Building a Better Beehive

Innovative Beekeeping & Value-Added Marketing

by Robert Gerard

Les Crowder always had a great curiosity about insects when he was a kid growing up in Bernalillo, New Mexico. This interest was particularly pronounced when it came to social insects such as ants, wasps and bees. He was fascinated with the organization of ants as they adjusted their behavior to the food he would bring them. Crowder said it appeared that the ants showed intelligence, as they got to know he would feed them at a certain time and a certain place every day and had the ability to communicate this information with their "sister" ants. Later, he managed to catch a bee swarm, which he put into a box. From that point, he was captivated by bees and would eventually spend the greater part of his life studying and making a business out of them. He now owns an apiary at Sparrow Hawk Farm with his wife, Beth, and family.

In developing his art, Les Crowder has borrowed and adapted techniques and information from beekeepers worldwide. One of the most obvious innovations that has been initiated at Sparrow Hawk Farm was the change from Langstroth to top-bar hives.

BUILDING A BETTER HIVE

Langstroth hives are known to beekeepers and laymen alike as the box-shaped structures so often seen in apiaries. The design was invented in the early 1800s by a Presbyterian minister named L.L. Langstroth and constituted a stroke of genius that revolutionized beekeeping. A Langstroth hive is made up of stacking boxes called "supers," with about 10 frames in each box. The thin wooden frames hold sheets of machine-pressed beeswax or beeswax-coated plastic, called "foundation," upon which the bees build honeycombs. The supers are where the bees make honey in the spring and summer. These boxes are removed and stored off the hive during the winter.

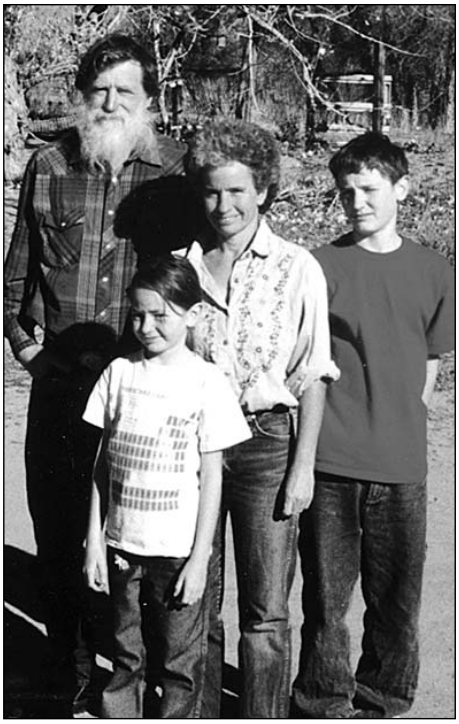
The bottom one or two boxes are called the "brood nest" and contain honey, pollen and the brood, or larval bees. Eggs are laid in the hexagonal cells by the queen. The eggs then hatch into larvae, which are fed by their adult sisters. The larvae eventually spin cocoons and hatch out as adults in this part of the hive.

Working with Langstroth hives is heavy work and hard on the back. Its design dictates that supers have to be removed as a unit to harvest. These boxes, which contain between eight and ten frames, are carried to the centrifuge, where the honey is separated from the honeycombs.

Beekeeping with Langstroth hives can also be an expensive proposition. There are between 50 and 70 frames in a hive, each of which costs $3 and has a limited life. The centrifuge or extractor used to separate the honey from the honeycomb costs between $300 and several thousand dollars.

The frames eventually become so dirty that, even with conscientious cleaning, they will have to be thrown out. On average, a frame in the supers will last 10 years and in the brood chamber about four years. If not done in a timely fashion, the bees will begin to sicken. Punctuality in throwing out old, dirty frames is easier said than done — with the expense of the frames and the labor involved in changing them, this activity is often put off, which puts the bees at risk for disease or other problems.

Although the hive with its frames is basically maintenance-free while the bees are at work, a lot of effort must be expended to keep the frames clean, since the bee larvae defecate under the cocoon, dirtying the comb. The frames are also cleaned so that moths, which Les Crowder calls "the weeds of beekeeping," do not become a big problem



The Crowder Family — for the past 20 years they have made a living as beekeepers at Sparrow Hawk Farm in Sabinal, New Mexico.

