


# THE IMPORTANCE OF SÃO PAULO CITRICULTURE AND CHALLENGES

Antonio Juliano Ayres | *General Manager*

- 
- A photograph of several ripe, bright orange oranges hanging from a tree with green leaves. The oranges are in various stages of ripeness, with some showing a slight green at the stem. The background is a soft-focus green, suggesting a healthy citrus grove.
- Importance of the citriculture
  - Tree inventory and orange crop forecast
  - Fundecitrus contributions
    - HLB status and management
    - Perspectives

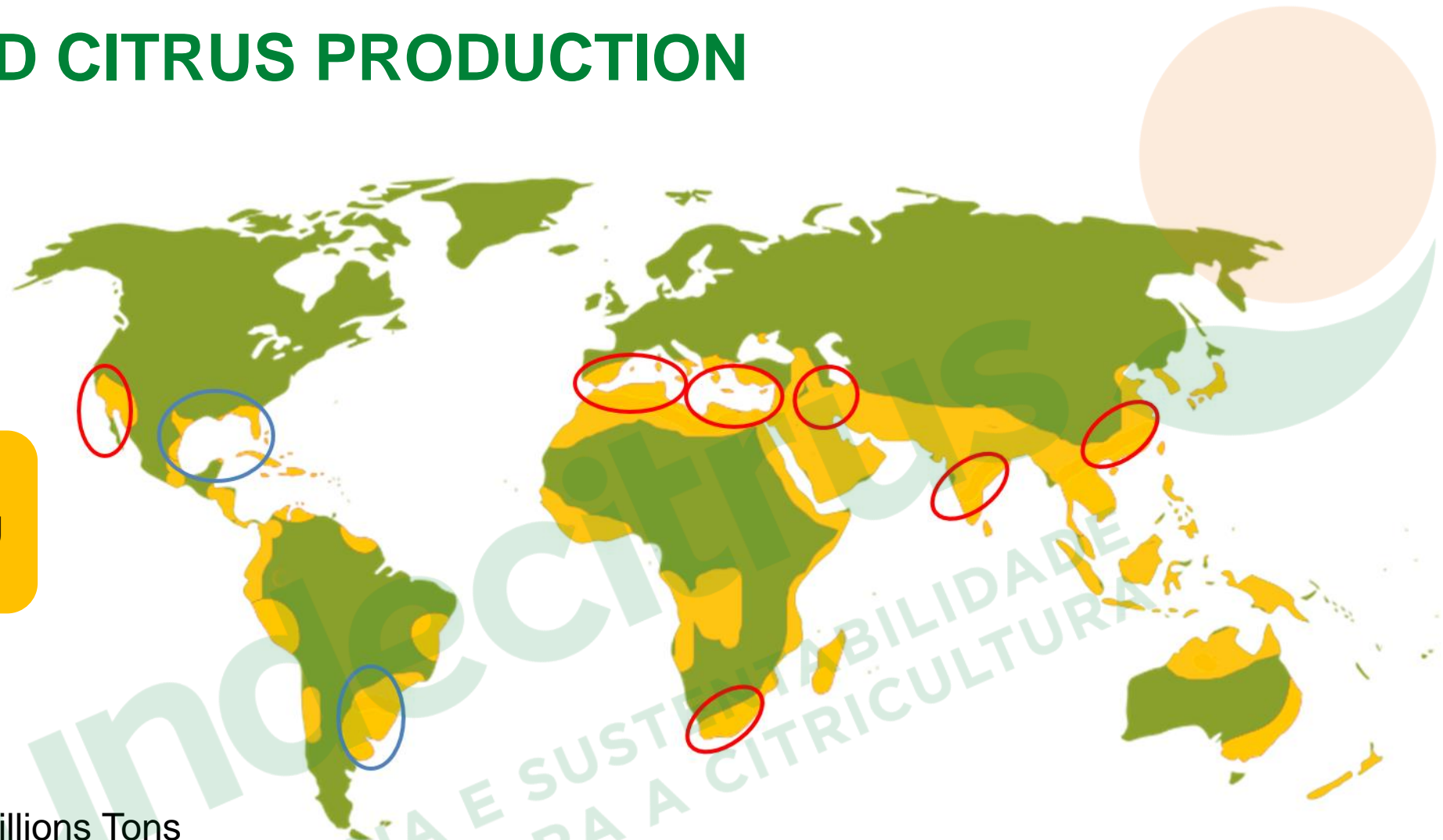


# ▶ WORLD CITRUS PRODUCTION

There are 140 citrus producing countries

2017/2018  
**Orange:** 47,754 millions Tons  
**Grapefruit:** 6,630 millions Tons  
**Tangerine:** 30,0188 millions Tons  
**Lemons and limes:** 7,686 millions Tons  
**Total:** 92,088 millions Tons

60% of the world's total citrus production is grown in China, Brazil and US



Source USDA

ORANGE PRODUCTION COUNTRY	1978/79	1988/89	1998/99	2008/09
	Million Boxes 40.8 kg	Million Boxes 40.8 kg	Million Boxes 40.8 kg	Million Boxes 40.8 kg
<b>TOTAL</b>	<b>814.55</b>	<b>1,123.67</b>	<b>1,313.74</b>	<b>1,691.68</b>
<b>Brazil</b>	192.50	346.81	379.78	427.01
<b>USA</b>	208.38	202.75	220.32	204.51
<b>China</b>	4.54	20.78	63.16	147.06
<b>India</b>	26.23	34.31	57.70	107.76
<b>Mexico</b>	31.37	55.59	71.15	101.47
<b>Egypt</b>	20.66	29.39	35.34	85.78
<b>Spain</b>	40.02	54.31	59.85	82.52
<b>Indonesia</b>	5.39	10.91	12.03	56.93
<b>Iran</b>	8.65	28.80	42.87	56.37
<b>Pakistan</b>	12.62	26.85	31.94	42.18
<b>Italy</b>	39.68	53.19	34.85	41.50
<b>Turkey</b>	16.08	18.14	23.77	38.24
<b>South Africa</b>	14.19	15.42	25.69	37.40
<b>Greece</b>	11.76	18.87	19.49	19.36
<b>Morocco</b>	18.53	24.36	22.06	19.36
<b>Argentina</b>	17.30	15.20	16.18	17.16
<b>Syria</b>	0.52	3.34	10.76	14.78
<b>Vietnam</b>	2.24	2.52	9.84	14.73
<b>Algeria</b>	6.98	5.10	6.87	12.03
<b>Ghana</b>	0.51	1.47	6.63	11.76
<b>Australia</b>	9.02	13.33	12.62	10.54
<b>Venezuela</b>	7.69	10.39	11.64	9.55
<b>Colombia</b>	4.71	8.17	7.35	8.65
<b>Thailand</b>	4.29	6.80	7.84	8.58
<b>Peru</b>	3.74	4.75	5.62	8.44
<b>Honduras</b>	0.83	1.45	2.03	7.11
<b>Costa Rica</b>	1.81	2.01	8.07	6.81
<b>Belize</b>	0.69	1.34	4.11	5.87
<b>Lebanon</b>	5.64	6.61	4.46	5.61
<b>Cuba</b>	4.72	12.44	9.17	4.91
<b>Paraguay</b>	4.45	4.20	5.10	4.66
<b>Congo</b>	3.49	4.04	4.88	4.43
<b>Portugal</b>	2.38	3.87	6.66	4.34
<b>Chile</b>	1.32	2.35	2.35	3.80
<b>Israel</b>	23.01	13.38	6.57	3.80
<b>Jamaica</b>	1.22	1.32	3.31	3.48
<b>Tunisia</b>	2.84	2.84	2.88	2.42



ORANGE PRODUCTION COUNTRY	1978/79	1988/89	1998/99	2008/09
	Million Boxes 40.8 kg	Million Boxes 40.8 kg	Million Boxes 40.8 kg	Million Boxes 40.8 kg
Guatemala	-	1.84	1.99	3.30
Yemen	-	0.12	3.67	3.22
Uruguay	0.85	2.28	4.54	3.16
Zimbabwe	0.66	1.20	1.72	2.28
Bolivia	1.98	1.81	2.46	2.25
Dom. Republic	1.48	1.45	3.32	2.21
Madagascar	1.96	2.03	2.06	2.21
Nicaragua	1.32	1.57	1.74	2.08
El Salvador	2.38	2.11	0.64	1.79
Iraq	3.35	4.29	7.75	1.79
Japan	8.84	6.99	3.04	1.59
Cambodia	0.69	1.00	1.54	1.54
Georgia	-	-	2.09	1.35
Ecuador	12.21	2.12	2.98	1.35
Panama	1.53	0.84	0.67	1.13
Libyan Arab Jamahiriya	0.78	2.01	0.99	1.10
Cyprus	0.90	0.98	1.09	1.08
Ethiopia	0.23	0.27	0.33	1.05
Senegal	0.45	0.64	0.74	0.98
Haiti	0.66	0.76	0.61	0.91
Nepal	-	-	0.70	0.90
Bhutan	0.61	1.32	1.42	0.89
Jordan	0.32	0.50	0.93	0.89
Swaziland	1.08	0.98	0.77	0.88
Côte D'ivoire	0.44	0.69	0.73	0.86
Palestine	-	-	2.54	0.86
Kenya	0.33	0.56	0.69	0.69
Laos	0.38	0.44	0.69	0.69
Central African Republic	0.29	0.36	0.54	0.54
Puerto Rico	0.82	0.69	0.36	0.48
Sudan	0.39	0.37	0.40	0.44
Mali	0.23	0.27	0.31	0.39
Bangladesh	0.21	0.19	0.20	0.38
Mozambique	0.49	0.49	0.37	0.34
Togo	0.22	0.29	0.30	0.33
Suriname	0.12	0.25	0.27	0.33
Azerbaijan	-	-	0.59	0.31
Benin	0.28	0.38	0.38	0.31

ORANGE PRODUCTION COUNTRY	1978/79	1988/89	1998/99	2008/09
	Million Boxes 40.8 kg	Million Boxes 40.8 kg	Million Boxes 40.8 kg	Million Boxes 40.8 kg
Malaysia	0.27	0.25	0.27	0.29
Afghanistan	0.37	0.28	0.28	0.28
New Zealand	0.14	0.15	0.23	0.22
Somalia	0.18	0.21	0.19	0.21
Dominica	0.08	0.14	0.20	0.18
Liberia	0.15	0.17	0.17	0.18
Guinea-Bissau	0.00	0.08	0.12	0.15
Guyana	0.26	0.18	0.06	0.15
Sri Lanka	0.25	0.12	0.12	0.14
Trinidad and Tobago	0.17	0.17	0.10	0.13
Montenegro	-	-	-	0.13
Albania	0.23	0.33	0.05	0.13
Philippines	0.48	0.44	0.21	0.12
Zambia	0.07	0.09	0.08	0.09
Congo	0.07	0.07	0.06	0.06
Guadeloupe	0.01	0.02	0.01	0.05
Saint Vincent/Grenadines	0.01	0.01	0.02	0.04
Malta	-	-	0.03	0.04
Tajikistan	-	-	0.02	0.03
Tonga	0.06	0.07	0.01	0.03
Grenada	0.02	0.02	0.02	0.02
Tanzania	-	-	0.01	0.02
Martinique	0.01	0.02	0.02	0.02
Reunion Island	0.01	0.03	0.07	0.02
Fiji	0.01	0.02	0.02	0.02
Botswana	0.01	0.01	0.01	0.01
France	0.03	0.07	0.03	0.01
French Guiana	0.01	0.00	0.01	0.01
French Polynesia	0.01	0.00	0.00	0.01
Timor-Leste	-	-	0.01	0.01
Saint Lucia	0.01	0.01	0.02	0.01
Croatia	-	-	0.01	0.01
Burkina Faso	0.00	0.01	0.01	0.01
Brunei Darussalam	0.01	0.01	0.01	0.01
Russian Federation	-	-	-	0.00
Bosnia and Herzegovina	-	-	0.00	0.00
Cook Islands	0.07	0.01	0.00	0.00
Guam	0.00	0.00	0.00	0.00



ORANGE PRODUCTION COUNTRY	1978/79 Million Boxes 40.8 kg	1988/89 Million Boxes 40.8 kg	1998/99 Million Boxes 40.8 kg	2008/09 Million Boxes 40.8 kg
Seychelles	0.00	0.00	-	-
Kuwait	0.00	0.00	-	-
Montserrat	0.00	0.00	-	-
Djibouti	-	-	-	-
Serbia/Montenegro	-	-	-	-
USSR	4.78	10.98	0	0
Yugoslav	0.10	0.20	0	0

- Represents less than one thousand.

Source: Prepared by Markestrat based on data from CitrusBR, USDA and FAO.

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# 2017/18 JUICE YIELD IN THE MAIN REGIONS

ORANGE GROWING REGIONS	TOTAL BEARING AREA	TOTAL ORANGE PRODUCTION		FARMING YIELD	JUICE YIELD ON FRUIT	JUICE YIELD PER HECTARE	
	Thousand Hectares (Above 3 Years Old)	Million Metric Tons	Million Boxes 40.8 kg	40.8 Kg Boxes Per Hectare	40.8 kg Boxes Per Metric Tons of FCOJ 66° Brix Equiv.	Metric Tons of FCOJ 66° Brix Equiv.	Liters Of Ready-To-Drink Orange Juice
São Paulo & M.Gerais Citrus Belt	385.5	16.3	398.4	1,033	282	3.67	19,622
South Africa	n.a.	1.5	36.0	900	330	2.73	14,597
Califórnia	62.7	2.0	48.3	770	350	2.20	11,775
European Union	n.a.	6.4	157.4	735	335	2.19	11,743
Florida (2016/17 Pre-Irma)	148,7	2,8	68,9	463	247	1,87	10.031
Argentina	n.a.	0.5	11.0	600	285	2.11	11,268
Australia	n.a.	0.5	11.8	750	360	2.08	11,151
Egypt	n.a.	3.2	77.9	600	330	1.82	9,732
Morocco	n.a.	1.0	25.1	600	330	1.82	9,732
All Other States of Brazil	192.6	4.3	105.0	545	315	1.73	9,263
Turkey	n.a.	1.9	46.7	650	380	1.71	9,155
Texas	3.0	0.1	1.4	457	300	1.52	8,162
Costa Rica	n.a.	0.3	8.0	400	285	1.40	7,512
Florida (2017/18 Post-Irma)	146,4	1,8	45,0	307	271	1,13	6.053
Mexico	n.a.	4.6	112.7	350	285	1.23	6,573
China	n.a.	7.3	178.9	250	300	0.83	4,460

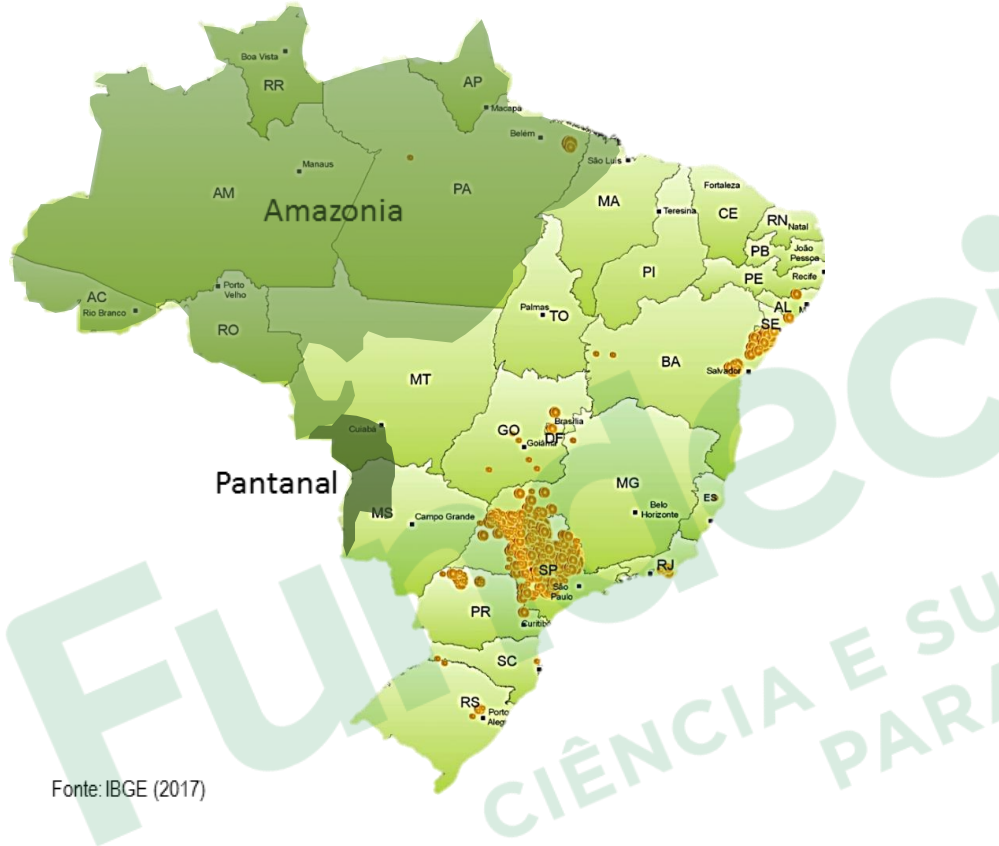
n.a. = not available.

Source: Based on data from Fundecitrus, IBGE, CitrusBR, USDA and FCPA.



# ▶ THE BRAZILIAN AND SÃO PAULO STATE CITRICULTURE

The main orange juice producer in the world



Fonte: IBGE (2017)



# ▶ SÃO PAULO COMPETITIVE ADVANTAGE

- Favorable soil and climate
- Adequate infrastructure (highway and port)
- Know-how of growers and industry
- Strong research network





# ▶ DIRECT JOBS IN SAO PAULO STATE

Citrus: 465,635 hectares  
9,845 farms in Sao Paulo  
**200,000 jobs (direct and indirect)**

**1 direct employee per 10  
hectares**





# TREE INVENTORY AND ORANGE CROP FORECAST FOR SÃO PAULO AND WEST-SOUTHWEST MINAS GERAIS CITRUS BELT

2018/2019



# ▶ TECHNICAL COMMITTEE



**Ezequiel Castilho**  
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**Ivan Brandimarte**  
Cambuhy

**Luiz Catapani**  
Citrus grower

**Bruno Zacarin**  
Statistician at Citrosuco

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PES Supervisors

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Technology Transfer

**Vinícius Trombin**  
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Analist of metodologies and full  
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**Marcos Fava Neves**  
PES Political-institucional and  
Methodological Coordinator, part-time  
Full Professor at FEA-RP/USP and  
other organizations



# METHODOLOGY

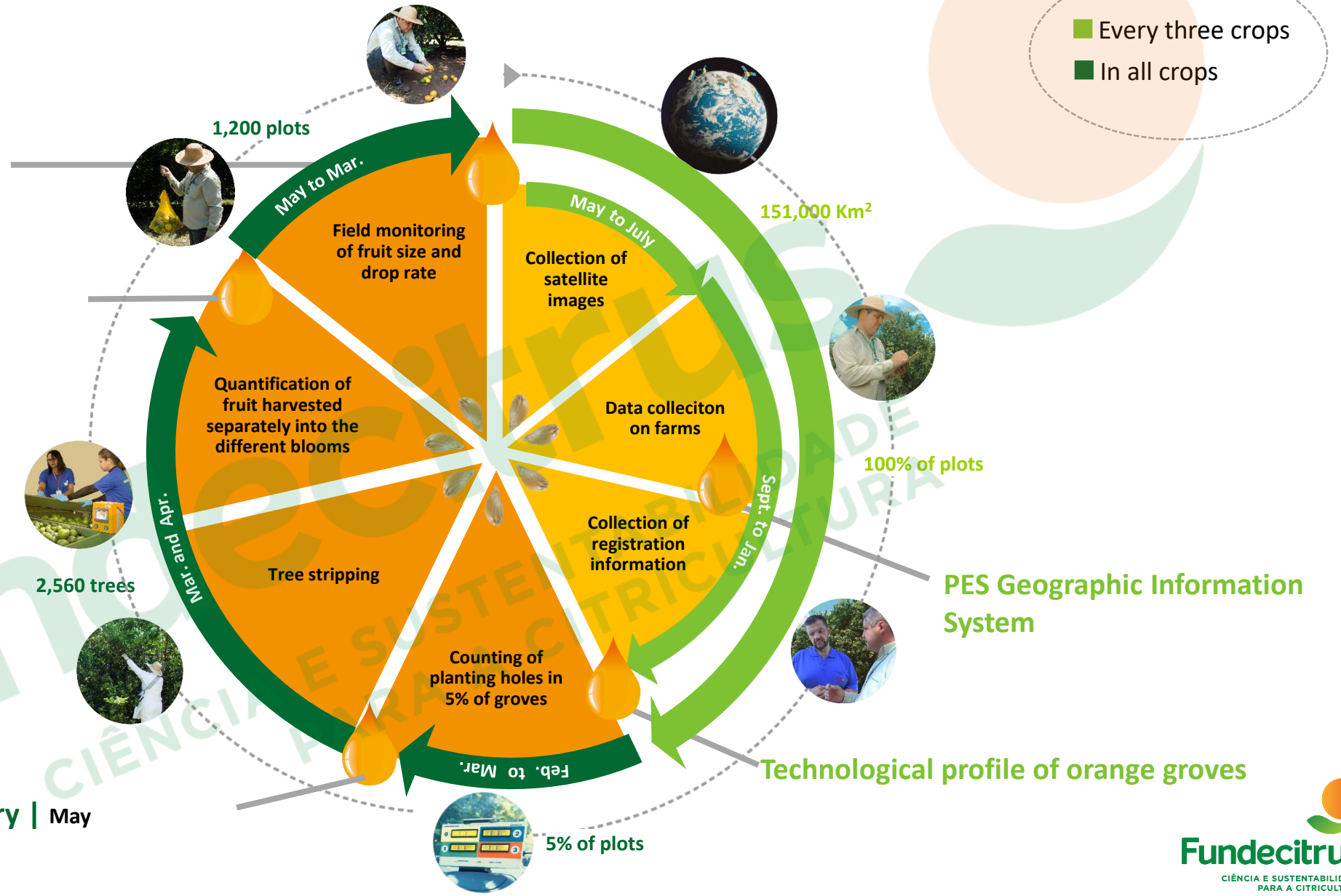


# PES METHOD AND CRONOLOGY

Orange crop forecast updates  
September, December, February and April

Orange crop forecast | May

Orange tree inventory | May



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# 2018 INVENTORY ALL CITRUS



# ▶ CITRUS BELT

Citrus: **465.635** ha

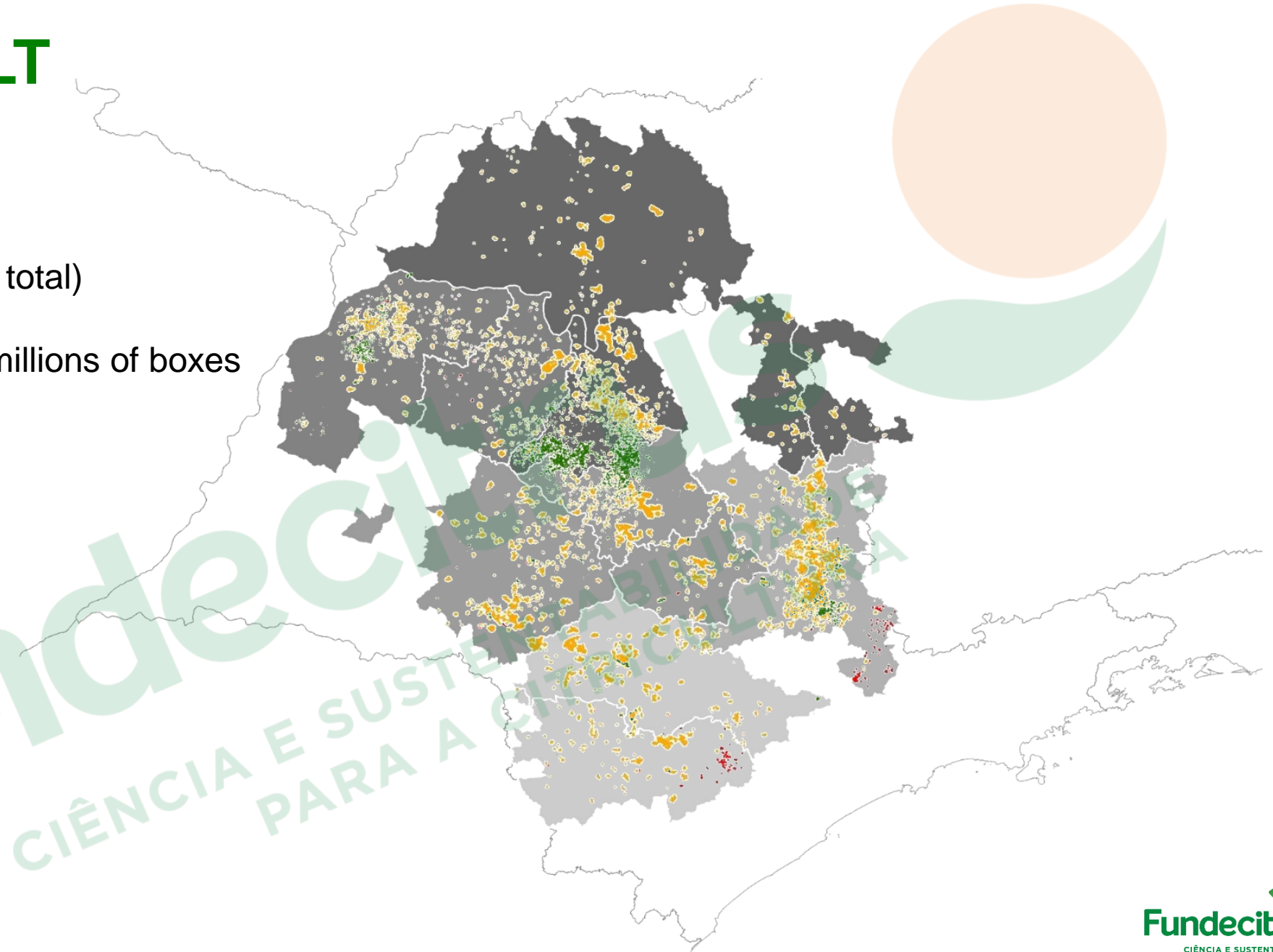
Orange: **401.470** ha (89% of total)

