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R3PACK

REDUCE, REUSE, RETHINK PACKAGING

WP5.1-deliverable: framework of the demonstration

Work package: WP5 – Cross Sectorial validation, demonstration and upscaling of the solutions

Task: 5.1 - Definition of the framework
Deliverable: 5.1 – Framework for the demonstrator

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INTRODUCTION

The framework of the demonstration is presenting R3PACK's business case for upscaling reuse and substitution of single-use plastic packaging with fibre-based alternatives. Indeed, as part of the project the beneficiaries will be carrying out a real-life demonstration allowing to assess the ideal conditions for success. These learnings will be translated into precise guidelines at a later stage of the project with the aim to help any interested party in the implementation of a reuse model or new alternative packaging. The demonstration process will be further described within this deliverable, explaining its purpose, calendar and perimeter, as well the specific approach adopted by R3PACK for reuse and substitution. Finally, we will introduce the methodology to generate valuable outputs from the demonstration process.

I / A DEMONSTRATION FOR REAL-LIFE INSIGHTS

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#1

The demonstration's purpose

A TEST & LEARN EXPERIMENT TO UPSCALE SUBSTITUTION & REUSE

R3PACK has one objective: reducing single use plastic packaging by rethinking and reusing packaging overall. To tackle this challenge the experts (universities, research centers and solution providers) of the consortium are working on developing recyclable alternatives with high fibre content on one hand, and the food manufacturers, retailers, together with the experts and the coordinator are drafting reuse schemes balancing economic and environmental factors.

These solutions might look good on paper, but the reality could be different. To see the process through, R3PACK aims at testing the developed solutions by confronting them with real-life conditions: industrial process, logistics, shelving, consumer behavior and more.

The demonstration is a 20-month long process allowing to test every step of the value chain, from the factory to the consumers' home, validating or invalidating the success of the solution.

This test and learn experiment will be carried out for the developed reuse schemes and the new fibre-based packaging, identifying the success and failure factors for each. This learning process will allow to set the path for following food manufacturers and retailers wishing to implement reuse or fibre-based packaging alternatives.

Ultimately, with the learning curve of the demonstration, R3PACK will be able to design and document the ideal reuse models and substitution process to cellulosic materials. This process secures their uptake and mass-markets plastic reduction at the European level.

#2

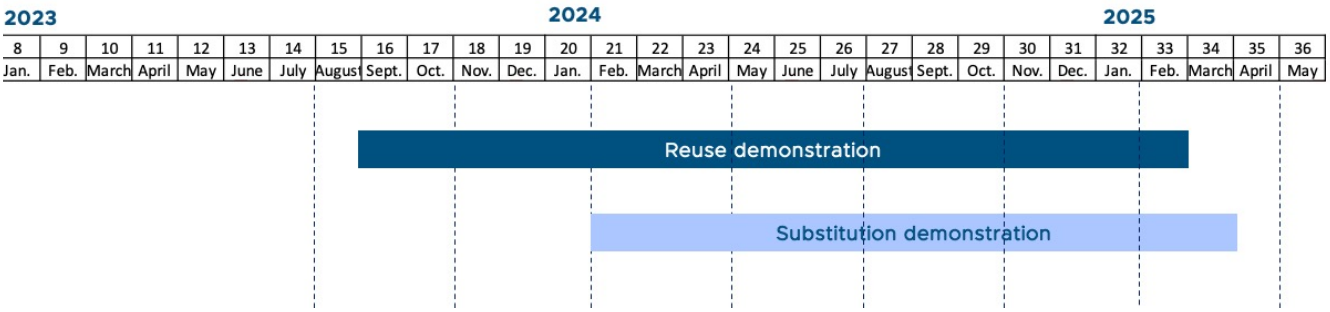
The demonstration's calendar

20 MONTHS OF DEMONSTRATION

The combined demonstration process for reuse and substitution will last about 20 months from end of 2023 to 2025. It will start with testing reuse schemes, while the research and development for the fibre-based alternatives is pursued. The demonstration marks the second phase of the project which is divided between a first preparation period followed by the experimentation one. Both demonstrations will be upscaled progressively to gather learnings at each step, allowing to rectify the parameters in case of poor/unexpected results. A comparative analysis will be carried out from phase 1 to 3 and a list of KPIs will be established to measure the performance all the way.

DRAFT

Figure 1: *R3PACK's demonstration calendar*



#3

The demonstration's perimeter

THE DEMONSTRATION IN A NUTSHELL

R3PACK is the first large-scale demonstration of reuse schemes involving all main actors of the chain at a transnational level in 3 EU countries and 30 stores (France, Belgium and Luxembourg) by allowing for the optimization of relevant cross-border facilities.

20 MONTHS

Of continuous demonstration

2 RETAILERS

At Carrefour & Système U

R3PACK

30 SHOPS

In hyper, super, proxi

3 COUNTRIES

In France, Belgium & Luxemburg

TESTING THE CONSUMERS' APPEAL FOR +15 FOOD CATEGORIES

INVOLVED PARTNERS

R3PACK is targeting the food sector covering a wide range of food products, from salads to chips and drinks. 10 food manufacturers are involved, from which 6 are beneficiaries and the 4 others are new industrials that recently joined the project as third parties. From the beginning R3PACK has tried to recruit new food manufacturers, without compromising the Consortium's functioning, to provide more visibility to the new packaging on shelves due the massification of the offer and thus fostering change in consumer behavior. With more companies participating in the demonstration, R3PACK should gain in visibility and speed up the uptake process of reuse and substitution.

RETAILERS

Carrefour

FOOD PRODUCERS

ALTHO

Sodiaal candia* yoplait EntreMont

europe snacks

Florédale UNE ENTREPRISE DU GROUPE AGRIAL

LSDH

Schreiber

Third parties

AGRIAL Cultiver nos racines, s'ouvrir au monde Eurial

Cérélia

Firmin Bouvard Maître Patissier depuis 1913

MONIN

**NB: Candia is R3PACK's official signatory member. However it is part of a larger group, Sodiaal, therefore the selection of packaged products to be considered within the project will be extended to the affiliated brands Yoplait and EntreMont*

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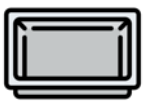
FOOD PRODUCTS CONCERNED

BAGGED SALADS

BUTTER

CHEESE

CHIPS



IN-SHOP PRODUCTS

JUICES

MILK

PREPARED SALADS

SAVORY BISCUITS

SYRUP

PREPARED/MASHED FRUITS & VEGETABLES

YOGHURT & SOUR CREAM

CIDER

SWEET BISCUITS

PASTRY DOUGH

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A EUROPEAN EXPERIMENT

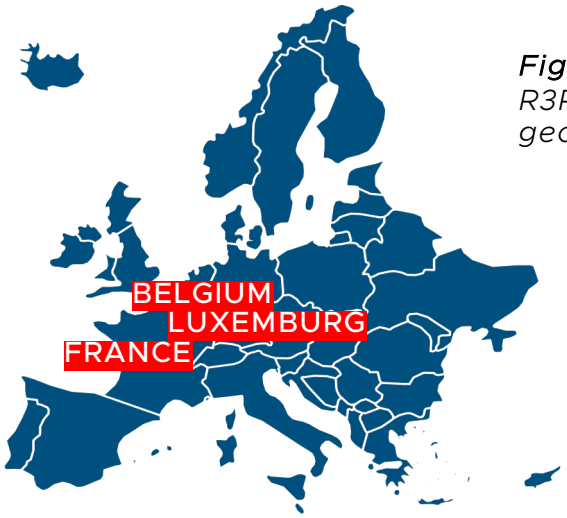

Figure 2:
R3PACK's demonstration geographical perimeter

The demonstration will be carried out in three countries: France, Belgium and Luxemburg leveraging on the presence of stores from the involved retailers (Carrefour and Systeme U). The cross-border settings offer a unique opportunity to serve as a laboratory for a systemic assessment of local, transborder and transnational optimization of the transition of food value chains.

