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Citricultor

Fundecitrus
SCIENCE AND SUSTAINABILITY IN CITRICULTURE

EXTERNAL MANAGEMENT REDUCES INCIDENCE OF GREENING

Farms that extended control beyond their gates have already reduced the disease

Sustainable production

FUNDECITRUS ESTIMATES THE 2020-2021 ORANGE CROP AT 287.76 MILLION BOXES AND QUANTIFIES THE AREA OF PRESERVED NATIVE WOODS WITHIN CITRUS FARMS

CONTENTS

Citricultor

CITRICULTOR magazine is a free publication edited by the Fundo de Defesa da Citricultura - Fundecitrus. Fundecitrus, a world reference in science for citriculture, is a non-profit private institution established in 1977 and maintained by citrus growers and processors in the state of São Paulo, Brazil, to foster the sustainable development of the Brazilian citrus belt.

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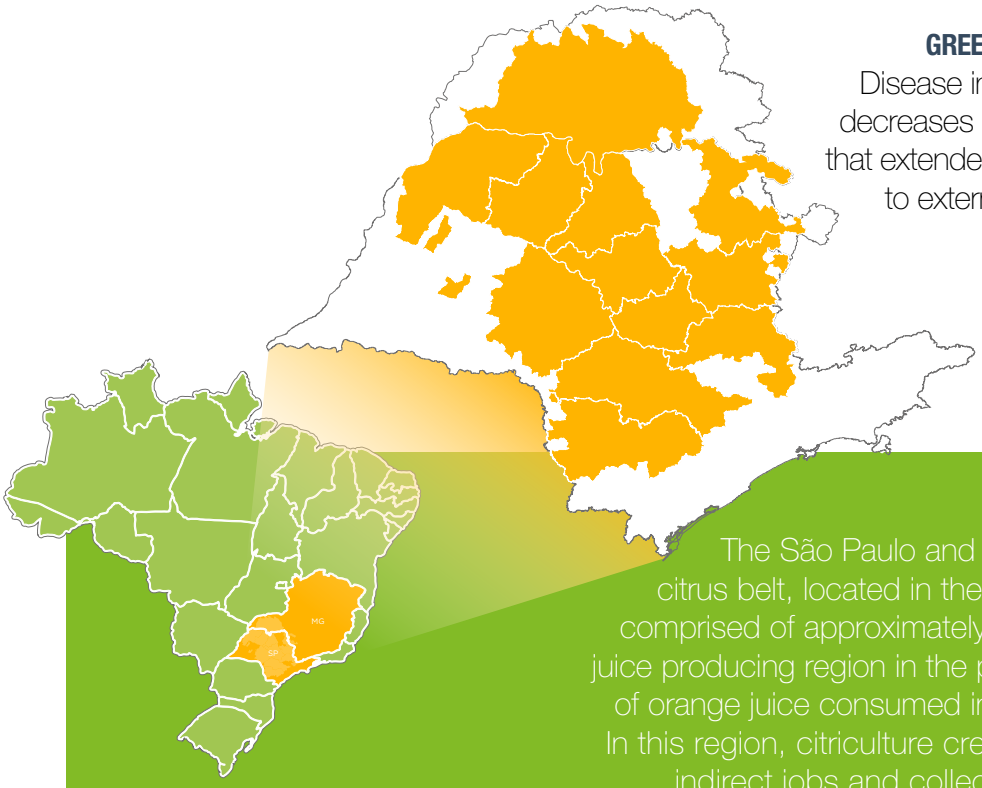

VALMIR CAMPOS

BRAZILIAN CITRUS BELT

The São Paulo and West-Southwest Minas Gerais citrus belt, located in the Southeast region of Brazil and comprised of approximately 350 cities, is the main orange juice producing region in the planet: three out of five glasses of orange juice consumed in the world are produced here. In this region, citriculture creates 200 thousand direct and indirect jobs and collects 189 million dollars in taxes.

From increased immunity to reduced risk of chronic diseases

RESEARCHER AT USP FRANCO LAJOLO TALKS ABOUT BENEFITS AND POTENTIAL OF ORANGES AND ORANGE JUICE

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Oranges are known especially for their high vitamin C content but are also a source of compounds that are essential to human nutrition and help prevent and recover from diseases. The Food Research Center (FoRc) at the Faculdade de Ciências Farmacêuticas of the Universidade de São Paulo (USP) carries out research in partnership with Fundecitrus to assess the importance of consuming orange and orange juice.

"Orange and orange juice are the main dietary source of vitamin C and flavonoids *[compounds with antioxidant and anti-inflammatory properties]* in Brazil, therefore playing a major role in our health under different circumstances", states coordinator at FoRc, Franco Lajolo. Professor Emeritus at USP and member of the International Academy of Food Science of Technology and of the Academia de Ciências do Estado de São Paulo, Lajolo has been committed to the study of food properties for more than 50 years. The researcher speaks to **Citricultor** magazine about benefits and potential of oranges and orange juice.

