

OP-237 [Beekeeping Technology and Quality]

Development of an economically resilient and climate-friendly beekeeping practice

Annely Brandt, Valon Mustafi

LLH-Bee Institute Kirchhain

The honey bee *Apis mellifera* is a key pollinator, but climate change, inflation, and rising energy costs threaten beekeeping. We developed a more resilient management approach and compared it to standard practices, focusing on colony health, energy use, labor, material costs, and climate impact. In 2023 and 2024, a total of 34 colonies were divided into a 'standard' and a 'resilience' treatment group. The standard group underwent regular drone brood removal and weekly swarm control. Normal sized split colonies were formed with two brood combs and transported to a new apiary in 3 km distance. Varroa destructor was controlled in summer with two formic acid (60%) evaporation treatments and in winter with an oxalic acid treatment. In the resilient group, drone brood remained, and 5–8 capped brood combs were removed in early summer (end of April/beginning of May) to build strong split colonies which remained at the same apiary. This suppressed swarming and relieved the colonies of a considerable proportion of varroa mites, which are mainly found in the capped brood cells. Queens were caged for 25 days in summer, followed by oxalic acid trickling; winter treatment was only applied if varroa mite fall exceeded two per day. Colony development was tracked using the Liebefeld method and we recorded weight change, honey yield, bee longevity, fat body reserves, mite infestation, management time and energy and resource consumption. Honey yield and overall colony strength did not differ significantly between treatment groups. However, splits from resilient colonies developed stronger and required less feed. Management time per colony averaged 53 minutes in the resilient group vs. 2 hours 10 minutes in the standard group. Fewer apiary visits also reduced climate impact. Interestingly, the total weight lifted by the beekeeper throughout the year decreased from 1059.7 kg per standard colony to 605.4 kg per resilient colony.

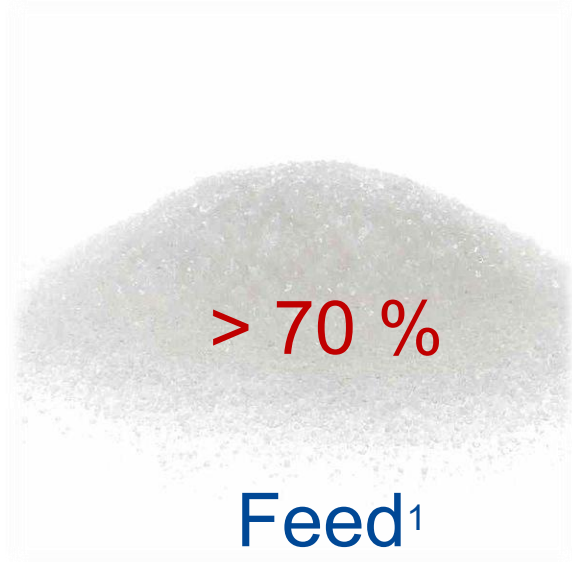


Development of an economically resilient & climate-friendly beekeeping practice

PD Dr. habil. Annely Brandt,
Msc. Valon Mustafi
LLH - Bieneninstitut Kirchhain
annely.brandt@llh.hessen.de



