

OP-280 [Pollination and Bee Flora]

Increased pollination activity by honey bee colonies managed in thermodynamic hives

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Primal Bee

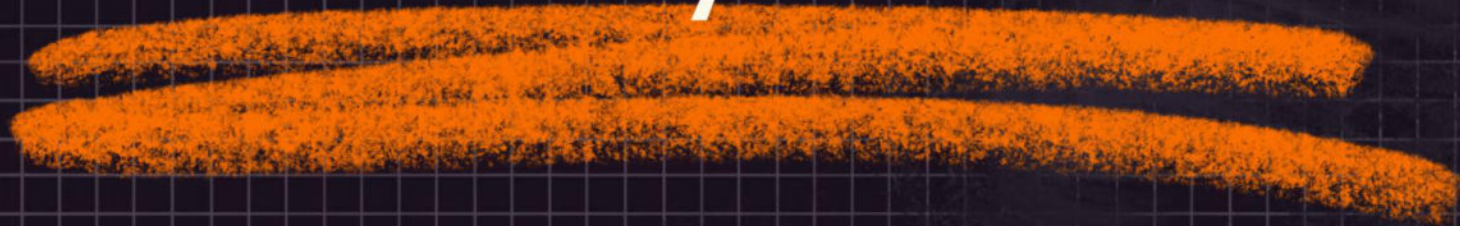
Pollination is a critical environmental service provided by bees that helps to insure food security by increasing the bounty and genetic diversity of plants that we and our livestock depend upon. Many beekeeping operations rely on income generated from locating hives of bees onto farmland in order to pollinate crops. Unfortunately, beekeepers also need to manage increased operational costs, and contend with high colony mortality. The decreased profitability and unpredictable high risks has become a barrier to beekeepers, leading to a potential shortage in agriculture pollination services and threat to food security.

This presentation explores the use of innovative methodology to increase pollination capability while reducing operational costs. Honey bee colonies (50) were installed in both thermodynamic Primal Bee hives (25) and standard, wooden, Langstroth hives (25) in a commercial operation in Israel. The two groups of colonies were managed in the same way, overwintered and were then used to measure and compare survivability and Spring pollination activity through the metrics of brood area and forager timing and frequency of bee flights.

The colonies managed in thermodynamic Primal Bee hives resulted in larger brood areas, larger forager populations which began foraging flights earlier and ended foraging later in the day, resulting in increased flight activity compared to colonies managed in standard Langstroth hives. The increase in population dynamics resulted in increased pollination services. The data collected were used in a comparative analysis of the economics of pollination services. The results demonstrated a margin within which commercial beekeeping operations can reduce the risk of high colony mortality, and increase profitability while providing pollination services to insure our food supply.



Increased Pollination Activity by Honey Bees managed on Thermodynamic Hives



Presented by:
Gianmario Riganti



Speaker:

Gianmario Riganti
Co Founder & CSO



Gianmario Riganti Co Founder & CSO

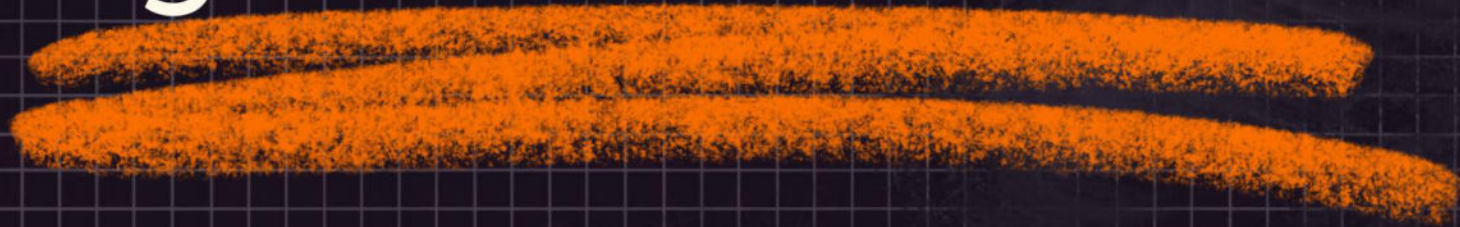
Bio:

- University of Milan -Italy - Engineering
- Founder and researcher at DynaMat fast dynamic laboratory
- Swiss critical research infrastructure.
- Teacher researcher at Swiss SUPSI University of Applied Science
- Multi physic non-proportional problem solving applications
in research /industrial projects
- Beekeeper and private researcher in honey bees 2006-2023
- Primal Bee Hive concept science and testing
- Author on multiple Physics peer-reviewed publications
- Managing beekeeping operations in North America Europe,
Middle East



Pollination

A Critical Environmental and Agricultural Service



Pollination

Predicting Risks



High managing costs

Standard hive



Pollination

Predicting Risks



Up to 70% mortality in the U.S



High managing costs



+60% feeding costs

Standard hive



Pollination

Predicting Risks



Up to 70% mortality in the



costs



+60% feeding costs

Profitability? Sustainability? Future?

Standard hive





Research:

**Does hive design effect
pollination?**

Case Study: Onion Seed Production

Evaluating pollination quality and associated costs

Thermodynamic hive

definition

- Minimize thermal burn rate
- Maximize available resources
- Advantage bee biology

Thermodynamic hive

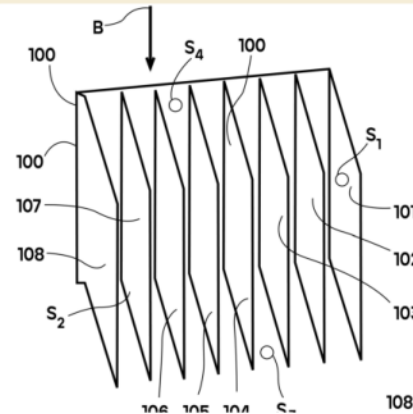
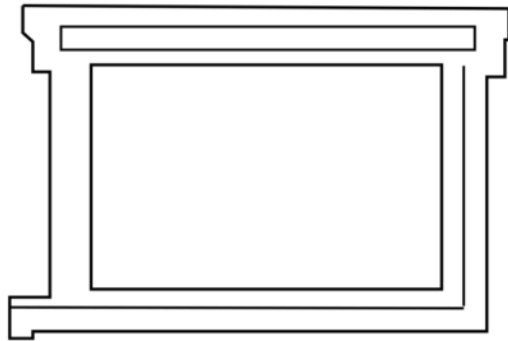
Scientific background
Measure thermal burn rate

- Published by Gamberoni and Riganti 2017
- International publication Nr. : WO 2018/189302 A1