The perimeter initially targeted Spain instead of Luxemburg, but after a careful analysis, research shows that it would be harmful (economically, environmentally and in terms of the quality of the data produced) to spread efforts between France, Belgium and Spain.

As a matter of fact, the French-Spanish border suffers from a virtual absence of washing facilities and very few points of sale for the distribution partners involved in the project. With such disparate sites, it's virtually impossible to achieve an economically and environmentally sustainable model, as the experiment requires a dense logistics network, otherwise resources would be invested in vain. Another limit to the French/Spanish border is the high tourism rate in that region causing fluctuations in sales and consumer behavior. The seasonality would distort the results obtained, compromising R3PACK's study.

As washing centres are mostly concentred in the Northern-East part of France, naturally the selection of stores will be focused there, allowing to create synergies with Belgium and Luxemburg, by mutualizing washing facilities.

This European experiment will take place in 30 shops, which are fully representative of the wide spectrum of store characteristics at EU level (location in urban centers, rural, peri-urban areas, ranging from small to big size stores).

THE SHOP IMPLEMENTATION

Carrefour FR is a global retailer and has more than 5,600 stores in France, both owned and franchised. There are three main types of stores, each differentiated by the store experience. Within the framework of the experimentation, a selection will be made on these three types. Their specificities are detailed below.

SHOP SEGMENTATION & SPECIFICITIES

248 « HYPER » SHOPS

- ✓ 56M€ (average)
- ✓ From 2400m² to 23.000m²
- ✓ 20.000-80.000 consumer sales unit
- ✓ Fresh products prepared daily on site
- ✓ More & more space dedicated to "green" offer: organic, local, bulk products
- ✓ Rural & peri-urban areas

Quick & large shopping experience
Variety of purchase withdrawal methods
Additional services such as banking & insurance
E-commerce solutions (Drive, express delivery, Uber Eats partnership, etc)

1071 « SUPER » SHOPS

- ✓ 70% franchised stores
- ✓ 7-45M€ revenue
- ✓ From 800m² to 4500m²
- ✓ Wide selection of fresh & local products
- ✓ Non-food products adapted to customers
- ✓ Urban & rural areas

Average basket 38€
For everyday purchases
Quality & freshness of products
Proximity & local supply

3959 « PROXI » SHOPS

- ✓ Franchised stores
- ✓ 250k€ (Proxi) – 10M€ (Carrefour city) revenue
- ✓ From 200m² to 900m²
- ✓ Up to 6000 consumer sales unit
- ✓ Warm & modern atmosphere
- ✓ Locally adapted offer & tight prices
- ✓ Wide opening hours
- ✓ Urban areas/cities

For everyday purchases
Proximity
Average basket 6-28€
Additional service such as parcel relay & car rental

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THE SHOP IMPLEMENTATION

Carrefour BE has more than 780 stores in Belgium & Luxemburg, both owned and franchised. There are three main types of stores, each differentiated by the store experience. Within the framework of the experimentation, a selection will be made on these three types. Their specificities are detailed below.

SHOP SEGMENTATION & SPECIFICITIES

40 « HYPER » SHOPS

- ✓ From 4100m² to 11.000m²
- ✓ 130.000 consumer sales unit
- ✓ Large choice of local, seasonal & organic at the best price
- ✓ At the forefront of retail experience
- ✓ Rural & peri-urban areas

Quick & large shopping experience
In-shop delivery
Additional services
Expert advice

415 « SUPER » SHOPS

- ✓ Franchised stores
- ✓ From 800m² to 3100m²
- ✓ Offer & services adapted to the area
- ✓ Good quality-price ratio
- ✓ Simplicity & convenience oriented
- ✓ Urban & rural areas

For everyday purchases
Ethical & responsible consumption
Customized services

334 « PROXI » SHOPS

- ✓ Franchised stores
- ✓ From 80m² to 800m²
- ✓ 5000-7000 consumer sales unit
- ✓ “the essentials” offer
- ✓ Fresh product offer
- ✓ Competitive prices & local promotion
- ✓ Rapidity
- ✓ Wide opening hours
- ✓ Urban areas/cities

For everyday purchases
Proximity
Customized offer

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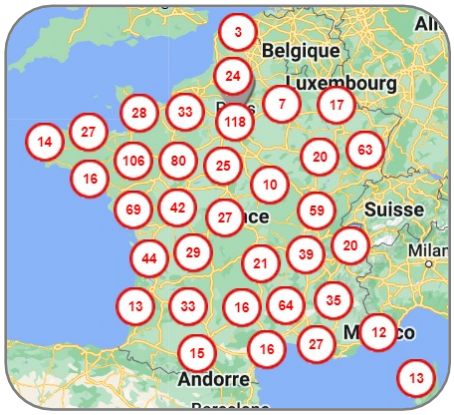
THE SHOP IMPLEMENTATION

Système U is a cooperative group of independent retailers, the U shareholders, who have chosen to join forces while continuing the development of their activities in complete independence. Système U is the 4th largest French generalist food retailer group. Its vision is based on proximity, their goal being “To propose an alternative to the traditional practices of large-scale distribution practices by privileging the human factor, local links and a more responsible value system”. Système U has only shops in France, therefore Carrefour will cover the netting for Belgium and Luxemburg.

SHOP SEGMENTATION & SPECIFICITIES



67 « HYPER » SHOPS

- ✓ Owned stores
- ✓ 53,7M € (average revenue)
- ✓ From 4000m² to 10000m²
- ✓ Commercial areas

Large shopping experience of food & non-food products
Average basket 48€
Services offer:
U Location, U Mobile, U Culture

756 « SUPER » SHOPS

- ✓ Franchised shops
- ✓ 21,4M € (average revenue)
- ✓ From 1000m² to 5000m²
- ✓ For more than 20 years, elected as the “favorite brand of the French consumers”
- ✓ Urban & rural areas

Customers products & services expectations met
Average basket 35€
Proximity & human touch
Established in the local ecosystem & with the farming community

847 « PROXI » SHOPS

- ✓ Franchised shops
- ✓ 3,7M € (average revenue)
- ✓ From 150m² to 1200m²
- ✓ Système U members encouraged to complete this network by opening smaller shops which are growing
- ✓ In the heart of big cities & rural areas

For everyday purchases
Proximity
Food & non-food offers
Mini formats & short ranges
Average basket 20€
A wide and extensive traditional &/or self-service offer notably with U-brands

Funded by the European Union

II / THE REUSE JOURNEY

Funded by the European Union

This project has received funding from the European Union's Horizon Europe Research and Innovation Programme under Grant Agreement No 101060806.

