by selling grapes in clear rigid packaging like sealed trays or boxes that allow the consumer to view the product without touching, reducing the risk of contamination.

Heavy-duty packaging materials offer climate control, which is critical for keeping food in good condition even in freezing weather. These materials are usually customised to shield against vibration, compression and temperature. They are typically made using HDPE, the most common and versatile member of the polyethylene family. It offers a balance of processability, toughness, stiffness and resistance to environmental stress cracking.

Thin-wall packaging solutions are commonly used to make yogurt cups, as well as packages

for chilled fruits, vegetables and frozen food that require resistance to low temperatures. The balance of stiffness to impact allows for a highly efficient pack-weight ratio, typically close to 100 percent.

OQ's Luban high flow Impact Copolymers (ICP) and Random Copolymers (RCP) solutions are popular choices for thin-walled applications.

In particular, Luban EP2380T and EP2348UC are high flow materials that can optimise pack weight while maintaining pack integrity.

Their design characteristics allow for consistent mould filling and rapid cooling, enabling faster cycle times. This makes them ideal solutions for producing thin-walled containers.

Aseptic packaging has also grown rapidly, as more operators package thermally sterilised liquid products into sterile containers to produce shelf-stable items that do not require refrigeration. Aseptic packaging use polyethylene as a barrier on the inner and outer sides to protect moisture from entering or exiting the container.

Such a process can extend shelf life of dairy products by six to 12 months without refrigeration⁷. This increased longevity could support food security in many places where

poor cold-chain and refrigeration infrastructure causes food like dairy products to spoil easily.

Food Retail

Primary packaging materials are the first layer of protection for food and the last piece of packaging that a consumer opens. Special attributes include safety, reusability and leak-proof protection. It is critical that this packaging is done right, especially for perishable foods.

Flexible packaging films offer seal integrity and barrier properties so that the food contents are kept intact even if package is dropped. This enables the food to retain its freshness and taste until it is consumed.

For instance, re-packaged products like steaks that are prepared in supermarkets from slabs of beef are now typically wrapped in barrier packaging. This form of flexible packaging involves film made with multi-layer, co-extruded polyamide-polyethylene, which keeps meat from browning by offering up to 10 more days of red colour stability, while combating bacterial growth⁸, thus reducing waste.

7 www.dairyfoods.com/articles/94705-aseptic-dairy-packaging-gains-acceptance

8 https://meatscience.org/docs/default-source/publications-resources/white-papers/wp_002_2008_co_map_packaging.pdf





Home Consumption

Durable, reusable containers enable households to plan meal sizes and keep leftovers for consumption later. They can be used to store food at cold temperatures.

These transparent, rigid packaging applications can be made from OQ's medium to high flow ICP and RCP solutions like the Luban RP RP2248R or RP2248TC – versatile and cost-effective materials that offer the optimal balance of toughness and stiffness for damage-resistant containers used to store food and retain their nutrient content longer.

Another useful application are the flexible lids for containers that are made from OQ's high-flow linear low-density polyethylene (LLDPE) solutions to ensure air tightness. These applications provide convenience for consumers to store food and plan meal portions, reducing unnecessary food waste.

These containers can also be useful in soup kitchens and non-profit agencies that collect, store and distribute excess food items from supermarkets and restaurants to those in need. Rather than only collecting and using canned food items, they can use durable plastic containers to make fresh, nutrient-rich meals available to impoverished and under-nourished populations.

Another example of how even a little piece of flexible packaging can do wonders is the 1.5g of film typically used to wrap a cucumber. This vegetable, which is 96 percent water, typically loses so much water after three days⁹ that it becomes dull, limp and unpalatable. But its shelf life can be stretched to 14 days thanks to the film.

Consumers' growing focus on health foods and convenience are also driving demand for health food packs and on-the-go pouches. These items require flexible packaging, which often **uses recycled and recyclable polymers**, satisfying growing public demands for more sustainable packaging options.

Another popular packaging is **resealable stand-up pouches**, which are designed to control gas transmission, inhibiting growth of mould and other microorganisms – a top cause of food spoilage. These pouches are able to extend shelf life of fresh vegetables by 50 percent to

100 percent¹⁰.

Meanwhile, **meal kits or single portion boxes** can help consumers avoid over-buying food.

OQ's Luban LLDPE and HDPE solutions provide all the right characteristics needed by the flexible food packaging products discussed above: damage resistance, high degree of toughness, seal integrity and rigidity.

In particular, our Luban HPR1018HA solution enables packaging to withstand impact and punctures, while ensuring seal strength; the Luban DGDZ-6095 provides the required stiffness needed for machinability, printing and downgauging.

9 www.researchgate.net/publication/277829239_Quality_Retention_and_Shelf-life_Extension_in_Mediterranean_Cucumbers_Coated_with_a_Pectin-based_Film
10 <https://www.sciencedirect.com/topics/engineering/modified-atmosphere-packaging>

03

OQ - Supporting Global Food Security



As a leading global energy company, OQ has the resources and global network to continually expand and improve our portfolio of polymer offerings. This supports our commitment to innovation, creating new, sustainable packaging solutions for food security.

OQ's solutions support the quest to package new breakthroughs for food security through the production of increasingly light-weight, durable and compact plastic packaging. Plastic packaging, particularly those made with recycled and recyclable polymers, can have a smaller environmental impact compared to traditional materials such as glass and metal.

Based on a comparative life cycle assessment between plastic packaging and heavier, bulkier materials like glass, plastic can consume less energy and water during the production stage, contribute less to carbon emissions during transport and storage, incur less stratospheric ozone depletion, and much more.

What's more, the environmental impact of plastic materials such as flexible packaging is typically five to 10 times¹¹ less than the food it protects. Many products are

now designed to be re-usable and recyclable, further reducing their pollution impact.

To expand our polymer product mix, OQ has built the new Liwa Plastics Industry Complex (LIPC), a US\$6.7 billion petrochemical complex in the Sohar Industrial Port of Oman. This transformational project adds more than 20 high-performing new solutions to our portfolios, while enabling us to annually produce an additional 300,000 tonnes of PP and 880,000 tonnes of PE.

OQ also strives to provide our customers with the best support. Our technical support teams on the groundwork closely with our customers to optimise productivity by improving the processibility of our polymer solutions in their applications. They also help clients to optimise production conditions, troubleshoot issues, and much more.

All this enables our customers to create smarter and better food packaging that can further reduce food waste and support the global fight against hunger.

¹¹ www.flexpack-europe.org/sustainability-new.html



Conclusion

Just as an ant can lift up to 5,000 times its own body weight, a small piece of packaging can wield immense power for good. Smart plastic packaging, which weighs very little compared to the large amount of food it protects, can make a world of difference in reducing food waste.

At OQ, we believe in the power of small things to make a big impact. In the same way that polymers are made of small molecules linked into long chains,

the path to food security can be strung together through countless positive actions taken by individuals and industry players alike to reduce food waste and improve food access – one package at a time.



For commercial enquiries, contact us at <https://connect.oq.com/polymers-inquiry> or scan the QR code

