RESEARCH AND DEVELOPMENT
INSTITUTE FOR THE
AGRI-ENVIRONMENT

BEEKEEPING PRODUCTIVITY AND POLLINATION SERVICES

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In November 2014, the first fact sheet on Québec honey production examined trends over the last 15 years. An analysis of data published by the Institut de la statistique du Québec (ISQ) revealed that, despite growth in the beekeeping industry, as testified by several indicators, productivity decreased during the study period. The sharp rise in indicators such as number of beekeepers, number of colonies in production, total honey production and value of production was attributed to the rapid increase in acreage planted with berries and to honey prices. The expansion of acreage of fruit-bearing crops drove a dramatic rise in demand for pollination services. This raises the question of whether the decrease in beekeeping productivity is linked to the growth in pollination services, or at least to a factor closely tied to those services (e.g. transportation of hives).

The purpose of this fact sheet is to try and answer that question through more in-depth analysis of productivity using additional, unpublished ISQ data made available to the IRDA for the purposes of the analysis. This time, changes in the different indicators and productivity were examined according to operation size (number of honeybee colonies per beekeeping operation). Beekeeping operations were divided into six size classes: 6-25 colonies, 25-99 colonies, 100-249 colonies, 250-499 colonies, 500-999 colonies and 1000 colonies or more per operation. Also, the study period in the first fact sheet was 1998-2013, whereas the period chosen for this fact sheet is 2001-2014 owing to the availability of data according to operation size.

THE LARGEST BEEKEEPING OPERATIONS ARE GAINING AN INCREASING SHARE OF PRODUCTION

It is important to remember that the number of honey producers fell by roughly one third at the turn of the 2000s before rising as of 2004 and returning to the initial number of 300 around 2011. The trough in 2003 (Figure 1) corresponds to the year of the highest mortality rate (50%) since the Ministère de l'Agriculture, des Pêcheries et de l'Alimentation du Québec (MAPAQ) began including honeybee colonies in its annual animal health surveys. The second highest mortality rate was in 2007, at 37%. Figure 1 shows that in the following two years, i.e. 2008 and 2009, the number of beekeepers fell again, although the decline was concentrated in the 6-24 and 25-99 colonies/operation size classes. Beekeeper numbers rose steadily after that, from 245 in 2009 to 309 in 2014. As could be expected, fluctuations in beekeeper numbers are concentrated in the size classes 6-25 up to 100-249 colonies/operation. Operations with between 250 and 499 honeybee colonies accounted for between 11% and 14% of the total number of beekeepers during the study period. However, as can be seen from the inset chart, the number of beekeepers with between 500 and 999 colonies fell by almost half in favour of operations with 1000 colonies or more and, especially, those with between 250 and 499 colonies. In other words, there was a shift to the extremes among the three size classes representing operations with 250 colonies or more.

