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## **Evaluating Strategies for Honey Value Chains in Brazil using a Value Chain Structure-Conduct-Performance (SCP) Framework**

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### **Abstract**

Development organizations have used value chain analysis in defining interventions for the honey business in major exporting countries like Brazil. Yet, the impact of interventions has been unclear. This paper aims at evaluating strategies of three honey value chain streams in Brazil, selected for a multiple case study between the years 2007–2011. Using the value chain Structure-Conduct-Performance (SCP) framework, likely successful strategies are identified by comparing stream performances. Next, the outcomes of this comparison are validated through questionnaires with experts. Understanding current stream strategies and local structural conditions, and fostering well-aligned strategies are found to be key for successful donor interventions.

**Keywords:** economic development; supply chains; interventions; beekeeping.

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## Introduction

Bees are important pollination agents for many commercial crops. In addition, economic sectors like processed food, food services, and pharmaceuticals use apiculture products as input. Recently, this intertwined relation became more explicit in Europe and the United States with the puzzle of disappearing bees (Tapparo et al. 2012; Henry et al. 2012). More fundamental problems in apiculture, however, are commonly found in countries that are major producers and exporters of honey: weak market linkages, low pricing transparency, inadequate labor skills, limited access to credit, and inability to perform quality requirement tests (Bradbear 2009).

In order to address these problems, several development agencies have employed the value chain perspective in defining their interventions (Anand and Sisay 2011; Reji 2013). However, often the outcomes of these interventions are not clear in terms of their contributions to competitiveness improvement and poverty reduction. This is because many interventions miss connections among their strategies and expected outcomes, fail to realize limitations in the environment in which they take place, or use evaluation periods shorter than the time required for the results to materialize (Brusky and Monteiro 2008; Horton et al. 2010; Demont and Rizzotto 2012; Fernandez-Stark and Bamber 2012). Additionally, intervention evaluations do not usually rely on causal relations, on a mix of qualitative and quantitative approaches, and on the inclusion of comparative case studies (Ton 2012), and are frequently not well documented (Kidoido and Child 2014). Impact evaluation is also compromised by the introduction of new policies and changes in the management of the government organizations that undertake the intervention, or by the absence of a sound monitoring system for the program (Cuny Garloch 2012).

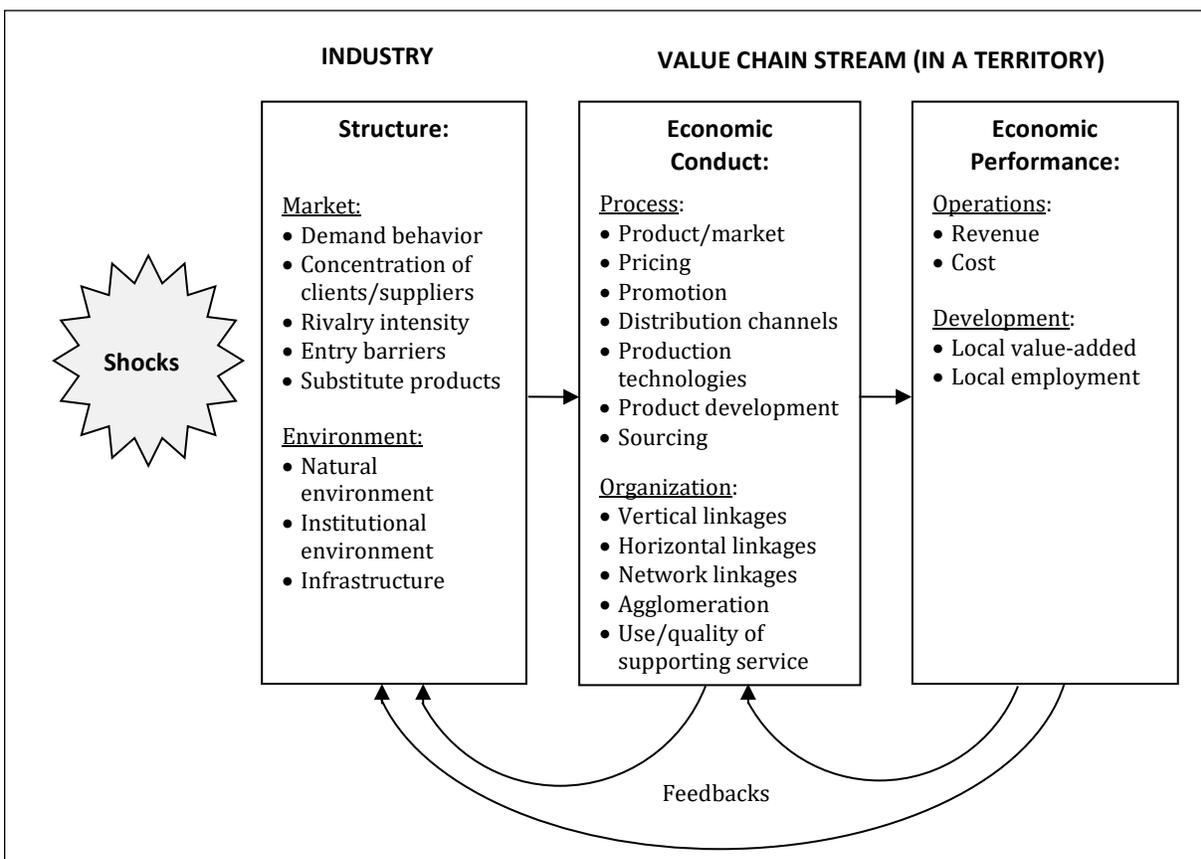
The shortcomings of the evaluation of interventions also apply to the honey value chain interventions carried out in the northeast of Brazil. There, national, state governments and non-governmental organizations (NGOs) have been investing in the honey value chain, so far with unclear outcomes. Those interventions are usually made on a segment of the honey value chain located in specific territories. Herein, a segment of a value chain located in a territory is defined as a value chain stream. Against this background, the main objective of this paper is to identify likely successful strategies employed by three honey value chain streams in Brazil, including the ones supported by interventions. The three cases investigated – Limoeiro do Norte, Picos, and Santana do Cariri – all received support from government and NGOs. The methodology employed in this paper to identify successful stream strategies addresses the aforementioned shortcomings of the evaluation of value chain interventions.

The remainder of this paper is organized as follows. Section 2 describes the methodology: the choice of the strategy framework to identify and evaluate value chain strategies, the selection of the value chain stream cases, the selection of the framework indicators for inter-case comparison, and the evaluation process. The evaluation of the streams' strategies itself is conducted using the value chain Structure-Conduct-Performance (SCP) framework in Section 3, and the discussion of the results and policy conclusions follow in Section 4.

