

# Sustainable Biodegradable Solutions Reshaping the Food Packaging Industry



## TOPICS COVERED

**FOOD CONSUMPTION & WASTAGE**

**PLASTIC IN PACKAGING**

**TRADITIONAL VS ALTERNATIVE  
PACKAGING**

**ALTERNATIVE FOOD PACKAGING**

**SOLUTIONS ACROSS THE GLOBE**

*OVERVIEW*

*PACKAGING SOLUTIONS*



## TOTAL WORLD POPULATION

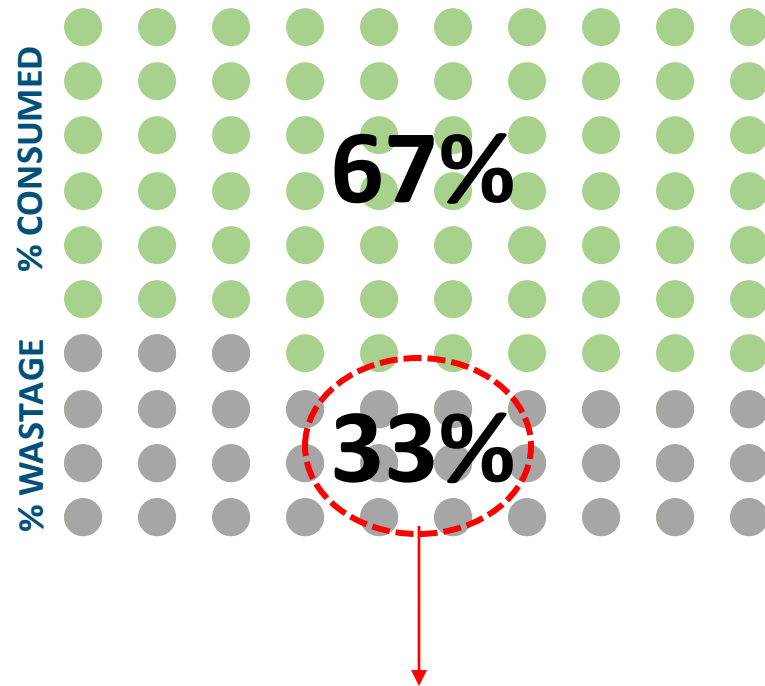
**7.8 Billion\***

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## FOOD PRODUCED FOR HUMAN CONSUMPTION

**4 Billion Tons\***

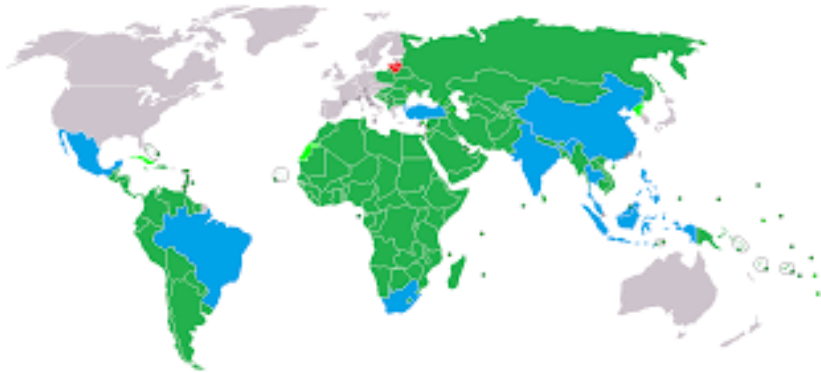
## % FOOD CONSUMED VS WASTED



STAGGERING **1/3<sup>RD</sup>** OF ALL FOOD PRODUCED FOR HUMAN CONSUMPTION IS LOST BETWEEN PRODUCTION & DISTRIBUTION PHASES

# FOOD LOSS PATTERNS – DEVELOPING VS DEVELOPED COUNTRIES


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In **developing countries**, early stage, postharvest food loss is significant due to structural and financial limitations



In **developed countries** food loss occurs largely in the later stages, for example when products are not consumed in time and expire