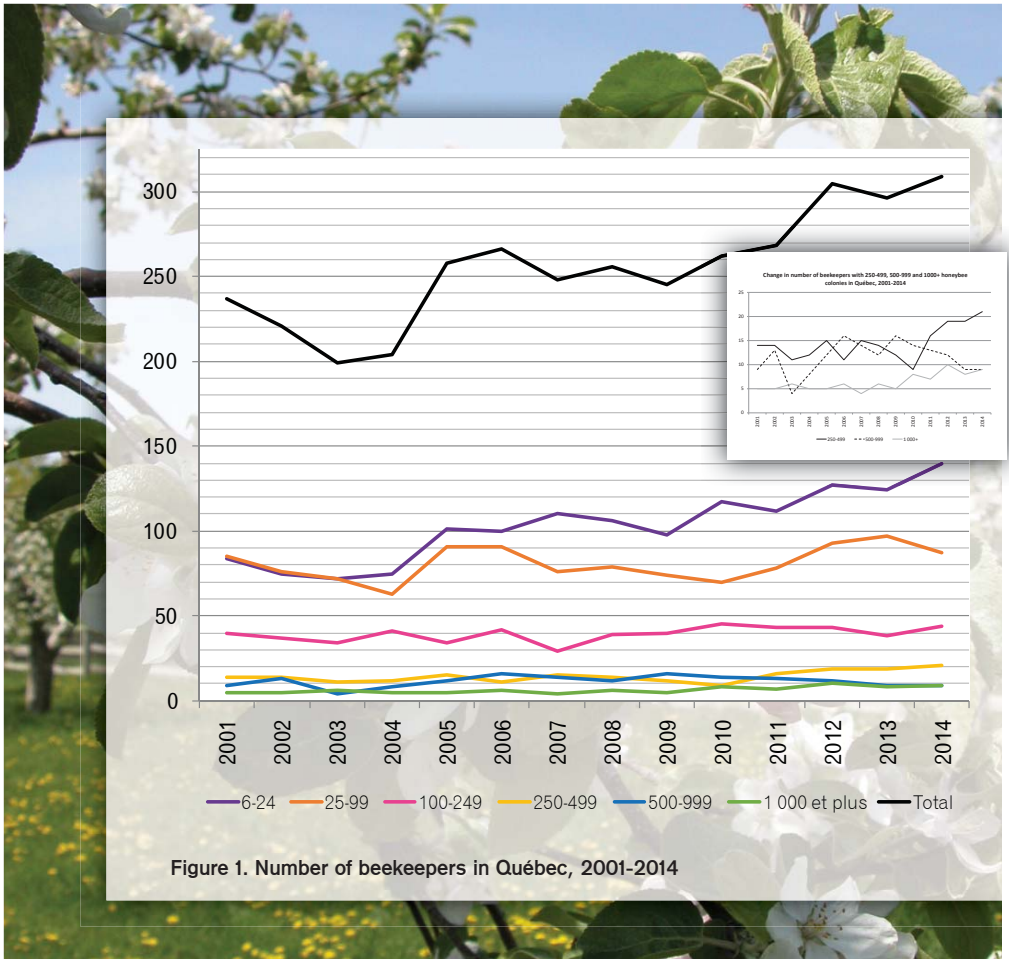

Figure 1. Number of beekeepers in Québec, 2001-2014

The same shift occurred in colony numbers in lockstep with the decline in beekeeping operations in the 500-999 colonies size class (Figure 2). This time, however, operations with 1000 colonies or more took the lead, driving a sharp increase in the number of colonies in production. Whereas in 2001, operations with 1000 colonies or more accounted for only 33% of Québec's total number of colonies in production (10 032/30 576), by 2014 their share had risen to nearly 50% (23 184/49 635 colonies). In terms of total honey production, all operation size classes experienced roughly the same fluctuations (Figure 3), although there was a significant shift from operations with between 500 and 999 colonies to operations with 1000 colonies or more starting in 2010. Also, Figure 3 clearly shows that operations with 1000 colonies or more gained a significant share of Québec's total honey production, which rose from 23% in 2001 (285 800 kg out of 1 219 000 kg) to 49% in 2014 (955 500 kg out of 1 946 400 kg).

As seen in Figure 4, the observed trend in total number of colonies in production (Figure 2) was mirrored in the number of colonies rented for pollination purposes. Once again, operations with 1000 colonies or more doubled their number of rented honeybee colonies from 12 152 in 2009 to 24 276 in 2014. Over the same period, the number of honeybee colonies rented by operations with from 500 to 999 colonies decreased by nearly 30% from 10 976 to 7876. Rentals by operations in the remaining size classes stayed flat, with the exception of operations with between 250 and 499 colonies, which nearly tripled their number of rented colonies from 2645 in 2011 to 7865 in 2014.

OPPOSITE PRODUCTIVITY TRENDS BETWEEN LARGE OPERATIONS AND OTHER SIZE CLASSES

After looking at the trends in indicators for the different operation size classes, now let's look at the productivity trends within these size classes. Productivity (yield) as a measure of the amount of honey produced per colony is shown in Figure 5. It is immediately apparent that productivity is characterized by highly varying cyclical developments. Cycles, that is, the period between two peaks or two troughs in productivity, vary in length from two to four years. Obviously, productivity and temporal fluctuations therein are determined in large

