Building Resilient Beekeeping Systems:
Actionable Insights from Chiapas, Mexico

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Brosi, B.J., Delaplane, K.S., Boots, M., de Roode, J.C. (2017). *Ecological and evolutionary approaches to managing honeybee disease*. Nature Ecology & Evolution 1: 1250–1262.

This article describes, from an ecological perspective, the ways in which industrial beekeeping practices increase the prevalence and severity of honey bee disease outbreaks. Specifically, authors examine the impacts of (1) keeping large honey bee colonies in crowded apiaries, (2) the annual production and long-distance sale of hundreds of thousands of honey bee packages, (3) the limited diversity of food resources available to honey bees in industrial contexts, and (4) the long-distance transport of honey bee colonies to fulfill pollination contracts. They take strong stand against industrial practices, stating, "To our minds, it is indefensible that current beekeeping practices are not only predicted to create more severe outbreaks, but to select for greater virulence." They outline changes in management strategies that could reduce parasite prevalence, and acknowledge that, in order to be achievable, these changes must be made economically and socially beneficial for beekeepers. This resource provides solid scientific backing for something that many beekeepers already implicitly know: that industrial beekeeping is bad for bees.

González Suriano, T.P., Tirado Piña, C., Cahum García, Y. Z.-H., García González, W., Retureta Aponte, A. (2022). *Situación actual de la apicultura en Sayula De Alemán, Veracruz. Revista Biológico Agropecuaria Tuxpan*, Revista Biológica Agropecuaria Tuxpan 10(1): 170–180.

This article discusses the current state of beekeeping in the state of Veracruz, Mexico. Of eleven participants interviewed, 80% are stationary beekeepers and 20% practice migratory beekeeping. The migratory beekeepers move their bees to boost their harvests, not to provide pollination services. The beekeepers report diminished honey harvests in recent years, and attribute this issue to land use change, illegal felling of trees, and the expansion of intensive agriculture. Other challenges include adulterated honey, climate change and agrochemical exposure. The *Varroa* mite is considered an issue, but only 40% of the beekeepers interviewed treat their colonies with miticides. Another 40% treat with natural plant products and 20% do not treat at all. This article provides insight into the extent to which beekeeping in Mexico has industrialized, and reveals that inputs use does occur, but that honey bees in the study region do not yet depend on inputs for their survival. Also of note, the authors propose a number of systems-level strategies to address the challenges beekeepers face. These include: stopping deforestation and planting flowers and trees in areas surrounding apiaries, launching campaigns to protect bees and to promote honey consumption, providing workshops for beekeepers to build their skills, and helping beekeepers navigate new commercialization channels and produce value-added products to increase their income. Articles like this provide a useful glimpse into pieces of the Mexican beekeeping system and elucidate resilience-building strategies that go beyond the bee yard.

Gordon, R., Bresolin-Schott, N., East, I.J. (2014). *Nomadic beekeeper movements create the potential for widespread disease in the honeybee industry*. Australian Veterinary Journal 92(8):283-90.

In this article, researchers use a network analysis to quantify the extent to which commercial beekeeping operations in eastern Australia are connected, as a means to improve disease surveillance and control. Beekeepers operating over 100 hives were asked to identify their apiary locations, and researchers used this information to map colony movement across several states. The resulting network maps provide a clear visual representation of one part of a highly interconnected beekeeping system. As the authors note, this analysis actually underestimates connectivity, since it only accounts for beekeepers managing upwards of 100 hives. It also focuses exclusively on the movement of colonies and does not track the commercial sale of colony 'parts': queen bees, nucs, and packages. Nevertheless, this article provides a rare glimpse into the extent to which bees and beekeepers operating in distant locations are connected to each other. Additionally, the methods this paper presents could serve as a key resource for future projects looking to map beekeeping systems at the local, regional, or national level. Finally, authors reference legislation limiting the interstate movement of colonies in some parts of Australia, highlighting opportunities for inter-sector efforts to reduce the risk of pathogen spread.

McEwen, E., McEwen, J. (2023). *Raising resilient bees: Heritage techniques to mitigate mites, preserve locally adapted genetics, and grow your apiary.* Chelsea Green Publishing, Vermont, USA.

Written by commercial beekeepers based in southern Oregon, this book lays out management strategies for beekeepers looking to raise resilient bees in the United States. Authors Joy and Eric McEwen describe their bee-centered management practices in great detail, and situate these practices within a broader systems analysis, describing the harms of industrialization ("The Return of Agrarianism: Farmer as Beekeeper," page 16) and the need to address bee health at the collective level ("A Network of Informed Apiaries," page 22). Their thoughtful discussion of treatment-free beekeeping (page 143) offers a nuanced analysis of the difficulties that emerge when raising resilient bees in an industrialized context. While this text does describe systems-level issues, its primary focus is in-apiary actions; broader strategies to support systems change are not discussed. Nevertheless, this book serves as a comprehensive resource for beekeepers looking for a practical, nuts-and-bolts "how-to" in the move towards low-inputs beekeeping and locally adapted bees.

