

**2005 Northeast SARE Farmer/ Grower Grant
FNE05-549:**

**Productivity Trials for the Combination Queen Rearing Nucleus and Comb Honey Hive
January 2010 Final Report, FIRST DRAFT**

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Goals:

Our goal is to construct and test a special purpose beehive designed for raising queens in the Spring and early Summer and producing comb honey during the Summer. This hive is named the Combination Queen Rearing Nucleus and Comb Honey Hive. Funding was to be used to build and field test a total of twenty beehives. 10 hives would utilize 9 1/8 inch by 7 inch frames while the other would utilize shallower 6 1/4 inch by 7 inch frames. Both hives were to be tested for production, overwintering and rate of growth. Income from this hive was to be compared to that generated by the standard Langstroth hive and another new hive, the Two Colony Hive. Clusters of bees would be tested on frames arranged in groups of 5, 6, and 7 frames to determine whether the number of frames would affect the rate of growth.

Farm Profile:

Johnston' Bee Farm is a sideline operation of 180 beehives. Approximately 90 of these hives are standard Langstroth hives and 70 are two colony hives, a design originated by the farm owner, and 17 are Combination Queen Rearing Nucleus and Comb Honey Hives, the subject of this experiment. In 2009, we grossed approximately \$12,000 from the sale of nucs, brood, and queens, an increase over the \$5,000 earned in 2008.

The farm built a 20 foot x 24 foot warehouse for woodworking and honey extracting in 2001. A substantial addition was closed in as of late 2007. During 2008, two lofts were constructed that provide additional storage for jars and lumber. In 2009, insulation and interior walls and heat were added to the original 20' x 24' portion of the warehouse. Lights, electrical outlets, and stairs were added to the lower part of the warehouse.



In 2009, a Farmland Viability Grant from the New York State Department of Ag and Markets was completed. This grant funded the writing of a Farmland Viability Plan (business plan) and the establishment of a web site for our bee business. The business plan was completed by Cornell Cooperative Extension's Farmnet Program in 2007. The web site, www.johnstonshoneybeefarm.com, was completed in January 2009.

A new honey label has been developed for our operation. It can be viewed in its latest form on the web site. We had 5,000 of these labels printed by Creative Labels of Vermont in 2009. We will probably print a different version of the same label to fit honey bears in 2010.

Though the recipient of this grant, Michael Johnston, had hoped to retire from his full time job at Madison County Soil and Water Conservation District during 2009, it didn't happen. Working a full time job in addition to the bees has had everything to do why I've been so slow working on these SARE grants.

Participants:

Technical Advisor Maryanne Frazier, Penn State – Maryanne is still the technical advisor for this project. We will send her a copy of this final report.

Employee Matthew Johnston – My son Matthew did some work on this grant in early 2009.

2008 Project Activities:

During 2008, Eight queen machines with deep frames were started and nine queen machines with shallow frames were started. These hives were started for the most part after the Spring season when I was busy doing pollination, selling bees and brood to other beekeepers, restocking dead hives that did not overwinter, and restarting two colony hives that had been nuc-ed out. So these hives were started between June 1 and July 20. Some hives built up enough to need a second hive body by late August. Some hives did not need a second hive body before the end of the growing season.



An inventory of these hives were made on October 10. These hives were again visited on December 14 at which time I tried to feed the hives that could use additional stores.

2008 Results:

After a summer of trying to start deep and shallow queen machines, we had 27 clusters of bees on deep frames and 28 clusters of bees on shallow frames that had had a successfully mated laying queen. Many of these clusters were not strong enough to make it through the winter though it is expected that enough will survive to continue the experiment. In comparing the clusters on deep frames with the clusters on shallow frames, the deep queen machines have had a great deal more success in surviving and have lasted longer. By December 14, twenty two of the deep clusters were still alive while 3 had died due to starvation, weakness, and robbing while 2 clusters did not last because the bees had gotten across the divider board (poor woodworking by the author). Also by December 14, twelve of the shallow clusters were still alive, 14 had died due to starvation, weakness, and robbing, while two did not last because of poor woodworking.

