Methods for evaluating sunflower nectar flow

Lorenzo Pons

Sunflower blossoming is just around the corner. Whether production is for consumption or for the seeds, the sunflower can provide more or less nectar flow depending on the circumstances. In this article we present a method allowing to evaluate the potential of sunflower honeydew. It starts from the analysis of the forecast before blooming, followed by the installation of the monitoring system and ends with the forecast of the nectar flow evolution

A sunflower seed plot, the male feet start before the others.

It is no longer a secret for anyone, that when it comes to tracking the nectar flow, an automatic weight scale installed in the apiary is a crucial tool in decision making. Very useful, this device allows you to act when needed bringing the appropriate tools. Nevertheless, without underestimating its' benefits, we can draw a parallel between a weight scale and a rear-view mirror: you need to have one, but what it tells you is already behind you.

Our ambition at Mellisphera is to help beekeepers **look forward**. The objective is to be able to easily **make forecasts**. Especially since the climate evolution is changing the established order. It is therefore relevant to have special tools helping in decision making to deal with the uncertainty in the best possible way.

And what can we predict, thanks to the data, about sunflower nectar flow? Here it comes our four-step method developed last summer, that we will now present to you.

There is how it goes:

Step 1. Before the nectar flow, we evaluate the expected indices

First of all, it is useful to take a look at the **Foraging® and Nectar flow® Indices**. These two indicators that we deployed on Mellisphera platform in the summer of 2021 set the scene for the next ten days. Here is the recorded evolution of these indices for the summer of 2021.

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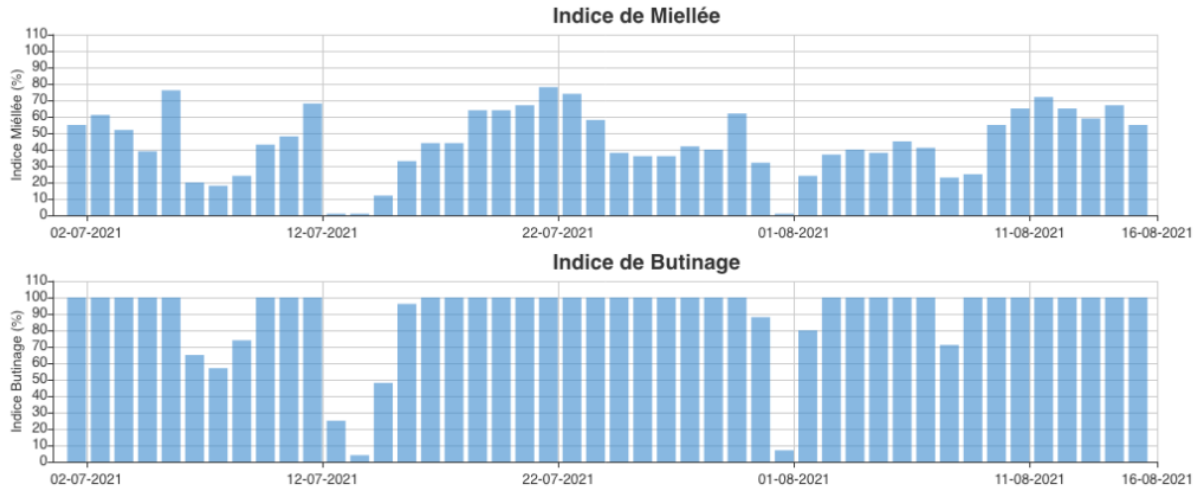


Foraging and Nectar flow Indices: they are key for assessing sunflower nectar flow.

In sunflower case, the Foraging Index is often 100%, because the weather is favourable in July. But not necessarily the Nectar flow index which can vary a lot. Experience has shown us that while nectar flow index is below 30% weight gain is jeopardized (see below).

Now that we have some visibility on the coming period (in 10 days horizon) we will apply a blooming scenario.

Step 2: We assume about the beginning and duration of blooming.

Depending on the temperatures during the period, the speed of blooming can vary. This is true before the opening of the florets, but also after. There may be blooms in very hot conditions that take place over barely 7 days, while this duration can be significantly extended by cooler conditions.