THE CONSUMPTION OF ORANGE AND ORANGE JUICE HAS INCREASED IN THE WORLD DURING THE COVID-19 PANDEMIC. HOW ARE THEY IMPORTANT TO BOOST OUR IMMUNE SYSTEM?

Our health depends on proper nutrition associated to a balanced diet of various nutrients. Orange and orange products are important foods in a balanced diet. They are a source of energy, fibers and micronutrients such as vitamin C, folate, potassium and others, and bioactive compounds like flavonoids and carotenoids. Vitamin C, flavonoids and carotenoids have an antioxidant and anti-inflammatory capacity, being part of our immune system modulation.

WHAT CAN BE SAID ABOUT THE CONSUMPTION OF ORANGE AND ORANGE JUICE AND THE NEW CORONAVIRUS?

There is currently no scientific evidence on medication, foods, vitamins and supplements to prevent or treat Covid-19, although we know that a balanced diet rich in vitamins, minerals and bioactive compounds plays an important role in maintaining our health.

WHAT OTHER HEALTH BENEFITS DO ORANGES AND ORANGE JUICE BRING?

Vitamin C and flavonoids have the antioxidant capacity

to neutralize free radicals and reduce the effects of cellular aging, decreasing the risk for the onset of some non-communicable chronic conditions such as cardiovascular disease and insulin resistance and improving cognitive function. Oranges also have a high dietary fiber content, which can contribute to better bowel function and controlled glycemia and cholesterol level.

WHAT IS THE RECOMMENDED CONSUMPTION FOR ATTAINING ALL THESE BENEFITS?

The recommended dietary allowance of vitamin C is 45 mg for adults and 30 to 35 mg for children. In 100 g of Pera orange there are about 50 mg of vitamin C and in 100 ml of orange juice there are approximately 73 mg of that nutrient. As for flavonoids, the intake of at least one glass of orange juice a day is recommended.

"ORANGE AND ORANGE JUICE ARE FOODS THAT ARE PART OF A BALANCED DIET. THEY SUPPLY ENERGY, FIBER AND MICRONUTRIENTS SUCH AS VITAMIN C, FOLATE, POTASSIUM AND OTHERS"

WHAT HAS RESEARCH AT USP ALREADY FOUND OUT IN TERMS OF OTHER HEALTH BENEFITS?

An ongoing study has shown that the daily intake of orange juice can help reduce body fat percentage especially in women and also lower the concentration of plasma triglycerides for a decreased risk of several chronic diseases such as obesity, cardiovascular disease and diabetes. In addition, results published in the Journal of Agricultural and Food Chemistry in 2019 show that the intake of orange juice can increase the beneficial bacteria in the small intestine.

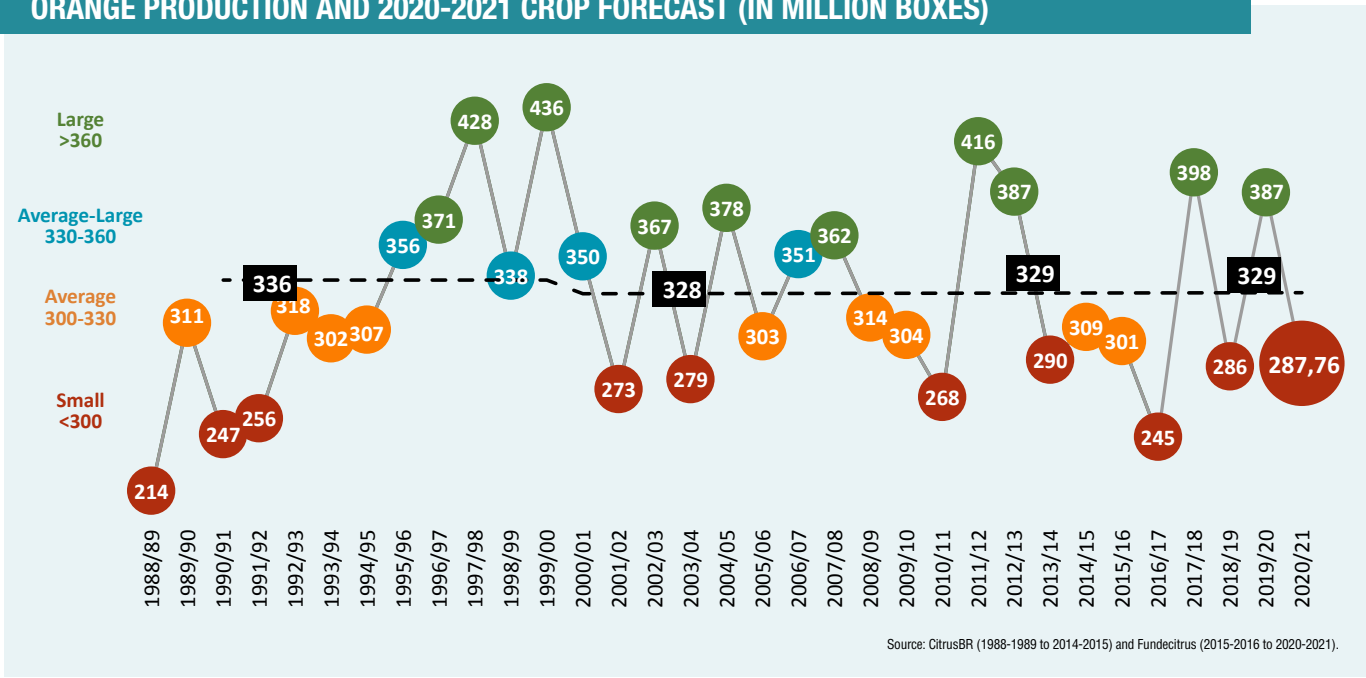
WHAT STUDIES ARE UNDERWAY AND WHAT RESULTS HAVE YOU HAD YET?

