

INNOVATIVE APPROACHES  
TO GREEN ROOFING



# HAYBASE: LIGHTWEIGHT GREEN ROOFS THAT LAST



Introducing HayBase, by Organic Roofs: the culmination of 20 years Swiss and UK research, with recent EU funding to product test for UK market.

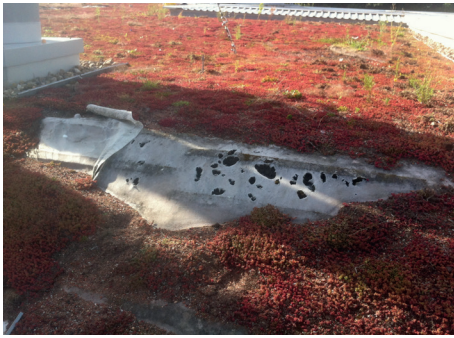
Using waste agricultural material (and knowhow) to improve the quality of new green roofs and cost-effectively revive poorly-installed old ones.

Supported by the  
 Regional Growth Fund

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OUR CLIENTS INCLUDE





## THE PROBLEM

### FAILING SEDUM ROOFS

Sedum roofs are often specified because they're claimed to be low cost (less material), low weight (less implied cost to strengthen the structure below) and low maintenance (O&M).

At least 80% we estimate are low quality, poorly installed (below GRO code) and often dead within 2 years.

Most constitute a costly waste of project spend, embodied energy and a missed opportunity to substantially reduce the lifecycle costs of the building and improve occupant experience.

Keeping under-specified roofs alive with fertiliser and irrigation enriches the substrate and builds-in unplanned reactive maintenance costs when windblown invasives take root.

Sedum is the popular choice but there is a better way of doing lightweight and cost-effective green roofs.



## THE ALTERNATIVE

### EXTENSIVE MEADOW ROOFS

Wildflower green roofs outperform sedum and are not significantly heavier.

- Energy savings through additional thermal mass (as much as £6/m<sup>2</sup> annually)
- Increased wellbeing metrics (eg improved occupancy ratings and +20% employee productivity)
- Deeper substrate provides greater SUDS contribution
- Improved BREEAM/HQM rating
- Genuinely low maintenance regime and negligible irrigation requirements once watered-in
- Nothing tells the world about your environmental principles like a wildflower meadow roof

But they are heavier and cost more - normally 100mm of substrate vs 60mm for sedum (GRO Code for Green Roofs) meaning they are often value-engineered out of all except those projects with stringent planning conditions.



## THE SOLUTION

### HAYBASE: LIGHTWEIGHT MEADOW ALTERNATIVE TO SEDUM

Replacing 50% of the substrate with hay or straw enables low-density long-term meadow growth that weighs the same, costs the same and is lower maintenance than sedum:

#### Benefits of HayBase over sedum systems

- Long term viability of vegetation compared to sedum - 15+ years proven track record in Switzerland
- Eliminates unplanned intensive horticultural interventions
- Self-sustaining meadow (Selbst erhaltende Wiese)
- Supports local economy
- Reduces embodied energy

Lightweight green roofs provide multiple project wins and substantial lifecycle cost savings especially for green retrofit: 85% of costs associated with a building are post-occupancy - a green roof that lasts can make a significant contribution to managing the long-term O&M costs.

# THE BENEFITS OF HAYBASE

**AFFORDABLE**  
**PRICE-MATCHED TO COMPETE WITH SEDUM, WITH NONE OF THE DRAWBACKS**

**LIGHTER**  
**UP TO 33% LIGHTER THAN A VIABLE SEDUM SYSTEM**  
**LONG-LASTING**  
**SWISS-INSPIRED METHOD WITH 20 YEAR HISTORY**

**BETTER FOR THE ENVIRONMENT**  
**LOWER EMBODIED ENERGY & FEWER TRANSPORT MILES**

**LOCAL ECONOMY**  
**SUPPORTING LOCAL FARMERS AND SME'S**



# RESEARCH FINDINGS

Organic Roofs and University of Brighton collaborated on a year-long R&D programme supported by EU funding, with academic support from internationally renowned sustainable architect Duncan Baker-Brown and Head of Biology and urban pollinator expert Dr Anja Rott.

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## Key findings:

- SUDS: A new HayBase 50 (50mm substrate/75mm HayBase) detains all rain in a 1-in-a-100-year rainfall event for 45mins. Sedum blanket alone does so for max 15mins
- Weight: HayBase 50 weighs up to 30% less than Sedum on 50mm substrate, 50% of a normal wildflower roof
- Species supported: Recent audits of 3 & 4 year old HayBase roofs show 15 species of native wildflower thriving, all of them target species for London Biodiversity Action Plan. HayBase tends to be more grassy over time.

