

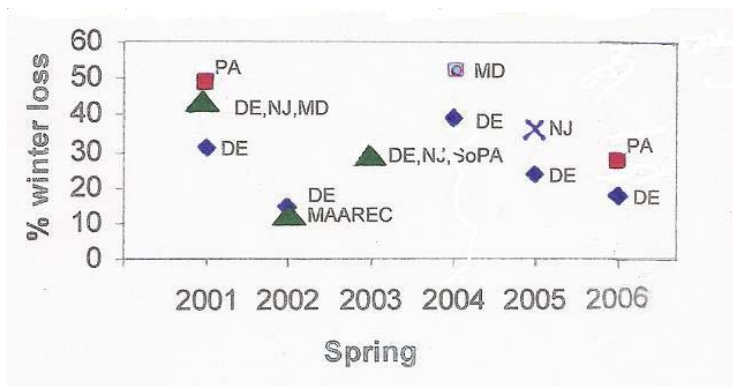
**MAAREC Beekeeper Survey**  
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Beekeepers belonging to their state bee association in the MAAREC region were sent a pre-stamped 3-page survey via U.S. Mail to determine how they were dealing with mites. It was sent to DE, NJ, and MD beekeepers in early spring 2005; returns varied from 12% DE to 30% in NJ and results were published on the MAAREC website (Caron et al 2005). The planned distribution to PA beekeepers did not occur so 775 PA beekeepers, who were members of the Pennsylvania Beekeepers Association, were mailed the same survey in early spring of 2006. We received 272 PA returns with at least some of the questions answered (31%).

As background we asked beekeepers their number of years of experience in beekeeping. Of 602 total responses, beekeeping experience averaged 16.7 +/- 15.38 years. The range was starting to 70 years of beekeeping. The median was 10 years of experience; the mode (most common response) was 5 years of experience. The average beekeeper age was 57 +/- 13.6. The median was 56 and mode age was 47. The age range was 75 years, ranging from 16 – 91 years old.

We wished to document winter losses with our survey so we asked how many colonies were managed the previous fall and how many survived the winter. This survey information was part of what we perceived as heightened overwinter losses that appears to be somewhat cyclic [Figure 1]. During 2000-2001, winter losses were high. In spring 2001 for example, 36 DE beekeepers responding to a *NewsyBee* survey reported losses of over 900 colonies, a 31.7% loss rate (Huber and Caron *ABJ* 2001.) *A Bee Culture* magazine survey pegged losses in New England, NY and PA at 50-51%, while the region of DE, NJ, and MD was listed as suffering a combined 43% loss (Flottum, *Bee Culture* 2001.) Winter losses were widespread in the northern US that winter according to other surveys (Wenning, *ABJ* 2001).

Figure 1. Overwinter loss estimates 2001-2005 in MAAREC region from various sources



In contrast, loss levels were more moderate the next year. In spring 2002, 44 beekeepers, owning 1266 colonies, returning a *NewsyBee* survey, said their losses were 1/3 the level of the previous year – 181 overwintering colonies died for an overall loss rate of 14.3%. A *BeeAware* survey (Caron 2003) included with the MAAREC April newsletter, estimated MAAREC beekeepers in DE, NJ, PA, MD and WV, had a similar, in fact slightly lower, rate of loss at 12.3% (272 colonies died with 2208 surviving).

The next winter, the 2002-2003 overwintering period, a survey of 75 beekeepers in the 3-state region of DE, NJ and SE PA, reported loss of 542 colonies, of 1795 going into the winter, a regional loss rate of thirty percent (30%).

In spring 2004, 20 Delaware beekeepers in another *NewsyBee* questionnaire, reported losing 155 colonies, a loss rate of 19%. Bob Mitchell, state apiary inspector, on the basis of early season inspections, pegged losses at 40-50% of the numbers of DE colonies that started the winter. In Maryland, State Apiary inspector Jerry Fischer found losses running 50% among the 930 MD beekeepers who report colony numbers to his office with mandatory registration.

