



RESEARCH ON FOOD WASTE

BY SCANNING THROUGH MORE THAN 75+ MAJOR STARTUPS,
COMPANIES AND ORGANISATIONS AROUND THE WORLD

VIGNESH KUMAR

FOOD LOSS

Takes place at

Production
Postharvest
Processing Stages
Distribution

FOOD WASTE

Happens at

Retail
Consumption

WHAT TYPE OF FOOD IS WASTED?

- Fresh produce that deviates from what is considered optimal in terms of shape, size and color, for example is often removed from the supply chain during sorting operations.
- Foods that are close to, at or beyond the “best-before” date are often discarded by retailers and consumers.
- Large quantities of wholesome edible food are often unused or left over and discarded from household kitchens and eating establishments.



SOME GENERAL STATS ON FOOD WASTE

- Around one billion people will eat too much
- Around one billion people will go to bed hungry
- Over 20,000 people will die from hunger
- An estimated one third of all food produced in the world ends up as waste



one third of the food produced in the world for human consumption every year — approximately 1.3 billion tonnes — gets lost or wasted.

Food losses and waste amounts to roughly **US\$ 680 billion** in industrialized countries and **US\$ 310 billion** in developing countries.

Every year, consumers in rich countries waste almost as much food (**222 million tonnes**) as the entire net food production of sub-Saharan Africa (**230 million tonnes**).

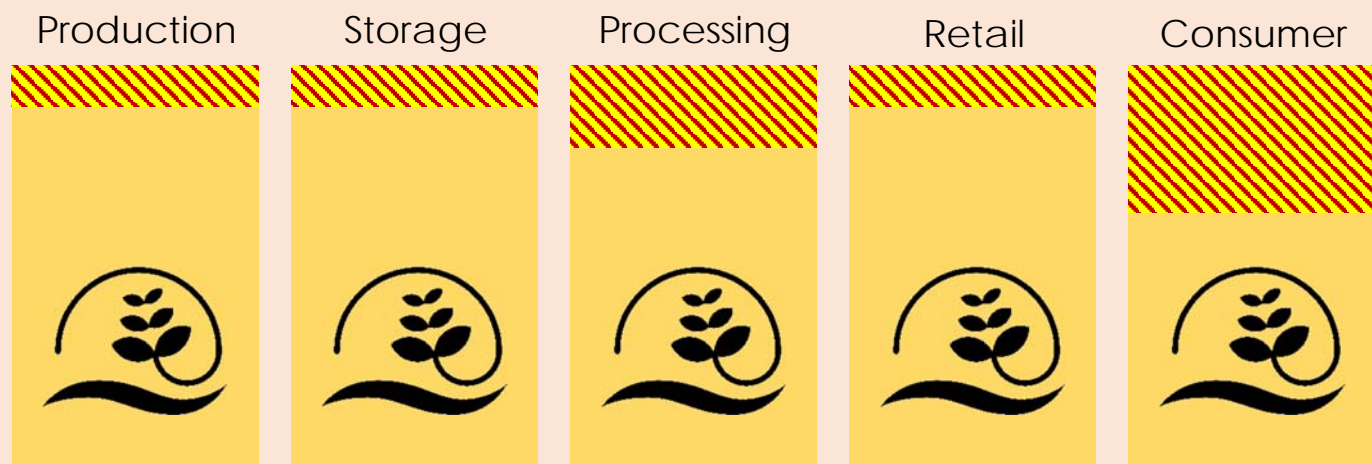
The food wasted by the United States and Europe alone **could feed the world 3 times over**.

Fruits and vegetables, plus roots and tubers have the **highest wastage rates** of any food.

At retail level, large quantities of food are wasted due to quality standards that over-emphasize appearance.

In developing countries **40% of losses occur at post-harvest and processing levels** while in industrialized countries more than **40% of losses happen at retail and consumer levels**.