## Swiss provenance

15 years long-term success on roofs in Swiss roofs monitored by our research partner at ZHAW (Zurich School of Applied Sciences).

## PLANT DEVELOPMENT



**0 MONTHS**  
SEEDED, BARE  
SUBSTRATE



**+12 MONTHS**  
NATIVE WILDFLOWERS  
THRIVING



**+36 MONTHS**  
GRASSY, DROUGHT-RESILIENT  
MEADOW

## IN NUMBERS

### NUMBER OF TESTS CARRIED OUT:

**9 RIGS**

(8 COMMON GREEN  
ROOF BUILD-UPS,  
1 FLAT ROOF)

**594**

OUTFLOW  
MEASUREMENTS

**801**

TEMPERATURE  
MEASUREMENTS

**243**

NITRATE, PHOSPHATE,  
PH MEASUREMENTS

**980**

SIMULATED 1/100 YEAR  
RAINFALL EVENT TESTS

**2000M<sup>2</sup>**

PROJECTS  
SINCE 2014

**TOTAL  
3455**

# HAYBASE: FROM FARM TO ROOF

Suitable for large commercial or small residential

**QUICK INSTALLATION,  
MINIMAL CARE**

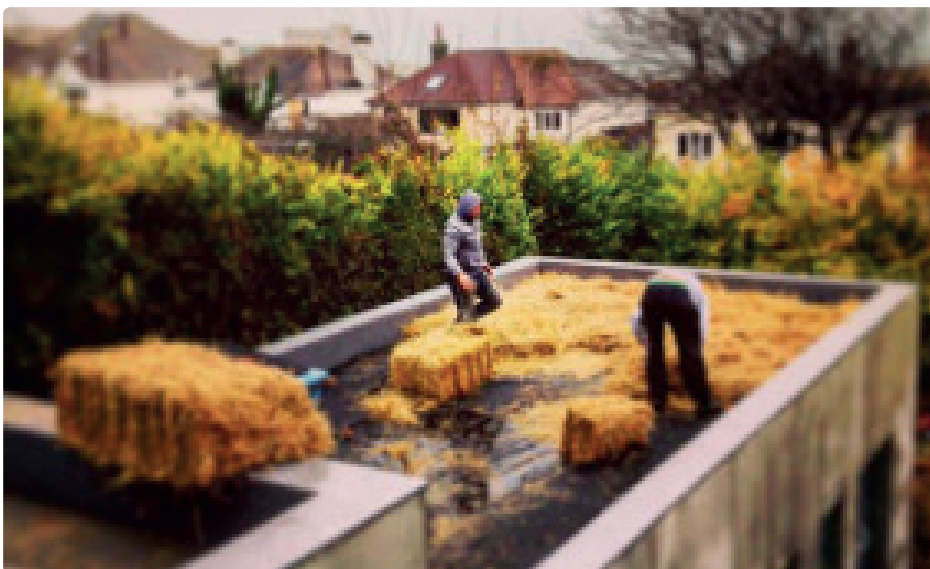
**RESILIENT TO DROUGHT  
ONCE WATERED-IN**