In our survey of DE, MD and NJ Beekeepers following the 2004-2005 winter, we determined that NJ beekeepers who responded lost 450 colonies – a 46% loss rate, the highest of the region, MD had a 36% rate and DE had a 19% loss rate. Overall weighted by colony numbers it was 37%. This higher survey finding for NJ was consistent with loss estimates from NJ State bee inspector Paul Reybold as quoted in the NY Times. Flottum (2005) in the June *BeeCulture* estimated losses in MD, DE and NJ as 33%. Beekeepers elsewhere, including Western states, experienced heavier losses according to numerous news articles.

When we analyzed the PA losses for the 2005-2006 winter with our spring 2006 sampling, the 272 beekeepers responding to this survey question lost 1163 colonies, a 27.5% loss in PA colonies [Figure 2a&b below]. A separate *NEWSY BEE* questionnaire of DE beekeepers revealed a loss rate of 18.6% in DE colonies the spring of 2006.

Figure 2a. Comparison of MAAREC winter losses 2004 and PA 2005

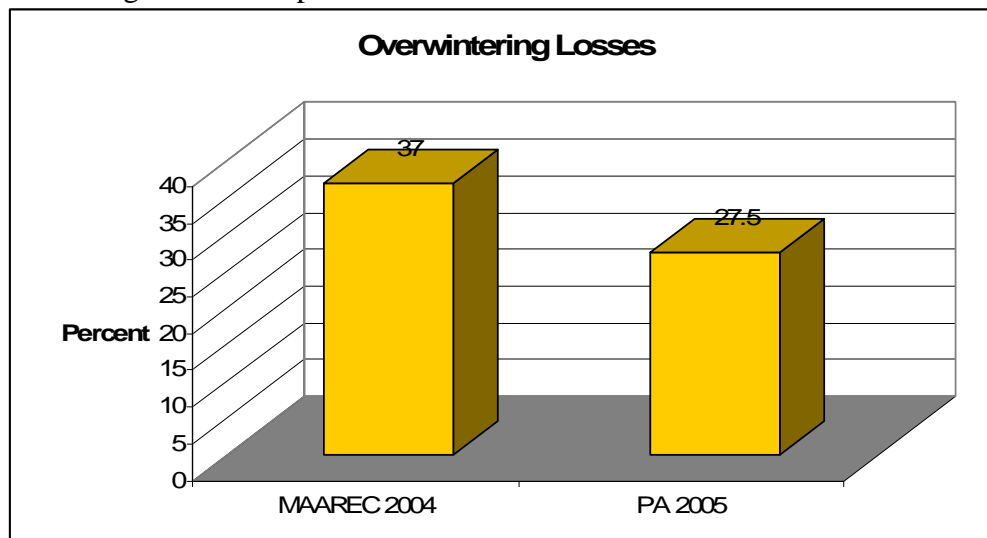
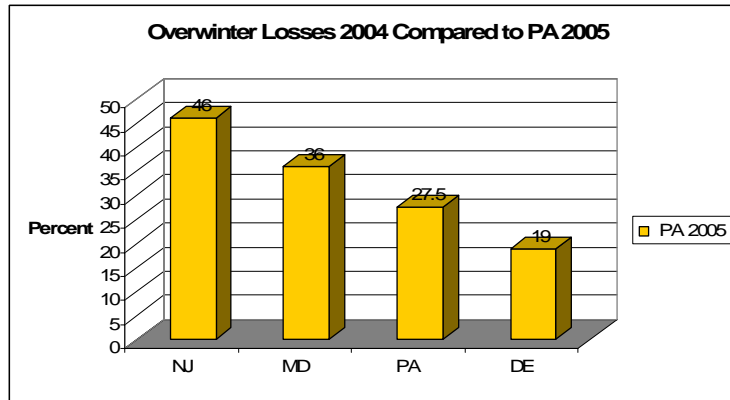


