
Responding to Deforestation: Productive Conservation, the World Bank, and Beekeeping in Rondonia, Brazil*

J. Christopher Brown

University of California, Los Angeles

Productive conservation, a sustainable development concept for the Amazon, ideally leads to economic development in rural areas with conservation of rain forest ecosystems. This study evaluates the human and environmental dynamics of productive conservation in Rondonia, Brazil, using as a case study beekeeping, which has been promoted by the World Bank-funded Rondonia Natural Resources Development Project. Promoters of beekeeping have given little attention to basic ecological or political economic issues that determine whether the practice contributes to ideals of productive conservation. While beekeeping can generate significant increases in household income, beekeeping co-operatives may become overdependent on donor funds. Once the flow of productive conservation donor funds stops, organizations may fail, making it too difficult for beekeepers to maintain their operations. Beekeeping does not lead directly toward rain forest conservation. Moreover, beekeeping almost exclusively employs introduced Africanized "killer" bees, commercially exploitable in the Amazon only because deforestation has temporarily created suitable habitats for them. Given the human and environmental configuration of beekeeping in Rondonia, the paper suggests ways to direct beekeeping toward accomplishing the goals of productive conservation. **Key Words:** productive conservation, beekeeping, Amazon, Rondonia, World Bank.

Introduction

The Food and Agriculture Organization (FAO) of the United Nations estimates that on average 15 million hectares of the world's tropical forests have been destroyed every year since the 1960s (FAO 1995). Since this deforestation and its negative impacts first attracted international attention in the 1970s, a range of initiatives in tropical forest regions has arisen to stem the problem. Fitting under the rubric of "sustainable development," such initiatives include the establishment of new parks and reserve areas, new environmental regulations and enforcement procedures, and socio-economic-ecological zoning exercises. In principle, all of these contribute to development that, as the Bruntland Report (WCED 1987) states, meets the needs of both present and future generations.

Another approach offered to achieve sustainable development in the Amazon involves attempts to generate income among peasant communities and indigenous groups through the promotion of alternative production strate-

gies to those most associated with deforestation, such as cattle ranching, annual cropping, and logging. This approach is based on the notion that the promotion of specific types of economic activities can reconcile economic development with conservation. Activities like beekeeping, for example, would promote conservation of natural resources and economic development while involving the participation of local people who make rain forest environments their home and depend on them for survival. Hall (1997, 216) calls this "productive conservation," the activities of which may include fish culture, the semidomestication of wild animals, nontimber forest product extraction, and agroforestry. Today, international nongovernmental organizations (NGOs), bilateral and multilateral development banks, and government aid institutions are major financiers of Amazonian productive conservation via disbursement of grants to local grassroots organizations engaged in some form of productive conservation (Hall 1997).¹

There is no shortage of literature claiming that productive conservation activities may

* An earlier version of this paper was presented at a meeting of the Latin American Studies Association, held on September 24–26, 1998 at The Palmer House Hilton Hotel, Chicago, Illinois. The author wishes to acknowledge the Fulbright Foundation, the Inter-American Foundation, the Organization of American States, and the UCLA Latin American Center for financial assistance in completing this research. Thanks also to Judith Carney, Michael Curry, Susanna Hecht, Wendy Jepson, Joseph Nevins, Craig Thorburn, and the anonymous reviewers for their thoughtful suggestions on earlier manuscripts and to Chase Langford for direction in graphics production.

serve to reduce deforestation and serve as models for future development in Amazonia (Smith 1981; Browder 1990; Robinson and Redford 1991; Redford and Padoch 1992; Dale et al. 1994; Smith et al. 1995a; Smith et al. 1995b; Browder 1996; Smith et al. 1996; Hall 1997). However, studies that evaluate the actual effectiveness of productive conservation efforts that have been implemented since the late 1980s in Amazonia are sorely lacking. We know very little about whether the actual human and environmental dynamics of these productive conservation activities, once cast in their proper historical and geographic contexts, are consistent with their stated goals.

This article addresses this research gap by critically assessing productive conservation's prospects of improving rural livelihoods while conserving tropical forests. It accomplishes this through a case study of productive conservation in the state of Rondonia, Brazil. Specifically, the paper examines the promotion of beekeeping among colonist farmers in the municipality of Campo Alto (a pseudonym) within the World Bank-funded Rondonia Natural Resources Management Project, PLANAFLORO. The paper begins with a brief review of Rondonian development to situate historically the promotion of beekeeping within the context of small farm development in the region and the involvement of the World Bank as a major financier of productive conservation. This is followed by an examination of the socioeconomic and ecological characteristics of Rondonian honey production. The study concludes that beekeeping, despite its lauded socioeconomic and environmental virtues, does not necessarily lead to economic development and rain forest conservation. The Rondonian beekeeping experience suggests that promotion of productive conservation via grant disbursements, with money originating from organizations like the World Bank, does little to encourage local cooperatives to address the economic and ecological issues that determine the success of production-based projects. Once project grants end, it will be extremely difficult for local cooperatives to continue providing the essential services of teaching farmers how to keep bees and processing, packaging, and marketing the honey farmers produce. By neglecting relatively simple economic and ecological considerations in the implementation of

projects, productive conservation projects may unwittingly cripple the efforts of small farmer organizations to establish sustainable livelihood options in this tropical rain forest region. Given this problematic situation, the paper offers ways to bring beekeeping more in line with the ideals of productive conservation.

The Emergence of Productive Conservation in Rondonia

Productive conservation policy in Rondonia is an outcome of a series of local, regional, and international events surrounding the unfolding human and environmental problems of development in the region. The plight of local peasant peoples and a rapidly disappearing rain forest environment in Rondonia spurred local and international NGOs to mount a campaign to hold the World Bank responsible for the negative consequences of its development policy and that of other multilateral development banks.² The World Bank and Brazilian government responded to this criticism by formulating new, "greener" development plans for Rondonia. Productive conservation was intended to become a major component of efforts to give local people more control over development, to raise rural income, and to conserve Rondonia's remaining tropical forest.