It is therefore useful to set on the nectar flow index a blooming start date t0, followed by an estimate of the blooming duration. Let's evaluate two scenarios for our case :

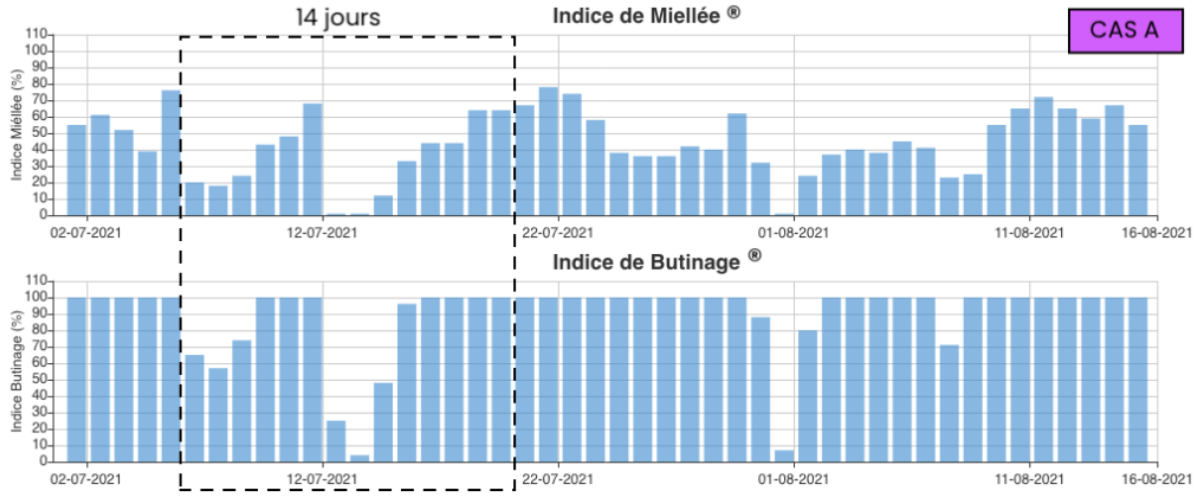
	Scenario A	Scenario B
Start of blooming t0	July, 6	July, 15
Estimated blooming duration	14 days	7 days

Two scenarios: depending on blooming start date, progress will be different.

In **scenario A**, it is estimated that blooming will begin on July 6, following a week of good weather that launched the flower heads. The period is punctuated by ups and downs, including a three-day interlude that will stop the nectar flow.

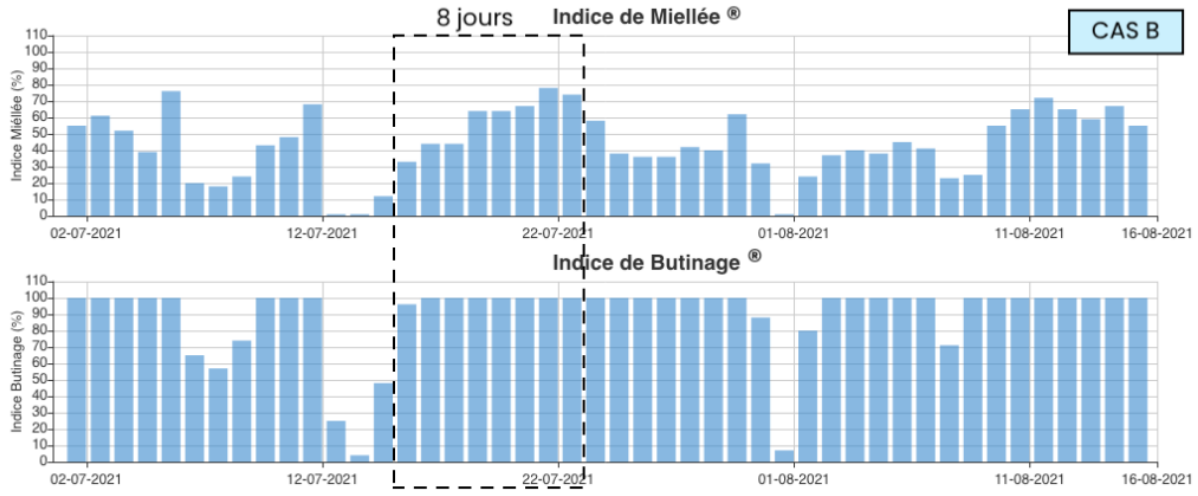
Here, we can consider either a long nectar flow duration, or the risk that it will be suddenly stopped, due to possible weather shocks.

==> Plan a quick installation to take advantage of the first days and monitor the outcome of the interlude of cool weather. If right after there is no weight gain, the nectar flow will be over.



In **scenario B**, it is estimated that blossoming will start after the cold period, during a week of excellent weather that will be favourable for bees and flowers, but which has every chance of also being dazzling.

==> Get ready to install the second supers shortly after if necessary to act quickly.



