Calculation Methods

The Bee Informed Partnership

Average Loss (AL) is the mean % of the <u>total colony loss</u> experienced by <u>respondents in a defined group</u> over a defined <u>period </u>of time. Average Loss was calculated by dividing the summed <u>total colony loss</u> of respondents within a specified group by the number of respondents in that group (N) and then multiplying the quotient by 100%.

Average Loss$_i$ = ($\sum$TL$_i$)/N$_i$ x100%

Total Colony Loss (TL) is the percentage of colonies lost in a specific group over a fixed <u>period</u> of time. Total Colony Loss in an operation or in a defined group was calculated by dividing the <u>total number of colonies that died</u> over a given time <u>period</u> (T$_{dead}$) by the <u>total number of colonies at risk of dying</u> in a given time <u>period</u> (T$_{Colonies\ at\ risk}$) and multiplying the quotient by 100%.

Total Loss$_i$ = (T$_{Dead\ in\ group\ i}$/T$_{Colonies\ at\ risk\ in\ group\ i}$) x 100%

Total number of colonies at risk of dying (T$_{Colonies\ at\ risk\ in\ group\ i}$) over a <u>period</u> was calculated by adding the number of colonies at the start of the <u>period</u> (T$_{Start}$) with the number of splits made by the beekeepers over the period (T$_{Splits}$) and the number of colonies purchased over the <u>period </u>(T$_{Purchased}$) and then subtracting the number of colonies removed (sold or given away) over the <u>period</u> (T$_{Removed}$).

Total number of colonies at risk of dying (T$_{Colonies\ at\ risk\ in\ group}$) = T$_{Start}$ +T$_{Splits}$ +T$_{Purchased}$-T$_{Removed}$.

Total number of colonies that died (T$_{Dead}$) was calculated by subtracting the total number of colonies at the end of a period (T$_{End}$) from the total number of colonies at risk of dying for the <u>period</u> (T$_{Colonies}$).

Total number of colonies that died (T$_{Dead}$) = T$_{Colonies}$ – T$_{End}$.

Period was the defined period of time for which colony loss was analyzed. There are three time periods used in colony management survey results:

Winter Losses: October 1 – April 1.

Summer Losses: April 1 - October 1.

Annual Losses: April 1 – April 1.

Respondents in a defined group are the group of respondents who responded to a specific question and provided data that met quality checks. Inclusion in a group is by self-report. Often, this data is dichotomous (e.g., "Yes, I treated or used product X" or "No, I did not treat or use product X").

Data Censuring: Responses were excluded from analysis because it was collected: 1) during survey test period; 2) was from a non-United States respondent; 3) was a duplicate response; 4) from a respondent

did not keep colonies during the survey period; 5) colony data were missing (i.e., creating an inability to calculate TL); 6) colony data were invalid (i.e. losses were less 0% or greater than 100%).

Data Editing: Text entries were converted into numeric values when possible.

95% Confidence Interval (95% CI): A confidence interval expresses the precision of an estimate by defining the interval around a point estimate. The confidence interval is the interval within which the point estimate would fall 95 times if the population were sampled 100 times.

Generally, 95% confidence intervals were calculated by subtracting or adding 1.96 times the standard error of the average loss from the point estimate for respondents from a defined group.

Results not reported: To protect confidentiality, data are not reported if there were 5 or fewer respondents.

A detailed explanation of colony loss calculations can be found at:

vanEngelsdorp, D., R. Brodschneider, Y. Brostaux, R. van der Zee, L. Pisa, R. Underwood, E. J. Lengerich, A. Spleen, P. Neumann, S. Wilkins, G. E. Budge, S. Pietravalle, F. Allier, J. Vallon, H. Human, M. Muz, Y. Le Conte, D. Caron, K. Baylis, E. Haubruge, S. Pernal, A. Melathopoulos, C. Saegerman, J. S. Pettis, and B. K. Nguyen. In press. Calculating and Reporting Managed Honey Bee Colony Losses, pp. 237-244. *In* Sammataro and Yoder [eds.], Honey Bee Colony Health: Challenges and Sustainable Solutions. CRC Press: Taylor & Francis Group, LLC.