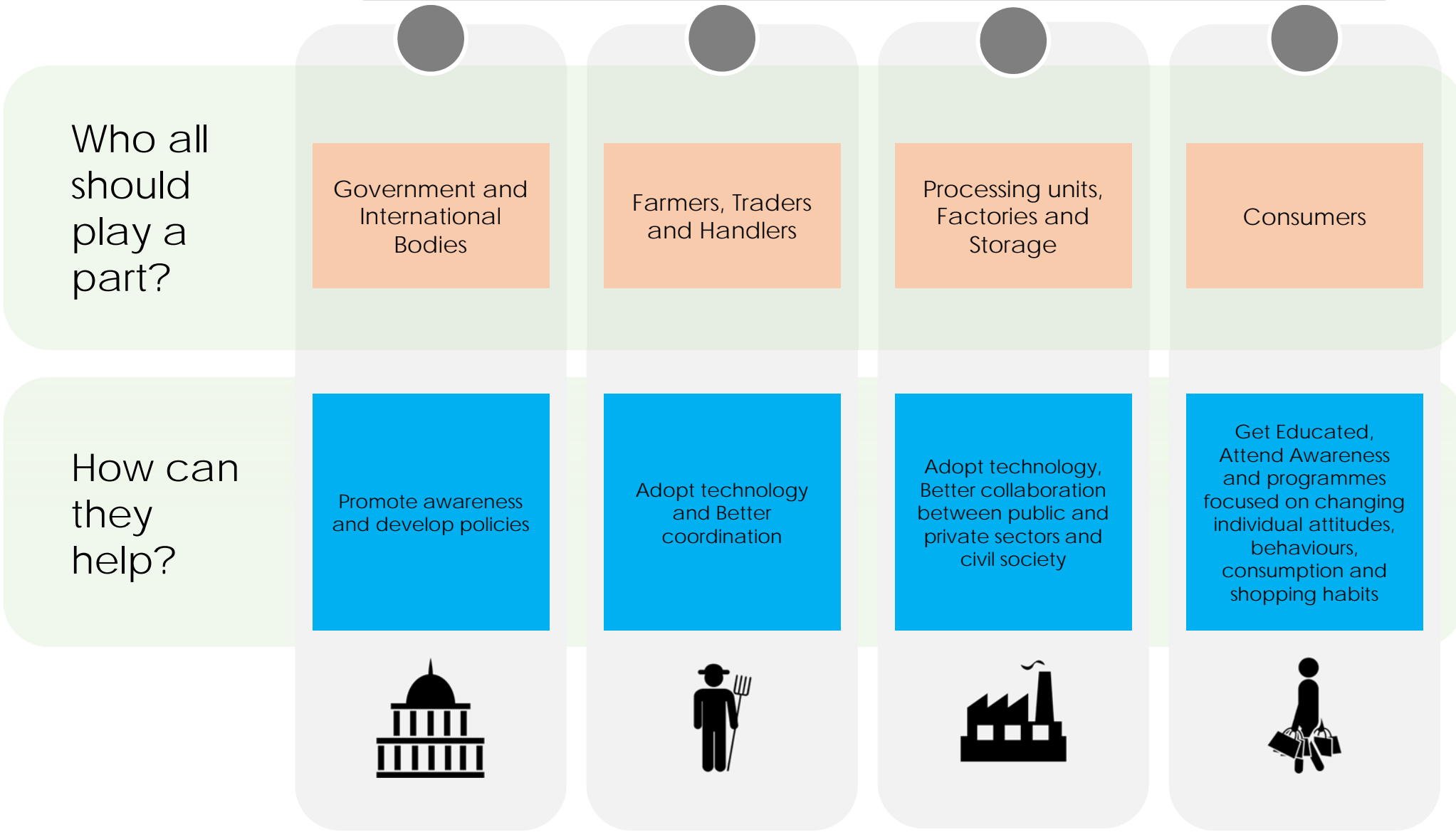
Food loss at various stages



Food loss and waste also amount to a major squandering of resources, including water, land, energy, labour and capital and **needlessly produce greenhouse gas emissions, contributing to global warming and climate change**.

HOW TO REDUCE FOOD WASTE?

BRINGING PEOPLE TOGETHER TO REDUCE FOOD LOSS AND WASTE



AI IN FOOD WASTE MANAGEMENT

Artificial intelligence technology-based software applications are capable of performing tasks which were only confined to the human mind. Its subset, machine learning is also playing an important role in reducing food wastage.

ML works on vast data that helps in detecting types of food and their demands to manage them efficiently. These technologies are serving in unimaginable ways with various innovative tools.

HOW AI CAN HELP?

1. Forecast food demand

USE CASE

The Japanese company Hitachi partners with a hospital to use AI. Hospitals always witness a significant amount of food wastage because of several reasons. One of the reasons is when patients aren't eating — in this case, it is not just about food waste but also about health implications.

The concept is to mount a camera on the trolley that collects trays. The camera would take pictures of the leftovers, which would later be examined by the Hitachi's deep learning algorithms. So, with the help of the after meal analysis, Hitachi would be able to recognise patterns in the leftovers that humans otherwise could not see.



2. Detect food quality

USE CASE

There is a company called Agshift which is based in the USA is using AI as a solution to this problem. They have their own food inspection system which is deploying the algorithms of deep learning.

The deep learning models developed by hired software developers are capable of analyzing the defects in the sample quality. Sample images used here are a base to find out the overall quality of the food sample.



3. Detect the food usually wasted

USE CASE

AI-bin Winnow is the first bin based on artificial intelligence technology to support the hospitality industry in its target of reducing food waste.

It has reduced food waste with machine learning algorithms. The smart scales, AI-guided smart meters, and camera are used with AI technology. The system has been programmed to identify the thrown food. Whatever goes into the bin is not recorded anywhere. With the help of winnow vision, the companies can detect the food items that are discarded the most. Moreover, the AI-based bin is capable of calculating the environment and financial cost of the thrown items automatically.



INNOVATIVE WAYS TO FIGHT FOOD WASTAGE

Trifocal is working to change people's behaviors by educating both through sustainable eating and food waste reduction.

"London households throw away an estimated 900,000 tonnes of food each year, of which 540,000 tonnes could have been eaten". That's why they use posters, social media and videos to share good practices and change behaviors. Their campaign small change big difference is a good example of raising awareness done well.