Orange Production: **288,29** millions of boxes

Productivity: **762** boxes/ha



- Oranges
- Acid lime and lemons
- Tangerines





# ▶ VARIETIES



**Oranges**



**Other oranges**



**Acid lime and lemons**



**Tangerines**

**Early season**

Hamlin  
Westin  
Rubi  
Valencia  
Americana  
Seleta  
Pineapple

**Mid season**

Pera Rio

**Late season**

Valencia  
Valencia Folha  
Murcha  
Natal

Washington Navel  
and Baianinha

Charmute de  
Brotas

Acidless sweet  
oranges and  
sweet lime

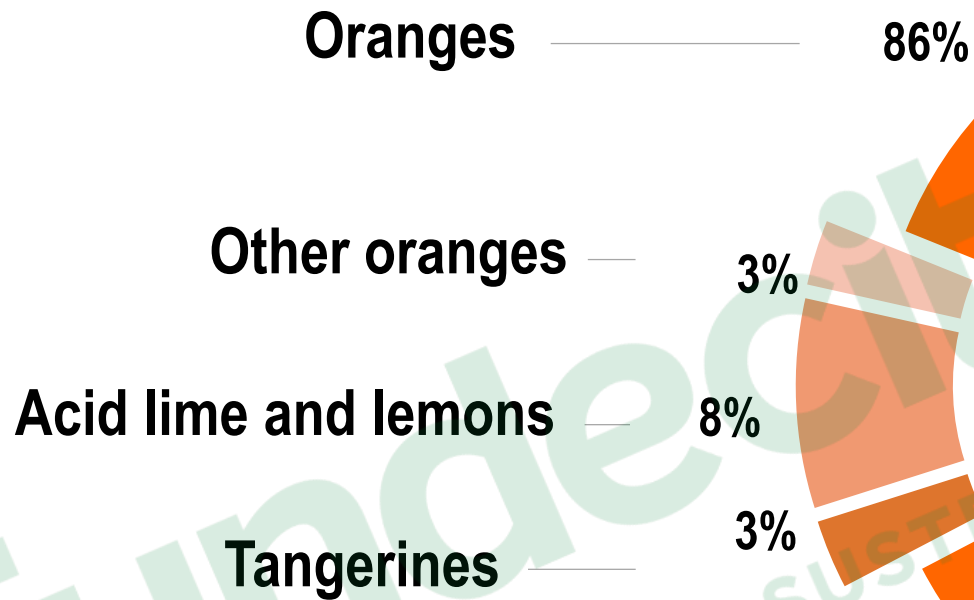
Tahiti acid lime  
(Persian lime)

Sicilian lemon

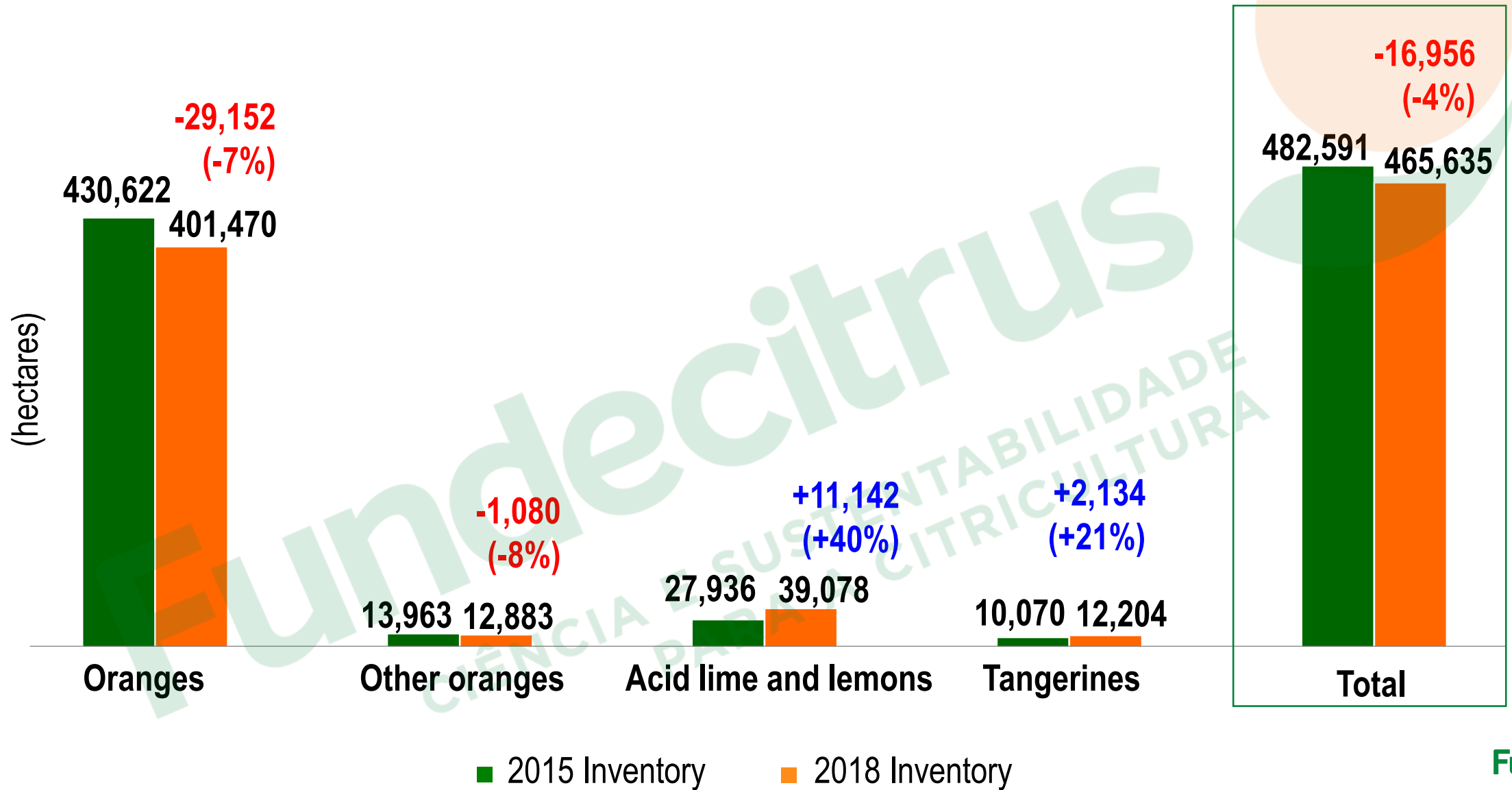
Other varieties  
including non-  
identified ones

Ponkan  
Murcott  
Other

# ▶ CITRUS AREA PERCENTAGE



# ▶ ALL CITRUS AREA (2015 AND 2018)

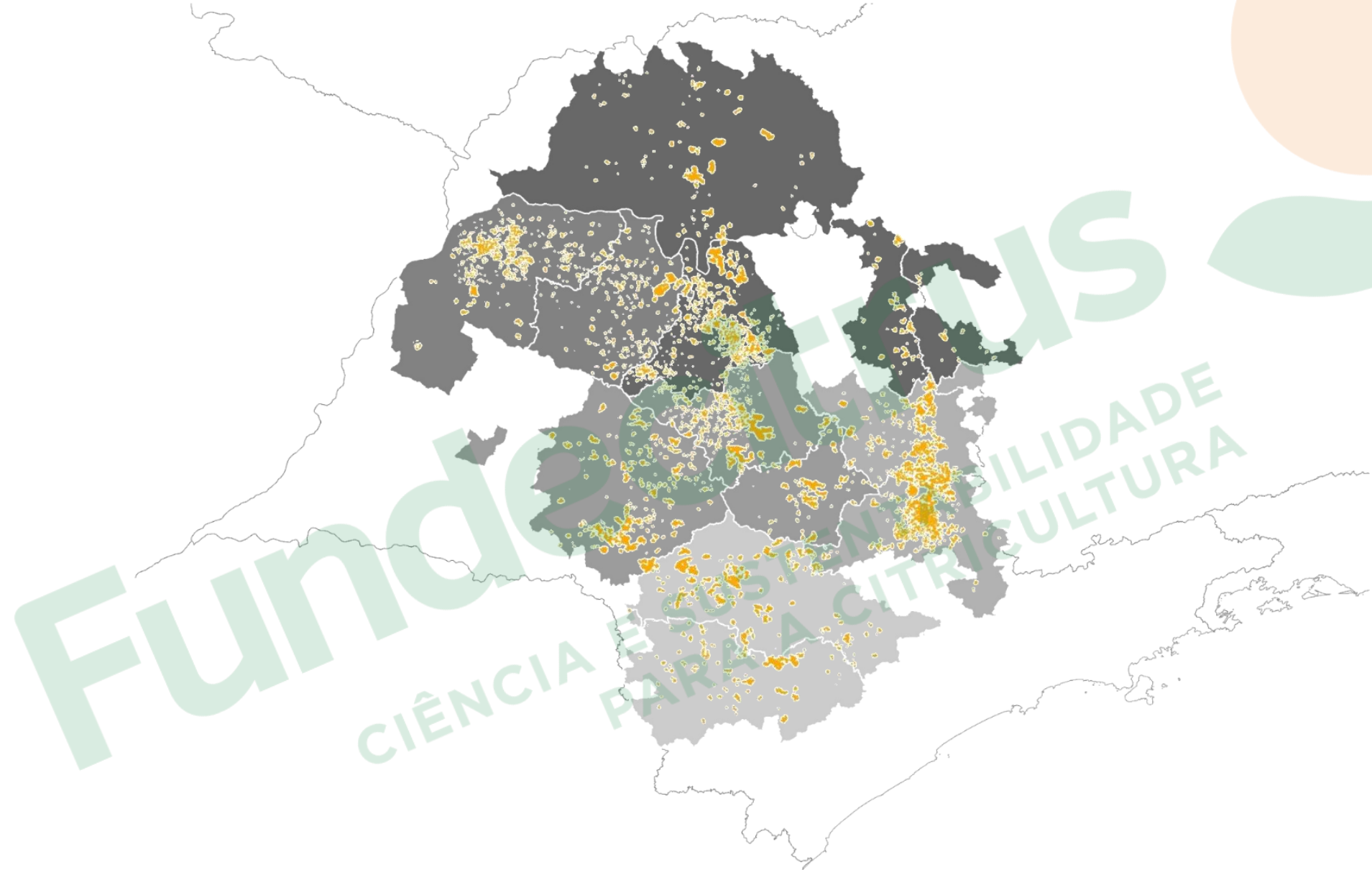
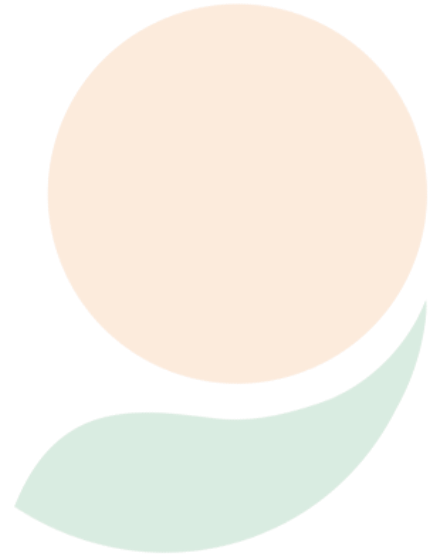




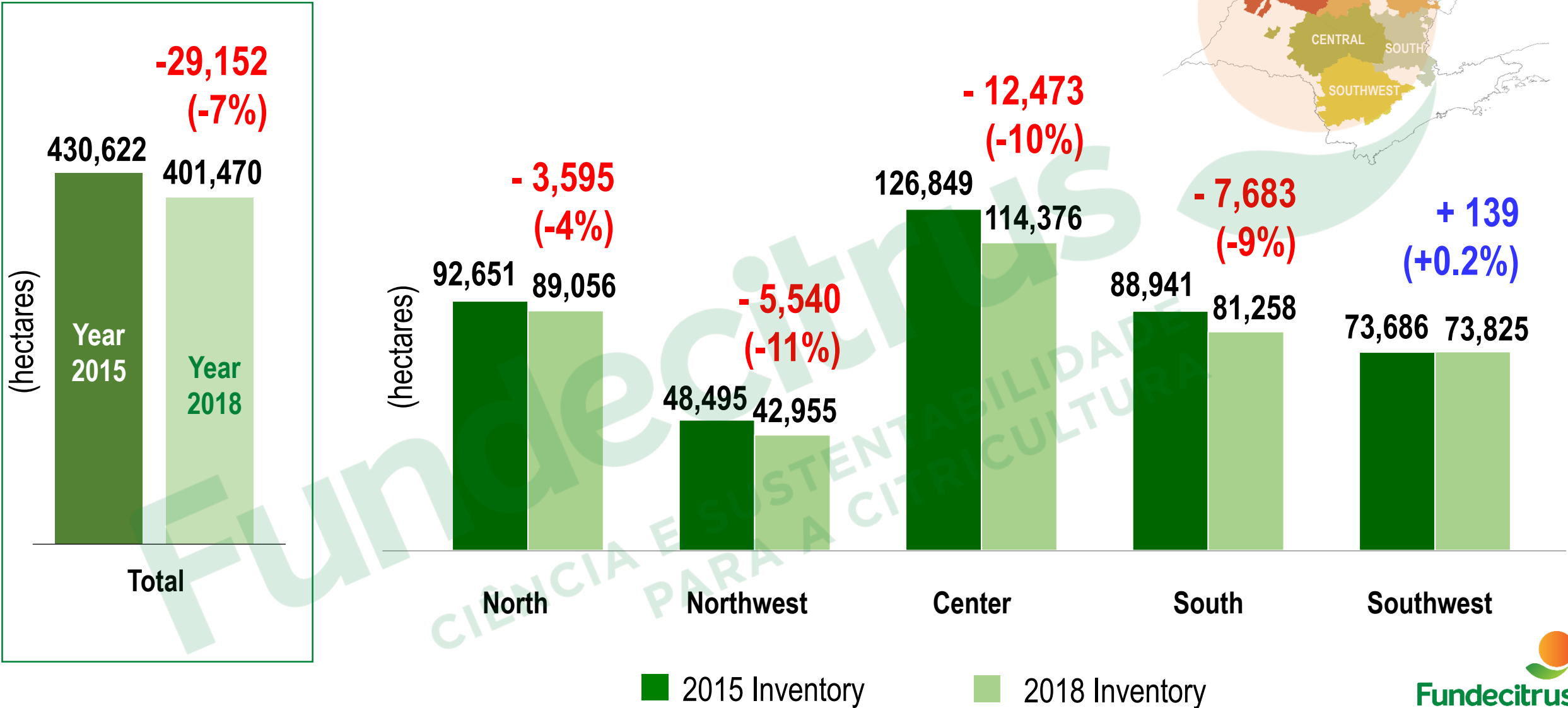
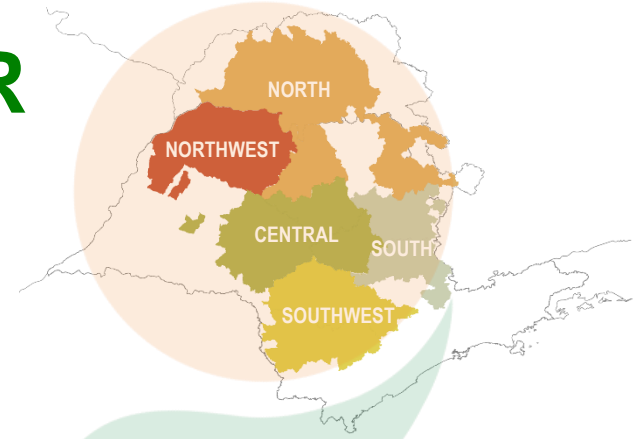
# ORANGES



# ▶ ORANGE GROVES

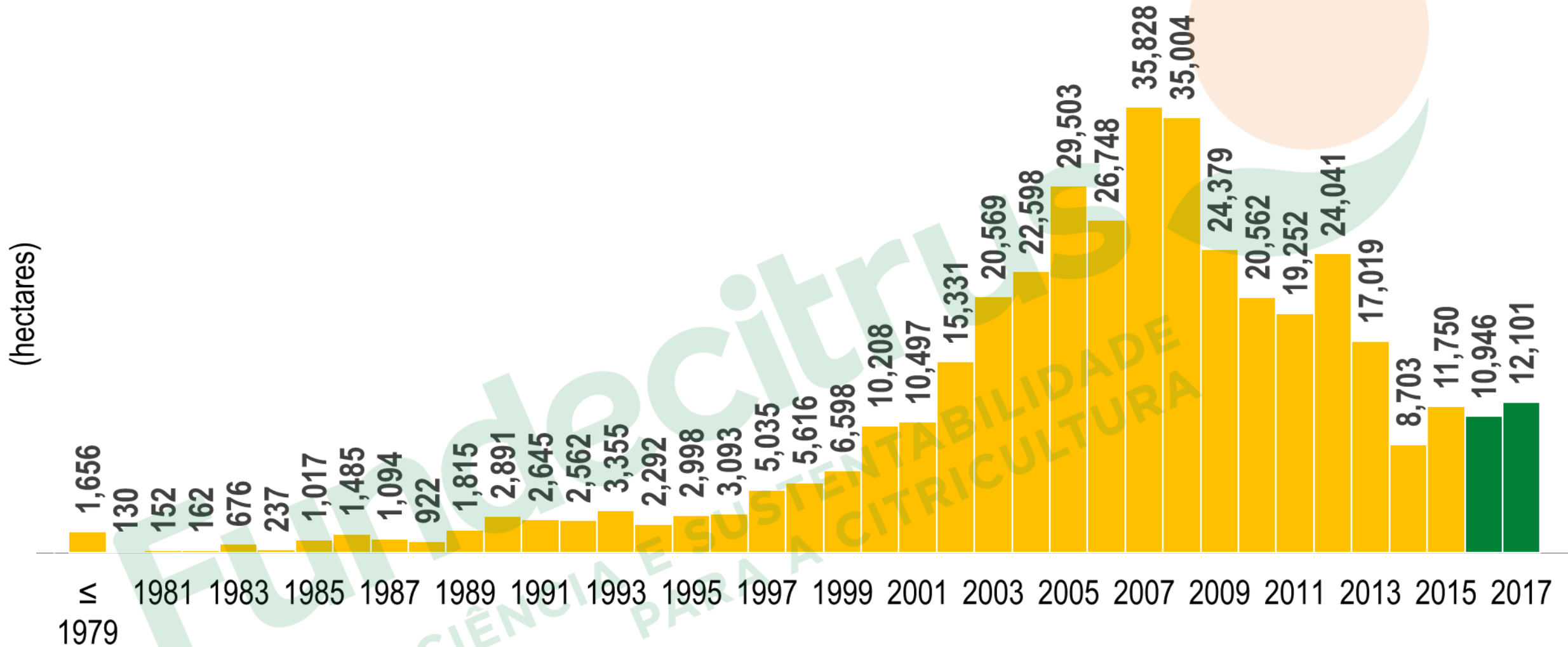


# AREA OF ORANGE GROVES BY SECTOR



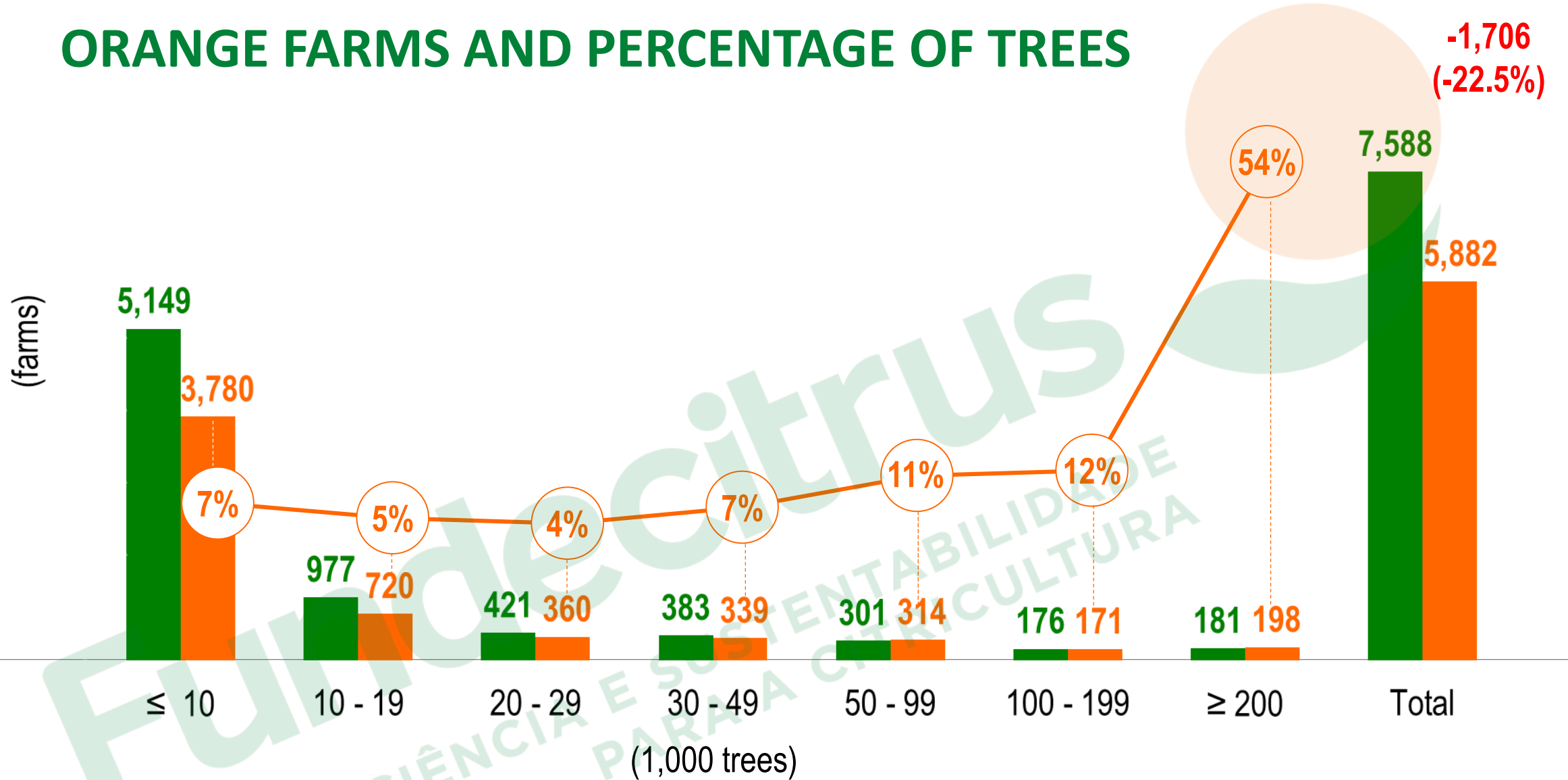


# AREA OF ORANGE GROVES BY YEAR SET





# ORANGE FARMS AND PERCENTAGE OF TREES



■ 2015 Inventory   ■ 2018 Inventory   ○ Percentage of trees in the citrus belt in 2018