FOOD PRODUCTS CONCERNED BY REUSE

The experiment for reuse will focus on the following 11 food categories to demonstrate their environmental and economic sustainability. As studied in the deliverable 2.1 some of the food categories have been excluded from the scope. For instance the product/packaging weight ratio (e.g. butter) or the required hermeticity (e.g. cheese) hinder the feasibility of reuse momentarily, due to the lack of suitable packaging available on the market.

CHIPS

IN-SHOP PRODUCTS

JUICES

MILK

PREPARED SALADS

SAVORY BISCUITS

SYRUP

PREPARED/MASHED FRUITS & VEGETABLES

YOGHURT & SOUR CREAM

CIDER

SWEET BISCUITS

OUR APPROACH TO THE REUSE MODEL

R3PACK has developped its own version of the reuse model based on some key guiding principles:

LOGISTICS

TRACEABILITY

IN-SHOP SHELVING

RETURN & SORTING

DEPOSIT

WASHERS

COSTS, PURCHASE & OWNERSHIP

PRODUCT MARKETING

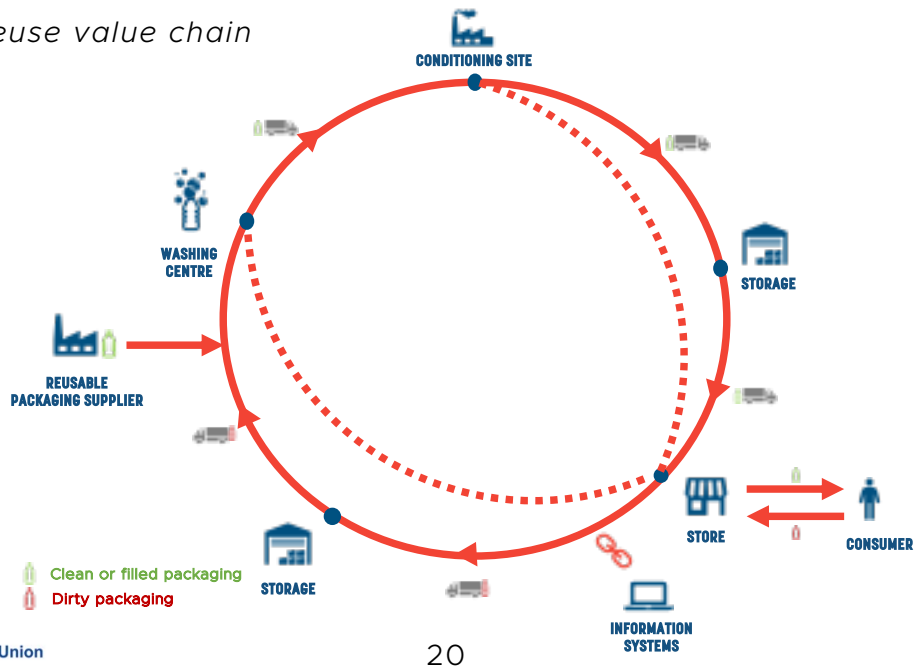
CONDITIONING

The decisions on the different principles are the result of :

- the willingness to be coherent with the national stance taken on reuse by France, Belgium and Luxemburg
- inputs from the University of Bologna's modelization on reuse schemes balancing economic and environmental factors
- a tradeoff between the ideal long term solution and the feasible option in the short term

R3PACK's model, that will be used as a basis for the reuse demonstration is depicted below and positions on the guiding principles are described further on.

Figure 3: Reuse value chain



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THE GUIDING PRINCIPLES

DECISIONS TAKEN:

LOGISTICS

- Product delivery to shops will not be subcontracted and will be done by industrials
- Direct shop delivery (no in between drop off at distribution center) to simplify the logistic flow, except for fresh products e.g. salads or yogurt
- Secondary packaging of the demonstrator has to be as close as possible to the existing secondary packaging.
- Return flow (from shops to washers and from washers to industrials) will be subcontracted

TRACEABILITY

- An operator will be in charge of traceability of the packaging
- Traceability will help to dispatch reusable packaging and to measure performance of the demonstrator
- The packaging will be traced through a unique QR code by packaging
- In shop, a combined EAN code will encompass both the product and packaging prices

WASHING

- A washing centre audit grid was developed by SGS
- If possible, washing will be supervised by the operator to simplify logistics and facilitate contract management by reducing the number of intermediaries

COSTS, PURCHASE & OWNERSHIP

- Industrials will purchase the reusable packaging and own it along the reuse cycle
- Retailers will take over the logistics costs from stores to washing centers
- Overall operator costs will be divided between the retailers and industrials, depending on sales volumes

DEPOSIT

- Same deposit rate will be applied by packaging typology at both retailers (Carrefour & Système U)
- The deposit covers at least the additional costs of the reusable packaging
- Reusable offer has a lower price per kg compared to single-use offer to be attractive compared to the single use offer

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THE GUIDING PRINCIPLES

DECISIONS TAKEN:

CONDITIONING

- Mutualized packaging between different food categories when possible
- Mutualized development of new packaging when there is none available on the market
- Diversification of materials, focus on plastic packaging, besides the common glass ones, to benefit from a ready-to use material (as glass has been mainly banned for security reasons in factories) and to acquire new learning on a material that may allow a more viable economic and operational model
- Ageing tests to validate shelf life
- Reduction in shelf-life may be considered - to be validated on a case-by-case basis with distributors
- Conventional secondary packaging

IN-SHOP SHELVING

- No fixed shelving plan : A/B testing between (1) dedicated corner for the offer, (2) front display of the aisle and (3) on shelf next to traditional offer, to evaluate the best option out of the three

PRODUCT MARKETING

- Common R3PACK washable label on all commercialized food products to inform about reuse
- Each food manufacturer adapts their current labels to be washed off

RETURN & SORTING

- Different RVM will be tested
- Low tech reverse vending machines (RVM) in “Proxi” shops
- High tech multi-packaging RVM in “Hyper” and “Super” shops
- Manual back-up solutions to refund at the checkout in all shops

MOVING FORWARD WITH SERVICE PROVIDERS

The discussions around the guiding principles have allowed the Consortium to define the roles and responsibilities of each actor within the demonstration and pinpoint the tasks that can and cannot be covered internally. The washing, sorting, collecting, logistics and supply of reverse vending machines will be part of an external operator's contract. The derisking process led by (RE)SET has allowed to map and qualify several service providers and washers across France, Belgium and Luxemburg. The specifications for the demonstrator have been drawn up for consultation with service providers. The service provider(s) who will accompany the demonstrator will be selected on the basis of their response to these specifications.

