i-REXFO

Increase in the REduction and REcovery of EXpired FOod

After life Plan

Deliverable Action E3

Vers. 28/02/2022

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LIFE 16 ENV/IT/000547

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1. Introduction

According to a FAO survey, around one third of the food produced for human consumption, roughly 1,3 billions tons, of which 80% still consumable, is lost or wasted. Every year the food produced and wasted consumes a volume of water equal to 250 km3, requires 1,4 billion ha of land, around 30% of the world agricultural land, and it is responsible for the emission of 3,3 billion tons of greenhouse gases. If food waste were a country it would be the third emitting one. While in developing countries over 40% of losses occur during the harvest or processing phase, food waste in industrialized countries is caused by a combination of supply chains inefficiencies and consumer behaviour. The supply and distribution chains are not always able to provide excess food at low cost to consumers or for donation while reading correctly the expiration label may be difficult for consumers resulting on edible food that goes to waste.
Moreover, consumers are responsible of poor management of leftovers and poor planning of shopping, buying more groceries than they can consume, often ignoring not aesthetically sound fruits and vegetables that remain unsold at the counter or even go to waste at the farm.
In the Hotel Restaurant Catering (Ho.Re.Ca) food waste is caused by the offering of ever larger portions while doggy bags for leftovers or last minute meals at the end of day are still options that are not adequately considered. Minimizing excess food production and making it available for human consumption before its expiration date is the first action to reduce food waste. This requires incentives to increase donation to charities and pre-expiration sales and also to raise consumer awareness on how to reduce food waste.

i-REXFO business model

Energy from organic waste through biogas production and use of the resulting digestate as a fertilizer, yields great environmental benefits, in terms of CO2 and water avoided emission and consumption respectively. It also generates cash that can cover partially or totally the cost for incentives for donations and consumer awareness.

i-REXFO reduces significantly the amount of food waste landfilled through an innovative approach that sustains actions to reduce food waste by promoting energy production from organic residues. Focus is on food waste produced by farms and food industries, by retailers and Ho.Re.Ca and by consumers. i-REXFO business model promotes biogas production from food waste in substitution of energy crops, resulting in an environmental benefit deriving from the reduction in the use of fertilizers, irrigation, etc and from the avoided landfilling of the organic waste.

Moreover, the lower cost of the fuel contributes to the economic sustainability of the i-REXFO business model together with the carbon credits that partners can claim for the environmental benefits produced.

These revenues cover the additional costs for food waste transportation and selection and provide finances for **waste reduction actions**:

- to charities for their recovery and donation of excess food.
- to Ho.Re.Ca for the acquisition and distribution of doggy bags and the promotion of last minute meals.
- to retailers for the design of low cost areas for pre-expiration sales.
- to consumer oriented awareness raising campaigns on food waste reduction.

Benefits for the community are evident namely in:

- providing food to people in need,
- reducing food waste and the related environmental impact, carbon footprint and energy-water consumption.

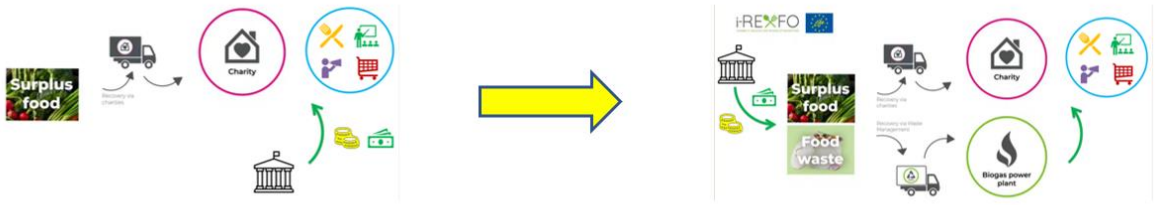


Figure 1 – iREXFO business model leverages public funding for food waste reduction – From spot incentives for single initiatives to continuous funding of actions to reduce surplus food and food waste

Benefits for partners are also evident namely in the increased cash flow, thanks to claimable carbon credits, and in an increase in the company social and environmental sustainability business performance, that can be disclosed in the corporate sustainability reporting ,according to the 2014 | 95 | EU Non-Financial Reporting Directive (NFRD).

i-REXFO business model is in line with the classification of sustainable activities foreseen in the Regulation (EU) 2020 | 852 on Taxonomy that establishes a framework to facilitate sustainable investments.

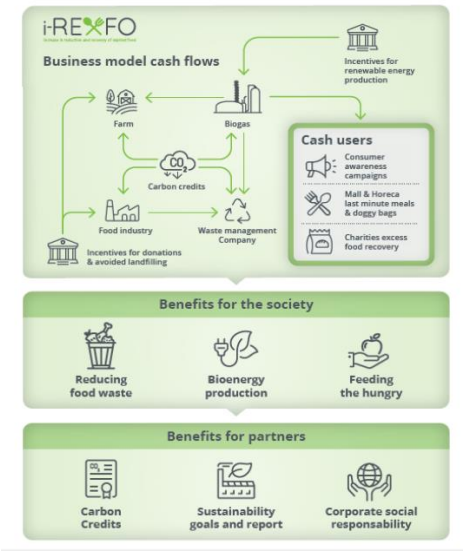


Figure 2 – iREXFO business model concept and cash flow

i-REXFO demonstration

Starting from September 2017, i-REXFO designed and built the solidarity and sustainable business model in Umbria – Italy with a software especially developed (transferability tool) and available for free in open source format on the project website www.irexfo.eu. The user identifies the batches of food waste available on EU territory, and the software evaluates the distance from the biogas plant and the methane production potential. To obtain this result, SESLAB has analyzed 100 types of food waste to determine their chemical-physical characteristics and above all the Bio-Methanation Potential (BMP), in bespoken mini reactors especially designed. The database itself is an important contribution to the state of the art and was therefore published in Golden Open Access format.