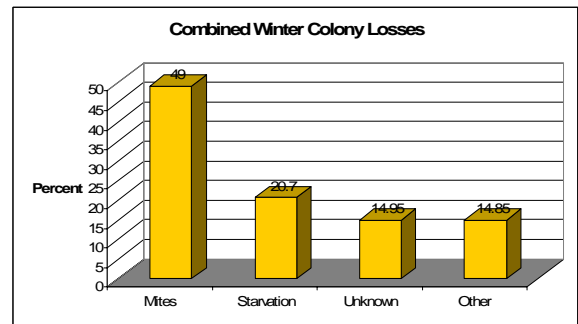
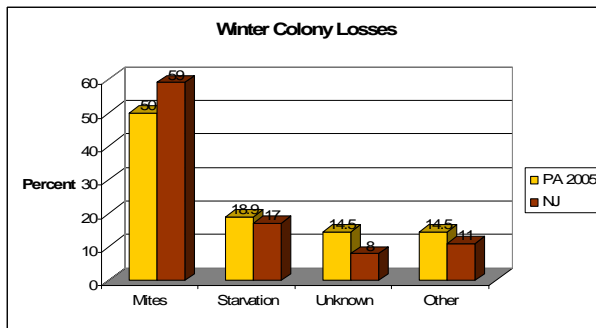
Figure 2b. Overwintering loss comparison in MAAREC states - spring 2005 & 2006



We asked in the survey to what did the respondents attribute losses. Results varied little between our 2 survey winters. In 2005, 50% attributed their losses to mites while 59% of PA beekeepers said mites were the reason for their 30+ % overwinter losses. [Figure 3]. The estimate for 2005 was lower in part because mites were listed by only 14% of DE respondents; they attributed 58% due to unknown cause. Figure 4 summarizes responses.

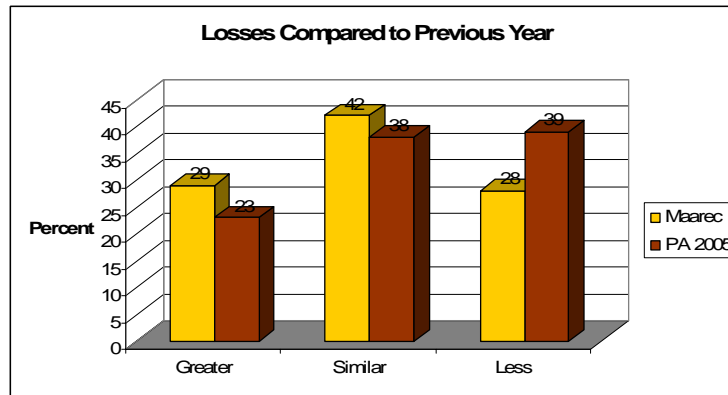
Figure 3 Beekeeper attributed reasons for losses.

Figure 4 Winter loss attributions combined.



We asked the respondents to compare their losses with the previous year. It appears PA beekeepers found losses less severe in spring 2005 than the beekeepers of DE, NJ and MD the winter before [Figure 5].

Figure 5 Losses compared to previous winter



Our survey focused on what beekeepers were doing for mite control. We had separate sections on Chemical mite control and another on IPM methods. When asked did they use a chemical for mite control, 73% of beekeepers (n=405) in the 4 survey states said yes and 27% said no. [Figure 6]. When asked if they surveyed first to determine if mites had reached our published threshold level, 51% said yes, 49% said no.

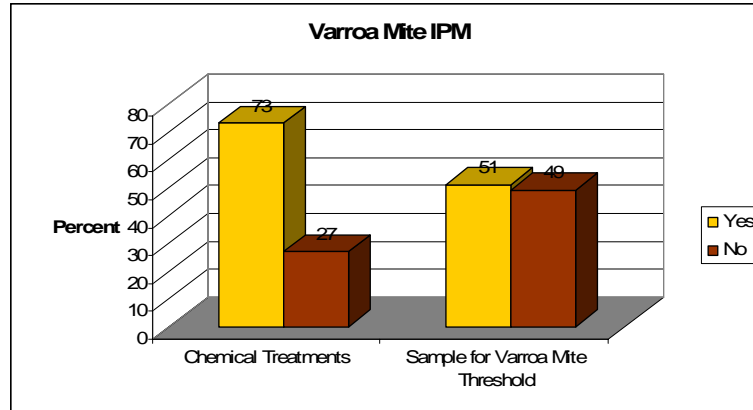


Figure 6

Of those who answered yes to the question of use of a chemical for mite control, we asked what they used, when, how much, time for application, did they combine chemicals with other management and how much they spent. For the most recent survey year 2005 (PA beekeepers), we received these responses on what chemical used [Table 1]

Table 1

	Apistan	Coumaphos	Formic Acid	ApiLife Var	Mite Away II	Checkmite	Sucrocide	Other	Total
#	101	38	37	34	28	8	4	6*	256
%	39	15	14	13	11	3	2	2	99

(\* Other: oil, menthol, Maverick, oxalic acid)

The vast majority of beekeepers (76%) treated with a chemical in the Fall (Aug-Nov). During the Spring (Mar-May), 17% treated for varroa mites. About 2 % of beekeepers treated during the summer (June & July) and an additional 2 % of beekeepers treated during the winter (Dec- Feb). The duration of the miticide treatment varied widely, because of the different products used. The most common response was 20-30 and 40-50 days in the case of use of Apistan and Coumapos.