Thermodynamic hive

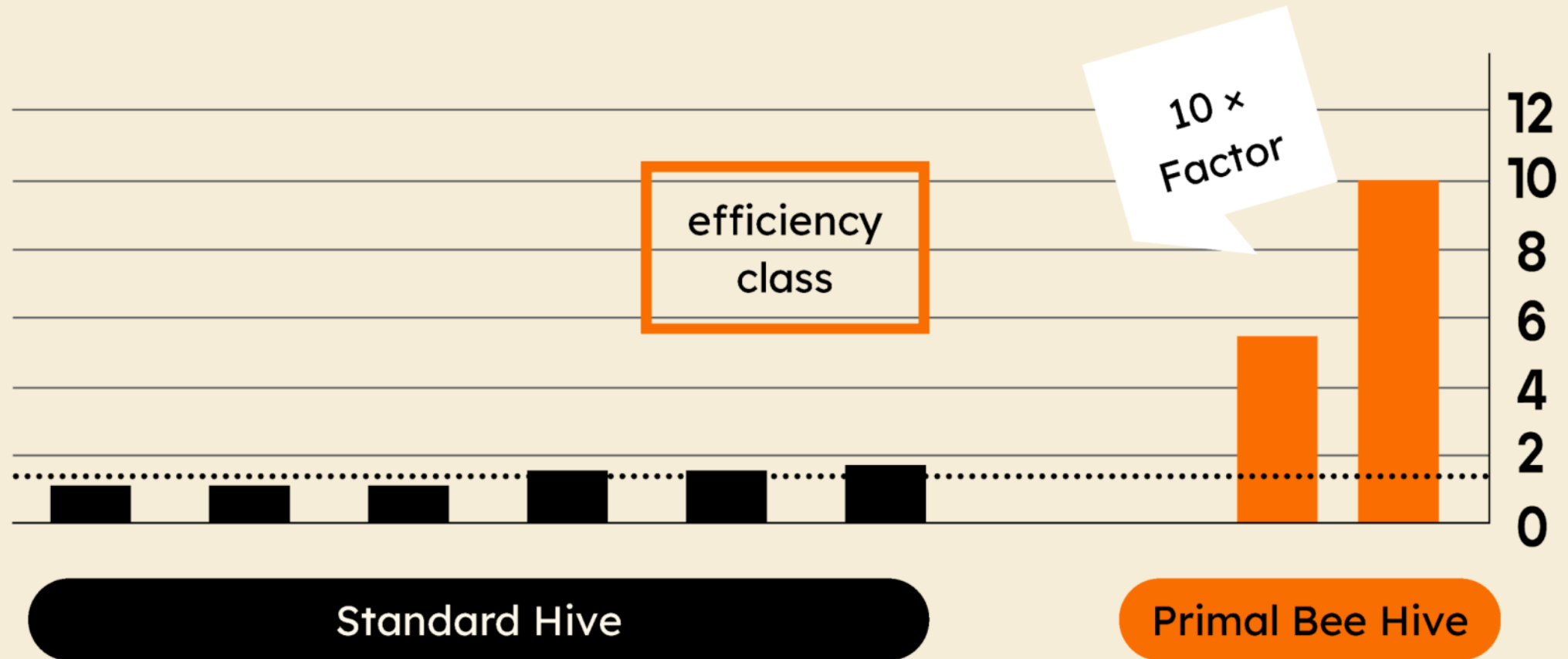
Scientific background
Measure thermal burn rate