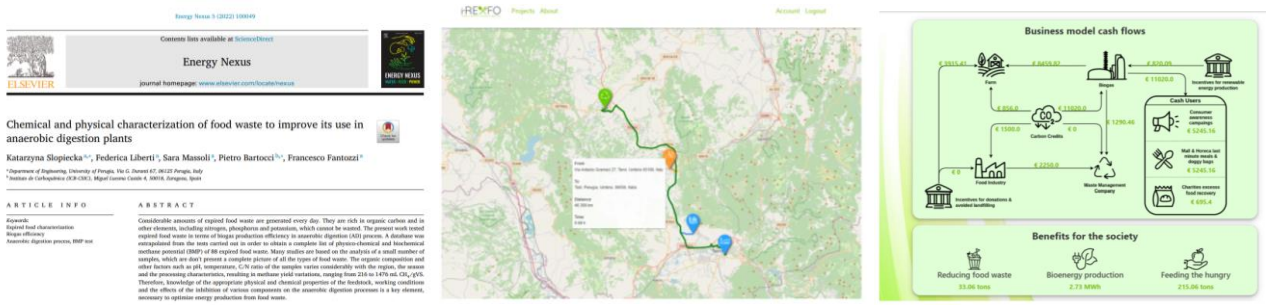


Figure 3 – Database on waste food characteristics and transferability tool

Through an optimization algorithm the software selects the quantities and location of waste food to maximize the economic profit and the avoided emissions of CO2, also considering transportation. The resulting economic benefits are then shared among partners and for the activities related to minimization of food waste in retail and Ho.Re.Ca, consumer awareness campaigns and for the recovery and donation of surplus to charities. The software can be used in any EU country and has been used to design similar supply chains in Puglia and Piemonte in Italy and Észak Alföld, Közép Dunántúl in Hungary.

In the last 18 months of the project i-REXFO has demonstrated in Umbria the economic and environmental feasibility of the solidarity and sustainable supply chain. IREXFO

- distributed to the Ho.Re.Ca of the provinces of Perugia and Terni, 100,000 design containers for the recovery of leftovers (doggy bags) and information material with practical advice for sustainable shopping, leftovers management and for reading correctly the expiration labels;
- installed 4 showcases for pre-expiration food sales were equipped with video installations in large supermarkets in Umbria (Coop, Conad and Emi), to provide useful information on how to reduce food waste and the environmental consequences.
- charities in Perugia and Terni took care of the recovery of food surplus from food industries and supermarkets which was eventually distributed in the solidarity emporiums they manage.
- installation of plexiglass containers for the recovery of household packaged surplus food in schools and parishes during awareness raising activities.

Figure 4 – iREXFO financed actions to reduce food waste

In the demonstration phase, these activities were financed by cash provided by the partners of the energy supply chain, namely biogas producers and waste management company.

Figure 5 – iREXFO produced biogas from food waste

i-REXFO impact

The i-REXFO software tool was used to design different scenarios in geographical areas characterized by different sensitivity towards food waste, different legislation regarding the use of food waste in biogas plants and of digestate on fields and different incentives for renewable energy production. Different cash flows resulted from varying bio-methanation potential of residues also considering possible oscillation in carbon credits market value.

i-REXFO demonstrated that in the **best-case scenario**, in which food waste with high bio-methanation potential is recovered (e.g. oil & fats, chocolate, cereals, etc.) and carbon credits are valued at 96 €/ton (February 2022 value), the business model is self-sustaining without the need for additional incentives besides those available for renewable energy production.

In the **worst-case scenario**, in which food waste with low bio-methanation potential is recovered (e.g. fruit & vegetables, juices, beverages, etc.) and carbon credits are valued at 20 €/ton (May 2020 value), the business model requires support in the form of an additional public incentive provided to food waste suppliers as a reward for sustainable disposal.

i-REXFO has demonstrated in Umbria the possibility of avoiding the landfilling of over 2500 tons/year of food waste that instead contributed to the production of over 2200 MWh/year of renewable energy and the donation of over 120 tons/year for surpluses. The integrated system has avoided the production of over 9200 tons/year of CO2 equivalent and the consumption of over 496,000 m3 of water, i-REXFO KPI were measured also considering a 5% engagement of people alerted.