Increase of costs since 2020



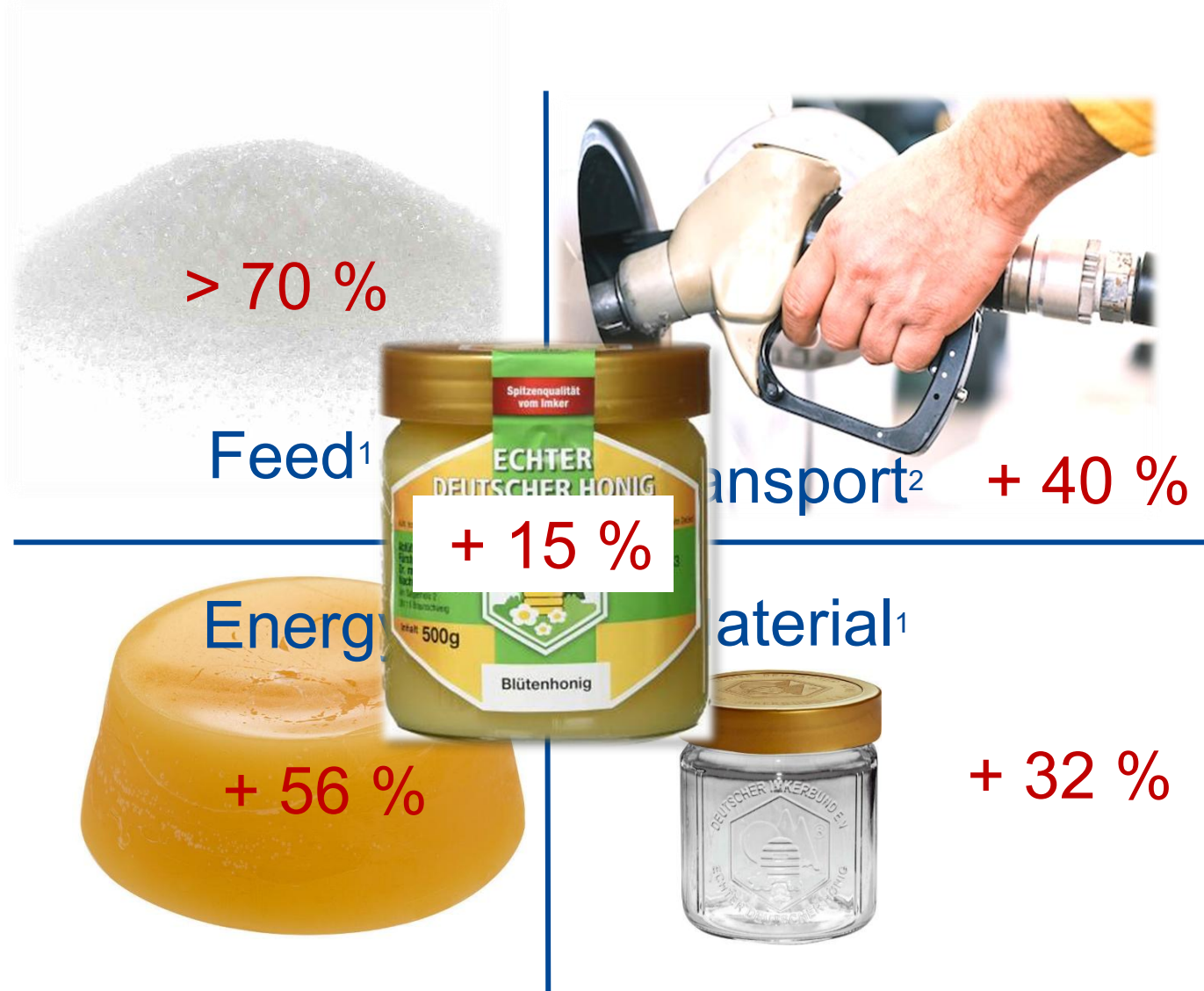
Material¹



+ 32 %