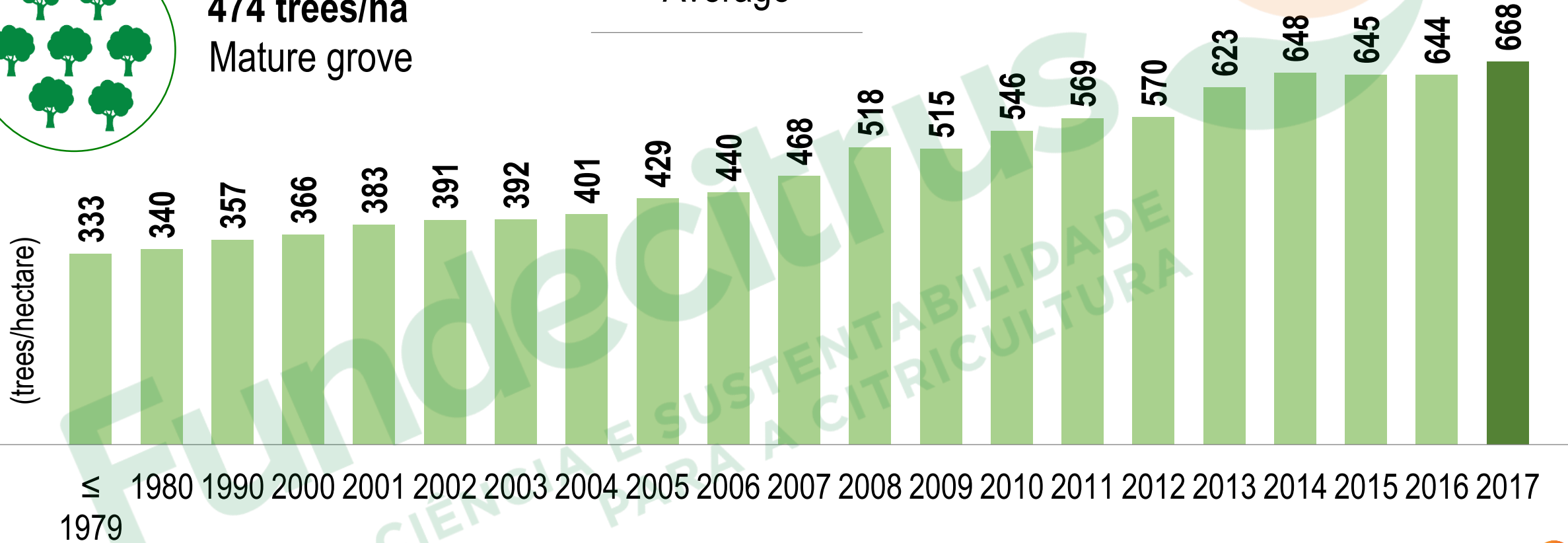
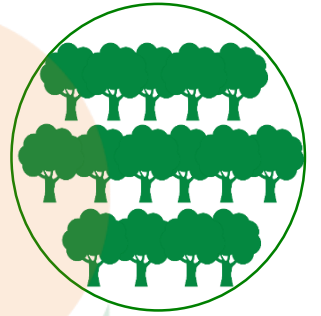
# DENSITY OF GROVES



**474 trees/ha**  
Mature grove

**484 trees/ha**  
Average

**656 trees/ha**  
Young groves



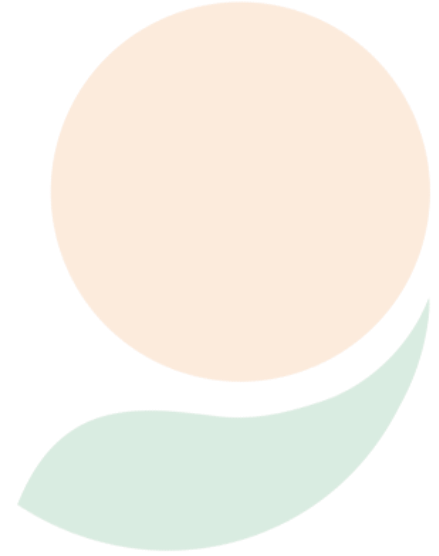


# 2018-2019 ORANGE CROP FORECAST





## ▶ EQUATION FOR CROP FORECAST



$$\text{Production forecast} = \frac{\text{Bearing trees} \times \text{Fruit per tree} \times (1 - \text{Fruit loss from droppage}) \times (1 - \text{CF})}{\text{Fruit size}}$$

CF = Correction factor

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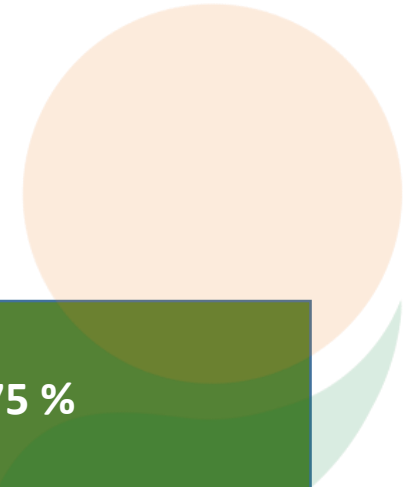
**288.29 MILLION BOXES OF 40.8 KG**



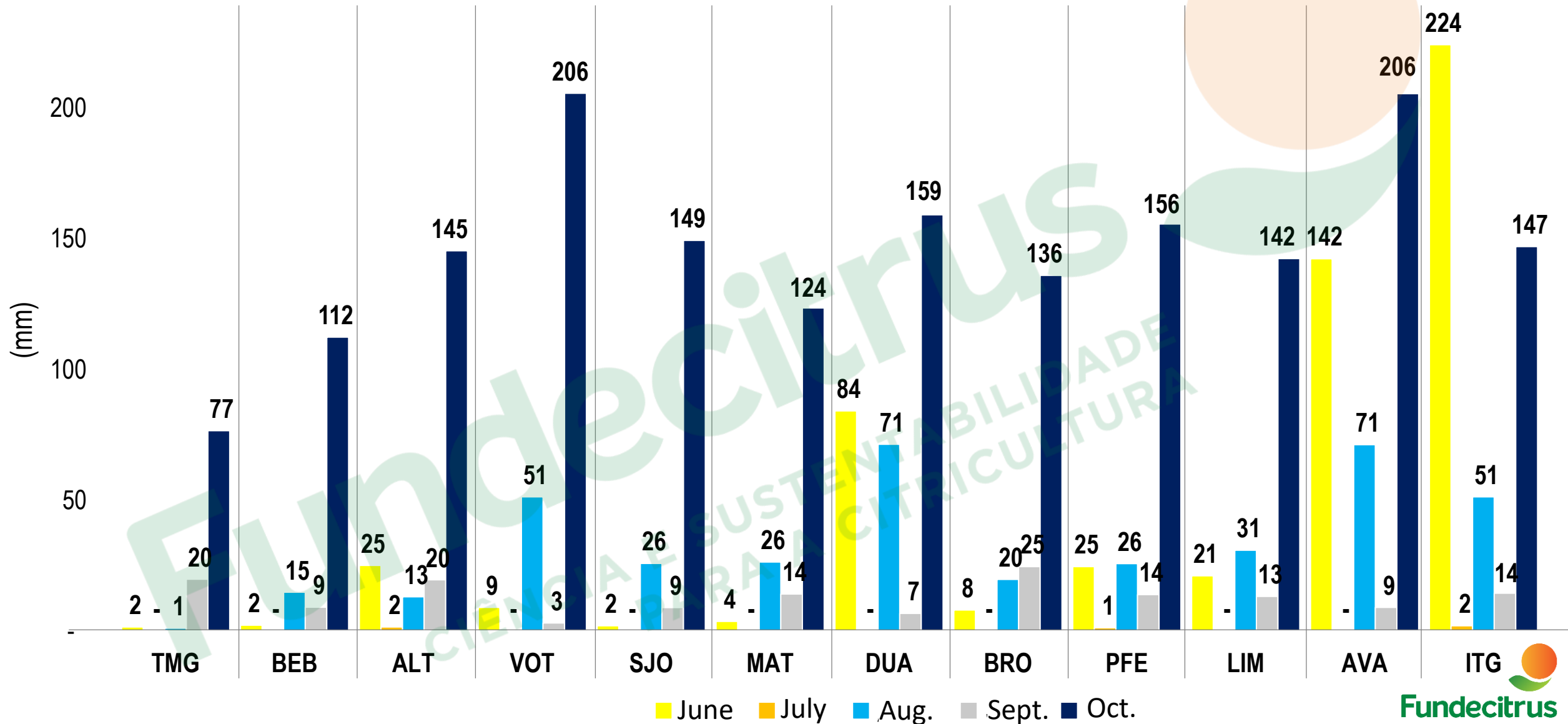




# BLOOM PROFILE FOR THE 2018-2019 SEASON

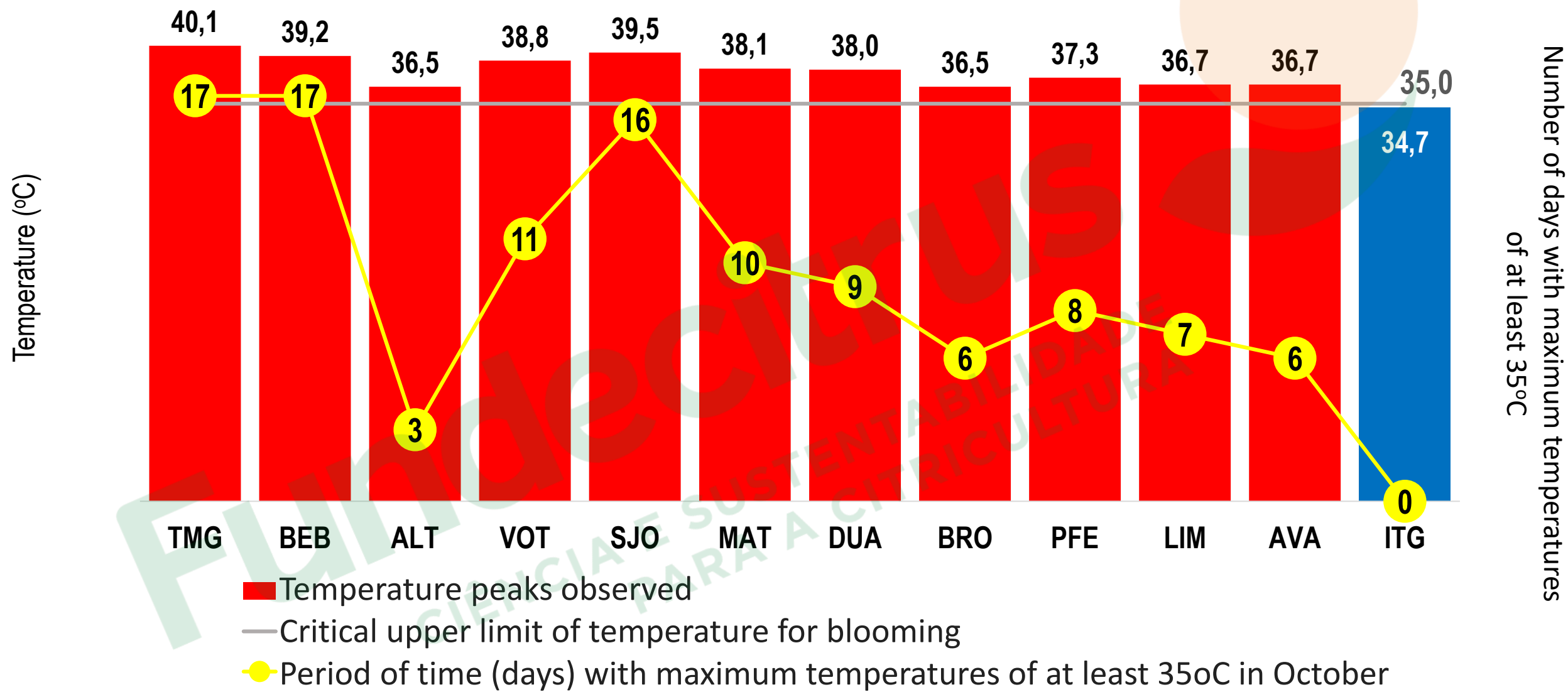


# PRECIPITATION IN OCTOBER WAS IMPORTANT FOR BLOOMING IN ALMOST ALL REGIONS - 2017





# TEMPERATURES ABOVE 35°C IN OCTOBER AFTER BLOOMING (FROM 05 TO 21 OCTOBER, 2017)



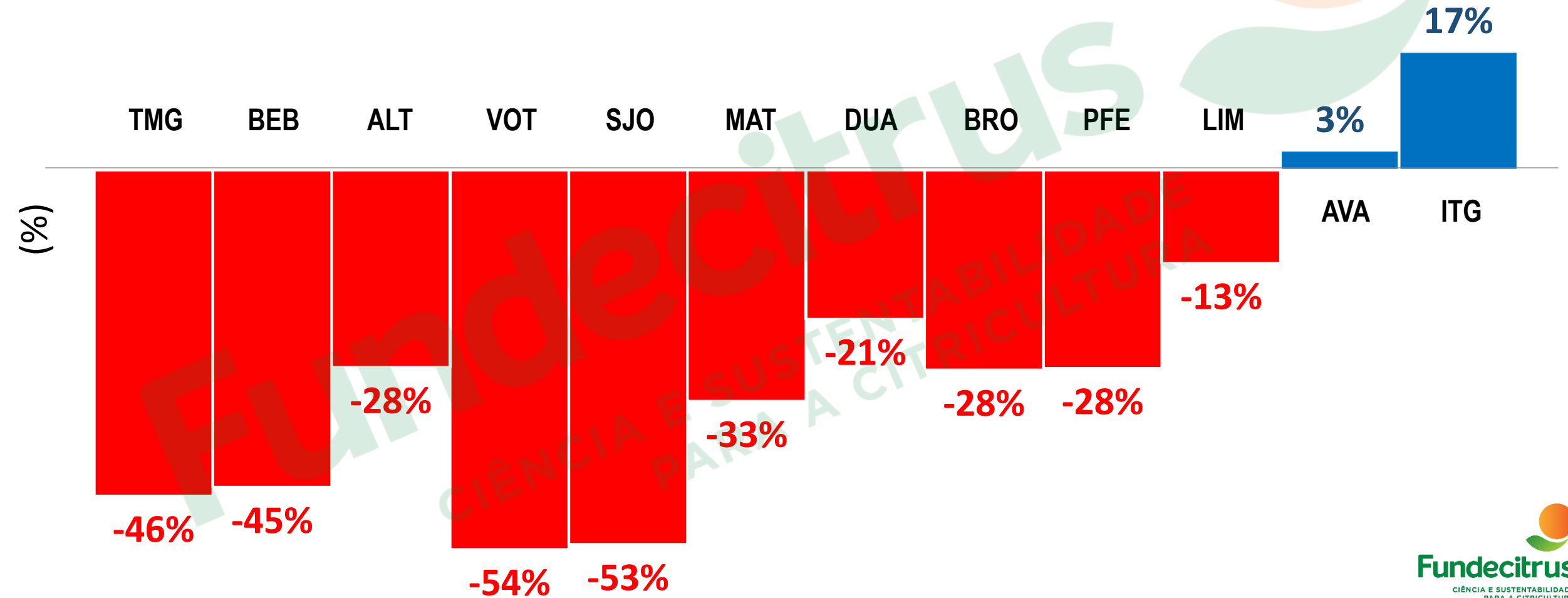
Source: Somar Meteorologia.





# VARIATION IN NUMBER OF FRUIT PER TREE AT STRIPPING BY REGION

Difference between average for April/2018 and April/2017



# Projections



**Final fruit size**  
(fruit per box at harvest)



**Drop rate**



# FINAL FRUIT SIZE ESTIMATION

Fruit per tree  
at stripping



Fruit weight  
at stripping



Accumulated  
precipitation  
for May  
through July

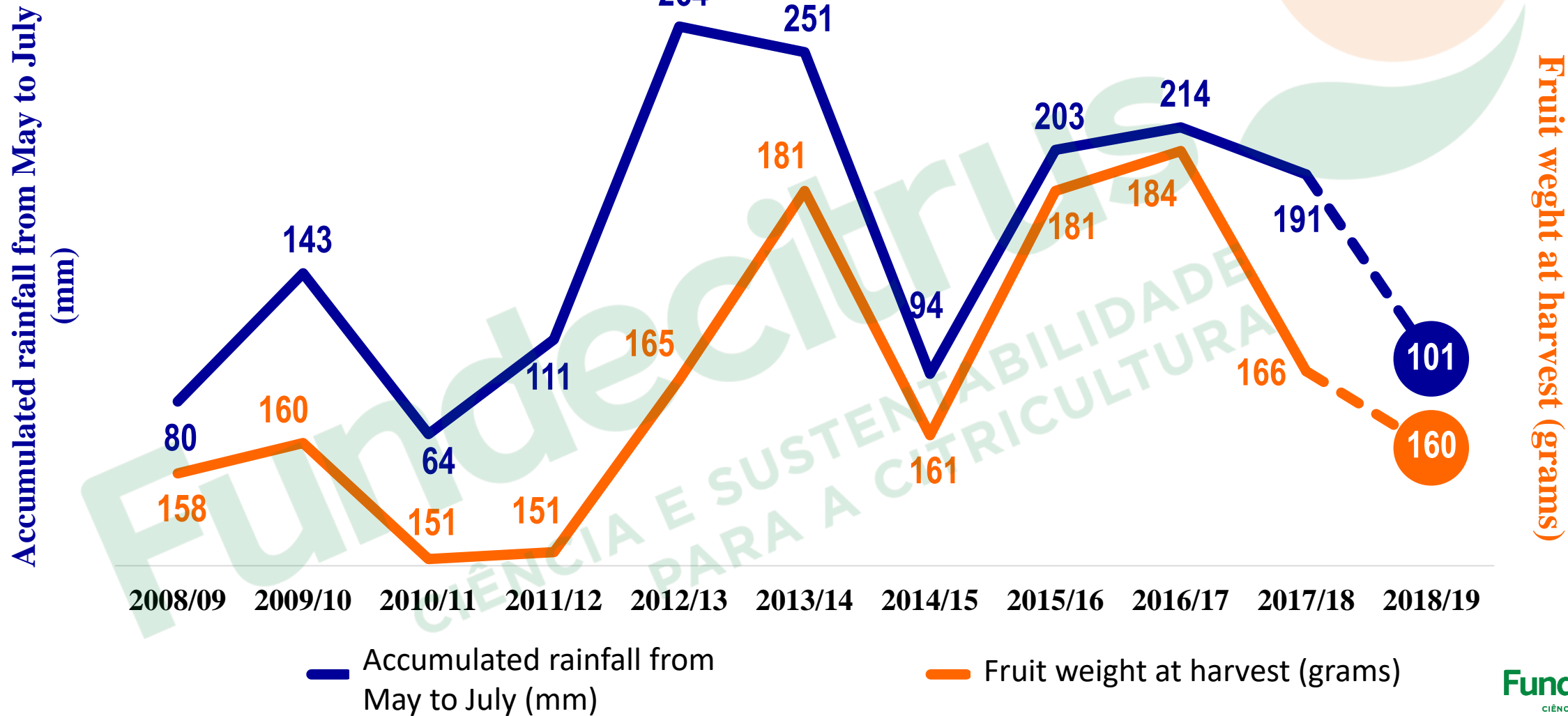
10 last seasons

Ajusted  $R^2 = 87\%$






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# INFLUENCE OF ACCUMULATED RAINFALL FROM MAY TO JULY ON FRUIT WEIGHT AT HARVEST



# REASONS OF THE ORANGE FRUIT DROP

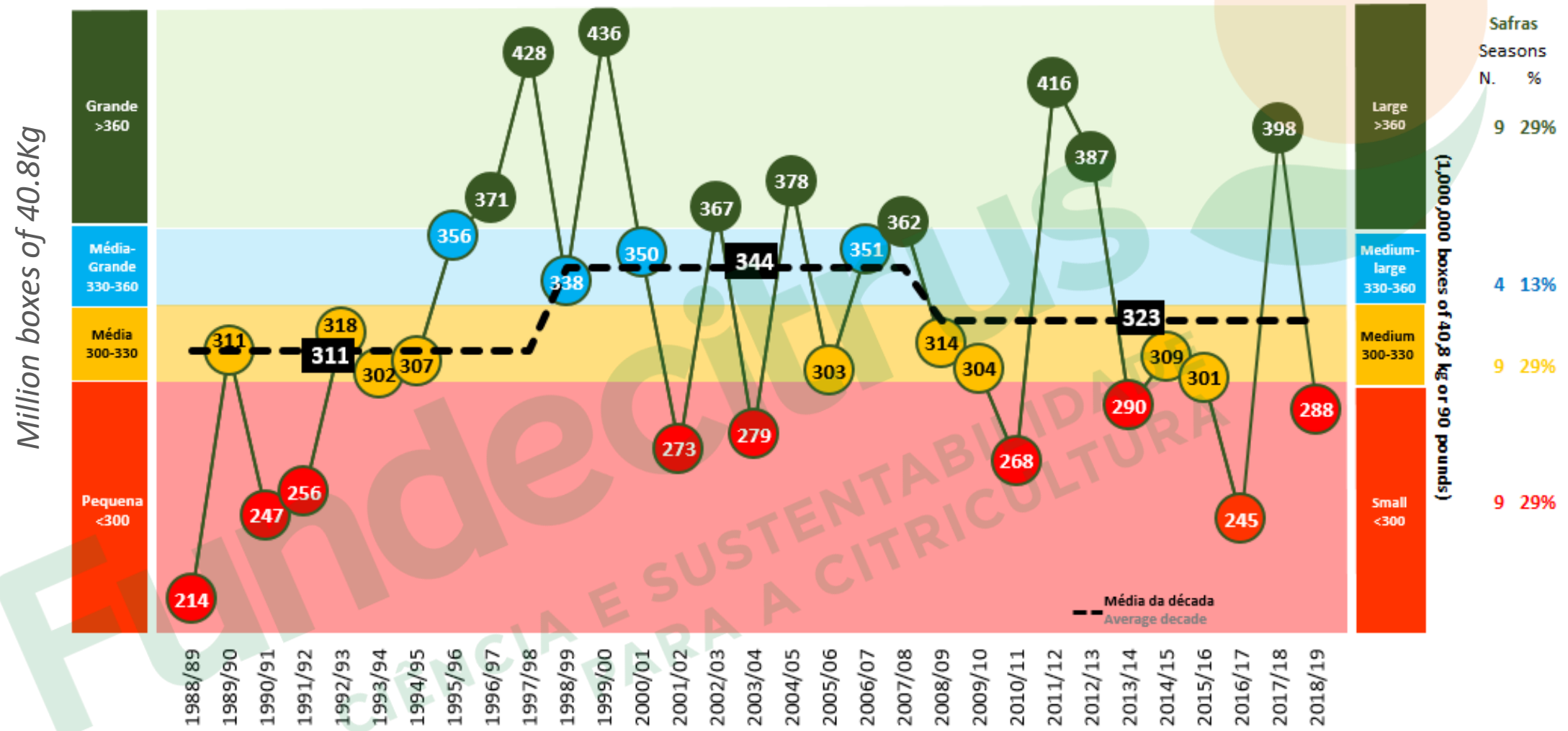
Reasons	2016/2017 (%)	2017/2018 (%)
Natural or physica	5.99%	7.45%
 Greening (HLB)	1.37%	4.06%
 Fruit borer and Fruit fly	2.34%	2.70%
 Black spot	3.75%	2.16%
 Leprosis	0.25%	0.62%
 Canker	0.03%	0.31%
<b>Total</b>	<b>13.73%</b>	<b>17.31%</b>

# ORANGE PRODUCTION FORECAST FOR THE 2018-2019 SEASON

Variety group	Forecast componentes				2018/2019 Orange crop forecast		
	Bearing Trees	Fruits per tree at stripping	Fruits forecasted by box	Fruit loss from droppage forecast	By tree	By hectare	Total
	<i>(1,000 trees)</i>	<i>(fruit/tree)</i>	<i>(fruis/box)</i>	<i>(%)</i>	<i>(boxes/tree)</i>	<i>(boxes/hectare)</i>	<i>(1,000,000 boxes)</i>
Hamlin, Westin and Rubi.....	26,649	766	292	11.0	2.09	917	55.81
Other earlies.....	7,959	664	255	11.0	2.08	914	16.55
Pera Rio.....	61,575	454	255	17.5	1.32	650	81.16
Valencia and Valencia Folha Murcha	59,583	560	240	20.0	1.67	764	99.80
Natal.....	19,503	603	240	20.5	1.79	797	34.97
<b>Total 2018/2019.....</b>	<b>175,269</b>	<b>564</b>	<b>256</b>	<b>17.0</b>	<b>1.64</b>	<b>762</b>	<b>288.29</b>



# ORANGE YIELD IN SAO PAULO STATE



Source: CitrusBR (1998/89 a 2014/15) e Fundecitrus (2015/16 a 2018/19).