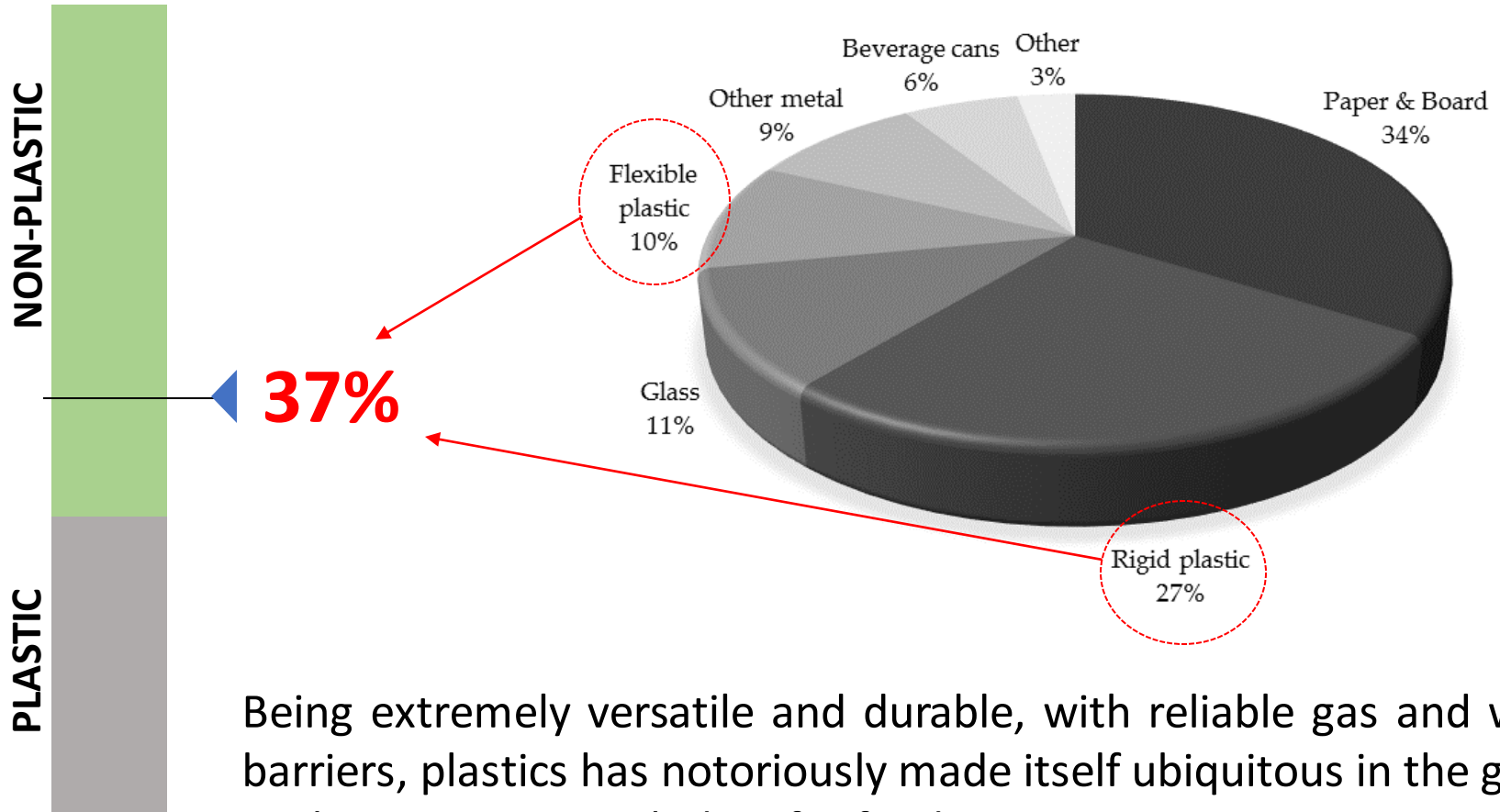
*To address hunger, investment in food production is a welcome move but it must be complemented with **STRATEGIES FOR REDUCING FOOD LOSSES** as a way to advance food security as well as to feed the hungry*

*Packaging has a vital role to play in containing and protecting food as it moves through the supply chain to the consumer. The main function of packaging is to **PROTECT THE PRODUCT AND EXTENT SHELF LIFE.***

# PLASTIC PRESENCE IN PACKAGING

Estimated that 37 per cent of the packaging products are made from rigid and flexible plastics, which makes plastic the most used packaging material

Market share of food packaging materials



Being extremely versatile and durable, with reliable gas and water barriers, plastics has notoriously made itself ubiquitous in the global packaging sector, including for food items

# WHY NOT RECYCLING?

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- Experts across the globe are raising awareness about recycling
- Is recycling a long-term solution?
- Most recycled plastics get shredded, melted, and reformed into goods.
- But plastic is quite good at what it does, which makes replacing it so devilishly difficult.



**"If only bananas had robust, natural, bio-degradable packaging of their own. Some sort of peelable skin, perhaps..."**





- **Traditional methods** were largely confined to glass, wood, leather, plant leaves-based (like dried sugarcane leaves) packaging.

- **Current Food Packaging Alternatives:** The major raw materials that are being used to provide alternative packaging are bioplastic (Polylactic Acid), wood pulp, cellophane, cellulose, seaweed, palm leaves, bamboo, banana leaves and mushroom



- **Polylactic Acid:** Almost every country is focusing on increasing the production of PLA in order to use it for food packaging solutions..



- **Innovative methods:** Apart from bioplastic and traditional methods, seaweed, fruit peels are also being used as raw material for food packaging.

- **Paper:** Paper is being used in place of polybags and increasingly finding application in quick service restaurants and burger chains.





UNITED STATES OF AMERICA (USA)



## Traditional Packaging Methods

- Glass, Pottery, paper.....

## Current Status of Biodegradable/composable solutions

- Major Innovation and commercialization in PLA, starch, biodegradable polyesters etc.