Humus pro a project by vert d'iris, an urban farming initiative in Anderlecht. The goal of the project is to create a 1800 m2 composting site to bring back nutritive quality to soil.



Ovie Smarterware is a system of "Smart Tags" that you stick on your food containers. You press the button on the tag to connect with the Ovie hub and tell it what kind of food it is; it registers the food and begins a countdown. When half the food's shelf life has passed, the tag changes colors and sends your phone a message so you know it's time to eat. No longer will you stand in front of the fridge, wondering whether that leftover lo mein is worth a possible food poisoning.



INNOVATIVE WAYS TO FIGHT FOOD WASTAGE

Flashfood app connects you with cheap deals on food getting close to its best-by date, through partnerships with local supermarkets. It only works with a limited number of stores in Canada and the Midwest right now, but plans to expand.



Ethylene gas is produced by some fruits, including apples and bananas, when they start to ripen; too much ethylene can cause produce to rot prematurely. The food industry has long used ethylene absorbers, often in the form of sachets, filters or films, to prevent early ripening and rot during shipment. But in recent years such products have been targeted directly at consumers. Bluapple, which looks like, well, a blue plastic apple, can be tucked into your produce drawer to suck up excess ethylene by oxidizing it with sodium permanganate. Other commercial products, such as Keep Fresh, promise similar results—fruits and veggies that last as much as three times longer.



Apeel Sciences, a California company dedicated to fighting food waste, has created a "second skin" for fruits and veggies called Edipeel. Edipeel is a film based on a plant's own cutin—the waxy substance that protects fruits and veggies from the elements by keeping water inside and oxygen out—that can increase shelf life up to three times. It's applied after harvesting and helps keep produce fresh until it makes it to your salad bowl.



INNOVATIVE WAYS TO FIGHT FOOD WASTAGE

Hyperspectral imaging—a technology that chops the electromagnetic spectrum into hundreds of bands to look for data the eye can't see—has been a hot topic in food technology circles in recent years. Hyperspectral cameras can see when produce is becoming ripe—the riper the fruit, the darker the image. This has made it useful in food inspection. More recently, researchers have been trying to bring the technology directly to consumers, with cost-efficient devices that could potentially be incorporated into smartphone cameras. So soon you may be able to snap a quick iPhone pic to know exactly when to eat that avocado.



Rice University researchers have developed a way of etching graphene patterns on food, literally turning a thin layer of the food itself into graphene. This process can be used to create edible radio-frequency identification (RFID) tags, which could be embedded with all sorts of information—where the food came from, how old it is, who produced it—and even warn of contamination.



You can often get cheap hotel deals by booking at the very last minute, since hotels have realized by then that no one else wants that room. The app Gebni is trying to bring something similar to the restaurant industry by offering lower "smart prices" for dishes that aren't moving quickly, especially near closing time. So if nobody else is feeling like a kale caesar today, you're in luck—you get a good deal and the restaurant doesn't waste food. It's currently only available in New York. An Israeli startup called Wasteless is getting in on the dynamic food pricing game with an algorithm for making food cheaper as it nears its sell-by date. It's a high-tech version of those yellow stickers supermarket employees slap on aging milk cartons and steaks.



wasteless

FOOD WASTE – MARKET LANDSCAPE



UK FOOD WASTE MARKET LANDSCAPE



WEIGHING YOUR OPTIONS

Its product the “smart scale” helps restaurants calculate how much food—in both quantity and cash—the kitchen wastes on a daily basis. Reports help management analyze food waste in near real-time and offer suggestions on how to do it better. One of its biggest clients is IKEA. In one store, the restaurant reduced food waste by 40 percent, saving about \$120,000 in one year.



FARESHARE

An independent charity that collects food from supermarkets, cafe chains, bakeries and other retailers that would otherwise be discarded and distributes it to 2,020 charities across the country. The charity's work in one year alone saw the redistribution of 7,360 tonnes of food, 15.3 million meals provided and saved the British voluntary sector an estimated £19 million.



TOAST ALE

Founded in 2016 by Tristram Stuart, this British beer company brews different kinds of beer using heel end of loaves that aren't used to make sandwiches. By brewing with surplus bread, this company does not only fight food waste but also raises awareness around this problem. Moreover, 100% of their profits are given to Feedback, an environmental charity campaigning to end food waste. And even if they only started two years ago, they are already operating on four continents, working with brewers in the UK, the USA, South Africa, Brazil and Iceland!



ITS FRESH !

UK-based It's Fresh! produces discrete ethylene absorbing filters called “e+active”, that purify the air around perishable produce inside its packaging. This helps keep fruit fresh longer and extends the shelf life. An active material is printed onto a normal pack label and can be used for any kind of packaging.

UK FOOD WASTE MARKET LANDSCAPE



OLIO

OLIO

OLIO, a free app launched in June 2014, lets Londoners list surplus food items they have at home. More than 1,000 items were posted online in the app's first four months -- viewed by nearly 10,000 users.



LOVE FOOD HATE WASTE

Love Food Hate Waste, an app from UK recycling charity WRAP, helps users plan meals with what they have in their cupboards. Five supermarkets have signed up to the scheme.