Like most other areas in the Amazon Basin, the 243,000 km² region that comprises the present-day state of Rondonia (Fig. 1) was sparsely populated by indigenous groups and rubber tappers engaged in subsistence agriculture and extraction. This was the case until drastic human and environmental changes began to overtake the region during the early 1960s. At that time, the Brazilian military, attempting to integrate Rondonia and the rest of the Amazon into the national economy, constructed highway BR-364 along an old telegraph line between Cuiabá, Mato Grosso, and Porto Velho. For the first time, there was an overland route connecting Rondonia to the markets and population centers of Brazil's densely populated South.

Beginning in the 1960s, the Brazilian government designated the then federal territory of Rondonia as one of several development poles in the Amazon. As a result, the region received millions of dollars of government investment, including support for agricultural



Figure 1 *Location of the state of Rondonia, Brazil.*

colonization. During this time, peasant livelihood options in Brazil's southern regions were shrinking due to agricultural mechanization and increased concentration of land ownership. Once a rudimentary infrastructure was established in Rondonia, the region's vast tracts of "uninhabited" land and the promise of federal project money for settlement and economic development acted as powerful magnets, drawing an unprecedented wave of migrants to the new frontier (Millikan 1988; Hecht and Cockburn 1990).

Agricultural settlement projects in Rondonia, designed to provide for the social and economic needs of colonist farmers, began to appear along the margins of the BR-364 in the early 1970s. Charged with developing infrastructure and providing services to migrants, Brazil's National Colonization and Agrarian Reform Agency (INCRA) fell woefully behind schedule in meeting the colonists' demand for land, roads, and other services (World Bank 1981). This lack of services and assistance, combined with numerous agronomic constraints inherent in tropical environments and soils, high incidence of malaria, and low prices for farm produce, contributed to the difficulty of establishing viable small farms on the frontier. Still, migrants continued to pour into the

region. In the midst of land speculation, most colonists sold their lots. Many colonists then pressed further into the forest, invading indigenous lands that were poorly protected by the efforts of Brazil's National Indian Foundation, FUNAI (Cultural Survival Inc. 1981).

In the early 1980s, the World Bank and the Brazilian government conceived a project named the Northwest Brazil Integrated Development Program (POLONOROESTE), to bring order to the settlement and economic development of Rondonia and parts of neighboring Mato Grosso. The U.S.\$1.6 billion plan had as its centerpiece the paving of the BR-364 between Cuiabá and Porto Velho, which accounted for 50% of the entire project budget. In addition to infrastructure development, POLONOROESTE sought to support environmental conservation, protection of indigenous peoples, and small farm development. The strategy was to create indigenous and environmental reserve areas that were off limits to settlement, in conjunction with the implementation of programs that would encourage colonist farmers to remain on their original lots. Thus, some project funds were allocated for the demarcation and enforcement of reserve areas, along with support for credit and technical services for small farmers. Support for smallholder tree crop cultivation (cacao, coffee, and rubber) was an important component of this strategy. These crops were to afford increased ground cover, thus conserving soil fertility and moisture. Moreover, they commanded a better price than most other farm products (World Bank 1981).

Despite POLONOROESTE's social and environmental safeguards, the dire situation in Rondonia only worsened. The state's population exploded, due to a massive influx of migrants arriving along the newly paved highway BR-364. At the onset of POLONOROESTE, the population of the state was approximately 491,000 (Lisboa 1989). By 1996, according to the 1996 census, 1.2 million lived there (IBGE 1996). In addition, most farmers never obtained credit to plant the new tree crops, and falling prices on world markets for the crops led even those who did plant them to pursue other land uses. Thus, the amount of land used for cattle ranching and annual cropping continued to expand. FUNAI experienced delays in demarcating and protecting vast areas of in-

digenous lands, allowing further intrusions by colonists, loggers, and miners (Coy 1986; FAO-CP 1987; BRA/87/037 1989).

Researchers using satellite remote sensing produced evidence of rapid deforestation, proof of POLONOROESTE's failure to stabilize the situation in Rondonia. Until 1980, even after more than ten years of development, only 3.12% of the state's total area had been deforested. In the next five years, however, this grew to 11.37% (Fearnside 1989). As of 1997, 22.8% of Rondonia's forests had been destroyed (Millikan 1998; Fig. 2).

In the early 1980s, North American NGOs launched an international effort to hold the World Bank accountable for the social and environmental ills of its loan practices. Citing the disaster of POLONOROESTE as a major case against the Bank, NGOs initiated a public information campaign to educate people about the Bank's use of taxpayer money to finance projects that resulted in environmental and social harm (Schwartzman 1986). Moreover, a letter-writing campaign involving NGOs from Europe and South Brazil—especially from Rondonia—pleaded the case that the Brazilian government had routinely violated the social and environmental safeguards of the POLONOROESTE loan agreements. The campaign demanded the halt of loan disbursements until Brazil could demonstrate compliance with these provisions.

Further pressure on both the World Bank and the government in Brazil came from an NGO lobbying effort on Capitol Hill. This led to no less than twelve investigative hearings during the mid- to late 1980s by various U.S. congressional oversight committees, including Environment and Natural Resources, Banking, Foreign Appropriations, and Foreign Affairs (Brown 1992). These hearings concluded that POLONOROESTE and other multilateral development bank projects were contributing directly to serious human and environmental problems around the world, and influential members of Congress demanded that the banks change their policies accordingly. Yielding to mounting public and political pressure, in 1987 then-World Bank President Barber Conable announced sweeping environmental reforms in the Bank and its operations. These included the creation of sixty new positions in the Bank's environmental staff, the production of environmental issue papers as part of the Bank's

efforts to review and address environmental problems, the provision of financial support for environmental programs to reduce or offset deforestation, and the incorporation of NGOs into Bank-supported operations (Rich 1990).

The World Bank responded to the POLONOROESTE experience with a new loan for Rondonia, incorporating many of the NGOs' human and environmental concerns. The Rondonia Natural Resources Management Project, PLANAFLORO, involved U.S.\$228.9 million, U.S.\$167 million of which was financed by the World Bank. It embraced a philosophy very similar to that of POLONOROESTE with respect to forest conservation (Table 1). Reserve areas were to be demarcated and protected, and migration-prone colonists would be disciplined to remain on their current lots through the adoption of alternative production systems such as agroforestry. The project also included measures to ensure the formal participation of local communities and Rondonian NGOs in project planning, monitoring, and evaluation. Loan disbursements began in 1993.