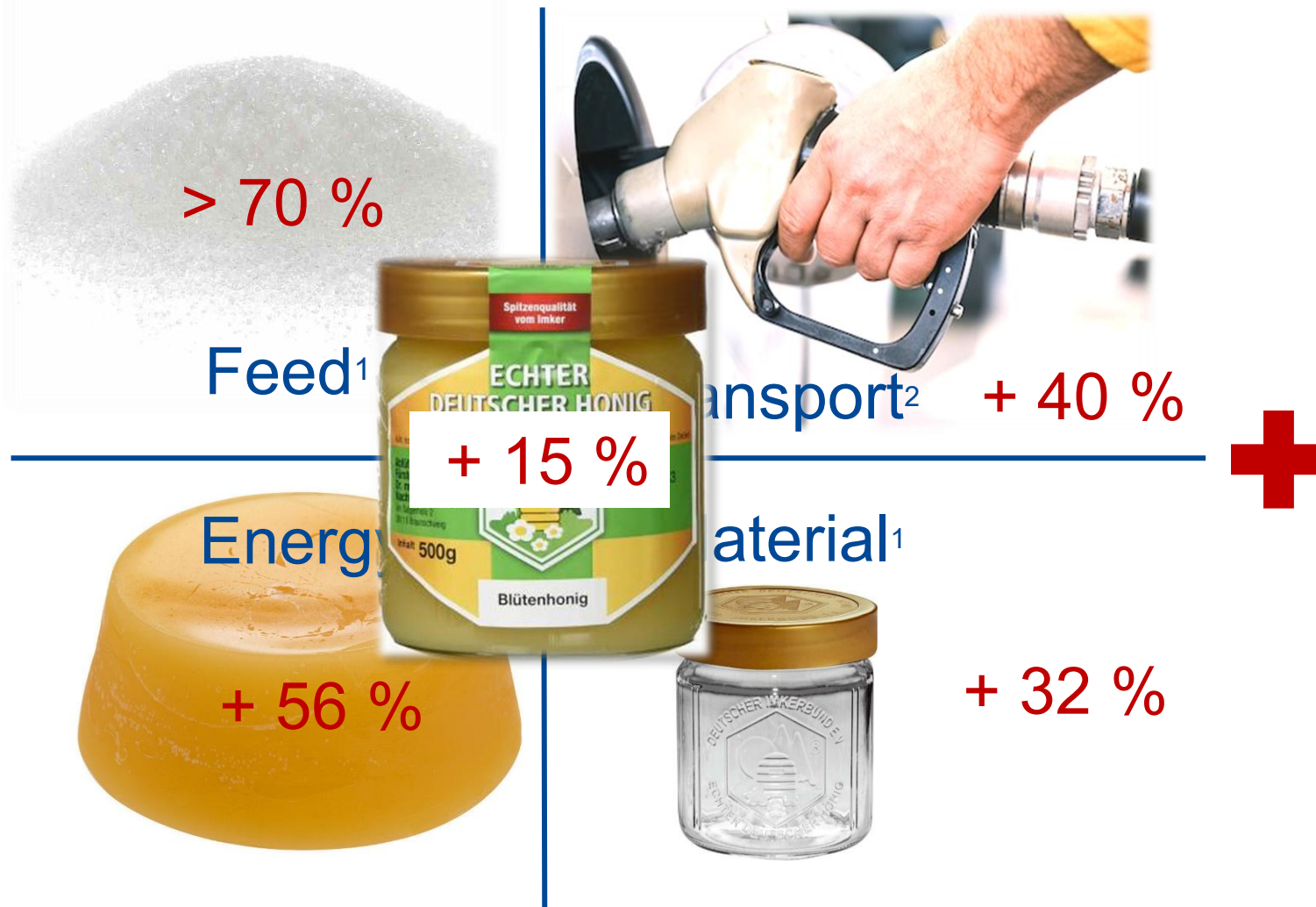
¹Statista.com, 05.03.2025, Statistisches Bundesamt, 2023; Deutsches Bienenjournal 2020

