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# Bees as important pollinators and producers of bioeconomy products in Brazil



*Breno M. Freitas*

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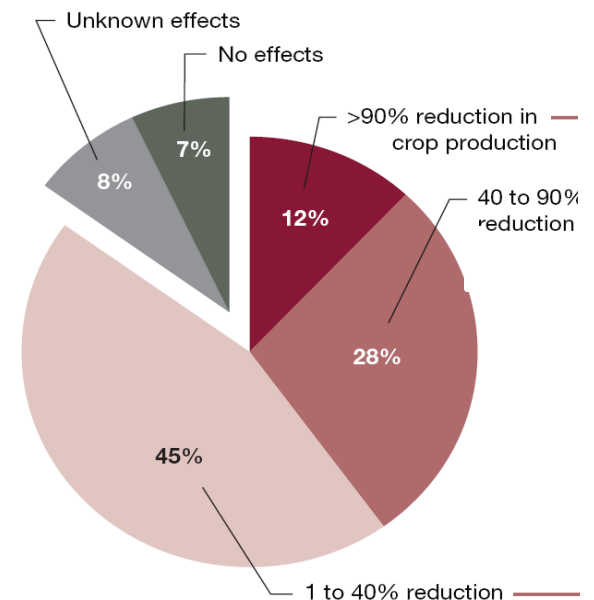


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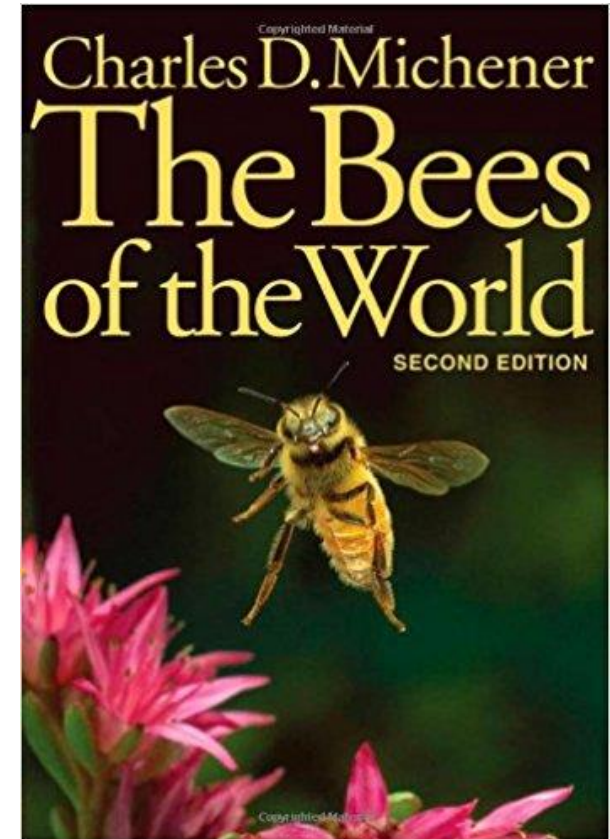
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In Brazil, this value reaches US \$ 12 billion for the 85 crops that depend on pollinators (Giannini et al., 2015).



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**Uruçu Nordestina**  
*Melipona scutellaris*



**Arapua**  
*Trigona spinipes*



**Lambe Olhos**  
*Leurotrigona muelleri*



**Jataí**  
*Tetragomiscia angustula*



**Mandaguari**  
*Scaptotrigona postica*



**Tataíra**  
*Oxytrigona tataira tataira*



**Mandaíca MQQ**  
*Melipona quadrfasciata quadrfasciata*



**Limão**  
*Lestrimelitta limao*



**Uruçu Amarela**  
*Melipona rufiventris*



**Abelha Orquídeas**  
*Euglossa bazinga*



**Benjoi**  
*Scaptotrigona polysticta*



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*Xylocopa (Nanoxylocopa) bella* Melo 2016

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According to Kerr et al. (1996), Brazilian native bees are responsible for pollinating up to 90% of plant species depending on biotic pollinators.



Native bees pollinators of annatto (*Bixa orellana*)

## Bees and crop pollination in Brazil

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There is a shortage of 45,000 honey bee colonies only for pollination of melon and apples, totaling an extra potential value of R\$ 2,900,000 (US\$ 828,000).





## Constrains for expansion of crop pollination in Brazil

Growers are not enlighten on the role of pollinators in increasing crop production. They do not understand pollination as a production input, such as selected seeds, irrigation, fertilization and pesticides, therefore do not adapt their production system to allow for bee pollination.



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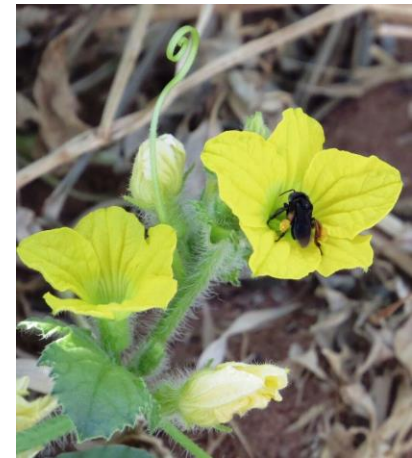
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Crop pollination restricted to the honey bees.



