

# Interreg



EUROPEAN UNION

## North-West Europe

### GROOF

European Regional Development Fund



# GROOF PROJECT

Communication report (short version) - 2023

# GROOF PRESENTATION

Reducing greenhouse gas emissions is a major international concern in the fight against global warming, which threatens our entire ecosystem. The construction sector obviously has a key role to play, and while energy-efficient building renovation is one way to contribute, another solution may well come from above. Let's look up and seriously consider the full potential of our roofs !



In this context, many European countries have committed to the GROOF project, which stands for "Greenhouses to Reduce CO<sub>2</sub> on Roofs". The project is an innovative cross-sector approach to reduce CO<sub>2</sub> emissions in the building and agricultural sectors by combining energy use for heating and cooling with local food production. It is supported by the INTERREG NWE programme and has a budget of approximately €5.9 million, with 60% co-funded by Interreg.

Within the framework of a partnership between 11 partners in France, Belgium, Germany, Spain, and Luxembourg, led by the CDEC (Conseil pour le développement économique du secteur de la construction) in Luxembourg, the Institut de Formation Sectoriel du Batiment (IFSB/LU), University of Liège (BE), Groupe One (BE), Cluster Eco-Construction (BE), Centre Scientifique et Technique du Bâtiment (CSTB/FR), Gally Farms (Fermes de Gally/FR), ASTREDHOR (FR), EBF GmbH (DE), University of Applied Sciences Trier (HS-Trier/IfaS/DE), and Universitat Autònoma del Barcelona (E).

The GROOF team has developed a benchmark for RTG (Rooftop Greenhouse) projects in NWE, Europe, and internationally. The aim of this work is to describe the diversity of projects, to identify the tools implemented and the respective levers that cities and actors can deploy to promote the installation of RTGs.

Each partner brings valuable skills and knowledge to the project, such as construction process and methodology, building energy management, urban agriculture development, knowledge of plants and growing systems, entrepreneurship, and socio-economic skills.

The idea is precisely to use rooftop greenhouses as efficient equipment to:

- Recover the heat produced and not consumed by the supporting building in an active way (through the ventilation and heating system) and passively (30% of heat lost through the roofs on average) in a plant production,
- Collect the CO<sub>2</sub> produced by people and activities in the building to "feed" the plants,
- Reduce CO<sub>2</sub> emissions from transport by producing plants locally.

# IFSB PILOT



FRESH is a pilot project in Luxembourg installed on the rooftop of the Institut de Formation Sectoriel du Bâtiment (IFSB) restaurant extension.

The country's fast-developing real estate industry cannot keep up with the demographic pressure, so the IFSB decided to create a tool for the construction sector to anticipate future food needs.



The project involves a 380 m<sup>2</sup> greenhouse above the restaurant, with some of the plants served directly to the restaurant below. The objective is to raise awareness about food production and reconnect people to it.

Popular products such as tomatoes will be prioritized to meet the restaurant's needs. A corridor around the greenhouse allows visitors to view the production area without disrupting operations. The connection to the building for CO<sub>2</sub> and heat recovery is also beneficial for the building sector, which is facing upcoming challenges in CO<sub>2</sub> recovery in Luxembourg.

## DISCOVER IFSB PILOT



### TECHNICAL OVERVIEW

Surface of 380 m<sup>2</sup>

Height of 7.50 m

Cost of the installation work:

870 000 €

Target :

Savings of 45 tons of CO<sub>2</sub> equivalent  
emissions per year

Steel used : 28 Tons

Aluminium used : 5.5 Tons

Glasses : 18 Tons

# EBF PILOT



The RTG is in Bürstadt, Germany, on the roof of the packaging hall on a farm owned by EBF. The packaging hall is a building from the late 1950s and is currently heated by fossil fuels, but the heat supply on the entire site will be replaced by renewable heating in the coming years.



The solar greenhouse covers 160 m<sup>2</sup> and is designed to have a low heating demand, produce electrical energy, and serve as a solar collector for the support building, achieving a net positive energy balance over one year of operation.

EBF specializes in industrial and horticultural energy management and is implementing new technologies and systemic solutions in the food production sector to make it more sustainable and future-proof.

The RTG serves as a unique selling point for the farm and shows how RTGs can increase farming capacity without increasing land use.

## DISCOVER EBF PILOT



## TECHNICAL OVERVIEW

Internal Area 150m<sup>2</sup>  
Internal Height 4.0m  
Installation cost €364,000, €2,366/m<sup>2</sup>

CO<sub>2</sub> Savings Target: 45 tCO<sub>2</sub>/annum  
GH Shell Cost: €45,000 (12%)

# GALLY PILOT

LES FERMES  
DE GALLY 

One of the four GROOF pilot rooftop greenhouses (RTGs) is located at the urban farm of Saint-Denis, near Paris, France. The farm is dedicated to production and education, and visitors include citizens, families, and companies interested in learning about farming, healthy food, nature, and the workings of the farm.



The farm is managed by Les Fermes de Gally, a company that specializes in landscaping and is devoted to bringing nature and farming into and around cities. The 360-m<sup>2</sup> RTG is dedicated to vegetable production, specifically increasing the tomato and herb production of the farm.