Morales Urbina, H.M., Morales, H., Vandame, R., Delfín, Y. (2025). *Global challenges and local beekeeping practices: A case study of the beekeeping group "20 de noviembre" in the municipality of Emiliano Zapata, Chiapas*. Agroecology and Sustainable Food Systems: 1–24.

This study, conducted in Chiapas, Mexico, describes challenges beekeepers face, and the strategies they use to meet those challenges. Morales Urbina et al. describe overlapping, preventative practices that beekeepers employ at multiple levels: inside the hive, inside the apiary, and within the beekeeping group. Written by a beekeeper, with research conducted in collaboration with a beekeeping group, this piece provides unique insight into the value of local knowledge and the need to look to beekeepers to understand strategies that build resilience. Importantly, the beekeeping system described in this paper is a resilient one: although some beekeepers employ alternative treatments to knock down *Varroa* mite loads, honey bees in the study region don't depend on mite treatments in order to survive. Additionally, rather than rely on supplementary feed, most beekeepers shift their harvest practices to make sure their bees have enough honey on their hives to get through times of dearth. These practices have taken root, in part, because the beekeeping group at the heart of this study practices knowledge sharing: beekeepers "use collective harvests and group meetings to share experiences, engage in dialogue about experiments, and express concerns related to beekeeping." This dynamic demonstrates that the points of connection inside a beekeeping system are not just sites of resource competition or pathogen exchange. They can also be opportunities to share knowledge and build strategies that seed resilience.

Nordhaus, H. (2011). *The beekeeper's lament: How one man and half a billion honey bees help feed America*. HarperCollins Publishers, New York, USA.

This book explains how industrial beekeeping came to be in the United States. Author Hannah Nordhaus follows migratory beekeeper John Miller through his annual pollination routes. She captures, in a way few others manage to, the sprawling history of the beekeeping industry, from the invention of modern beekeeping equipment (page 30) to the emergence of the Varroa mite (page 55) and the advent of Colony Collapse disorder. In Chapter four ("Faustian Bargains"), Nordhaus describes the complex relationship between commercial beekeeping and industrial agriculture: many beekeepers rely on income from pollination contracts to keep their businesses afloat, but "the age of mass production has not been kind to bees." Though now somewhat dated, this well-researched resource provides rare look into the United States beekeeping system, its co-evolution and now co-dependence with industrial agriculture.

Requier, F., Leyton, M.S., Morales, C.L. *et al.* (2024). *First large-scale study reveals important losses of managed honey bee and stingless bee colonies in Latin America*. Scientific Reports 14: 10079.

This article reports results from the first systematic large-scale honey bee colony loss survey conducted in Latin America. Data were collected from 2016-2018 and capture the experiences of 1,736 honey bee-keepers and 165 stingless bee-keepers, representing between 1 and 30% of the beekeeping population, depending on the country. On average 30.4% of honey bee colonies were lost per year, with relatively "low" levels of colony loss occurring in countries like Mexico (16.2% of colonies lost annually), and relatively high levels of colony loss in countries like Colombia (47.7% of colonies lost annually). Colony losses were found to increase with operation size. The results from this report are alarming. Whereas 15 years ago honey bees in Latin America were generally healthy, the "fragile equilibrium" maintaining that health seems to have been toppled. The data presented in this article demonstrate that colony loss is now a pressing issue throughout Latin America. While this article does provide a crucial broad-brush picture of colony loss conditions at the national level, these results must be considered alongside more fine-grained, regional work. Beekeeping in Mexico, for instance, is highly heterogenous. In southern Mexico, colony loss occurs only rarely, while in northern Mexico in 2024 beekeepers reported losing up to 100% of their colonies due to pesticide kills. While this large-scale, systematic study may – out of necessity – overgeneralize in some areas, it also demonstrates a clear need for immediate action to rebuild resilience.

SADER - INIFAP. (2022). *Producción para el Bienestar: Manual de Prácticas Agroecológicas para la Estrategia de Acompañamiento Técnico- Miel* Vol 1-5.

This five-volume series of instructional manuals was produced by a Mexican government program titled "Producción para el Bienestar" (Production for Wellbeing) whose stated goal is to support small- and medium-scale producers (defined here as beekeepers who manage fewer than 100 colonies) and to decrease dependence on imported foods and agricultural inputs. These manuals, along with an accompanying training program, were provided to beekeeping technicians throughout Mexico in 2022. While these materials ostensibly promote agroecological practices, their actual focus seems to be "increasing yield and fortifying services related to productivity." The subject areas of the five volumes are as follows: feeding *Apis mellifera*, dividing bee colonies [as a means of increasing colony numbers], harvest and post-harvest management practices, queen replacement, and queen-rearing. While a few of the "agroecological practices" listed at the end of each manual do align with widely recognized agroecological principles, many of them could actually be considered anti-agroecological (e.g., using artificial feeds to boost honey production), or at minimum anti-resilience. The mixed messages that these manuals promote demonstrate two things: (1) there is a need for greater clarity around what agroecological beekeeping is, and (2) absent that clarity, the term "agroecology" can be easily co-opted to promote inputs use and other industrial practices.