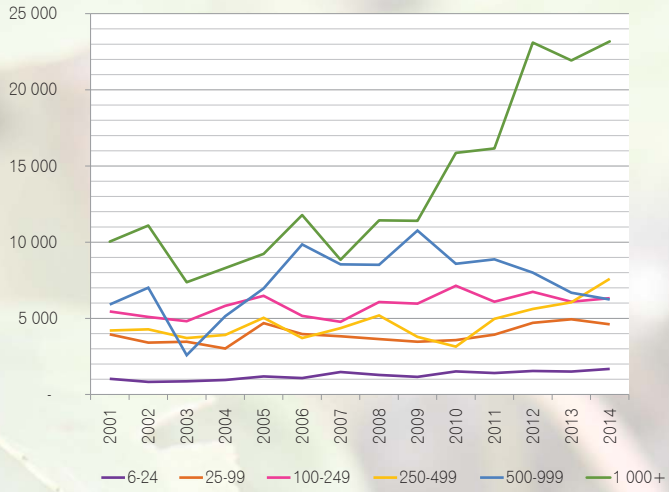

Figure 2. Total number of honeybee colonies in Québec, 2001-2014

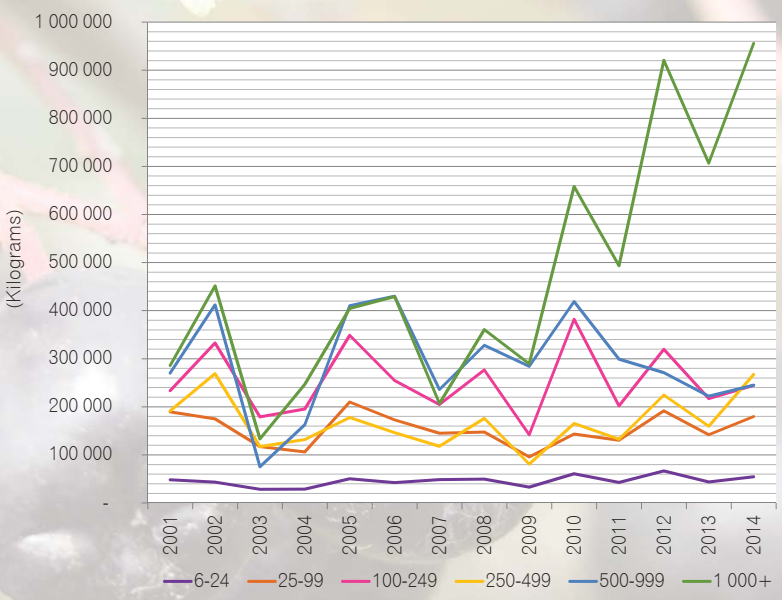

Figure 3. Total honey production in Québec, 2001-2014

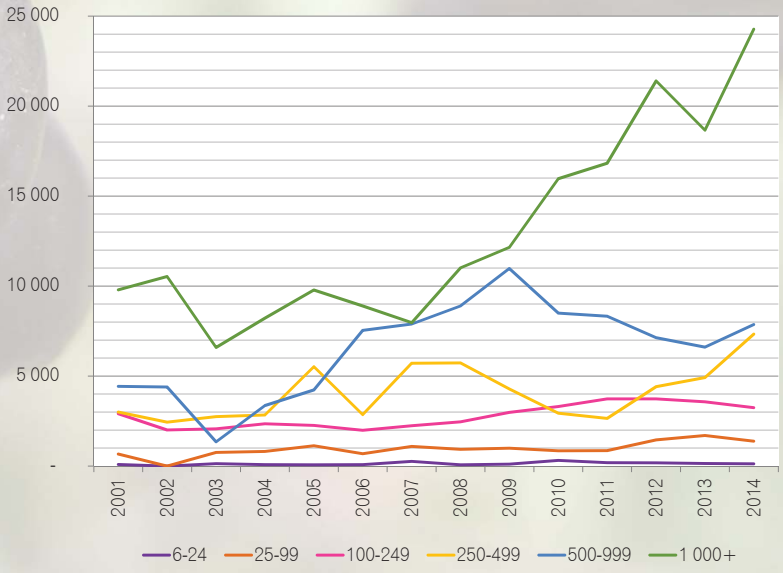

Figure 4. Total number of rented honeybee colonies in Québec, 2001-2014

part by weather conditions. The fluctuations shown in Figure 5 make it hard to draw any firm conclusion as to the other contributing factors. Furthermore, there were only around 5 operations with 1000 colonies at the beginning of the study period and around 10 at the end; therefore, data should be interpreted with caution. However, they nevertheless reveal some interesting trends.

First, productivity among operations with 1000 colonies or more oscillated around 35 kg honey per colony in the first decade of 2000 and has oscillated around 45 kg/colony since 2010. Also, up until 2009, productivity was always lower in operations with 1000 colonies or more than in operations in the other size classes. After 2009, the largest operations generally saw honey yields equal to or higher than those of other operation sizes. Operations with between 100 and 249 colonies also performed well as of 2009. Operations in the other size classes saw their honey yields fall from around 45 kg/colony at the start of the study period to around 35 kg/colony in 2009.

Nothing in these trends enables a link to be established between the decrease in productivity among some operation sizes and the growth in pollination services. In fact, operations with 1000 colonies or more did not experience a decline in productivity over the 15-year study period, whereas they gained a large share of the market for pollination services. In contrast, operations with between 250 and 499 colonies also captured a share of the market for pollination services starting in 2011, but saw their productivity stagnate at around 35 kg honey/colony. Productivity losses seem to be highest among small operations, which have been slower to enter the market for pollination services.

Figure 5. Beekeeping productivity in Québec, by operation size, 2001-2014

POSSIBLE EXPLANATIONS

That said, there is reason to ask how it is that very large beekeeping operations increased their productivity while taking the largest share of the market for pollination services. As large operations were seeing their productivity go up, the smallest operations (6-24 and 25-99 colonies) were seeing the sharpest decline in productivity.

This phenomenon may be attributable to varying access to technology. For example, it is possible that the largest operations winter their bee colonies indoors more than small operations. In addition, the largest operations derive a significant portion of their income from beekeeping, whereas small operations are run by part-time beekeepers who likely don't have the time required to improve productivity. Obviously, fluctuations in productivity may be caused by other factors as well and this issue needs to be studied at greater length. However, as demonstrated in this fact sheet, there does not appear to be a link between pollination services and a decline in beekeeping productivity.

FOR FURTHER INFORMATION

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Industrie apicole québécoise (16.12.2015)