## Research & Development

- Universities are creating new forms of food packaging. Eg- 3D printed straws made of sugar and seaweed extract. Shrilk, made from shrimp shell extracts and silk protein derived from insects

## 100% Compostable Packaging Solutions made from Mushroom (Mycelium Technology)



- The company uses mycelium technology to provide packaging solutions to its customers
- Company's mushroom packaging is made from mycelium and agricultural byproduct of hemp
- It's a high-performance packaging solution that's cost-competitive with conventional foams, yet 100% home compostable

## Plant-based NON GMO materials



# alter eco

- The company launched world's first compostable, non-GMO, non-toxic candy wrapper and invented world's first compostable stand-up pouch
- Raw materials: Plant based non-GMO materials, FSC eucalyptus & birch trees called Natureflex (Innovia) and inner layer is made from a certified commercially compostable resin called Mater-Bi®

- Alter Eco sells chocolate and chocolate-centric snack products
- The company produces a line of chocolate bars and chocolate truffles that are organic, non-GMO, and some are vegan

## 100% Plant Fiber: Recyclable & Compostable Food Packaging



- Be Green Packaging specialize in the design, manufacture and distribution of compostable packaging solutions.
- The company global manufacturer of specialty molded fiber packaging for foodservice, a wide range of consumer packaged goods



- The company offers biodegradable, recyclable and eco-friendly packaging for restaurants and small businesses
- The product line includes clamshell containers, plates, trays, cups, lids, and sushi trays
- Foodservice line composed of renewable, wild-harvested plant fibers such as bulrush, bamboo and bagasse, containers are oven safe, microwave safe, and freezer safe

## Bottles made from Paper



- THE ECO.BOTTLE® manufactures paper bottles made from recycled materials
- The company manufactures bottles with recycled fiber and polymers

ecologic  
packaging the earth can live with

- The inner liner and outer shell are made of recycled plastics and rest of the body is made of molded fiber shell
- The company is catering to segments such as personal care, alcoholic & non-alcoholic beverages, food & powder, pet care and home care
- Product design: Outer shell is made from 100% recycled cardboard and old news paper and inner line is made of recyclable monomer



## Bio-degradable, Compostable & Edible Six Pack Ring



- The six-pack rings are 100 percent biodegradable and edible—constructed of barley and wheat ribbons from the brewing process
- Raw materials: This packaging can actually be safely eaten by animals that may come into contact with the refuse, it is constructed of barley and wheat ribbons from the brewing process

- The company is a craft beer manufacturer and is based out of Florida
- The company is the first brewery to use and implement the Eco Six Pack Rings, first ecofriendly six pack ring made from by-product waste and other compostable materials

## 100% Compostable Food Containers



# LEAN ORB

- The company uses bagasse, bamboo, areca palm leaf and wheat straw as basic raw materials
- Bagasse – fibrous stalks from sugarcane are utilized to manufacture sustainable plates, bowls, compartment trays and containers, biodegradable within 90 days
- Bamboo – the company utilizes bamboo to manufacture natural cutlery
- Wheat Straw – Used as a sustainable alternative for Styrofoam
- Areca Palm Leaf – Disposable tableware, biodegrades within 6 weeks

## Pizza Products & Lids



- The company manufactures 100% biodegradable plates, trays, container, food boxes and clamshell
- Major raw materials that company uses are wheat straw, sugarcane, and cornstarch

**ultra green**  
Sustainable Packaging

- UltraGreen manufactures plant-fiber packaging solutions which are 100% compostable and biodegrades in a commercial composter in 60-90 days
- Company's plant-fiber products are ASTM 6868 certified, and all bio-plastic (PLA) products are ASTM 6400 certified
- Products are biodegradable, compostable, bakeable, microwaveable and freezeable



INDIA



## Traditional Packaging Methods

- Pottery, paper, leaves, leather.....

## Current Status of Biodegradable/composable solutions

- Major Innovation and commercialization in plant-based starch food packaging solutions

## Research & Development

- Development for creating new forms of food packaging from seaweed, plant based starch etc..

## Poly Lactic Acid (PLA)



- The company produces & uses PLA packaging as an alternative to the plastics which pollute the environment.
- The company has more than 5000 valued customers in India and also exports its product to 30 other countries for the commercial solutions.
- The company manufactures plastic ancillary equipment and the packaging materials.
- The company has around 20 years of experience in custom plastic injection moulding and in thin wall plastic packaging

## Bagasse



ecoware™

- Ecoware was founded in 2010. The company take crop waste and turn it into a commercially viable product to curb the menace of single-use plastics which have caused untold damage to the environment and adversely impact human health.
- The company have 12 sales partners globally, 23 distributors in India and 500+ point-of-sales shops.