When the supers are removed at the end of the season, they are then treated for moth eggs imbedded in the wax of the honeycomb and in the wood of the frame. Treating for moths must be done with utmost care, as any material or chemical used on the frames will affect the bees when the frames are reused.

One of the most effective methods of killing wax-moth eggs and larvae is with paradichlorobenzene, the active material in mothballs. This treatment involves storing, stacking, and making the frames airtight before adding mothballs. Although this method performs its task well, it is a lot of work. In addition, the Crowders and other beekeepers are concerned that the mothballs themselves might leave residues that could affect the bees the following season.

As an alternative to mothballs, the Crowders have tried storing frames on the roof of their house so that the New Mexi-

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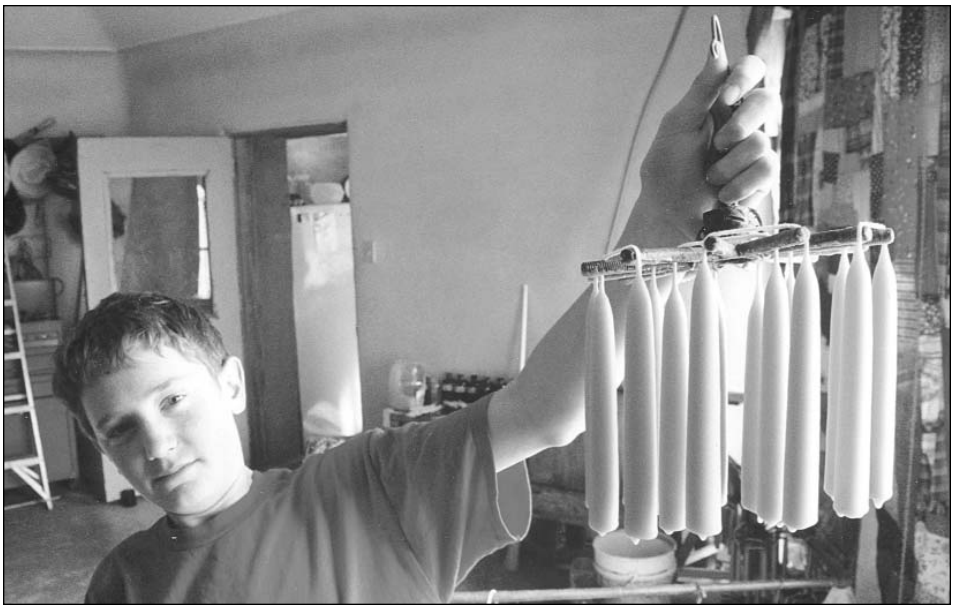
Beeswax hanging on the right, made from the mold on the left. Many of the beeswax products at Sparrow Hawk Farm reflect the diversity of various cultures.



Peter Crowder holding candles made at the farm. The Crowders use the excess wax inherent in top-bar hives to make a series of products that are sold both locally and through the mail.

co sun and dry climate could work on them, and foraging bees could clean out any honey residues. Wax moths don't like clean, honeyless combs. This method worked well on the moths, but the Crowders discovered that the mice could get on the roof and tear up the beeswax, allowing the sun to melt it.

Another option was to scrape clean the dirty frames and put in new foundation sheets during the winter. The honeycomb sheets could be bought at a relatively cheap price and could be installed into the frames on the farm. However, the Crowders found this approach equally or even more expensive when labor was considered. It was as tedious a task to recycle old frames as it was expensive to buy and build 1,000 new frames each year.

The Langstroth hives served the Crowders well, but it was inevitable that the frames would get dirty and decrepit. Early on in his beekeeping enterprise, however, Crowder read an article on African beekeeping in which a "top-bar hive" was described. Impressed with the simplicity of the design, he decided to construct a few as an experiment. Over the years, he kept track of these top-bar hives and how they compared with the Langstroth design.

When the Crowders suffered losses from Varroa mite, they needed to put the bees in a clean environment immediately. Their Langstroth hives were old, dirty and falling apart. To avoid the huge expense of buying new hives and frames, the Crowder family decided to build top-bar hives as a practical, cheap and effective environment for their bees. They have used this design ever since.

