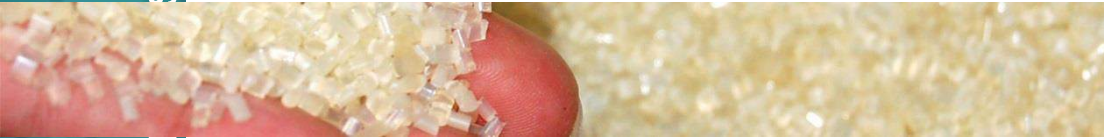From Research...

...to Market

PACKAGING
INNOVATION
TO IMPROVE YOUR
COMPETITIVENESS

ROADMAP
"Active and Intelligent packaging
in the context of Food waste"

CONCLUSIONS OF SESSION 2

9TH OF MAY, INTERPACK 2014

Organized by ITENE in
collaboration with

AIPIA
Active & Intelligent
Packaging Industry
Association

RESEARCH
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BUSINESS, SCIENCE & INNOVATION

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AIM:
Map the route to fight food waste through the latest packaging developments

1. **Map the route through an interactive working session around the** latest technology development **Active and Intelligent Packaging** in the packaging industry to save food in industrialized countries.

2. **Bring Key players of the Food and Packaging industry together** and offer the opportunity to participate and generate networking and new ideas.

3. **Identify challenges and new solutions needed** from an industry to ensure implementation of ready-to-market active and intelligent packaging solutions.

4. **Enable interested companies to work together in common R&D projects**, being ITENE and AIPIA facilitators for this to happen.

¿Roadmapping…?

❑ Roadmapping sessions offers a unique opportunity to work with other members of the value chain or sector on a specific area, to exchange opinions and ideas on the future of a market or subject.

SCOPE OF THE ROADMAP

- 2014 has been declared the EUROPEAN YEAR against Food Waste

- Focus on ¿HOW CAN ACTIVE AND INTELLIGENT PACKAGING CONTRIBUTE TO THE REDUCTION OF FOOD WASTE IN INDUSTRIALIZED COUNTRIES?

- The global food packaging industry has a lot to contribute not only in addressing food losses but also in ensuring food safety as well as enhancing global food trade, which is a key to economic development.

2014 - The European year against Food Waste

2014 The European Year against Food Waste

initiative save FOOD

Methodology used

❑ Roadmapping is a strategic tool that allows to identify key market drivers for a concrete sector, in this case, active and intelligent packaging to reduce food waste, in a predefined time scale, at short medium and long term view, in this case, 2015- 2017 and 2020.

❑ As a result of the roadmap it is possible to obtain key solutions and applications needed to face the challenges and needs of the market, as well as the route to develop applications.

❑ The following report is the result of a 2 hours roadmapping session where participants of the event in Interpack 2014 have shared ideas and opinions.

❑ The results of the roadmap session contains the different comments of participants gathered in post-it and represents the discussions held in the group.

❑ At the beginning of the session, all participants have been introduced to the methodology and the facilitators explained the aim of this "networking session".

Methodology used

During the session participants worked on 2 main parts that builds the roadmap landscape:

1. **Identification of key Market Drivers:**

   ▪ Idea generation using *post – its*, indicating time scale and initials.

   ▪ Generation of market drivers groups by clustering ideas following thematic.

2. **Generation of ideas about applications and solutions to answer the key market drivers identified before**

   ▪ Idea generation using *post – its*, indicating time scale, initials and the associated market driver group.

   ▪ Creation of application groups by clustering ideas.

❑ **Furthermore, connections between market drivers groups and applications have been established.**

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RESULTS OF THE SESSION AND MAIN CONCLUSIONS

Key Market drivers identified

Main conclusions about market drivers

❑ Participants were asked to identify market drivers and trends are mooving innovation in active & intellligent packaging in the context of food waste reduction.

❑ Innovation in this field is framed by **sustainability, concerns about food safety, the need to extend shelf life along the supply chain, and consumers asking for more information, less chemical preservative in food, and more convenience products.**

❑ These have been the most discussed market drivers for active & intelligent packaging and food waste reduction.

Key Market drivers identified

❑ All post-its and ideas shared during the roadmapping session among participants are detailed in the table below. Ideas were put into groups of market drivers.