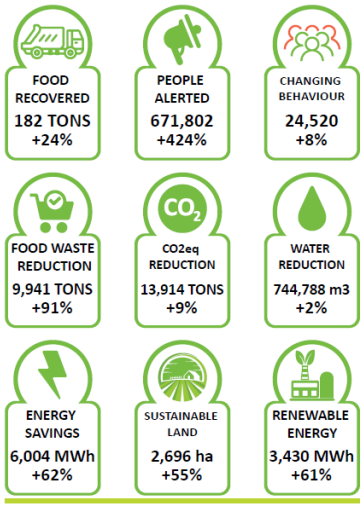


Figure 5 – iREXFO Key Project Indicators – KPI

Figure 6 – iREXFO dissemination reached also Nobel Prize recipient dr. Muhammad Yunus

2. AFTER LIFE Exploitation Plan

WHAT

Project AfterLife will guarantee the running of the iREXFO business model in Umbria and implement the i-REXFO approach in the target areas identified during the replicability and transferability action (B4) namely in Puglia and Piemonte in Italy and Észak Alföld, Közép Dunántúl in Hungary.

The replicability and transferability plan developed in B4.3, together with the lessons learned during the fine tuning and permanent running of the REF (B2.3) and EFE (B3.3) chains were used to identify the resources.

REF (Reduction of Expired food) CHAIN - ACTIVITIES
Here is a projection of the activities that will be carried out in the after life in the areas. Two different scenarios were considered depending on the valorization of carbon credits (see section How) and on the availability of food waste for biogas production.

1) Horeca awareness campaign kit

	**1.1 DOGGY BAGS** Compostable thermal container for excess food recovery in Ho.Re.Ca's – 0,5 kg. Cardboard handle with project logos and information on the outside and consumer awareness info on how to reduce food waste on the inside. SCENARIO A N° items - 500 per Horeca N° of HORECA – 100 TOTAL ITEMS – 50.000 SCENARIO B N° items - 500 per Horeca N° of HORECA – 10 TOTAL ITEMS – 5.000
	**1.2 STICKERS** Window/door sticker for iREXFO partners SCENARIO A N° items - 2 per Horeca N° of HORECA – 100 TOTAL ITEMS – 200 SCENARIO B N° items - 2 per Horeca N° of HORECA – 10 TOTAL ITEMS – 20

	**1.3 FLYERS** Foldable flyer 4 pages - Consumer awareness information on how to reduce food waste during shopping, conservation and disposal. SCENARIO A N° items – 1.000 per Horeca N° of HORECA – 100 TOTAL ITEMS – 100.000 SCENARIO B N° items – 1.000 per Horeca N° of HORECA – 10 TOTAL ITEMS – 10.000
	**1.4 MENU' HOLDERS** Cardboard menu holder with project logo on the front side and consumer tips on how to reduce food waste on the back side SCENARIO A N° items – 20 per Horeca N° of HORECA – 100 TOTAL ITEMS – 2.000 SCENARIO B N° items – 20 per Horeca N° of HORECA – 10 TOTAL ITEMS – 200

2) Mall campaign kit

	**2.1 DIGITAL REGLETTE** Digital video reglette to be positioned on top of pre-expiration food containers. Video contents with consumer awareness information on food waste environmental effects and how to reduce food waste. SCENARIO A N° items -1 per Mall N° of Mall – 4 TOTAL ITEMS – 4 SCENARIO B N° items -1 per Mall N° of Mall – 1 TOTAL ITEMS – 1

	**2.2 FLYERS** Foldable flyer 8 pages - Consumer awareness information on how to reduce food waste during shopping, conservation and disposal. SCENARIO A N° items – 2.500 per Mall N° of MALL – 4 TOTAL ITEMS – 10.000 SCENARIO B N° items – 2.500 per Mall N° of MALL – 1 TOTAL ITEMS – 2.500
	**2.3 FLYERS** Foldable flyer 6 pages - Consumer awareness information on how to read the expiration label. SCENARIO A N° items – 2.500 per Mall N° of MALL – 4 TOTAL ITEMS – 10.000 SCENARIO B N° items – 2.500 per Mall N° of MALL – 1 TOTAL ITEMS – 2.500

3) Charities activities

	**3.1 PLEXIGLASS BOX IN SCHOOLS** Distribution of plexiglass containers in schools to recover excess food from pupils and families and distribution in solidarity markets and canteens. SCENARIO A N° items – 1 per School N° of Schools – 20 TOTAL ITEMS – 20 (13 already available) SCENARIO B N° items – 1 per School N° of Schools – 13 TOTAL ITEMS – 13 (already available)

	**3.2 EXCESS FOOD DISTRIBUTION** Recovery of excess food from food industries and farm and distribution in solidarity markets and canteens. SCENARIO A Food surplus donors – 15 (11 malls and 4 Ho.Re.Ca.) N° of Solidarity markets/canteens – 3 SCENARIO B Food surplus donors – 10 (10 malls and 0 Ho.Re.Ca) N° of Solidarity markets/canteens – 1
	**3.3 STUDENT AWARENESS RAISING** Activities in primary schools to raise awareness environmental and ethical consequences of food waste. Laboratory on climate change, bioenergy, food waste and energy/water savings. SCENARIO A N° items – 6 hrs lessons N° of Schools – 13 TOTAL hrs – 78