## Potential for expansion of crop pollination in Brazil

Use of honey bees to pollinate crops which are not highly-dependant on bee pollination but benefit from it, such as coffee, sunflower, soybean and orange.



## Potential for expansion of crop pollination in Brazil



**Table 1** Seed yield (kg/ha) of soybean (*Glycine max* (L.) Merrill) cv. BRS Carnaúba under three pollination treatments in NE Brazil (s.e.m = standard error of mean)

Treatment	Replicates	Seed yield $\pm$ s.e.m. (kg/ha)	% Increment	
			Caged	Open
Area with honeybee colonies	5	3,333.2 $\pm$ 142.7a	18.09	11.04
Open area	5	3,001.6 $\pm$ 97.1b	6.34	–
Caged area	5	2,822.4 $\pm$ 52.6c	–	–5.97

Means followed by different lower case letters differ at  $p < 0.05$

## Potential for expansion of crop pollination in Brazil



**Table 2** Total pod production and number of pods with 1, 2 or 3 seeds in a soybean (*Glycine max* (L.) Merrill) cv. BRS Carnaúba plantation, under three pollination treatments in NE Brazil (s.e.m = standard error of mean)

Treatments	# Of plants	Total pods	Pods with 1 seed		Pods with 2 seeds		Pods with 3 seeds		% Total
		$\bar{X} \pm \text{s.e.m.}$	$\bar{X} \pm \text{s.e.m.}$	(%)	$\bar{X} \pm \text{s.e.m.}$	(%)	$\bar{X} \pm \text{s.e.m.}$	(%)	
Honeybee + wild pollinators	50	59.6 ± 2.71a	5.92 ± 0.51aC	9.93	39.54 ± 1.95aA	66.34	14.14 ± 1.10aB	23.72	100.00
Wild pollinators	50	57.16 ± 1.87ab	4.54 ± 0.47abC	7.94	40.94 ± 1.54aA	71.62	11.68 ± 0.85bB	20.43	100.00
Pollinator restricted	50	49.64 ± 2.64b	3.86 ± 0.40bC	7.78	36.52 ± 2.29aA	73.57	9.26 ± 0.51bB	18.65	100.00

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## Potential for expansion of crop pollination in Brazil

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Soybean area cultivated in 2010 = 102.5 million ha (Milfont et al. 2013)

Present cultivated area = 120.9 million ha (USDA 2017)

## Potential for expansion of crop pollination in Brazil



Soybean world production - 316,76 Million Tons



## Potential for expansion of crop pollination in Brazil



Soybean world production - 316,76 Million Tons / cultivated area - 120.9 million ha  
= **2,620 kg/ha** < 2,800 kg/ha in 2010.

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But the number of colonies for pollination will have to grow dramatically; Brazil grows near 42 million hectares of soybean.



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Brazilian *Bombus* species are promising, but still too aggressive.





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# Bioeconomy products in Brazil