The effect of the juice of Pera and Moro oranges, the latter being red and rich in anthocyanin *[a natural dye with antioxidant properties]*, is being assessed. Juices have been found to cause a reduction in the lipidic profile, to help lower the damage resulting from a hypercaloric diet and especially to reduce the oxidative stress *[excessive free radicals]*, which can make the presentation of insulin resistance less severe. The importance of oranges and of our continued research is made clear.

CITED STUDIES WERE CARRIED OUT BY RESEARCHERS NEUZA HASSIMOTTO, ADRIANA ROZENBAUM, LAYANNE FRAGA AND CAMILLE COUTINHO

Watch the crop forecast announcement broadcast live online

ORANGE PRODUCTION AND 2020-2021 CROP FORECAST (IN MILLION BOXES)



Source: CitrusBR (1988-1989 to 2014-2015) and Fundecitrus (2015-2016 to 2020-2021).

The 2020-2021 crop is estimated at 287.76 million boxes

LOWER LEVEL OF ACCUMULATED RESERVES IN PLANTS AND ADVERSE CLIMATE EXPLAIN THE REDUCTION OF 25.6% IN CURRENT PRODUCTION IN RELATION TO THE 2019-2020 CROP SEASON

The 2020-2021 orange crop in the São Paulo and West-Southwest Minas Gerais citrus belt is expected to total 287.76 million boxes of 40.8 kg, according to the Crop Forecast Survey (PES) announcement made by Fundecitrus on May 11. This number is 25.6% smaller than the 386.79 million boxes of the 2019-2020 crop and 12.5% below the average crop size for the last ten years. Approximately 20.56 million boxes are expected to be produced in the Triângulo Mineiro.

This smaller crop relates to the large production in the previous crop season, which led to an increased consumption of nutrient reserves in plants, triggering the phenomenon known as alternate bearing. The climate was also a negative influence, with high temperatures in September and October 2019 affecting the setting of newly formed fruit and dry weather in March and April impacting fruit at a more advanced stage of development.

DESPITE THE YIELD DROP, THE TREND IS OF INCREASE

Average yield is estimated at 790 boxes per hectare, as compared to 1,045 boxes per hectare in the previous season, the highest yield ever recorded since the beginning of the historical series (1988-1989).

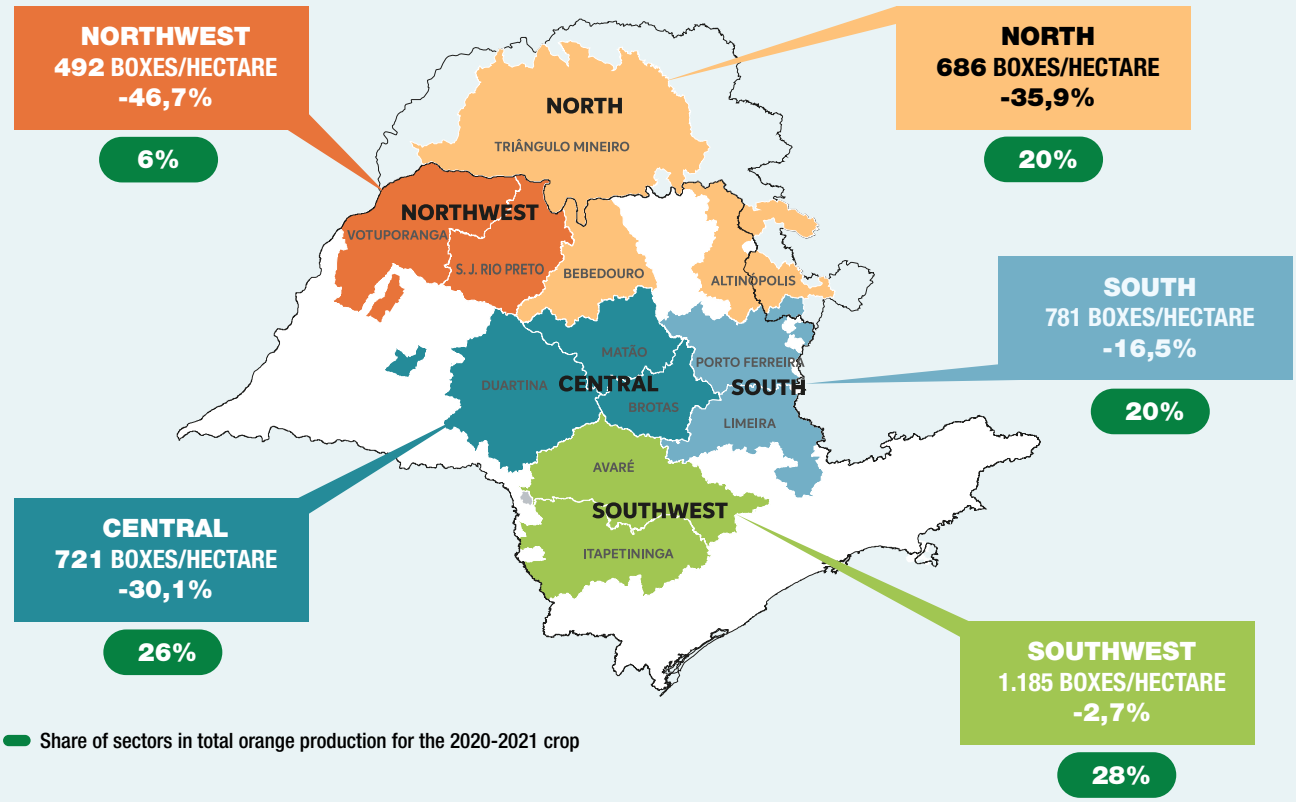
"Although the crop is small, it is worth mentioning that yield has increased throughout the years and is a worldwide benchmark even in a year with adverse climatic conditions", says Fundecitrus general manager, Juliano Ayres. "However, our citriculture is not only competitive from the economic point of view, but it is also sustainable, with a major concern about conservation and reduction of the environmental impact", he adds *(see more on page 9)*.