The amount of treatment used varied because of the different products used. Most beekeepers reported using 2 strips (33%) while 32 % used only 1 strip/colony. Others (21%) simply reported that they treated as directions specified . Additionally 9 % of respondents reported using 4 strips; 5 % said they treated using 3 strips.

The majority of 131 responding PA beekeepers (37%) estimated their chemical expenditure as between \$25-50 on miticides each year; 19% spent under \$25; 24% spent

up to \$100. The range was \$0.50 - \$300.00. 40% of beekeepers spent 5-10 minutes on each colony for varroa control; 24% of beekeepers needed more than 10 minutes per colony for varroa control. [Table 2]. Most (80%) of beekeepers said they were able to combine varroa treatment with other hive management practices; the remaining 20% did not combine these practices.

Table 2.

Time	Response	Percentage
> 5 min	30	16
5 min	36	19
5-10 min	74	40
<10 min	45	24
Total	185	99

Most beekeepers would pay someone under \$10/hr to make the varroa chemical treatments for them [Table 3].

Table 3

Wages	Response	Percentage
<\$10/hr	36	36%
\$10/hr	30	30%
\$10-15/hr	21	21%
\$15/hr	1	1%
\$15-20/hr	9	9%
\$20-30/hr	3	3%

Other than for varroa control, most beekeepers (48%) reported they spent under \$25 for pest and disease control [Table 4]

Table 4

\$ Disease /Pest	Response	Percentage
\$1-25	34	48
25-50	17	24
50-75	6	8
75-100	1	1
100-125	4	6
150	1	1
175	0	0
200	2	3
225	0	0
250	2	3
300	1	1
Don't Know	3	4
Total	71	99

In our survey we asked what other products were used for pest & disease control (no choices were offered, respondents needed to write in a material). Responses included 52 terramycin, 25 fumigilin (Fumidil-B), 18 menthol, 17 sticky boards/bottom boards/drone frames, 10 sugar, 9 grease, 9 oil, 7 Paramoth, 4 Honey-B-Healthy, 4 Miteathol. Beekeepers also recorded Apistan, Tylanol, queens, fencing, garlic, vinegar, sucroside, Terra Pro, Tetra Bee Mix, oxalic acid, thymol, Bee Pro, pollen substitute, nosema treatment, antibiotic, formic acid and tobacco for the smokers, a total of 38 additional responses.

We included a section on value of colonies and income but got a very poor return response. The results just from PA beekeepers are presented here.