Increase of costs since 2020



¹Statista.com, 05.03.2025, Statistisches Bundesamt, 2023; Deutsches Bienenjournal 2020

Increase of costs + climate change



¹Statista.com, 05.03.2025, Statistisches Bundesamt, 2023; Deutsches Bienenjournal 2020; <https://volofoundation.org>

Aims

Less
work

Less
material

Less
CO₂

Healthy
colonies

Field experiment: 2 years
2 experimental groups (19 colonies each)



Split colonies

Standard



Mother



Split



Split colonies

Standard



Mother



Split



3 km

Resilient



10 m

Swarm control

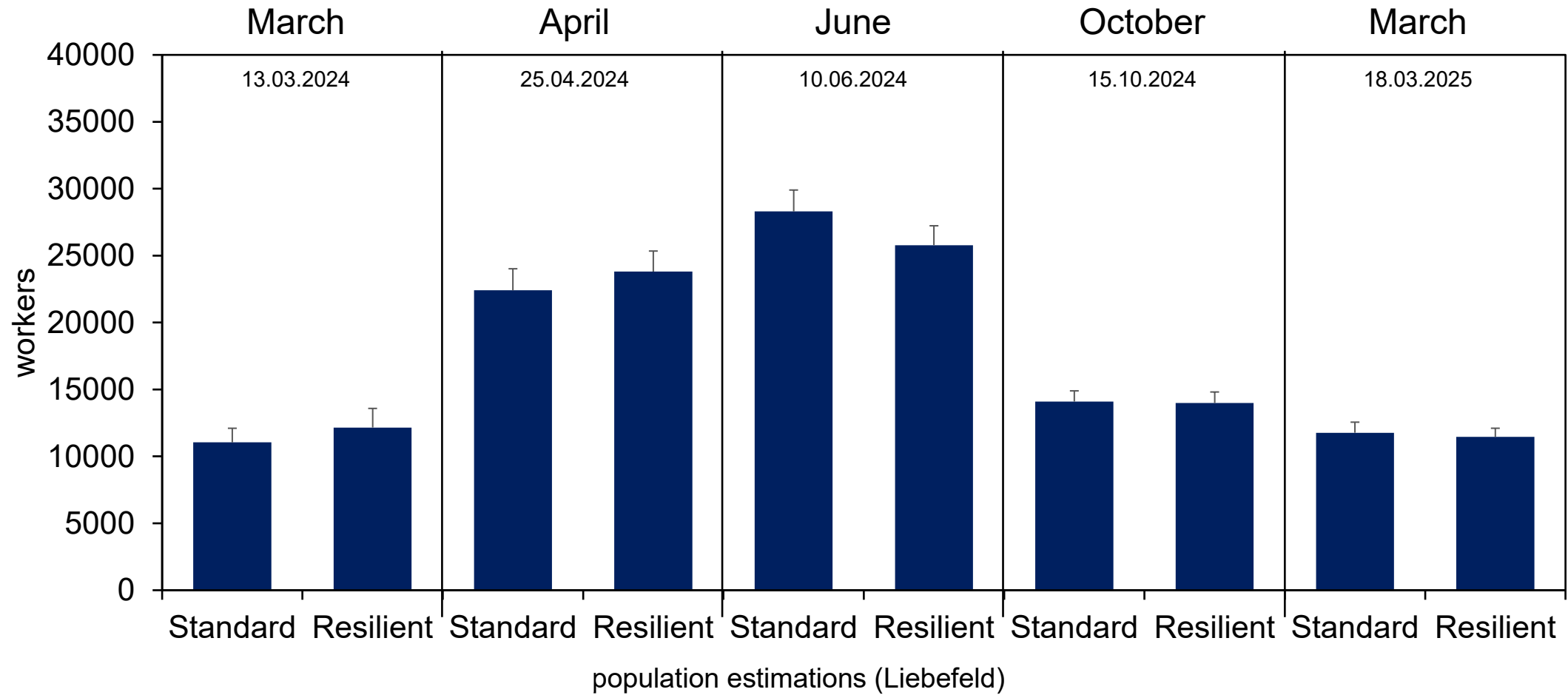


Swarm control & drone brood



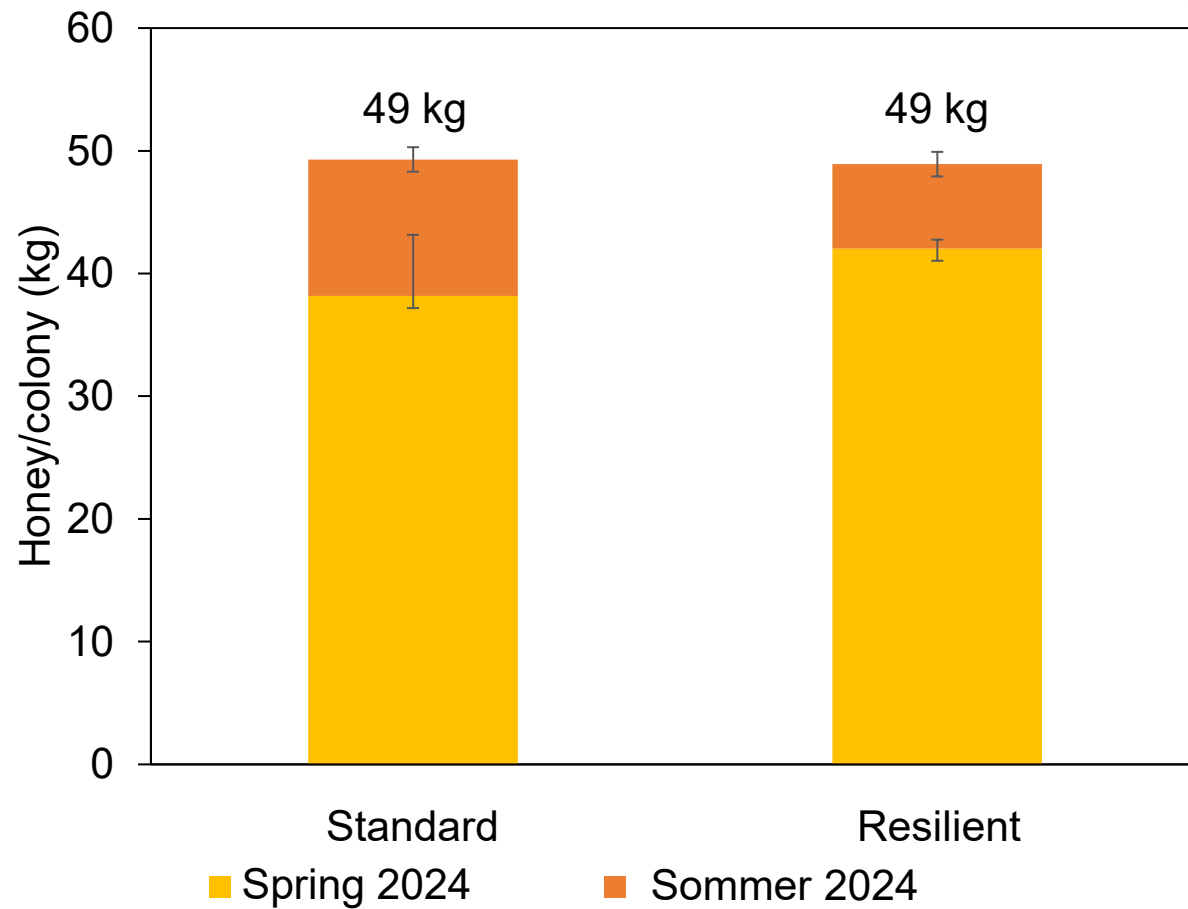
Population estimations

Liebefeld method



Population estimations on full-size colonies (Liebefeld method). There was no significant difference between the experimental groups (MWU, $p > 0.05$; Standard, $n = 9$; Resilient $n = 8$).