## Methodology

### Strategy Identification and Evaluation Framework

This paper used the value chain SCP framework (Figueiredo Junior et al. 2014) developed specifically to devise and evaluate strategies (conducts) for value chains through an integrated assessment of structure, conduct, and performance. This value chain SCP framework extends the dynamic SCP framework (Bain 1951; Bresnahan 1989; Scherer and Ross 1990; Lee 2007), used more recently by managers to conceive strategies for firms (Copeland et al. 2000; Stuckey 2008). This framework not only recognizes direct interactions but also feedbacks among structure, conduct and performance, and accounts for the occurrence of shocks, i.e. significant events that can alter the way those interactions take place. The value chain stream is the unit of analysis, and the categories of the framework are groups of related indicators describing a relevant dimension of structure, conduct and performance. For structure, there are categories related to market forces, and categories related to the enabling environment. For conduct, there are categories related to business process decisions, and categories related to organizational decisions. And for performance, there are categories related to the operations of a stream, and categories related to the contribution of that stream to local development. The performance categories related to the stream operations can be associated to the competitiveness of the stream, while the performance categories related to development can be associated to poverty alleviation (Figure 1).



**Figure 1.** Value chain SCP framework and its categories

**Source.** Figueiredo Junior et al. (2014).

The value chain SCP nests the Five-forces framework (Porter 1980, 1990), and is compatible with the resource-based view of firms (Barney 2001). The value chain SCP framework also takes into account the concepts of governance and value distribution from global value chain (GVC) theory (Gereffi and Korzeniewicz 1994; Humphrey and Schmitz 2002) in its conduct categories. Moreover, the framework incorporates, from Global Production Network (GPN) theory (Coe et al. 2008; Coe and Hess 2011), the concept of territorial embeddedness in its unit of analysis and in its structural categories, and the notion of competing geographies in its unit of analysis. By doing so, the value chain SCP framework combines the strengths (Parrilli et al. 2013) of two leading approaches, GVC and GPN, towards local and regional development. With its economic development perspective, the framework departs from the Supply Chain Management (SCM) literature, concentrated on performance of a local firm's supply chain (Lambert and Cooper 2000; Drost et al. 2008), but maintains SCM's orientation to performance.

### *Case Selection*

A multiple case study was conducted with competing streams of the honey value chain in Brazil with different business characteristics: two in Ceará State—one in and around the municipality of Limoeiro do Norte and the other in and around the municipality of Santana do Cariri – and one in Piauí State—in and around the municipality of Picos. Those three municipalities accounted for 3.3% of the Brazilian production and ranked in the top five among the more than 3,800 honey producing municipalities in the entire country in 2011 (IBGE 2012). The country itself was among the top ten world honey exporters in 2011 (FAO 2013). Each case is a value chain stream in a territory, consisting of a set of firms vertically and horizontally linked, with their own group of products, technology levels, supporting market services and other conduct characteristics, under a given business environment. The selected value chain streams also experienced distinct degrees of donor interventions. The reason to pick different streams of the same value chain is to allow for retrospective inter-case comparison (Yin 2009). Picking the streams in the same country reduces the complexity of the analysis as the number of relevant structural indicators goes down, and makes the data collection less costly.

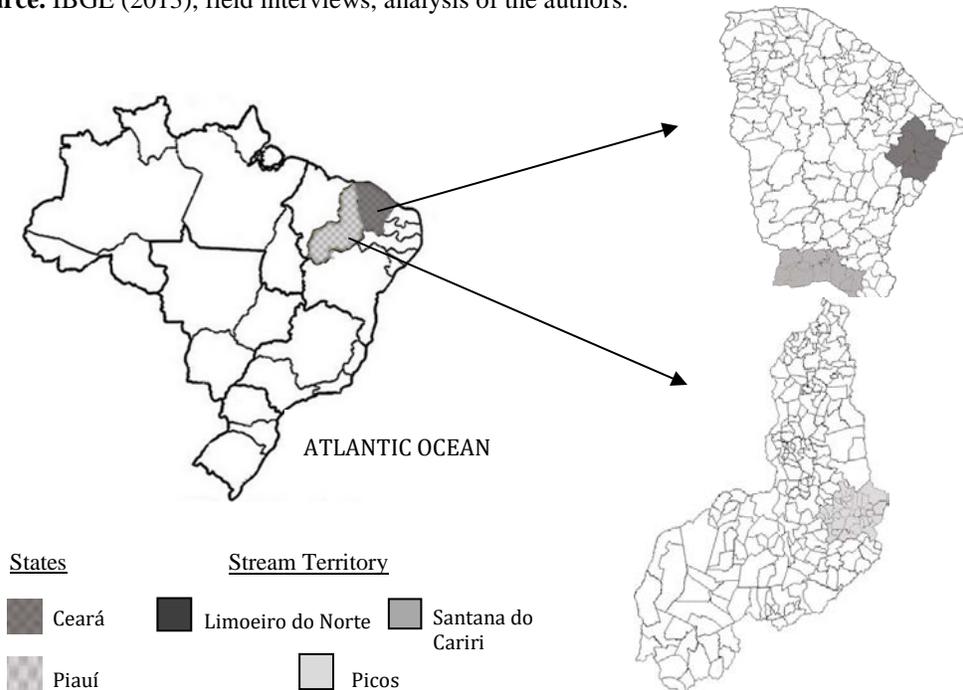
Both primary and secondary sources were used according to the type of data required. Production by municipality was extracted from Brazilian official government registries. This information was used to support the identification and selection of the streams of the honey value chain. Information about the chains was also obtained through interviews with 45 stream stakeholders such as beekeepers, processors, traders and supporting services providers (Appendix, Table A1). The interviews took place between November 2012 and October 2013 in the locations of the streams and were undertaken using a semi-structured general interview schedule with mostly closed questions and some open questions. This schedule, by the stream, aimed at obtaining quantitative and qualitative information about the participants of each step of the value chain stream, about the interventions the stream went through, and about the value chain stream SCP categories and their indicators. Each interview focused on parts of the schedule which were more familiar to the interviewee and lasted between thirty minutes and two hours. Sometimes, the interviews were followed up by phone calls or e-mail exchanges, depending on the need for further clarification on the information initially provided by each interviewee. Data were gathered for the period from 2007 to 2011. Five years is considered to be a sufficiently long period to capture the effects of interactions within the value chain SCP framework.