In one case, by happenstance, some deep frames were placed above a queen that was already producing brood on shallow frames. A few weeks later, when the author returned to the hive, it was found that the queen had abandoned the shallow frames and was producing brood on the deep frames only. With this one unplanned case, we can infer that this queen thought that the deep frames were a better idea as well. This one case does provide hope that perhaps the bees will more naturally store honey in the shallow frames and produce brood on the deep frames, reducing the need for the use of queen excluders.

The results so far indicate that the deep frames are better suited for the brood chambers of the queen machine than shallow frames. Certainly, the overwintering survival rate is better with the deep frames than the shallow frames. The deep hives also grew faster than the shallow hives. This is indicated by the fact that 6 of 8 deep hives were strong enough by August to require a second hive body while 2 of 9 shallow hives had required a second story. Both types of hives had been started together in equal numbers over the course of the summer.

2009 Project Activities

During 2009 we ran 13 Combination Hives with deep frames and 4 Combination hives with shallow frames. During June, 10 of these hives were used to produce queens for sale to other beekeepers that either picked up the queens at our operation or had them shipped through the mail. My success rate for raising queens was 79% (49 of 62 possible, 8 of 12 hives had 6 compartments). In eight of the hives, a single round of queens was produced. In two of the hives with six compartments, two rounds of queens were produced. A new queen cell is placed in each compartment one day after queens are caged. It generally takes 11 to 14 days before the queens have mated and begun laying.

As of December, 2009 we have the following inventory of hives:

Deep Hives

Pierce Yard

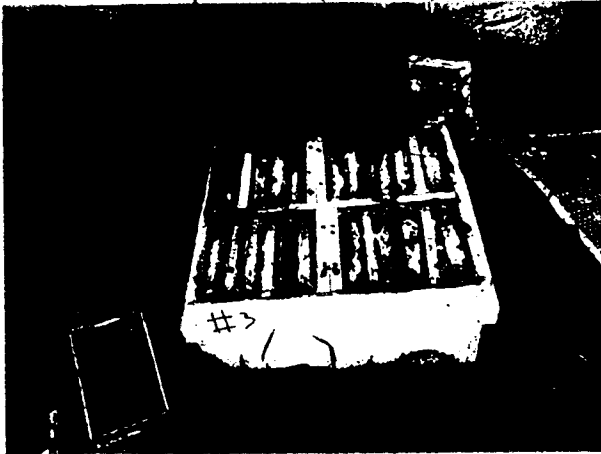
#1 – single story hive – 2009 queens

2 six frame compartments

1 seven frame compartment

1 five frame compartment

#3 – single story hive – 2009 queens
4 six frame compartments (one dead)



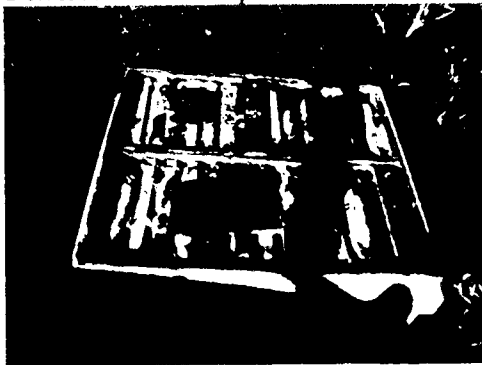
#7 – double story hive (not strong) – 2009 queens
2 twelve frame compartments

#8 – single story hive – 2009 queens
1 seven frame compartment
1 twelve frame compartment

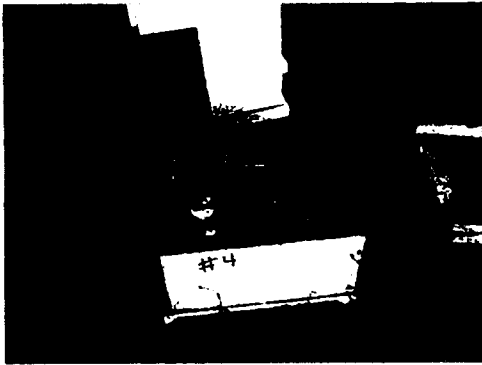
#31 – single story hive – 2009 queens
2 twelve frame compartments

#32 – single story hive – 2009 queens
2 twelve frame compartments

Davis Yard
#2 - single story hive –
2 six frame compartments
1 twelve frame compartment