## **FORECAST DATES**

*Executive Summary for the 2018-2019 Season:  
May 09, 2018*

*March/2018 tree inventory:  
May 21, 2018*

*May forecast (orange production forecast):  
May 21, 2018*

**September forecast (1st orange  
production forecast update):  
September 10, 2018**

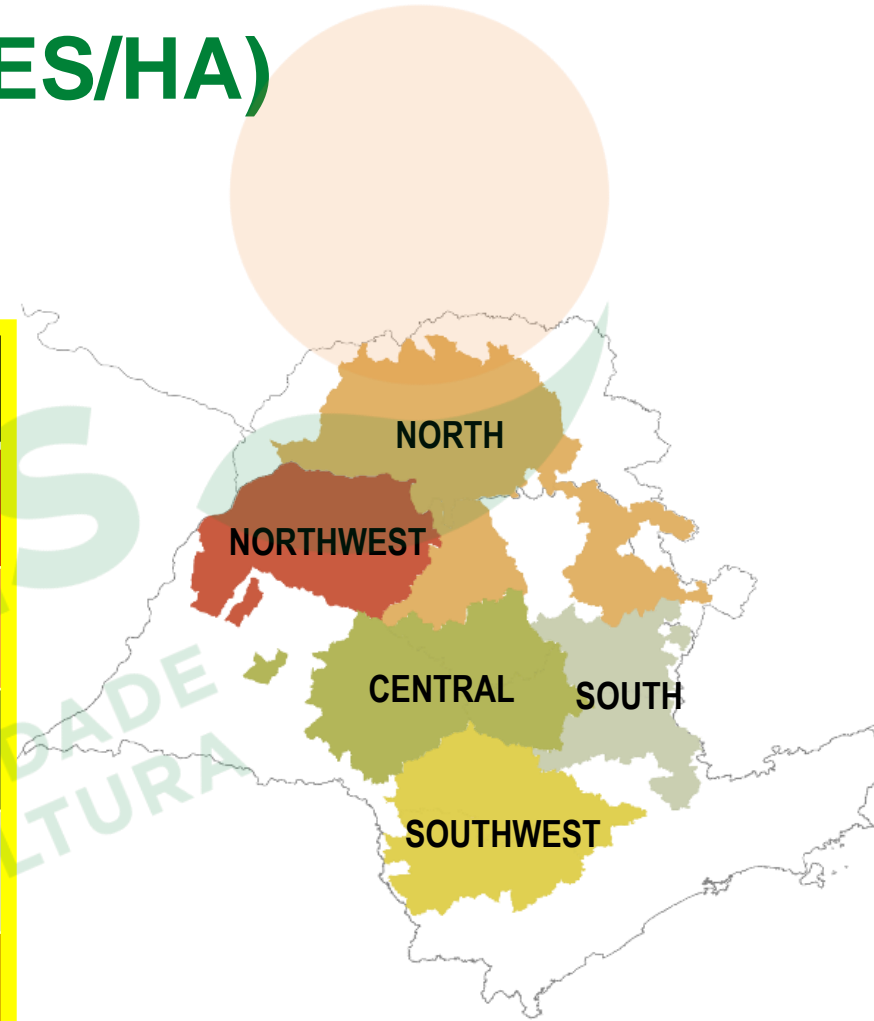
*December forecast (2nd orange production forecast  
update): December 10, 2018*

*February forecast (3rd orange production forecast  
update): February 11, 2019*

*April forecast (final orange production estimate): April 10,  
2019*

# SECTOR AND PRODUCTIVITY (BOXES/HA)

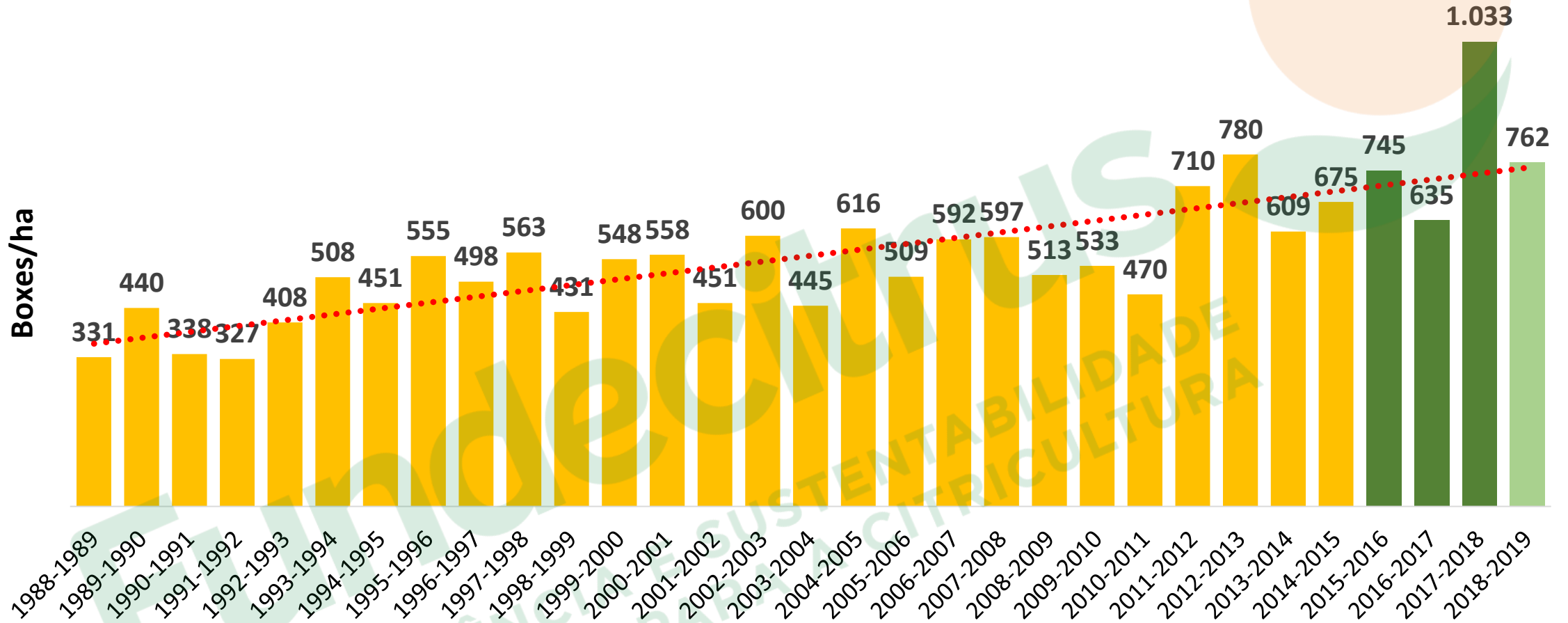
SECTORS	2015	2016	2017	2018	AVERAGE
NORTHWEST	450	377	880	419	531
NORTH	792	495	1105	612	751
CENTER	613	616	981	714	731
SOUTH	779	664	986	773	800
SOUTHWEST	1052	950	1.151	1.199	1.088







# PRODUCTIVITY



Source: CitrusBR e IBGE (1988-1989 a 2014-2015) Fundecitrus (2015, 2016, 2017) Forecast Fundecitrus (2018)

# WHY HAS THE PRODUCTIVITY INCREASED?

- Health young trees
- Varieties and rootstocks
- New planting systems
- Irrigation and Nutrition
- Higher planting density
- Disease management







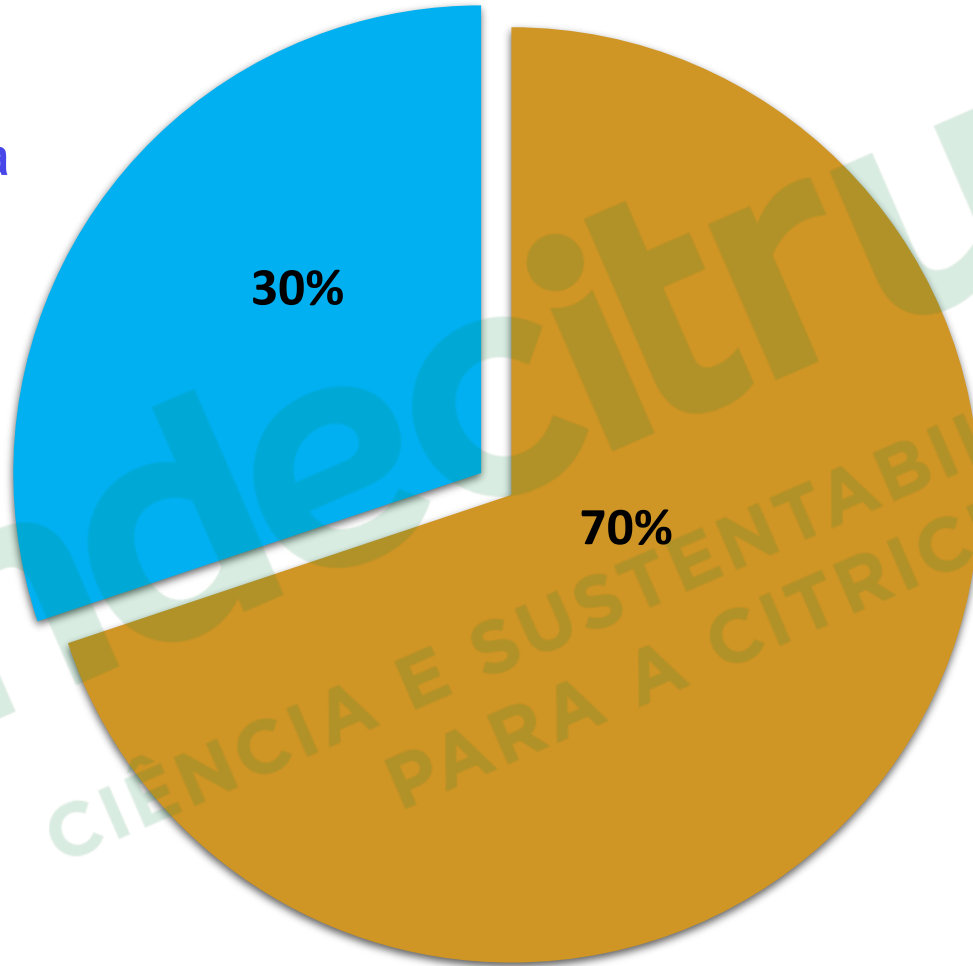




# IRRIGATED AND NOT IRRIGATED ORANGE GROVE AREA - 2018

Total 401,470 ha

120,988 ha  
Irrigated



280,482 ha  
Not irrigated



# FUNDECITRUS



Intelligence center, worldwide benchmark for science and sustainability in citriculture.

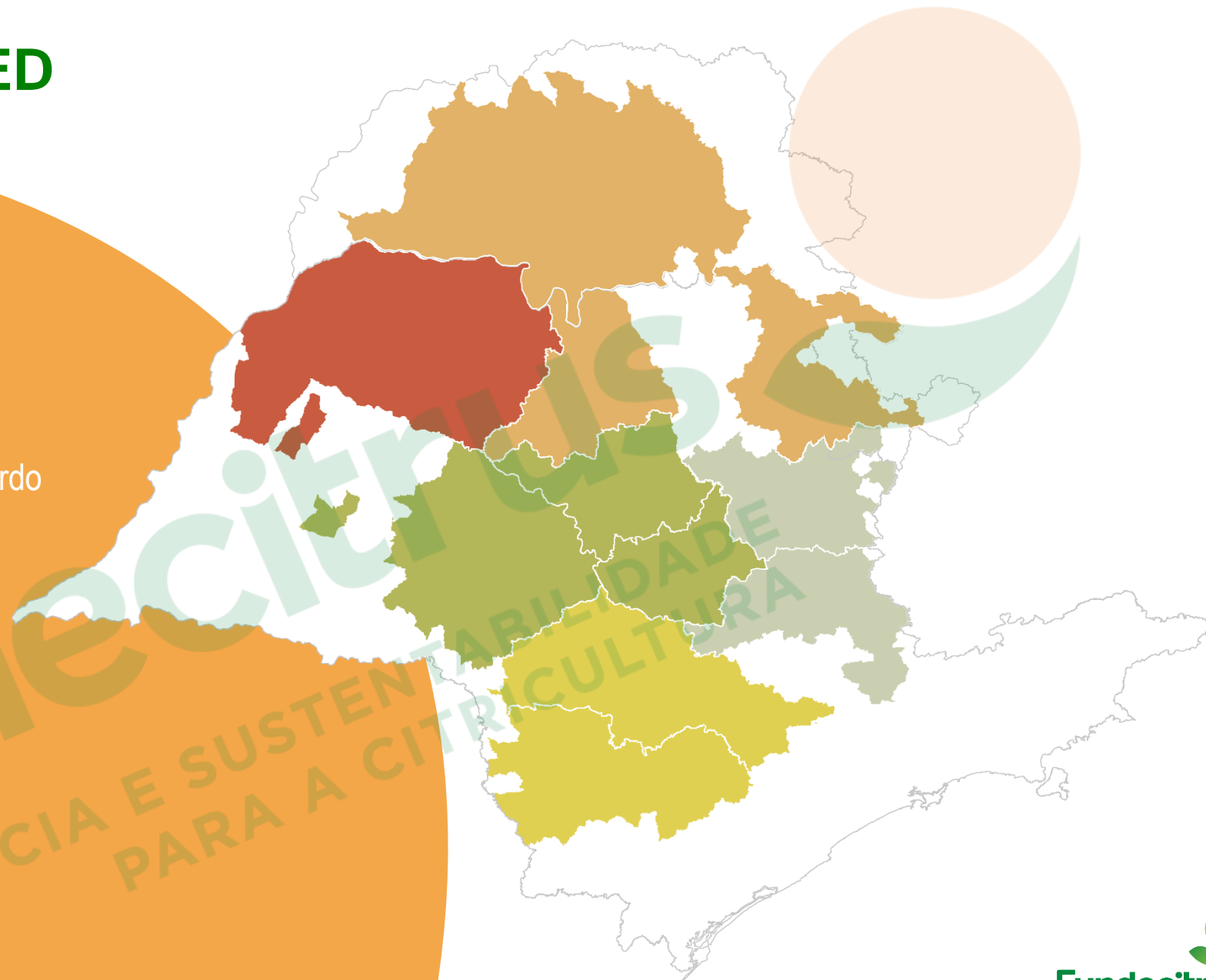
Maintained by citrus growers and orange juice companies (Budget: US\$ 9 million/year)

Pursuing effective and sustainable solutions to challenges in citrus plant health for 41 years.



## REGIONS COVERED

-  North  
West of Minas Gerais, Bebedouro and Altinópolis
-  Northwest  
Votuporanga and São José do Rio Pardo
-  Central  
Duartina, Matão and Brotas
-  South  
Avaré and Itapetininga
-  Southwest  
Porto Ferreira and Limeira







# ORGANIZATION CHART



Executive Board



President



Manager



Research & Development



Technology Transfer



Communication and Education



Crop Forecast Survey



Administration

Fundecitrus  
CIÊNCIA E SUSTENTABILIDADE  
PARA A CITRICULTURA



# AREAS OF WORK



RESEARCH AND  
INNOVATION



TRAINING OF  
PROFESSIONALS



TECHNOLOGY TRANSFER



CROP FORECAST  
SURVEY



# FUNDECITRUS IN NUMBERS

Fundecitrus



Centro de  
Pesquisa e  
Desenvolvimento

Joseph Marie Bové

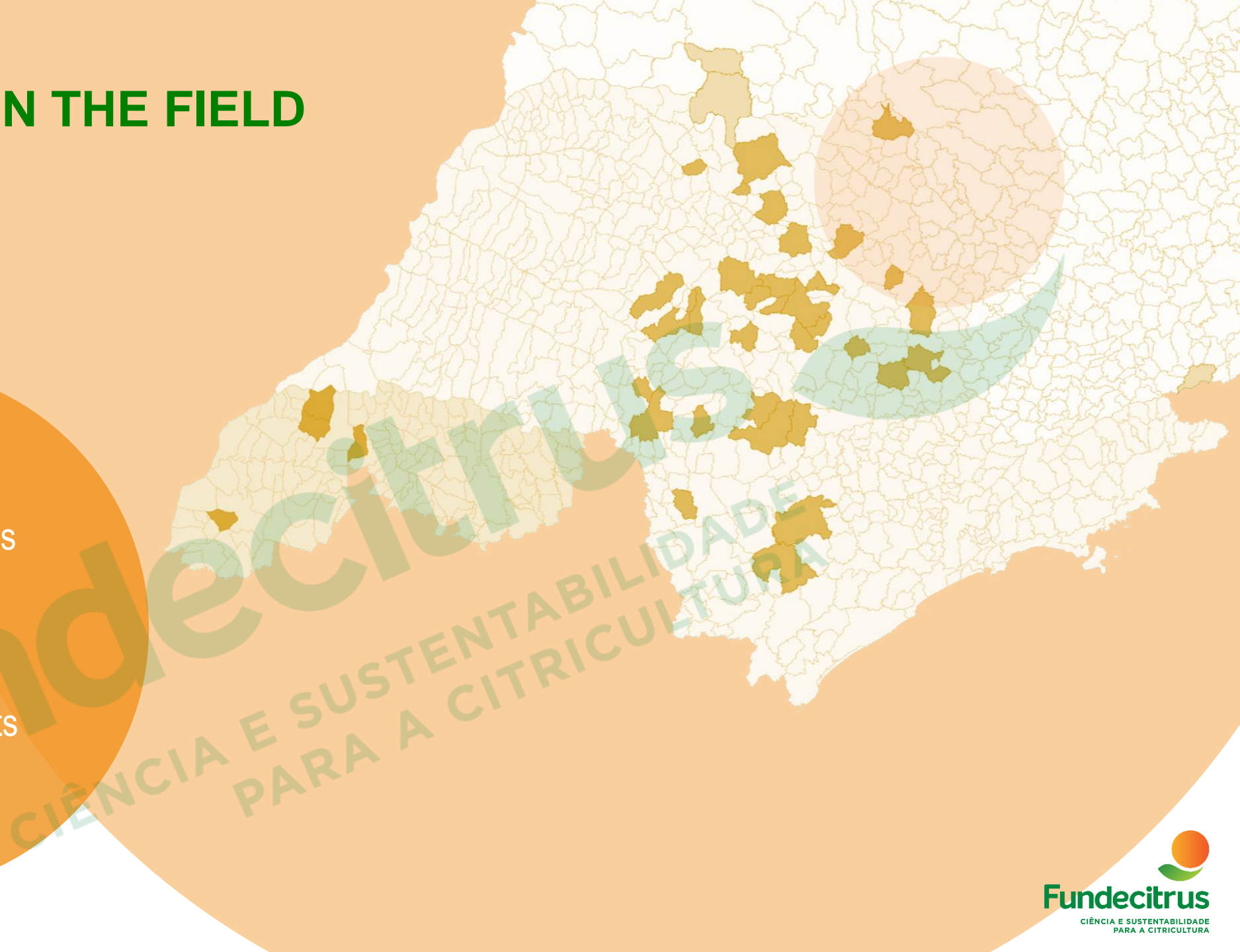
- 24 years of research
- 11 researchers
- 113 professionals in the team
- 1.3 mil m<sup>2</sup> of laboratories
- 70 experimental fields in 800 hectares
- 10 diseases and pests studied
- 80 research projects in progress
- 40 partner agencies in Brazil and worldwide





## RESEARCH IN THE FIELD

70 experimental areas  
798,423 hectares  
52 cities  
3 states  
10 diseases and pests



# FUNDECITRUS WORLD PARTNERS





# FUNDECITRUS COMPLEMENTARY EDUCATION CENTER



Cities: Araraquara and Itápolis





## THE PATH TO SUSTAINABILITY

Fundecitrus' efforts are consistent with the conservation of natural resources. Research draws attention to actions that contribute to a more sustainable management in citriculture, with investments on natural enemies, bioinsecticides, reduced use of water and more modern techniques for the application of agrochemicals.



A photograph of an orange orchard with many ripe oranges hanging from the trees. The text is overlaid on the left side of the image.

► FUNDECITRUS  
CONTRIBUTION TO THE  
CITRICULTURE  
COMPETITIVENESS





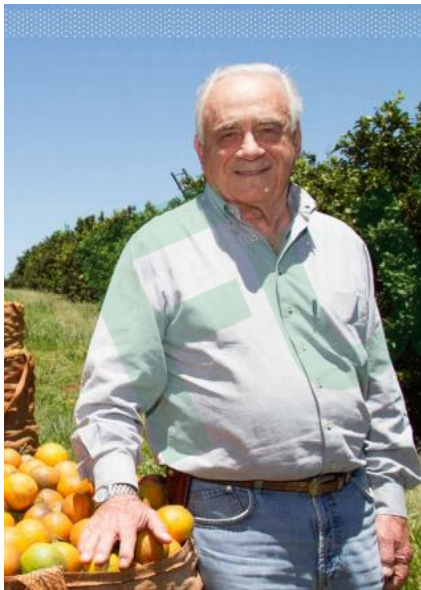
# TREE INVENTORY AND ORANGE CROP FORECAST



Center of projects and research



Public universities



At the beginning , a series of meetings helped transferring knowledge from the USDA





# DIAGNOSIS OF DISEASES AND BIOTECHNOLOGY LAB







# HEALTHY YOUNG TREES – PROTECTED NURSERIES



**Past – Before 2002**



**200 millions of young trees  
produced since 2003**



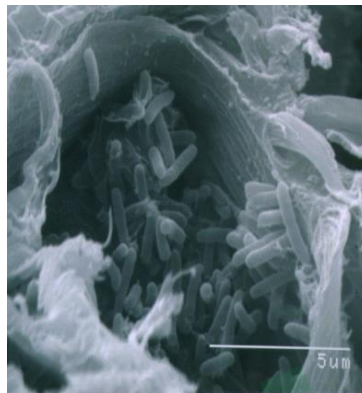
# CITRUS VARIEGATED CHLOROSIS

**Causal agent:** *Xylella fastidiosa*

**Vector:** sharpshooters

**Damages:**

- Defoliation
- Fruit depreciation for fresh market
- Yield reduction
- Poor fruit quality
  - Smaller fruit
  - Higher Brix and acidity
  - Less TSS and Ratio
  - Less intense juice color

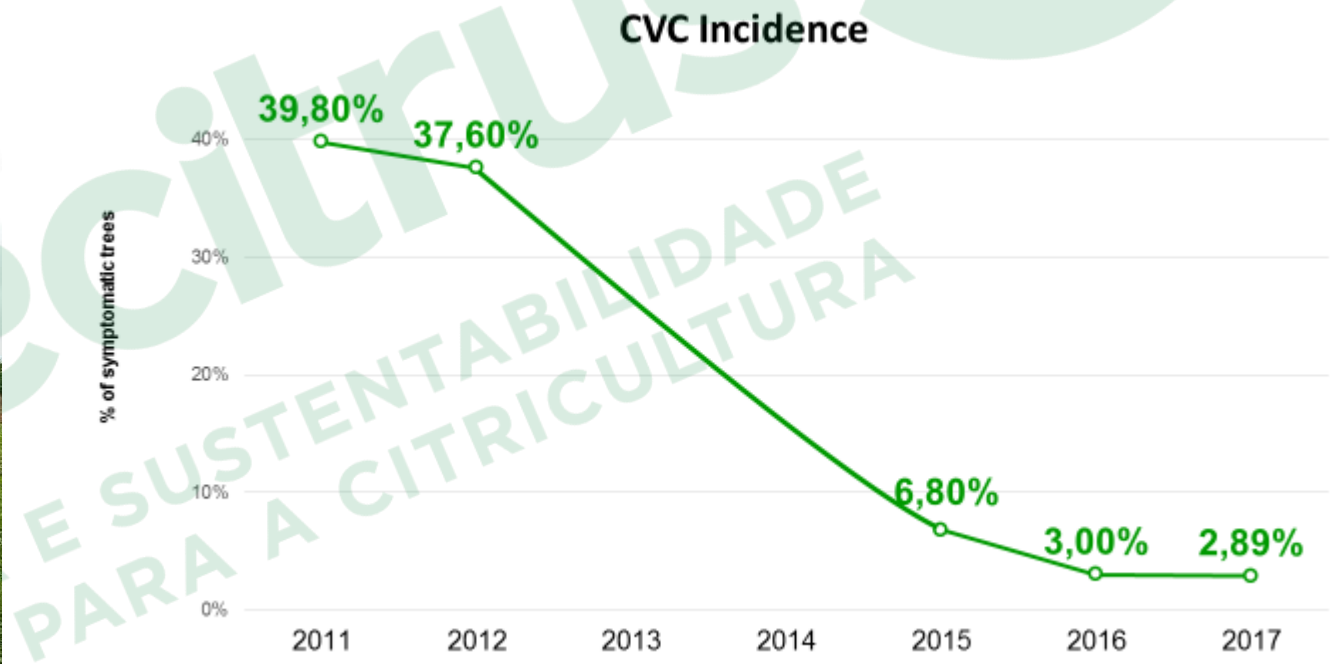




# CITRUS VARIEGATED CHLOROSIS

- ▶ SEQUENCING OF *XYLELLA FASTIDIOSA* GENOME
- ▶ CVC MANAGEMENT

- Healthy young trees
- Inspection and eradication of affected trees
- Vector control



Source: Fundecitrus.