Arbitrary Hive

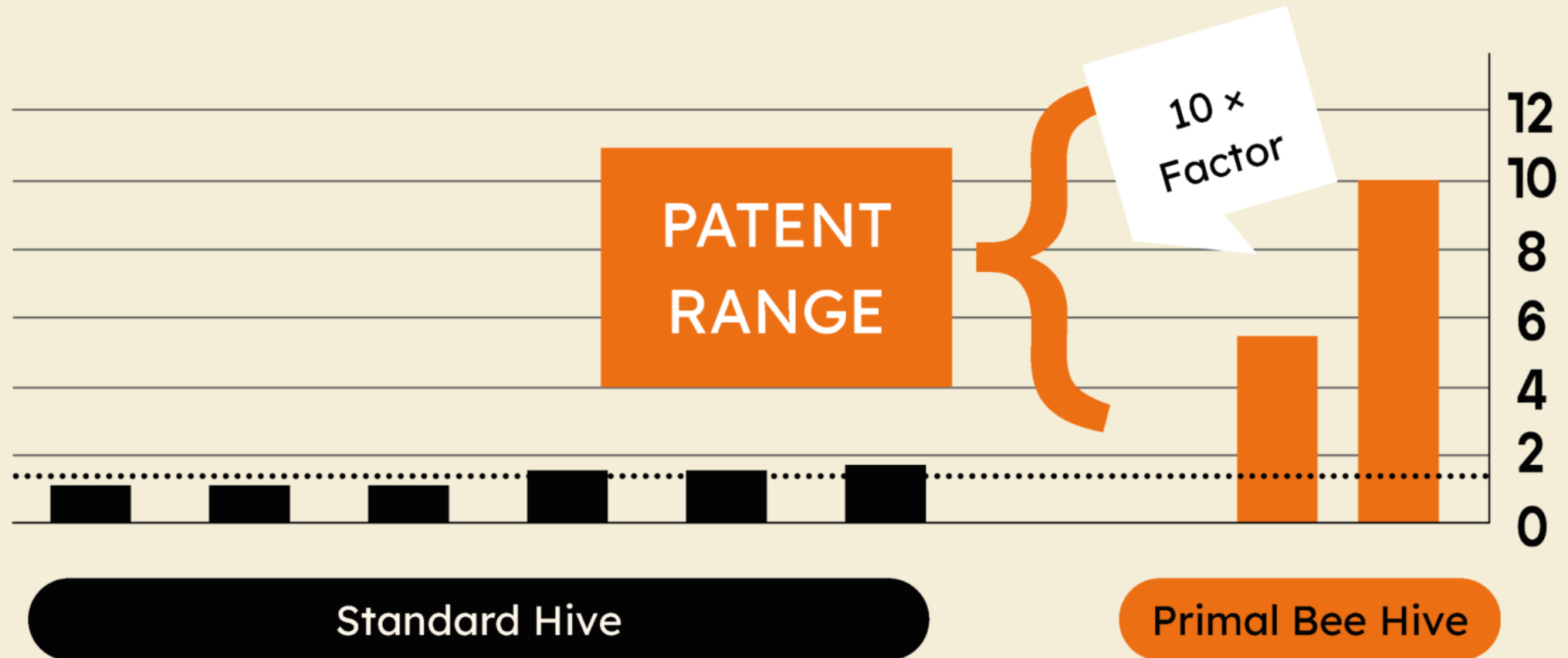


Hive radiator with
shape and size
corresponding to
arbitrary nest

Hive design to thermal efficiency



Hive design to thermal efficiency

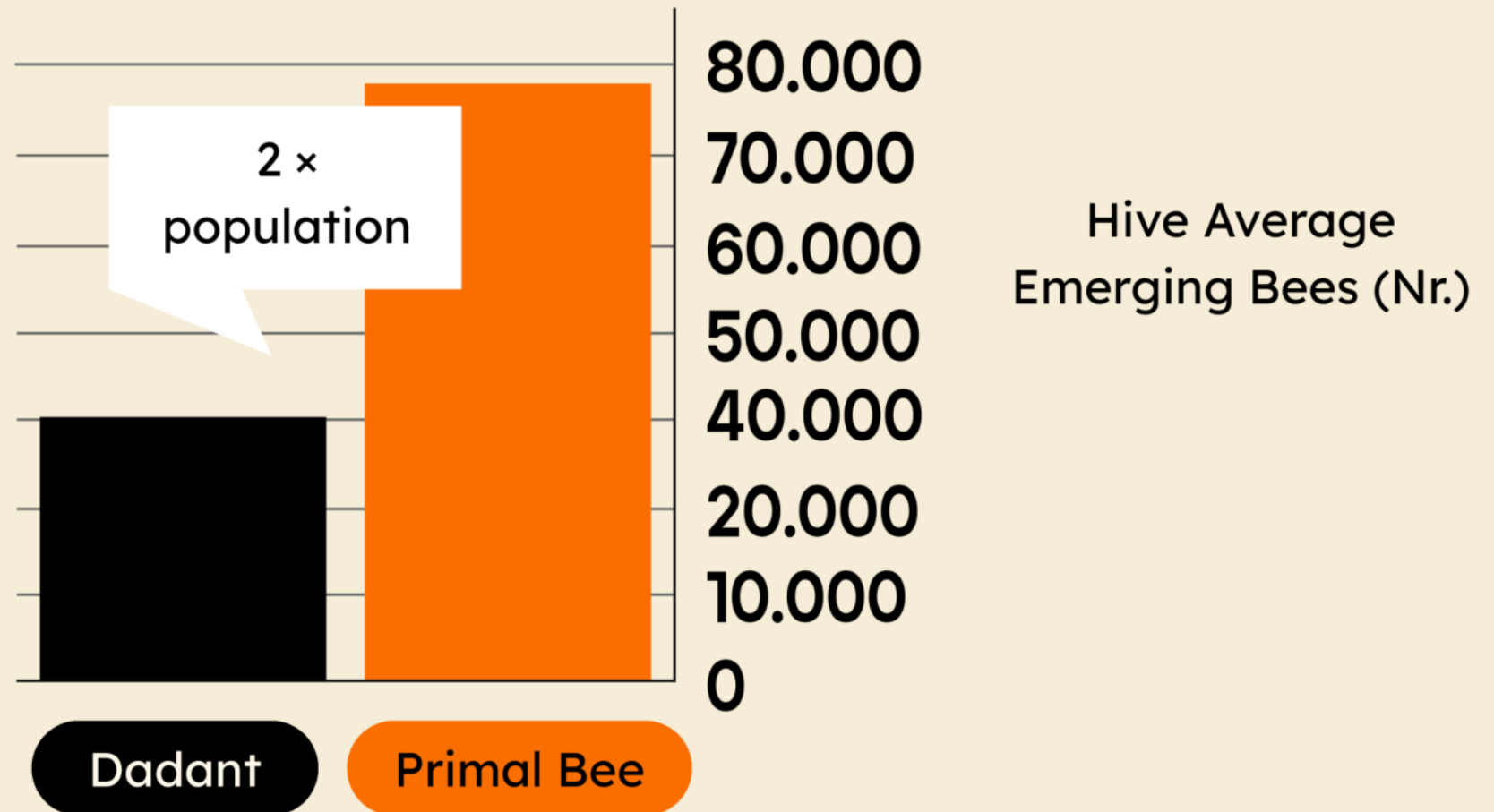


Thermal efficiency to colony success

Field Test



Swiss cantonal
inspector poc 2016





Thermal efficiency to colony success





can we reach pollination standard?

12 Primal Bee Hives

vs

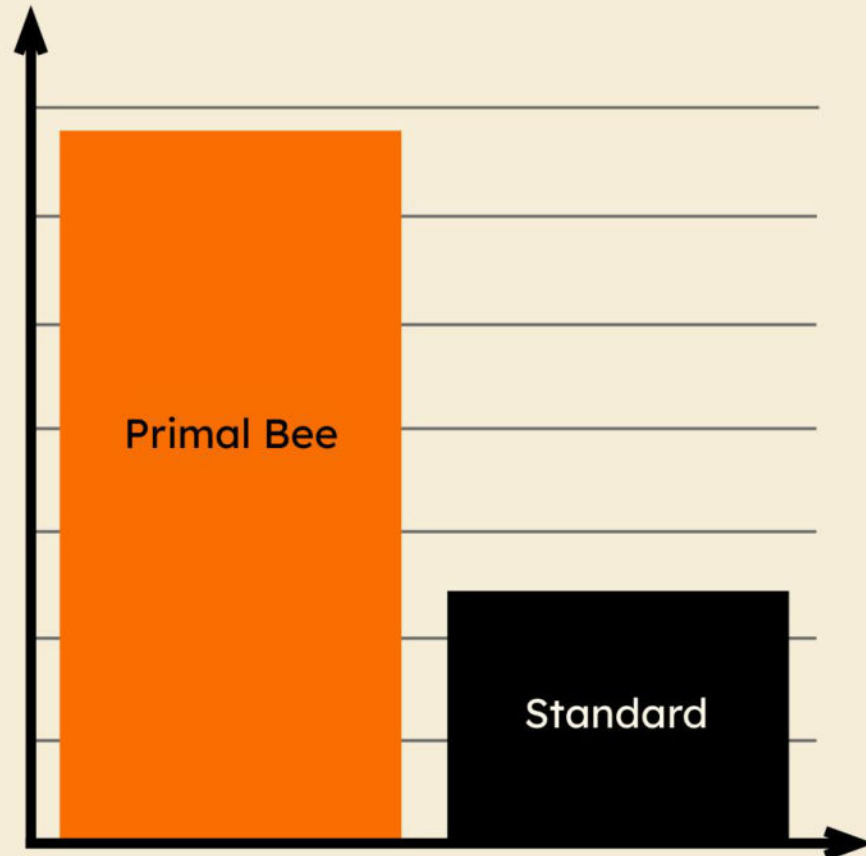
25 Standart Hives





- Management: Primal Bee - 1/3 of Standard feed
- Development: Primal Bee growth rate not achievable with standard hives

Brood area comparison



Brood area comparison





Hive comparison

Metric	Langstroth	Primal Bee
Colony Strength	Double Deep	Nest and Super
Total Colony Area (dm ²)	320-440	550-670
Brood Area (dm ²)	95-130	150-290
Flight Activity (bees/min)	30-60	70-120
Bees on Flowers (bee/flower)	0.1-0.3	0.2-1
Orchard Owner Pollination Rank	Good	Exeptional



Results

Significant Larger pollination for Primal Bee thermodynamic hive.