#4 – single story hive – 2009 queens
2 twelve frame compartments



#5 – double story hive – 2008 queens, very strong
2 twelve frame compartments



#6 – double story hive – 2008 queens
1 six frame compartment
1 seven frame compartment



#21 – single story hive
1 twelve frame compartment



#22 – Double story hive- 2009 queens
2 twelve frame compartments



#23 – Double story hive – 2008 queen
1 six frame compartment

Shallow Hives

Pierce Yard

#11 – Single story hive – 2009 queens

1 five frame compartment (dead)

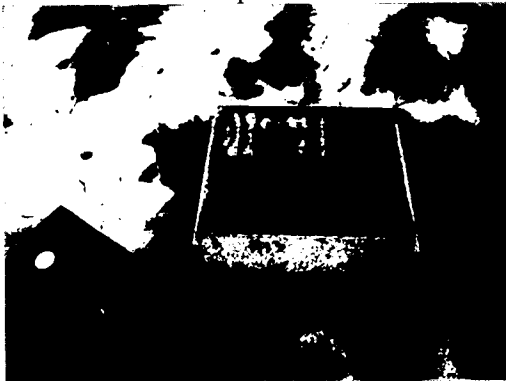
2 six frame compartments

1 seven frame compartments



#13 – single story hive – 2009 queen

1 twelve frame compartment



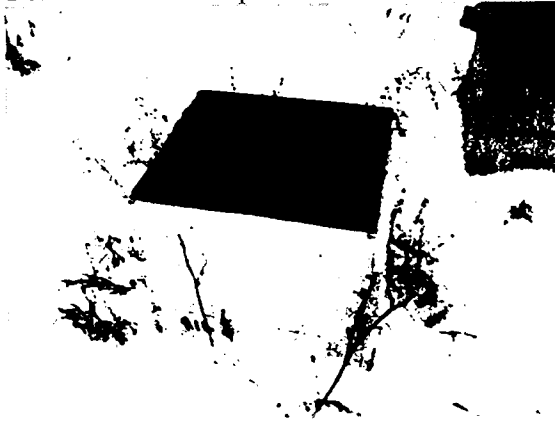
Davis Yard

#12 – single story hive

2 five frame compartments



#16 – three story hive – 2008 queen
1 twelve frame compartment



Site Conditions affecting the Results

The year 2008 was really a very good growing season for beekeeping in Central New York. Any shortcomings in the experiment can mainly be attributed to lack of time available to the author. Though we actually did get some satisfactory results, an earlier start on raising queens will produce stronger hives with a better chance of surviving the following winter. I have had trouble producing strong hives even with standard equipment when the hives were not started early enough in the growing season.

The year 2009 was our busiest year to date selling bees. We did not produce enough of the specialized bee equipment to do this experiment justice. We did, however, concentrate our efforts on increasing the number of deep combination hives. Some of our hives did swarm because of the lack of available equipment.

Economic Findings

As part of our business plan, we calculated how much money could be made from the Combination Queen Rearing Nucleus and Comb Honey Hive. The following information is excerpted from the business plan.

Sale of Bees – Queens

The Combination Queen Rearing Nucleus and Comb Honey Hive is specifically designed for the production of queen bees. I plan to build and stock 20 of these hives in 2008 as part of an experiment funded by USDA's Sustainable Agriculture Research and Education (SARE) program out of the University of Vermont. This experiment will help to establish the optimum depth for the frames used in the hive. During following years, I plan to increase the number of Combination hives by 20 per year in 2009, 2011, 2012 and by 40 in 2010. Each one of these hives should be able to produce 4 queens/ round x 3 rounds/ year x \$15/ queen = \$180

These estimates were based on a 75% success rate in raising queens with these hives. In practice, we were able to observe a 79% success rate in raising queens.

Comb Honey

Queen production season should last for the months of May and June. After that the Combination Queen Rearing Nucleus and Comb Honey Hive will be used for comb

honey production. Conservatively, each of these hives should be able to produce one full hive body of comb honey containing 24 frames. Each of these frames should sell for \$3. Each of these hives will yield \$72 worth of comb honey.