Healthy grove: 97,1% without CVC



# ▶ ROOTSTOCKS TOLERANT TO CITRUS SUDDEN DEATH



INARCHING

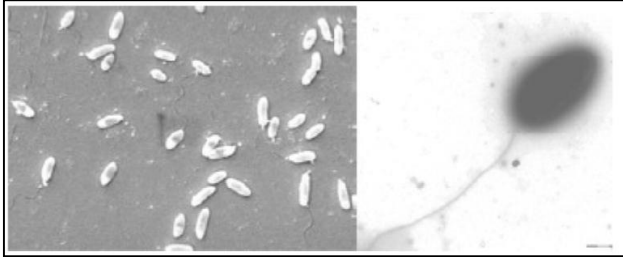
Valencia/Rangpur lime

Valencia/Cleopatra



# CITRUS CANKER

Causal agent: *Xanthomonas citri* pv. *citri*



## Damages:

- Defoliation
- Fruit depreciation for fresh market
- Premature fruit drop





# ▶ CITRUS CANKER MITIGATION



- Grove inspections
- Leaf miner biocontrol

- Windbreak
- Tolerant varieties
- Copper spray

- Material disinfection



# ▶ FRUIT BORER PHEROMONE



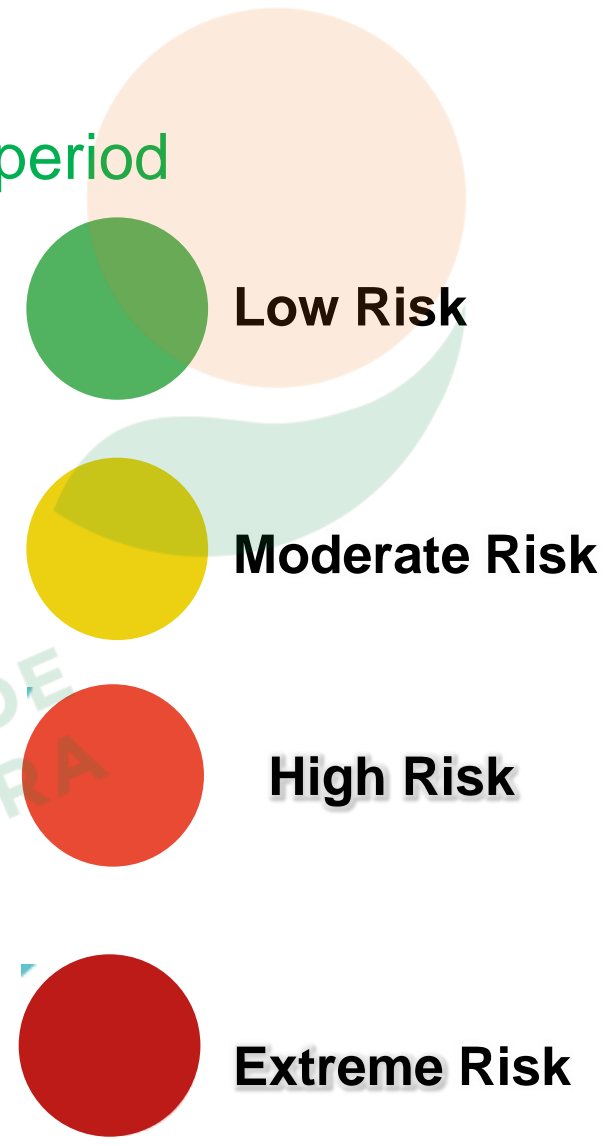
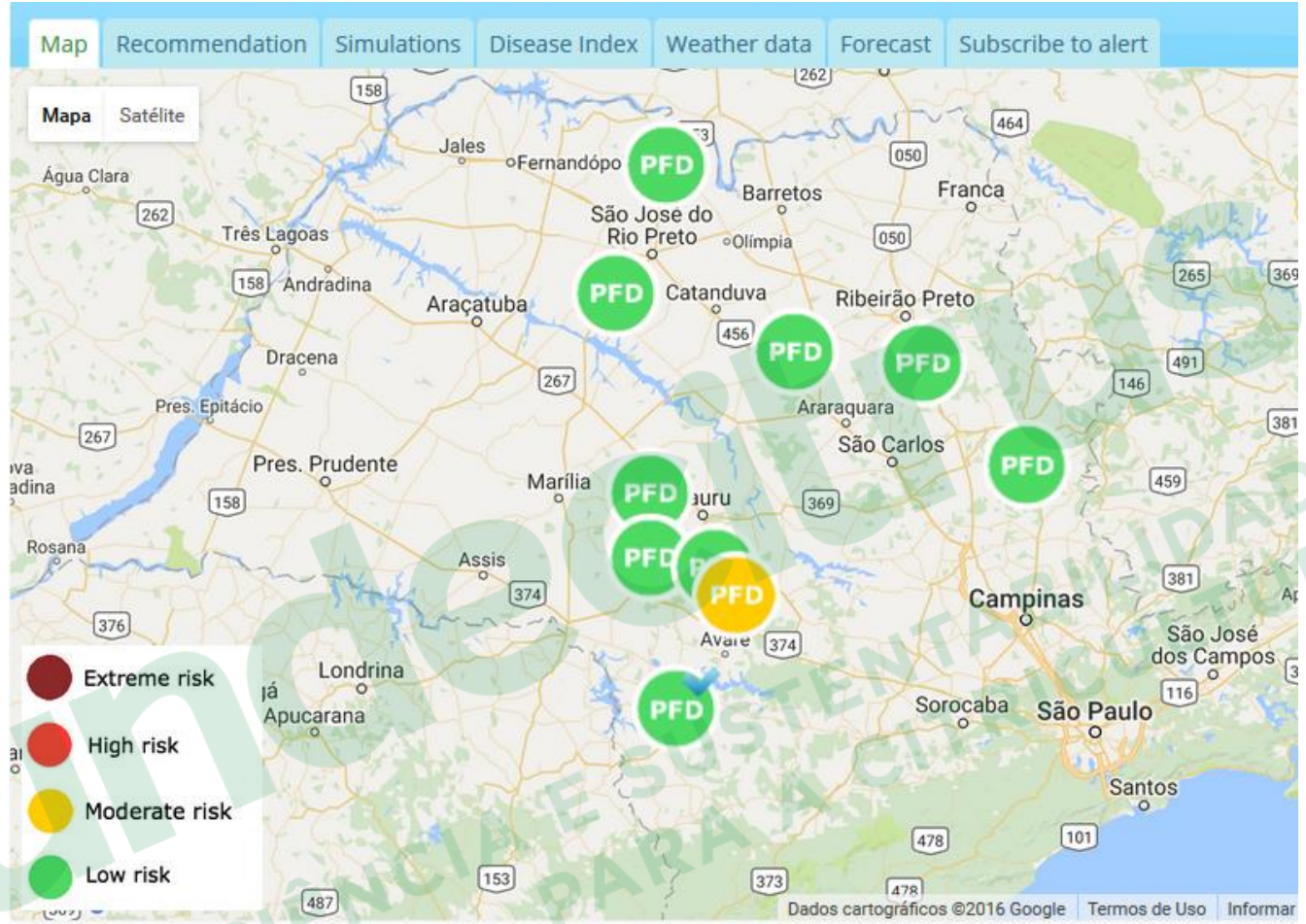
- Losses avoided in 10 years - US\$ 1.2 billion dollars
- 50% less insecticides
- Natural enemy preservation

Bento et al. 2016



# ▶ POSTBLOOM FORECAST SYSTEM

▶ Depend on the climate condition during the blossom period



• Access - [www.fundecitrus.com.br/tecnologiasfundecitrus](http://www.fundecitrus.com.br/tecnologiasfundecitrus)

# ▶ SPRAY VOLUME ADEQUACY

## SAVINGS

- 30 – 70% water saving
- Up to 50% pesticide saving
- Less environmental impact
- Increasing operational time



## FUNDECITRUS INTEGRATED SPRAYING SYSTEM

- Versions - desktop, website and mobile
- Access - [spif.fundecitrus.com.br](http://spif.fundecitrus.com.br)
- > 1,000 users





# ► Comparative of insecticides used in São Paulo and Florida for *D. citri* control

1) Rates (ml or g a.i. / L): **66% lower in SP**  
(17 – 87%)

2) Volume application: **48% lower in SP**  
Grove of 6 y-old: FL = 950 L/ha – SP = 500L/ha

Reduction: **65% a.i. / ha /season**

3) More frequent spray just on the edges blocks



## ▶ LISTA PIC (*PIC List*)

### RULES FOR LISTING:

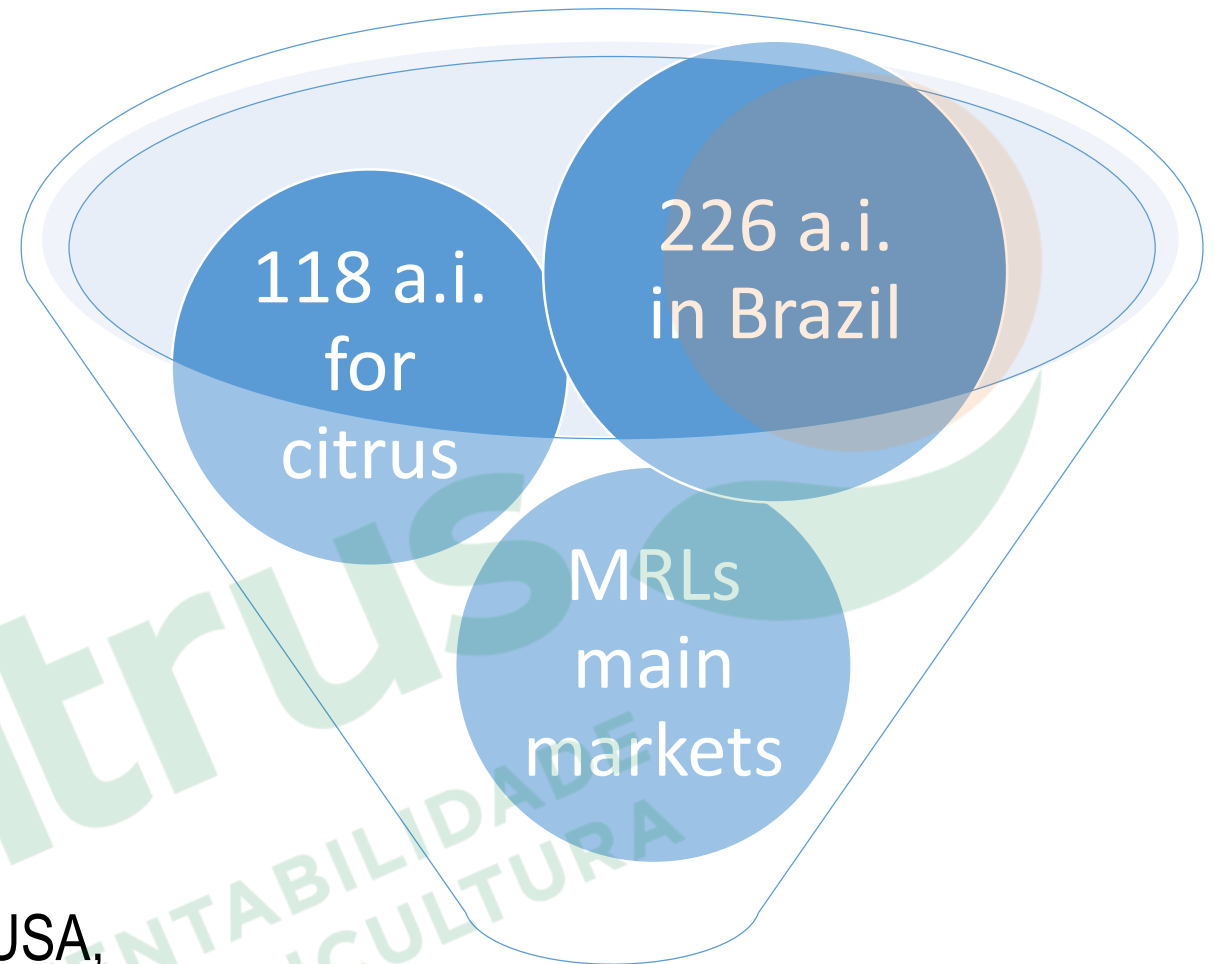
Active ingredient (a.i.) approval

Maximum residue level (MRL) / Import tolerance

Pre-harvest interval defined

According to Anvisa and MAPA (Brazil), Europe, USA, Canada, Japan and Codex

\*MRL is based in the most restrictive country



**67** a.i. available  
for growers



# COMMUNICATION

## MAGAZINE AND TECHNICAL MATERIALS

64.660 materials distributed last year.



Fundecitrus  
CIÊNCIA E SUSTENTABILIDADE  
PARA A CITRICULTURA

# COMMUNICATION

## WEBSITE

News, scientific articles, researches results, technical materials, reports and information about pests and diseases.



## NEWSLETTER

Sent to more than five thousand emails.





# COMMUNICATION

Videos for the citrus grower

**YOUTUBE CHANNEL**



**You Tube**

Information for the sector and society

**SOCIAL MEDIA**

FACEBOOK AND TWITTER



Direct contact

**WHATSAPP**



Fundecitrus  
CIÊNCIA E SUSTENTABILIDADE  
PARA A CITRICULTURA

## ▶ EVENTS

Fundecitrus provides updated information on techniques and technologies to thousands of people every year, giving courses and lectures throughout the São Paulo and Minas Gerais citrus belt.

The institution offers a professional master's degree in control of citrus diseases and pests – MasterCitrus aimed at qualifying professionals in the sector.



# ▶ FUNDECITRUS CONTRIBUTION TO HLB CONTROL



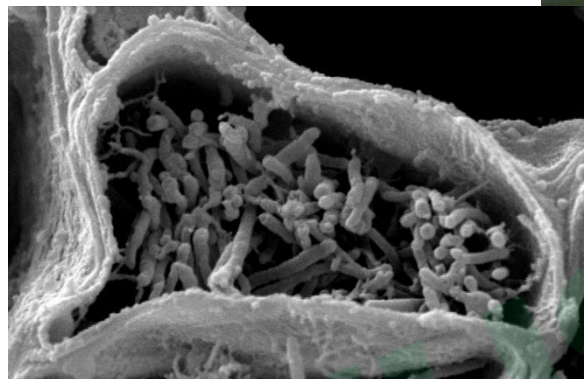
# CITRUS HUANGLONGBING (HLB / GREENING)

**Causal agent:** *Candidatus Liberibacter asiaticus*

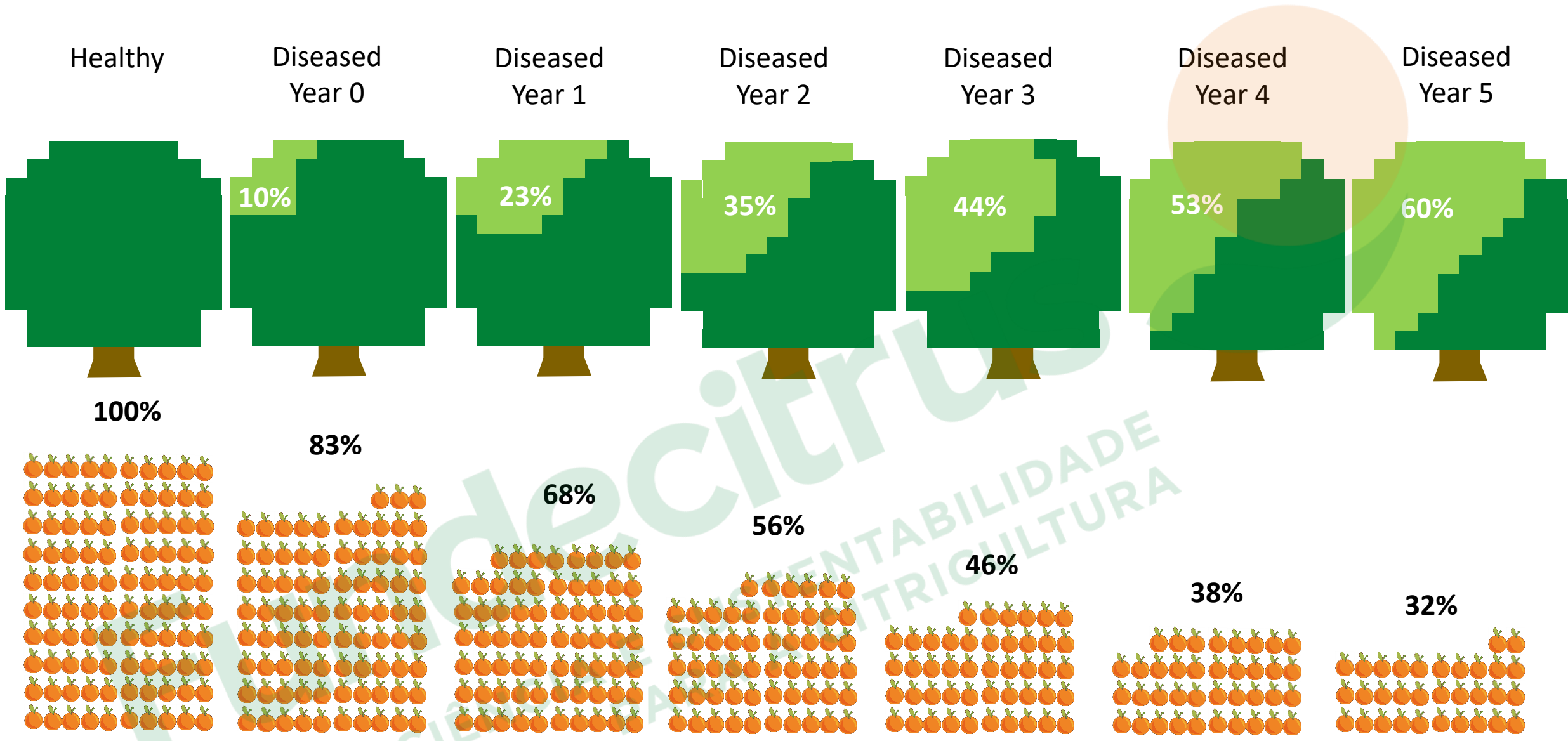
**Vector:** *Diaphorina citri*

## Damages:

- Defoliation
- Tree decline
- Yield reduction
- Premature fruit drop
- Poor fruit quality
  - Smaller fruit
  - Less TSS, Brix and ratio
  - Higher acidity and bitterness
  - Less intense juice color







100%

83%

68%

56%

46%

38%

32%

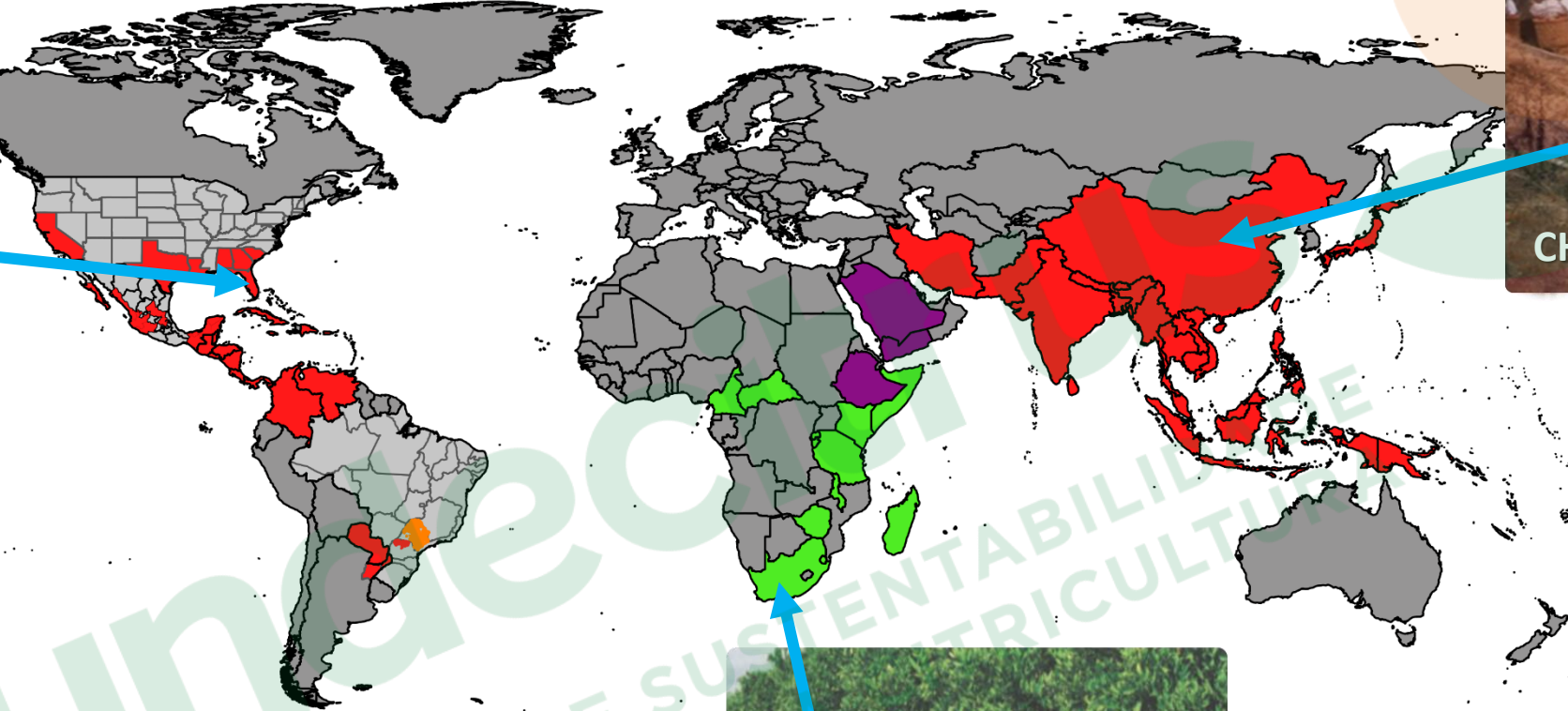
AgroCiteR  
SUSTENTABILIDADE  
AGROPECUÁRIA  
AGROPECUÁRIA



# HLB IN THE WORLD







FLORIDA



CHINA



SOUTH AFRICA

-  *Candidatus Liberibacter asiaticus*
-  *Candidatus Liberibacter africanus*
-  *Candidatus Liberibacter americanus x asiaticus*
-  *Candidatus Liberibacter africanus x asiaticus*