Honey

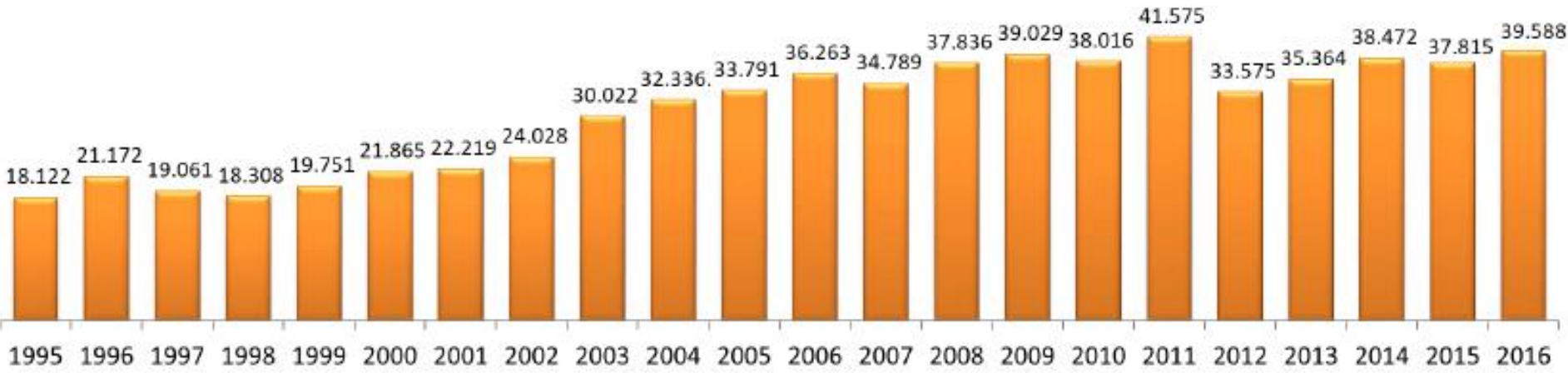




# Bioeconomy products in Brazil

## Honey production in Brazil

Metric Tons



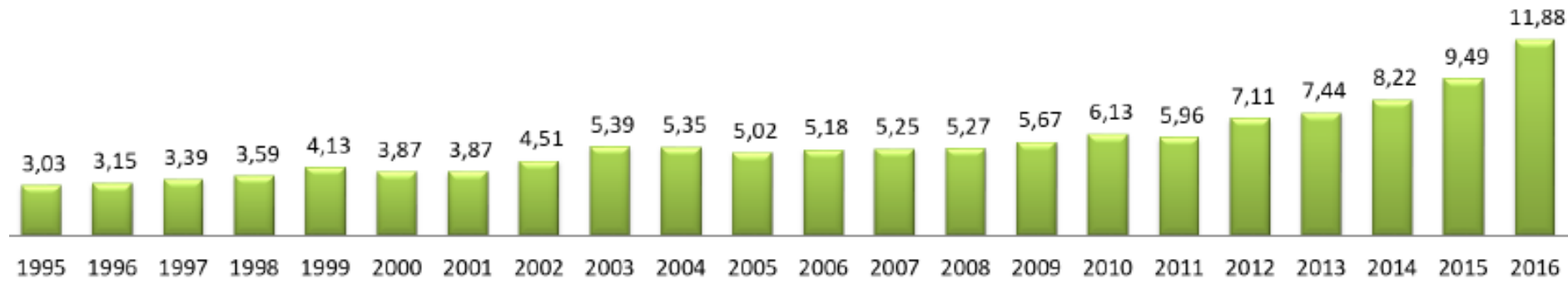




# Bioeconomy products in Brazil

Honey production in Brazil

Value/kg (R\$)