Another paramount aspect for launching the experiment is defining the volumes to be produced by the food manufacturers, and to be managed by the service providers. R3PACK has established a formula based on several criteria helping to calculate the right volumes. The calculation is based on the reuse share compared to the single-use offer and products' sales volumes per type of shop (hyper, super and proxi). The "reuse rate" will be discussed and adapted for each product type with a mutual decision between industrials and retailers

Figure 4: sales volume calculation for reuse for one product

PRODUCT AVERAGE SALES VOLUME (per shop type) X **NUMBER OF SHOPS (per type)** X **HYPOTHESIS % REUSE ON TOTAL SALE**

To be discussed & defined by each food manufacturer

Example of calculation:

Data:

- *Average sale for 1L syrup in hypermarket = 50 units / month*
- *Number of hypermarket in phase 3 = 4*
- *Duration of phase 2 = 3 months*
- *Reuse Rate = 25%*

Calculation:
Quantity of syrup to produce for phase 2 for hypermarkets : (50x3)x0,25x4= 150 units

Example of criteria:

- Regulatory requirements in FR : 5% - 10% - >10% ?
- Merchandising plan
- Industrial min/max production volume
- Consumer study insights by Aarhus and from other relevant public sources

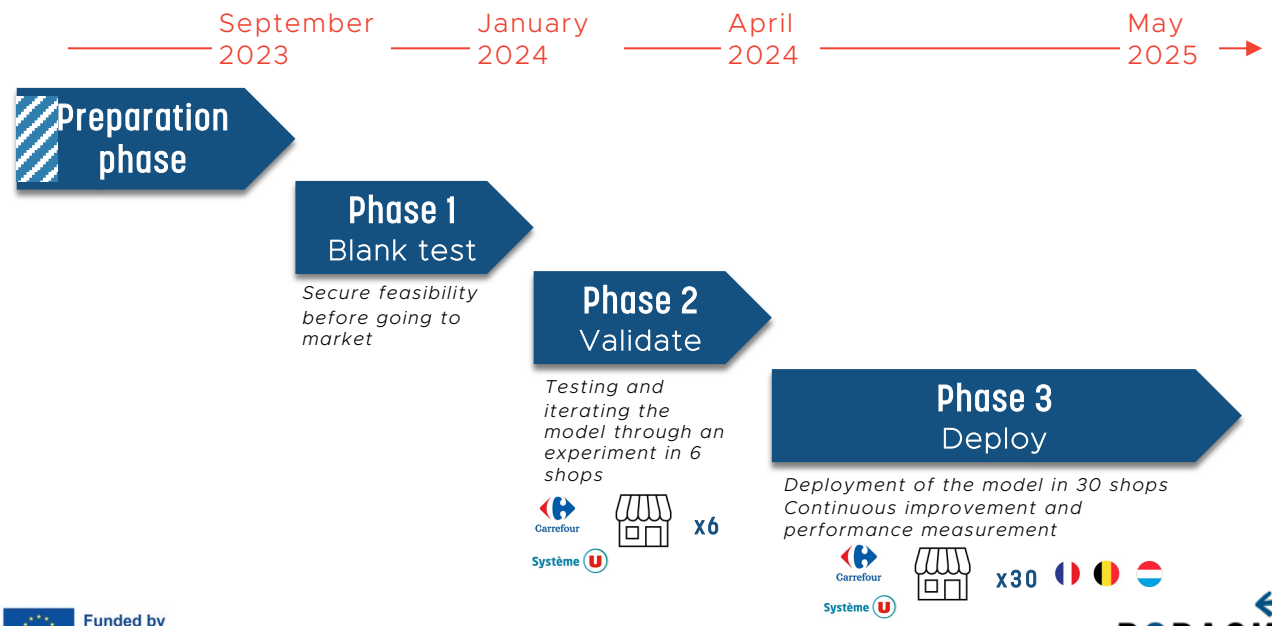
3 PHASES TO SUCCEED

Unlike other European countries, such as Germany or Denmark, the demonstration territories have yet to permanently implement reuse. Switching to this new economic paradigm is disruptive of the whole value chain and comes along with several challenges. The key obstacles ahead to launch the demonstration are following ones:

Challenge #1: mobilizing the entire value chain to change their habits and commit to a new way of proceeding for a long time period
Challenge #2: designing new reusable packaging when there are none available on the market for certain food categories
Challenge #3: securing the food safety all along the loop, especially for newly developed packaging (using SGS's food safety protocol and auditing grid for washers)
Challenge #4: finding alternatives for food manufacturers that cannot run reusable packaging on their conditioning lines due to structural differences between the single use and reusable packaging (e.g. the selected reusable version of chips bags is a bucket)
Challenge #5: the incompressible time for shelf-life tests, that can take up to a year for some products (e.g. savory biscuits)

Multiple factors come into play when preparing for the implementation of reuse within an established optimized industrial model. Therefore, the demonstration will be carried out in 3 distinct phases, allowing to overcome the hurdles step by step and progressively testing the market responsiveness.

Figure 5: Reuse demonstration calendar



3 PHASES TO SUCCEED

September 2023 — January 2024 — April 2024 — May 2025 →

Phase 1
Blank test

Secure feasibility before going to market

Phase #1: the previously mentioned challenges are pre-requisites to launch the food products on the market. These will be tested for a period of about 4-5 months, between September 2023 and January 2024, following strict test protocols established for each food category. A main focus will be set on the logistics, washing process, machinability and integrity of the packaging ensuring a smooth reuse loop.

With a view to pooling resources and saving time, 5 groups have been set up for similar types of packaging to carry out joint tests where possible (cf. figure 2). The groups are either confronted with alike issues, which they can tackle together or they face different problems, for which they can help each other out. Together they can design common packaging, find collective solution to conditioning, conduct food safety tests and more.

As the safety of the consumers is not negotiable, this first phase will exclude the in-shop sales, leaving the time to 100% secure that aspect while testing the other steps of the reuse loop.

Figure 6: *overview of R3PACK's food manufacturers' groups based on similar packaging and/or challenges - Reuse*

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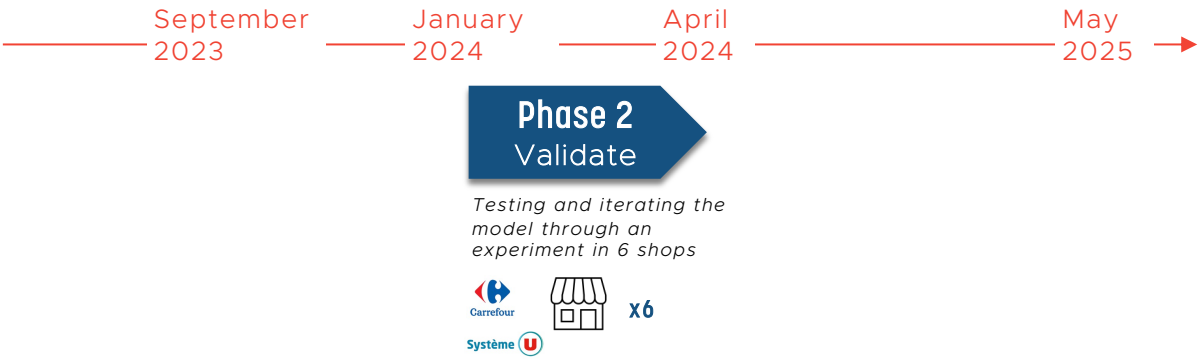
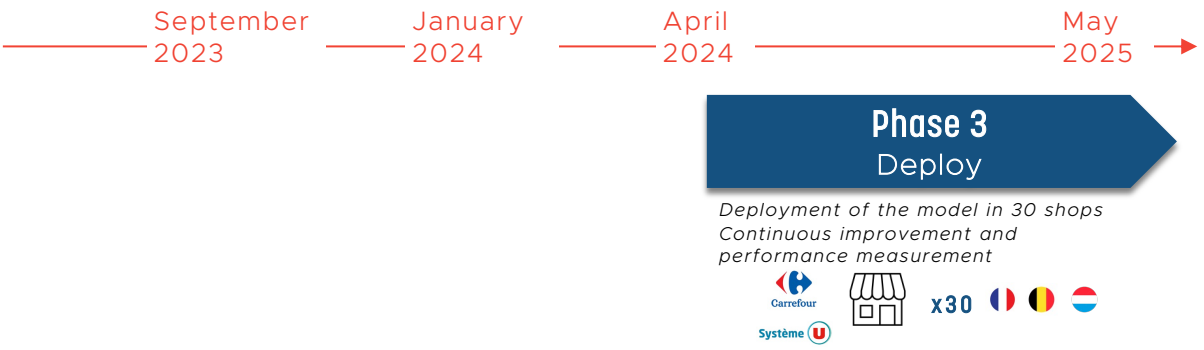
3 PHASES TO SUCCEED