A top-bar hive is elegantly simple in its design. It can be a box of basically any shape or design or a 55-gallon drum cut lengthwise. Across the top of the box are a series of wooden bars or stakes. On the side of the box is a small hole where the bees can enter and exit. Les Crowder has found through experimentation that the bees prefer an entrance at the bottom of the box so as to easily get rid of waste and dead bees.

When introduced into the top-bar hive, the bees construct their own honeycombs, which extend down from each bar. When the honeycombs are made and filled by the bees, they are removed from the bar for harvest. Once the honeycomb is removed, the bees once again begin the process of building a new honeycomb.

In the top-bar hive, the ripe honeycombs are harvested from the bars in the back half. The 12 bars in front are left as brood combs. Often, at the end of winter, half of the brood combs are disposed of if they look old and dirty.

The top-bar hive design has several advantages. Crowder says the hives are cleaner and more conducive to natural bee behavior. In the wild, Crowder has noticed that bees are continually moving from old, dirty combs to build new ones. When the bees have moved out, the old combs are soon attacked by wax moths, which eat and demolish them. Similar to nature's model, the honeycombs of the top-bar hives are regularly removed during honey harvest, which keeps them cleaner and means that the bees are

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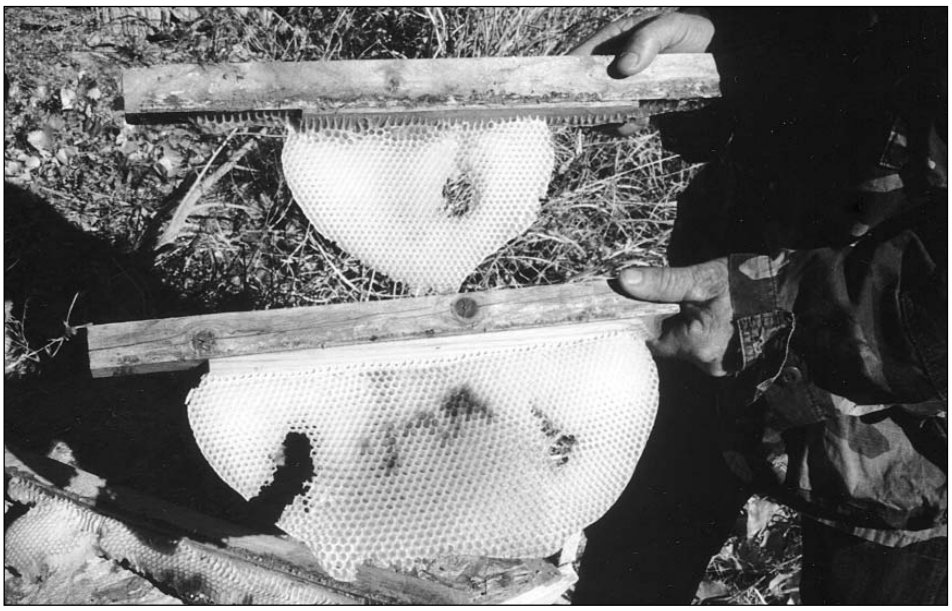
Les and Beth Crowder teaching a workshop on top-bar hives and the skills necessary to be a successful beekeeper.



Wooden bars with abandoned honeycombs still clinging to them. Honey is harvested easily in this style of hive by cutting the honeycomb from the bar.

healthier and have less problems with mites and diseases.

Top-bar hives are also economical, at a cost of $25 each, or less. They don't need an expensive centrifuge to separate the honey. They don't demand as much labor or time to produce honey as Langstroth hives. Another very important aspect of top-bar hives is that the whole winter comb-storage job is eliminated.

The harvest of honey from top-bar hives is less difficult than with the Langstroth model. Instead of the heavy lifting to carry boxes to a centrifuge, the honey is cut directly off the bars and into a bucket. Once the bucket is filled, it is carried inside, where the honeycombs are crushed, and the honey filtered from the wax. Beth Crowder says that harvesting from top-bar hives is easy on the back and is not unlike picking vegetables.

