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The Honorable Dale L. Bumpers
Chairman
The Honorable Thad Cochran
Ranking Minority Member
Subcommittee on Agriculture, Rural
Development, and Related Agencies
Committee on Appropriations
United States Senate

The Honorable Richard J. Durbin
Chairman
The Honorable Joe Skeen
Ranking Minority Member
Subcommittee on Agriculture,
Rural Development, Food and Drug
Administration, and Related Agencies
Committee on Appropriations
House of Representatives

As requested by the Senate and House conferees for the U.S. Department of Agriculture's (USDA) fiscal year 1994 appropriations act (P.L. 103-111), we examined (1) the importance of honeybees to the pollination of crops and (2) the relationship between the price support program for honey and the pollination of crops by honeybees. In preparing this correspondence, we updated information contained in a report we issued in 1985.¹

The price support program for honey was enacted as a part of the Agriculture Act of 1949 for the specific purpose of ensuring the continuing presence of adequate pollinators for the nation's crops. The program was to remain in place until crop producers would adequately compensate beekeepers for providing pollination services. From the inception of the program through 1993, beekeepers could obtain nonrecourse loans from USDA on the honey they produced and

¹Federal Price Support for Honey Should Be Phased Out,
(GAO/RCED-85-107, Aug. 19, 1985).

either repay the loans or forfeit to the government the honey used as collateral. The Omnibus Reconciliation Act of 1993 (P.L. 103-66) requires USDA to support the price of honey through the 1998 crop year, but the 1994 Department of Agriculture Appropriations Act requires that the program be carried out at no cost to the government. Beekeepers may continue to take out these loans, but they must repay the principal with interest.

RESULTS IN BRIEF

The pollination of some crops is essential, specifically, seed crops, nuts, fruits, and some vegetables. Honeybees are an important pollinator of these crops, but they are not the exclusive pollinator; wind and other insects also pollinate these crops. Researchers who have attempted to quantify the annual economic benefits attributable to pollination by honeybees have developed widely varying estimates. The latest analysis suggests that these benefits total between \$1.6 billion and \$5.7 billion annually.

Although honeybees help farmers with the pollination of their crops, a federal price support for honey is not necessary for ensuring adequate numbers of bees for pollination. With or without a price support program for honey, crop producers who require the pollination of their crops will acquire such services--either by owning and managing bees or by purchasing pollination services from beekeepers--as long as the cost of obtaining pollination by honeybees is more cost-effective than other forms of pollination. In fact, the honey subsidy may have actually impeded the development of a healthy pollination services market by providing an incentive for beekeepers to concentrate on earning revenue from honey production rather than from pollination.

Because of this incentive, some beekeepers move their honeybee colonies seasonally to be near crops, such as alfalfa and clover for hay production, that provide abundant flowers and the nectar necessary for honey production. Since these crops do not require pollination, the crop producers have no reason to pay for pollination services. Without the influence of the price support program for honey, beekeepers as well as the producers of crops requiring pollination would be more likely to establish a viable pollination services market.

HONEYBEES ARE AN IMPORTANT, BUT NOT
EXCLUSIVE, POLLINATOR OF CROPS

The pollination of some crops, specifically, seed crops, nuts, fruits, and some vegetables, is essential. Although honeybees are an important pollinator of these crops, wind and other insects also contribute. Researchers have published studies estimating the economic value of the pollination of these crops by honeybees; these estimates vary widely and none has been proved to be conclusive.

Pollination Process

An understanding of the pollination process is essential to estimate the incremental value added by honeybees. Pollination, the inconspicuous transfer of pollen from the male part of flowers to the female part, is essential to most seed and fruit production. (For other crops, such as alfalfa or clover for hay production, pollination is not necessary because the crop is harvested before a seed develops.) The flower blooms, and only if it is pollinated does it set a fruit or seed. When a crop has been adequately pollinated, it will have a higher yield--properly shaped fruit or well-filled seedpods.

Pollination occurs by several means, including self-pollination and pollination by the wind. For some plants, pollination takes place before the flower opens; the pollen is released within the bud directly onto the female part of the flower. Examples of self-pollinating plants are barley, wheat, oats, tobacco, potatoes, flax, rice, peas, beans, soybeans, and tomatoes. Other plants require an external force, or pollinating agent, to transfer the pollen. There are a number of pollinating agents, the most significant of which is wind. Many plant species can be pollinated by wind, and the most successfully wind-pollinated plants are those that have a great deal of light pollen that can be carried through the air easily. Wind-pollinated plants include most forest and landscape trees, corn and rye, and many grasses and weeds.