EFE (Expired Food to Energy) CHAIN - ACTIVITIES

	**1.1 FOOD WASTE RECOVERY** Recovery of food waste from food industries and food farms for biogas production SCENARIO A Waste food recovered – 2500 ton SCENARIO B Waste food recovered – 2500 ton
	**1.2 BIOGAS AND DIGESTATE PRODUCTION** Biogas, digestate and renewable energy production from selected food waste in existing biogas plants. SCENARIO A Waste food to biogas – 2500 ton Renewable energy production – 424 MWh SCENARIO B Waste food to biogas – 2500 ton Renewable energy production – 424 MWh

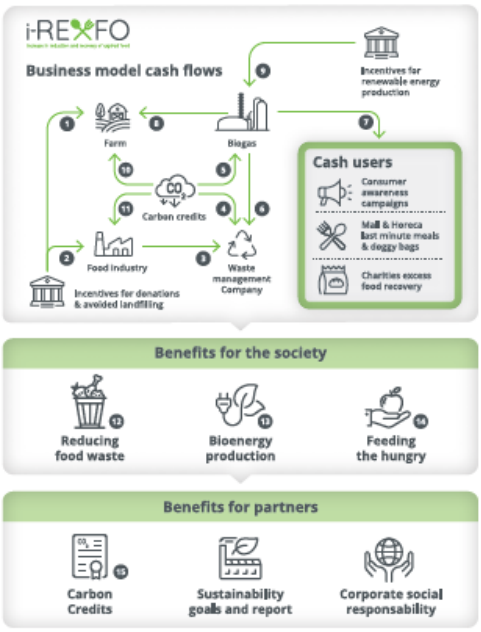
HOW

Yearly costs to carry out the activities for the REF chain are the following which include (operational costs (personnel, gasoline, etc.) and production costs (flyers, doggy bags, etc.):

REF	SCENARIO A	SCENARIO B
1 Activities in Ho.Re.Ca	€ 35.000	€ 3.500
2 Activities in Malls	€ 20.000	€ 2.000
3 Activities in Charities and Schools	€ 77.000	€ 24.000
TOTAL	**€ 132.000**	**€ 29.000**

They will be covered by revenues of the EFE chain, carbon credits and incentives for renewable energy production and avoided landfilling, according to the business model cash flow scheme (Figure 7)

i-REXFO demonstrated that in the best case scenario, in which food waste with high bio-methanation potential is recovered (e.g. oil & fats, chocolate, cereals, etc.) and carbon credits are valued at 96 €/ton (February 2022 value), the business model is self-sustaining without the need for additional incentives besides those available for renewable energy production.
In the worst-case scenario, in which food waste with low bio-methanation potential is recovered (e.g. fruit & vegetables, juices, beverages, etc.) and carbon credits are valued at 20 €/ton (May 2020 value), the business model requires support in the form of an additional public incentive provided to food waste suppliers as a reward for sustainable disposal.



	Carbon credits @ 96 €/ton		Carbon credits @ 20 €/ton	
	High CH4 yield Food Waste	Low CH4 yield Food Waste	High CH4 yield Food Waste	Low CH4 yield Food Waste
1	€ 0	€ 0	€ 0	€ 16.940
2	€ 0	€ 0	€ 45.614	€ 0
3	€ 112.500	€ 0	€ 112.500	€ 0
4	€ 0	€ 0	€ 0	€ 0
5	€ 140.346	€ 97.931	€ 29.239	€ 20.402
6	€ 198.563	€ 0	€ 198.563	€ 0
7	€ 191.396	€ 148.442	€ 29.239	€ 20.402
8	€ 0	€ 53.438	€ 0	€ 53.438
9	€ 315.053	€ 84.788	€ 315.053	€ 84.788
10	€ 0	€ 20.000	€ 0	€ 20.000
11	€ 50.000	€ 0	€ 50.000	€ 0
12	2921 tons	2794 tons	2588 tons	2561 tons
13	1575 MWh	424 MWh	1575 MWh	424 MWh
14	421 tons	294 tons	88 tons	61 tons
15	2515 t CO_2eq	1755 t CO_2eq	1681 t CO_2eq	1173 t CO_2eq

Figure 7 – iREXFO business model cash flow for best-case (SCENARIO A) and worst-case scenario (SCENARIO B)

REQUIREMENTS

The iREXFO business model produces a sensible reduction in $CO2_{eq}$ emissions which can be calculated and verified by a third party thanks to the open source transferability tool. For the financial sustainability of the business model **iREXFO requires the economic valorisation of the carbon footprint reduction** for every partner **through a third party Verified Emission Reduction in a Voluntary Carbon Market** that takes into account the carbon reduction obtained by digestate use in agriculture, avoided landfilling of food waste, surplus food donations and consumer awareness campaigns for food waste and food loss reduction.

The iREXFO business model requires a **biogas plant facility able to process food waste** in full compliance with standing regulation and authorization while **receiving incentives for renewable energy production** and **using the resulting digestate in agriculture**, without prior composting which would require a dedicated composting unit, unaffordable for farmers.

According to these requirements iREXFO produced a set of EU recommendations to remove main barriers to the implementation of the business model across member states. They are synthetized in Figure 8. Given the critical requirements highlighted, a risk assessment and contingency plan is also provided (Figure 9).