SENOPTICA TECHNOLOGIES

Senoptica Technologies, from Ireland, develops a sensor that reduces food waste. It is printed into the laminated film of a package (Vacuum Packaging, Modified Atmosphere Packaging or Vacuum Skin Packaging). This enables non-invasive and non-destructive identification of packaging defects. Depending on the O₂ levels within the package, a different color will appear when scanned with the Senoptica scanning system.



INSIGNIA TECHNOLOGIES

People discard food that is still safe to eat because they're unsure how long the packaging has been open for or they feel it has been open "too long". An alternative solution is intelligent packaging, which includes smart tags or color changing indicators according to surrounding conditions. This packaging can indicate how long a package has been open and allows the consumer to only discard food that is indicated as unsafe to eat. Scottish company Insignia Technologies develops smart pigments and inks that change color when exposed to a variety of gases or UV light. Smart pigments are incorporated into plastic food packaging as a color changing plastic film which helps minimize food waste and ensures consumers that their food is still fresh for consumption unless indicated otherwise.

UK FOOD WASTE MARKET LANDSCAPE



RUBIES IN THE RUBBLE

This UK startup has taken a similar approach to that of Misfit, but transforms wasted produce into ketchups, relishes, and chutneys. Today, Rubies in the Rubble offers a variety of ten products that are sold online and in a number of supermarkets.



FEEDING THE 5000

Tristram Stuart's initiative is organizing the world to prevent "wonky" fruits, vegetables, and other food from being wasted. Feeding the 5000 encourages farmers to participate in the "gleaning movement" – where volunteers collect unattractive produce that would otherwise be wasted.



LOVE FOOD, HATE WASTE

This program teaches consumers about food waste and provides them with helpful portioning and planning tips, as well as an array of recipes to make sure food doesn't go to waste.

US FOOD WASTE MARKET LANDSCAPE



THE FERTILE CRESENT

The company produces fertilizer, mainly through food waste such as meats and produce sourced from grocery stores and restaurants. Its clients use the company's Harvester, which grinds food waste into a slurry that retains more than 90 percent of the nutrients versus 40 percent from traditional composting.



CALIFORNIA SAFE SOIL

California Safe Soil converts supermarket waste into liquid fertilizer, as well as feed pellets for chickens and pigs. The company claims its trademarked Harvest-to-Harvest fertilizer can increase organic yields by 10 to 40 percent per acre with 25 percent less water.



BLUME DISTILLATION

Blue Distillation manufactures large-scale systems for converting food waste and other bio waste into alcohol. Blume uses two basic system models to provide production capacity in the range of 20,000 to 500,000 gallons of bio-ethanol per system per year.



LEAN PATH

Founded in 2004, the company offers several products including its all-in-one LeanPath Tracker 2.2, which includes a built-in scale, camera, and touchscreen user interface. Before throwing away any food waste, a worker places the food on the scale, the camera snaps a photo, and the user inputs a few pieces of info, which generates an online report. LeanPath says its system has been installed in more than 1,000 kitchens across more than 20 countries. In one case, at Boston College, the kitchen reduced food waste by 60 percent.

US FOOD WASTE MARKET LANDSCAPE



MINT SCRAPS

A California company called MintScraps, founded in 2013, offers a cloud-based analytics platform for tracking food waste. New York City offered the app to restaurants, supermarkets, cafes and other business to track and visualize their waste streams as part of the city's efforts to divert food waste from landfills. The program saved 2,500 tons in its first six months. The app also provides a marketplace where businesses can post leftover food for pickup and non-profits and food banks can search for food to pick up.



BLUWRAP

Founded in 2006, San Francisco-based BluWrap has raised \$12.6 million for fuel cell technology that helps extend shelf life of protein while in transit aboard container ships. BluWrap uses fuel cells to manage oxygen levels in refrigerated containers, extending the shelf life of fresh proteins well beyond 40 days. Sensors continually monitor oxygen and temperature levels throughout the journey. So that means a shipment of pork from Europe to Australia doesn't need to be frozen or vacuum sealed to survive the ride overseas.



BLUAPPLE

Bluapple is a product that absorbs ethylene gas in refrigerators, allowing consumers to store fresh produce for longer. By activating a natural oxidation process, Bluapple can be an effective ethylene absorber that is capable of extending produce shelf life by up to three times longer.



BT9 XSENSE

A real-time cold chain management system, BT9 XSENSE monitors the condition of perishable food products along the transit line, from the producer to store shelf. The data allows users to identify problems along the cold chain and take action to maximize products' quality along the entire supply chain.

US FOOD WASTE MARKET LANDSCAPE



COPIA

By redistributing food surplus to feed people in need, Copia uses its extensive food waste reduction dashboard to connect businesses with surplus food to local shelters, after-school programs and other nonprofit organizations. By paying a volume-based fee, businesses can request pickups for their surplus food in real time, and they can use Copia's analytic software to manage and track their surplus to save money and reduce their overall food waste.



EDIPEEL

A natural postharvest protection, Edipeel is an invisible, edible and tasteless innovation engineered by Apeel Sciences to protect food surfaces. Made from all natural plant extracts recycled from agricultural byproducts, Edipeel serves as a barrier-like skin to protect produce from transpiration, oxidation and microbial activity, keeping produce fresh for longer. Applied post harvest, the technology is working to reduce the amount of food spoilage that results between harvest and consumption.