In this research, the borders of the territory where the stream activities take place were defined by the administrative borders of the group of municipalities (Table 1) housing the participants of the stream. The selection of the municipalities to compose continuous stream territories (Figure 2) started from the main honey producing municipality. Next, its immediate neighbors in the same state were included. Furthermore, municipalities within the range covered by local service providers, as identified by the interviewees, were added to the territory. The final configuration of the stream territory was validated by stream representatives. The three resulting streams accounted for 11.2% of Brazilian honey production (IBGE 2012) and 10.2% of honey volume exports in 2011 (MDIC 2013).

**Table 1.** Geographical composition of value chain streams

Value Chain Stream	Geographical Composition
<b>Limoeiro do Norte</b>	- 7 municipalities, 8,214 km <sup>2</sup> , 261,037 inhabitants (2010): Alto Santo, Limoeiro do Norte, Morada Nova, Quixeré, Russas, São João do Jaguaribe, Tabuleiro do Norte
<b>Picos</b>	- 34 municipalities, 15.784 km <sup>2</sup> , 294.017 inhabitants (2010): Alagoinha do Piauí, Alegrete do Piauí, Aroeira do Itaim, Belém do Piauí, Bocaina, Caldeirão Grande, Campo Grande do Piauí, D. Expedito Lopes, Francisco Macedo, Francisco Santos, Fronteiras, Geminiano, Itainópolis, Jaicós, Marcolândia, Massapê, Monsenhor Hipólito, Padre Marcos, Paquetá, Patos, Picos, Pio IX, Santa Cruz do Piauí, Santana do Piauí, Santo Antônio de Lisboa, São João da Canabrava, São José do Piauí, São Julião, São Luís do Piauí, Simões, Sussuapara, Vera Mendes, Vila Nova do Piauí, Wall Ferraz
<b>Santana do Cariri</b>	- 14 municipalities, 9,352 km <sup>2</sup> , 640,306 inhabitants (2010): Altaneira, Araripe, Assaré, Barbalha, Campos Sales, Crato, Farias Brito, Jardim, Juazeiro do Norte, Missão Velha, Nova Olinda, Potengi, Salitre, Santana do Cariri

Source. IBGE (2013), field interviews, analysis of the authors.



**Figure 2.** Location of the value chain streams in Brazil

Source. IBGE (2013), field interviews, analysis of the authors.

Several government and donor interventions took place during 2007 and 2011 in the selected streams and are described next, based on the information obtained during the interviews. Very often, those interventions did not rely on a comprehensive development plan for the chain in the region, but just addressed demands of producers. One of the few initiatives that addressed several aspects of the honey business and took a longer range view was the APIS Project carried out by the Brazilian Micro and Small Business Support Service (SEBRAE) between 2003 and 2008 in many regions of Brazil, included the regions around Limoeiro do Norte, Santana do Cariri and Picos. Its goal was to develop a sustainable apiculture in the Brazilian territory, through the diffusion of technical and managerial assistance to smallholders (Souza 2006).

In Limoeiro do Norte, with the end of the more widespread technical and managerial assistance by the regional development agents of the APIS Project in 2008, only a small group of producers in one village kept receiving some assistance by SEBRAE. From the state government, one intervention was reported between 2007 and 2011: training of groups of producers on beekeeping management, honey house operations and association of farmers, offered by the Secretariat of Agrarian Development of Ceará State (SDA).

In Santana do Cariri, the number of interventions is abundant from 2007 to 2011. The stream was also served by SEBRAE's APIS Project until 2007. In the beginning of that year, the stream was granted by the Ceará State Government and the Ministry of National Integration a new honey processing unit in the municipality of Barbalha, and five new honey houses in other municipalities of the region of the stream. The farmers were expected to extract honey in the houses and process it in the new unit, but that unit never worked. Out of the five honey houses, none has the Hazard Analysis and Critical Control Points (HACCP) certification, and one was not finished. From 2008 on, SDA, with resources from The Food and Agriculture Organization (FAO), Ministry of National Integration (MNI), Banco do Brasil (Bank of Brazil) Foundation (BBF) and its own, undertook scattered initiatives to small groups of farmers consisting of distribution of queens, and training on beekeeping, honey house operations, and association of farmers. SDA also funded the construction of another honey house with money from the World Bank whose construction has been paralyzed for three years. A very local initiative with a group of 75 small producers in five rural agrarian reform communities was under way by BBF from 2007 to 2011 as a sustainable development action (social program). BBF mobilized partners for technical (from the Rural Extension and Technical Assistance Ceará State Company – EMATERCE) and managerial (from SEBRAE) assistance, and provided financing through regular rural credit lines of the local bank branch.

In Picos, government and donor interventions were even stronger in terms of the total amount of subsidies provided. MNI, SEBRAE, BBF, Unisol (a workers' national cooperative), Unitrabalho (network of universities and unions), and ICCO (a Dutch NGO) contributed to the construction, in 2007, of Casa Apis, a processing and fractioning unit in the form of a central producers' cooperative (joint venture of 8 regional honey cooperatives in Piauí State). During this period and with money from those supporters, standard HACCP accredited honey houses were built in the region of the stream to supply Casa Apis. Starting in 2008 and still going on are donations of Casa Apis by SEBRAE and BBF to fund the full salary of regional sustainable development agents and extension officers (inspired in the previous APIS Project). Casa Apis is currently an important player in the Brazilian and in the export market. The national (through the

government-owned São Francisco Valley Development Company – CODEVASF) and the Piauí State government (through its Rural Development Secretariat) also implemented programs that involved the donation of hives and training of new producers. In addition, CODEVASF funded a brand new honey technology development center (CENTAPI) that was built in 2009, and not used so far.

### *Selection of Indicators for Stream Comparison*

Starting from a suggestion of generic indicators by category (Figueiredo Junior et al. 2014) of the value chain SCP framework, specific indicators were chosen for each category according to: a) relevance; b) measurability; c) mutual exclusivity; and, d) data availability. Normalization of indicators in terms of growth, percentages of total or per unit values was sometimes required to allow for appropriate inter-stream comparison. Categories for which data on indicators were not available, like cost, were left out. The problems found by Bradbear (2009) in honey value chains were used to point out the relevance of indicators associated to the value chain SCP categories. For instance, in the case of structure categories, labor characteristics are considered in the institutional environment. In the case of conduct categories, commercial and physical market linkages are considered in distribution channels, quality certification is considered in production technologies, and access to credit is considered in use of supporting services. In general, the main strategic alternatives faced by the value chain streams during the period, per conduct category, were translated into conduct indicators. At least one indicator per conduct category was initially identified to ensure that all value chain SCP conduct categories were represented from the outset.