Within a year of PLANAFLORO's inception, the newly organized front of Rondonian NGOs called for its suspension, citing numerous irregularities in its implementation, particularly a lack of NGO control over project implementation. Indeed, according to the 1995 request submitted by the NGOs for a formal review by the Bank's Inspection Panel, few PLANAFLORO benchmarks were achieved during the first year (Millikan 1995). After months of review, the World Bank chose to deny the NGOs' request. However, negotiations between the Rondonian state government and NGO representatives in 1996 yielded an agreement to reformulate the project and to redirect the remaining U.S.\$110.4 million in project funds (Millikan 1997). Most significantly for productive conservation, the reformulated project allocated U.S.\$22 million for special subprojects called PAICs (Community Initiative Support Projects), to be financed entirely with World Bank funds. This initiative was in line with a decentralization trend in development funding already established in PLANAFLORO and elsewhere in Brazil. Under this new program, community groups could apply for grants of up to U.S.\$150,000 to organize and implement their own development projects to better their communities.³

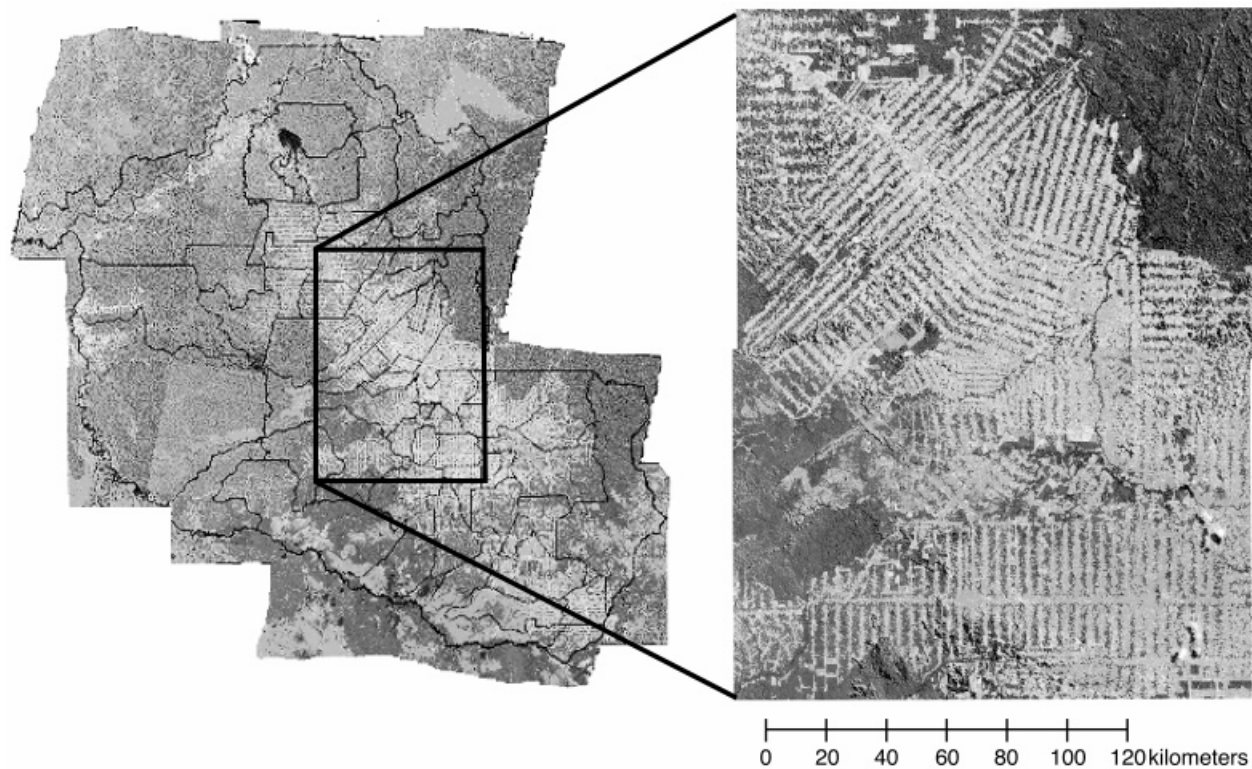


Figure 2 1995 LANDSAT TM images of the state of Rondonia. Left is a composite image of the entire state. Right is a close-up of the central region of the state, emphasizing the cross-hatched pattern of deforestation so typical of agricultural colonization in the Brazilian Amazon. Dark areas are tropical forest. Lighter areas are deforested. Large, light blotches are areas of savanna.

Table 1 PLANAFLORO budget

Project Component	Cost (U.S.\$Millions)
Promotion of improved natural resource management, better protection of indigenous, rubber tapper, and environmental reserves, socioeconomic and ecological macrozoning	64.8
Development of smallholder agroforestry through research and rural credit	81.4
Socioeconomic and service infrastructure development	71.5
Administration, monitoring, evaluation, and technical assistance	11.2

Source: Millikan (1997).

The PAICs were an attempt to increase the participation of local people in their own development. The projects aimed to raise rural living standards and to contribute to the conservation of rainforest resources, both main components of productive conservation (Hall 1997). Funds were granted only to associations of colonist farmers, *ribeirinhos* (floodplain dwellers), indigenous peoples, and rubber tappers. Eligible PAIC projects included small-scale infrastructure development, environmental protection, environmental education, sustainable natural resource management and biodiversity conservation, and promotion of alternative production strategies. Eligible organizations submitted proposals to PLANAFLORO officials beginning in 1996. Project money was to be disbursed and used within just one year, but this deadline was later extended through 1998.

Beekeeping and Productive Conservation Funding

Beekeeping is a production system that complements the ideals of productive conservation and the social-environmental terms of production-related PAIC projects. A large promotional literature supports beekeeping as an ideal small farm development strategy, touting the following characteristics: Beekeeping requires relatively few labor and capital inputs, and it does not interfere with already existing farm practices. Honey production takes advantage of otherwise unused nectar, pollen, and bee resources while contributing toward the pollination of both natural vegetation and agricultural crops, thus improving yields and helping to conserve natural environments. Bee-

keeping is an activity around which producer cooperatives can easily form. And finally, honey is a product that does not spoil if properly harvested and processed, and it already has well-established local, regional, and international markets (Drescher and Crane 1982; Gentry 1982; Merrill Sands 1984).