### Colony Value & Beekeeping Expenses

1. There were 348 responses explaining how beekeepers generate income from their colonies. Most beekeepers (58%) generated income from their colonies by selling honey. 21% of beekeepers profited by selling beeswax. Only 12% of beekeepers used their bees for pollination. A few (4%) of beekeepers sold pollen and another 4% sold nucs. Only 1 beekeeper responded that he sold packages of bees.
2. For the 12% of beekeepers who said they charged for pollination services the mode & median rental price was \$40, with range broad from free to \$87.50. The number of hive rentals varied from 2 – 200 rentals. The mean was 29.7 with large standard deviation of 41.7. The median was 11 hive rentals and mode was 2. There were 35 responses.
3. Respondents (169) sold their honey retail for \$3.25 +/- \$1.10 – the median & mode was \$3.00. The price range was from free - \$7.00. The amount of honey sold retail in pounds ranged from 5- 36,000 +/- 4,128.5. The mean was 1,000 lbs. The median was 155 lbs. The mode was 100 lbs. There were 142 responses.
4. The wholesale price of honey ranged from \$0.93 to \$6.80 - the median & mode was \$2.00 with mean \$2.25 +/- \$1.08. There were 62 responses. The amount of honey sold wholesale ranged from 10 -127,000 +/- 2,968.2 lbs. The mean was 3,755.8. The median was 400 and the mode was 200. There were 48 responses.
5. Other services beekeepers reported for income included bee removal, candles, cosmetics, and presentations. Only 13 beekeepers responded to this question. 38 beekeepers responded that they sold wax. The range was 1 lb -1,500 lbs of wax. The mean was 97.7 lbs. The median amount was 22.5 lbs of wax. The mode was 10 lbs of wax. The total amount of wax reported sold was 3,712 lbs.
6. Twelve beekeepers reported selling nucs. The number of nucs they sold ranged from 3- 325 nucs. The standard deviation was 98.6. The mean was 73.1. The mode was 20 and the median was 22.5. All of the sold nucs combined totaled 877.
7. Six beekeepers sold 583 lbs of pollen.
8. 152 beekeepers recorded what they would charge for a colony if offered for sale. The prices ranged from \$ 50 - \$300. The standard deviation was 45.1. The mean was 130.5. The median was \$125 and the mode was \$100.
9. 164 beekeepers recorded what they spend on annual hive upkeep. 41 of the beekeepers responded that beekeeping was a hobby, so they spent as needed, or had no budget, etc. There were 122 numerical responses. The range was \$0 to

\$17,000. The standard deviation was \$1607.8. The mean was \$422.9. The median was \$125 and the mode was \$100.00.

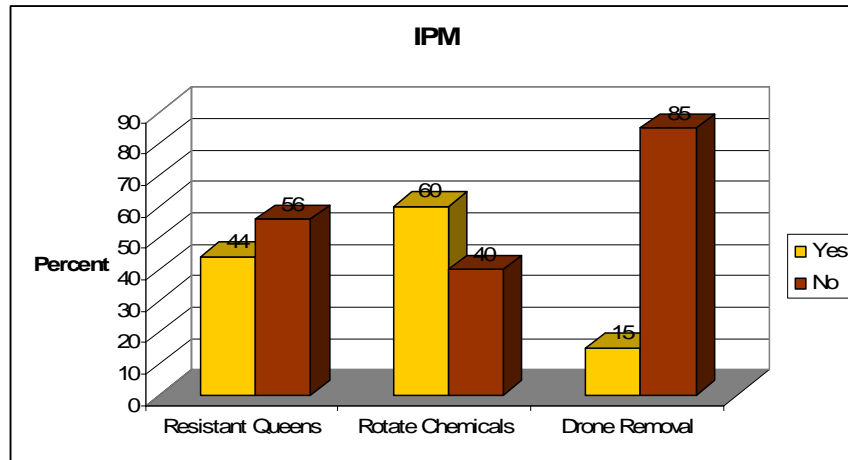
## IPM

In our survey we asked for a definition of IPM and asked questions about IPM practices. 89 beekeepers defined IPM as multiple methods of treatments – both chemical & non-chemical. Thirty three beekeepers defined it as a management practice, 10 as watching the pest threshold. Thirty eight said it was not using chemicals. Slightly more than half the respondents said they sampled to determine if varroa mites had reached threshold numbers [see Figure 6].

1. The methods of sampling for varroa mites included: (53%) sugar roll, (20%) sticky board, (9%) screen bottom board, (8%) visual observation, (7%) drone brood removal/scratching, and (3%) counting the mites. There were 173 PA responses. 52% said they used homemade sticky boards to monitor.
2. 115 beekeepers answered the sampling frequency question. 29% of the beekeepers sampled once in September or October, 31% of beekeepers sampled once a month from June to October, 15% of beekeepers sampled twice in September & October, 14% of beekeepers sampled otherwise such as “in the fall” and 2 % sampled “in the spring.”

We asked about how frequently some IPM tools were utilized. Graph [Figure 7] below represents the response of 230 beekeepers: More rotated chemicals (60%) than used resistant queens (44%) or drone brood removal (15%).