FREIGHT FARMS

Freight Farms created the Leafy Green Machine and its supporting Farmhand Connect app, which collectively work to produce consistent harvests 365 days of the year in any different geographic locations. The Machine offers a closed-loop hydroponic system within a shipping container outfitted with climate control technology and efficient growing equipment. The accompanying app allows growers to remotely track their farm's climate conditions and control its humidity, temperature, carbon dioxide and nutrient and pH levels to maximize its efficiency and production — minimizing waste.



GEBNI

Gebni is a food app delivery service working to reduce food waste by using an algorithm to adjust prices according to real-time demand. By lowering prices during off-peak hours it can increase sales, while also increasing the accessibility of food delivery to low-income customers.

US FOOD WASTE MARKET LANDSCAPE



CRISP

Crisp ingests and analyzes data from myriad sources with a view to helping food brands forecast their food production requirements — which can in turn inform other business decisions, such as staffing needs. Data can be gleaned from historical sales and purchase orders, promotional activity, inventory databases, point-of-sale (POS) systems, and more, with integration support for the likes of Salesforce, Netsuite, QuickBooks, Seasoftware, and CSB.



WIZE MONKEY

The leading pioneer in making tea from coffee leaves started as a Kickstarter campaign. Its tea blends are made from prunings from coffee plants that would otherwise be wasted, and has been shown to have antioxidant, anti-inflammatory properties



FOOD MAVEN

A startup based in Colorado, brought in \$8.6 million in January to continue buying excess food items from retailers and distributors and selling them through an online marketplace to restaurants and commercial food preparers. Participants in the initial funding round included the Walton family, which owns about half of Walmart.



REGRAINED

ReGrained is a San Francisco-based startup that has developed a patent-pending technology to upcycle spent grain from the beer brewing process. The technology makes use of the fact that during beer brewing, sugar is processed out of grains, giving "optimal access to protein, fiber, and a whole bunch of micronutrients," as stated by the company. The upcycled product is called Supergrain+ flour, and it's used to make nutritious protein bars. On September 25, 2018, ReGrained secured a \$2.5 million series C seed financing investment from Griffith Foods to upscale production and commercialize their ingredient innovations. To date, the startup has upcycled 48,841 pounds of Supergrain+.

US FOOD WASTE MARKET LANDSCAPE



MISFIT FOODS

Based in Washington, D.C., Misfit Foods (previously known as Misfit Juicery) is a startup dedicated to preventing food waste. In 2015, the company launched their concept based on transforming “ugly” fruits and vegetables into bottled juices. According to Misfit, about one third of harvest is tossed due to cosmetic issues, and an estimated 40% of food is dumped by supermarkets due to spoilage and overbuying.



¡YAPPAH!

Tyson Food’s Innovation Lab launched ¡Yappah! on May 31, 2018. ¡Yappah! uses spent malted barley from beer brewing and veggie purees near their expiration dates combined with chicken breast scraps and tapioca flour to make ¡Yappah! Chicken Crisps.



SEVEN BROTHERS BREWERY

Kelloggs recently announced that it will be sending rejected cornflakes to the Seven Bro7thers Brewery in Manchester to be used as part of the grain that goes into their new Throw Away IPA. The rejected cornflakes are those that are too small, too big, or overcooked. According to the Telegraph, “A spokesperson for Kelloggs said that around 30 per cent of the grain content of the beer will be cornflakes, and 70 per cent wheat.” The cornflakes will sweeten the beer and add to its golden color.

Dickinson

DICKINSON COLLEGE CAMPUS FARM

This student-run farm composts daily deliveries of salad bar scraps from the cafeteria. In 2005, Dickinson expanded the compost program into a campus-wide initiative with student farm workers, partnering with facilities management to ensure that campus food waste is composted.

US FOOD WASTE MARKET LANDSCAPE



FOOD RECOVERY NETWORK

A group of enterprising University of Maryland students decided to take action and launched this initiative with the goal of delivering cafeteria leftovers to local food shelters. It has since expanded to 11 chapters on campuses across the U.S. Students involved in the Food Recovery Network visit their campus dining halls nightly to rescue leftover food and deliver it to local shelters and food pantries. Close to 55,000 kilograms (121,000 pounds) of food have been rescued by the Network since 2011.



FOOD WASTE REDUCTION ALLIANCE

Tyson Food's Innovation Lab launched ¡Yappah! on May 31, 2018. ¡Yappah! uses spent malted barley from beer brewing and veggie purees near their expiration dates combined with chicken breast scraps and tapioca flour to make ¡Yappah! Chicken Crisps.



POSTHARVEST EDUCATION FOUNDATION

This organization offers training materials, e-learning programs, and mentoring opportunities that help farmers around the world prevent food loss. Their postharvest management guide is available in 10 languages, featuring topics such as how to choose the best time for harvest and the advantages of different transportation methods.