Beekeeping first gained popularity in Rondonia in the late 1980s when state agriculture programs started to promote it as an income-generating activity for colonist farmers. Groups of farmers engaging in the new practice formed honey cooperatives as a way to facilitate exchange of technical information, purchase inputs in bulk, and expedite honey sales. PAIC funds thus allowed both extant and would-be cooperatives to capitalize on the popular view of beekeeping as an environmentally beneficial and economically sound small-farm activity. Meeting the criteria of representing the interests of their respective communities, honey cooperatives were virtually assured funding from PAIC funds to initiate or expand activities.

While modest by international development program standards, World Bank-funded community initiative programs represented an unprecedented amount of money flowing directly to Rondonian peasant groups to support community initiatives. In 1995, PIC (Community Initiative Project) funds were supplied to 58 projects, for a total disbursement of U.S.\$2.65 million. Of these, 16 projects had beekeeping components, worth U.S.\$689,000 (PLANAFLORO 1996). PAIC disbursements totaled U.S.\$7.3 million in 1996–1997, and among 117 projects funded in this time period, 22 included a beekeeping component, for a total of U.S.\$1.1 million (PLANAFLORO 1998a, 1998b).⁴ Moreover, beekeeping projects attract funds from sources outside the PLANAFLORO initiatives. Several international donors have supported or are interested in supporting beekeeping initiatives in Rondonia, and since there is little coordination between donor groups, some farmer groups may receive double funding for their projects.⁵

Socioeconomic and Environmental Characteristics of Rondonian Beekeeping: The Case of Campo Alto

The Campo Alto Beekeepers' Cooperative has worked under significant productive conserva-

tion grant support—U.S.\$350,000 over the last ten years—to disseminate beekeeping in the municipality, using the exotic Africanized honeybee (*Apis mellifera scutellata*).⁶ The most recent and sizeable grants to the cooperative have come from PLANAFLORO's community initiative programs, in addition to funds from the G-7. Both economic and ecological factors are considered below to evaluate the contribution of beekeeping toward the goals of productive conservation.

Economics

Africanized beekeeping can generate significant increases in rural income, satisfying a major development objective within productive conservation programs. The author interviewed all twenty-two beekeepers in the Campo Alto cooperative in 1996, and determined that mean honey yield/year/beekeeper between 1990 and 1996 was 171.71 kilos. The mean price producers obtained from the cooperative between 1992 and 1996 was U.S.\$3.28/kilo, a generous price by national Brazilian standards.⁷ Thus, the average Campo Alto beekeeper has a gross annual income of U.S.\$563.21 from honey sales.

The precise contribution of beekeeping to household income is difficult to determine, since it is unclear what household income is in Campo Alto. A promotional pamphlet for one agroforestry and beekeeping project in Rondonia reports, without explanation, that beekeeping doubles income (Browder 1996). A consulting report on producer income for the municipality of Ouro Preto do Oeste, a municipality for which PLANAFLORO collected baseline socioeconomic data, reports an average gross farm income of U.S.\$6,674.47 (MC&A—Consultoria e Assistência Empresarial 1993).⁸ Assuming an average farmer can keep bees without altering existing on- or off-farm activities, beekeeping represents 8.4% of the reported gross income of colonist farmers.

Given the disparity in these estimates, it may be more meaningful to discuss what farmers say about the impact of beekeeping income on their lives. Nearly all beekeepers in Campo Alto reported that beekeeping provided important cash supplements. The higher producers were able to purchase light machinery (for example, chain saws, a generator, water pumps), pay for bus trips to visit family in the South of

Brazil, or settle debts accumulated during the year at grocery and hardware stores, as well as pharmacies in the city. A few beekeepers used income from honey sales to make home improvements such as installation of running water, indoor showers, and toilets.

Beekeeping's return to labor is quite high in comparison to other common activities. The average labor required to work the average number of colonies is seventeen person-days/year—a daily return of U.S.\$33.13/person-day.⁹ This is over six times the daily wage for farm labor, and nearly six times the daily urban minimum wage. The return to labor also compares quite favorably with annual cropping, as shown in Figure 3. Even if the calculation for honey is off by an order of magnitude, honey production is potentially a lucrative way to use one's labor in comparison to these annual crops.¹⁰ The cost of inputs, determined from a review of past meeting minutes of the Campo Alto Cooperative and of beekeeping project funding proposals, is approximately U.S.\$700 for 10 bee hives, 4 kilos of wax foundation, a smoker, two bee suits (protective overalls), two veils, and two pair of gloves. Members are supposed to repay this cost over a period of one to three years in cash or in honey as part of a rotating fund program.¹¹

The apparent improvement in living standards from honey sales, however, depends on the financial viability of the cooperative. Most beekeepers remarked that their continued commercial activity would be hindered if the Campo Alto Cooperative no longer existed. This is because the cooperative provides for all

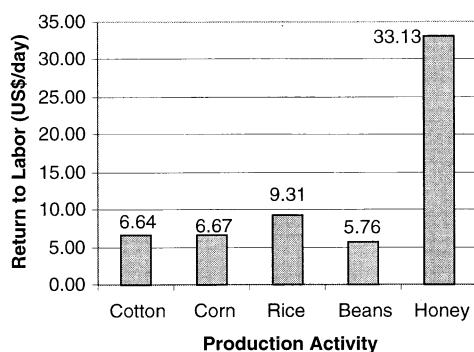


Figure 3 Return to labor comparison between honey and some annual crops.

necessary equipment, honey processing, packaging, and sales. Unfortunately for the beekeepers, the cooperative is currently not supporting itself sufficiently with profits from honey sales. It is dependent on the continual diversion of funds from successive productive conservation projects to maintain basic operations. The cooperative requires \$1,000/month to pay basic operational expenses, which include rent, salaries, office supplies, telephone, and utilities. After paying producers for their honey and costs for packaging, the cooperative takes in only \$734 each month, on average, to pay its expenses. However, the cooperative actually spends a monthly average of U.S.\$2,935. The use of diverted productive conservation grant money pays for the budget deficit and numerous expenses that have little to do with honey production itself.