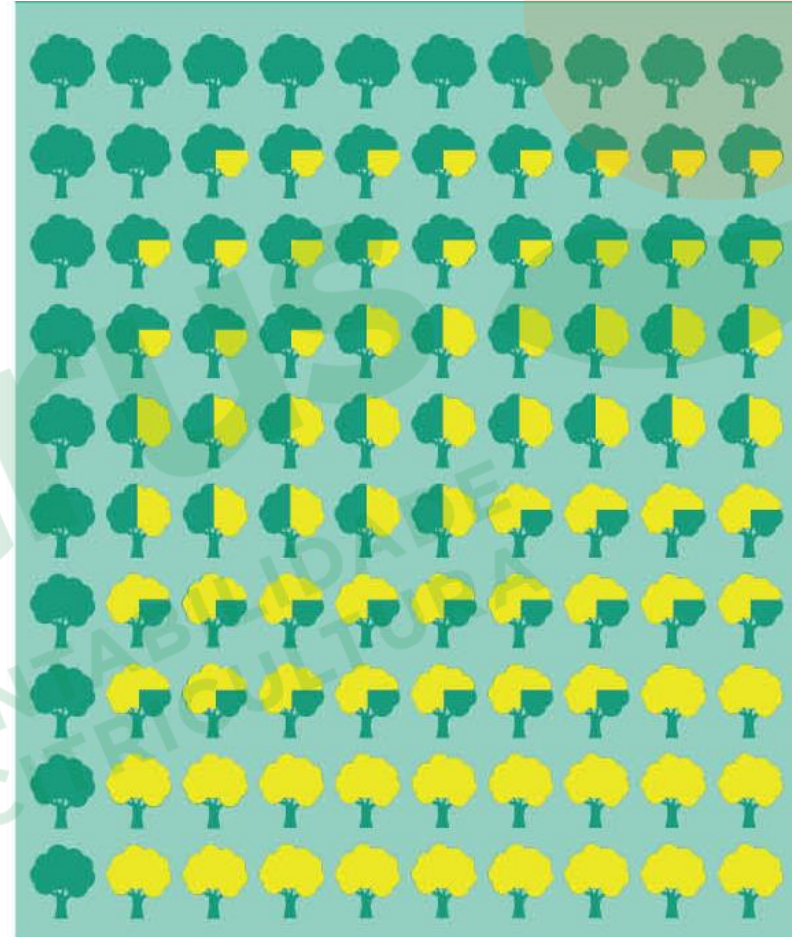




# HLB LOSS IN FLORIDA



**Productivity:** 1059 box/ha (2004)  
352 box/ha (2018)  
Less quality of fruit and juice

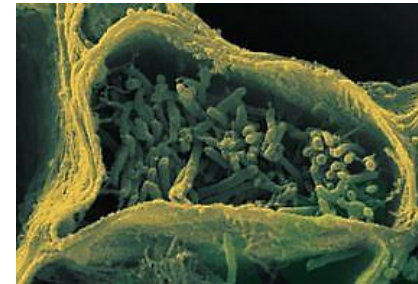
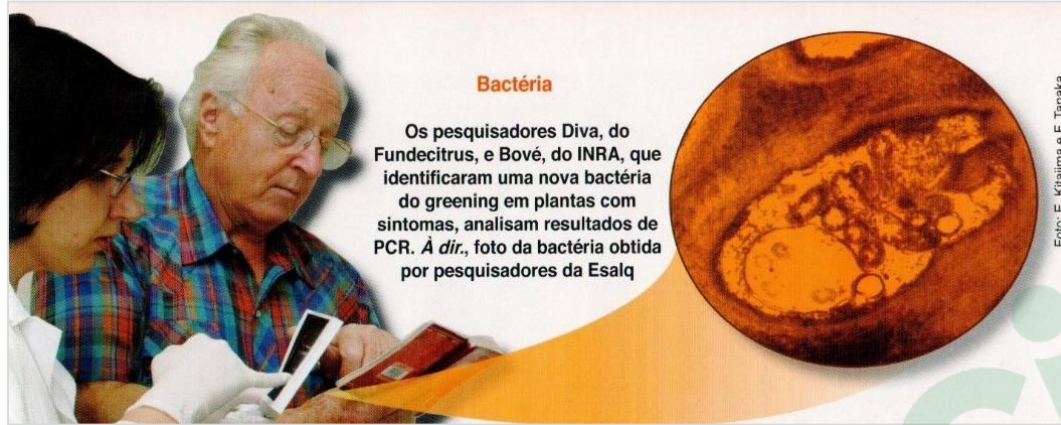


90% incidence  
High severity



# ▶ HLB IN SÃO PAULO STATE

## Detection in 2004

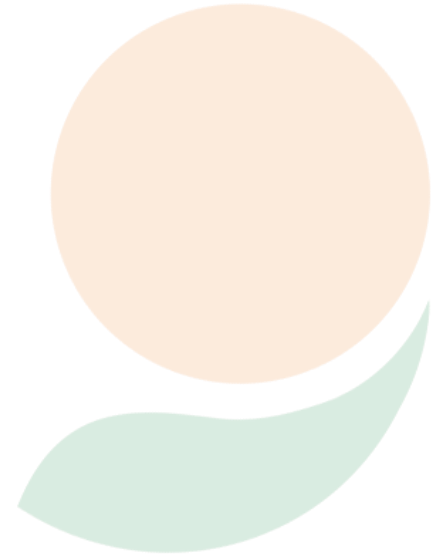






## WARNING SIGN

**Immediate  
Action**





# CRUCIAL FACTORS THAT SUPPORT THE CONTROL OF HLB

Healthy young trees

Historical success in the control of Canker and CVC

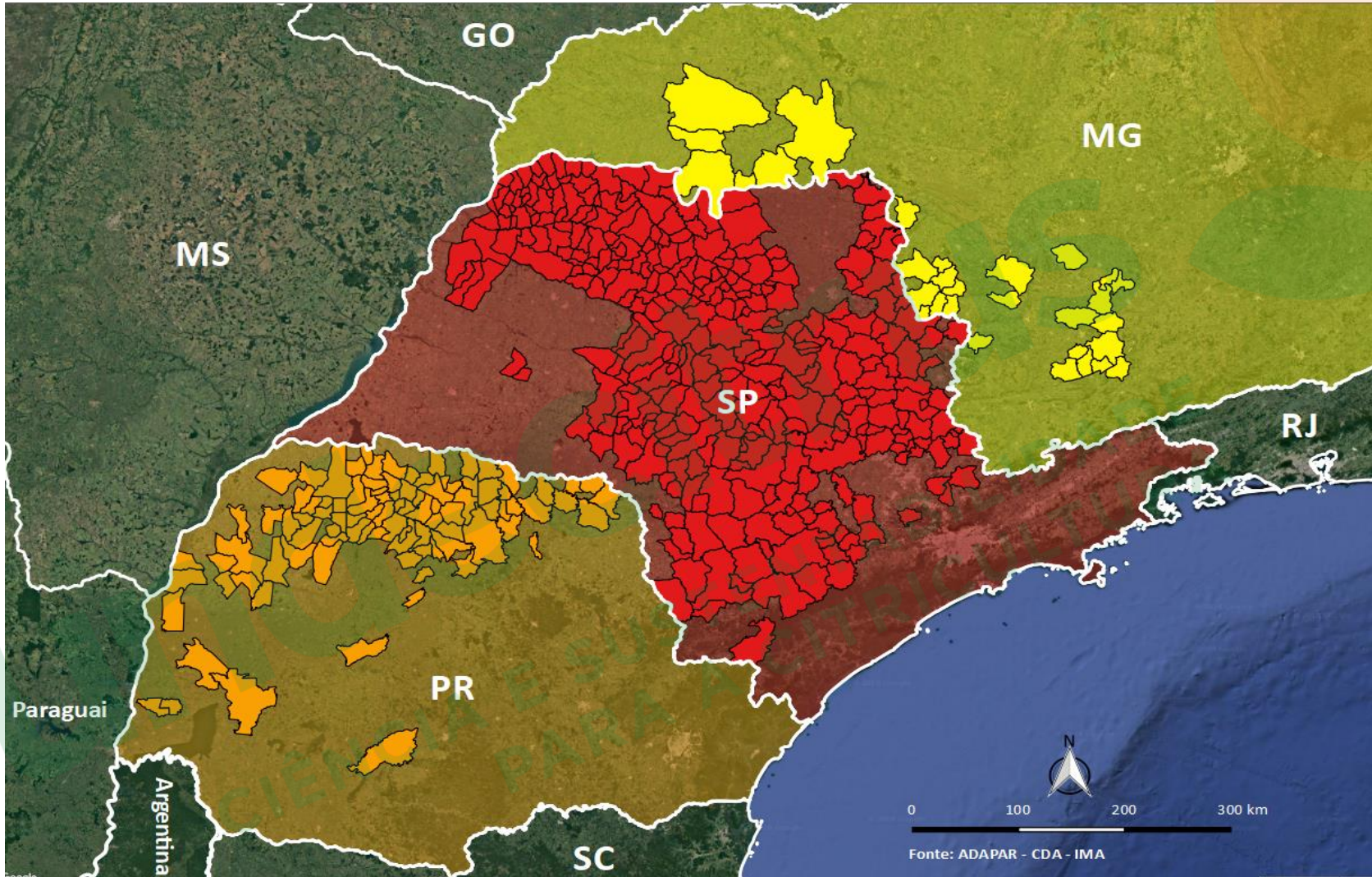
Fundecitrus leadership with growers and government

Research institution network



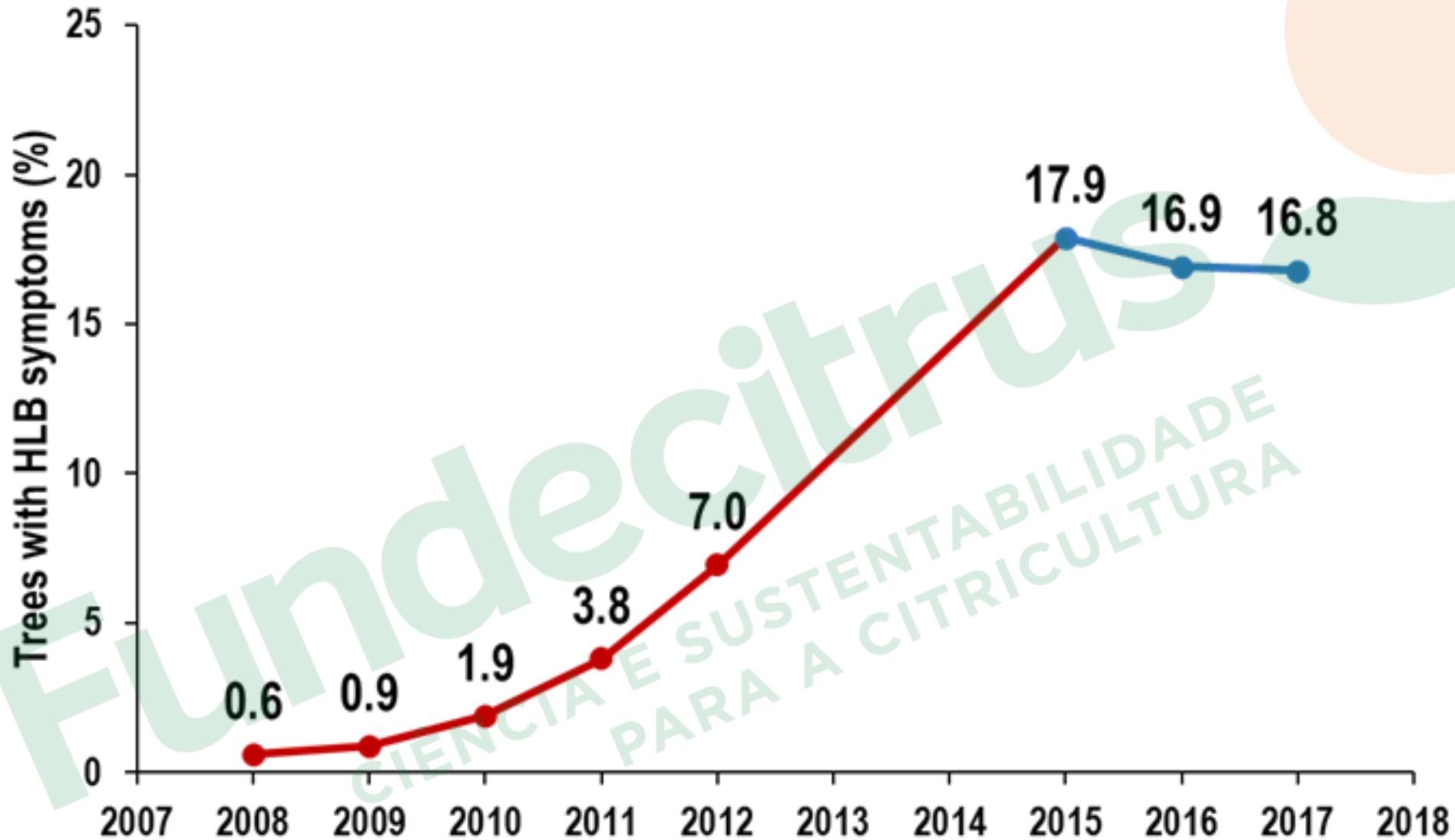


# BRAZIL HLB DISTRIBUTION





# HLB PROGRESS IN SPS AND TRIÂNGULO MINEIRO



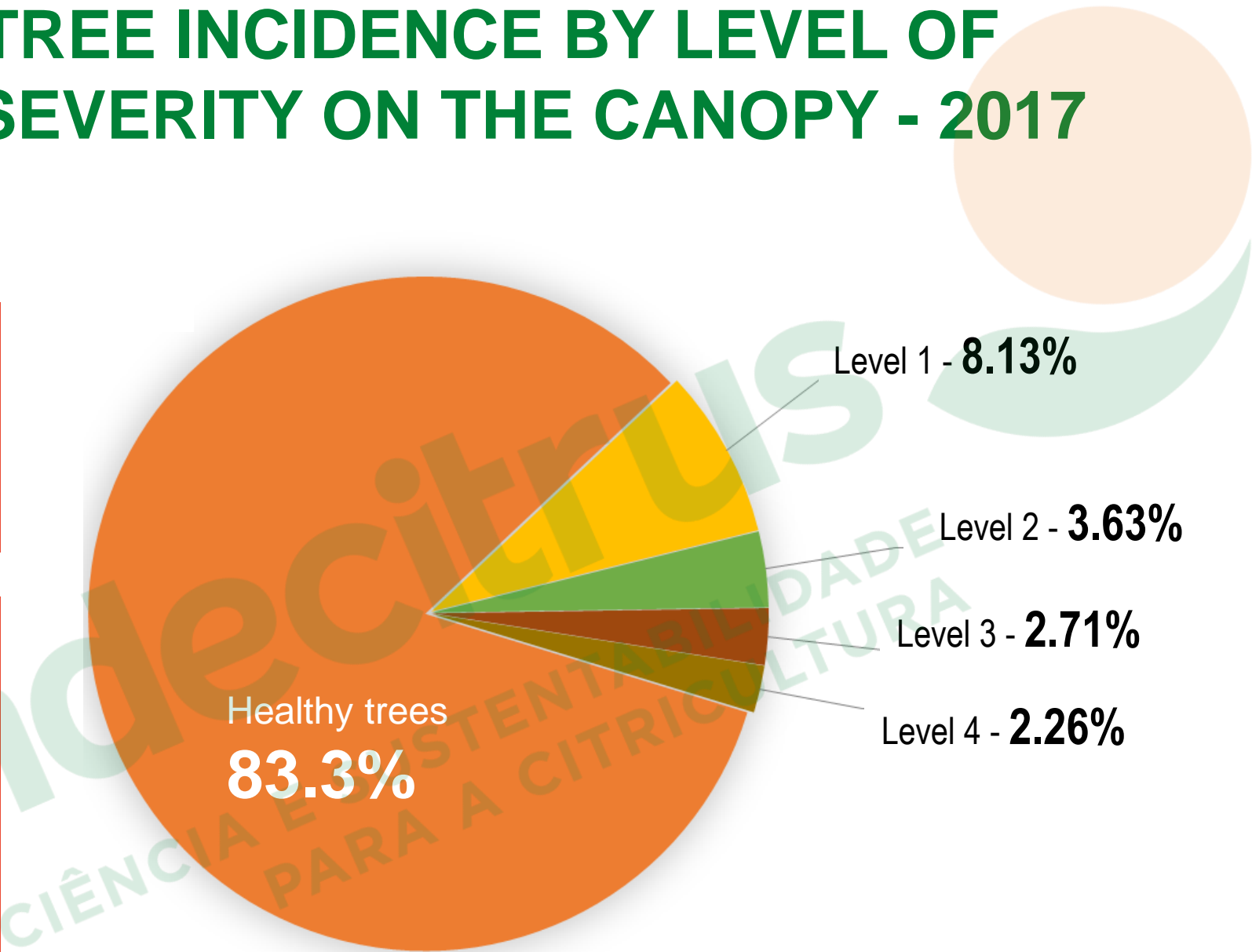




# DISEASED TREE INCIDENCE BY LEVEL OF SYMPTOM SEVERITY ON THE CANOPY - 2017

Disease trees  
**16.7%**

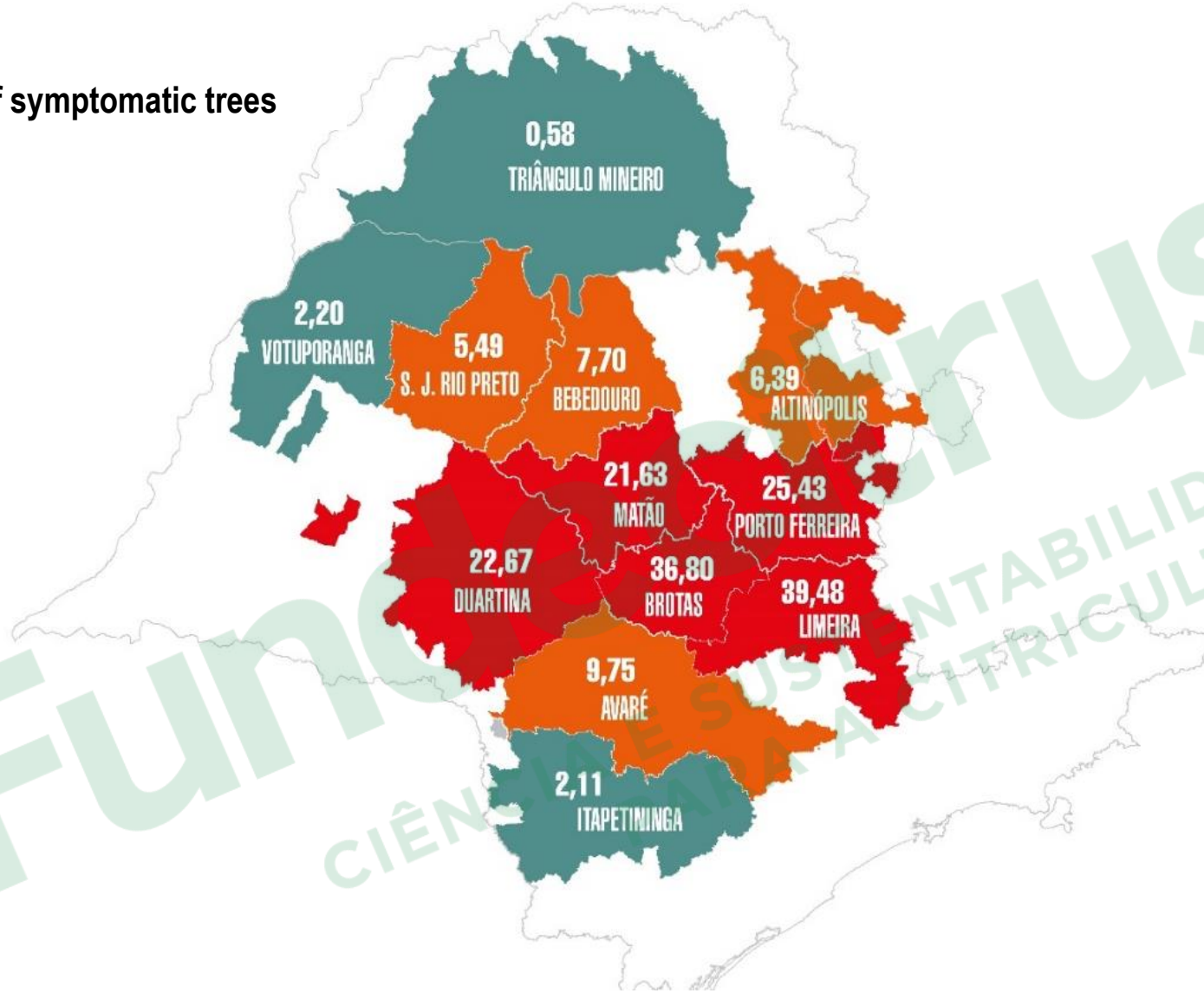
Fruit Drop:  
**19.5** millions of  
orange boxes  
(4.06% total)



# HLB INCIDENCE BY REGION IN 2017

## REGIONS

Percentage of symptomatic trees



Severity Level

Initial

Intermediate

Severe

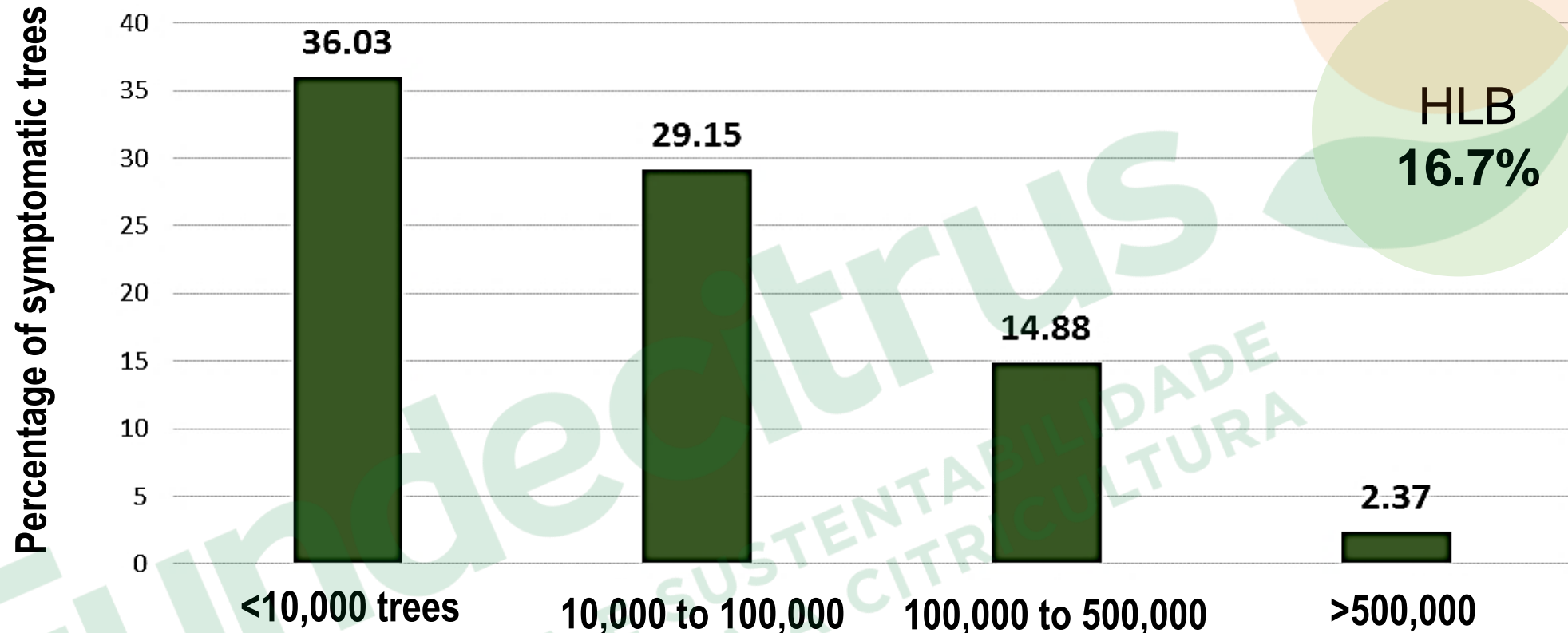
Intermediate

Initial

Incidence



# ▶ HLB INCIDENCE BY FARM SIZE - 2017



HLB  
16.7%

Fundecitrus  
CIÊNCIA E SUSTENTABILIDADE  
PARA A CULTURA

# EDGE EFFECT OF HLB





# ▶ SUCCESS IN HLB CONTROL

**GREENING  
MANAGEMENT**

**10**  
COMMANDMENTS  
TO THE SUCCESS  
IN DISEASE  
CONTROL

**Fundecitrus**  
SCIENCE AND SUSTAINABILITY  
IN CITRICULTURE

**#UNITEDAGAINSTGREENING**

**10**  
COMMANDMENTS  
TO CONTROL  
GREENING  
DISEASE

- 1 - NEW PLANTINGS SYSTEM
- 2 - HEALTHY YOUNG TREES
- 3 - NUTRITION
- 4 - INSPECT THE ORCHARDS
- 5 - ELIMINATE THE SYMPTOMATIC TREES
- 6 - MONITORING OF PSYLLID
- 7 - CONTROL THE VECTOR
- 8 - GIVE ATTENTION TO THE BORDER
- 9 - NEIGHBOR IS A PARTNER
- 10 - REGIONAL MANAGEMENT



# CONTROL INSIDE THE FARM

## 8

### PSILLID CONTROL



As aplicações de inseticidas devem ser feitas para prevenir a infecção de novas plantas e a disseminação do greening no pomar. É necessário escolher produtos que façam parte da Lista PIC (Produção Integrada de Citros), que contém os defensivos em conformidade com a legislação internacional. Além disso, deve-se avaliar o histórico de pulverizações e realizar a rotação de grupos químicos com diferentes modos de ação. Para informações sobre a eficácia e produtos que podem ser utilizados na citricultura, consulte o **Guia de Controle Químico do Fundecitrus** e a **Lista PIC**, disponíveis no site do Fundecitrus ([www.fundecitrus.com.br](http://www.fundecitrus.com.br)). O citricultor deve respeitar o período de carência dos produtos.