Crowder feels that through the use of top-bar hives, the farm has saved significant amounts of money in beekeeping supplies and labor. These savings have in turn played a major role in the success of their venture. Crowder strongly contends that in beekeeping, as in other forms of agriculture, "It is not what you make that is important, it is what you save."

The top-bar hive only demands that the beekeeper keep the honeycombs straight as they develop. If this task is not done — especially when the bees are first building the honeycomb and at two week intervals after that — "cross-combing" might result, that is, the bees build their honeycombs on two or more bars, causing them to tear when the bar is removed from the hive.

In Langstroth hives, the foundation for the comb is imprinted with six to eight artificial cell sizes. In general these sizes are for the workers, which produce the honey, rather than drones, which don't. Each of these sizes has proponents and detractors. Larger cell sizes produce larger bees, which perhaps work harder and are sturdier than smaller bees. However, it is thought that larger bees are more susceptible to disease and mites than are smaller bees.

Top-bar hives, on the other hand, allow the bees to choose the correct cell size for

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Les Crowder standing by a group of top-bar hives. Crowder has about 100 of these trouble-free hives, each of which yields between one and five pounds of honey per year. Although this type produces more wax than a conventional hive, the wax has become an advantage and an integral part of the Crowders' business.

A top-bar hive made from a 55-gallon drum cut lengthways. Across the top are wooden bars on which the bees produce their honeycombs.

themselves. They also determine by cell size and other means how many workers and drones they want to produce, as well as the size of bees they will raise. Crowder believes that these decisions are best left to the bees, who know better than the apiculturalist the conditions they face and what is needed for a healthy hive.

Sparrow Hawk Farms has about 100 top-bar hives in different locations. They are basically permanent, although they are sometimes moved to take advantage of clover or purple sage. Each hive contains between 50,000 and 80,000 bees in summer and 2,000 to 3,000 in winter. Crowder says the population varies in response to the availability of flowers that supply the honey. In spring, the queen lays a lot of eggs as flowers come into bloom, but with the onset of fall and decreasing flowering, the supply of honey drops, and fewer eggs are laid.

Each top-bar hive produces one to eight gallons of honey and three to five pounds of beeswax per year. This is 20 to 50 percent less honey but a significantly greater amount of wax than are produced by a Langstroth hive. Crowder explains that the greater quantity of wax in the top-bar hive is due to fact that the bees have to build their own honeycomb each year. Crowder has turned this extra wax production to his advantage, utilizing it to make a number of products that have become an integral part of the business.

DEALING WITH DISEASE

One of the biggest problems facing beekeepers is bacterial brood disease. These diseases attack larvae and can be extremely destructive. The most common method to combat these diseases is the use of the antibiotic oxytetracycline, which is mixed with powdered sugar so the bees will feed on it. The literature suggests that this chemical should only be used 30 days before honey making begins in the spring and after honey making ends in the fall. The treatment leaves bees vulnerable for the entire honeymaking season. "So what does a beekeeper do if they have a lot of sick bees in the middle of summer?" asks Crowder.

Crowder did not use antibiotics when he started as a boy in beekeeping, but he succumbed to their use when the bees started to get sick. He always questioned their necessity, however, and wondered what ancient Greek and Roman beekeepers had done, since they obviously hadn't developed antibiotics.

In an article by Steve Taber, Crowder discovered that breeding disease-resistant bees was a realistic alternative. In Taber's experiment, bee larvae were killed to see how long it would take the bees to clean out the carcasses. He found that some bees delayed the work and did it poorly, whereas others did the work sometimes too well. Taber selected for the "clean gene," or those bees that did the best job in cleaning and removing the dead from the hive. Given the name "Hygienic Bees," they were distributed to beekeepers.

Inspired by Taber's work, Crowder began selecting bees from healthy hives, and found that disease resistance was quickly and easily attained. He also realized that his use of antibiotics had created dependencies on these chemicals and also that the resistance he was searching for was being cloaked by the antibiotic. He also found that antibiotics worked against the "clean gene," making bees lazy and vulnerable to diseases and mite infestations. Since the inception of his breeding programs, Crowder has completely discontinued the use of antibiotics in his hives.