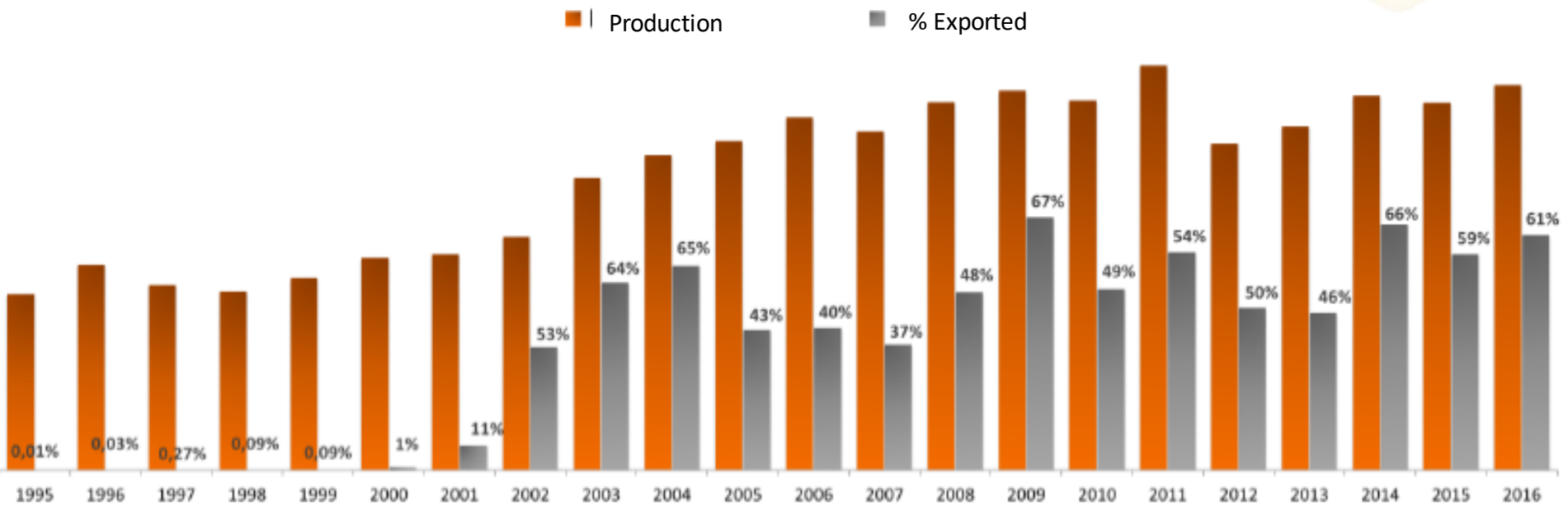


FONTE: IBGE, 2017

# Bioeconomy products in Brazil

## Honey production in Brazil

Exports in relation to honey production

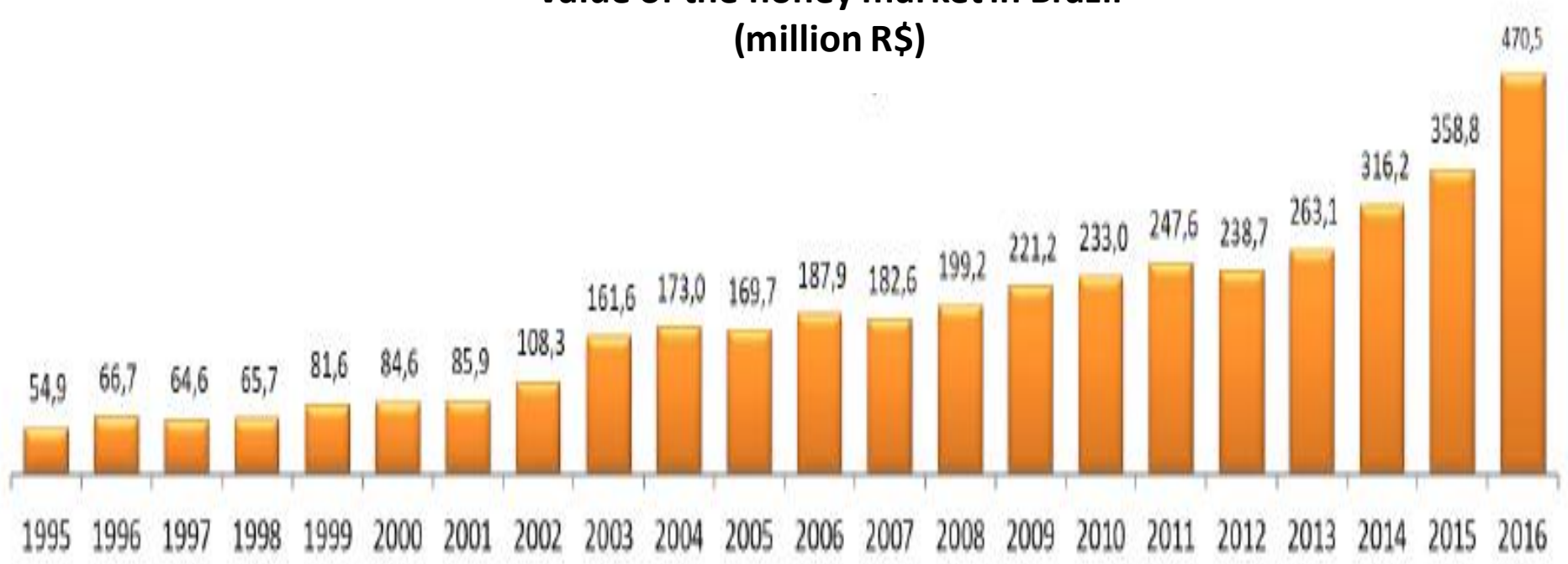




## Bioeconomy products in Brazil

Honey production in Brazil

### Value of the honey market in Brazil (million R\$)

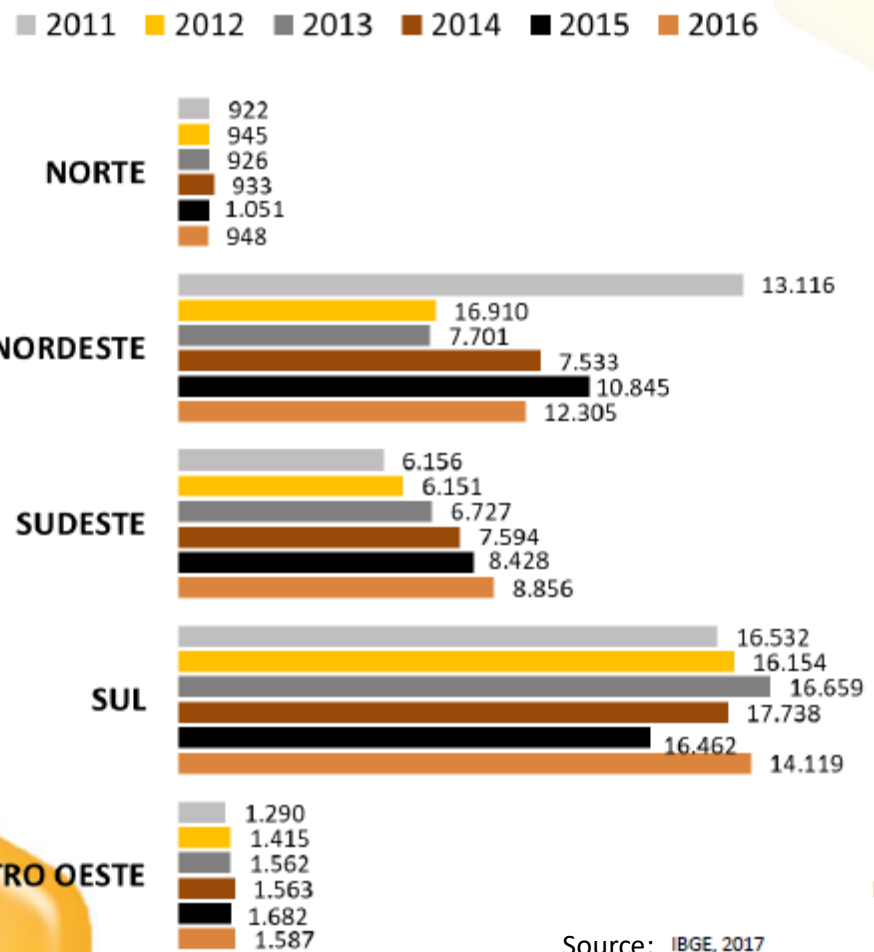




# Bioeconomy products in Brazil

Honey production in Brazil

Annual honey production per region (Tons)