In total, eighteen indicators were initially selected for structure, twenty-six for conduct, and four for performance. A list of the selected SCP indicators is presented in Appendix, Table A2. For structure and conduct categories, both quantitative (for instance, coverage of technical assistance) and qualitative indicators (for instance, technical assistance type) were obtained from the interviews with the chain representatives and from secondary data. For performance, apart from possible conflicting goals, the interpretation of the results is straightforward for each of its quantitative indicators: that is, higher reflects a better performance. Conflicting goals in terms of increased competitiveness and poverty alleviation may be evidenced, for instance, when attempting to increase local value-added by processing commodity honey in the stream territory leads to lower export growth.

### *Evaluation of Strategies*

After the quantitative and qualitative indicators were chosen and assessed, the value chain streams were ranked according to each performance indicator. A list of strategies that were most likely to have influenced the relative performance of each stream was initially prepared, based on literature and deductive reasoning in line with the SCP framework. Variations among stream strategies were exploited to explain performance. Strategies that were somewhat similar for each stream were not expected to contribute to performance differences, and thus, were discarded as important.

Next, the importance of each remaining strategy and the effects of those strategies on each stream were further evaluated through a structured questionnaire with two local experts per stream, six in total. The experts consisted of honey business consultants and large honey processor associates, who actually experienced the discussed facts. The experts were asked to rank the strategies, according to the impact of each strategy on the performance indicator(s) the stream excels. The questionnaires were applied between October and November, 2013. Finally, the top three strategies for each performance indicator were determined by averaging the ranks of the two experts in each stream. Thus, the robustness of the qualitative explanation of each stream performance by its strategies, using the SCP framework, is quantitatively assessed by the experts.

## Results

### *Structure*

The majority of the structure indicators was similar for the three value chain streams, either because they depict world market and environment conditions, or because they depict conditions of similar regions of Brazil where the streams are located. Out of the eighteen structure indicators initially selected, ten were assumed to influence the relative performance of the streams, either directly (as in the case of the favorable conditions shown by the natural environment indicators) or by strengthening the effects of stream strategies (as in the case of the demand behavior indicators that favor the streams that choose to export). A summary of the more influential honey business market and environmental structure indicators is presented in Table 2, and the figures for the remaining, less influential structure indicators are presented in Appendix, Table A3.

During the 2007-2011 period, some events (shocks) with the potential to significantly alter the structure of the honey industry, as defined by the value chain SCP framework, are identified. More generally, the financial crisis in the US and the EU that started in 2008 may have affected relationships among some exporting firms and traders but, overall, both international honey prices and consumed volumes kept going up. Other events in the supply side counterbalanced the economic slowdown, such as the CCD in Europe and US, and the gradual displacement of traditional bee forage cultures by cattle farms in Argentina (D. Chiachiarini, personal communication, November 14, 2012). More specific to Brazil, the embargo to Brazilian honey by the EU from 2006 to 2008 represented an opportunity for competitors in the EU at the time that it forced Brazil to redirect its exports to the US. The 2011 EU ban on honey ruling out genetically-modified organisms (Court of Justice of the European Union 2011) from general sale was another relevant event, but its effect may be mostly felt by producers from 2012 on. As a result of industry dynamics, worldwide average honey import prices rose by 8.7% per year between 2007 and 2011, which is mainly attributed to a poor harvest in the US, EU and Argentina (USAID 2012). Alongside, the average price of honey exported from Brazil went up 17.8% per year (MDIC 2013) in the period 2007–2011.

**Table 2.** Relevant structure indicator figures for the selected value chain streams

Category	Indicator	Value Chain Stream		
		Limoeiro do Norte	Santana do Cariri	Picos
Demand behavior	World honey consumption growth 2007-2011 (% year) <sup>1</sup>	2.7% (with growing organic and fair trade segments)		
	National honey apparent consumption growth 2007-2011 (% year) <sup>1</sup>		(3.2%)	
Concentration of clients	World market share of top 4 honey import countries (% of volume, 2007 and 2010) <sup>1</sup>		64%, 56%	
Entry barriers	Capital and knowledge intensity <sup>2</sup>	Relatively low in production		
Local natural environment	Average temperature (°C) <sup>1</sup>		25-29	
	Normal rainfall (mm/year) <sup>1</sup>		721-973	
Institutional environment	Subsidies* <sup>2</sup>	Limited	Limited	Very strong to small producers
	Business chamber/board/federation <sup>2</sup>	Existence of honey chamber and beekeeping federation at state and national levels		
	Labor <sup>2</sup>	Increasing cost of labor at national level, limited highly skilled labor at local level		
	Quality requirements <sup>2</sup>	Stricter quality requirements at both national and international levels		

**Source.** (1) CBI (2011), FAO (2013), IBGE (2012, 2013), INMET (1992), IPECE (2012), MDIC (2013); (2) field interviews.

\* Indicator taxes and subsidies divided to account for realized stream differences

### *Stream Conduct*

Some of the strategies followed by the value chain streams can be read from the interventions undertaken by government and donors, and more rarely by explicit declarations of leading firms. However, most of the strategies are not known beforehand, they have to be deciphered through registering and comparing conduct indicators. In that sense, from the twenty-six conduct indicators initially selected, fourteen were selected for further analysis. These fourteen indicators presented in Table 3 were selected because they differed between chains and, thus, were assumed to be important for explaining performance differences between streams. The importance of these conduct indicators was confirmed by the outcomes of the questionnaires with experts. A description of these indicators enriched with qualitative information provided during the interviews with the value chain stream stakeholders is next. Less influential conduct indicators are reported in Appendix, Table A4.