The logic of productive conservation is that profits from the production system give people a reason for engaging in a particular practice. These profits are reinvested into the system, thus making the production system and cooperatives economically and socially robust (Hall 1997). However, regions like Rondonia where productive conservation programs exist are historically cash-poor, and peasants in these regions often engage in patron-client relationships to satisfy basic livelihood needs. The Campo Alto Cooperative's leadership takes advantage of its access to grant money to command a line of patronage involving the cooperative's membership and other political constituents as clients. Payments for meals in the city, medical bills, personal "loans," and unnecessary use of the cooperative's vehicle are all costs incurred by the cooperative, requiring the diversion of grant project money from its intended purpose. While these payments may help rural people, they are not directed at the production system, which supposedly drives productive conservation. In 1998, leadership infighting over this misuse of project funds caused a few important producers to leave the cooperative entirely, lowering honey production and profits and threatening the political stability of the organization.

Ecology

In addition to the precarious economic situation of the cooperative, beekeeping in a humid tropical zone like Rondonia is ecologically

problematic with respect to its promotion as an activity that contributes to conservation. Beekeeping funding proposals submitted by the Campo Alto cooperative and others in Rondonia embrace a narrative that describes beekeepers as allies of forests and bees with the following logic: The pollination services provided by bees maintain ecological balance in natural ecosystems. Thus, by association, beekeeping is a production system that benefits the environmental integrity of rain forest ecosystems.

What is known about the ecology of Africanized bees and beekeeping, however, contradicts this logic. In fact, Africanized beekeeping in humid tropical regions like Campo Alto would never have been possible in the first place without the very deforestation that productive conservation projects are supposed to halt. Despite their high adaptability, Africanized bees originated from savanna environments in East Africa and do not survive well in humid tropical environments where the forested ecosystem is intact (Taylor 1999). In such an environment, nectar sources are very dilute, making it extremely difficult for honeybees to collect and store surplus nectar (Nogueira-Neto 1972; Espina Pérez 1983; Condé 1989). Like all *A. mellifera*, Africanized bees adapt well to edge areas where both forest vegetation and open vegetation formations are available. Flowers blooming in open areas are important for the bees in one season, and in another they are able to find adequate forage in the tops of forest trees (Espina Pérez 1983).

The Rondonia that agricultural colonists have shaped contains patchy edge environments ideal for Africanized bees. Each colony of Africanized bees in the Campo Alto region is able to gather resources from a number of different forest and nonforest environments, most importantly large areas of abandoned land in some stage of ecological succession. Especially in the early stages, abandoned lands become the home of sun-drenched, weedy flowers with concentrated nectar, and these plants are the ones that provide most of the nectar Africanized bees use for the production of honey. Researchers point to one weed in particular as the major source of nectar for bees in Rondonia: *assa-peixe*, scientific name *Vernonia polyanthes* (Asteraceae), a variety of ironweed that rapidly invades areas of recently abandoned cattle pasture or agricultural plots (Condé 1989). Its

bloom brings on the main honey harvest in Rondonia during the dry season months of July and August (Condé, Coelho, Rezende, and de Melo 1990). A major pollen source for bees is *Cecropia* spp., trees that grow quickly over large areas once the forest canopy is removed (Marquez-Souza et al. 1993). Condé (1989, 7) firmly states the importance of disturbed habitats and open vegetation formations for honey production in the state: "Areas of savanna, fallow, and weedy pastures are the most favorable landscapes for the production of nectar and pollen in the region, in contrast with the dense, moist, and heterogeneous forest of the Amazon, which does not support commercial raising of *Apis* . . ." (author's translation).¹²

This leads to the question of whether the weedy character of much of the Rondonian beekeeping landscape is a temporary or fairly permanent situation, a key concern with respect to the activity's ecological sustainability. Interviews with farmers suggest that this situation is merely temporary. Newly opened areas of colonization tend to have more *assa-peixe* than more established areas. As colonization areas age, people tend to intensify production on pasture and cropland, ridding the area of weeds. Further evidence for this comes from Smith et al. (1995b), who note a general trend towards improved pasture management in the Amazon involving the introduction of new weed-resistant pasture grasses like *braquiário* or *brizantão* (*Brachiaria* spp.). Beekeepers in Rondonia lament this trend, pointing out examples in the field where dozens of hectares of neighboring lots, once covered entirely by *Vernonia* spp., are today a monoculture of hearty *Brachiaria* spp.

Conclusions and Recommendations

The Campo Alto case study supports the following conclusions. Productive conservation activities may contribute to significant increases in colonist farmer income, with little labor or capital investment on the part of farmers—linked with cooperatives—satisfying a major goal of productive conservation. However, much of the money cooperatives pay to producers for their produce may not result from profits, but from subsidies in the form of continual influxes of productive conservation grant money. Thus, it is likely that when these

grant programs end, so too will the cooperatives and the commercial activities associated with them. As long as it is possible to receive additional grant money under the pretext of productive conservation, cooperatives will continue to operate as institutions delivering patronage as their main function. Organizations that have the power to address these contradictions, such as the World Bank and intermediary NGOs, seem unwilling to address the possibility that peasants and their cooperatives engage in productive conservation programs simply to gain access to capital, not necessarily to conserve or produce anything. Failure to discuss this openly with project beneficiaries only perpetuates an illusion that social and ecological progress is being achieved. In the end, well-intentioned productive conservation could unwittingly harm the long-term organizational efforts of colonist farmers.

If grant disbursements are so problematic, what should be the main vehicle to promote productive conservation? If the World Bank and other productive conservation financiers expect these production systems to survive in an increasingly competitive free market, they are obliged to encourage financial responsibility among project beneficiaries. Financiers should consider providing flexible no- or low-interest loans, instead of grants, to community projects with production-related components. Repaying loans should not overburden farmer organizations if they are engaging in truly economically and ecologically viable production systems. There exist numerous government and nongovernmental organizations that can help farmer cooperatives become sound enterprises. Development institutions should encourage a dialogue between cooperatives and these organizations.