One of the biggest challenges Sparrow Hawk Farm faced was with the introduction to the United States of the Varroa mite from China. Sparrow Hawk Farm saw their first Varroa mite in 1995. By the time 1998 rolled around, their hives were devastated by this imported pest, and the writing was on the wall for the end of their business.

The most common practice to combat these mites was the use of miticide-saturated Apistan pest strips within the hive. Although Apistan or fluvalinate worked with varying degrees of success, they cre-

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ated serious problems, including contamination of the beeswax. Another concern was the growing resistance of mites to Apistan, leading to the emergency approval of a more powerful organophosphate. The mites subsequently became resistant to the organophosphate, as well.

Searching for alternatives, Crowder discovered that apiculturalists in northern Mexico were using smoke from the Chaparral or Creosote bush to clear their hives of mites. He decided that it was worth a try and went into the desert to gather some.

As a control for the experiment, he puffed smoke from burning cow manure into the hive, the result being that he caught 10 dead mites on paper saturated with vegetable oil. Next he blew in creosote smoke. On the vegetable soaked paper, he counted about 300 dead mites. Almost crying tears of joy, the Crowders recognized they had a silver bullet to the mite problem and that their farm would survive. Since this initial experiment, they have used creosote bush on a consistent basis to keep mites at bay. They have also found that juniper bark and leaves when burned are an even more effective solution on mites.

Top-bar hives in an orchard, where the bees fill a crucial role as pollinators and increase the orchard owner's harvest.

The use of creosote or juniper as a miticide was quickly discredited by the producers of Apistan, who claimed the smoke contained chemicals that could cause harm to the bees and the consumer. There were members of the scientific community who thought otherwise, however, finding the practice to be not only an effective way to kill mites, but one that was safe for bees.

The Varroa mite has also been controlled through the breeding of resistant bees. Although hygienic bees had some resistance to mites due to their cleaning behavior, it wasn't enough, and the Varroa mite was more difficult to breed against than were brood diseases. Crowder and other beekeepers had to turn to other sources.

The search for Varroa-resistant bees went overseas, and Crowder has bees that were bred in Russia for resistance to mites. Because they reached the goal of mite resistance when American breeders couldn't do it, Crowder believes that these creative and intelligent people should be known as Russian Master Beekeepers.

A strain of bees resistant to mites was also developed by the Baton Rouge Bee Laboratory, the result of a call that went out to beekeepers asking for the queens of all hives that survived mite problems. The resistant strain of bees was developed and given the name "Suppressed Mite Reproduction Trait" (SMaRT) bees, then distributed to beekeepers nationwide.

Sparrow Hawk Farm has also faced challenges with a much larger pest. Driven out of the mountains by starvation and an extended drought, bears have sometimes come to visit the farm with destructive consequences. In one particularly hair-raising experience, Crowder waited, shotgun in hand, for a bear that had been destroying his hives. When he finally came face to face with this powerful animal, he managed to coax it away from his hives and into a huge live trap. The bear was then taken far away to be released.

Since this unnerving incident, Sparrow Hawk Farm has taken the lead from the Canadians, who have successfully used solar-charged electric fences to keep these big animals out. They have had no more bear problems since the fences went up.

HONEY & PESTICIDES

It is said that bees need to visit 1,600 florets of clover to make one drop of honey. To accomplish this monumental task, bees such as those at Sparrow Hawk Farm need to work hard and cover great distances. For maximum honey production, bees need a long flowering season. As each kind of flower comes into bloom and the bees carry their pollen back to the hive, a different, unique-flavored honey is produced.

The bees at Sparrow Hawk Farm begin their honey production by visiting desert sumac in March and early April. They move on to Phacelia in late April, mesquite in May, salt cedar in June, alfalfa and clover in July, purple sage in August, and finally Cenizio in October.

The work of gathering the pollen and nectar makes bees vulnerable to many dangers, not the least of which are pesticides. Often Crowder and other beekeepers have had to face this problem in a proactive manner to keep their hives productive. In one instance, Crowder worked out an arrangement with a nearby corn grower whereby he would be given advance warning before spraying takes place. With this warning, the bees can be moved away and protected while the pesticide is being applied.