Phase #2: Once the loop is operational and all aforementioned elements are validated/adjusted, the food products packaged in reusable containers can officially be launched at a small scale in about 6 shops in France divided between the two retailers Systeme U and Carrefour to test all commercial aspects.

To maximise the chances of a successful demonstration, all products will be launched simultaneously whenever possible. The reuse offer will be more visible that way, with the hope to rapidly convert consumers. Alongside Aarhus, leader of work package 2 on consumer behavior, will go on with its consumer studies by doing research directly on field. First insights on customers' understanding of the reuse offer, deposit return system and so on will help to adjust communication all along this second phase.



Phase #3: After a few months, when phase 2 has a stable performance, the full scale demonstration can be launched, encompassing all product categories, all 30 shops, in all 3 countries. It is the longest phase, which allows to test different scenarios with the purpose to optimize the return rate and perform as many rotations as possible for each type of packaging. A/B tests will be conducted in store to analyse the impact of different factors on the consumer journey (e.g. different types of RVMs, …). This third phase will last almost until the end of the project, gathering numerous insights on the success factors of reuse models.

III / SUBSTITUTION JOURNEY

Funded by the European Union

This project has received funding from the European Union's Horizon Europe Research and Innovation Programme under Grant Agreement No 101060806.

FOOD PRODUCTS CONCERNED BY SUBSTITUTION

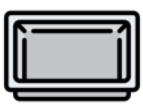
The experiment for substitution will focus on the following 11 food categories to demonstrate their environmental and economic sustainability. As studied in the deliverable 2.1 some of the food categories have been excluded from the scope, more specifically the liquids. The current bottles (often made out of PET plastic or Glass) have a high recycling rate and technologies for replacing them with fibre-based solutions are far from mature. There are early stage solutions but they are not satisfactory because they still contain high amounts of plastic and their capacity to be fully recycled is much lower than that of existing solutions. In that specific case, Reuse is clearly a better solution.

BAGGED SALADS

BUTTER

CHEESE

CHIPS



IN-SHOP PRODUCTS

PREPARED SALADS

SWEET BISCUITS

PREPARED/MASHED FRUITS & VEGETABLES

SAVORY BISCUITS

PASTRY DOUGH

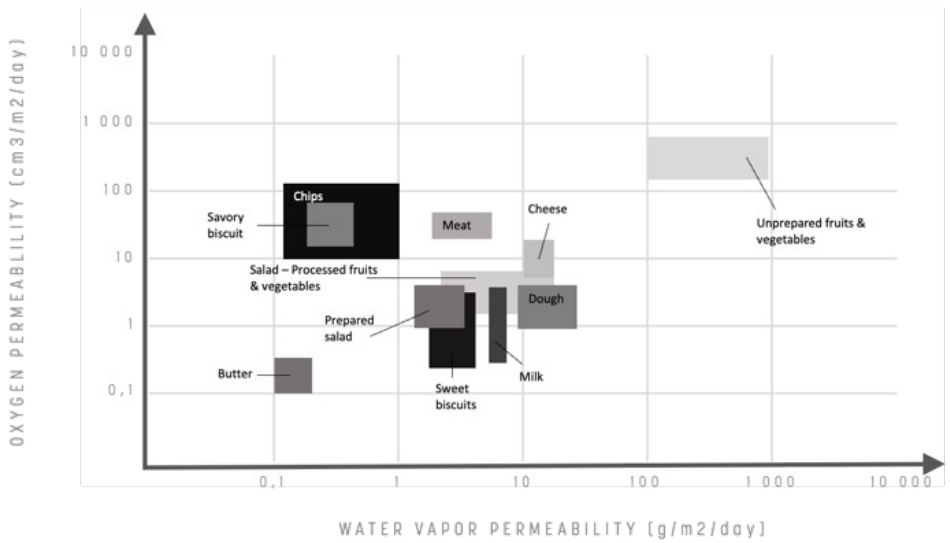
YOGHURT & SOUR CREAM

OUR APPROACH TO SUBSTITUTION

Unlike the reuse model, the substitution demonstration aims at using the same value chain as for the single-use packaging to ease the industrial launch of new packaging alternatives for food manufacturers and retailers. Therefore the main guiding principles to decide on are the conditioning, product marketing and in-shop shelving. Similarly to reuse, a formula to calculate the volumes to be produced for that specific offer will have to be defined.

The complexity lies in the development of new performing solutions and their large scale production. The diversity of products requires different barriers properties (OTR, WVTR, grease, aroma…) multiplying the research and development efforts to be done. Some food categories are more challenging than others, therefore as part of the risk mitigation strategy of R3PACK, other options are being evaluated to secure the substitution for the more difficult food categories. The R&D partners and the coordinator (RE)SET are working on two strategies in parallel. On one hand R3PACK is working on the development of new fibre-based and recyclable alternatives reaching >90/95% paper ratio. On the other hand the consortium is working on the machinability of commercial fibre-based solutions (with high paper ratio) to help their upscale. The optimization of the latter allows to secure alternatives in case the R&D is not advanced enough to cover all food categories requirements by the time of the demonstration's start.