The total for one season of running this hive is \$252.

This compares to an income from our two colony hives of nuc production and honey production of \$75.60 for nucs and \$60 for honey, a total of \$135.60.

Assessment - New Ideas/ The Next Step

The year 2008 experiment certainly gave me some new ideas about hive construction and woodworking that will help eliminate the problem of bees getting across the divider boards to the other clusters in the hive. I have satisfactorily solved this problem in the two colony hive by using divider boards in the second hive body that are not nailed in place. The divider board is able to slide up and down in a groove that is cut into the hive body with a dadoe blade before the bee box is assembled. This approach can also be used in the queen machine though the solution is more complicated if this method is going to be applied to a multiple number of dividers that are not parallel.

I will continue to run some of the queen machines with shallow frames simply because they are now built and operating. I am well satisfied that the deep frame is the correct frame to use in the brood chambers.

The next step was to continue my experiment to determine the optimum number of frames for this deep frame. This was to be done by comparing the rate of growth of 5 across, 6 across, and seven across. This has already been done with standard frames in the two colony hive. I compared 4 across, 5 across, and 6 across and found that the five across arrangement was definitely the fastest growing.

During the 2009 growing season I came to the realization that the optimum spacing of frames for the Combination hive was not 5 across, 6 across, or 7 across. What is really important is the amount of brood available in a given compartment rather than the spacing of the frames. The amount of space available in each compartment of a combination hive is very similiar to the amount of space available in a two colony hive because the outside dimensions of these two hives are the same. The center divider board is thicker in a combination hive and some additional space is lost to the lateral divider boards. In a two colony hive, the amount of brood space per queen per hive body available is 8 inches x 16.75 inches 5 frames x 2 sides per frame = 1,340 square inches. In a combination queen rearing nucleus and comb honey hive the amount of brood space per queen per hive body is 8 inches x 6.31 inches 12 frames x 2 sides per frame = 1,212 square inches. So the answer is that when the Combination Queen Rearing Nucleus and Comb Honey Hive is not used for queen production, it is best that this hive be converted to a two colony hive that utilizes a different dimensioned frame. This also simplifies the carpentry needed to keep the queens apart. It is relatively simple to construct a hive with a center divider board that moves up and down in a dadoed slot in order to seal the division between multiple hive bodies. It is much more complicated to construct hive bodies with additional lateral divider boards that can change position and also move up and down in order to seal the divisions.

Adoption

In October of 2009, I was notified that Johnston's Honeybee Farm was chosen by NYS Department of Ag and Markets to receive a USDA Specialty Crop Grant. The name of my grant application is *A Demonstration of the Feasibility of a Northeast-based Honeybee Production Industry While Meeting the Challenge of the Newest Disease to Hit New York State Honeybees*. Under this grant opportunity, for three growing seasons I am supposed to demonstrate the production of 50 Two Colony Hives and 50 Combination Queen Rearing Nucleus and Comb Honey Hives in relation to their ability to produce nucs and queens. We currently have 70 two colony hives going into winter. We will need to build at least another 37 Combination Hives and many of the specialized frames that go in them. Fortunately, our wood shop is now heated and insulated as of this past July. I have already been in touch with the wood technology program at Morrisville College and will hire students to help with wood working.

There seems to be a large demand for queens produced in the Northeast that are better suited to our climate than queens produced in the South. Africanized bees are spreading rapidly through Florida and it is unknown how well they will adapt to Georgia, another queen producing state. In addition, Johnston's Honeybee Farm has successfully developed its own strain of mite resistant bees; we have not used miticides in our hives since 2003. So far, we have been able to sell all of the bees that we produce and I expect that trend to continue.

Comb honey, another product of the Combination Hive, is very saleable at a premium price. Draper's Bee Supply in Millerton, PA will take all of the comb honey that a person can provide.

Outreach

In 2009, an article on the Two Colony Hive appeared in NYS SARE Farmer Grant Profiles by NY SARE Outreach and the Cornell Small Farms Program. This article does briefly mention the queen machine. I had asked the Outreach Coordinator, Violet Stone, if we could do a follow-up article on the queen machine but she was not in favor of it at that time. There is some information on the queen machine in my new web site.