ALTERNATE BEARING IN SECTORS

Yield per sector as compared to last year's shows significant variations. According to PES coordinator, Vinícius Trombin, the larger the yield drop expected this season the larger the yield increase observed in the last crop.

"This is evidence of the biennial production cycle of orange trees, showing that the fruit load one year is usually inversely proportional to the load in the previous year, causing considerable variations in yield per hectare, which alternates with crop seasons", he explains. "But the main reason for fluctuations is the climatic change that frequently takes place from one year to the next", he says.

YIELD PER SECTOR AND YIELD DROP IN RELATION TO THE 2019-2020 CROP



STABLE SOUTHWEST

Orange production in each sector relates to the number of bearing trees but is under great influence of climatic conditions that can hinder or enhance all the productive potential of orange trees. When the climate is favorable in the entire citrus belt, as seen in the 2019-2020 crop, the sectors with the highest number of trees also produce the most fruit. However, in years with adverse climatic conditions, the Southwest takes the lead in total production, surpassing the Central sector for having better rainfall distribution and milder temperatures.

SMALL ORANGES

It takes a projected 257 fruits to fill a 40.8 kg box, i.e, oranges have an average weight of 159 grams each. Should this weight be confirmed as harvest progresses, oranges will be approximately 6% smaller than those in the last five crop seasons (169 grams average weight).

HIGH CONCENTRATION OF FRUITS FROM THE SECOND BLOOM

Different climatic conditions in the citrus belt caused a lack of uniformity in the bloom profile: out of the estimated total, 245.15 million boxes are of fruit from first and second blooms (85.2%); 34.64 million boxes from third bloom (12%); and 7.97 million boxes from forth bloom (2.8%).

The dry period necessary to produce water stress and induce flowering did not start at the same time in all regions and varied in duration and intensity. In most regions it lasted approximately 30 days. Only in the Triângulo Mineiro the period with no rainfall surpassed 90 days. In some regions, the drought took place in June whereas in others it took place only in August.

Rains picked up unevenly in all regions. Rains that ended the dry period fell in July in Porto Ferreira and Limeira, in August in the region of Votuporanga, and in the first week of September 2019 in the other regions. Although flowering was favored by rains in non-irrigated groves, it was affected by an Indian summer that lasted for two weeks in September for most part of the citrus belt. Along with that phenomenon, temperatures were high with peaks of up to 41 °C in several cities in the regions of Triângulo Mineiro, Bebedouro and São José do Rio Preto.

High temperatures continued throughout October 2019, with highs of at least 35 °C in all other regions, according to data from Somar Meteorologia. Bebedouro was the region with more days of maximum temperatures above 35 °C – 23 days.

Heat was less intense in the regions of Altinópolis, Brotas, Porto Ferreira, Limeira, Avaré and Itapetininga, which favored the setting of newly formed fruit. In those locations there were days with temperatures above 35 °C in October, although they alternated with milder days. Contrarily to the rest of the citrus belt, these regions did not record more than three consecutive days with temperatures above 35 °C.

In order to advance flowering, irrigation started primarily in July 2019, as seen in many groves in the Triângulo Mineiro, where 80% of the citrus area is irrigated. Irrigation contributed to minimize fruit drop in relation to the previous year.