## Appreciations Received:

- Finalist, The Circular Awards, World Economic Forum, Davos
- Runner-up, Indian Circular Economy Awards, New Delhi
- Member, National Restaurants Association of India
- Sustainable Vendor of the Year, Wal-Mart

## Areca leaf plate



### Manufacturing Process:

- The leaves of the areca palm tree (Areca Catechu) are picked up from the ground.
- They are originally used to harvest betel nut. The tree is endowed with huge leaves and fronds, which shed and fall to the ground every few weeks.
- The fallen fronds of the Areca Leaves are collected, soaked in hot water and compressed to a form of a design plate between two hot casts.
- When the Areca plate cools down it will harden to a form which can endure even a bit harder use.



- Eco palm leaf is one of the leading areca leaf plate manufacturers and exporters in India.
- The company supply various type of areca leaf plates like square shaped areca leaf plates, round shaped areca leaf plates, rectangular shaped areca leaf plates and so on.
- The company create best quality eco palm plates through their unique product life cycle.





CHINA



## Traditional Packaging Methods

- Pottery, paper, leaves.....

## Current Status of Biodegradable/composable solutions

- Major Innovation and commercialization of packaging made from raw materials such as corn, sugar and other crops.

## Research & Development

- Universities are creating new forms of food packaging from plants and crops

## Shower-friendly paper



- The products use advanced equipment and facilities to perfect every detail in the flow, ISO complied QC system assure you high and stable quality.
- Easy Green have exported products and services all over the world, especially in Europe, North America, Oceania, Southeast Asia and South Africa with tremendous reputation.

- Easy Green Eco Packaging Co., Ltd., is specialized in supplying safe, eco-friendly disposable food packaging.
- The products including 100% recyclable plastic products , 100% biodegradable pulp products and PLA products, which comply to FDA and EU.

## Poly Lactic acid



- The company is one of biggest PLA products enterprises in China mainland and focus on producing PLA (poly lactic acid) Lids, CPLA Cutlery, PLA Straws, PLA clear cups, PLA foam lunch boxes and dishes etc.
- The company has a high-tech enterprise in researching, developing, producing poly lactic acid (PLA) and modified products.



- Anhui Hengxin Environmental Protection and New Material Co., Ltd. is a modern high-tech enterprise, which is dedicated to research, development, production and sales of environmental products.
- The company is a large-scale production manufacture of PLA products in China, takes an important role in PLA disposable catering products in international market.

## Bamboo Fibre



- Xiamen Ebei is an eco-friendly products supplier from China, we are focusing on bamboo products for more than 6years, we have wide range of bamboo products



- The company is able to combine bamboo with metal, ceramic, glass, acrylic, stone to get a better combination on functions and colors.
- Apart from the existing range products, the company does OEM designs as well.

## Corn Starch



- Shandong Lianhong Plastic Co. Ltd is located in Shandong province of China, nearby Qingdao airport and seaport. the company does production and sales of plastic product business.
- The company owns the most advanced machines, strong technical development and research capability, and complete quality control system.
- The company's R&D capability and can also produce according to customer's most specific requirements.
- The company earned good reputation among customers with the quality products.



GERMANY

## Traditional Packaging Methods

- Beeswax, paper.....

## Current Status of Biodegradable/composable solutions

- Major Innovation in food packaging made from plant leaves and cellulose based food packaging films

## Research & Development

- Universities are creating new forms of food packaging from plants extracts and residual timber



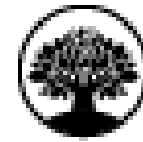
## 100% Compostable Food containers made from palm leave



# arekapak

- Arekapak products are made from an untreated agricultural by product - with no added chemicals
  - Packaging products are 100% compostable and bio-degradable, products bio-degrade within 90 days
  - Process: Leaves of areca palm leaves are collected, washed and dried in the sun and finally pressed into shape
- Arekapak is a start-up and was established in February 2019 in Germany
  - Currently the company is developing its prototype and trying to materialize the concept

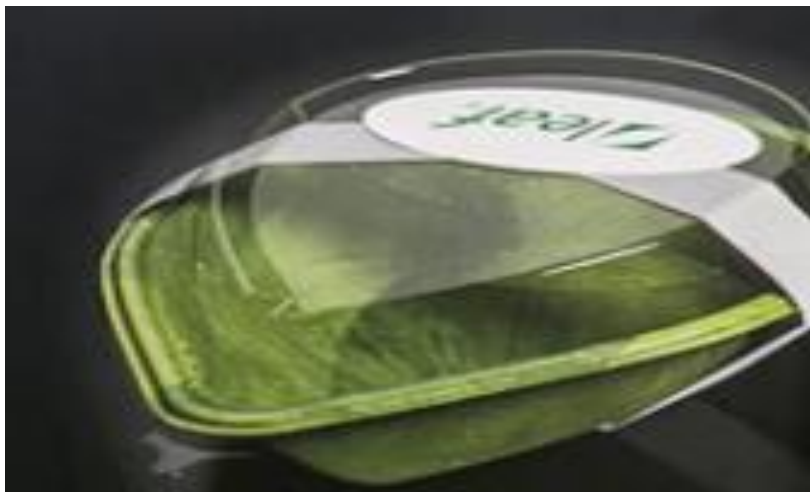
## Co2 Neutral Independent Packing Solutions