Insects are generally needed for the successful pollination of plants that have less pollen or pollen that is sticky and heavy and not easily blown from flower to flower or moved between the parts of one flower. Examples of these plants are nuts, fruits, and some vegetables. Although the wind provides some pollination of these crops, there is a lower probability that the pollen will reach the female parts of the flowers because the flowers have fewer pollen grains.

Insects increase the chances for pollination because they visit the flowers. Many visit for pollen and/or nectar and, by the act of removing it, move the pollen from the male to the female parts of the flowers, and fertilization occurs.

Most insects are known to pollinate some plants. Those known to pollinate commercial crops include ants, aphids, bees (including honeybees), beetles, butterflies, flies, midges, mosquitoes, moths, and wasps. However, these insects may not be naturally present in sufficient numbers in a crop's vicinity or be effective enough in pollinating the crop. In these cases, producers can bring in colonized bees--honeybees and other bees--or provide favorable nesting and foraging areas to increase the number of wild pollinators.

Value of Honeybees to the Pollination Process

A 1983 USDA study² estimated that the incremental value of honeybees' pollination to crops' value was about \$19 billion annually. However, in our 1985 evaluation of this study, we concluded that the methodology used led to a misleading estimate because it included (1) the total value of the crops rather than the value of the increased production attributable to pollination by honeybees and (2) the value of some crops for which producers generally do not use honeybees but rely on the wind and native insects to pollinate. The estimate also included the value of crops pollinated by all species of bees, rather than honeybees alone.

A 1989 study by Cornell University, sponsored by USDA, attempted to improve upon the 1983 study.³ The 1989 study concluded the following:

-- Changes in agricultural crop production in the past two decades have been accompanied by a heightened demand for

²Value of Bee Pollination to U.S. Agriculture, USDA, Agricultural Research Service (Washington, D.C.: 1983).

³Willard S. Robinson, Richard Nowogrodzki, and Roger A. Morse, "The Value of Honey Bees as Pollinators of U.S. Crops," parts I and II, American Bee Journal (June and July 1989). These researchers, in the Department of Entomology at Cornell, prepared their study under a cooperative agreement between Cornell and USDA's Economic Research Service, with funds from the National Honey Board.

honeybees as a pollinator. These changes are continuing, and the demand for honeybees is increasing, especially for pollinating fruits and vegetables.

- For all U.S. agriculture, the marginal increase in value attributable to pollination by honeybees--that is, the value of the increased yield and quality achieved through pollination by honeybees alone--was about \$9.3 billion in 1985. Of this amount, about \$3.2 billion was attributable to pollination services provided by rented honeybees. This value was well over 60 times the combined sum of all fees paid to beekeepers for pollination, estimated at \$40.7 million to \$50.9 million annually.

While the 1989 study used an improved methodology, we still have one significant concern with its approach. For some crops, the study assumed that the entire economic value of the crop depended on the availability of insect pollinators. That is, for these particular crops, the study assumed that the economic value would have been zero without pollination by insects. Such an assumption is not appropriate because other significant pollinators are present.

A 1989 critique of the Cornell study by researchers at the state universities of New York at Buffalo and Brockport raises additional concerns.⁴ The critique suggests that agricultural markets are dynamic. If honeybees were not available for pollination, a variety of price and production adjustments would be triggered, with associated impacts on agricultural incomes and consumer spending. The critique pointed out that the Cornell study instead assumed a static market, with no opportunity for adjustment in prices and product quantities by producers or consumers. The authors of the critique, in a separate 1992 analysis, estimated that the economic benefits associated with honeybee pollination total between \$1.6 billion and \$5.7 billion annually.⁵ All in all, while a number of studies have been undertaken, considerable uncertainty remains about the actual

⁴Lawrence Southwick, Jr., and Edward E. Southwick, "A Comment on Value of Honey Bees as Pollinators of U.S. Crops," American Bee Journal (Dec. 1989).