Adverse climatic conditions caused a high loss of fruits from the first bloom. However, due to the compensatory effect of the low fruit setting, there was a significant increase in fruits from the second bloom.

THE BROADCAST LIVE ONLINE OF THE 2020-2021 ORANGE CROP FORECAST ANNOUNCEMENT WAS VIEWED BY MORE THAN 3.8 THOUSAND PEOPLE IN BRAZIL AND OTHER 25 COUNTRIES

PROFILE OF THE CITRUS PLANTED AREA

In relation to 2019, the area planted with the main varieties of orange remained basically the same, changing from 395,764 to 395,671 hectares. Total trees moved from 195 to 198 million. "Figures for the citrus planted area are extremely significant. Oranges occupy less than 400 thousand hectares, where there are 198 million trees. Despite the smaller figures for next crop, we have the means to meet market needs with a product of ever-increasing quality", highlights Fundecitrus president, Lourival Carmo Monaco.

In terms of planting density, 2019 recorded 616 trees/hectare. According to Fundecitrus general manager, Juliano Ayres, the number of trees is increasing whereas the planted area is not. "The reason is that groves are now planted with more than 600 plants per hectare as compared to less than 400 plants in the past. As of 2004, in the presence of greening (huanglongbing/HLB), denser plantings expanded and citriculture today strives for balance", he analyzes.

INCIDENCE OF GREENING (HUANGLONGBING/HLB)

In 2019, 19.02% of trees were contaminated. In drier years, the probability of fruit drop caused by the disease is higher. "The severity of symptoms increases with the years. According to studies carried out by Fundecitrus, six years after a plant is contaminated its production may be reduced up to 68% due to two factors: small fruit size and intense fruit drop", explains Ayres.

PLANING AND FOREIGN CONSUMPTION

The 2020-2021 crop forecast brings technical and market perceptions to agents in the citrus sector and helps decision making in a markedly biennial sector.

"From the technical point of view, this year's survey reinforces the work and improvement of the methodology and forecast. From the market point of view, the survey helps growers make rational decisions in view of changes at every crop season. Having an independent, reliable and transparent crop forecast system such as Fundecitrus's is the best insurance to understand market forces and for players to make their calculation", assesses CitrusBr executive director, Ibiapaba Netto.

In assessing market demands, PES methodological coordinator and professor at USP and Fundação Getúlio Vargas (FGV), Marcos Fava Neves, says that the 2020-2021 crop and inventory volumes are now in balance due to a recovered consumption of juice in the main markets because of the pandemic.

"This considerably lower supply meets at least a stable demand because consumption has increased in Europe and in the United States as an effort to boost immunity against Covid-19", he comments. "It is incredible to see the size of our domestic citriculture in the current context. Orange provides two billion dollars a year to Brazil while using only 400 thousand hectares. It is five thousand dollars per hectare, one of the greatest value additions in Brazilian agribusiness", he applauds.

Preserved vegetation and animal life

CAMBUHY AGRÍCOLA

CITRUS FARMS HAVE 182 THOUSAND HECTARES OF NATIVE WOODS EQUIVALENT TO ONE HECTARE OF FOREST TO EVERY TWO AND A HALF HECTARES OF CITRUS

SINCE IT IS A PERENNIAL CROP, WITH INFREQUENT INTENSE EARTH MOVING, CITRUS SET FAVORABLE CONDITIONS TO PRESERVE FLORA AND FAUNA

This year, the Crop Forecast Survey (PES) by Fundecitrus included an unprecedented study in citriculture on the quantification of areas dedicated to the preservation of native vegetation and biodiversity on citrus farms in São Paulo and West-Southwest Minas Gerais, which showed that green areas total 181,750 hectares. The area allocated to citriculture on those same farms amounts to 459,058 hectares, i.e., there is one hectare dedicated to environmental preservation to every 2.52 hectares of citrus groves *(see adjoining map)*.

"For the first time it was possible to assess the environmental contribution of citriculture, which is quite considerable. This preserved fixed asset shows the commitment of the Brazilian citriculture to environmental sustainability", says Fundecitrus general manager, Juliano Ayres.

PES coordinator, Vinícius Trombin, explains that the perenniality of citriculture favors the preservation of flora and fauna, creating favorable conditions for animal life to thrive. "The bearing life of citrus trees is approximately 20 years, therefore intense earth moving is not frequent and the growing system involves low traffic of invasive equipment, keeping woods stable and safe to animals", he clarifies. "Fruticulture also provides food to birds and small animals", he adds.

SUSTAINABLE PRODUCTION

According to the Brazilian forest code, preservation of vegetation aims at conserving water resources, land-

MATEUS FIORESI

ARTHUR TOMASETO

MARCELO SCAPIN

scape, soil, biodiversity of flora and fauna and the well-being of the population.

In the assessment by researcher at the Instituto Internacional de Ecologia (IIE) José Galizia Tundisi, who specializes in the management of water resources, the rate between areas of native forests and citrus growing areas represents an important investment and a crucial example for sustainable production. "This initiative benefits not only the citrus production sector, but rather all society", he states. "It has already been scientifically evidenced that areas of preserved native vegetation have quantitative and qualitative influence on the hydrological cycle and the spring water quality, as well as on the preservation of the land biodiversity", he points out.