**Table 3.** Relevant conduct indicator figures of the selected value chain streams

Category	Indicator	Value Chain Stream					
		Limoeiro do Norte		Santana do Cariri		Picos	
		2007	2011	2007	2011	2007	2011
Product/ market	Honey direct exports (% of production) <sup>1</sup>	8%	41%	150%	127%	11%	27%
	Honey certified organics (% of production) <sup>2</sup>	0%	22%	89%	75%	7%	14%
	Honey certified fair trade (% of production) <sup>2</sup>	0%	0%	0%	0%	0%	16%
	Monofloral honey (% of production) <sup>2</sup>	0%	0%	45%	37%	0%	0%
Production technologies	Number of honey house units/HACCP units and per 100 beekeepers <sup>*.2</sup>	13/0 (2.6/0)	43/2 (4.0/0.2)	14/0 (3.0/0)	29/3 (4.4/0.5)	20/17 (2.6/2.2)	22/19 (1.2/1.0)
Vertical linkages	Honey production by vertically or quasi-vertically integrated processors (% of production) <sup>2,3</sup>	5%	16%	Insignificant		7%	22%
	Honey production sold to local processors (% of production) <sup>2,3</sup>	10%	42%	95%	85%	19%	31%
Horizontal linkages	Resources sharing at production step <sup>2</sup>	Associations for sharing equipment, labor and facilities for honey extraction		Associations for sharing equipment, labor and facilities for honey extraction		Strong cooperatives for sharing equipment labor and facilities for honey extraction & sale	
Network linkages	Participation in Chamber/Board/Federation <sup>2</sup>	Almost no participation in apiculture State Federation or Chamber		Irregular participation in apiculture State Federation or Chamber		Active participation in apiculture State Federation or Chamber	
Quality of supporting services	Technical assistance type <sup>2</sup>	Specialized	Specialized	Not Specialized		Specialized	
	Technical assistance practice <sup>2</sup>	No free distribution of hives		No free distribution of hives		Free distribution of hives	
Use of supporting services	Technical assistance coverage (% beekeepers) <sup>2</sup>	63%	6%	NA	43%	59%	30%
	Managerial assistance coverage (% beekeepers) <sup>2</sup>	63%	22%	54%	12%	59%	30%
	Credit coverage (% beekeepers) <sup>**.2</sup>	9%	5%	10%	11%	21%	25%

**Source.** (1) FAO (2013), IBGE (2006, 2013), MDIC (2013); (2) field interviews; (3) estimated by authors.

\* Standard capacity around 1,400 kg/day

\*\* Two government-owned banks, Banco do Nordeste and Banco do Brasil, represented 100% of apiculture credit contracts

NA: Not available

In terms of product/market choices, the streams present many differences. In Limoeiro do Norte, despite the enormous growth, less than half of the production was directly exported. In Picos,

exports were less than 30% of production and in Santana do Cariri, the processing units exported more than the local production, by acquiring honey from other regions. The only region able to offer monofloral honey was Santana do Cariri, due to the high demand for its white *Serjania sp* honey, and to the separate site and season of this plant's blossoming. All but Santana do Cariri increased the participation of organically certified honey in the production, while only Picos had part of its production certified as fair trade. When comparing production practices, relevant is the total number of honey houses and the ones with the HACCP accreditation: Limoeiro do Norte had more houses than the other streams but Picos had more houses with HACCP (often built with support of donors).

A clear-cut distinction is observable in the vertical linkages among producers and processors within the stream. In Picos, propelled by cooperative arrangements and family relationships, there was a quasi-vertical integration organization that accounted for roughly 25% of the local production. In Limoeiro do Norte, the processors were vertically integrated towards production, and although their volume represented only around 15% of the stream volume, the processors were local entrepreneurs with a long-standing history of trust-based deals and technical assistance. In Santana do Cariri, the processors were entrepreneurs that moved from other producing areas in the south of Brazil, and managed to pioneer the activity in the region and grow the business through market-based exchanges. As to the flow of the locally produced honey through the streams to the end markets, in Santana do Cariri, the local units acquired almost all local production while in Limoeiro do Norte it was the opposite, with Picos somewhere in between, but growing towards local processing.

In all three streams, it was still common to find groups of producers organized in associations, very often as a result of a requirement of donors to qualify for grants. Nonetheless, horizontal co-operation was usual among producers in the form of labor and material sharing during honey harvest and extraction, especially among the ones located close together. Only in Picos, the associations were turned into active cooperatives, with sales capabilities. In both Ceará and Piauí states, there was one state honey chamber which served as a forum for problem solving and for channeling demands of the honey chain representatives to government, a form of network level co-ordination. Picos representatives were very participative on the state honey chamber, occupying management positions, while Santana do Cariri and Limoeiro do Norte representatives were not. Apart from participation in the honey chamber, co-operation among processors was not existent.

As to supporting services, technical and managerial assistance originally provided by SEBRAE development agents in 2007 through the APIS Project were mostly discontinued, except for Picos, where the local cooperative maintained its specialized assistance to its affiliates and resorted to donor funds to distribute hives for free to beekeepers. In Santana do Cariri, technical assistance was provided by the Ceará State extension services company but the technicians also provided extension to producers of other products such as fruits, sheep and goats. In Limoeiro do Norte, those services were provided only to a small group of beekeepers by SEBRAE. Financial services were provided by two national government-owned banks, Banco do Nordeste and Banco do Brasil, with the former being more active in apiculture than the latter, especially in Ceará state. Picos financial service providers were able to cover a larger percentage of producers than in the other two streams but, in all regions, close to 80% of the producers had no access to credit between 2007 and 2011.

### Stream Performance

A description of the performance of each value chain stream is presented next, for both the operational and the developmental dimensions (Table 4). As for the operational dimension, a comparison between streams also requires understanding aspects of the performance of the honey chain as a whole in the country. In that regard, Brazil's honey production grew 4.6% per year, on average, between 2007 and 2011 (IBGE 2012), while the value of exports grew, in value, on average, 35.2% per year in the same period (MDIC 2013). Meanwhile, Limoeiro do Norte's production grew below the country's rate, but its exports grew far above the country's rate due to the start-up of the operations of the local processing and exporting unit during the period. Picos production grew even higher than Limoeiro do Norte's, followed by a rapid increase in its exports, while Santana do Cariri was not able to keep the pace with its exports despite its fast production growth. As for the development dimension, Santana do Cariri had the highest local value-added for all steps of the stream in 2011 normalized by kilogram of honey produced in the stream, with Picos and Limoeiro do Norte lagging further behind. In terms of employment generation, the growth in the number of beekeepers was also the highest for Picos.

The effects of the international trade shocks that occurred around 2008 (EU embargo and world financial crisis) apparently impacted more strongly the export pioneer Santana do Cariri stream, while Limoeiro do Norte and Picos were able to build up their businesses in the new environment. It is not possible to make educated inferences about the impact of the trade shocks on the local value-added behavior of the streams since the measurement was for only one year.