The ecological basis of honey production in Rondonia calls into question the current rationale for the activity as an approach to rain forest conservation. One wonders whether other productive conservation practices are currently promoted with similarly flawed logic. The contribution of an activity to conservation must be examined case by case with already existing information or with original research. Then the system must be managed in a way that maximizes this contribution. Africanized bees currently benefit from disturbed areas, but this does not mean that beekeeping programs con-

tribute to deforestation, that beekeeping depends on it in the future, or that funding for beekeeping must stop. Colonized Rondonia is a disturbed landscape, and the bees are part of that. However, farmers could manage the beekeeping landscape to change the weedy character of their honey production system. For example, cooperatives could organize the cultivation of high-quality nectar-producing plants to make Africanized beekeeping less dependent on weedy flowers.¹³ In short, Africanized beekeeping should be promoted as a conservation strategy not for some essential, "natural" characteristic, but for the ways in which it can raise incomes without the need to deforest new land.

Proper management could even bring beekeeping in line with the flawed logic that has promoted it so far. The unquestioned environmental benefits ascribed to Africanized bees attract attention away from the rich native bee population of the region. For thousands of years, indigenous peoples have used stingless bees for honey and wax production. There are hundreds of species in the Amazon alone, and proven techniques exist for the sustainable management of dozens of species (Nogueira-Neto 1997).¹⁴ If beekeeping programs involved these species in some way, they would hold greater promise of attaining the goal of dual conservation and use of forest resources.

In some ways, the contradictions of productive conservation suggested in this case study should not be surprising. Arguably, knowledge, technology, and production systems develop within particular human and environmental geographic contexts. Thus, models of sustainable development, even those based on indigenous technical knowledge or seemingly unproblematic practices like beekeeping, cannot be applied universally without appreciation of local and regional geography (Chapin 1988; Kloppenburg 1991; Bebbington 1996). Moreover, recent work in ecology and political ecology cautions against equilibrium-based models of nature, stressing the dynamic biogeographic and ecological processes that shape the outcomes of development-with-conservation strategies (Pimm 1984; Zimmerer 1994; Worster 1995; Zimmerer and Young 1998).

Yet productive conservation in Rondonia has taken for granted the ecology of beekeeping as a system in equilibrium, which in turn leads to a view of beekeepers as passive beneficiaries of

nature's products, not shapers of the very ecology on which honey production depends. That the very basics of the economics and ecology of honey production in the Amazon among peasant farmers have not been questioned until now suggests the power of the conceptual to mask material processes (Mitchell 1996; Purcell 1998; Sluyter 1999). Thus, future research could focus more specifically on where and how did the concept of beekeeping-as-productive-conservation develop and whose interests are served by ignoring the material processes highlighted in this paper.

There is a strong push among governmental and nongovernmental development agencies to provide funds for the promotion of productive conservation in Amazonia. Productive conservation is based on the assumption that the alternative activities themselves—be they fish farming, agroforestry, or Brazil nut collecting—stem deforestation and provide for peasant livelihoods. This article has endeavored to show that these activities in and of themselves may have little connection to these ideals. It is imperative that we view such activities as we do any other production system. If we do so, we are more likely to concern ourselves with how their character changes over time depending on numerous related human and environmental factors. The viability of productive conservation depends entirely on efforts to manage political economic and ecological factors to assure that their relationship bodes well in the long term for both people and the environment. ■

Notes

¹ Development banks do not actually grant money directly to grassroots organizations. However, their loans to federal governments may then be used to grant money to grassroots organizations, and the banks may be involved in the formulation of such grant programs. That was the situation in Rondonia, as explained below.

² These NGOs included international environmental and human rights groups as well as local rural workers' unions, indigenous peoples, and rubber tapper organizations. See Brown (1992) for a complete listing.

³ Though the PAICs were given much fanfare as a significant departure from development practice, the fact is that much smaller subprojects early on in the PLANAFLORO years (PIs [Innovation Projects] and PICs [Community Initiative Projects]) and small farm development projects in Northeast Brazil (PAPPs [Small-Scale Farm Support

Projects)) disbursed money directly to community organizations to carry out a number of different projects related to community health, education, environmental conservation, and alternative production strategies, including those associated with productive conservation.

⁴ Data from PAIC project money disbursed in 1998 was not available.

⁵ Donors that have promoted beekeeping in Rondonia or that have shown interest in promoting future beekeeping include the WWF, the G-7, the Canadian Embassy, and the Ford Foundation, just to name a few.

⁶ After the New World introduction of Africanized bees in 1957 in Rio Claro, São Paulo (Kerr 1967), wild populations began to disperse on their own, reaching Rondonia and the rest of the southern Amazon in the early 1970s (Taylor 1985). By the 1830s, Jesuit missionaries had introduced European races of *A. mellifera* to southeastern Brazil. Later introductions by German colonists in Rio Grande do Sul, Santa Catarina, and Paraná followed in the 1840s (Nogueira-Neto 1972, 17–21). Introductions to the northern regions of Brazil occurred in the 1870s. By the mid-1950s, it appears, European bees were widespread in most regions of Brazil except for Amazonia. Researchers reported in 1967 that few if any colonies of *A. mellifera* existed in the entire state of Amazonas (Kerr et al. 1967), though they had been introduced there at some unknown point.

⁷ The Brazilian Beekeeper's Federation reports average per kilo producer prices in Brazil of U.S.\$1.60 wholesale/U.S.\$4.50 retail (Wiese 1998).

⁸ This report lists income figures for "mini" and "small" producers without adequately defining these terms, or adequately demonstrating how data was collected and how income figures were calculated. For the purposes of this study, the figure for "mini" was used.

⁹ Two funding proposals for beekeeping in Campo Alto viewed by the author presented different figures. One quoted a typical labor input of 30 person-days/year (15 colonies); the other quoted a labor input of 25 person-days (10 colonies). Unfortunately, there is no information in these documents as to how these inputs were calculated. From interview data, the average labor required to work the average number of colonies (8 colonies) is 14 person-days, or 1.75 person-days/colony. Splitting the difference between the higher labor input from the proposals (2.5) and the value from interview data (1.75), we are left with 17 person-days.

¹⁰ The data for these calculations come from detailed production cost estimates provided by officials from the government-operated rural extension office in Campo Alto (EMATER) and refer to production as of January 1996.

¹¹ In reality, however, the cooperative keeps no records as to receipt or repayment of equipment. Repayment cost is worth less than two years' honey production.