Larger pollination with lower feeding , less inspection and higher growth rate



Results

Primal Bee achieved the highest pollination standards with half the number of hives.

Increased profitability per hive for the beekeeper.

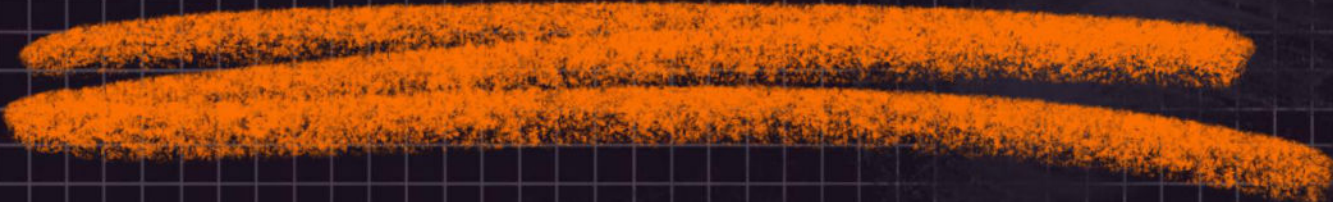
Impact on future of pollination

The results demonstrated how commercial beekeeping operations can reduce the risk of high colony mortality, and increase profitability while providing pollination services to insure our food supply.