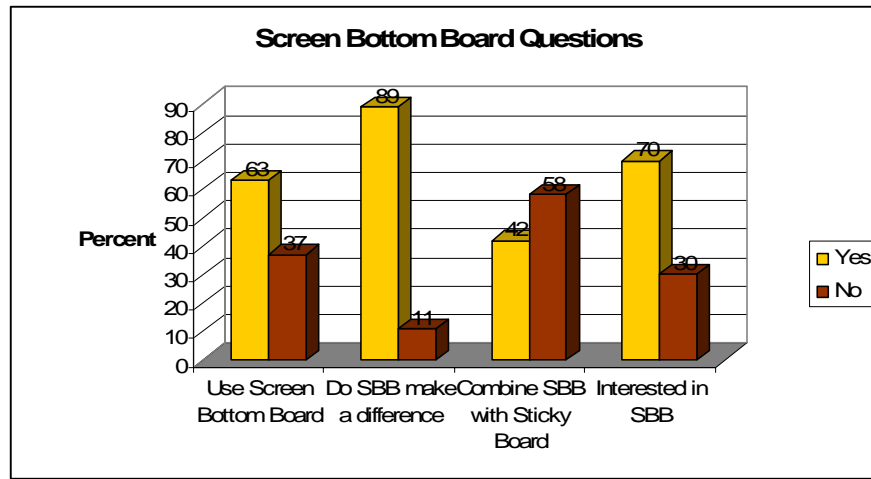
Figure 7



We asked a series of questions regarding use of screen bottom boards. 63% of beekeepers (n= 244) reported that they used screen bottom boards. Most (49%) said they made their own Screens. Of 136 beekeeper respondents, 89% thought that screen bottom boards make a difference. Out of 151 responses, 42% use screen bottom boards with

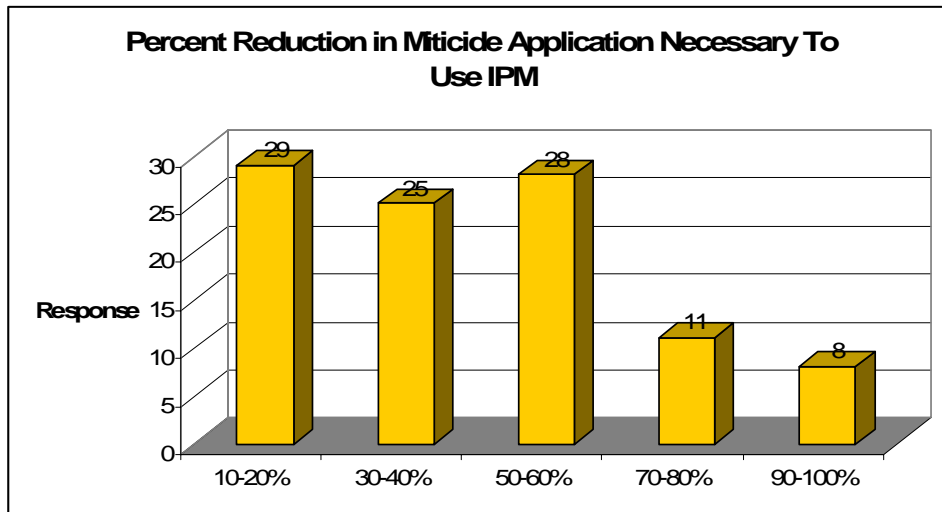
sticky boards, 58% did not. An additional 92 respondents said they were interested in using screen bottom boards, although were not at present using them [Figure 8] .

Figure 8



We asked what percent reduction in miticide application would be needed to convince them to use screen bottom boards. Out of 79 responses, 29% of beekeepers would use screen bottom boards if 10-20 % of colonies would not need treatment, 25% of beekeepers would use screen bottom boards if 30- 40 % of colonies would not need treatment, 28% of beekeepers if 50- 60 % of their colonies would not need treatment, 11% of beekeepers would use screen bottom boards if 70-80% of their colonies would not need treatment and 8% of beekeepers would use screen bottom board only if 90-100% of their colonies would not need treatment. [Figure 9].