¹² Original text: "*As áreas de cerrados, capoeiras e pastagens sujas, mostraram-se mais propícias [sic] à produção de néctar e pólen na região, em contraste com a floresta densa, úmida e heterogênea da Amazônia, que não sustenta a criação racional de abelhas Apis . . .*"

¹³ It is unrealistic to cultivate plants only for their use as bee forage. Ideally, these plants would also produce wood, fruit, or other materials for farmers. Lists of the common and scientific names of nectar-producing plants in Rondonia are available (Condé 1989; Condé, Rezende, Coelho, and Melo 1990; Marquez-Souza et al. 1993). Alternatively, farmers could manage fallow land to encourage the growth of naturally occurring nectar-producing plants, as in the case of Bora Agroforesters in Peru (Denevan and Padoch 1988).

¹⁴ The species most important for honey production, *Melipona* spp., require the cavities of live trees for nesting in the wild. In disturbed areas like colonized Rondonia, managing stingless bees would do much to preserve native biodiversity while benefiting people directly from the effort. Stingless bee honey, which is very different than *Apis* honey, has important use- and high exchange-value. It is less viscous and more acidic, and local people use it as an effective antibiotic. In Rondonia, stingless bee honey is worth at least twice the market value of *Apis* honey. Most stingless bee management does not require smokers or protective clothing, minimizing production costs. However, stingless beekeeping does present its own challenges to producers and cooperatives with respect to management, honey processing, and sales.

Literature Cited

- Bebbington, Anthony. 1996. Movements, modernizations, and markets: Indigenous organizations and agrarian strategies in Ecuador. In *Liberation ecologies: Environment, development, social movements*, ed. R. Peet and M. Watts. New York: Routledge.
- BRA/87/037. 1989. Cooperação Técnica na Implementação do Programa Integrado de Desenvolvimento POLONOROESTE. O Problema da Ecologia Regional no Desenvolvimento Rural e Florestal dos Estados de Mato Grosso e Rondônia. Documento de Trabalho No. 5. Brasília, SUDEO, MINTER, FAO, PNUD.
- Browder, John O. 1990. Extractive reserves will not save tropics. *Bioscience* 40 (9):626.
- . 1996. *Planting seeds of change in the ashes of the rainforest: The Rondonia Agroforestry Pilot Project*. Blacksburg, VA: Virginia Polytechnic Institute and State University, College of Architecture and Urban Studies.
- Brown, J. Christopher. 1992. Development in Rondônia, Brazil 1980–1990: POLONOROESTE, Nongovernmental Organizations (NGOs) and the World Bank. Master's thesis, University of Kansas, Lawrence.

- Chapin, Mac. 1988. The seduction of models: Chianampa agriculture in Mexico. *Grassroots Development* 12:8–17.
- Condé, Paulo Amato Afonso. 1989. *Levantamento preliminar da flora apícola dos municípios de Ji-Paraná e Porto Velho, Rondônia*. Porto Velho: Secretaria de Estado de Indústria, Comércio, Ciência e Tecnologia.
- Condé, Paulo Amato Afonso, Hugo de Alencar Coelho, Ubiratan Rezende, and Otoniel H. de Melo. 1990. Fluxo de néctar e pólen em onze colônias de *Apis mellifera* no município de Ji-Paraná, Rondônia. *Ciência e Cultura* 42 (11):978–83.
- Coy, M. 1986. Realidade atropela os planos de POLONOROESTE. *Pau Brasil* (11, Ano II):67–73.
- Cultural Survival Inc. 1981. *In the path of POLONOROESTE: Endangered peoples of Western Brazil*. Cambridge, MA: Cultural Survival Inc.
- Dale, Virginia H., Robert V. O'Neill, Frank Southworth, and Marcos Pedlowski. 1994. Modeling effects of land management in the Brazilian Amazonian settlement of Rondonia. *Conservation Biology* 8 (1):196–206.
- Denevan, William M., and Christine Padoch. 1988. Swidden-fallow agroforestry in the Peruvian Amazon. *Advances in Economic Botany* 5:1–107.
- Drescher, W., and Eva Crane. 1982. *Technical cooperation activities: Beekeeping. A directory and guide*. Eschborn, Germany: Deutsche Gesellschaft für Technische Zusammenarbeit (GRZ) GmbH.
- Espina Pérez, Darío. 1983. *Apicultura Tropical*. Cartago, Costa Rica: Editorial Tecnológica de Costa Rica.
- FAO-CP. 1987. Brazil: Northwest I, II, and III technical review: final report. Rome: Food and Agriculture Organization Cooperative Program.
- Fearnside, Philip Martin. 1989. A Ocupação Humana de Rondônia: Impactos, Limites, e Planejamento. Programa do Trópico Úmido POLONOROESTE Relatório de Pesquisa. Brasília, CNPq.
- Food and Agriculture Organization (FAO). 1995. *Forest Resources Assessment 1990: Global Synthesis*. Rome: FAO.
- Gentry, Curtis. 1982. *Small scale beekeeping*. Washington, DC: Peace Corps.
- Hall, Anthony. 1997. *Sustaining Amazonia: Grassroots action for productive conservation*. Manchester, UK: Manchester University Press.
- Hecht, Susanna B., and Alexander Cockburn. 1990. *Fate of the forest: Developers, destroyers, and defenders of the Amazon*. New York: HarperCollins.
- Instituto Brasileiro de Geografia e Estatística (IBGE). *IBGE Sistema de Recuperação Automática—SIDRA 97—Contagem da População 1996*. Accessed on the web July 13, 1999: <http://www.sidra.ibge.gov.br/>.
- Kerr, Warwick E. 1967. The history of the introduction of African bees to Brazil. *South African Bee Journal* 39:3–5.
- Kerr, Warwick E., S. F. Sakagami, R. Zucchi, V. de Portugal-Araújo, and João M. F. Camargo. 1967. Observações sobre a arquitetura dos ninhos e comportamento de algumas espécies de abelhas sem ferrão das vizinhanças de Manaus, Amazonas (Hymenoptera, Apoidea). *Atas do Simpósio sobre a Biota Amazônica* 5 (Zool.):255–309.
- Kloppenburger, Jack. 1991. Social theory and the de/reconstruction of agricultural science: Local knowledge for an alternative agriculture. *Rural Sociology* 56 (4):519–48.
- Lisboa, Pedro. 1989. *Rondônia: Colonização e Floresta. Programa do Trópico Úmido*. POLONOROESTE Relatório de Pesquisa No. 9. Brasília: CNPq, AED.
- Marquez-Souza, Antônio C., Maria Lucia Absy, Paulo Amato Afonso Condé, and Hugo de Alencar Coelho. 1993. Dados da obtenção do pólen por operárias de *Apis mellifera* no município de Ji-Paraná (RO), Brasil. *Acta Amazonica* 23 (1):59–76.
- MC&A—Consultoria e Assistência Empresarial. 1993. *Marco Zero Ouro Preto D'Oeste*, volume I e II. Porto Velho, Rondonia: PLANAFLORO.
- Merrill Sands, Deborah. 1984. The mixed subsistence-commercial production system in the peasant economy of Yucatan, Mexico: An anthropological study in commercial beekeeping. Ph.D. diss., Cornell University.
- Millikan, Brent H. 1988. The dialectics of devastation: Tropical deforestation, land degradation, and society in Rondonia, Brazil. Master's thesis, University of California—Berkeley.
- . 1995. *Pedido de investigação apresentado ao Painel de Inspeção do Banco Mundial sobre PLANAFLORO*. Porto Velho: Fórum das ONGs e Movimentos Sociais Que Atuam em Rondônia & Friends of the Earth.
- . 1997. *Análise Crítica da Implementação do Plano Agropecuário e Florestal de Rondônia um Ano Após o Acordo para sua Reformulação*. São Paulo e Porto Velho: Amigos da Terra Internacional—Programa Amazônia, Oxfam—Associação Recife-Oxford para a Cooperação ao Desenvolvimento.
- . 1998. Zoneamento Sócio-Econômico-Ecológico no Estado de Rondônia: Análise de um Instrumento de Ordenamento Territorial na Fronteira Amazônica. Porto Velho: Projeto BRA/94/007 (PNUD/PLANAFLORO).
- Mitchell, Don. 1996. *The lie of the land: Migrant workers and the California landscape*. Minneapolis: University of Minnesota Press.
- Nogueira-Neto, Paulo. 1972. Notas sobre a história da apicultura brasileira. In *Manual de Apicultura*, ed. J. M. F. Camargo. São Paulo: Editora Agronômica Ceres Ltda.
- . 1997. Vida e criação de abelhas indígenas sem ferrão. São Paulo: Editora Nogueirapris.
- Pimm, Stuart L. 1984. The complexity and stability of ecosystems. *Nature* 307 (26):321–26.