Ref.	Group	Term-time	Initials	Comments
1	SAFETY	2016	RC	FOOD SAFETY. MIGRATION. BARRIER TO INHIBIT EXTERNAL HARMFUL CHEMICALS
		2018	JG	TRUST: CAN WE TRUST THE PRODUCERS OF OUR FOOD?
		2020	BF	SAFETY/HEALTH. FOOD DEMAND
		2020	JG	TOTAL SAFE. NATURAL FOOD: FISH-MEAT (SALMONELA, CAMPYLO)
2	SHELF LIFE	2015	CW	INCREASE SHELF-LIFE PRODUCTS HAVE TO TRAVEL LONG DISTANCES IN ORDER TO ARRIVE TO CUSTOMERS
		2015	BF	CONTROL OF MICROBIOLOGICAL GROWTH IN VEGETABLES EXTENSION SHELF-LIFE
		2015	BF	EXTEND SHELF-LIFE OF FRUITS (CUTED)/EXPORT
		2020	RC	VITAMIN PRESERVATION IN FRESH FOOD
			BUDK	INCREASE SHELF-LIFE WHOLE SUPPLY CHAIN
3	LEGISLATION	2017	GM	LEGISLATIONS
4	CONSUMERS	2014	JG	INFORMATION ABOUT PRODUCT AND END USER
		2015	PH	EDUCATION: REDUCING FOOD WASTAGE CAN SAVE MONEY, DESPITE PAYING A LITTLE EXTRA
		2016	CW	CLEAN LABEL: PEOPLE ARE MORE WORRIED WITH HEALTH AND THE CONTENT OF PRESERVATIVES IN FOOD
			BUDK	PACKAGING CONVENIENCE FOR CONSUMERS
5	SUSTAINABILITY	2016	CS	BETTER RECYCLING OF PACKAGING (UPGRADING NOT DOWNGRADING)
		2020	YI	SAVE VULNERABLY RESOURCES
			ALM	CREATE RESPONSIBLE PACKAGING WHICH CAN BE COME BACK TO THE ANY PRODUCTIVE CHAIN IN ORDER TO MAXIMIZE THE USE OF NATURAL RESOURCES
6	SUPPLY CHAIN	2014-2015	PH	ADOPTABILITY BY RETAILERS
		2015	YI	ENLONGER SELLING TIMES/TIME TO EAT
		2016-2020	RC	PORTION CONTROL: DISPENSE/SELL ONLY ENOUGH FOODNEEDS
		2018	GM	COLD CHAIN QUALITY/RESPONSABILITY DEFINITION
		2018	GM	MORE TRANSPARENT: INFO OF PRODUCT HISTORY/QUALITY
		2020	JG	E-COMMERCE
			BUDK	PACKAGING DEVELOPMENTS
7	AUTOMATIZATION	2020	JG	ELECTRONIC SYSTEM FOR AUTOMATIC TEMPERATURE INDICATOR
			JG	AUTOMATIZATION

Key Market drivers identified

CONCERN ABOUT FOOD SAFETY

Food legislation is getting more stricter in response to food alerts (e.g. presence of salmonella). Migration from external chemicals to the products. Packaging is essential to preserve quality and safety of food.

Furthermore, consumer habits have changed and there is greater concern for food safety. "Can producers be trusted?" (see table previous slide). Consumers want to purchase healthier products and 100% natural, totally safe, and this requires packaging developments to ensure the total safety in food among the distribution chain and avoid food waste.

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Key Market drivers identified

THE NEED TO EXTEND THE SHELF-LIFE OF THE PRODUCTS ALONG THE WHOLE SUPPLY CHAIN

In these days, market globalization is an opportunity for Food producers and companies to sell their products worldwide. Therefore, it is required to develop packaging that extend the shelf-life of the products to reach the consumers keeping the quality of the products from the beginning.

Increasing shelf life of highly perishable products such as fruits and vegetables, meat or fish, allow on one hand, to fight against food waste and on the other hand, to access new markets and supply customers with good quality products.

Key Market drivers identified

INTEREST IN STANDARDIZING THE LEGISLATION

Legislative requirements are severe in terms of food safety and besides, they must be adapted to technological advances applied to packaging and labelling. New packaging developments will encourage new food safety legislation.

Furthermore, legislative standardization between countries is an increasing demand of food producers and the packaging industry.

Key Market drivers identified

CONSUMERS ask for more information, less chemical preservative in food, and more convenience products.

Due to the growing concern for a healthier diet, consumers are looking for more information about the products during the purchasing process. For this reason, the producers and the packaging industry must work together to provide more information to consumers about the product but in a clearer and simpler way of communication. For consumers it is becoming more and more important to know the origin of the product and should be seen as a tool to increase confidence in the manufacturer.