**Table 4.** Performance indicator figures of the selected value chain streams

Category	Indicators	Value Chain Stream		
		Limoeiro do Norte	Santana do Cariri	Picos
Revenue	Honey production growth 2007–2011(% per year) <sup>1</sup>	2.7%	4.9%	8.0%
	Honey exports value growth 2007–2011(% per year) <sup>1</sup>	85.4%	10.6%	52.7%
Local value-added*	Honey value-added in all stream steps 2011 per total production (US\$/total kg produced) <sup>1,2,3</sup>	2.4	3.5	2.6
Local employment	Number of beekeepers growth 2007–2011 (% per year) <sup>2</sup>	21%	9%	23%

**Source.** (1) IBGE (2012, 2013), MDIC (2013); (2) field interviews; (3) estimated by authors.

\* Proxy calculated by the difference from honey sales and acquisition costs at each step

### Evaluation of Stream Strategies

For each performance indicator, the top performer among the three value chain streams was identified along with the strategies adopted by that stream that can be more closely or directly associated with that outcome (Table 5). Notice that some strategies can be more directly connected to the market and the environment structure while others require more investigation to make those connections. Following, the findings about the connections between the SCP indicators in the streams are explained.

**Table 5.** Top value chain stream performers by indicator, likely contributing strategies and supporting structure

Performance Indicator	Top Performer	Likely Contributing Strategies*	Likely Supporting Structure
Honey production growth (% per year)	Picos	<p><i>Increase in honey direct exports as % of production**;</i></p> <p><i>Offer of technical assistance with free hives;</i></p> <p><i>Offer of specialized technical assistance;</i></p> <p>Cooperative-type of horizontal linkage among producers;</p> <p>Higher coverage of technical and managerial assistance;</p> <p>Higher coverage of credit.</p>	<p>High world honey consumption growth as opposite to decrease in local consumption;</p> <p>Favorable natural conditions;</p> <p>Low capital and knowledge intensity in production;</p> <p>Strong subsidies to small producers;</p> <p>Increasing labor costs;</p> <p>Stricter quality requirements.</p>
Honey export value growth (% per year)	Limoeiro do Norte	<p>Increase in honey direct exports as % of production;</p> <p><i>Increase in honey certified as organic as % of production;</i></p> <p><i>Increase in % of honey production sold to local processors (the exporters);</i></p> <p><i>Increase in number of HACCP accredited honey houses.</i></p>	<p>High world honey consumption growth as opposite to decrease in local consumption;</p> <p>Low concentration of foreign clients;</p> <p>Stricter quality requirements.</p>
Honey value-added in all stream steps per total production (US\$/ total kg produced)	Santana do Cariri	<p><i>High differentiation through organic certification;</i></p> <p><i>High differentiation through monofloral production;</i></p> <p>Aggressive acquisition of honey outside territory;</p> <p><i>High % of honey production sold to local processors.</i></p>	<p>High world consumption growth of differentiated honeys.</p>
Number of bee keepers growth (% per year)	Picos	<p><i>Offer of specialized technical assistance;</i></p> <p>Higher coverage of technical and managerial assistance;</p> <p>Increase in coverage of credit;</p> <p>Active participation in honey chamber;</p> <p><i>Offer of technical assistance with free hives;</i></p> <p><i>High % of honey production sold to local processors**.</i></p>	<p>High world honey consumption growth;</p> <p>Low capital and knowledge intensity in production;</p> <p>Strong subsidies to small producers.</p>

**Source.** Interviews with experts and analysis of the authors.

\* Strategies *in italics* were the top three of fourteen conduct indicators selected by experts

\*\* Included by the experts

Picos opted to offer higher coverage of credit, specialized technical and managerial assistance, along with free distribution of hives. Those strategies can be directly linked to performance not only in terms of growth in production but also in terms of growth in the number of beekeepers. Alignment with the cooperative-type of horizontal relation among producers facilitates the offer of specialized technical assistance, and alignment with an active participation of stream representatives in the state chamber facilitates fund raising with donors for distribution of hives. Free distribution of hives to overcome the limited investment capacity of the resource-poor entrepreneurs in the territory was only possible because of the low capital intensity of honey production. Other structural conditions such as honey world consumption growth and adequate local natural conditions potentiate the effects of the strategies adopted by Picos. Stricter quality requirements also favor Picos, which offered specialized technical assistance to a higher proportion of producers, just like increasing labor costs encourages co-operation of producers for costs savings. For exports, under a growing general demand for honey, a low client concentration and stricter quality requirements, it is expected that the streams that grow their exports faster are the ones like Limoeiro do Norte, which target the export market and increase the number of honey houses certified for exports. In addition, selling more of its honey production for local processing also contributes to the increase in exports, as the local processors are the only exporters. Although no hard figures are available for the organic honey segment growth, the increase in the production fraction certified as organics may explain part of the exports growth as well.

Processing more of the produced volume internally in the stream and selling part of this volume as differentiated, premium-priced products can lead towards a relatively high value-added in the stream. Complementarily, aggressive acquisition of honey outside the stream territory by local processors and packers (notice that the stream exported more than it produced) increases local value-added. This is a successful combination used in Santana do Cariri.

By and large, the experts interviewed confirmed those strategies as the most influential to the individual performance of the streams. Only the effects of horizontal and network linkages were not immediately recognized by the Picos experts, who preferred to associate the superior performance of the stream to market and vertical linkage choices. In all cases, the experts unanimously agreed that reducing the coverage of credit and technical/managerial assistance had a negative impact on the performance of the streams.

Whereas Picos managed to achieve the highest performance among the streams both in honey production and in the number of beekeepers growth, production grew less than the number of beekeepers, meaning that productivity went down, as new producers are likely to lag behind in the learning curve. In a period of growing demand and prices, like the one from 2007 until 2011, this combination of top operational and developmental performance is more likely to be found in practice. However, in the long run, the stream needs to increase its technical and managerial assistance coverage to recover its productivity.

Notice also that strategies that were identified as not important to some performance indicators under the structural conditions prevailing during the period of analysis (2007–2011) may become relevant when those conditions change. For instance, during a period of drought, the stream

whose beekeepers adopt migratory apiculture is likely to have its production less affected by the harshness of the climate.

It is also noteworthy that the conduct indicators measure the realized strategies, not the intended strategies. This is relevant when considering that some strategies attempted by the interventions did not even materialize (such as building and putting into work honey houses and a processing unit in Santana do Cariri, and an R&D centre in Picos). Other strategies that did materialize (such as offering of technical and managerial assistance in all three streams, technical assistance along with free distribution of hives in Picos, and construction and operation of a processing unit in Picos) can be evaluated by linking the conduct indicators they influence (such as technical and managerial assistance coverage, technical assistance practice, % of honey production sold to local processors) to the performance indicators.