**PAPACKS®**  
PACKAGING BY NATURE

- PAPACKS® is a developer and initiator of CO2 neutral, independent packaging cycles and solutions
- The company offers 100% plastic-free and fully recyclable coffee capsule and cutlery
- The company is a producer of environmentally friendly and recyclable packaging from, for example, fast growing plants or secondary raw materials

## 100% Compostable Food containers made from leaves



- The company is a manufacturer of 100% bio-degradable food packaging solutions
- Products are made of leaves and bio-degrade within 28 days
- Process: Sketch to renderings followed by 3D prints of prototypes to CNC-milling of the tools

## 100% Compostable Food containers and cutlery

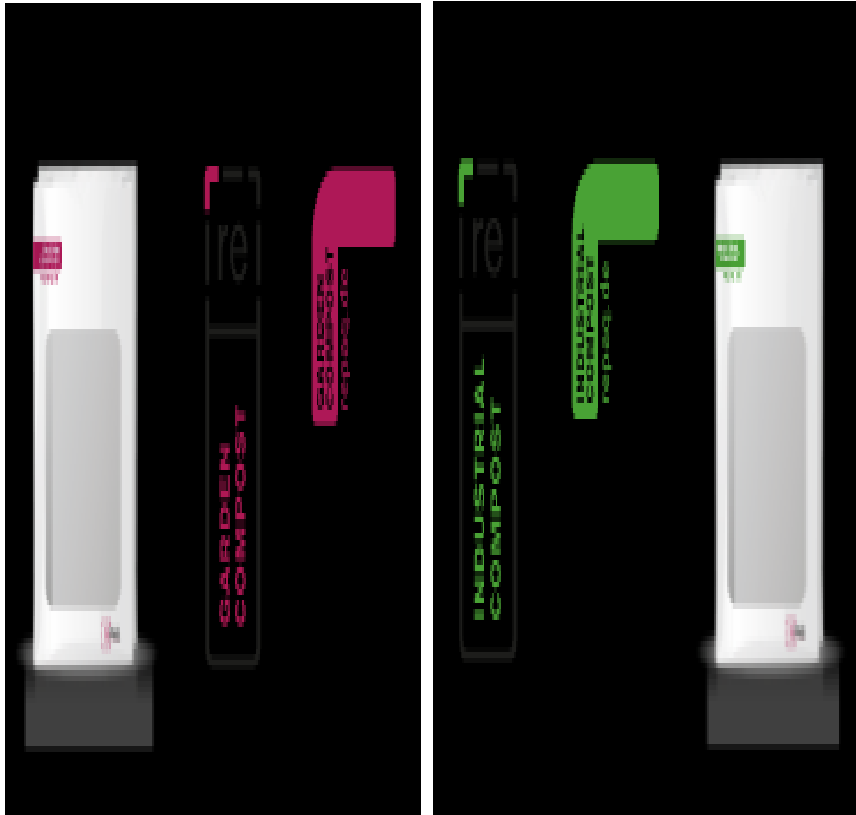


- BIO-LUTIONS is an innovator in the field of bio-materials and a creator of biodegradable materials and products. The bio-materials made from agricultural residues, paired with innovative production processes, make sustainable packaging and disposable tableware affordable



- BIO-LUTIONS offers sustainable packaging and disposable tableware solutions made of agricultural residues
- BIO-LUTIONS products are designed to be part of a circular economy. They can decompose under natural conditions, be used for Biogas production, be recycled, or burned with a near CO2 neutral carbon footprint

## Pioneer in 100% bio-degradable Film Packaging



- RePAQ cellulose consists to 99% of renewable and natural resources – 90% cellulose, 5% glycerin and 4% water. The cellulose is obtained from residual timber from forestry