⁵"Estimating the Economic Value of Honey Bees as Agricultural Pollinators in the United States," Journal of Economic Entomology (June 1992).

incremental economic value of pollination by honeybees in general and managed honeybees in particular.

RELATIONSHIP BETWEEN THE PRICE SUPPORT PROGRAM
AND THE POLLINATION OF CROPS BY HONEYBEES

Beekeepers can earn revenue from maintaining honeybee colonies in two basic ways: (1) by charging crop producers a fee for using the bees to pollinate crops and (2) by selling honey produced by the bees. Providing a price support for honey increases the revenue beekeepers are likely to receive for producing honey and therefore gives beekeepers an incentive to use their bees in ways that increase honey production even if doing so reduces their income from providing pollination services. As a result, to maximize their income from honey production, some beekeepers move their honeybee colonies seasonally to be near crops, such as alfalfa and clover for hay production, that produce abundant flowers and the nectar necessary for honey production. Because these crops do not require pollination, the producers of these crops have no reason to pay for pollination services.

Evolution and Status of the Price
Support Program for Honey

The price support program for honey, implemented in 1950 as part of the Agricultural Act of 1949 (7 U.S.C. 1425a and 1446h), was designed with the specific purpose of ensuring the continuing presence of adequate pollinators for the nation's crops. The program was to remain in place until crop producers would adequately compensate beekeepers for the pollination services being provided. The legislative history of the 1950 program shows that some Members of Congress believed that beekeepers were normally not paid sufficiently for providing pollination services; that in the broad view, pollination was a far more valuable contribution to America's welfare than honey production; and that low market prices for honey were driving beekeepers out of business, thus threatening the supply of honeybee colonies for pollination. On the other hand, the legislative history also shows that some members expressed concern that the price support for honey would result in too much emphasis on honey production and not enough on pollination services.

From the inception of the program through the mid-1980s, beekeepers obtained nonrecourse loans from USDA and could forfeit their honey to the federal government in full satisfaction of the loans if the market price remained lower

than the loan amount. A sales policy of the Commodity Credit Corporation required USDA to sell the forfeited honey at a price that was 110 percent or more of the loan rate. Since the loan rate had been higher than the market price for several years, the honey could not be sold, and USDA gave most of the honey away through various domestic food assistance programs, such as school lunch and distribution programs for the needy.

Starting in the 1980s, when USDA's costs for the program increased dramatically, the honey program came under criticism. For example, in 1983, the Secretary of Agriculture proposed legislation that, if enacted, would have eliminated the mandatory price support for honey but would have allowed the Secretary, using discretionary authority, to support the price of honey. In our 1985 report, we concluded that the Congress should phase out the program because, among other reasons, (1) it was no longer needed to ensure crops' pollination and (2) it encouraged beekeeping for honey production rather than pollination.

The Food Security Act of 1985 changed the basis on which price support was provided to beekeepers. This legislation, in essence, paid the beekeepers the difference between the world market price and the price support stipulated in the legislation. By the end of 1993, legislation eliminated loan forfeitures as a way to satisfy loan obligations and, in effect, removed USDA from the business of acquiring and distributing honey.

The honey price support legislation, as most recently amended by the Omnibus Reconciliation Act of 1993, requires USDA to carry out a honey price support program through the 1998 crop year. The 1994 Department of Agriculture Appropriations Act, however, prohibits the payment of salaries and expenses for the purpose of making price support payments or accepting honey forfeited as loan collateral. Accordingly, during fiscal year 1994, although producers may continue to take out price support loans, they must repay the full principal and interest.⁶ As for the future, the nature of the price support mechanisms that will

⁶In cases in which a producer attempts to abandon honey rather than repay the loan, USDA will implement the appropriations act by foreclosing on the honey, taking possession, selling it, and proceeding to recover any difference between the value of the honey and the accrued principal, interest, and government costs incurred.

be available to producers beginning in fiscal year 1995 depends upon whether the underlying price support legislation is amended or the current restrictions in the appropriations act are extended.