SANFORD AND SON

Sanford and Son is a father-and-son company that works in the West Side of Chicago to repurpose food waste for urban farms. Ray Sanford and his son Nigel recycle food waste from restaurants and private homes and convert it into organic compost, which is then distributed to urban farms to use as fertilizer. They claim to save 226 kilograms (500 pounds) of organic waste for each family that uses their composting services.

US FOOD WASTE MARKET LANDSCAPE



SOCIETY OF SAINT ANDREW

This national network connects volunteers with farms to glean produce that has been left unpicked after a harvest. The Society distributes the gleaned produce to food banks and other organizations serving marginalized communities. In 2012, the Society gleaned 10.4 million kilograms (23.7 million pounds) of produce across the United States.



SPRINGBOARD KITCHENS

This Pittsburgh organization, through a partnership with the Greater Pittsburgh Community Food Bank, rescues 3,200-4,500 kilograms (7,000 – 10,000 pounds) of fresh food that would have otherwise been thrown away, and prepares approximately 4,000 meals per day.



UNIVERSITY OF CINCINNATI SOLERCOOL

Developed by MBA students at the University of Cincinnati, this solar-powered refrigerator runs on eight solar panels to keep food comfortably cool when it is being transported.



FlashFood

The app prevents food waste in the U.S. and Canada in two ways: It re-sells grocery foods approaching their best-before date at a discount, and it saves "not good enough" retail items and ships them to customers.



EUROPE FOOD WASTE MARKET LANDSCAPE



SMART PACKAGING

Wireless sensors developed by VTT Technical Research Center detect ethanol in the headspace of food packaging, allowing live data on the food's quality and freshness to be transmitted to retailers and customer via radio frequency identification (RFID) tag technologies. The smart packaging products can help to improve the shelf-life of packaged food products and can help better control and monitor food quality throughout the distribution chain, reducing the amount of food wasted during transportation and in retail.



WAKATI

A solar-powered, standalone device, Wakati uses hydration to preserve food instead of a cooling system, creating a low-cost, low-energy alternative to conventional refrigeration. Using just one liter of water per week and solar energy, the Wakati system functions to keep fresh produce hydrated, enabling farmers in warm climates to more effectively store their harvests on-farm and in transit, increasing their ability to bring crops to market.



KARMA

A European startup that sells off spare food from local cafes and supermarkets at a discount has raised \$12 million (£9.4 million) from investors, including US firm Bessemer Venture Partners. Karma is headquartered in Sweden and expanded to the UK earlier this year. It partners up with supermarkets, restaurants, and even food delivery services to sell off leftover food direct to consumers, who then go and pick up their discounted items directly. The Series A round was led by Swedish firm Kinnevik, appl.



WE FOOD

At WeFood, the first food waste supermarket, opened in February 2016 in Copenhagen, customers have access to products that other supermarkets do not want on their shelves anymore because they don't look as perfectly good as before, their 'best-before' dates are almost passed or their packages are damaged. These products are thus sold at a price cheaper by 30 to 50%.

EUROPE FOOD WASTE MARKET LANDSCAPE



INSTOCK

The whole story behind Instock started with four trainees at Albert Heijn. There, they experienced food waste and decided to take action. They came with the idea of opening a restaurant where the chef creates recipes based on surplus food. Albert Heijn sponsored them and a first restaurant was opened. The surplus food came directly from the Albert Heijn stores. Currently, Instock consists in three restaurants (Amsterdam, The Hague and Utrecht), a food truck and a catering service. Besides restaurants, the startup has also developed some food waste products: two beers brewed with surplus bread or potatoes and granola made out of the malt residue due to the beer production. The little extra, they turned the basic 'best-before' dates into 'at least delicious until' dates to empower consumers to make better decisions about how to interpret dates on packages.



TOOGOODTOGO

What's the concept? The Too Good To Go team noticed that many restaurants, shops or bakers had to throw away food every day at closing time. The app gives them the opportunity to sell all this surplus food at a price cheaper by 50%. So consumers have access to cheaper meals while stores get a last chance to sell what they would usually throw in a bin. What a fair deal! Since 2016, they built more than 3.000 partnerships, the app was downloaded more than a million times, and was even the number one in downloads when it entered the Belgian market, and at least two million meals were saved!



CRONOGARD

Special inorganic components capture contaminants in water vapor and gas, while an organic molecule makes the packaging surface less susceptible to colonization by microorganisms. This gives the food an optimal environment, which benefits its shelf-life. Italian startup Cronogard patented a technology used in packaging to reduce the formation of biofilm on packaging surfaces. The protective and antibacterial activity of Cronogard inhibits the agents responsible for organoleptic decay from forming inside the package thereby extending the shelf-life of packaged food.

EUROPE FOOD WASTE MARKET LANDSCAPE



UPPRINTING FOOD

Upprinting Food, a Netherlands-based startup, uses 3D printing technologies to upscale different kinds of food waste into elegant snacks. How? A 3D printer is fed with food paste, with which it prints appealing shapes and designs. The printed food is then baked and dehydrated to last longer. Upprinting Food's idea started off with old bread that was mashed and mixed with water, spices, and herbs to make a crispy, tasty snack. The startup has now extended their ingredients to include fruits and vegetables. Their aim is currently to help restaurants analyze and reuse their food waste.