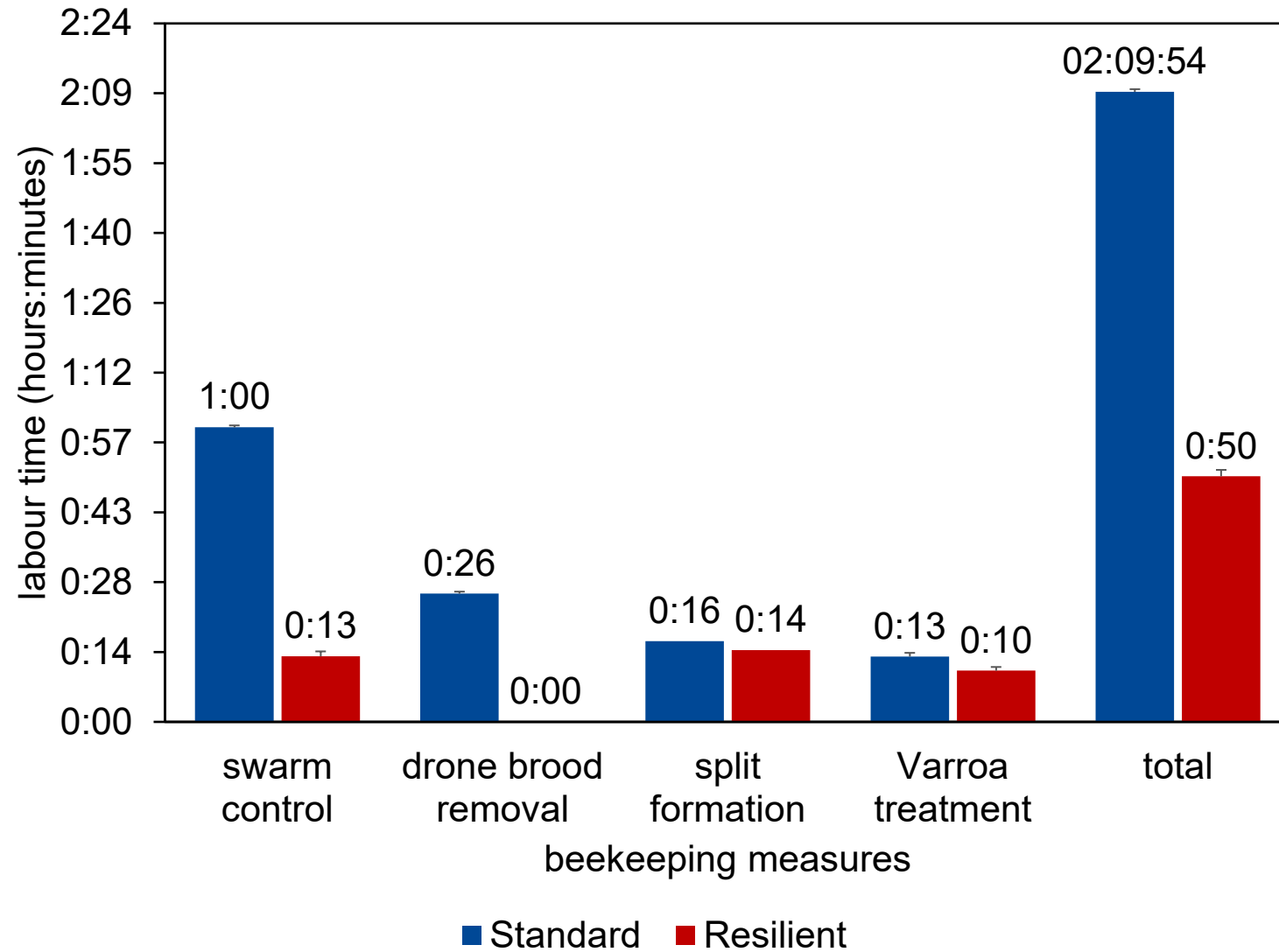
Honey yield



Honey yield of the full-size colonies. There was no significant difference in the spring and in the total annual honey yield (MWU, $p > 0.05$) between the experimental groups. In summer, honey yield differed significantly (MWU $p = 0.002$)