BARRIERS TO iREXFO APPLICATION	EU RECOMMENDATION FOR POLICY MEASURES	SPECIFIC DG RECIPIENT
Multiple operators are needed	Establishment of legal COnsortia of operators of circular business models to Reduce FOod WAste (CORFOWA);	JUST
Subsidies to food waste fuelled biogas plants	Encourage EU incentives for renewable energy/fuel production from food waste prioritizing biogas plants in CORFOWAs;	ENER-ENV;
Facilitate reuse of digestate in fields	- Encourage member states to roll out EoW criteria (2008/98/EC) for food waste derived biogas fuels - Promote the direct use of digestate (no composting) as a fertilizer and the uptake of Regulation (EU) 2019/1009; - Allow reduced authorization procedures for CORFOWAs;	ENV-SANTE;
Promote recognition of carbon credits for all operators	- Facilitate and promote the access to the ETS market (Directive 2003/87/EC) to voluntary and third parties Verified Emission Reduction (VER); - Consider CORFOWA a sustainable activity according to Taxonomy Regulation (EU) 2020/852 and include as a listed activity in a specific delegated act; - Extend PEF procedures and PEFCR methodologies to biogas, surplus food donation and food waste prevention measures and awareness campaigns;	ENV-CLIMA

Figure 8 – iREXFO EU recommendation for barrier removal

REQUIREMENT	RISK	SEVERITY PROBABILITY	CONTINGENCY
Roll out End of Waste criteria (Directive 2008/98/EC) for food waste derived fuels;	Significant delay in rolling out EoW criteria in the focus areas	High High	Focus on food waste without a CER Code Switch to scenario B
Incentives for energy - biogas-biomethane production from food waste across the EU;	Reduced or non existing incentives in the focus areas	High Low	Increase in local incentives to the business model

			Switch to scenario B
Uptake Regulation 2019/1009/EU on fertilizers.	Significant delay in the uptake of regulation in the focus areas	Medium Medium	Switch to biogas plant with composting unit
Rolling out of a voluntary carbon market in the EU	Significant delay in rolling out a voluntary carbon market in the EU	High Very High	Start procedure for third party Verified Emission Reduction (VER) obtained through iREXFO and marketing action. Increase in local incentives to the business model Switch to scenario B
Inclusion of VER (Verified Emission Reduction) in the EU-ETS market (Directive 2008/87/EC) trading	EU future policy on	High Very High	Start procedure for third party Verified Emission Reduction (VER) obtained through iREXFO and marketing action. Increase in local incentives to the business model Switch to scenario B

Figure 9 – Risk Assessment and Contingency Plan

CONCRETE STEPS FOR REPLICATION IN EACH AREA

Umbria	Piemonte	Puglia	Észak Alföld	Közép Dunántúl
Società Agricola Iraci Borgia STEP 1 monitors closely and as an active member of CIB (Consorzio Italiano Biogas) lobbies to include specific categories the inclusion of food waste with CER code in the list of inputs to biogas plants allowed to spread digestate in field without prior composting. EXPECTED OUTPUT ➔ National-Regional Law allowing use of digestate from food waste in fields without composting STEP 2 – Start new authorization procedure to include	**Società Agricola Cascina Bertone** STEP 1 - monitors closely the inclusion of food waste with CER code in the list of inputs to biogas plants allowed to spread digestate in field without prior composting. EXPECTED OUTPUT ➔ National-Regional Law allowing use of digestate from food waste in fields without composting STEP 2 – Start new authorization procedure to include food waste as an input. EXPECTED OUTPUT	**Azienda Agricola A.r.t.e. srl** STEP 2 focuses on food waste without a CER code. - Finds new food waste providers. EXPECTED OUTPUT ➔ List of new food byproducts providers with quantities	**Biogaz** STEP 1 - Lobbies (with Ministry of Industry) to receive public incentives for electricity produced by food waste in biogas plant. EXPECTED OUTPUT ➔ incentives for biogas production from food waste STEP 2 – Start new authorization procedure to receive incentives and include food waste or EoW from food waste as an input. EXPECTED OUTPUT ➔ Authorization to use food waste/EoW and receive incentives	**Biogaz** STEP 1 - Lobbies (Ministry of Industry) to receive public incentives for electricity produced by food waste in biogas plant. EXPECTED OUTPUT ➔ incentives for biogas production from food waste STEP 2 – Start new authorization procedure to receive incentives and include food waste or EoW from food waste as an input. EXPECTED OUTPUT ➔ Authorization to use food waste/EoW and receive incentives