CULINARY MISFITS

Started by two friends, Culinary Misfits seeks out the ugly vegetables at grocery stores, farmers markets, and restaurants and turns them into delectable dishes at the events they cater in the city.



FUSIONS

After recognizing that the European Union discards approximately 89 million tons of food every year, Brussels has pledged, through the FUSIONS program, to reduce that number by half by the year 2025. Currently in development, FUSIONS hopes to tackle the issue throughout the supply chain, working with farmers so that they don't reject less-than-perfect-looking produce. And they work with grocery stores to offer discounts to consumers on products that are nearing their expiration dates.

EUROPE FOOD WASTE MARKET LANDSCAPE



LAST MINUTE MARKET

Last minute market works with farmers, processing centers, grocery stores, and other food sellers to reclaim food. Founded by BCFN adviser Andrea Segrè, LMM now runs food donation programs in more than 40 Italian communities



SAVE FOOD FROM THE FRIDGE

Jihyun Ryou, Korean designer and expert on food preservation, launched this project that attempts to prevent waste in homes. She outlines several ideas for keeping foods fresher longer without the use of modern kitchen technologies. In addition, she has also created a collaborative blog where anyone can submit their own innovative food storage ideas.



STOP SPILD AF MAD

Danish food expert Selina Juul's campaign inspired Danish supermarket Rema 1000 to replace buy-one-get-one-free and other quantity-based discounts with general discounts in all of its stores. Such discounts, frequently implemented by grocery stores to get produce off the shelves, often result in food being wasted at home.



NOFOODWASTED

NoFoodWasted aims at reducing food waste in the Netherlands by 50 percent in the next five years. This app stimulates demand for discounted products with a best before date. It alerts supermarket shoppers which items are approaching their expiration date.

ISRAEL FOOD WASTE MARKET LANDSCAPE



LEKET ISRAEL

Leket Israel – the National Food Bank – collects surplus food from farms and restaurants, distributing the food to nonprofits throughout the country to feed an estimated 175,000 needy Israelis weekly. Partnering with the Good Energy Initiative, Leket also ensures that food no longer suitable for human consumption doesn't go to waste by recycling lost food and supplying it to farmers to feed their animals.



AMAIZZ

Amaizz helps customers reduce food loss by up to 50 percent with drying, refrigeration, and storage solutions that prevent food from spoiling and degrading. Genie Energy company's products target clients including small- and medium-scale farmers, commercial farmers, factories, and logistics centers.



SUFRESCA

Sufresca develops edible coatings for fruits and vegetables that facilitate longer shelf life and reduce post-harvest loss and waste. Sufresca's coatings are tailored for each targeted fruit or vegetable using specific liquid formulations that are suitable for both traditional and organic agriculture.

wasteless

WASTELESS

Wasteless has developed dynamic pricing technology that automatically cuts the price of products on the shelf when their expiry date is approaching. The price of a product is determined by a machine learning system that accumulates a large volume of knowledge from all the supermarkets of the participating chains. In addition to the technology's consumer value, the system increases the chains' sales, while simultaneously significantly reducing the amount of food thrown away.

INDIA FOOD WASTE MARKET LANDSCAPE



JSAMEY BIOTECH PVT. LTD

We have seen trends like farm to fork or farm to plate; Jsamey is the Farm to Farm concept. We collect the food waste from various hotels and restaurants and convert it into nutritious organic fertilizer through the fermentation process.



FEEDING INDIA

Feeding India is a NGO run by youth, started by Ankit Kawatra, which works to end hunger & malnutrition. The initiative is headed by a core team of working professionals who come from different backgrounds like consulting, marketing, e-commerce, etc. Starting with a team of 5 in August 2014, they now have a network of more than 2,200 volunteers in 32+ cities. Feeding India has served 1,300,000+ meals till date. Their belief is that there is no need to create new food to feed the less privileged, but to simply direct the extra food which is already created.



GIVEAWAY

GiveAway founded by, Asif, Nareshwar Sivanesan and Fahd Khaleel Wallajah, were always concerned about the problem of hunger in the country and as an effort to address the interlinked problems of hunger and food wastage. It all started in September, 2015. GiveAway started its journey by collecting extra and leftover food from households, wedding receptions, restaurants and parties from all over Chennai & personally went to these places to collect the food and to ensure that it was packed in a safe and hygienic manner before it was delivered to the beneficiaries. Soon they started taking requests on WhatsApp.

INDIA FOOD WASTE MARKET LANDSCAPE



NO FOOD WASTE

No Food Waste is a social startup, began in Coimbatore, which is working to address urban hunger. It has a mobile app of the same name that allows it to crowd source data on hunger spots in India and take requests for donation of excess food.

The app has identified 80 such spots in Delhi and the national capital region. "Anyone can pinpoint a place as a hunger spot on our app, and our team verifies it and updates our database. Individuals can directly donate food or request us, through the app, to collect and distribute it, which we do through our volunteers," says No Food Waste's founder Padmanaban Gopalan. For now, the initiative is entirely crowd funded and is looking to tie up with individuals and organizations alike to scale up the operations significantly. Soon the startup will be working with Greater Chennai Corporation to accomplish their objectives. Parallely, the project will also set up 2 fridges at restaurants/bakeries in its initial run to enable a 'public take away' system for the homeless.