**WONT GO RED AND DIE  
QUICKLY, UNLIKE SEDUM**

**GROWS QUICKLY FROM  
SEED, MATURE IN 1-2  
YEARS**

**DOESNT NEED  
FERTILISER,  
UNLIKE SEDUM**

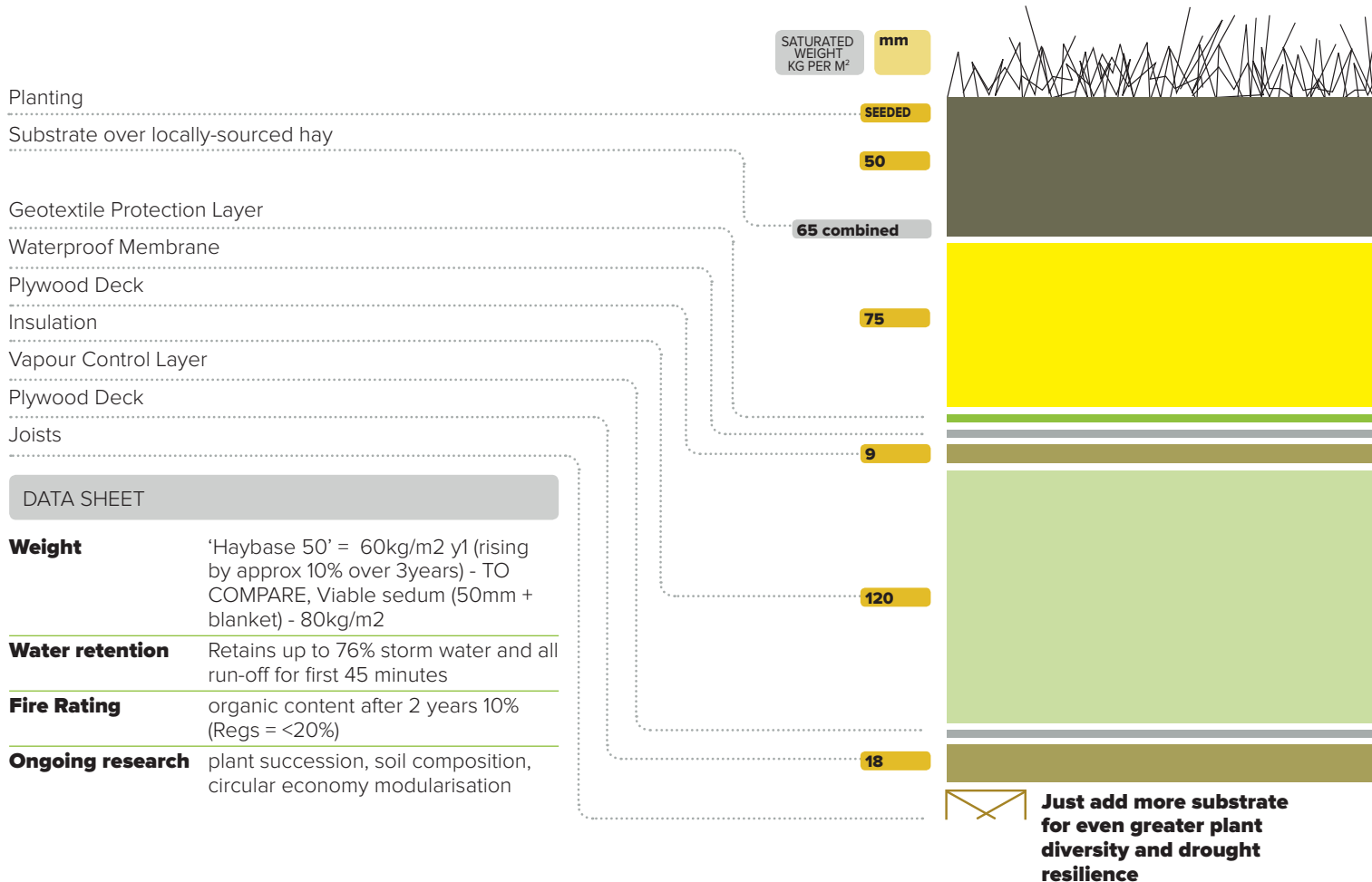
**PLANTS THAT BLOW  
IN ARE HIDDEN BY  
FLOWERS UNTIL  
MAINTENANCE TIME**



# HAYBASE: DATA



## How your HayBase 50 green roof is built up



## CHANGING WITH AGE (THE SCIENCE BIT!)

HayBase roofs do get slightly heavier as they age. This is due to the slight increase in organic material (decomposing straw mixes with plant roots and fungus hyphae forming a healthy soil conglomerate with increased nutrients available for plant growth, but slowing drainage). However this also means an aging Haybase roof

positively influences the soil's water retention ability (see FAQ below) as well as reducing the potential drought stress for plants. As the straw is broken down by microorganism and fungi, it breaks up into smaller fragments - losing weight but increasing moisture content. In our tests this amounted to approximately 10% increase, stabilising after 3 years.





# HAYBASE: FAQ

## **Is there a fire risk from the use of straw on the roof?**

NO. UK guidelines on flammability require green roof substrate to be less than 20% organic composition by volume. HayBase is less than 10% organic composition after 1 year, and our membranes form minimum 30 minutes fire resistance over the entire surface of the roof. Firebreaks using flagstones or pebbles every 40m can be deployed over larger installations.

## **Water retention?**

HayBase 50 retains 100% of rainfall for the first 30 minutes, thereafter it releases approximately 10% of the rainfall every 15 minutes during a six hour extreme rainfall event, retaining 40% by the end of the test. Once Hay has broken down, this increases marginally to 42%.

## **Does HayBase require a drainage layer?**

When HayBase is first installed the straw acts as a drainage layer. Once the straw has broken down the roof does not drain as freely. This is a benefit where there is no parapet but where the roof is contained on all sides, a drainage layer covering part or all of the roof would be recommended, depending on pitch and area.