Figure 7: Overview of R3PACK's products barrier properties needs (OTR and WVTR) to reach their shelf-life



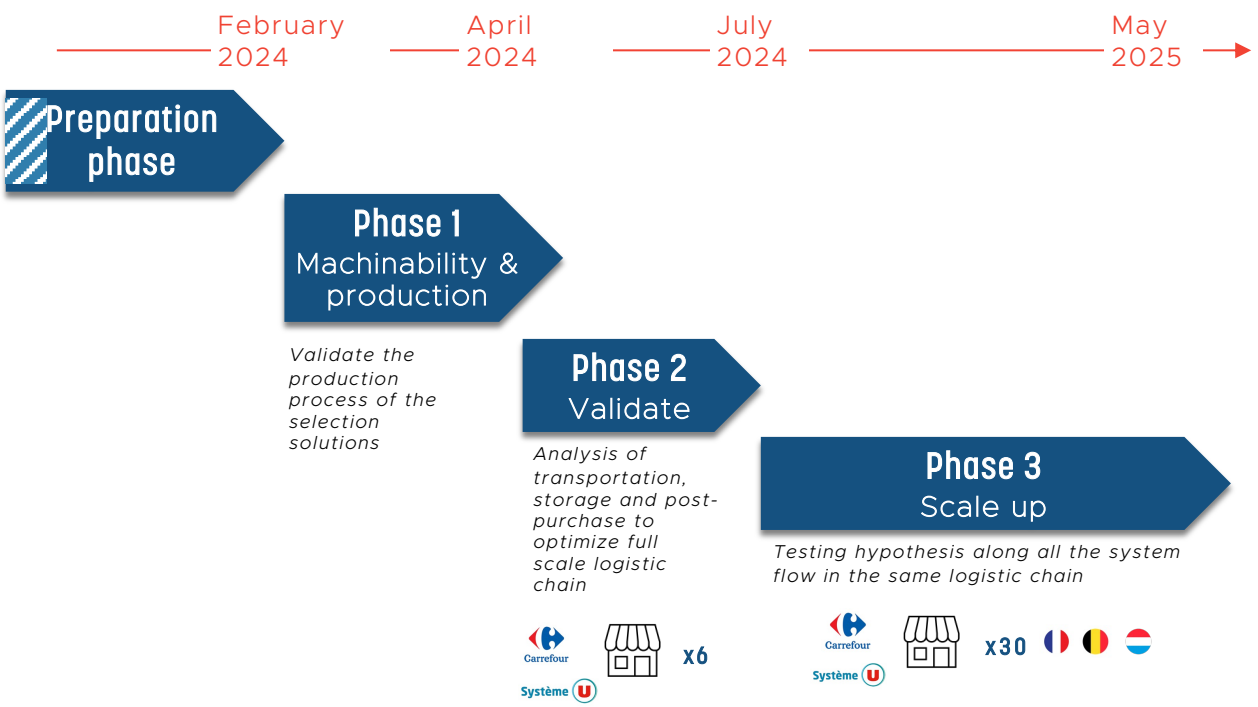
3 PHASES TO SUCCEED

Switching away from plastic-based packaging to fibre-based (paper, cardboard or molded fibre) comes with some challenges and requires work from numerous partners along the value chain (chemists, R&D centers, packaging producers, manufacturers, retailers…). The key challenges ahead to launch the demonstration are following ones:

Challenge #1: developing the right solution for the right products, that are recyclable, with a high paper ratio (>90/95%).
Challenge #2: once the solution is found, adapted and replicable, it has to run through the conditioning lines of the manufacturers.
Challenge #3: securing the food safety and shelf life all along the loop, especially for newly developed packaging.
Challenge #4: the incompressible time for shelf-life tests, that can take up to a year for some products (e.g. savory biscuits).

Multiple factors come into play when preparing for the deployment of plastic substitution solutions. Therefore, the demonstration will be carried out through 3 distinct phases, allowing to overcome the hurdles step by step, avoiding food spoilage while testing consumer responsiveness.

Figure 8: Substitution demonstration calendar



3 PHASES TO SUCCEED

February 2024 — April 2024 — July 2024 — May 2025 →

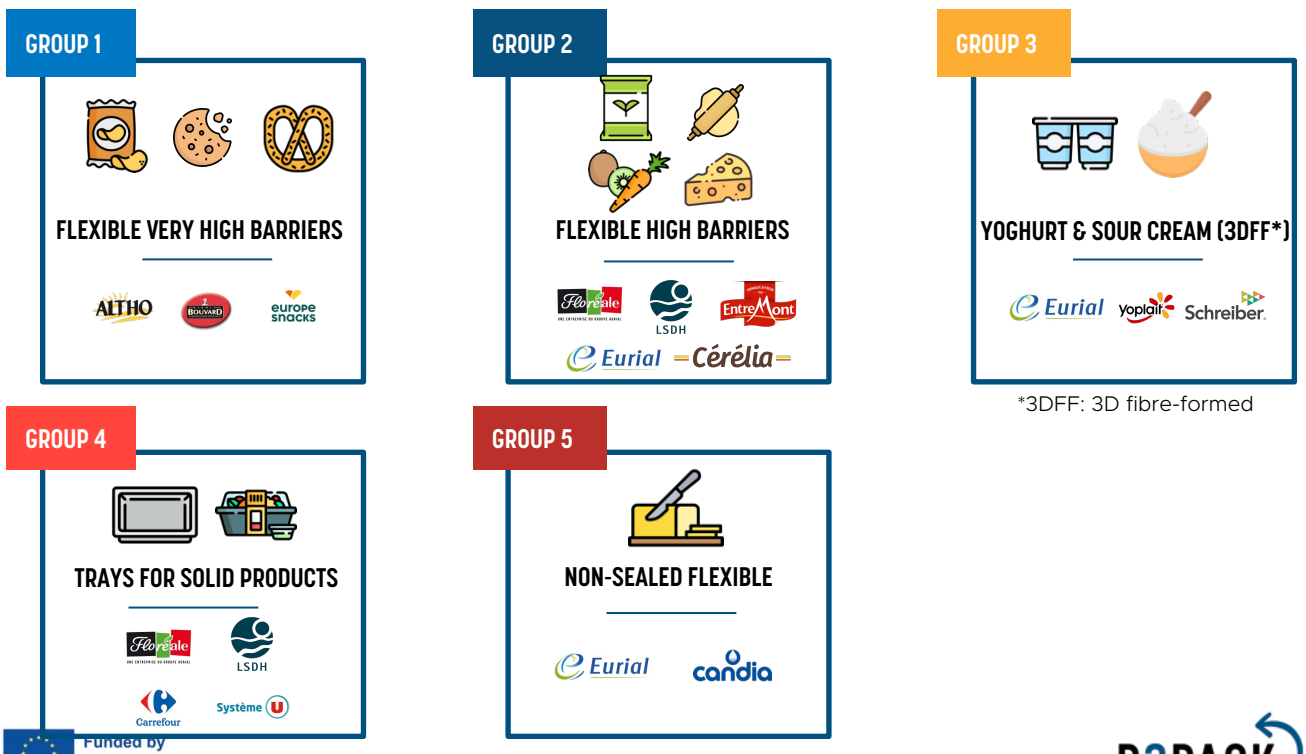
Preparation phase

Preparation phase: within the 11 food categories prioritized for the substitution demonstrator, we have identified 5 groups based on two main criteria:

- **Criteria #1:** packaging is flexible (eg. sachet, doypacks) or rigid (eg. pot, trays)
- **Criteria #2:** barrier properties needed for the product to reach complete shelf-life and avoid spoilage. The barrier properties are numerous: OTR (Oxygen Transmission Rate), WVTR (Water Vapour Transmission Rate), grease, liquid water, aroma etc.

Additionally, are taken into consideration the manufacturing process, temperature (ambient, refrigerated), humidity level and line type (horizontal, vertical, fully automatic, semi-automatic, manual) of each product category given by T2.1 **(specifications from industries)** which aimed to define, collect and assess the industries' specifications for the project.