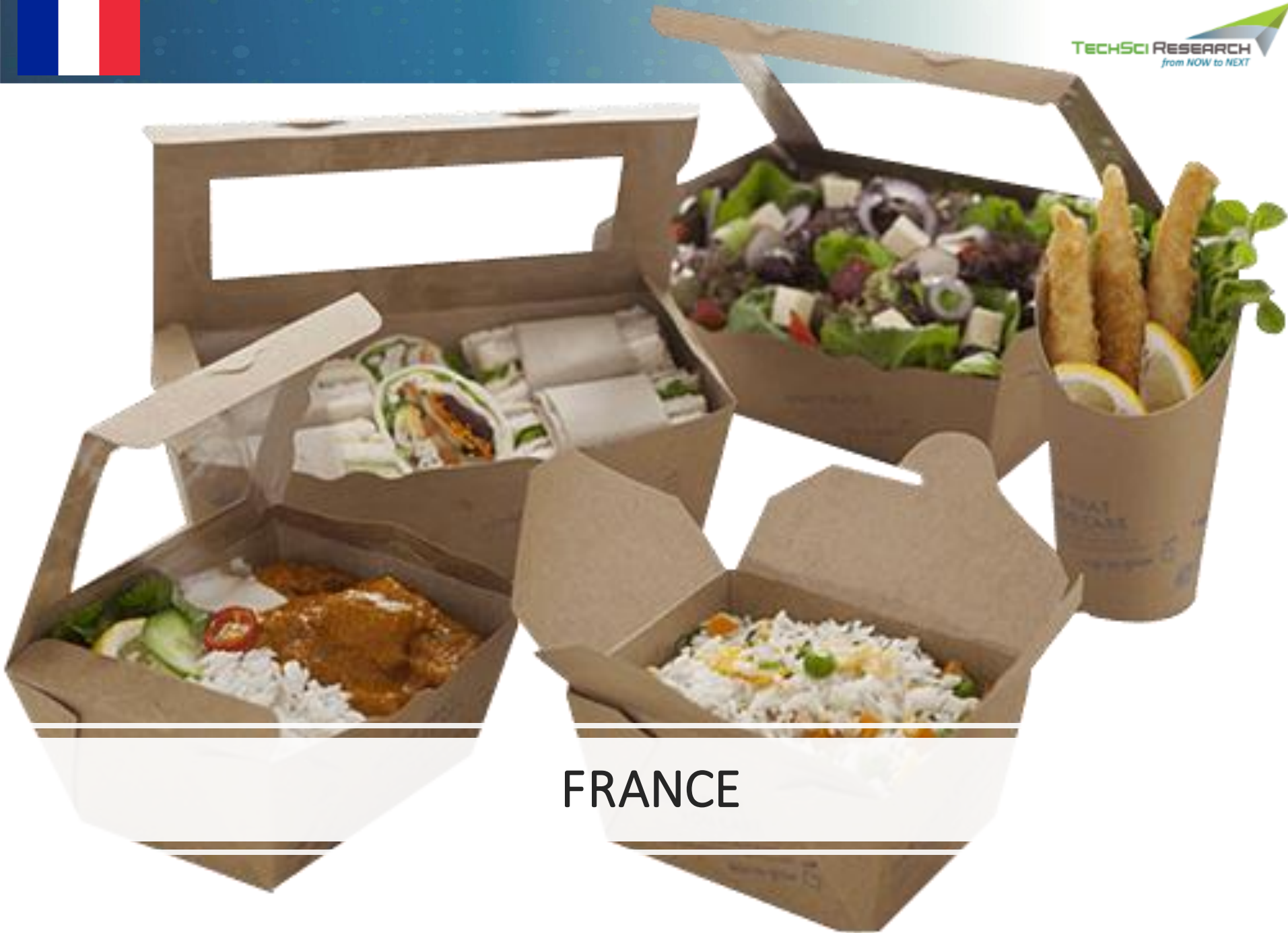
- RePAQ cellulose is the only plastic free printed film packaging throughout Europe which is verifiably 100% biodegradable
- The raw material is residual timber from the FSC certified forestry, Only fast-growing GMO-free (genetic modification-free) plants are used
- RePAQ cellulose is certified by the German TÜV and compostable in both home and garden. Right now this is the highest environmental standard for film packaging worldwide

## Compostable Food Packaging



- In 2017, Bio4Pack become world's first company with its sustainable packaging solution for fresh meat
- The company was founded in 2009, and has been manufacturing compostable and sustainable packaging
- Products comply with various stringent EN, AS, OK Compost Home, OK Biobased and ASTM standards

- Repaq cellulose consists to 99% of renewable and natural resources – 90% cellulose, 5% glycerin and 4% water. The cellulose is obtained from residual timber from forestry



FRANCE

## Traditional Packaging Methods

- Paper, leaves.....

## Current Status of Biodegradable/composable solutions

- Major Innovation and commercialization of packaging made from raw milk protein and corn starch

## Research & Development

- Universities are creating new forms of food packaging from plants and amalgamation of natural fibers, paper and water.



## Edible Food Packaging from Milk Protein



- Lactips produces water soluble and biodegradable thermoplastic pellets based on milk protein
- The company is already providing edible packaging solutions to detergent and soap industry and is likely to roll out its food packaging product line in 2020
- The company has received funding from the European Union's Horizon 2020 research and innovation program under grant agreement No 766603

## Food Containers from Bamboo Fibers

# EKOBO



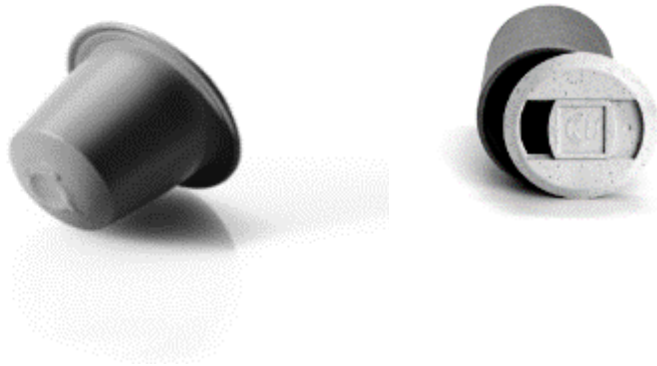
- The company manufactures alternative packaging solutions to plastics, disposable or fragile dishware, products are Forest Stewardship Council (FSC) certified
- Raw material: Bamboo fibre with a 100% food-grade melamine binder
- Biobu brand caters to dishware segment which mainly includes food containers, food trays, ice-cream sets, cups, plates, and bowls