The greenhouse is designed for flexible production using hydroponic systems and aims to be easily manageable, sustainable, and dedicated solely to production. Visitors will be able to walk on a platform located on the east and south sides of the RTG. In addition to the research aspect, the project is based on four distinct and complementary functions: receiving the public, promoting direct and local sales, hosting training and awareness-raising workshops, and training gardeners for other places and companies.

The greenhouse on the roof of the Ferme Ouverte in Saint-Denis is focused on four main areas: local production, energy saving, materials used for construction, and irrigation.

## DISCOVER GALLY PILOT



## TECHNICAL OVERVIEW :

Internal Area 360m<sup>2</sup>  
Total Farm Area 2.3ha (1ha committed to vegetable production)  
Total Cost €210,000, €583/m<sup>2</sup>  
GH Shell Cost: €85,000 (41%)

# ULIEGE PILOT



The greenhouse, named SERR'URE (SERRe URbaine basse Energie), is located on the rooftop of the Gembloux Agro-Bio Tech faculty building in Belgium. The 198m<sup>2</sup> (5.5 x 36m) greenhouse is developed by the Research Centre in Urban Farming of Liège University and is dedicated to research on production systems for rooftop farming.

The greenhouse is equipped with various sensors for monitoring climate parameters, electricity, and heat meters, and a weighing system for production and waste. It can be easily removed without affecting the waterproofing of the building. The research center focuses on developing low-tech and high-tech approaches for urban farming, such as SPIN, agroforestry, aquaponics, rooftop farming, and indoor cultivation. The RTG will research and demonstrate innovative production systems adapted to RTG applications and also host educational activities.

## DISCOVER ULIEGE PILOT



## TECHNICAL OVERVIEW :

Internal Area 198m<sup>2</sup>  
Total Cost €528,000, €2,669/m<sup>2</sup>  
GH Shell Cost: €182,000 (34%)

# COACHING

## CALL 1 – 2019 – 2020



Since September 2019, GROOF has already supported 10 greenhouses projects located exclusively on rooftops. The coaching involved a total of 175 hours of individual coaching and 5 on-site visits to help the project owners build, develop, and implement their projects.

Phase 2 coaching: 5 projects selected to accelerate implementation.

Out of the 10 projects, 5 have been selected to continue the coaching in phase 2, with a focus on accelerating the implementation of their projects.

## CALL 2 – 2022 – 2023



In 2021 GROOF launched a new call for projects offering a year of coaching to early adopters located in UK, Ireland, The Netherlands and Germany.

This time, the scope of the coaching program was opened to non-rooftop greenhouse projects, such as greenhouses on facades or on the ground, as long as they are connected to a building to exploit synergies. The 10 selected Building Integrated Greenhouse projects utilize various techniques (hydroponic, aquaponics, soil-based vegetable gardens, etc.) and serve different purposes (educational, social, private, etc.).

# GUIDELINES

The guidelines provide a summary of GROOF's experience in designing and building energy-efficient rooftop greenhouses (RTGs). They include feedback from existing projects and advice for each stage of project development. The purpose of the guidelines is to help RTG project owners integrate energy, construction, and production synergies with the host building in their business model to strengthen its robustness while reducing CO<sub>2</sub> emissions.

Existing buildings that do not meet current thermal regulations can lose up to 30% of stored heat on average through their roofs in winter. Additionally, heat and CO<sub>2</sub> can be collected through ventilation systems. The amount depends on the building's usage and the technical specifications of installed systems. Each building is unique (in size, use, location, materials, energy equipment configuration, bearing capacity, etc.), so each situation requires customized treatment.

However, these specificities do not necessarily require the use of expensive technical innovations to connect the greenhouse to the building. Any greenhouse manufacturer should be able to build and implement RTGs aimed at reducing CO<sub>2</sub> emissions.

The innovation lies in the combined work of the construction and agriculture sectors in the design and construction stages to connect the greenhouse to the building in an efficient and cost-effective manner, as well as in terms of its management and operation. A successful collaboration will result in a project that consumes less energy than the two structures managed separately.

These guidelines are designed to meet the needs of four major stakeholders who will use them in practice: building owners, financial partners, farmers, and project partners.

Our team of experts conducted several observations (visits to existing RTGs, meetings with project stakeholders, etc.) and tested four pilot projects exclusively owned by GROOF. They also provided coaching to 20 other early adopter projects. Based on this experience and collected data, we organized this document according to the success factors identified for RTG projects with a reduced carbon impact.

To learn more about our guidelines, please visit our website!



- Are you motivated by the idea of growing vegetables and plants and distributing them locally?
- Are you an expert in one of the skills required by the project but maybe not in all of them?
- Are you wondering how to start such a project, the steps to take, the priorities, and how to streamline the process?

# THANK YOU



TO DISCOVER OUR  
GROOF INTERIM  
RESULTS



Do not hesitate to visit GROOF website : [www.groof.eu](http://www.groof.eu)

Discover GROOF Guidelines : <https://www.urbanfarming-greenhouse.eu/>  
This is a summary of GROOF's experience in designing and building an energy efficient rooftop greenhouse.