A more difficult problem was faced by beekeepers with the chemical Furadan, which is sprayed on alfalfa fields to control the alfalfa weevil. When aerially sprayed, it can kill bees for a seven-mile radius. Because they were losing so many bees to this chemical, the New Mexico Beekeepers Association went to the alfalfa growers to work out a solution.

At first, the two sides were confrontational. To help the alfalfa growers to understand the plight of the beekeepers, Crowder asked them what they would think if, when beekeepers sprayed for something, all the alfalfa was wiped out in a seven-mile radius. The alfalfa growers understood this scenario perfectly and have since worked in a positive fashion with beekeepers.

One adjustment they have made is an early shut-off date, to prevent spraying

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Gathering a wild swarm. When gathered, these bees will be introduced into a hive, where their honey can be harvested by the beekeeper.

while the willows are in bloom and the bees are visiting them. The alfalfa farmers have also opted for ground spraying to decrease the drift and area of impact inherent in aerial spraying. Finally, they have made the change from Furadan to the much-less-toxic Lorsban.

Crowder does not foresee his farm having problems with Africanized bees. He believes that these bees, originating from the lowlands of Africa, will not be able to tolerate the cold. He also suspects that because of their background in the warmer climates, they will not develop a genetic tolerance for the cold.

The Crowders readily admit that their farm survived because of diversity. They reminisce on the difficulty of making ends meet when their concentration was just on honey. Beth Crowder describes how in the beginning they would go from one buyer to the next carrying a bucket of honey to sell. This hand-to-mouth existence ended when they started to look at beeswax as an asset.

The beeswax is made into a large variety of products. Candles and ornaments are made with molds. Often the resulting designs are reminiscent of different nationalities and cultures.

To create their candles, the Crowders experimented with wick size and the wax to get the most clean-burning product. Beth Crowder said that these beeswax candles consume the wax completely without leaving the petroleum residue of parafin candles. They also have the bonus of smelling like honey when lit

The Crowders started their beeswax business with these candles, which were sold locally and at festivals. After they saw braided Havdallah candles in the musical *Fiddler on the Roof,* they decided to create them, as well. They found that

Beeswax candles such as this one consume wax completely and don't leave the petroleum residue in the air that parafin candles do. They also have the added bonus of smelling like honey when lit.

these candles were very popular with Jewish people and were bought for use in their religion. It was not long until they were asked to produce other kinds of candles for other Jewish celebrations. They now produce Shabot, Minora, as well as the braided Havdallah candles.

By going to festivals, the Crowders met people who were interested in their products and wanted to wanted access to them after the festival closed. A mail-order business was set up, and, encouraged by its success, the Crowders decided to make a brochure and catalogue of their business and the products they offered. They now have a brisk mail-order business that peaks around Christmas.

People often drive great distances to buy the Crowders' honey. Customers recognize that this honey is special and are willing to pay the appropriate price for the work that was put into it.

Although the Crowders' operation is organic in its practices, they have not become certified. Interest in their products is already so strong that they can't meet customer demand. In fact, they encourage others in their area, hoping in the future to form a honey cooperative.

The Crowders promote their art by maintaining an open-door policy for groups and people interested in beekeeping. At Sparrow Hawk Farm, they have

greeted people from places as far away as Chili, Tanzania and Denmark. They have also welcomed many different groups, from the Hochitl Indians of Mexico, to schools, to antique car and book clubs. They also try to extend information on beekeeping through their biannual workshops.

With the income from both honey and beeswax products, the Crowders have built their home and bought more land. Even with their success, they readily admit that beekeeping is a humble though good life that requires a certain kind of person. Crowder says the requirements of being a beekeeper are enjoying the outdoors, tolerating stings, and willingness to stay close to home, especially in the summer. "Beekeeping is not a way to make a lot of money, but it is a way to have a very good life," he declares.

Robert Gerard is a market gardener in Chaparral, New Mexico, and frequently writes on agricultural topics. He is the author of Gardening the Arid Land, *a technical manual on dryland gardening. It is available from the author for $8.95 postpaid at 441 Paseo Real, Chaparral, New Mexico 88021.*

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