Figure 9: Overview of R3PACK's food manufacturers' groups based on similar barrier properties needs & manufacturing specificities - Substitution



*3DFF: 3D fibre-formed

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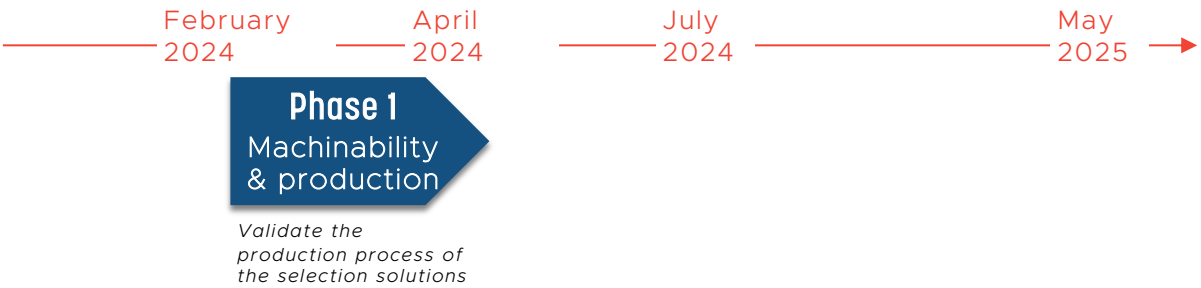
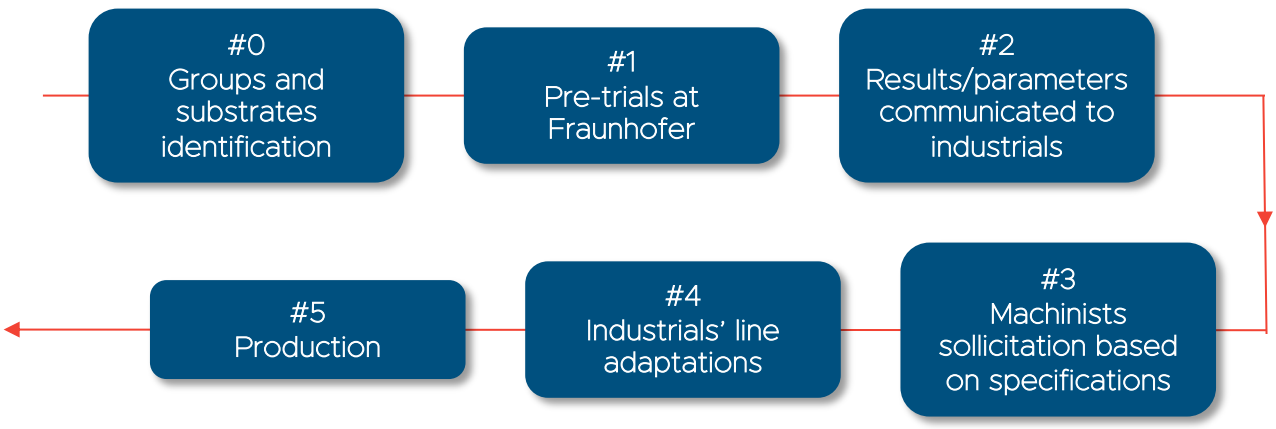
3 PHASES TO SUCCEED



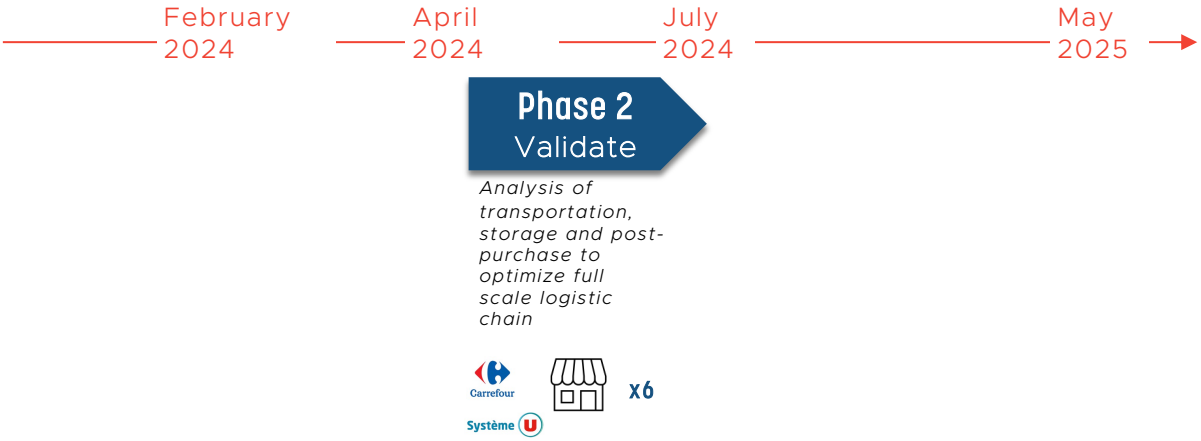
Phase #1: When the solutions are developed and optimized for each food category, machinability needs to be tested and validated in order to allow manufacturers conditioning their products in an efficient way. This is an iterative approach. The machinability subject especially affects manufacturers packing their product within flexible packaging as the solution needs to go through the machine (vertical or horizontal bagging machine). To mutualize efforts and resources during this phase, Fraunhofer will be conducting pre-trials for concerned groups. The objective being to determine the final processing parameters (sealing time, sealing pressure, sealing temperature, type of sealing jaws, line speed etc.) to reach hermeticity of the package.

A machinability protocol has been developed with the consortium partners:

Figure 10: Machinability protocol

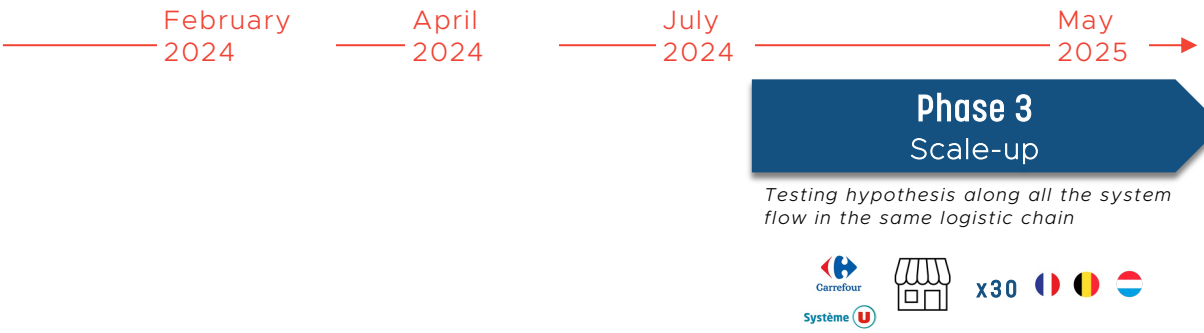


3 PHASES TO SUCCEED



Phase #2: Once the substrates are matched with the products' needs and achieved required shelf-life and the machinability is validated, the food products packaged in fibre-based packaging can officially be launched at a small scale in about 6 shops in France divided between the two retailers Systeme U and Carrefour to test all commercial and logistics aspects.