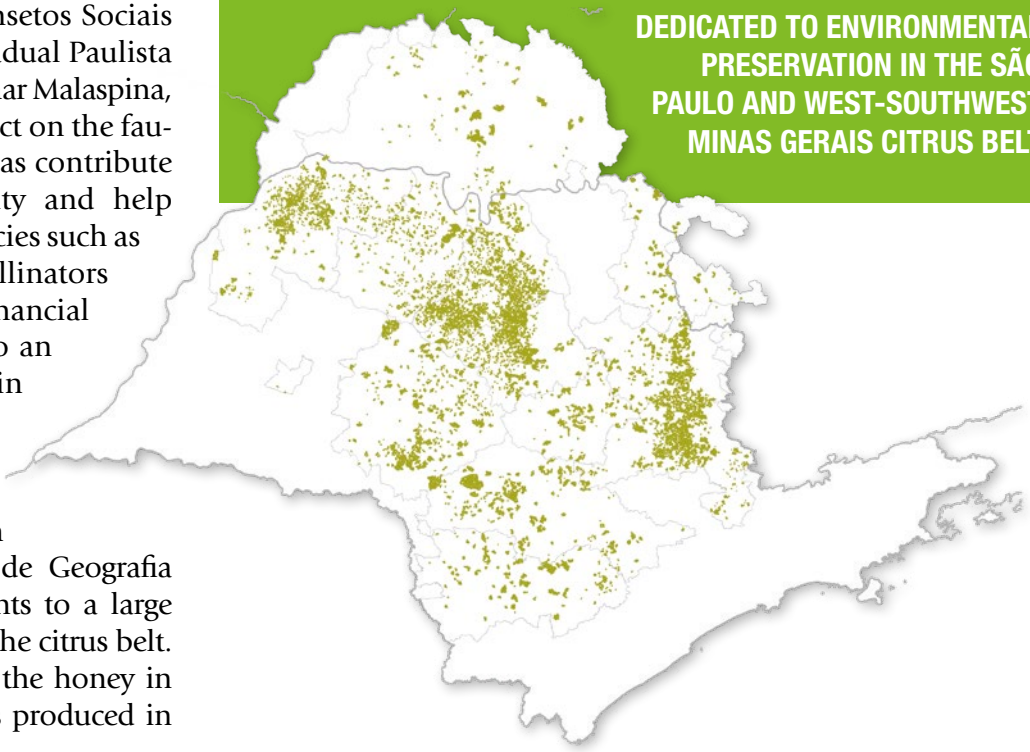
Biologist and researcher at the Centro de Estudos de Insetos Sociais of the Universidade Estadual Paulista (Unesp-Rio Claro), Osmar Malaspina, also highlights the impact on the fauna. "These protected areas contribute to sustained biodiversity and help preserve pollinating species such as bees. The presence of pollinators generates a significant financial return to growers due to an increase of up to 50% in the quantity and quality of fruits produced", he emphasizes.

In addition, data from the Instituto Brasileiro de Geografia e Estatística (IBGE) points to a large production of honey in the citrus belt. "Approximately 80% of the honey in the state of São Paulo is produced in cities where citrus is grown. In the region, the increase in honey production in the last decade was much greater than in cities that are not part of the citrus belt", highlights Trombin.

In Aguaí (SP), the farm of citrus grower Richard Van Den Broek surpasses the 20% of preserved woods required by law. His family has been dedicated to citriculture for three generations, passing on the concern about the environment. In order to conserve the soil and the eight kilometers of the Itupeva river that cross the farm, the citrus grower employs no-till and contour farming. Animals such as puma, pampas deer, black capuchin and paca are often seen – hunting and fishing are prohibited. Bees are kept in the woods as well.

PROTECTED AREAS ALSO HELP PRESERVE BEES; 80% OF THE HONEY PRODUCTION IN SÃO PAULO COMES FROM CITIES WHERE CITRUS IS GROWN

LOCATION OF AREAS DEDICATED TO ENVIRONMENTAL PRESERVATION IN THE SÃO PAULO AND WEST-SOUTHWEST MINAS GERAIS CITRUS BELT



"AS LONG AS GROWERS RESPECT THE ENVIRONMENT, THEY BENEFIT THE MOST", SAYS RICHARD VAN DEN BROEK, CITRUS GROWER IN AGUAÍ (SP)

"The farm was purchased in 2002 and already had a preservation area that demanded care, so all recommended good practices were adopted to maintain it", he comments. "As long as growers respect the environment, they benefit the most, with preserved tributaries, water supply and a balanced ecosystem. We perceive that as wealth and are greatly pleased to know that flora and fauna are in harmony with citrus growing", he says.