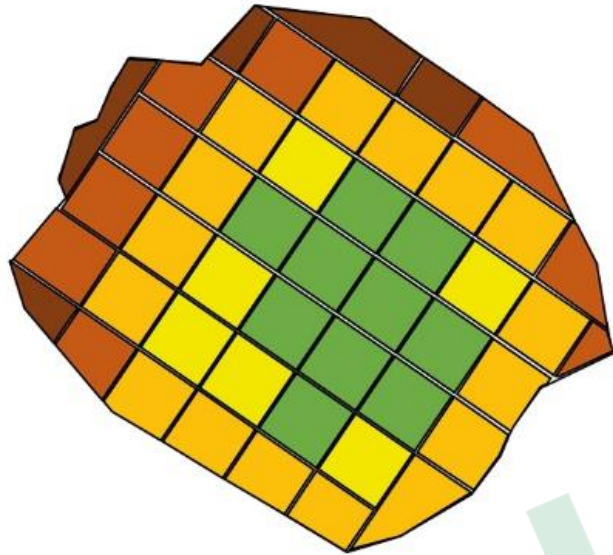


**A NEW CONCEPT FOR THE PLANTINGS –  
MORE EFFICIENCY AND SUSTAINABILITY**

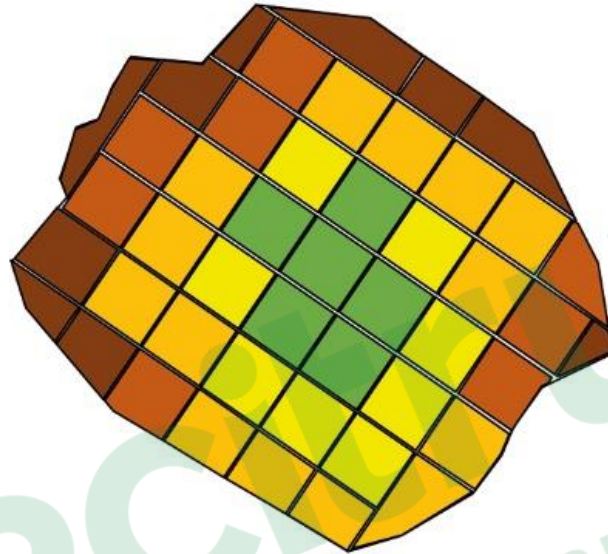




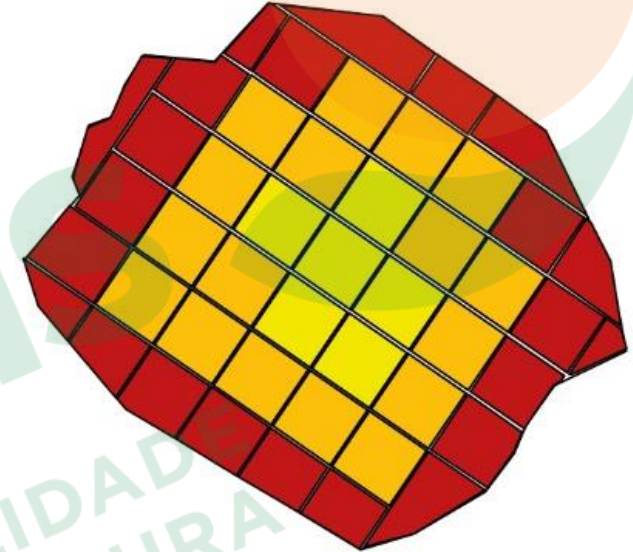
# IDENTIFICATION OF RISK AREAS AND CONTROL MANAGEMENT



**Psyllids / Trap in the period**



**HLB incidence in the period (%)**



**Psyllid Control Program**

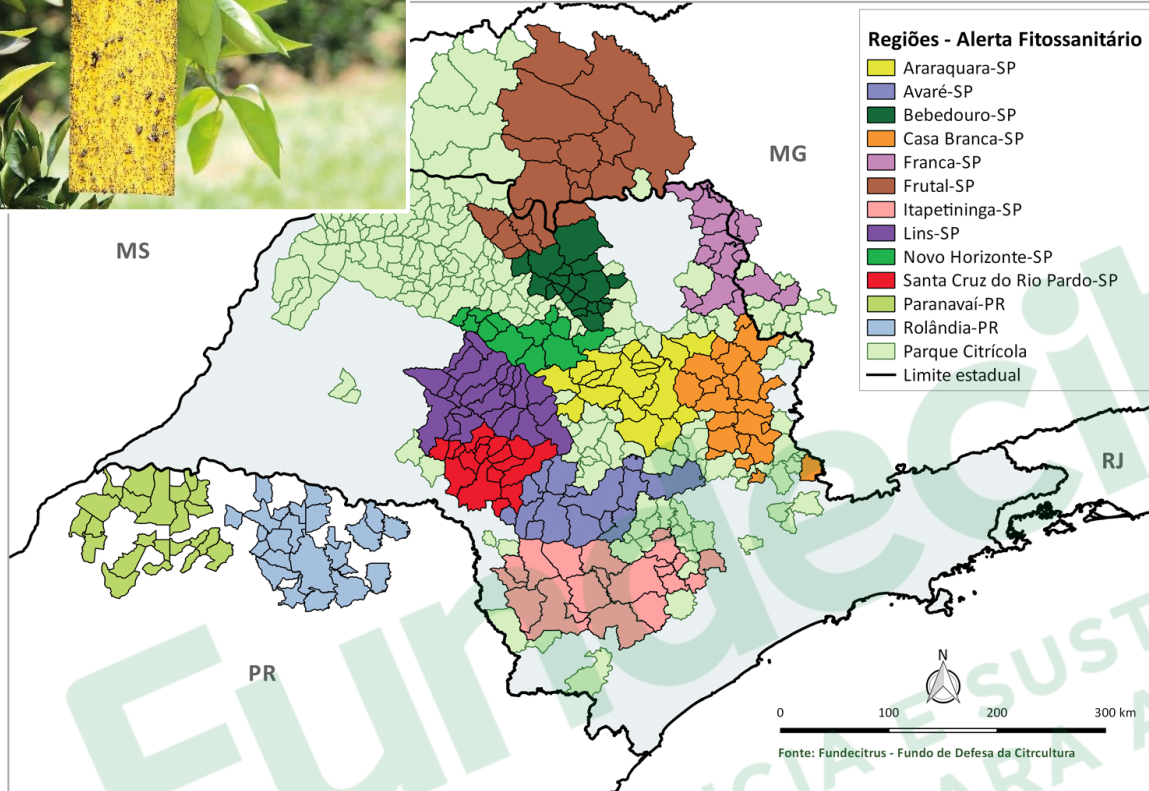


▶ **LOOKING OUTSIDE**

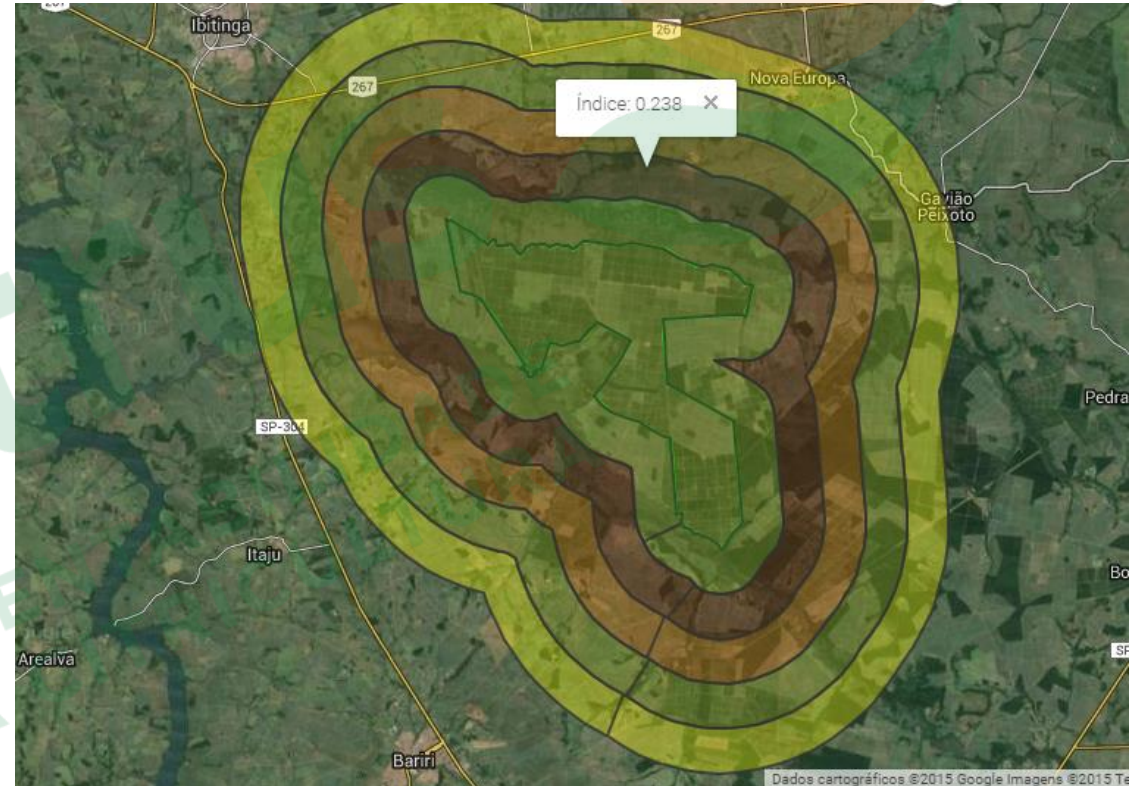




# PSYLLID ALERT SYSTEM AND REGIONAL MANAGEMENT



85% surveyed area

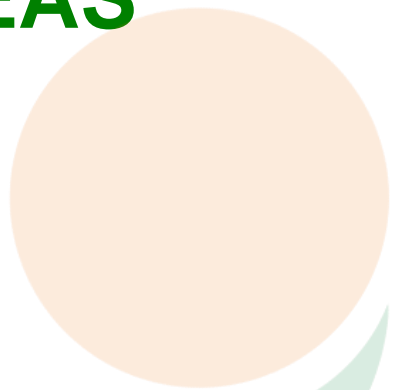


27,000 yellow traps monitored each 14 days

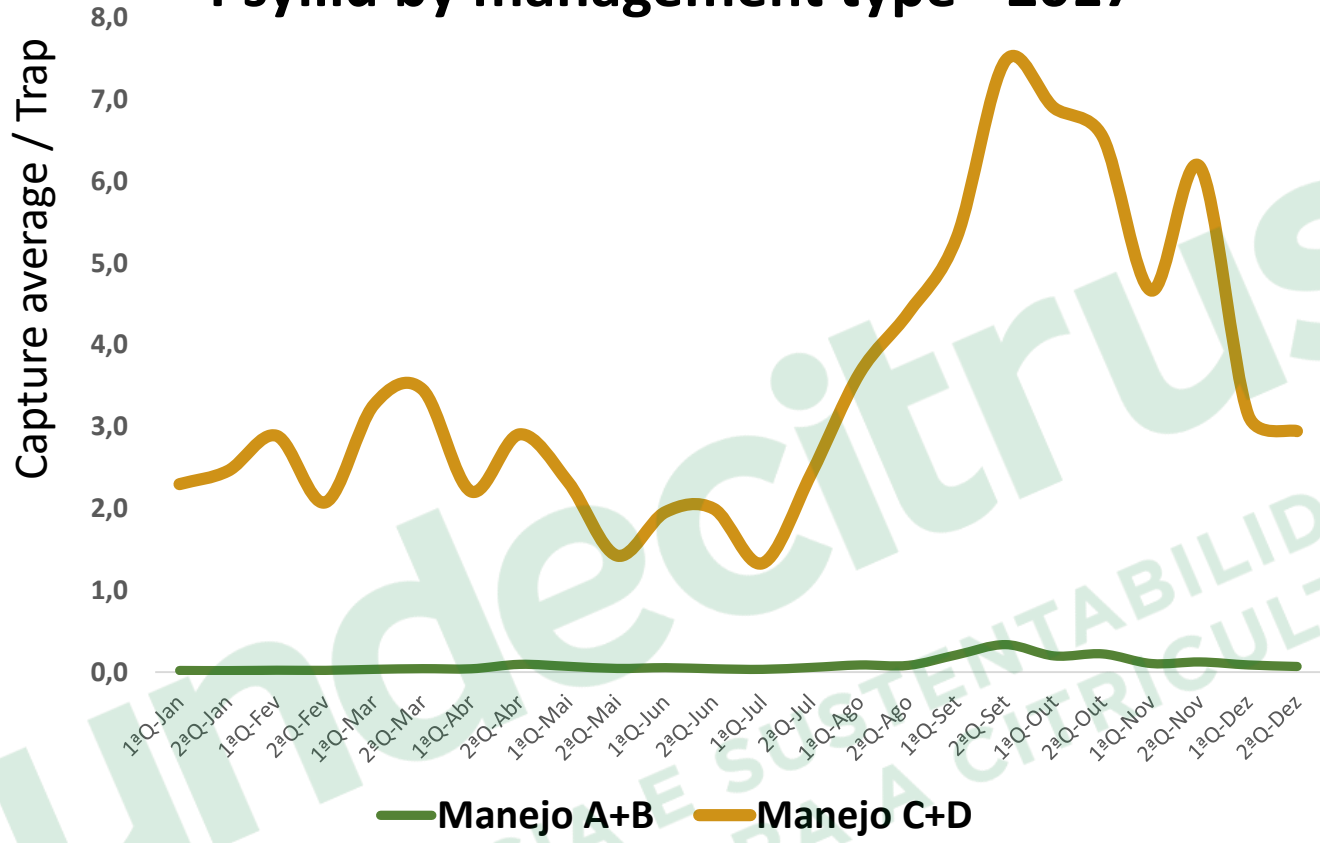




# TRAPPED PSYLLIDS IN MONITORED AREAS



### Psyllid by management type - 2017



**40-200x**

- A - Psyllid control and trees eradication
- B - Good psyllid control
- C - Commercial with no management
- D - Backyard with no management

# EXTERNAL CONTROL





# CITRUS GROWER FRIEND COMPANY



Bayer CropScience



Agricultura é a nossa vida



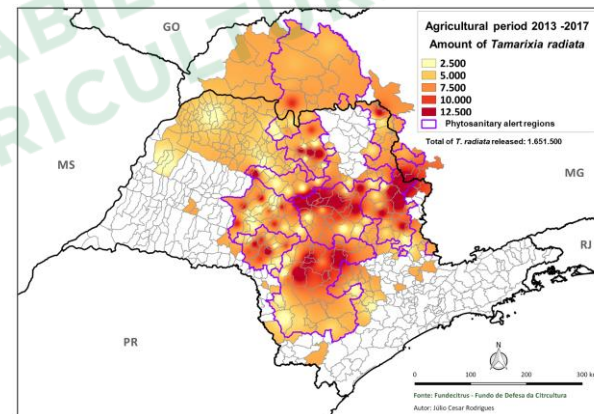


# PSYLLID BIOCONTROL

*Tamarixia radiata*



100 thousand parasitoids released every month in non commercial groves





# ▶ NEW ALTERNATIVES FOR SUSTAINABLE MANAGEMENT OF HLB

## Bioinsecticide (*Isaria fumosorosea*)

### BENEFITS

- Psyllid control
- No residue on fruit
- No interval of carency
- Preserve natural enemies and polinization agents
- Compatibility with other products