To maximise the chances of a successful demonstration, the phase 2 of the demonstration will be used to assess further transportation impact on the packaging, storage as well as shelving process. Completing storage tests performed in T4.5 and transportation tests conducted by RISE. Thus, highlighting the need for additional R&D (namely to increase the packaging resistance to humidity) or modify machine parameters (for example to inscrease the packaging resistance to pressure) to limit spoilage. Post-purchase will be simulated in parallel.



Phase #3: After a few months, when phase 2 has a stable performance, the full scale demonstration can be launched, encompassing all product categories, all 30 shops, in all 3 countries. This third phase will last almost until the end of the project, gathering numerous insights.

IV / HOW TO MONITOR PERFORMANCE?

Funded by the European Union

This project has received funding from the European Union's Horizon Europe Research and Innovation Programme under Grant Agreement No 101060806.

KPIS TO MEASURE SUCCESS

The demonstrations' purpose is to boost the uptake of reuse and substitution by providing key learnings on the associated success factors and a thorough implementation methodology. Therefore, R3PACK is not only operating, but also monitoring the experiment. Our methodology is to analyse success on two complementary levels:

- Implementation of **key performance indicators (KPIs)** to measure the overall operational, economic and environmental success (the latter will be confirmed with the comparative LCAs in WP6)
- **A/B testing** to identify the influence factors on the success rate

This systemic approach is based on the test and learn principle, that is paramount for adjusting parameters all along the demonstration.

#KPIs

A KPI dashboard will be developped to closely monitor the demonstration's performance and observe its evolution in time. Some of those will be specific to reuse or substitution or be transversal, therefore measured for both. Below an example of some key aspects that will be considered for piloting the experiment and evaluate its overall success at the end.

Figure 11: KPIs table

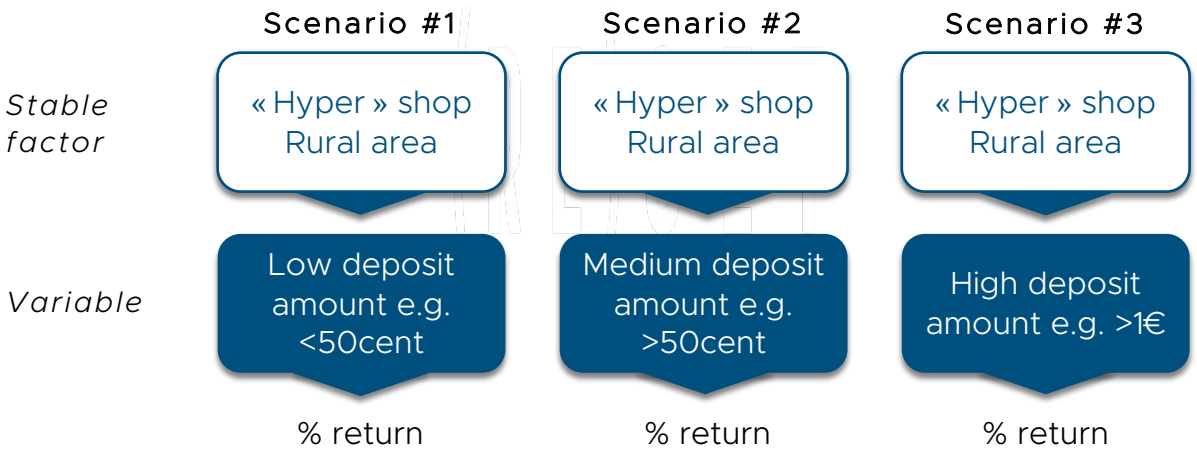
KPIS	REUSE	SUBSTITUTION
Total breakage rate	X	
Total packaging loss per cause	X	
Total return rate	X	
Totale number of rotations	X	
Additional in shop worker time needed	X	
Productivity (e.g. cadency)		X
Customer claims and complaints	X	X
Total unsold products	X	X
Sales & market share	X	X
Etc…		

A/B TESTING TO IDENTIFY SUCCESS FACTORS

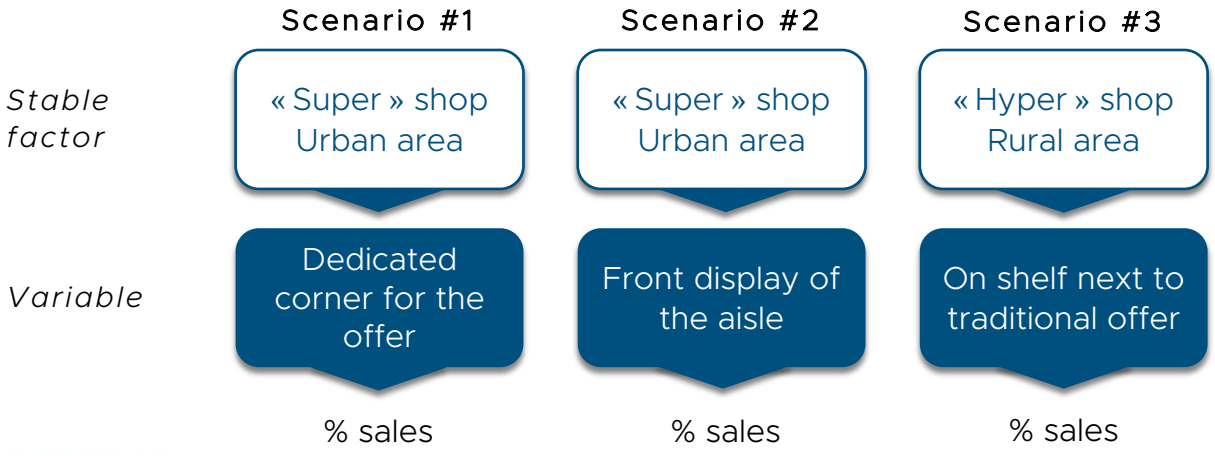
#A/B testing

A/B tests consist in comparing two equivalent situations where one variable has been changed to measure its impact on the overall model. In the case of reuse or substitution, a list of key variables that may influence the success of the system will be identified. The different imaginable scenarios for each variable will be carried out to evaluate the level of impact it has in real-life. Ultimately, the collected data will help external stakeholders in their decision making when implementing reuse or substitution

Example for reuse: measure the impact of different levels of deposit amount (low, medium, high) on the return rate



Example for substitution: measure the impact of the shop implementation of the fibre-based packaging offer on the sales



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CONCLUSION

R3PACK's demonstration is a unique experiment that aims to bring clarity to all concerned actors on the success factors for launching reuse models and/or introducing new packaging alternatives to plastic. The demonstration will be designed in such a way to gather key information at every step of the value chain providing insights on the best suitable model to adopt. Furthermore, it will perform several A/B testing collecting key data to help making the right choices to maximize reuse or substitution success. Ultimately, the result of the demonstration will provide concrete guidelines orientating the choices to make and the situations to avoid for securing performance. The information provided in this deliverable is subject to change and will be further detailed once the demonstration is offically launched in the framework of other deliverables (e.g. D5.2 and D5.3).

FIGURES

Funded by the European Union

This project has received funding from the European Union's Horizon Europe Research and Innovation Programme under Grant Agreement No 101060806.

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