Labour time at apiary

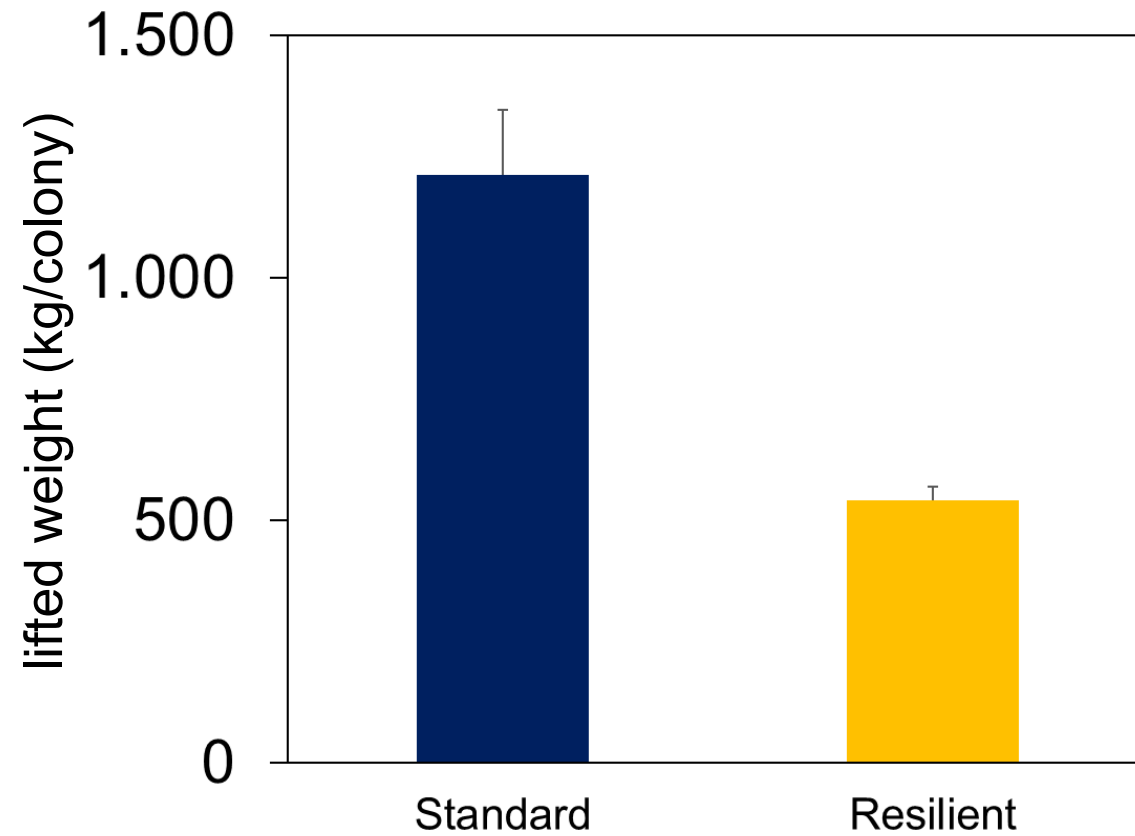


Visits to apiaries

Visits to apiary	drives	journey time (hours:minutes)
Standard	22	7:18
Resilient	9	3
Splits: Standard	11	2:36
Spilts: Resilient	3	1