Figure 9

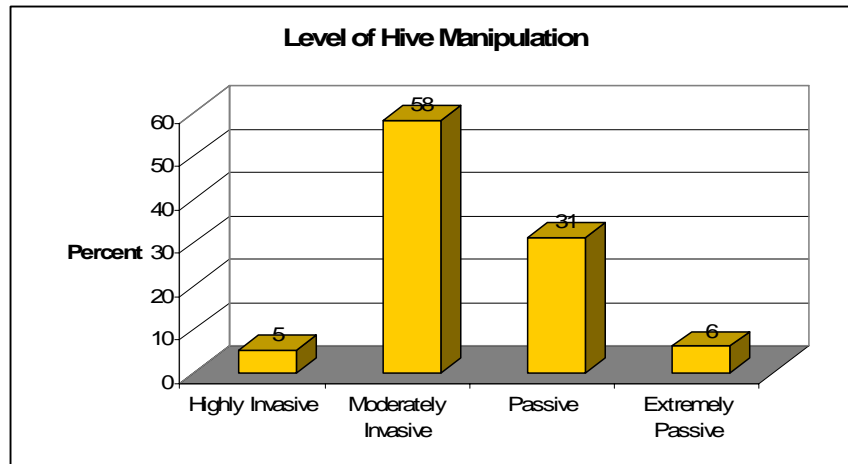


Non-chemical methods to reduce mite levels included 2% nutrition, 3% vinegar, 5% garlic, 6% strong colonies, 6% resistant queens, 6% smoke, 7% screen bottom board,

8% drone removal, 10% fgmo/ mineral oil, 10% essential oils, 10% acids/ chemicals, 11% powder sugar, and 14% grease patties. There were 108 responses.

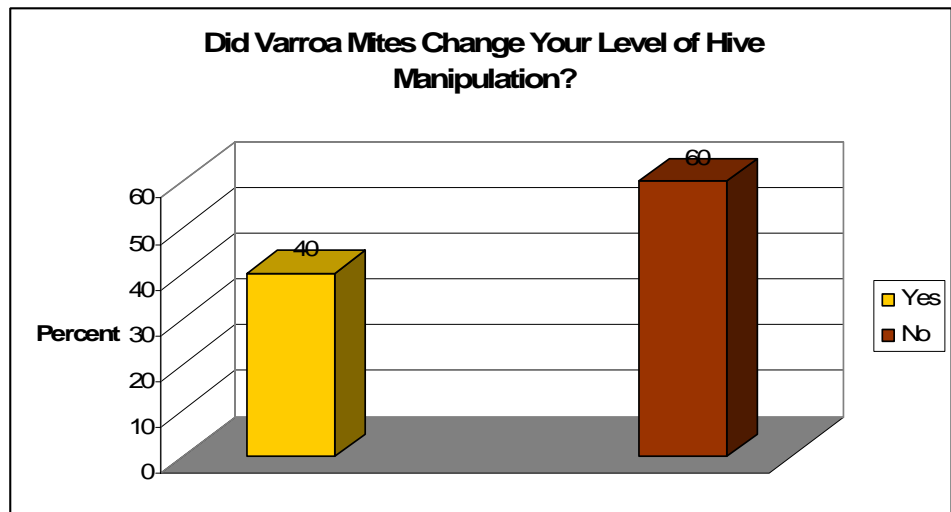
We asked how the beekeepers considered themselves relative to their level of hive manipulation. Of 474 responses, 5 and 6 % respectively considered themselves highly invasive or extremely passive. More considered themselves moderately invasive (58%) compared to passive (31%). [Figure 10].

Figure 10



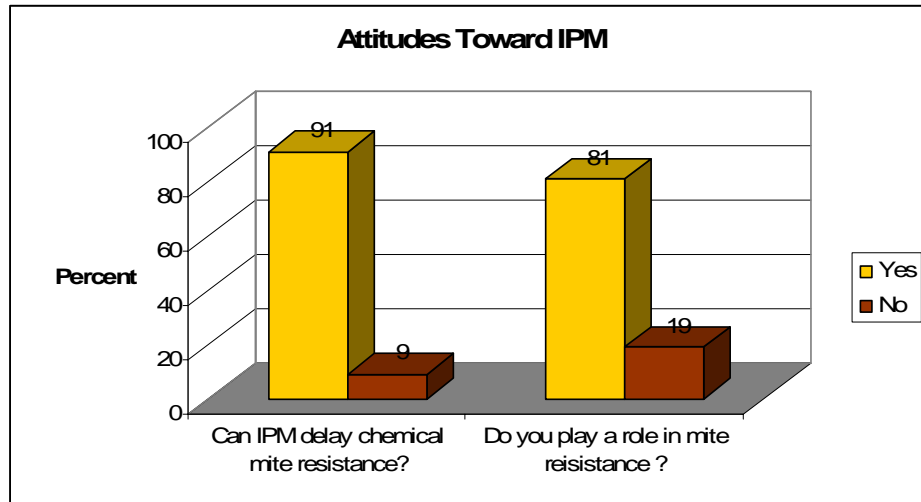
When queried if mites have changed their level of hive manipulation (486 respondents) 40% indicted YES mites had changed their hive manipulation level while 60% said NO that mites had not changed their manipulation level. [Figure 11].