The concerns about health among people is the driver that supports the demand for healthier, fresher and natural products. Products should be free of chemicals, free of artificial preservatives and additives. Many consumers consider them safer and nutritionally better.

Key Market drivers identified

SUSTAINABILITY and responsable use of natural resources.

Sustainability is also a key market driver which rises the awareness among consumers and companies.

Sustainability and scarcity of raw materials drives the demand and need for more eco-friendly processes, better recycling processes and a more responsible use of natural resources.

The growing concern for the environment is reflected in the need of developing more environmentally friendly packaging, recyclable and reusable materials in the supply chain to optimize the use of natural sources.

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Key Market drivers identified

SUPPLY CHAIN trends and requirements

Globalized markets generates more complex supply chains. A high percentage of food waste is generated during the distribution of food products. Cold chain management of food is getting more and more important as e-commerce channel is increasing product portfolio.

Greater collaboration between producers and distributors, greater control of all processes of the supply chain and new adaptable packaging to these new channels of selling is required.

Another important aspect is the optimization of packaging to the distribution cycle to ensure product safety, cost optimization and controlled information through the Supply Chain to increase transparency.

Key Market drivers identified

AUTOMATIZATION and development of electronic devices to inform about the food freshness or temperature

By 2020, technological solutions based on printed electronic indicators will allow real time information about product freshness, moisture and / or temperature of the food.

Key applications and solutions identified

Main conclusions

❑ Participants were asked to generate ideas about solutions and applications in the field of active & intelligent packaging in order to answer key market drivers identified.

❑ **Main solutions discussed were:**

- Sustainable packaging materials (reuse, recycle, biodegradable materials…)

- Active Packaging to extend shelf life

- Intelligent packaging (freshness indicators, RFID lablels, automatization…)

- Monitorization of supply chain (Double labelling of products, traceability, authentication and temperature control, real time monitoring

- Communication and collaboration

Key applications and solutions identified

❑ All post-its and ideas shared during the roadmapping session among participants are detailed in the table below. Ideas were put into groups of applications.

GROUP	TIME	INITIALS	POST-IT	LINK
1-SUSTAINABILITY	2014	RC	PACKAGING MATERIALS THAT ARE EASIER/BETTER FOR RECYCLING OR EVEN REUSABLE	3,5
	2017	GM	ENVIRONMENTAL CONDITIONS. MONITORING/TRACKING/LOGGING OVER THE PRODUCT LIFE FROM MAKING TILL CONSUMPTION	1,6
2-ACTIVE PACKAGING	2015	BF	PACKAGING WITH HIGHER BARRIER PROPERTIES	2
	2015	YI	OPTIMIZE MAP	1,2,5
	2015	BF	ANTIOXIDANT/ANTIMICROBIAL PACKAGING	2
	2016	RC	SHELF-LIFE EXTRUSION. MIXTURE OF PASSIVE+ACTIVE PACKAGING	2
	2020		PACKAGING THAT REDUCE THE O2/CONTROL MOISTURE/ANTIMICROBIAL PACKAGING	1,2
	2020	YI	ANTIMICROBIAL PACKAGING	1,2,5
	2020	JG	MERCURY SCAVENGERS/ABSORB MATERIAL	1,2
	2020	BF	ETHYLENE SCAVENGERS	2
	2030		PROCESS/PACKAGING THAT ELIMINATE OR MAKE THE COLD CHAIN MORE FLEXIBLE (MEAT/PROCESSED MEAT)	1,2
		ALM	IT IS IMPORTANT TO DEVELOP INTELLIGENT PACKAGING FOR FARMER'S USE=DISTRIBUTION PACKAGING THE FOOD LOSSES FOR VEGETABLES AND FRUITS ARE HUGE BETWEEN FARMERS AND DISTRIBUTION CENTERS	
3-LEGISLATION	2016		TAXATION FOR NON-CONFORMANCE BY LARGE ORGANISATIONS (REDUCING THEIR CARBON FOOTPRINT)	3
	2017	GM	STANDARDIZATION	3
4-EASY COMMUNICATION	2015	BUDK	COLLABORATION BETWEEN FOODPACKAGING TECHNOLOGY AND FILM SUPPLIERS: NO OVERVALUED FILM	2
	2015	BUDK	COMMUNICATION TO CONSUMERS. WHAT IS SUSTAINABILITY? EXPLANATIONS	5
	2018	BUDK	BETTER AND CLEARER UNDERSTANDABLE INFO ON PACKAGING (INTERACTIVE APPS)	1
5-SUPPLY CHAIN	2014	BUDK	AIPIA/ITENE: FORM DEVELOPMENT TEAM WITH RETAILERS	6
	2015	PH	SUPPLY CHAIN LOGISTICS: DOUBLE LABELLING 1ST-PALE/CONTAINER, 2ND-INDIVIDUAL PRODUCT	6
	2015	JG	COMPLETE INTELLIGENT BOX ENVELOPE FOR E-COMMERCE: WHERE I AM, TEMPERATURE RANGE, NOT OPENED/MANIPULATED, OPEN ONLY BY MYSELF	7
	2018	GH	REAL TIME MONITORING ACROSS THE COLD CHAIN FOR INCREASE SHELF LIFE	2
			DEVELOP INTELLIGENT ACTIVE PACKAGES THAT CAN BE COME BACK TO THE PRODUCTIVE CHAIN	
6- INTELLIGENT PACKAGING AND LABELS	2016	RC	INDICATOR/MONITOR OF STORAGE CONDITIONS OR FRESHNESS OF FOOD	1,6,4
	2016	PH	AUTOMATIC TEMPERATURE INDICATOR: HYBRID LABEL OF PRINTED ELECTRONICS + CHEMICAL DISPLAY	7
	2020	YI	O2-SCAVENGERS LABEL	1,2
	2020	BF	MORE ECONOMIC RFID LABELS/PRINTED ELECTRONICS	6
	2020	YI	TTIS	1,2,5,6,7
		GH	SECURE UNIQUE ID (SECURITY)	1,5,6
7-AUTOMATIC	2020	JG	AUTOMATIC SYSTEM WITH AN INK IN THE PLASTIC PAPER MATERIAL	6
	2020	YI	FRESHNESS SCAN + PREDICTIVE MICROBIOLOGY	1,2,6
	2030	YI	AUTOMATIC FOOD STORAGE IN THE FRIDGE (CLUSTERED)	4,5,6