## **What kind of plants does it include?**

HayBase starts with a seed mix including over 30 UK-native annuals and perennials, and there will also be a number of species of flower and grass in the seedbank from the hay itself. If maintained, we would hope that around a dozen species will still be present in Y5 - this is considered an excellent amount of diversity for any green roof. Where left to do its thing, it is likely that in a HayBase roof grasses will be prevalent and that the number of other species is lower. Understanding how plant communities develop on HayBase roofs is currently the subject of research at UoB Biology.

## **How long will the vegetation last?**

In a rural meadow, individual plants have root systems that are very deep and in some case can access moisture 1-2 metres below the ground. This means that it would take months of dry weather before the meadow looks brown and many species are wonderfully drought tolerant. However, on a roof, wildflowers only have access to moisture to the depth of the substrate and wildflowers have high transpiration rates compared to sedum. HayBase, for example has an initial depth of 125mm, thus limiting available moisture, as with any comparable

green roof. However as an aging Haybase roof positively influences the soil's water retention ability, it will reduce the potential drought stress for plants. For any green roof, limiting water will speed up the plant's life-cycle and encourages the plant to flower and shed seed a lot quicker. This does not mean the plant will die off completely, it will simply shut down until water is available and then rejuvenate itself for the following year.

## **Does HayBase have a guarantee?**

We're confident the roof will enjoy at least 75% coverage after 3 years if its properly watered-in. If it doesn't, we'll reseed and set up a temporary irrigation system for you.

## **Can we put a HayBase roof over existing waterproofing?**

HayBase is very lightweight so its perfect for retrofit projects, and often this means going over existing waterproofing. We can simulate the effect of a greenroof to give peace of mind about the existing roof covering. If its a non-root resistant covering such as felt we can add a root barrier to protect the joints.

## **What kind of wildlife will be attracted?**

We are continuing to monitor wildlife on our HayBase roofs with University of Brighton Biology undergraduates visiting dozens of sites during the flowering season. Our planting schemes are designed to provide forage and shelter for a much longer part of the year, especially for solitary bees which pollinate 20 times more plants than honey bees, as well as butterflies, moths, hover flies and spiders. We can also develop specific planting schemes for your area, by postcode.

## **Straw will rot. How does this affect the performance of the technology?**

Straw is 100% organic material, which as it decomposes becomes organic matter. This is good for the substrate/soil as it:

- Improves the quality by adding nitrogen, phosphorous and potassium
- Reduces compaction
- Increases drainage and water holding capacity through the organic matter, soils & micro-organism conglomerate
- Plants will be healthier, more tolerant of drought, insects and diseases
- Serves as a reservoir for plants nutrients/returns nutrients back into the soil/substrate

In addition to the straw the plants, grasses

and herbs that grow on the roofs become organic matter as their cells slough off or as they die.

## **Do you plan to obtain BBA accreditation for HayBase?**

In order to assess a material, it needs to be assessed against a criteria so there needs to be a standard in place, there are currently no standards in place for green roofs so HayBase technology cannot be tested. There is about a 20 year process to get a standard and nothing is underway yet: green roofs are early in the stages of development and evolving all the time, by not having a standard it enables innovative technology to be trialled and tested and for research like ours to be carried out.

## **How does HayBase help with BREEAM?**

BREEAM POINTS are awarded for the following:

POL5 – Flood risk – Take measures to reduce the impact of flooding on buildings in areas with a medium or high risk of flooding.

LE4 – Mitigating ecological impact – minimise impact of a building development on existing site ecology.

LE5 – Enhancing site ecology – To recognise and encourage actions to maintain and enhance the ecological value of the site as a result of development.

LE6 – Long term impact on biodiversity – minimise the long term impact of the development on the site and surrounding areas biodiversity.

Green roofs can also have more indirect impact on other sections of BREEAM.

## **Does HayBase have a specific maintenance requirement?**

HayBase roofs will tend to become more grassy over time. This can either be accepted as part of the plant community suited to low substrate depth, or addressed with an annual cut. All green roofs should have a visual inspection at least once a year. Unlike sedum roofs, which can appear either unkempt when invasive take amidst the low-growing plants, a HayBase roof provides good cover for incomers in the intervening periods between maintenance visits.

## **Does the addition of straw have any consequences for the performance of the waterproofing?**

Yes, it will at least treble the lifespan by avoiding exposure to UV and diurnal changes in temperature (hot days, cold nights)