## New Range of Flexible and Biodegradable Cooking Molds



# solia

- Solia provides high-performance molds, entirely made of genuine greaseproof paper
- Baking molds are made from renewable materials (cellulose), biodegradable and compostable
- Tableware is made from bamboo fibres and lamination contains starch-based PLA which provides resistance to moisture and grease
- It also manufactures dishes made from palm leaf



- Vegeplast produces VEGEMAT®, raw material for the development and production of compostable, biobased, and environmentally friendly packaging and consumer goods
- It also manufactures products for food packaging, biotray is one of their products
- Products are 100% biobased, biodegradable and in compliance with European Standard EN13432



- Lyspackaging is a manufacturer of Veganbottle, ecological compostable containers made from sugar co-product
- Products are made from 100% compostable material
- The company is catering to over 60 clients and manufactures 4000 bottles per hour
- Raw material (sugar cane) is converted into biopolymer which is used to manufacture vegan bottles



UNITED KINGDOM (UK)



## Traditional Packaging Methods

- Paper, leaves.....

## Current Status of Biodegradable/composable solutions

- Major Innovation and commercialization of packaging made from seaweed, PLA etc.

## Research & Development

- Centre for Process Innovation (CPI) has collaborated with leading packaging companies to develop alternatives to commonly used fossil-based polymers.

## Packaging Solutions made from Pulp, Wood and PLA



- Biopac was set up in 2002 and is UK's leading developer, manufacturer and supplier of eco-friendly food packaging and catering products
- The company uses polylactic acid or PLA which is derived from corn starch, it breaks down completely in less than 12 weeks
- KFC and Burro e Salvia are some of the clients worth mentioning. Biopac provided clamshell and take home box





## Packaging Solutions made from Pulp, Wood and PLA



- Sovereign is a food packaging supplier of quality disposable products to the upmarket coffee and food to go sector
- Goodlife® brand, the latest product is plastic free hot cups which do not require industrial composting and can be recycled in the local paper recycling stream with newspapers and cartons

## Packaging Solutions made from Pulp, Wood and PLA



- Ooho (edible water packaging) and other packaging solutions are made from Notpla, a material made from seaweed and plants that disappear naturally
- The company encapsulates a wide range of sauces, salad dressings and condiments. Target market is take-away industry, quantity of sachet is ranges from 10-60 ml and can be composed with the rest of the food waste

# Zeus (Acquired VaioPak) : Alternative Food Packaging



- Zeus was established in 1998 and is one of the largest packaging companies in Ireland & the UK
- The company offers retail and food industries with products such as coffee cups, salad containers, deli trays, cutlery, and fast food supplies
- Acquisitions: Acquired VaioPak Group, a UK based packaging company
- Leaf coffee cups are made from sustainable and renewable resources, lined with a plant-based wax which means they are 100% biodegradable and compostable. The lids are made from a corn-based starch known as PLA



## Corn, Beet and Sugar Cane PLA



- PLA, bio based plastic and MATER-BI®, both 100% biodegradable and compostable bioplastics.
  - PLA is a bioplastic produced from renewable sources (Corn, beet and sugar cane), biodegradable and compostable.
  - The great mechanical performances allow to reduce the weight of the packaging.
- Mater-Bi is a bioplastic mainly coming from plant starches of different nature, compostable according to the European standard EN 13432, 100% biodegradable. It has a thermal-resistance up to 90°C

## Corn-based Starch, Bagasse



- The waste materials from the crops (i.e. the natural starch produced from corn and the fibers from sugarcane known as bagasse) can all be made into packaging and are a great alternative to conventional petroleum-based plastics which the Greenman's used.



- The company deals with 100% certified compostable plant-based packaging.
- The company is passionate about what they do and passionate about eliminating single-use plastic from the food service industry.
- The plant-based products are made from annually renewable plant crops like corn, sugarcane and potatoes.



BRAZIL



## Traditional Packaging Methods

- Paper, corrugated boxes.....