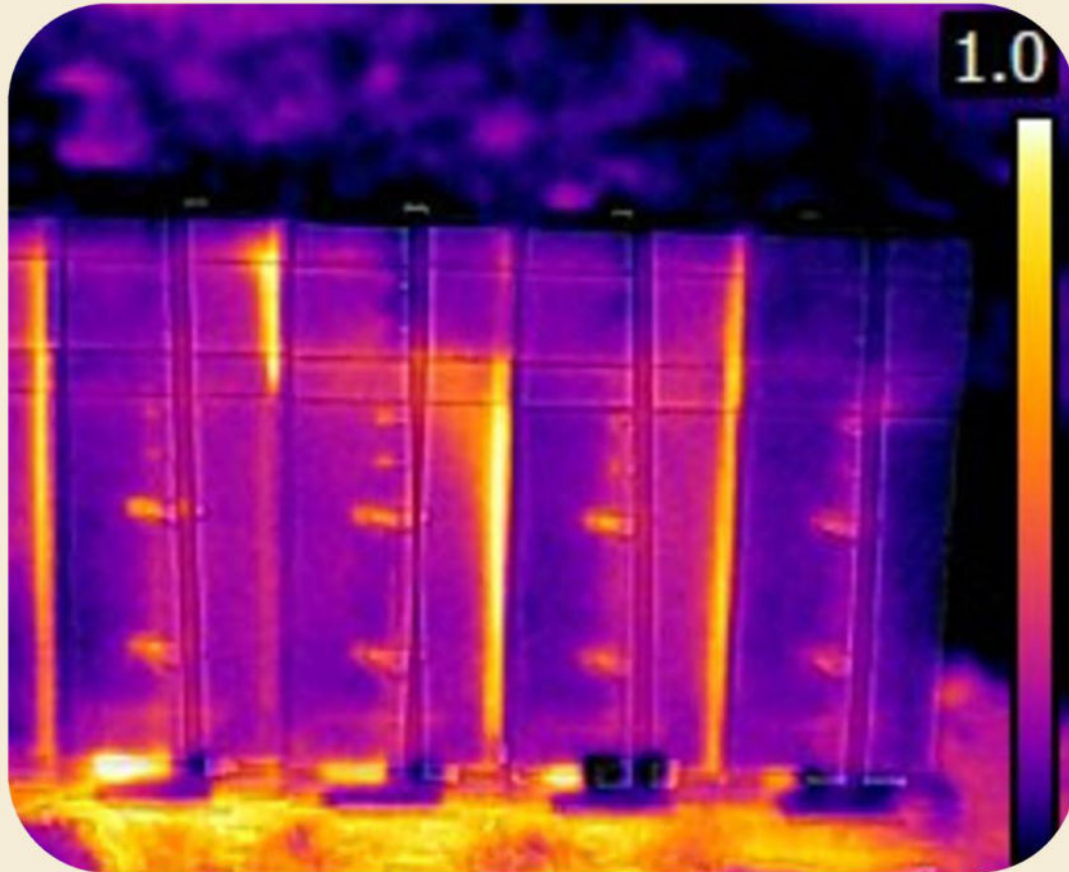


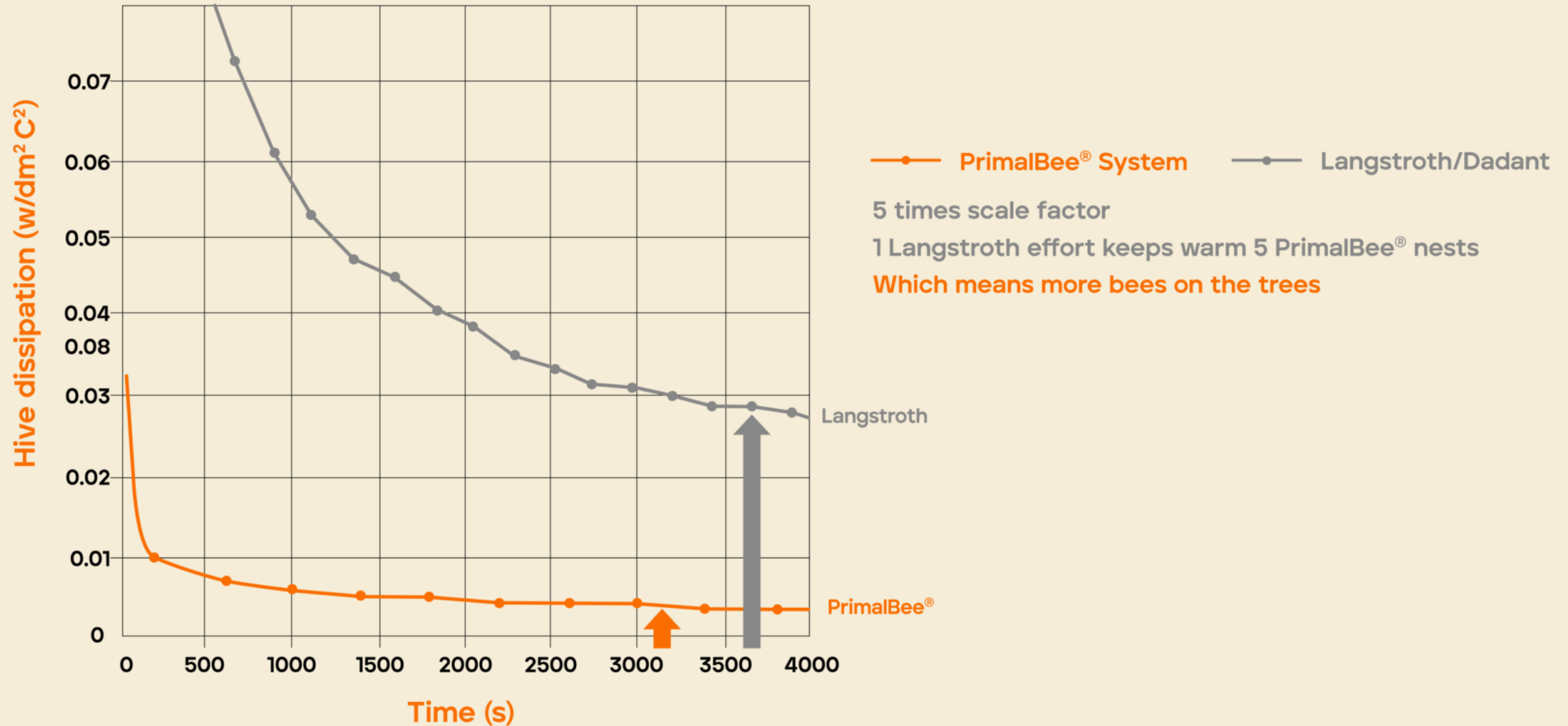


Let's improve
pollination worldwide!

Two thick, horizontal orange brush strokes are positioned below the text, adding a hand-drawn, artistic touch to the design.

Thermal Efficiency





The importance of thermal efficiency to colony success