Source: IBGE, 2017

## Bioeconomy products in Brazil

Honey production in Brazil

### Social impact of beekeeping in Brazil

Hives per beekeeper	Beekeepers (%)	Honey produced (%)
Up to 50	49,5	17,0
51 - 100	25,3  90%	20,7  60%
101 - 200	15,6	22,5
201 - 400	6,5	17,6
401 - 700	2,2  10%	12,2  40%
More than 701	0,9	9,8

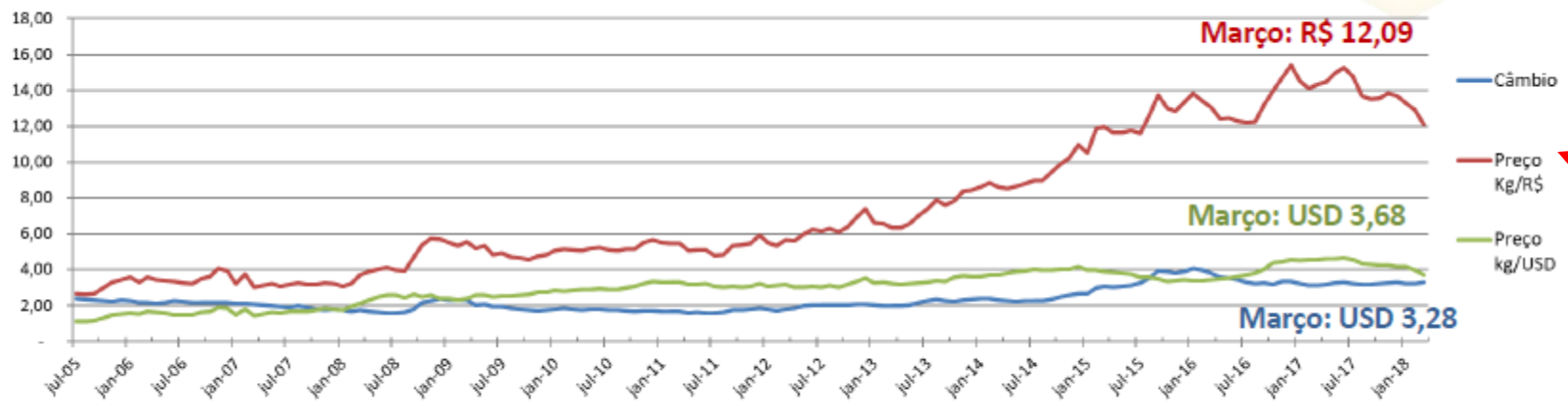
Professional  
beekeeping



# Bioeconomy products in Brazil

## Honey production in Brazil

### Evolution of price for exported honey in Brazil



Source BANCO CENTRAL

Price 17 May 2018

USD 2.80/kg (organic)

R\$/U\$ 3.70

**R\$ 10.36/kg (organic)**

## Bioeconomy products in Brazil

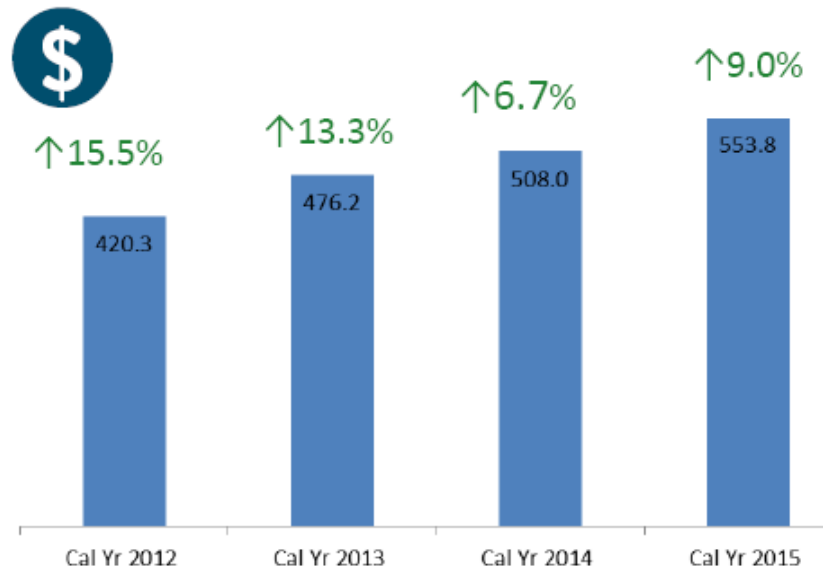
Honey



### HONEY IS A \$553.8 MILLION CATEGORY AT RETAIL

Dollar growth is steady with slight deceleration trend, Unit growth also experiencing deceleration. Trend bucked in 2015

DOLLARS (in Millions)