## Discussion and Conclusions

The value chain SCP framework allows development practitioners to make an integrated assessment of structure, conduct and performance from a value chain perspective. Thereby, it clearly identifies the value chain strategies and points out the main links between strategies and outcomes in a certain business environment. Data collection to proceed with making an integrated assessment is intense. Given the large number of conduct indicators, a qualitative analysis prevails; a quantitative, statistical analysis to identify key success factors is only feasible if data for more value chain streams are available.

The qualitative inference highlighting successful strategies in honey value chain streams, revealed through the multiple case studies presented in this paper, find ground in the value chain literature. Product and functional upgrades (Humphrey and Schmitz 2002) such as organic certification and additional local processing are regarded as the main sources for increasing honey value-added. HACCP accreditation of honey houses, a process upgrading strategy, is also seen as a source of export value growth—a sign of increased competitiveness (Trienekens 2011). In line with widespread knowledge that technical, managerial and financial assistance positively influence production and job creation, the higher the coverage of those supporting services, as observed in Picos, the higher the performance regarding production and beekeeper growth.

In all cases, a market-based type of vertical arrangement among the value chain streams and their outside clients is observed. This arrangement is in line with the following expectation from Gereffi et al. (2005) for products like honey that require little specification from buyers. As quality requirements increase further, movement towards a more modular kind of governance may take place, with local processors codifying the requirements of their foreign buyers. However, determining the effects of vertical, horizontal and network linkages within the stream on stream performance, is not straightforward, as shown by the interviews with experts.

Explicit feedbacks from conduct or performance to structure were not expected at the national or world level due to the small size of the selected streams. At the local level, feedbacks to structure were not identified. Feedbacks from performance to conduct may have taken place, reinforcing or not the behavior of the streams but they were also not observed because more frequent, intermediary periods of data collection would be required to investigate such events.

As to the interventions by donors observed in the three value chain streams, according to the typology by Humphrey and Navas-Alemán (2010), they were not based on existing lead firms but rather on strengthening chain linkages, especially among small producers. Besides, none of the interventions started off with the understanding of the current stream strategies and of the local structural conditions, or with development plans calling for integrated network strategies. The stream strategic decisions were made by leading processors and supporting service organizations in the streams, and the existing network arrangements did not follow up any stream strategy implementation.

In the studied streams, interventions that considered upgrading strategies without observing the alignment to other categories of strategy, like building processing units, or without observing local structural limitations, like building a technology development centre, were not successful. The bulk processing and packaging unit in the Santana do Cariri territory for a cooperative could not run in the absence of horizontal co-operation and in a situation where almost all local honey was already sold to local processors. An apiculture technology centre in Picos required the existence of local R&D personnel (a structural limitation) or the attraction of outside competence at a high cost. The opposite happened when interventions were aligned with the stream strategies and took advantage of structural conditions. Supporting the construction of a bulk processing and packaging facility in Picos succeeded as it was built on existing cooperative ties, and free distribution of hives (taking advantage of the availability of direct subsidies) worked better when specialized technical assistance was offered. The alignment of strategies recognized as a good management practice in the supply chain literature (Chopra and Meindl 2013) also seems to hold in general when the unit of analysis is a value chain stream instead of a focal firm.

In this study, only likely positive contributions were investigated, and ‘offer of specialized technical assistance’ was found to positively contribute to two performance goals: ‘honey production growth’ and ‘beekeepers growth’. Along those lines, ‘high % of honey production sold to local processors’ was also found to positively contribute to ‘honey value-added’ and to ‘beekeepers growth’. Value chain participants, however, should bear in mind that those situations where one strategy contributes positively to different performance goals at the same time does not always hold, and conflicting goals may arise for the same strategy.

Specific findings related to the most successful stream strategies in Brazil – for honey production and export value growth (associated to increased competitiveness), and for honey value-added and beekeepers growth (associated to poverty reduction) – can serve as good practices for the honey value chains streams only during the period of analysis in this study. In line with the value chain SCP framework, if structural indicators change in the future, those specific strategies need to be reevaluated. Also, applying those successful strategies to streams in other countries depend on the similarity of their structural indicators to Brazil’s. Contrary to Brazil, a country with a large and growing domestic market, for example, is likely to host high performance streams that sell their production locally.

For development agencies and donors, the upfront understanding of the current strategies deployed by the targeted streams and their competitors, along with local structural conditions, are paramount for a successful intervention. Strategies that do not reinforce others tend to fail and jeopardize the stream. Therefore, an intervention should identify the business and organizational strategies it

intends to act upon, and foster strategies that are aligned with each other and reinforced by the business environment. In addition, value chain participants should be aware that effective strategy choices vary according to the goal of the value chain stream in a given industry structure, be they in the context of development interventions or be they in response to structural shocks.

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## Appendix

**Table A1.** Number of interviewees per value chain stream and type of stakeholder

Type of stakeholder	Value Chain Stream			Total
	Limoeiro do Norte	Santana do Cariri	Picos	
Beekeeper*	3	4	1	8
Intermediary	1	-	1	2
Processor	2	2	4	8
Service provider (technical/managerial assistance)	5	9	3	17
Service provider (financing)	2	2	2	6
Regulator (sanitary inspection)	1	-	1	2
Trader	-	1	1	2
Total	14	18	13	45

**Source.** Field Interviews.

\* Selected beekeepers represented large groups of producers. Six out of the eight processors and the two intermediaries were also beekeepers