Link to market drivers group

Key applications and solutions identified

SUSTAINABILITY

As a response to different market drivers, this group of application points out in a short term at the employment of **recyclable or reusable packaging materials** and at medium term at the **monitoring of the complete product /packaging life, from design to waste**.

Actions must be carried out for promoting reuse and recycling, involving companies, national and local authorities as well as citizens. Balance between the solution and its environmental impact must be found as a key element of sustainability together with the social aspects related to consumer acceptance.
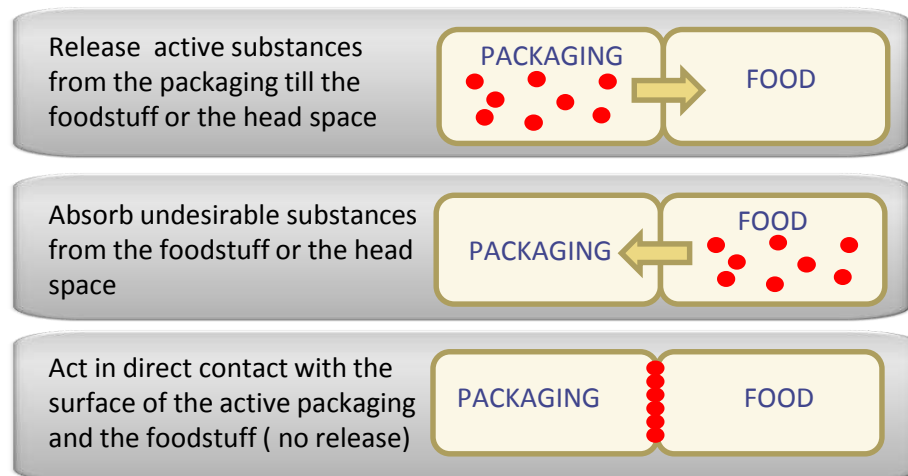
Key applications and solutions identified

ACTIVE PACKAGING

One of the new R&D trends to solve food waste is the development of Active Packaging technologies, able to extend food shelf-life even twice as much as conventional packaging does. These innovative solutions avoid food losses not only in household but also in the industry and commercial sectors. Thanks to these reductions, active packaging contributes to a smarter management of world limited food resources.