These examples illustrate, based on 2021 data, the two possible cases, on the same location. We thus discover what can happen. This step is crucial to properly evaluate the potential of sunflower nectar flow.

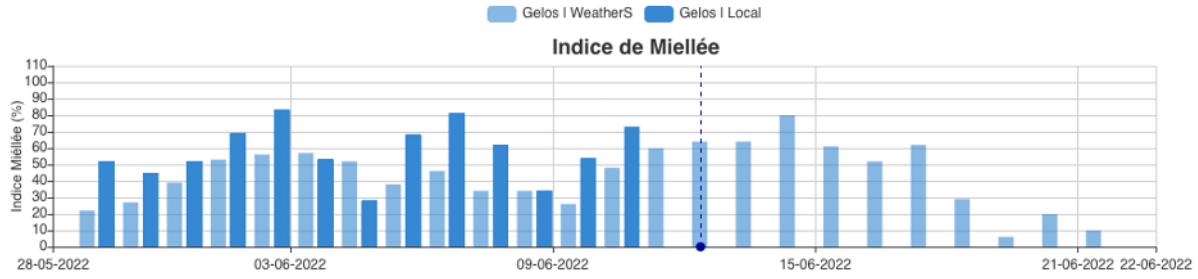
The situation is now visualized, and some conclusions are drawn. It's time to act.

Step 3: We install the optimal monitoring system

The time has come to install the apiary on site. We will follow what is happening and certainly make the link between our assumptions above and the actual process. When installing the apiary, it is preferable to equip **two hives** each with a **weight scale** and a **brood sensor**, in addition to a **Weather Hub**.

Apart from the transmission of data from all the sensors, every hour, the Weather Hub performs a very important function in this context: it is monitoring a **local Nectar flow Index ®**, specific to the apiary. This index is displayed next to that of the weather service and helps us to better judge whether the conditions of the apiary are better or worse than those of the weather service.

In the example below, the local index (dark blue) is often more favourable than that of the weather service (sky blue).



In sunflower example, the difference between indices can be significant, because the extent of the fields and their possible irrigation modify the ambient conditions.

Step 4: We ensure good remote monitoring

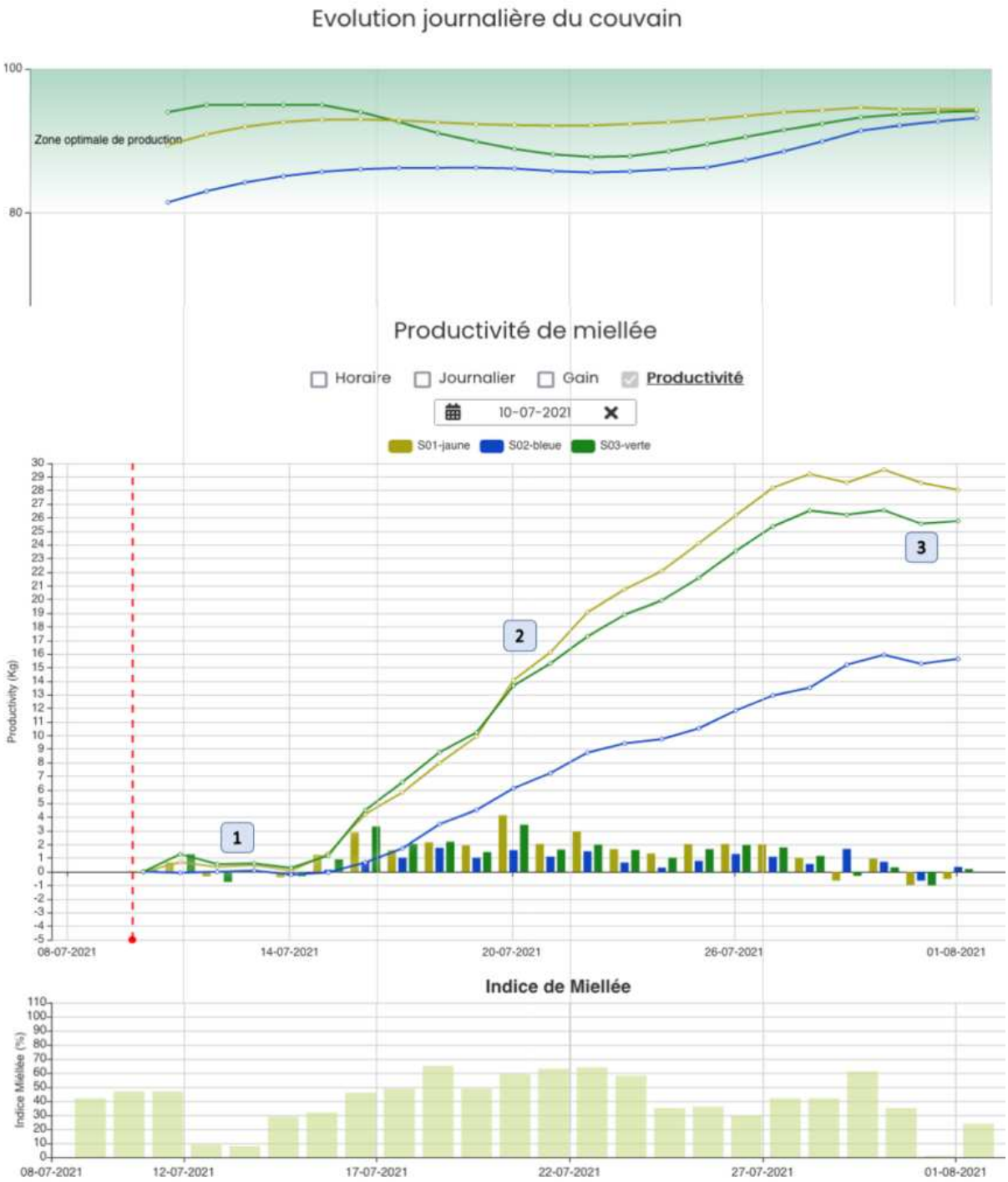
Now that the system is in place, it's time to track the sunflower nectar flow remotely. Here is the monitoring method that seems to me the most effective given the experience of the last few years:

1. First **check the brood levels** of the monitored hives. It is a question here of confirming that they are always at the highest (no swarming, no blocking of laying eggs, for instance). This makes it possible to certify that the weight observed subsequently is representative.
2. Then **check the weight** of the scales: both **absolute weight** and also **productivity**.

3. Finally, **compare the evolution of weight with the Nectar flow Index**, identify the thresholds and forecast the evolution of weight over the next 10 days.

Once this exercise, which takes 5 minutes, is completed, we acquire an updated visibility on the **current situation, but also the future**.

So, we will do this exercise on the example of sunflower in 2021:



Three key indicators from Mellisphera platform: Brood, Productivity and Nectar flow indices

4.1 Assessing sunflower nectar flow from the Brood-Productivity angle: current situation

(Those are the first two charts in the stack of three above).

First, we observe that over this period of 3 weeks the brood evolves on the three hives. The green hive is the strongest, the most productive at the beginning of nectar flow. However, around July 17, it loses in brood index and quickly gets behind the yellow hive, which thus becomes the most productive.

The blue hive has a little less brood strength (although 80% is still a very acceptable level) and as such it is significantly behind the other two.

This shows that the amount of brood in the hive is a key parameter in production. We also see the usefulness of remote monitoring with several scales.

4.2 Assessing sunflower nectar flow from the Productivity angle – Nectar flow Index: future situation

(see charts 2 and 3 above)

If we now compare the productivity with the nectar flow index, we distinguish 3 zones:

Zone 1: the index is too low, no productivity in the first two days since the installation. It is not negative, so the hives are maintained, which is already a good sign for strong colonies like these.

Zone 2: Nectar flow index is at a very good level, productivity follows. It's beautiful!

Zone 3: the index falls and for the first-time productivity turns negative. We see a small recovery the next day (1/08) but the nectar flow seems to be over. It's time to harvest.

IMPORTANT: This example presents a complete dataset because it concerns the sunflower nectar flow of 2021. In a real-time case, Nectar flow index data is forecasted 10 days in advance compared to those of weight or brood. **It would have been possible here, from July, 21, to estimate the end of nectar flow on July, 31.**

Conclusion

In this article, we have outlined a method that allows us to evaluate sunflower nectar flow. The method applies to the entire process: Before, During and After the nectar flow. It is based on a combination of forecast indices with local measurements from scales, brood sensors and weather sensors.

Of course, as with any method, there are certain limitations. It does not take into account factors such as the history of sowing, the previous weather or the genetics of the seeds. Despite this, the results obtained on the nectar flow of 2021 show that the approach is quite consistent. **Combined with beekeeper's expertise, it will allow an optimal flow of operations.**

Acknowledgements

The development of this type of methods is a laborious work that requires many inputs of information and data. In this case, this work would not have been possible without the invaluable contribution of Maryline and Frédéric Bacquerisse from the Jouanchiq Apiary. I want to say them a big thank you.

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