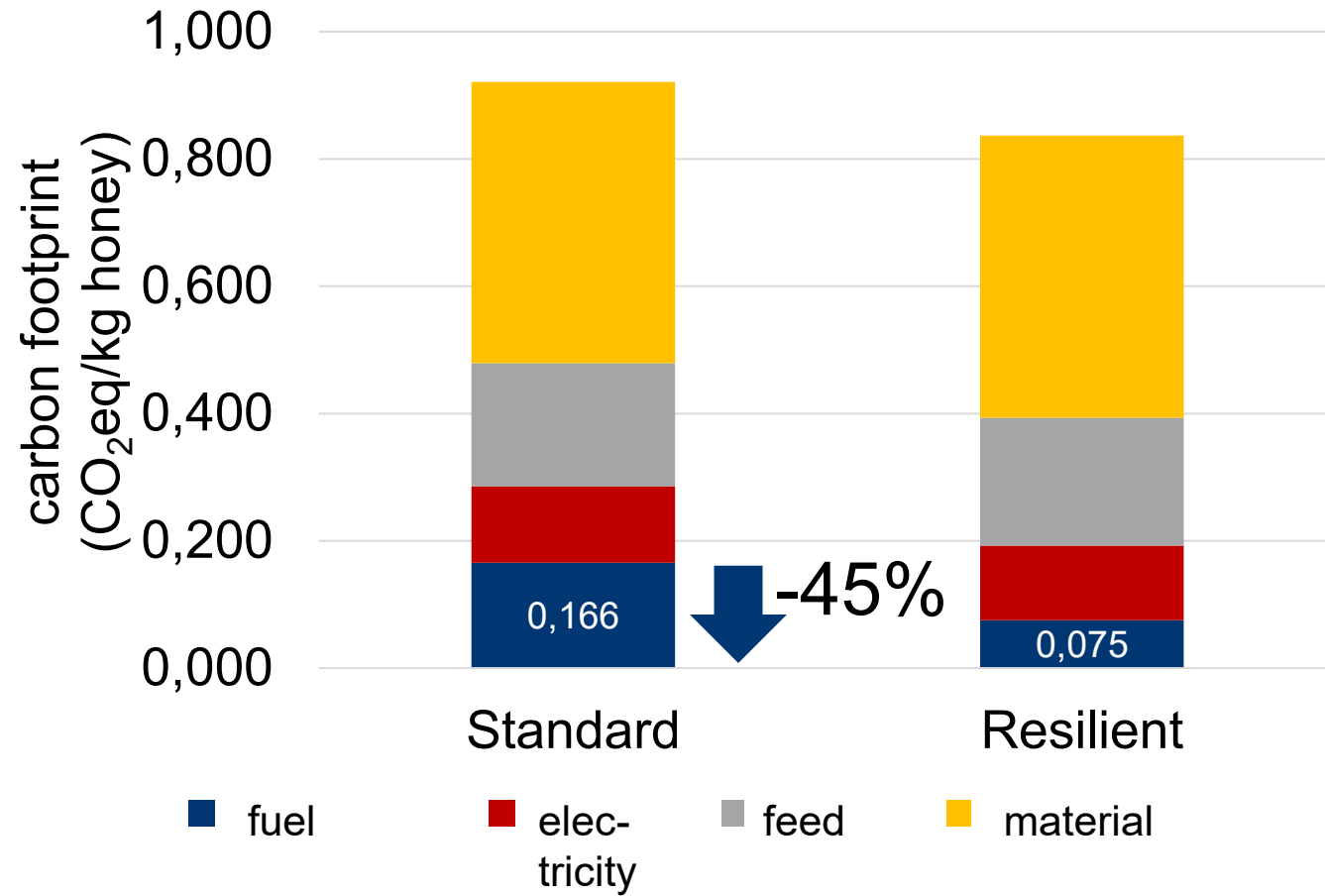
Lifted weight



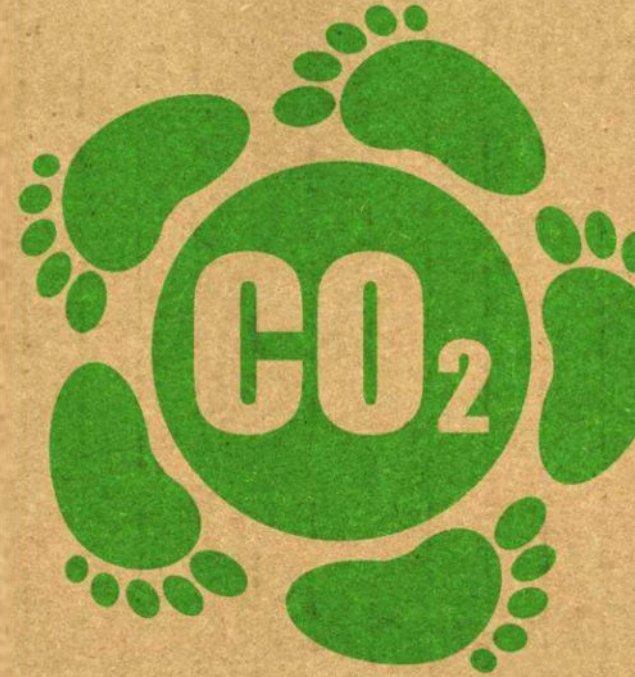
Lifted weight. The total weight lifted by the beekeeper throughout the year differed significantly between the experimental groups (MWU, $p < 0.001$; Standard, $n = 9$; Resilient $n = 8$).



Carbon footprint



ACCT-Standard (A. Vorwald)



Conclusions

- | | | |
|----------------------|-------------|---|
| • Colony development | = | ✓ |
| • Honey yield | = | ✓ |
| • Labour time | approx. 1/2 | ✓ |
| • Lifted weight | approx. 1/2 | ✓ |
| • Fuel | approx. 1/2 | ✓ |