## Current Status of Biodegradable/composable solutions

- Major focus is on recyclable products, but Innovation is being done in food packaging alternatives

## Research & Development

- Research work for 100% biodegradable packaging with raw materials derived from vegetal origin and agro-industrial residues
- Research on malleable film based on cassava starch with a substance called anthocyanin, obtained from grape skin, as additive



**estilopack** | Produtos Sustentáveis

- Estilopack is one of the pioneers in sustainable packaging industry in Brazil and started their operations around 40 years back
- The company provides biodegradable paper and beverage packaging to its customers
- The company has FSC certification and is approved by the Commitment Program for Responsible Social and Environmental Management – able to use the Green Seal Chico Mendes





- Offers its burgers wrapped in edible paper
- Paper is made of rice and can be eaten in one go, negating the need to unwrap the burgers or dispose of the packaging afterwards.
- As part of a marketing campaign called You Cannot Control, co-conceived with Brazilian advertising agency NBS, the idea was formulated to communicate the message that their burgers are quite literally irresistible, as well as providing an environmentally friendly solution to litter. According to Bob, the campaign was so successful that no wrappers were left in the restaurant



ARGENTINA



## Traditional Packaging Methods

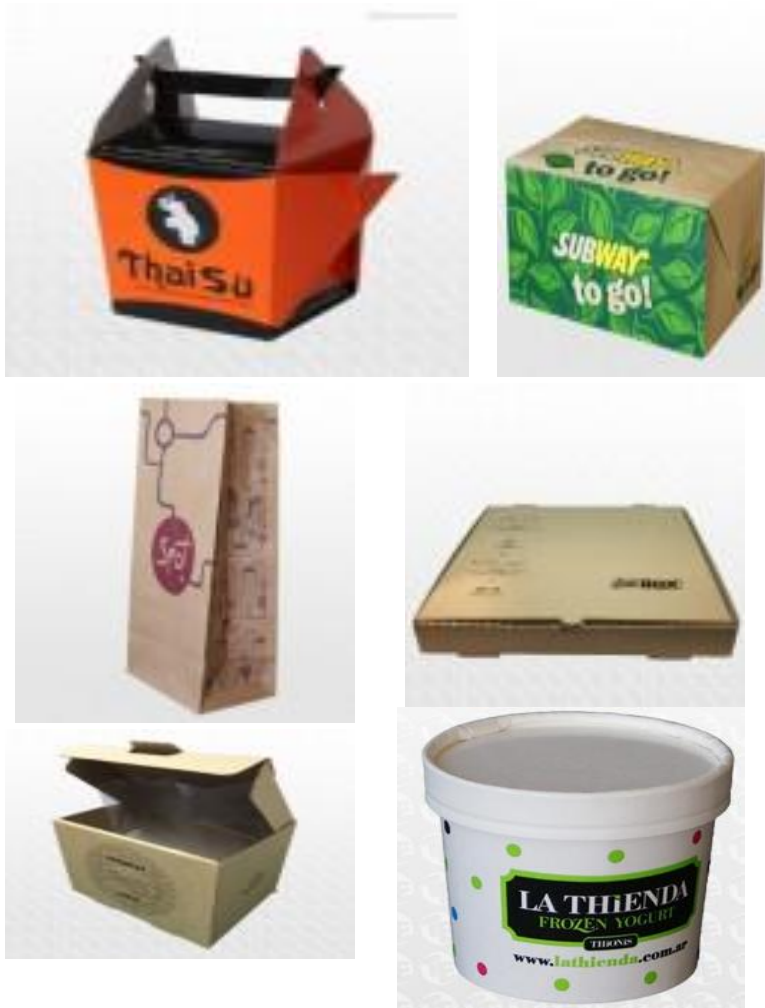
- Paper.....

## Current Status of Biodegradable/composable solutions

- Innovation are happening but the current economy doesn't support commercialization

## Research & Development

- National Institute of Industrial Technology is working on project named PHBOTTLE aiming to reduce bioplastic processing costs, waste water from fruit juice industries used as culture medium.



- The company has been providing disposable food packaging since 1972, it develops and designs packages according to the needs of its clients
- The company incorporates a line of paper, polipapel and cardboard products
- The company has an impressive client base which includes Betos, Subway, Havana and Freddo

# SANOVO GREENPACK Argentina SRL: Alternative Food Packaging



- The company has been providing disposable food packaging since 1972, it develops and designs packages according to the needs of its clients
- The company incorporates a line of paper, polipapel and cardboard products
- The company manufactures cases and maples for eggs, trays for pears and apples



# Mamaland Bioplastics: Alternative Food Packaging



- The company manufactures products made from cornstarch and vegetable oils
- Products bio-degrade from between 90 and 180 days
- Materials used by the company are certified as compostable by European Standard EN 13432



# biotransito

- The provides food packaging solutions for food industry in the form of biodegradable bags which can be used for packaging various food items
- They launched toot-brush made of bamboo recently as part of their mission to manufacture eco-friendly products



# MOVING FORWARD

- ❑ We are on the Verge of a Packaging revolution that could help reduce plastic waste.
- ❑ This revolution is not only driven by packaging startups and established packaging companies but also from FMCG and food sector businesses.
- ❑ TechSci research is helping companies to discover newer products and enter unexplored territories. We are assisting our clients to formulate and develop better strategies for future.







# Thank you!!

*We look forward to serving your research needs!!*

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