TERRITORIAL AND ENVIRONMENTAL DIMENSION

The quantification of the preserved area was based on a methodology developed by Empresa Brasileira de Pesquisa Agropecuária - Embrapa Territorial, with information of the complete mapping of the citrus belt performed by Fundecitrus in 2017 and data from the Rural Environmental Registry (RER).

According to head of Embrapa Territorial, Evaristo de Miranda, information is relevant to protect the sustainability of the Brazilian production. "This work complements and enriches the analyses on the territorial dimension of areas designated to preservation of native vegetation by farmers who use the methods developed by Embrapa Territorial on their farms in the citrus belt with significant results", he comments.

Head of research at Embrapa Territorial Lucíola Magalhães divulges that the partnership with Fundecitrus will reach beyond territorial extension. "We have started negotiations to develop research on the environmental dimension of mapped areas, including the monitoring of biodiversity and the current and future inventory of carbon, besides environmental services rendered in those areas", she mentions.

TOWARDS AN EVER MORE SUSTAINABLE CITRICULTURE

Fundecitrus's concern about reducing the impact of citriculture and contributing to environmental preservation is present in several projects and research studies with many results already obtained:

- Reduction of 70% in water and chemicals to control psyllids in the last ten years
- Biological control of greening (huanglongbing/HLB) with the use of *Tamarixia radiata* as a complementary management measure
- Reduction of up to 80% of copper application and amount used yearly to control citrus canker
- External actions for greening management have already donated more than 60 thousand nursery plants to be planted in the citrus belt
- Up to 75% less spraying with the use of the prediction system for blossom blight

External actions have already reduced greening

DISEASE INCIDENCE DROPPED ON FARMS THAT EXPANDED CONTROL BEYOND FARM GATES

MORE THAN 60 THOUSAND NURSERY PLANTS HAVE BEEN DONATED TO THE POPULATION, WHO ACCEPTS REPLACEMENT OF PLANTS DUE TO THE SOCIAL AND ECONOMIC IMPORTANCE OF CITRICULTURE

Assessments performed by Fundecitrus on farms located in several regions of the citrus belt show that external actions for greening (huanglongbing/HLB) management resulted in a reduction in the disease incidence on those farms. In 2019, studies carried out by that institution had already related the work beyond farm gates to a decreased capture of psyllids, however this is the first result from the effect of external actions in the decrease of greening in commercial groves under strict internal management *(see adjoining graphs and analyses)*.

"As the removal of citrus and orange jasmine plants increases within a radius of five kilometers around farms, there is a decrease in the incidence of greening, which reinforces the importance of external actions as a disease control measure", states Fundecitrus general manager, Juliano Ayres. "Studies in several countries are underway to improve the effectiveness of management and provide more alternatives to citrus growers, but this work is what has really been successful. Results strengthen the actions recommended by Fundecitrus and adopted in the citrus belt", he says.

VALMIR CAMPOS

EXTERNAL MANAGEMENT AND REDUCTION IN GREEENING

Graphs show the relation between further external management actions (orange line) and decrease in greening rate (green line):

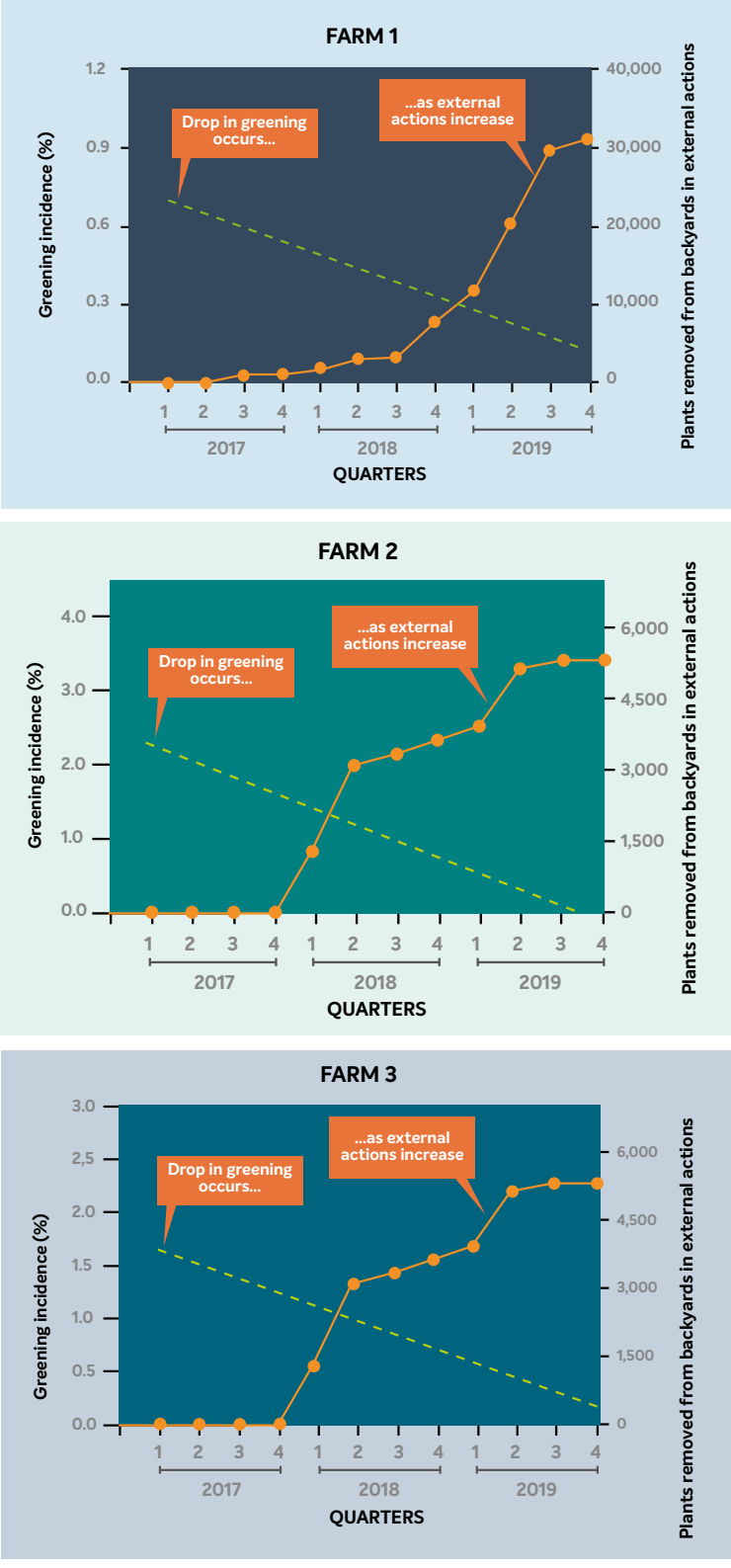
"In addition to observing that the increased elimination of inoculum sources results in a decreased incidence of greening, there is a downward trend of the disease with time", explains Fundecitrus agronomist Arthur Tomaseto, in charge of statistical analyses.