The Price Support's Effect of Encouraging
Honey Production Instead of the Pollination of Crops

A price support for honey may help ensure a supply of honeybees, but, in doing so, it increases the revenue beekeepers are likely to receive for producing honey and therefore provides beekeepers an incentive to use their bees in ways that increase honey production even if doing so does not maximize their income from providing pollination services. For example, responding to this incentive, some beekeepers move their honeybees to North and South Dakota and Minnesota, where crops with abundant flowers and the nectar needed for honey production are grown. Some of these crops, such as alfalfa and clover for hay production, do not require pollination.

Producers of crops requiring pollination view its cost as one of many expenses, like those for fuel and fertilizer, that they incur. With or without a price support program for honey, producers of these crops will use honeybees to pollinate their crops--either by owning and managing their own bees or by purchasing pollination services from beekeepers--as long as the cost of obtaining pollination by honeybees is lower than the incremental revenue such pollination produces and is more cost-effective than other forms of pollination.

Although 44 years have passed since the honey price support program was implemented, a market for fully valued pollination services has not developed. Beekeepers continue to receive far smaller payments for providing pollination services than the estimated value of the pollination. Even in California, where honey production in recent years has truly become a by-product of pollination services, most commercial beekeepers still rely heavily on income from honey sales and government price support payments.

The 1989 Cornell study recognized that because pollination services were undervalued, honey sales were important to beekeepers' income. It noted that for most beekeepers involved in commercial pollination (about 1,600 to 2,000 of the estimated 212,000 beekeepers in the United States), the costs of maintaining honeybee colonies are greater than the income generated by rental fees for pollination. Without

honey sales, these beekeepers would have made no profits at the rental rates then being charged. The study concluded that an adequate market price for honey was the best way for ensuring the continuing presence of strong honeybee colonies, which help ensure the adequate pollination of crops.

We agree with the Cornell study's observations that under the conditions of the past honey program, commercial beekeepers relied on honey sales and government price support payments. We also agree with the Cornell study that pollination services are undervalued. But we see no evidence from Cornell to indicate that the continuation of a price support program for honey encourages the development of the market for reimbursable pollination services. Rather, we believe that pollination services, like fuel, fertilizer, labor, and other farm inputs, are best provided through a pollination services market.

In the absence of subsidies, under the appropriations act for 1994, beekeepers have greater incentive to locate their bees to increase revenue from pollination services even if this reduces honey production. This could lead beekeepers to increase fees for providing pollination services, where justified, and to develop the market for these services where fees are not being collected. The potential for further development of this pollination services market appears significant in view of the estimated difference between the economic value attributable to pollination by honeybees and the rental fees obtained by beekeepers.

CONCLUSIONS

Although we agree that pollination is essential for crop production and that honeybees play an important role in carrying out this process, we continue to believe that a price support for honey is not needed for ensuring a supply of honeybees for pollination. Eliminating the price support program for honey reduces beekeepers' incentives to focus primarily on honey production and increases beekeepers' incentives to focus on developing the market for pollination services, as envisioned in the governing legislation enacted 44 years ago.

The 1994 congressional decision to eliminate the price support for honey will likely result in some changes in the beekeeping industry with respect to the number of beekeepers and hives, their location, and the relative importance to beekeepers of producing honey and providing pollination

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services. However, to the extent that a need for pollination services exists, a market for these services will develop that recognizes their full value to crop producers.

Beekeepers face a trade-off in deciding where to locate their honeybees--near crops whose nectar would allow the bees to produce the most honey or near crops that would benefit most from bee pollination. By keeping the price of honey higher than it otherwise would be, a reinstatement of the price support for honey would provide beekeepers an incentive to move their honeybee colonies to be near crops that produce abundant flowers and the nectar needed for honey production even though the producers of some of these crops have no reason to pay beekeepers for pollination. Since the incentive was removed for 1994, beekeepers will be more likely to keep their bees near crops that benefit from pollination by honeybees because the producers of these crops will likely be willing to pay for pollination services.

We are sending copies of this correspondence to the appropriate congressional committees and the Secretary of Agriculture. If I can be of further assistance, or if you would like to discuss this program further, please contact me at (202) 512-5138, or Bob Robinson, Associate Director, at (202) 512-9894. Major contributors to this correspondence included Carl Lee Aubrey, Dale A. Wolden, and Olin S. Thummel from our Kansas City Regional Office and Jay R. Cherlow, Senior Economist, from our Resources, Community, and Economic Development Division.



John W. Harman
Director, Food and
Agriculture Issues

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