New EIP–Project: Sustainable & Efficient Beekeeping



Kofinanziert von der
Europäischen Union

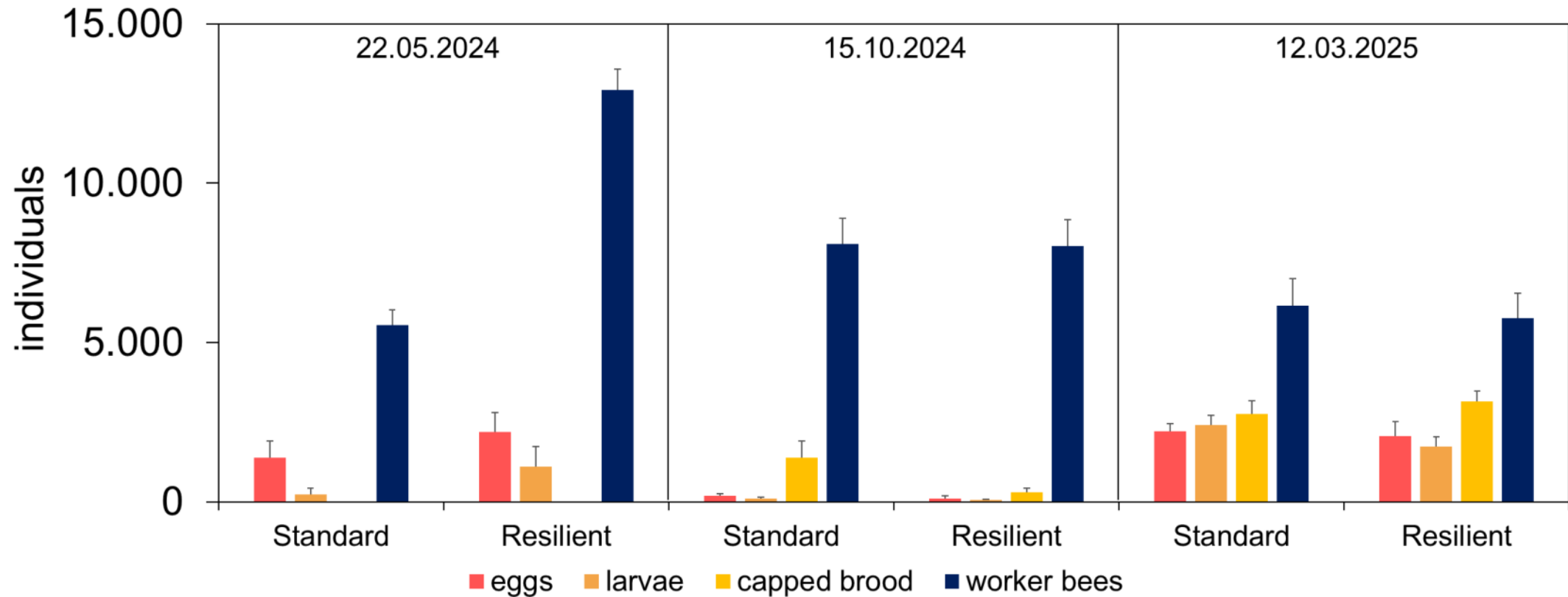




**Vielen Dank für Ihre
Aufmerksamkeit!**

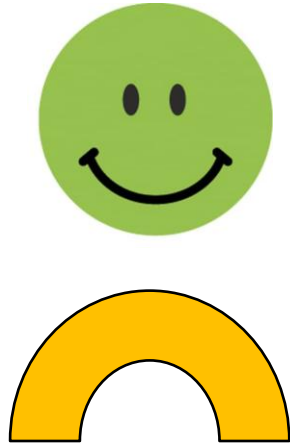
Population estimations

Split colonies

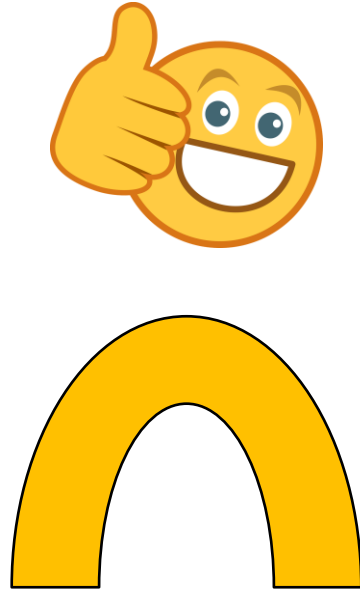


(Liebefeld method). There was a significant difference only in the number of worker bees between experimental groups in May (MWU, $p < 0.001$). No significant differences were found between the experimental groups in October and March (MWU, $p > 0.05$; Standard; $n = 8$; Resilient $n = 6$).

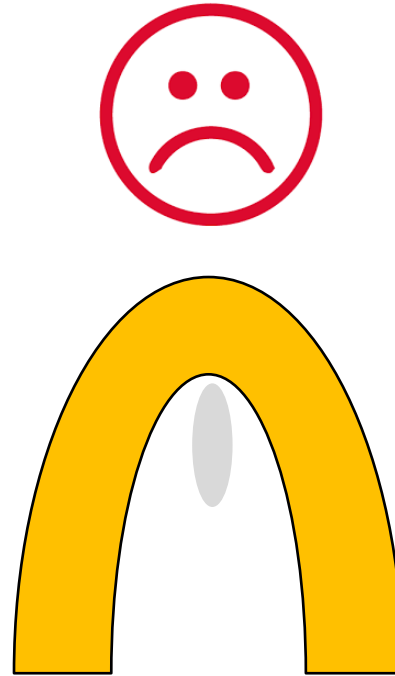
Optimal timing for split colonies?



ok...



Now!



Too late!

⇒ Swarm controls



Varroa destructor treatments