SAGARPA. (2010). *Situación actual y perspectiva de la apicultura en México*. Claridades Agropecuaria (199): 3-34.

This report is quite dated, but it does reveal the key objectives that the Mexican Secretariat of Agriculture (formerly known as SAGARPA, now known as SADER) has historically had for beekeepers and for honey production. This text focuses primarily on production, documenting the amount of honey produced nationwide from 2000 to 2010; the production potential of wax, propolis, royal jelly, pollen and other hive products; and honey bee pollination. The report states that in 2008, a total of 590,000 colonies were moved from one location to another. The majority of these colonies were moved by migratory beekeepers looking to increase their honey harvest, but over 135,500 colonies were rented for pollination services. The report also includes a state-by-state breakdown listing principle pollinated crops and number of colonies rented, noting that 90% of migratory colonies stayed within state. Data around commercial and migratory beekeeping in Mexico are difficult to come by; this report is a rare resource with which one can begin to imagine the contours of the Mexican beekeeping system at a national level.

Sánchez-Gómez, J., Vázquez-Alfaro, M., Alaníz-Gutiérrez, L., González-Álvarez, V.H., & Saavedra-Jiménez, L.A.. (2022): *Características y necesidades tecnológicas de los apicultores de la región centro-sur de Jalisco*. Acta universitaria: 32, e3493.

This article discusses beekeeping in Jalisco, which is described as the state in Mexico with the greatest degree of "vertical and horizontal agroindustrial integration." Beekeepers running small (<70 colonies, 36 avg), medium (71-450 colonies, 170 avg), and large (451+ colonies, 1,238 avg) operations were interviewed. In general, the authors note that keeping a larger number of colonies requires a greater investment of time and money, and results in an increased use of technologies and machinery. Challenges are listed for each group, and the authors note that the solution to these challenges is not necessarily more capacity-building. In many cases, beekeepers know what to do but require infrastructure or social support or organizing to achieve their goals. This article speaks not only to the mechanization and scale of beekeeping operations in some parts of Mexico; it also points to the need to for systems-level solutions to address systems-level problems.

Seeley, T. D. (2019). *The lives of bees: the untold story of the honey bee in the wild*. Princeton University Press, Princeton, USA.

In this book, honey bee researcher Tom Seeley examines honey bee life in the wild and argues that approaching honey bee management through an evolutionary lens could support improved colony health. After decades spent studying a population of feral honey bee colonies living in the Arnot Forest in New York, Seeley shares unique insights into the conditions that allow honey bees to thrive. He examines nest space size, orientation, and location, and colony density, among other attributes, and notes that conventional beekeeping practices often distance honey bees from the conditions in which they evolved. His chapter on Darwinian Beekeeping is of particular utility. Here, he examines ways that beekeeping practices could reorient to facilitate or imitate wild honey bee nest conditions. These changes, he argues, would allow honey bees to “make full use of the toolkit of adaptations that they have acquired over the last 30 million years.” Seeley’s Darwinian Beekeeping is an important resource to support alternatives to industrial beekeeping. As beekeepers evaluate the long-term impacts of beekeeping practices and identify practices that help honey bees survive without beekeeper intervention, understanding the evolutionary adaptations that shape honey bee biology is key.

Vandame, R., Palacio, M.A. (2010) *Preserved honey bee health in Latin America: a fragile equilibrium due to low-intensity agriculture and beekeeping*? *Apidologie* 41, 243–255.

Published in 2010, this article describes a particular set of conditions in Latin America which had, until recently, allowed honey bees in to thrive. The authors note that – at time of writing – there were periodic reports of large, localized colony die-offs, attributed to factors such as insecticide application, forage shortages, and the intensification of agriculture. However, up until 2010 there had not been reports of Colony Collapse Disorder, or the massive, generalized die-offs that beekeepers were (and are) experiencing in other parts of the world. The authors identify three possible factors contributing to honey bee health: (1) the prevalence of disease-resistant "survivor stock", (2) an abundance of forage resources due to relatively low proportions of cropland to total land area, and (3) the predominance of small-scale, low-income, and minimally subsidized farms with comparatively low pesticide use. The authors use the term "fragile equilibrium" to describe these conditions, noting that if they are sufficiently disrupted, honey bee health could take a turn. This article provides an important baseline for assessments of honey bee health in Latin America. More recent studies seem to suggest that that "fragile equilibrium" has since been undermined.