An article about the 2009 Specialty Crop grant was submitted to the American Bee Journal in December of 2009. This was a long article because it explained how the grant will be applied and also explained the advantages of the two specialized beehives that I will be utilizing. Joe Graham, ABJ Editor, asked that I shorten the article and focus on the Specialty Crop grant. At this time, I plan on writing two articles. The second article will focus on my specialized equipment and will be submitted to Bee Culture magazine.

Report Summary

During the 2008 growing season, I was able start 27 clusters of bees on deep frames and 28 clusters on shallow frames suited for use in the queen machine. So far, clusters on the deep frames have exhibited a faster rate of growth and a better survival rate than clusters on the shallow frames.

During 2009, I continued my experiments but focused my efforts on Combination Hives with deep frames. Though I had always thought that the number of frames per compartment would have a significant influence on the rate of growth of the Combination Queen Rearing Nucleus and Comb Honey Hive, I came to the conclusion that this was wrong. The amount of space available for the production of brood is really more important than the spacing of frames. Utilizing this knowledge, I was able to finalize the design of the combination hive. When it is not used for queen production, the combination hive will be converted from 6 compartments to two compartments and additional two compartment hive bodies will be stacked above the bottom hive

body. Deep hive bodies will be used for brood chambers while shallow hive bodies will be used for honey production.

Profitability of Beekeeping in the Northeast

In beekeeping's present form, it is difficult to be a prosperous beekeeper in the northeast if you're not a migratory operation going to the southern states. Non-migratory beekeepers that are actually making a living are few and far between. I know of two in Vermont that make their living selling bees from hives that also use divider boards but which do not continue the division above a single hive body. I know of another non-migratory beekeeper that focuses on packing honey and selling his product at a higher price.

Using these hives to produce replacement bees

Most beekeepers don't know how to raise queens and most believe that raising queens is more difficult than it really is. Restocking dead hives that have not survived overwintering can be a major expense, especially if you purchase packages or nucs to do the job. The two different beehives that I have originated will make beekeeping much more profitable because these expenses will be eliminated. By selling bees to other beekeepers, this former expense can become an actual source of income. While these hives are not meant to replace the standard hive invented by Lorenzo Langstroth in the 1850's, they are meant to supplement an operation employing the standard hive so the beekeeper can produce his own bees to replace overwintering losses. The Two Colony Hive and the Combination Hive are much more labor intensive than the standard hive and require a higher level of beekeeping. Compared to other forms of agriculture, today's form of beekeeping is rather simplistic: you replace the dead hives, put the supers on, then take the supers off and extract the honey. Northeast beekeepers can become much more profitable if they learn how to become bee producers rather than just beekeepers. These two beehives that I am advocating are certainly not the only means of accomplishing this but I believe that they will prove to be a significant improvement over all previous methods.

Using these hives to produce honey

During this project, I was not able to test the Combination Queen Rearing Nucleus and Comb Honey Hive's potential for honey production.

In 2003 as part of a previous SARE grant, I ran two Two Colony Hives for honey production. When both hives grew to almost 20 frames of brood in late May, I stole brood from them to use in other parts of my operation. This was done before any swarm cells had formed. A zinc excluder was placed over the two deep brood nest and I "bottom supered" during the honey flow. I pulled honey a number of times and managed to keep these hives supplied with enough empty supers so that swarming was never a problem. Honey production was measured by weighing honey supers before and after extracting. One hive yielded 370 pounds of honey and wax while the other hive yielded 344 pounds. This is pretty good considering that the world record for honey production is 405 pounds of honey in one year. The average honey production per hive in New York State is 70 lbs. These two hives demonstrated greater than a 400% increase in production even after deducting the weight of beeswax that was also produced.

When run for honey production, the Combination Queen Rearing Nucleus and Comb Honey Hive should be very similar to the Two Colony Hive. Both hives have two separate colonies of bees. The Combination Hive will have 12 smaller frames instead of 5 standard frames in each compartment. The Combination Hive will have 90.4% of the brood space available to a Two Colony Hive. Though this hive should not be as productive as a Two Colony Hive, it still has very great potential for honey production.

Respectfully Submitted,

Michael Johnston

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