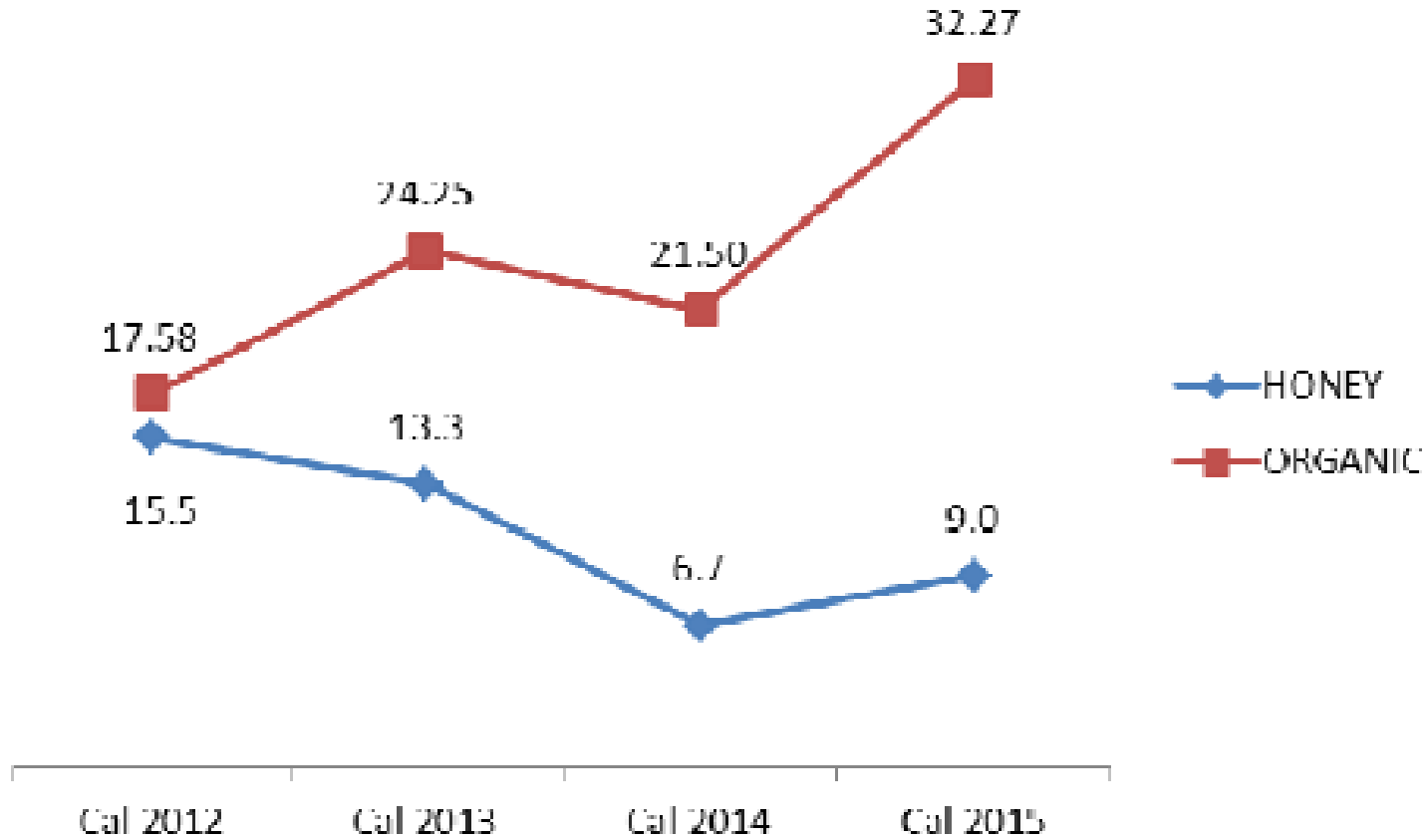


Source: [NILSEN RESEARCH](#)



## Bioeconomy products in Brazil

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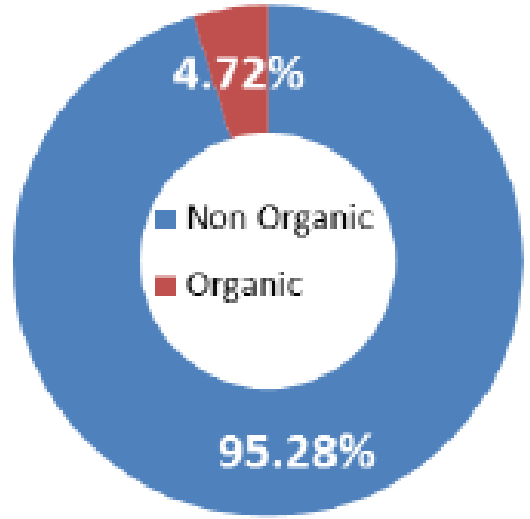