S4S TECHNOLOGIES

S4S preserves or converts fresh onion into a dehydrated form having one year of chemical-free shelf life at ambient conditions. Using solar dryer, a patented technology, it increases the shelf life of perishable food items to up to a year without the use of preservatives and chemicals.

SE ASIA FOOD WASTE MARKET LANDSCAPE



UGLYFOOD

The vision statement of Singapore-based startup UglyFood says “to be the leading go-to company well-known for reducing food wastage in the supply chain”. The founder, an SUTD-SMU Double Degree Programme graduate, Pei Shan found the inspiration when her grandmother was ill with cancer. She started reading more about healthier food choices when she stumbled upon a video about food wastage on social media. Upon research, her team found out that in the insta-worthy age, food that is not “cosmetically” attractive is wasted more. Shoppers don’t want to sell it and buyers don’t want it on their tables.



GOOD FOR FOOD

Another Singaporean startup working towards the cause of food waste management is Good For Food that uses technology to track food wastage. Founded in March 2017, this startup uses artificial intelligence and data analytics to help businesses reduce food waste and lower costs. Their first product is a “smart dustbin” called ‘InSight’ that uses big data and machine learning to track the types and quantities of disposed of food being. Every time food is discarded, InSight’s smart sensors and camera weigh as well as identify the waste



GRUB CYCLE

The objective of this startup is to raise awareness about food wastage and its implications while making surplus food accessible to people at bargain rates. The Grub Cycle app known as Grub Bites allows registered users to buy food from a selection of listed restaurants at bargained prices. This enables restaurants and cafes to sell off the over-produced food, reducing wastage, and increasing revenue while allowing buyers to purchase food at cheaper costs- a win-win situation for all.



GARDA PANGAN

Garda Pangan, a Surabaya-based startup and social enterprise is focusing on addressing this issue with two main objectives- the eradication of food wastage and human relief by the elimination of the struggles of hunger. Garda Pangan rescues food from the hospitality industry and serves it to those in need. They have a Standard Operating Procedure (SOP) to determine the quality of procured excess food. The usable portion is distributed to poor families while the expired portion is sent to farms where it is processed to make animal feed or compost.

AUSTRALIA FOOD WASTE MARKET LANDSCAPE



YUME

Australian-based Yume, founded in 2014, has raised about \$2 million for its online platform where vendors can offload surplus food before it spoils at deeply discounted prices



GOOD FOR FOOD

One way to reduce food waste is through the use of barrier packaging. It protects food from external factors such as oxygen, moisture, light and extends a product's shelf life. Australian startup PA Packaging Solutions offers home compostable barrier packaging, made from renewable resources such as plant fibers, that give a longer shelf life to products and turns into compost in 26 weeks.

CANADA FOOD WASTE MARKET LANDSCAPE



LOOP MISSION

This Montreal-based company specializes in repurposing outcasts of the food industry, creating a circular economy by creating cold-pressed juices made from surplus produce. They also make delicious sour beer out of day-old bread and plans are underway to launch a fermented bubbly drink this spring.



FEEDBACK

The Toronto-based app borrows a tactic from airlines, offering time-specific deals from more than 300 local restaurants. At non-peak times, hungry diners can get takeout at up to 80 per cent off the original price.

SOUTH AMERICA FOOD WASTE MARKET LANDSCAPE



BARNANA

Barnana produces snacks from dehydrated bananas, sourced from Latin America, that would have been otherwise wasted — either because they're scuffed, too ripe, or an unappealing size for consumption. The company has even "close(d) the banana waste loop."



DUBAI FOOD WASTE MARKET LANDSCAPE



AL MAHA DESERT RESORT

The Songhai Centre is a sustainable development organization that, among other projects, teaches environmentally conscious farming practices in rural areas in Benin, Nigeria, Liberia, Sierra Leone, and the Democratic Republic of the Congo. Their agricultural education is based on a policy of production totale zéro déchet (zero waste total production) – in the organization's own words, "the byproducts of one field are valuable raw materials for another."



BON APP

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AFRICA FOOD WASTE MARKET LANDSCAPE



SONGHAI CENTRE

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INTERNATIONAL FOOD WASTE MARKET LANDSCAPE



Think *Eat* **Save**

THINK.EAT.SAVE

This initiative, launched by the U.N. Environment Programme and the U.N. Food and Agriculture Organization, works to reverse food loss and food waste by providing consumers, retailers, leaders and the community with advice and ways to take action to reduce their yearly food waste. The campaign aggregates and shares different methods of conserving food, including policy recommendations and steps that consumers and households can take on their own to prevent waste.

 **SKOOL**

SKOOL

In partnership with the United Nations Food and Agriculture Organization (FAO), the International Food Waste Coalition implemented the SKOOL pilot of Do good: Save food!: an initiative to link together all the actors in school catering to reduce food waste throughout the chain and reassert the value of food.

SOURCES :

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