food waste as an input. EXPECTED OUTPUT ➔ Authorization to use waste food STEP 3 - Finds new food waste providers EXPECTED OUTPUT ➔ List of new waste food providers with quantities	➔ Authorization to use food waste STEP 3 - Finds new food waste providers EXPECTED OUTPUT ➔ List of new waste food providers with quantities		STEP 3 - Finds new food waste providers EXPECTED OUTPUT ➔ List of new waste food providers with quantities	STEP 3 - Finds new food waste providers EXPECTED OUTPUT ➔ List of new waste food providers with quantities
ECO-Partner STEP 1 - monitors closely the Uptake of EoW legislation and lobbies with Ministries. EXPECTED OUTPUT ➔ National-Regional Law introducing EoW for food waste STEP 2 – Start the procedure for EoW EXPECTED OUTPUT ➔ EoW recognition STEP 3 - Finds new food waste providers EXPECTED OUTPUT ➔ List of new waste food providers with quantities	**ECO-Partner** STEP 1 - monitors closely the Uptake of EoW legislation and lobbies with Ministries. EXPECTED OUTPUT ➔ National-Regional Law introducing EoW for food waste STEP 2 – Start the procedure for EoW EXPECTED OUTPUT ➔ EoW recognition STEP 3 - Finds new food waste providers EXPECTED OUTPUT ➔ List of new waste food providers with quantities	**ECO-Partner** STEP 1 - monitors closely the Uptake of EoW legislation and lobbies with Ministries. EXPECTED OUTPUT ➔ National-Regional Law introducing EoW for food waste STEP 2 – Start the procedure for EoW EXPECTED OUTPUT ➔ EoW recognition STEP 3 - Finds new food waste providers EXPECTED OUTPUT ➔ List of new waste food providers with quantities	**Biogaz** STEP 1 - monitors closely the Uptake of EoW legislation and lobbies with Ministries. EXPECTED OUTPUT ➔ National Law introducing EoW for food waste STEP 2 – Promotes the the start of procedures for EoW recognition of its food waste providers EXPECTED OUTPUT ➔ EoW recognition of food waste providers STEP 3 - Finds new EoW providers EXPECTED OUTPUT ➔ List of new EoW providers with quantities	**Biogaz** STEP 1 - monitors closely the Uptake of EoW legislation and lobbies with Ministries. EXPECTED OUTPUT ➔ National Law introducing EoW for food waste STEP 2 – Promotes the the start of procedures for EoW recognition of its food waste providers EXPECTED OUTPUT ➔ EoW recognition of food waste providers STEP 3 - Finds new EoW providers EXPECTED OUTPUT ➔ List of new EoW providers with quantities
UNIPG/HFA STEP 1 – Evaluation of Voluntary third party Verified Emission Reduction (VER) – Direct contact with Goldstandard – VCS/VERRA - Reteclima EXPECTED OUTPUT ➔ Economic and technical feasibility STEP 2 - Start up of procedure for Voluntary third party Verified Emission Reduction (VER) EXPECTED OUTPUT	**UNIPG/HFA** STEP 1 – Evaluation of Voluntary third party Verified Emission Reduction (VER) – Direct contact with Goldstandard – VCS/VERRA - Reteclima EXPECTED OUTPUT ➔ Economic and technical feasibility STEP 2 - Start up of procedure for Voluntary third party Verified Emission Reduction (VER) EXPECTED OUTPUT	**UNIPG/HFA** STEP 1 – Evaluation of Voluntary third party Verified Emission Reduction (VER) – Direct contact with Goldstandard – VCS/VERRA - Reteclima EXPECTED OUTPUT ➔ Economic and technical feasibility STEP 2 - Start up of procedure for Voluntary third party Verified Emission Reduction (VER) EXPECTED OUTPUT	**HFA/UNIPG** STEP 1 – Evaluation of Voluntary third party Verified Emission Reduction (VER) – Direct contact with Goldstandard – VCS/VERRA - Reteclima EXPECTED OUTPUT ➔ Economic and technical feasibility STEP 2 - Start up of procedure for Voluntary third party Verified Emission Reduction (VER) EXPECTED OUTPUT ➔ Voluntary Emission Certification	**HFA/UNIPG** STEP 1 – Evaluation of Voluntary third party Verified Emission Reduction (VER) – Direct contact with Goldstandard – VCS/VERRA - Reteclima EXPECTED OUTPUT ➔ Economic and technical feasibility STEP 2 - Start up of procedure for Voluntary third party Verified Emission Reduction (VER) EXPECTED OUTPUT ➔ Voluntary Emission Certification

➔ Voluntary Emission Certification	➔ Voluntary Emission Certification	➔ Voluntary Emission Certification		
A+ STEP 2 – finds new HoReCa's and Malls available for consumer actions EXPECTED OUTPUT ➔ List of new HoReCa and Malls STEP 3 – Organisation of logistics in each facility EXPECTED OUTPUT ➔ Design of logistics	**A+** STEP 2 – finds new HoReCa's and Malls available for consumer actions EXPECTED OUTPUT ➔ List of new HoReCa and Malls STEP 3 – Organisation of logistics in each facility EXPECTED OUTPUT ➔ Design of logistics	**A+** STEP 2 – finds new HoReCa's and Malls available for consumer actions EXPECTED OUTPUT ➔ List of new HoReCa and Malls STEP 3 – Organisation of logistics in each facility EXPECTED OUTPUT ➔ Design of logistics	**HFA** STEP 2 – finds new HoReCa's and Malls available for consumer actions EXPECTED OUTPUT ➔ List of new HoReCa and Malls STEP 3 – Organisation of logistics in each facility EXPECTED OUTPUT ➔ Design of logistics	**HFA** STEP 2 – finds new HoReCa's and Malls available for consumer actions EXPECTED OUTPUT ➔ List of new HoReCa and Malls STEP 3 – Organisation of logistics in each facility EXPECTED OUTPUT ➔ Design of logistics
CARITAS Perugia and Terni STEP 2 – finds new HoReCa's and Malls available for food donation EXPECTED OUTPUT ➔ List of new HoReCa and Malls STEP 3 – organisation of logistics in each canteen/solidarity market EXPECTED OUTPUT ➔ Design of logistics	**CARITAS Diocesana** STEP 2 – finds new HoReCa's and Malls available for food donation EXPECTED OUTPUT ➔ List of new HoReCa and Malls STEP 3 – organisation of logistics in each canteen/solidarity market EXPECTED OUTPUT ➔ Design of logistics	**CARITAS Diocesana** STEP 2 – finds new HoReCa's and Malls available for food donation EXPECTED OUTPUT ➔ List of new HoReCa and Malls STEP 3 – organisation of logistics in each canteen/solidarity market EXPECTED OUTPUT ➔ Design of logistics	**HFA** STEP 2 – finds new HoReCa's and Malls available for food donation EXPECTED OUTPUT ➔ List of new HoReCa and Malls STEP 3 – organisation of logistics in each canteen/solidarity market EXPECTED OUTPUT ➔ Design of logistics	**HFA** STEP 2 – finds new HoReCa's and Malls available for food donation EXPECTED OUTPUT ➔ List of new HoReCa and Malls STEP 3 – organisation of logistics in each canteen/solidarity market EXPECTED OUTPUT ➔ Design of logistics
TIMELINE STEP 1 start @ 01-01-2023 – STEP 2 starts when all STEP 1 of every partner in that area are finalised – STEP 3 starts when all STEP 2 of every partner in that area are finalised				