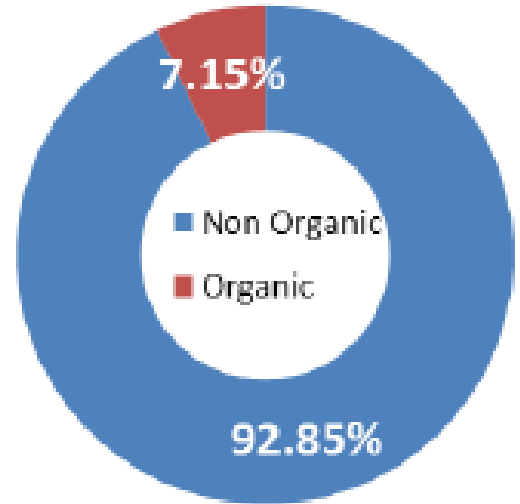
## Bioeconomy products in Brazil

Honey

Cal 2012



Cal 2015

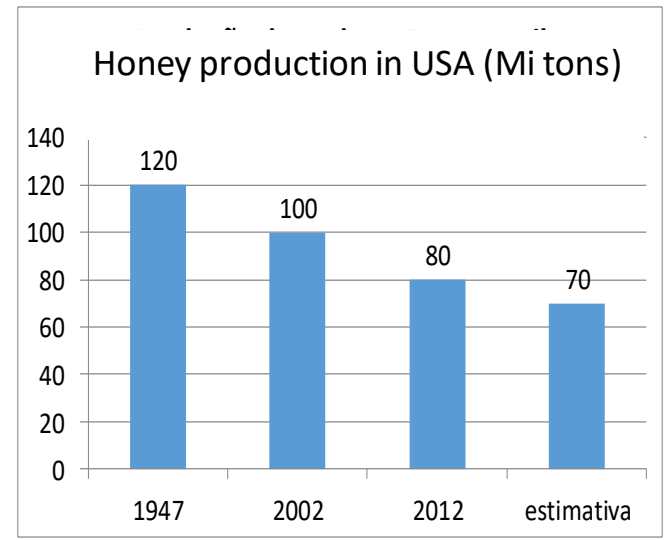


**IN 2022 IT CAN BE 50% OF HONEY MARKET**

## Bioeconomy products in Brazil

World trend in honey

Honey production is decreasing in USA and Argentina.



### PRODUCCIÓN DE MIEL EN ARGENTINA

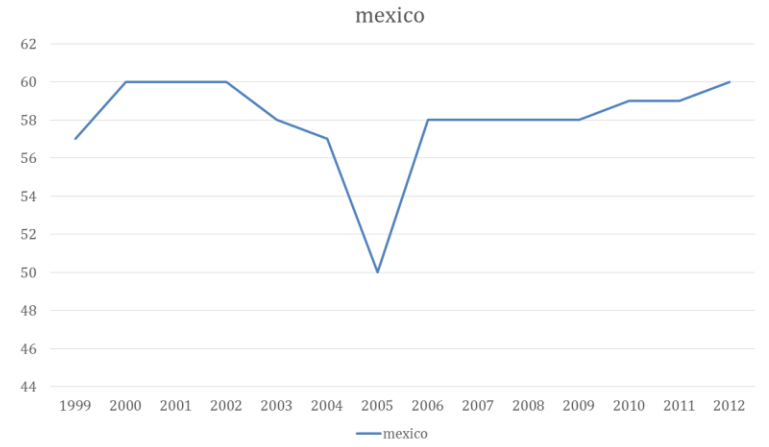


## Bioeconomy products in Brazil

World trend in honey

Honey production is decreasing in USA and Argentina.

Honey production is stable in Mexico.



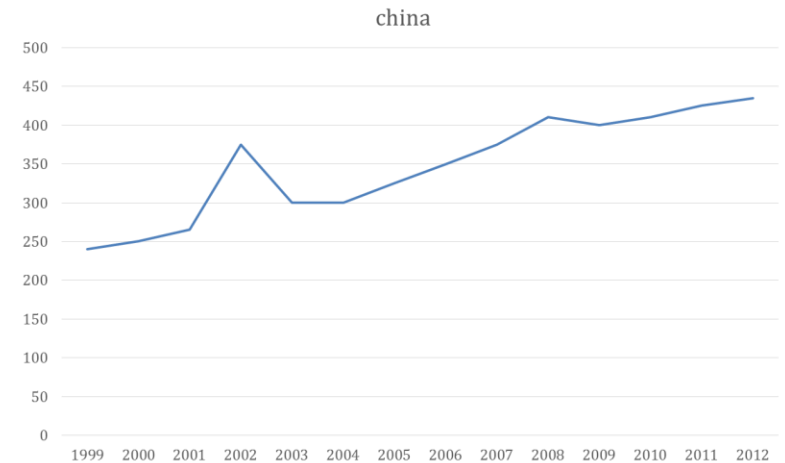
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Beekeeping abroad has good/high productivity

Brazilian beekeeping shows low productivity

It is expected a deficit of 100,000 tons in the world market in the next 5-10 years.





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## Potential for expansion of honey market in Brazil

Increase exports





## Potential for expansion of honey market in Brazil

Increase exports

Increase honey consumption in Brazil

Present consumption: 0.1 kg/capita

1 spoon of honey = 19g

$19\text{g} \times 365 = 6.935\text{ g} (\sim 7\text{ kg})$

$1/7\text{ population} \times 7\text{kg} = 1\text{kg/capita}$

Brazilian population = 200 million people

200 millions = 200,000 tons !!!