# ▶ NEW ALTERNATIVES FOR SUSTAINABLE MANAGEMENT OF HLB

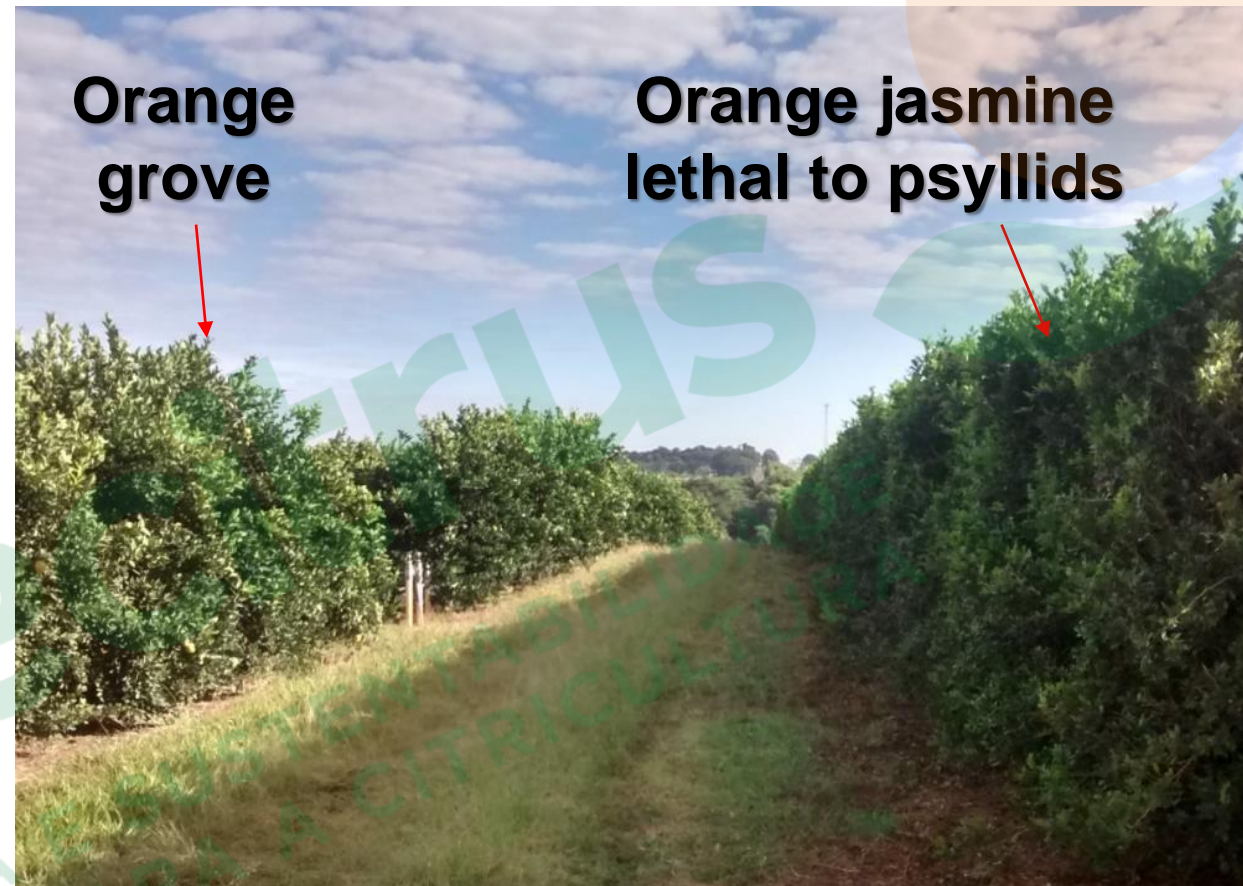


## BENEFITS

- Psyllid repellency



# ▶ PERSPECTIVES FOR SUSTAINABLE MANAGEMENT OF HLB



# TOOLS FOR HLB

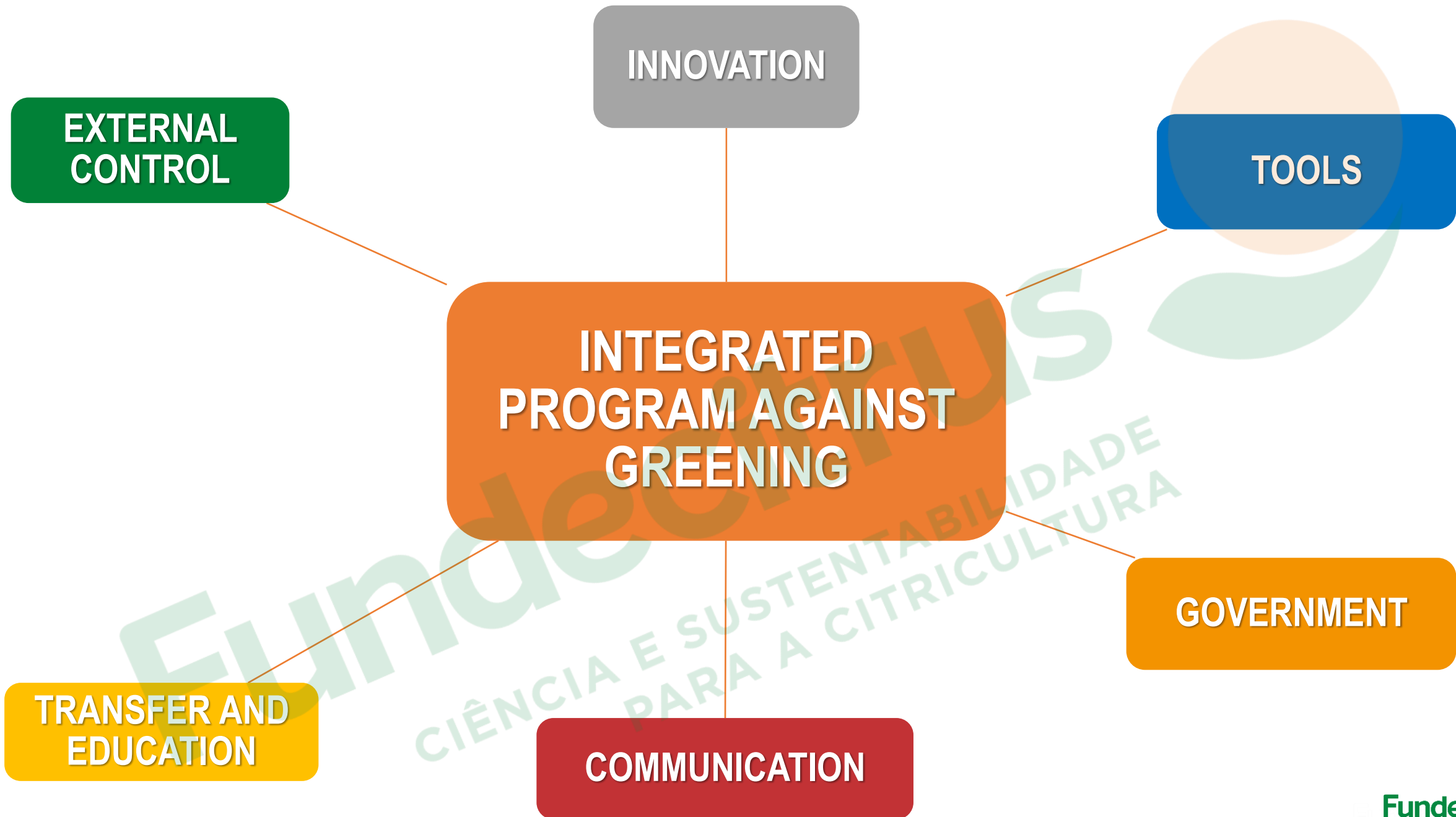
App for external control – SICEG

App for internal control

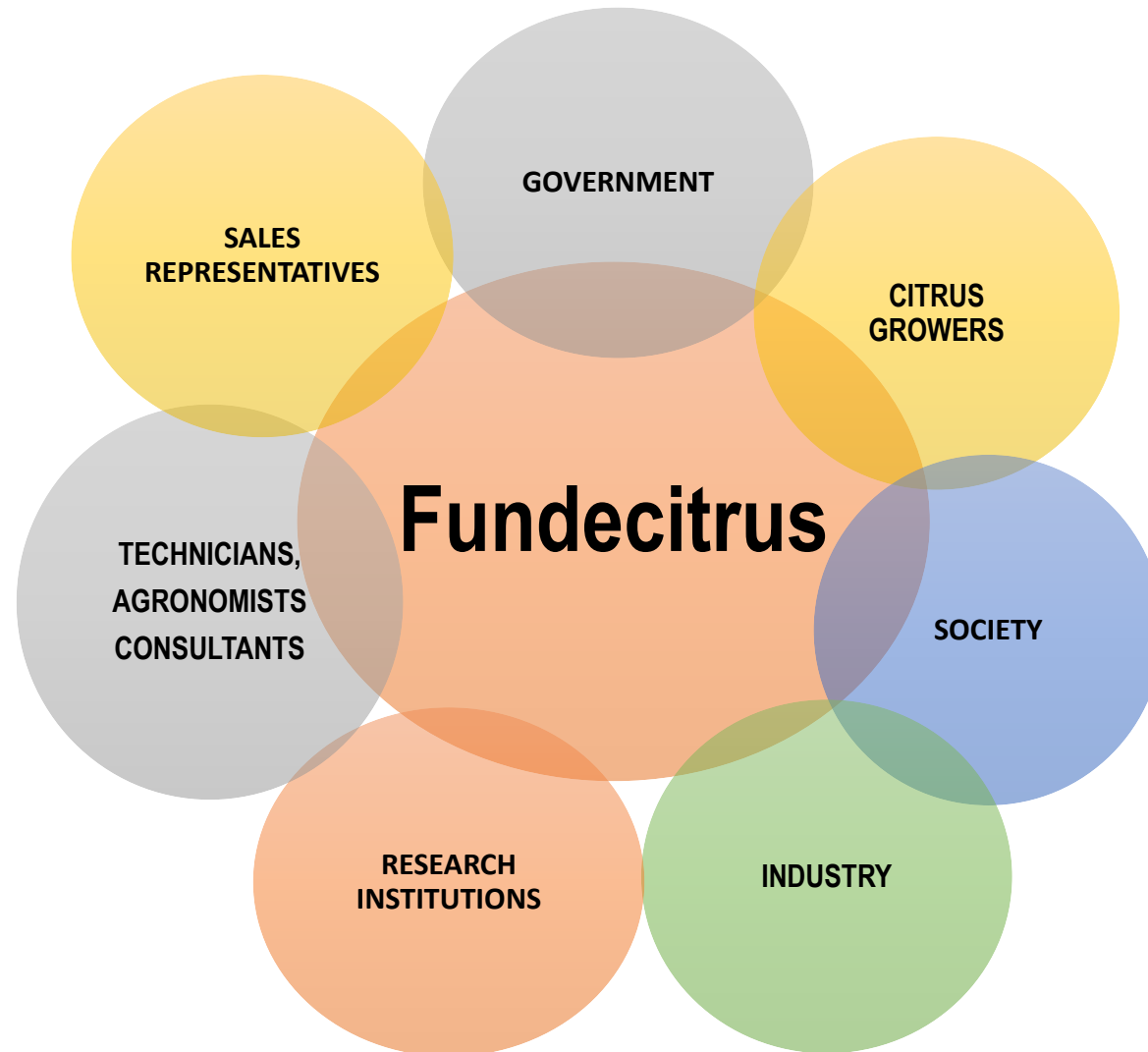
App for psyllid trap reader







# SUCCESSFUL CONTROL OF HLB





#UNITED  
against  
GREENING

**Fundecitrus**  
SCIENCE AND SUSTAINABILITY  
IN CITRICULTURE

Fundecitrus  
CIÊNCIA E SUSTENTABILIDADE  
PARA A CITRICULTURA



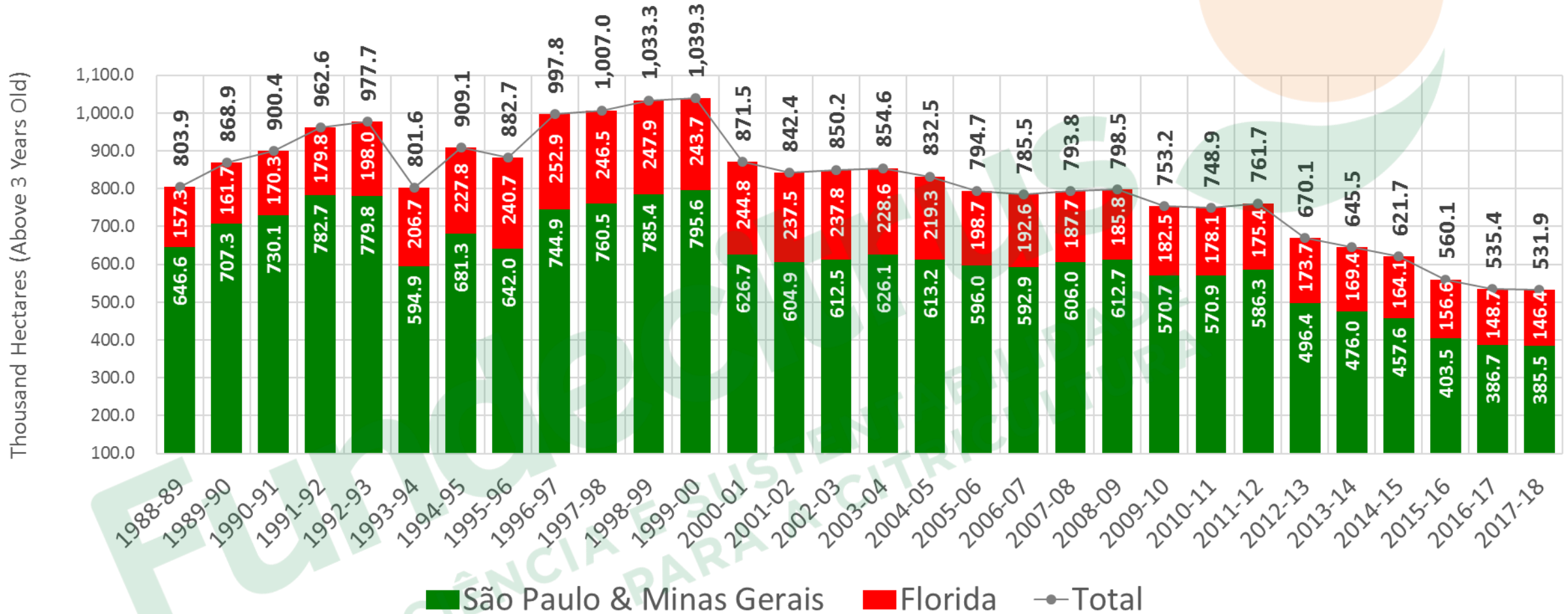
# PERSPECTIVES





# TOTAL ORANGE BEARING AREA

Thousand Hectares (Above 3 Years Old)

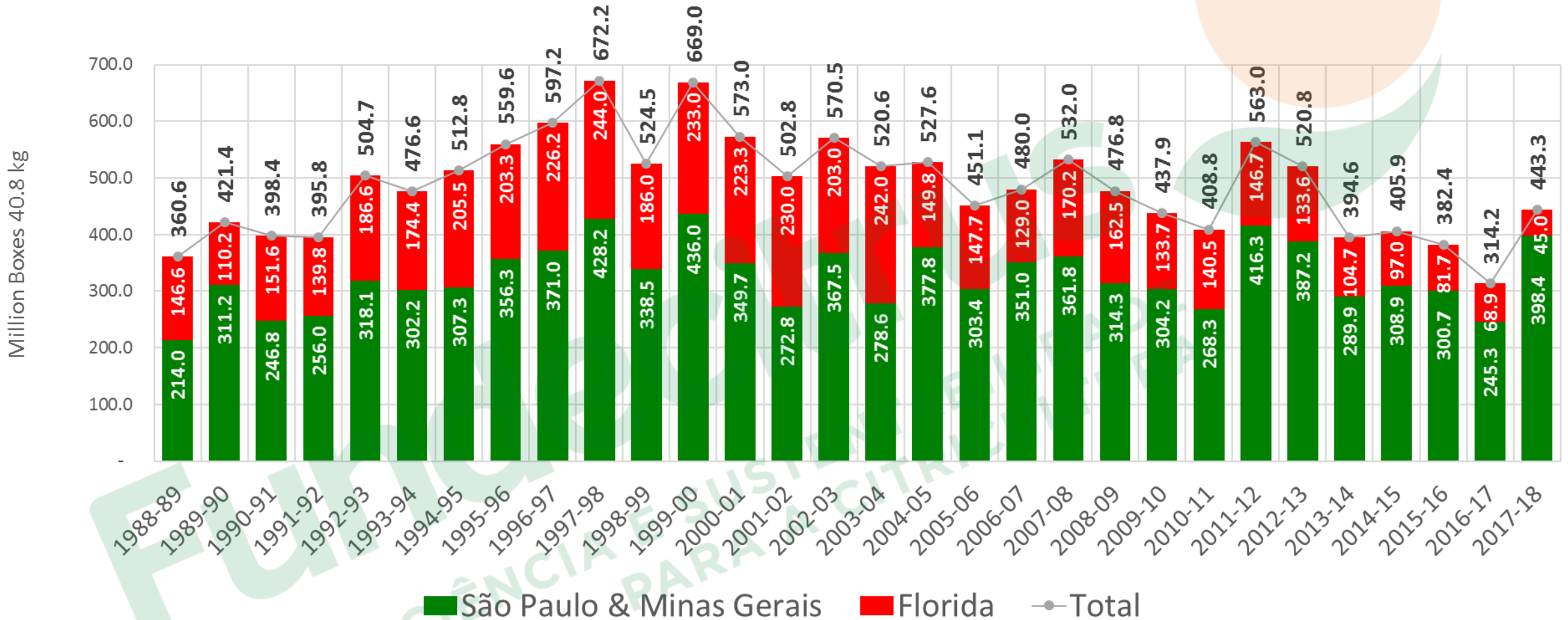


Source: Based on data from Fundecitrus, CitrusBr, USDA and FCPA.



# ORANGE PRODUCTION

Million Boxes 40.8 kg

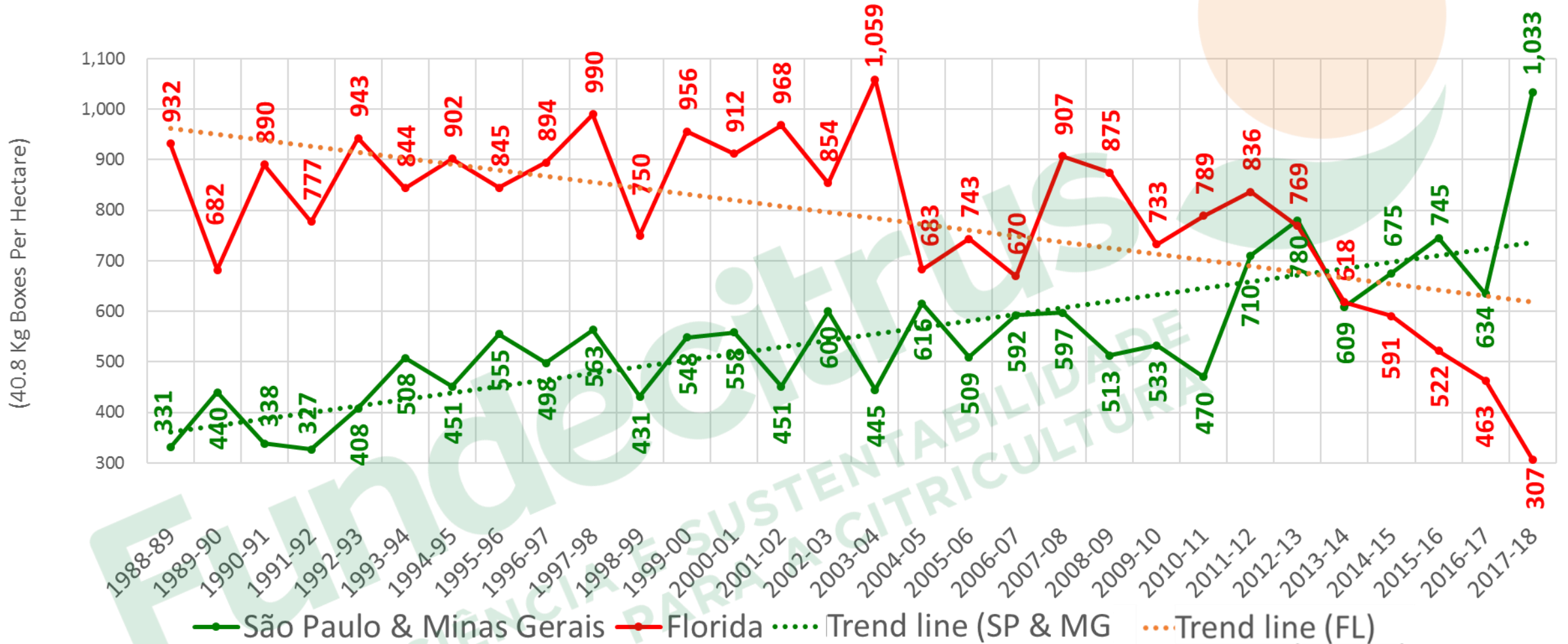


Source: Based on data from Fundecitrus, CitrusBr, USDA and FCPA.



# FARMING YIELD (PRODUCTIVITY)

Million Boxes 40.8 kg per Hectare

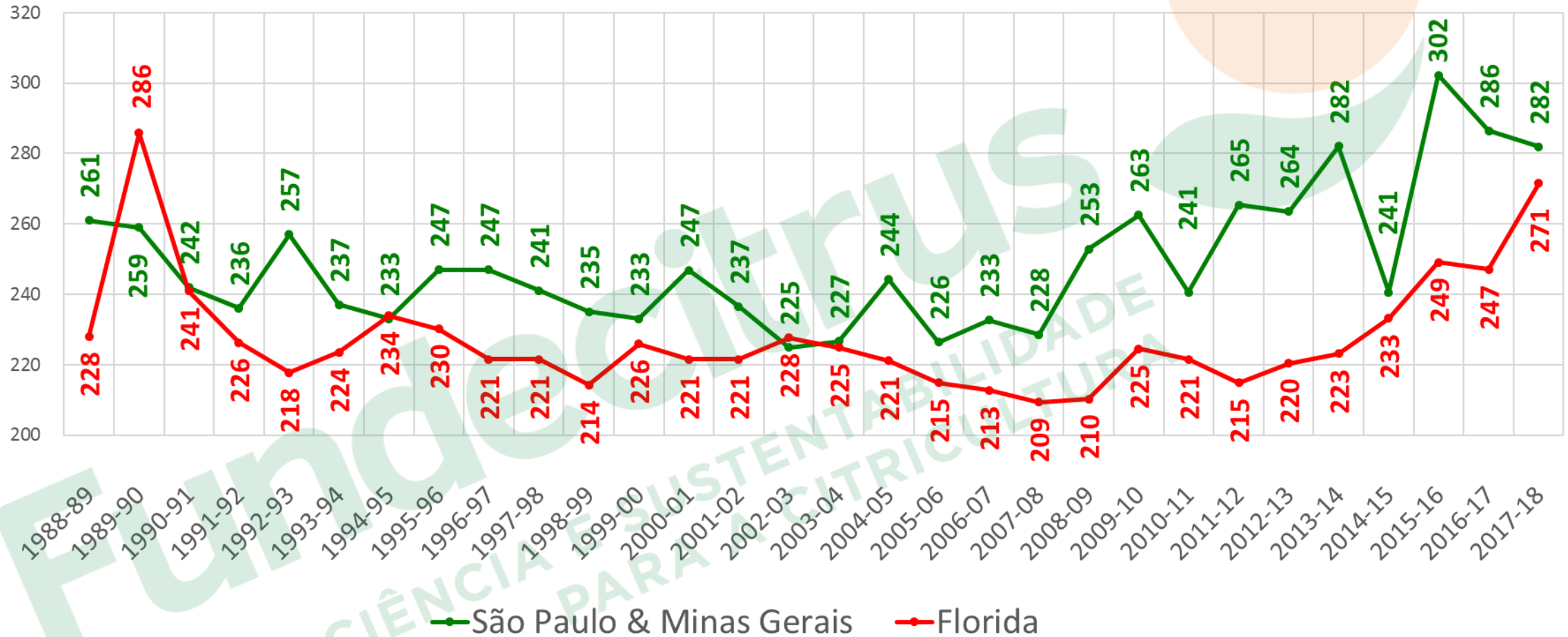


Source: Based on data from Fundecitrus, CitrusBr, USDA and FCPA.

# JUICE YIELD ON FRUIT

40.8 kg Boxes per Metric Tons of FCOJ 66°Brix Equivalent

(40.8 kg Boxes per Metric Tons of FCOJ 66°Brix Equiv.)



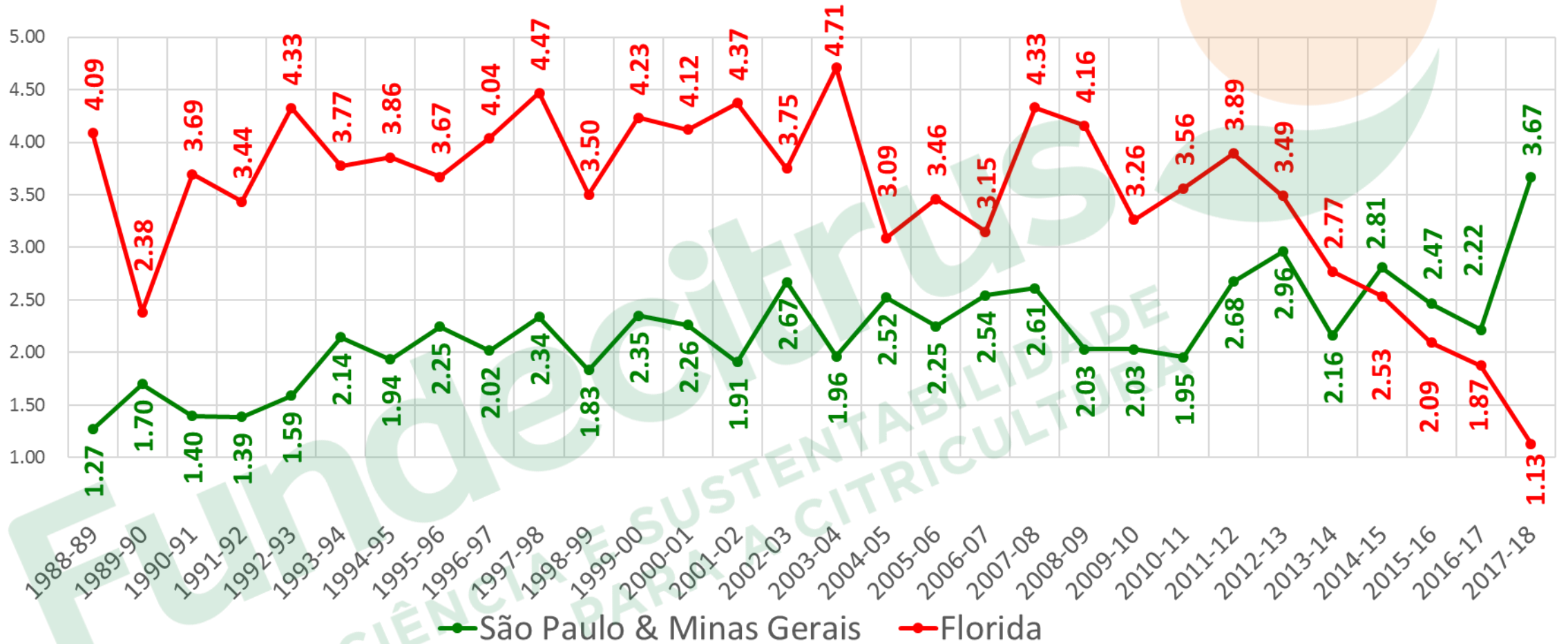
Source: Based on data from Fundecitrus, CitrusBr, USDA and FCPA.



# JUICE YIELD ON FRUIT

Metric Tons of FCOJ 66°Brix Equivalent per Hectare

Metric Tons of FCOJ 66°Brix Equiv. per Hectare)

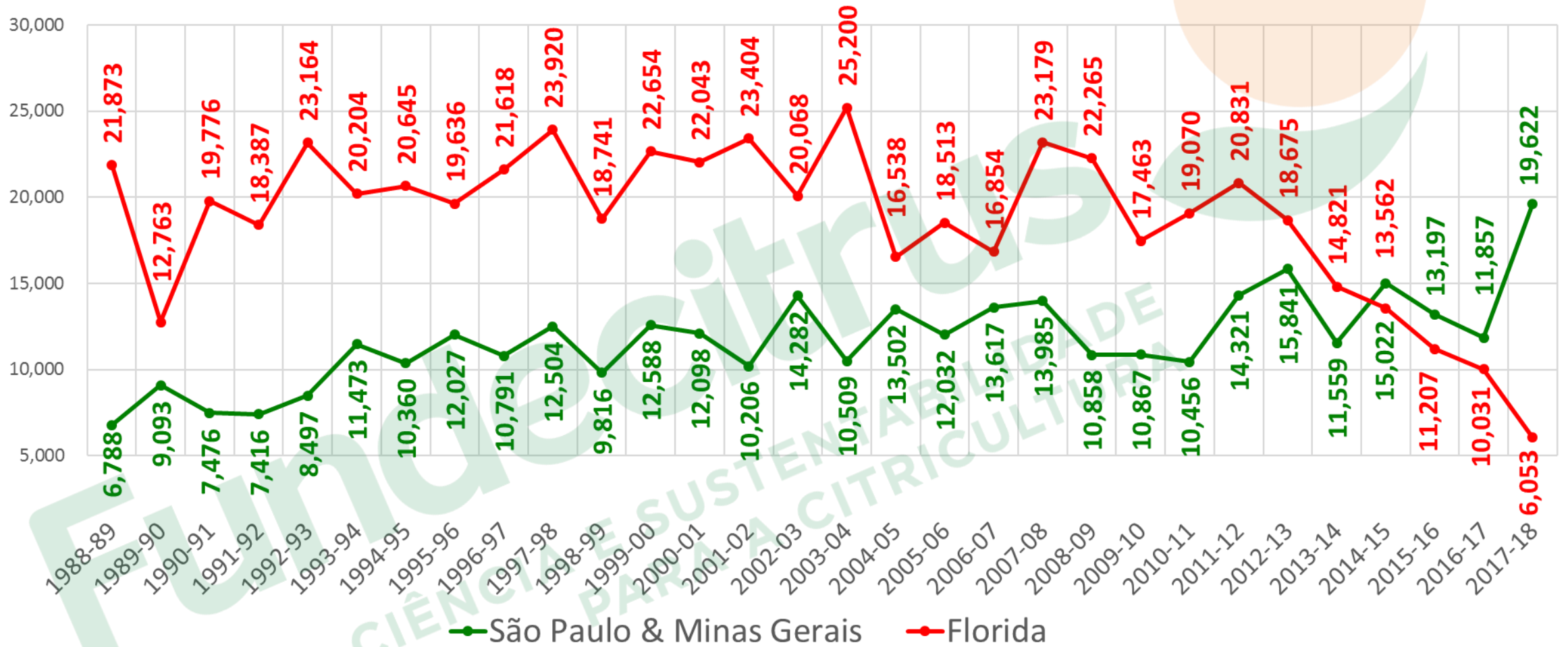


Source: Based on data from Fundecitrus, CitrusBr, USDA and FCPA.

# JUICE YIELD ON FRUIT


Liters of Ready-To-Drink Orange Juice per Hectare

(Liters of Ready-To-Drink Orange Juice per hectare)



Source: Based on data from Fundecitrus, CitrusBr, USDA and FCPA.





**Fundecitrus' mission is to  
continuously support projects of  
best agricultural practices to  
make stronger the sustainability  
of the citriculture**



# THANK YOU