**Table A2.** Initial selection of structure, conduct and performance indicators

Component	Category	Indicator	
<b>Structure</b>	Demand behavior	- World honey production growth - National honey apparent consumption growth	
	Concentration of clients	- World market share of top 4 honey import countries - National market share of top 4 food retailers	
	Concentration of suppliers	- Not applicable	
	Rivalry intensity	- World market share of top 4 honey export countries	
	Entry barriers (barriers created by competition)	- Capital and knowledge intensity	
	Substitute products	- Existence of relevant substitute products	
	Local natural environment	- Average temperature <sup>1</sup> - Normal rainfall <sup>1</sup> - Main bee forage sources	
	Institutional environment	- Taxes and subsidies - Business chamber/board/federation - Labor - Import tariffs - Quality requirements - Exchange rates	
	Local Infrastructure	- Access to utilities - Road distance to export harbor	
	<b>Conduct</b>	Product/market	- Honey direct exports as % of production - Direct exports to US as % of exports - Honey certified organics as % of production - Honey certified fair trade as % of production - Monofloral honey as % of production
		Pricing	- Honey bulk export price and % ratio to market price
		Promotion	- Message/media
		Distribution channels	- Honey exported directly to packers as % of exports - Transportation modes to main clients
Production technologies		- Honey production and extraction - Number of honey house/HACCP* units, level and per 100 beekeepers - Honey bulk processing and packaging	
Product development		- Internal vs. outsourced	
Sourcing		- Floral sources distribution as % of production	
Vertical linkages		- Production by vertically integrated processors as % of total production** - Type of governance regarding clients outside stream - Honey production sold to local processors as % of total production**	
Horizontal linkages		- Resources sharing at production step - Resources sharing at other steps	
Network Linkages		- Participation in chamber/board/federation	
Agglomeration		- Concentration of stream beekeepers per km <sup>2</sup>	
Quality of supporting services		- Technical assistance type - Technical assistance practices	
Use of supporting services		- Technical assistance coverage as % of beekeepers - Managerial assistance coverage as % of beekeepers - Credit coverage as % of beekeepers	
<b>Performance</b>		Revenue	- Honey production growth <sup>*****</sup> - Honey exports value growth <sup>***</sup>
		Local value-added	- Honey value-added in all stream steps per total production
	Local employment	- Number of beekeepers growth <sup>****</sup>	

**Source.** (1) Adjare (1990); field interviews and authors' analysis.

\* Hazard Analysis and Critical Control Points accreditation. \*\* Indicators not mutually exclusive but left in final selection to reveal perspectives of vertical integration. \*\*\* Indicators not mutually exclusive but left in final selection to reveal components of revenue. \*\*\*\* Indicators not mutually exclusive but left in final selection to represent operations and development categories.

**Table A3.** Additional structure indicator figures for the selected value chain streams

Category	Indicator	Value Chain Stream		
		Limoeiro do Norte	Santana do Cariri	Picos
Concentration of clients	National market share of top 4 food retailers (% of sales, 2011) <sup>1</sup>		50%	
Rivalry intensity	World market share of top 4 honey export countries (% of volume, 2007 and 2010) <sup>1</sup>		49%, 44%	
Substitute products <sup>2</sup>	Existence of relevant substitute products	Sugar, glucose syrup and other sweeteners		
Institutional environment	Taxes <sup>*,2</sup>	Tax incentives to attract processing units offered at state and national levels		
	Import tariffs <sup>1</sup>	Lower import tariffs to competitors from North America (by US) and Africa (by US and EU)		
	Exchange rates <sup>1</sup>	Appreciation of Brazilian Real while main competitors Argentina, Turkey, Mexico and Vietnam depreciated their currencies against US dollar		
Local natural environment	Main bee forage sources <sup>2</sup>	<i>Borreria verticillata</i> , <i>Merremia aegyptia</i> , <i>Croton sonderianus</i> <i>Müll. Arg.</i> , <i>Hyptis</i> <i>suaveolens</i>	<i>Serjania sp</i> , <i>Croton</i> <i>sonderianus Müll.</i> <i>Arg.</i> , <i>Borreria</i> <i>verticillata</i> , <i>Hyptis</i> <i>suaveolens</i>	<i>Croton</i> <i>sonderianus Müll.</i> <i>Arg.</i> , <i>Piptadenia</i> <i>moniliformis</i> , <i>Merremia aegyptia</i> , <i>Hyptis suaveolens</i>
Local Infrastructure	Road distance to export harbor Pecém/CE (km) <sup>1</sup>	253	538	560
	Access to utilities <sup>2</sup>	Partial coverage of cell phone, electricity and water in some areas of the apiaries and honey houses		

**Source.** (1) ABRAS (2012), European Commission (2013), FAO (2013), FXTOP (2012), IPECE (2012), USITC (2010); (2) field interviews.

\* Indicator 'taxes and subsidies' divided to account for realized stream differences

**Table A4.** Additional conduct indicator figures for the selected value chain streams

Category	Indicator	Value Chain Stream					
		Limoeiro do Norte		Santana do Cariri		Picos	
		2007	2011	2007	2011	2007	2011
Product/market	Direct exports to US (% of exports) <sup>2</sup>	100%	90%	100%	90%	100%	80%
Pricing	Honey bulk exports 2011 (US\$/kg) and ratio to market price (%) <sup>1</sup>	1.49 (91%)	3.09 (98%)	2.04 (124%)	2.97 (94%)	1.92 (117%)	3.29 (104%)
Promotion	Message/media <sup>2</sup>	Natural, wild blossom honey through word of mouth					
Distribution channels	Honey exported directly to packers (% of exports) <sup>1,2</sup>	0%	0%	67%	100%	0%	23%
	Transportation mode to direct export clients <sup>2</sup>	Trucks (inside Brazil) and ships from Pecém harbor in Ceará State					
Production technologies	Honey production and extraction <sup>2</sup>	Stationary apiculture		Some migratory apiculture (less than 5% of producers)		Some migratory apiculture (less than 5% of producers)	
	Honey bulk processing and packaging <sup>2</sup>	Standard					
Product development	Internal vs. outsourced <sup>2</sup>	Outsourced					
Sourcing	Floral sources distribution (% of production) <sup>2</sup>	<i>Borreria verticillata</i> , 50%; <i>Merremia aegyptia</i> , 25%; <i>Croton sonderianus</i> Müll. Arg., 15%; <i>Hyptis suaveolens</i> and other bushes, 10%		<i>Serjania sp.</i> , 30%; <i>Croton sonderianus</i> Müll. Arg., 30%; <i>Borreria verticillata</i> , 20%; <i>Hyptis suaveolens</i> and other bushes, 20%		<i>Croton sonderianus</i> Müll. Arg., 50%; <i>Piptadenia moniliformis</i> , 30%; <i>Merremia aegyptia</i> , <i>Hyptis suaveolens</i> , <i>Croton campestris</i> and other bushes, 20%	
Vertical linkages	Type of governance regarding clients outside stream <sup>2</sup>	Market-based until 2011					
Horizontal linkages	Resources sharing in other than production steps <sup>2</sup>	No sharing of resources					
Agglomeration	Concentration of stream beekeepers per 100 squared km <sup>1,2</sup>	6.2	13.1	4.1	6.0	3.5	9.5

**Source.** (1) FAO (2013), IBGE (2006, 2012, 2013), IPECE (2012), MDIC (2013); (2) field interviews.