Brazilian honey production = 40,000 tons



## Potential for expansion of honey market in Brazil

Increase exports

Increase honey consumption in Brazil  
Present consumption: 0.1 kg/capita

Improve management techniques

Increase hive productivity: 18 kg/hive/year



## Propolis

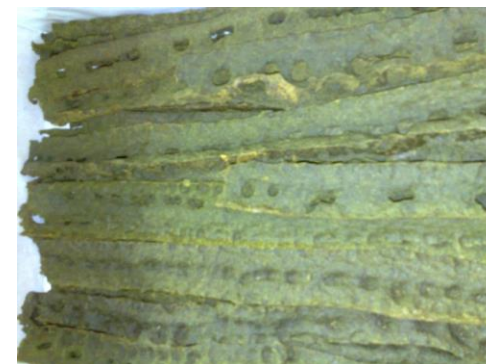
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*Baccharis dracunculifolia*



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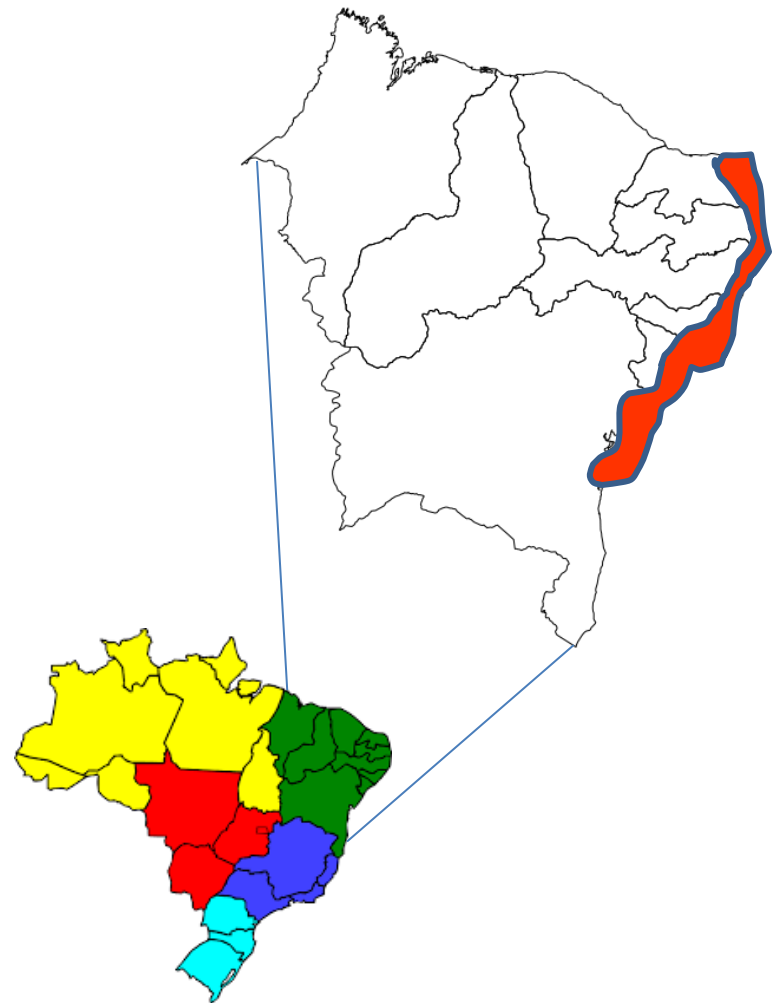
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*Dalbergia ecastophyllum*



## Trends for propolis in Brazil

Number of beekeepers producing propolis is growing.

Brazilian propolis comes from wild plants, therefore limiting production to areas where they occur.

There have been attempts to cultivate these plants, but their requirements has limited success to the areas where they already are naturally present.

Investigate propolis from other areas of the country.



## Pollen

Production of bee pollen is low in Brazil < 17 tons

The state of Santa Catarina due to European immigrants has lead pollen production in Brazil.

Recently, NE states like Bahia and Sergipe have invested in pollen production.

Production in NE began in areas where honey production was low, but pollen is abundant.

Other states still have isolated beekeepers with low pollen production.



## Constrains for pollen production in Brazil

Population do not eat pollen.

People are not aware of nutritional value of pollen.

Pollen is expensive: R\$25/160g (U\$ 7).

Small internal market.

Low production to gain international market.



## Other bee products

Bee wax production is restricted to the beekeeping industry consumption (embossed wax for hives, handcrafts, candles, etc.)

Most wax comes from extensive collection in feral colonies.

There is a shortage even to the beekeeping industry because beekeepers concentrate in honey production.

Average price: raw bee wax - R\$ 40 (U\$11.4) and embossed bee wax - R\$ 55 (U\$15.7).

Perspective: feeding cane sugar syrup for wax production.

Apitoxin and Royal jelly: There have been attempts to explore these products in recent years, unsuccessfully.





# Acknowledgements



UNIVERSIDADE  
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# Bees as important pollinators and producers of bioeconomy products in Brazil



*Breno M. Freitas – freitas@ufc.br*