Figure 11



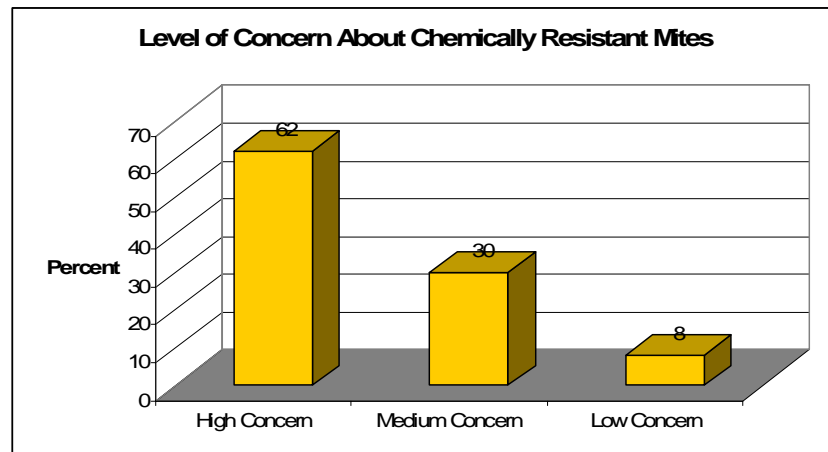
We queried if IPM could delay the onset of chemical resistance in mites – 91% thought it could. When asked if the beekeeper played a role in mite resistance only 81% thought yes. [Figure 12]

Figure 12



In our survey we asked about the level of concern respondents had about the development of chemically resistant mites. Overwhelmingly, 62% of 600 respondents were highly concerned, 30 % were moderately concerned and only 8 responded that they had low concern about development of resistant mites.

Figure 13



### Conclusions

The results of several surveys point to widely varying estimates of winter losses since 2000. In the winter of 2001-2002 losses were generally light (under 20%) but otherwise overall colony losses for 2000- 2006 were approximately 30%. Beekeepers consider the overwhelming reason for such losses is Varroa mites. 73% of beekeepers surveyed used chemical methods to treat for Varroa mites. Most of those beekeepers used Apistan (39%) & Coumaphos (15%). 62% of all respondents were highly concerned about chemically resistant mites.

In our survey 50% of beekeepers said they had tested the mite threshold. Could losses be due to Varroa mite resistance to these chemicals? Varroa mites that are resistant to Apistan have been found in Europe & in the U.S. (Pettis & Jadczyk 2005). Coumaphos resistant mites have been documented in Florida and in Maine (Pettis & Jadczyk 2005).

The cost of Varroa mite treatments in Pennsylvania 2006 ranged from \$0.50 - \$300.00. Most (37%) of these beekeepers managed to keep their treatments between \$25-\$50. This makes Varroa mite treatments more expensive than the treatments for other pests & diseases. The same beekeepers (48%) paid under \$25 for their other bee health expenses.

The PA beekeepers also are either spending 5-10 (40%) minutes per colony or under 10 minutes (24%) for each Varroa treatment. This has led to a possible new beekeeping niche: the traveling Varroa mite treater. When the PA beekeepers were asked how much they would pay someone else to do their Varroa treatments, the majority (36%) answered under \$10/hr.

Although 41% beekeepers recorded that they had no set budget, the average beekeeper can make enough money to subsidize the cost of Varroa mites. Most of the PA beekeepers sold their honey for \$3.00 retail and \$2.00 wholesale and an additional 12 % used their bees for pollination services at \$40 per trip.

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Link to: MAAREC Survey Preliminaries (pdf file)  
<http://maarec.cas.psu.edu/pdfs/MAARECSurveyPRELIMAA.pdf>