WHERE

The activities will be carried out in Umbria, Puglia and Piemonte regions in Italy and Észak Alföld Közép Dunántúl regions in Hungary,

WHO

The activities will be carried out by iREXFO partners and associates in all Regions. To this aim partners have signed a Memorandum of Understanding.

WHEN

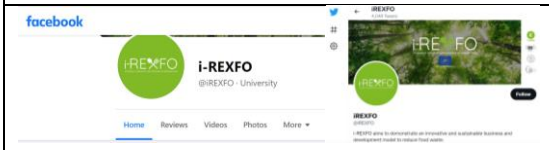
The activities will be carried out in 2023-2025,

3. AFTER LIFE Communication & Dissemination Plan

WHAT

The after-LIFE Communication and Dissemination Plan was designed based on the experience gained during the project, the effectiveness of the dissemination activities performed and the response achieved by the audience through these activities. The continuous maintenance and operation of the of the i-REXFO website (www.irexfo.eu) will guarantee the possibility to download the projects' informative leaflet and Layman's Report and the transferability tool, in an Open Access modality.
The communication plan will also consider:
- maintenance of the project's notice board with the Life + logo;
- continuation of the dissemination activities through publication of articles and interviews;
- distribution of to all interested parties;
- display of project results with special posters in participants' premises that are widely accessible from a large audience;
- communication of project outcomes to scientific teams active in the broader area of food waste management.

1) WEB & SOCIAL

	**1.1 WEBSITE** Project website www.irexfo.eu will be accessible throughout the afterlife with dissemination material available for download: - flyers template; - doggy bags template; - material for school; - scientific papers; - database on food waste; - access to trasferability tool; News section will be update with one news per month to share information of events linked to food waste and to give visibility to afterlife activities carried out by partners. Project website will be linked to partner website throughout the afterlife.
	**1.2 Social channels** Project social channels (facebook, twitter, linkedin, youtube) will be accessible throughout the afterlife – posts will be guaranteed to share information of events linked to food waste and to give visibility to afterlife activities carried out by partners.

2) SCIENTIFIC ACTIVITY


Springer Link

Original Article | Open Access | Published: 07 January 2022

Development of a tool to optimize economic and environmental feasibility of food waste chains

Irene Celli, Edoardo Brunori, Michele Eugeni, Cecilia Andrea Cristinariu, Mauro Zampilli, Sara Massoli, Pietro Bartocci, Valentina Caldarelli, Stefano Saetta, Gianni Bidini & Francesco Fantozzi

Biomass Conversion and Biorefinery (2022) | Cite this article

262 Accesses | Metrics

3.1 Scientific papers

SESLAB will follow up on its research activities on food waste focusing on:

- use the tool to analyse different scenarios in the EU;
- biomethane and biohydrogen production from food waste

Results will be published in selected journals.

3.2 Scientific conferences

SESLAB will attend selected conferences to present iREXFO approach and scientific results.

Already Identified:

08-05-2022 – XXII Congresso Nazional CIRIAF - Perugia

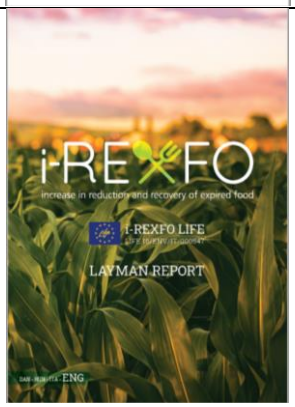
23-05-2022 - "Platform Meeting "Economia circolare: dallo spreco all'efficienza". Scambio di esperienze, trasferimento di buone pratiche e soluzioni innovative per la gestione dei rifiuti e l'uso efficiente delle risorse" - Ministero della Transizione Ecologica - Roma

3.3 Scientific seminars

SESLAB will present iREXFO approach and scientific results in dedicated seminars in the framework of University Courses:

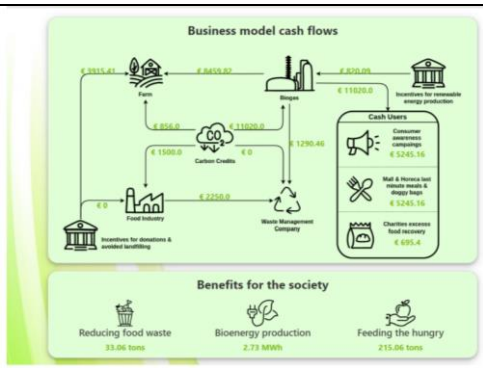
- Energy from biomass and waste - M.Sc. Mechanical Engineering – University of Perugia
- Energy Sysems - M.Sc. Industrial Engineering – University of Perugia
- Sustainability – Ph.D. Energy and sustainable development – University of Perugia
- Circular Economy – Master in Environmental Management – Scuola Superiore Sant'Anna - Pisa
- Circular business models - MBA – LUISS Guido Carli - Roma

3) NETWORKING AND COMMUNICATION

	**4.1 Notice Board** Partners will maintain the iREXFO notice board with LIFE logo on display at their premises throughout the afterlife. n. ITEMS = 18
	**4.2 Layman Report** Downloadable from i-Rexfo website. Partners will distribute the Layman Report in networking events and fairs that they attend. n. items = 800 Example will be: - ASME Turboexpo – EU - USA - Congress Associazione Termotecnica Italiana - Italy - UNFCC – COP
	**4.3 Networking and Communication** Partners will disseminate iREXFO results and the in networking events and fairs that they attend. Example will be: - SHARPER – Researcher's Night – Perugia - Ecomondo – Rimini -Itali - ASME Turboexpo – EU - USA - Congress Associazione Termotecnica Italiana - Italy - UNFCC – COP Dissemination will also be guaranteed by members of the iREXFO International Stakeholder Advisory and Assistance Committee (ISAAC) in their respective associations. The main stakeholders involved are: • Wholesale retailers associations and HORECA; • Food banks and charity associations and their association; • Waste management companies associations and networks; • Biogas producers and renewable energies networks; • Regional and local Government authorities all over Italy and Europe; • National and European authorities in the field of energy policies, waste management and health (Environmental,

	Economic Development and Health Ministries and other national and EU agencies); • National and European Non Governmental Organisations committed with environmental and social issues; • Citizens' formal groups or opinion movements dealing with the renewable energy production and the communities' quality of life (local and global vision); • Universities and research institutes all over Italy, Europe and other third countries.

4) TRANSFERABILITY

	**4.1 Software Tool** iREXFO transferability tool will be accessible during the afterlife through the website. Partners will guarantee assistance to users interested in carrying out feasibility studies in different countries and scenarios. The tool also gives access to: - database of bio-methanation potential for expired foods; - regulation framework;
Regione Umbria	**4.2 Coordination table against food waste** Regione Umbria approved a Law to promote actions against food waste [DGR 14-11-2017, n.16] which includes a permanent coordination table – iREXFO Coordinator University of Perugia is a member of the table. The coordination table assigns resources to activities to reduce food waste and is an opportunity for iREXFO model to be replicated in Umbria and to distribute the earnings of the business model. University of Perugia will maintain his presence in the coordination table throughout the afterlife.
	**4.3 The EU platform on Food Loss and food Waste - FLW** The EU Platform on Food Losses and Food Waste (FLW) was established in 2016, bringing together EU institutions, experts from the EU countries, international organisations and relevant stakeholders. The Platform aims to support all actors in: defining measures needed to prevent food waste; sharing best practice; and evaluating progress made over time. iREXFO partner HFA is a member of the the EU Platform on Food Losses and Food Waste (FLW): Sub Group on Food Donation and it will continue to share the iREXFO results and

	promote iREXFO transferability among the EU members of the platform. HFA will maintain his presence in the FLW throughout the afterlife.
Food and Agriculture Organization of the United Nations initiative SAVE FOOD Solutions for a world aware of its resources	**4.4 The FAO SAVE FOOD iniative** The SAVE FOOD initiative aims at encouraging dialogue between industry, research, politics, and civil society on food losses. For this purpose, the initiative will brings together stakeholders involved in the food supply chain for conferences and projects and support them in developing effective measures. Another goal is also to raise public awareness of the impact of food waste. iREXFO is partner of the FAO SAVE FOOD initiative and one of its senior technician is a member of iREXFO ISAAC. iREXFO will maintain his presence in the FAO SAVE FOOD initiative throughout the afterlife.

HOW

Yearly costs to carry out the activities for will be covered by partners with own resources

	PARTNER	**RESOURCES**
1 WEB & SOCIAL	University of Perugia (web site) - All partners (other activities)	Own resources
2 SCIENTIFIC ACTIVITY	University of Perugia	Own resources
3 NETWORKING AND COMMUNICATION	All partners	Own resources
4 TRASFERABILITY	University of Perugia - HFA	Own resources

WHERE

The activities will be carried out in Italy, Hungary and Denmark

WHO

The activities will be carried out by project partners (see above)

WHEN

The activities will be carried out in 2023-2025,