- PLANAFLORO. 1996. Quadro demonstrativo de metas e beneficiários de Projetos de Iniciativa Comunitária conveniados em 1996. Porto Velho: PLANAFLORO.
- . 1998a. *Relatório No. 01 de acompanhamento da execução orçamentária/financeira dos Programas de Apoio às Iniciativas Comunitárias—PAIC's—1997*. Porto Velho: PLANAFLORO.
- . 1998b. *Relatório No. 03 de acompanhamento da execução orçamentária/financeira dos Programas de Apoio às Iniciativas Comunitárias—PAIC's—1996*. Porto Velho: PLANAFLORO.
- Purcell, Mark H. 1998. Power in Los Angeles. Ph.D. diss., University of California, Los Angeles.
- Redford, Kent H., and Christine Padoch, eds. 1992. *Conservation of neotropical forests: Working from traditional resource use*. New York: Columbia University Press.
- Rich, Bruce. 1990. The emperor's new clothes: The World Bank and environmental reform. *World Policy Journal* 7 (2):305–29.
- Robinson, John G., and Kent H. Redford, eds. 1991. *Neotropical wildlife use and conservation*. Chicago: University of Chicago Press.
- Schwartzman, Stephen. 1986. Bankrolling disasters: A citizens' environmental guide to the World Bank and the Regional Multilateral Development Banks. San Francisco: Sierra Club.
- Sluyter, Andrew. 1999. The making of the myth in postcolonial development: Material-conceptual landscape transformation in sixteenth-century Veracruz. *Annals of the Association of American Geographers* 89 (3):377–401.
- Smith, Nigel J. H. 1981. Colonization lessons from a tropical forest. *Science* 214:755–61.
- Smith, Nigel J. H., Italo C. Falesi, Paulo T. Alvim, and Emanuel Adilson Serrão. 1996. Agroforestry trajectories among smallholders in the Brazilian Amazon: Innovation and resiliency in pioneer and older settled areas. *Ecological Economics* 18 (1):15–27.
- Smith, Nigel J. H., T. J. Fik, Paulo T. Alvim, and Italo C. Falesi. 1995a. Agroforestry developments and potential in the Brazilian Amazon. *Land Degradation and Rehabilitation* 6 (4):251–63.
- Smith, Nigel J. H., Emanuel Adilson S. Serrão, Paulo T. Alvim, and Italo C. Falesi. 1995b. *Amazonia: Resiliency and dynamism of the land and its people*. Tokyo: United Nations University Press.
- Taylor, Orley R. 1985. African bees: Potential impact in the United States. *Bulletin of the ESA* Winter:14–24.
- . 1999. E-mail communication with author, June 3.
- Wiese, Helmuth. *Brazilian honey prices 1998*. Accessed on the web May 22, 1999: <http://beekeeping.com/countries/brazil.htm>.
- World Bank. 1981. *Brazil: Integrated development of the northwest frontier*. Washington, DC: Latin American and Caribbean Regional Office, World Bank.
- World Commission on Environment and Development (WCED). 1987. *Our common future*. Oxford: Oxford University Press.
- Worster, Donald. 1995. The ecology of order and chaos. *Environmental History Review* 14 (1/2):1–18.
- Zimmerer, Karl S. 1994. Human geography and the “new ecology”: The prospect and promise of integration. *Annals of the Association of American Geographers* 84 (1):108–25.
- Zimmerer, Karl S., and Kenneth R. Young, eds. 1998. *Nature's geography: New lessons for conservation in developing countries*. Madison: University of Wisconsin Press.

J. CHRISTOPHER BROWN is a Lecturer in Geography at the University of California, Los Angeles. His research interests include the political and ecological dynamics of rural development and conservation, biogeography, development institutions and policy, NGOs, human-environment relations, and Latin America.