A few examples of active packaging were mentioned during the session such as :

- Antimicrobial packaging
- Antioxidant packaging
- Antifungal packaging
- Oxygen scavenger packaging
- Ethylene scavenger packaging
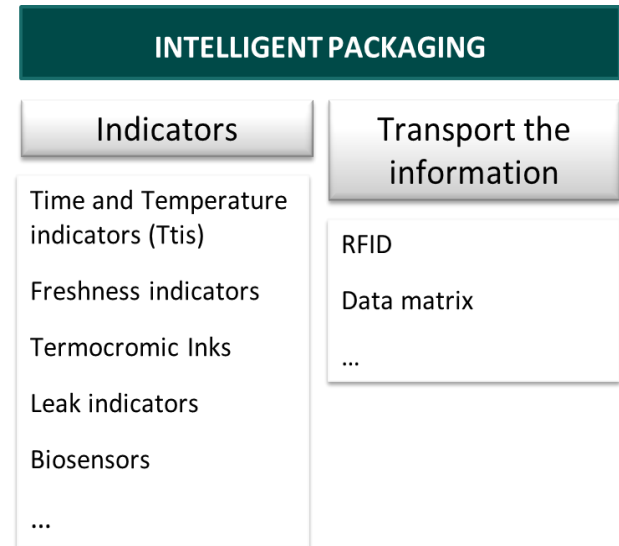- Humidity controllers

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Key applications and solutions identified

INTELLIGENT PACKAGING AND LABELS

Intelligent Packaging technologies able to provide valuable information (i.e. not only an uncertain expiration date) to the user and consumer about current product spoilage, thus helping them to make decisions. Colorimetric indicators (labels) are incorporated onto packaging and change their color to show product freshness level, product exposure to unsuitable temperatures, etc. So these intelligent indicators give reliable information about foodstuffs to avoid unnecessary food loss along the whole supply chain.

Intelligent packaging also provides information about the traceability of the product. Such information will allow companies to design protection strategies or redesign the package or logistics.

INTELLIGENT PACKAGING

Indicators	Transport the information
Time and Temperature indicators (Ttis)	RFID
Freshness indicators	Data matrix
Termocromic Inks	…
Leak indicators	
Biosensors	
…	

Key applications and solutions identified

SUPPLY CHAIN

In an interconnected and globalized word, **traceability** of products is a key driver to ensure control of supply chain, increase communication among the supply chain and reducing unnecessary cost and mistakes. In the context of food waste, monitoring the supply chain could allow to control and measure food losses to implement solutions.

In this sense, ideas were shared among participants such as:

- Double labelling of products, at pallet scale and individual products to allow complete traceability through SC

- Intelligent packaging for e-commerce products with traceability, authentication and temperature control.

- Real time monitoring in cold supply chain to address shelf life issues

Key applications and solutions identified

Other application groups mentioned :

❑ **EASY COMMUNICATION**
Use of new ITC technologies applied to packaging to increase information exchange between packaging and users, educate consumers about sustainability, and more collaboration through market players

❑ **LEGISLATION** focused on standardization and taxation of high carbon footprint organizations.

❑ **AUTOMATIC** application group gather ideas at long term (2020-2030)

  ▪ Ink in the packaging material to automatize information system

  ▪ Predictive microbiology and freshness scan

  ▪ Automatic food storage in the fridge

CONCLUSIONS:
Overview of the roadmap

This table indicates main Market drivers groups and how they are connected to solutions and applications identified by participants.

Ref	Solutions and applications	Votes	Market Drivers						
			SAFETY	SHELF LIFE	LEGISLATION	CONSUMERS	SUSTAINABILITY	SUPPLY CHAIN	AUTOMATIZATION
		Votes							
	Ref.		1	2	3	4	5	6	7
1	SUSTAINABILITY		■		■		■	■	
2	ACTIVE PACKAGING		■	■			■		
3	LEGISLATION				■				
4	EASY COMMUNICATION		■	■			■		
5	SUPPLY CHAIN			■				■	■
6	INTELLIGENT PACKAGING / LABELS		■	■		■	■	■	■
7	AUTOMATIC		■	■		■	■	■	

Thank you for your great participation

Complete participants list

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Agenda

10h30	Welcome from AIPIA and ITENE
10h40	Speaker Presentation: Eef de Ferrante, Director of **AIPIA**
10h50	Speaker Presentation: Jorge García, Business Director of **ITENE**
11h00	Speaker Presentation: Peter Higgins, CEO of **UWI Labels**
11:10-11:15	Introduction to the roadmap methodology
11:15-12:15	Define **Key drivers** for Active and Intelligent Packaging, **Discuss challenges** of food waste and where to act
12:15-13:15	**Generate Ideas about solutions** and how can active and intelligent packaging contribute to the main market drivers and challenges
13:15- 13:20	**Conclusions**
13:30 –14:00	**Light lunch and Networking**