EXTERNAL CONTROL

External control of greening is based on taking action on inoculum sources located outside commercial groves, within a five-kilometer radius. For citrus plants without the recommended disease control and orange jasmine plants present in places such as backyards, sidewalks, countryside houses and cottages, therefore both in rural and urban areas, a free replacement by other fruit or ornamental species that are not attractive to greening-carrying psyllids is offered.

HIGH EFFICIENCY: ACTIONS REPLACED 93% OF CITRUS PLANTS WITHOUT DISEASE CONTROL AND ORANGE JASMINE PLANTS

ON THREE FARMS LOCATED IN THE SOUTHWEST REGION IT IS POSSIBLE TO OBSERVE THAT THE RATE OF GREENING DECREASED AFTER EXTERNAL ACTIONS WERE CARRIED OUT



SUSTAINABILITY

Greening has no cure, that is why preventive management measures are so important for its control. According to Fundecitrus agronomist Ivaldo Sala, external actions bring mid- and long-term gains.

"The reduction in greening translates into decreased loss of diseased plants and fruit drop, with yield unchanged. With time, that represents many citrus growers remaining in the sector", he comments. "Other benefits include the extended longevity of groves, which is greatly affected by the disease today, and more confidence in planting new groves", he assesses.

Fundecitrus researcher Renato Bassanezi highlights also that the decreased pressure exerted by external areas without disease control results in less dependence on chemical control. "On farms that eliminated contamination sources in their surroundings, the number of spray applications to control psyllids can be reduced for an increasingly more sustainable citriculture from the economic and environmental points of view", he anticipates. "On the other hand, we see that frequent applications are often not enough to halt the advance of greening on farms that do not adopt external management actions", he points out.

HIGH EFFICIENCY

The high efficiency of external actions in the citrus belt, with the replacement of 93% of citrus plants without disease control and orange jasmine plants found in places like pastures, countryside houses and sidewalks, has caused a reduction in the capture of psyllids and consequently in greening. According to Fundecitrus agronomist Guilherme Rodriguez, the support from the population was decisive.

"Nine out of ten people accept the replacement of their plants that are breeding sites and contamination sources of the greening-carrying insect by other fruit and ornamental species. They understand the social and economic importance of citriculture, with its job creation and income generation to so many families and cities", he comments. "In addition, with the donation of nursery plants, external actions also contribute to larger and revitalized urban forests in many cities", adds Rodriguez *(see page 16)*.

FORMATION OF TEAMS

The external management work intensified by Fundecitrus in 2018 and carried out in partnership with citrus growers encompassed more than 1.4 million hectares in the citrus planted area from August 2018 to May 2020. More than 800 thousand plants have already been replaced.

In many locations, teams formed with several citrus growers enabled or increased the efficiency of the actions, since a larger number of contributing people expands the radius of reach, besides sharing costs.

WHY DO EXTERNAL MANAGEMENT?

ANDRÉ LUIZ TEIXEIRA CRESTE

Agricultural director at Agro São José – farms in Ubirajara, Bariri, Pirajuí and Santa Cruz do Rio Pardo (SP)

External actions started in 2018, when new groves were planted. "Our greening rates have never been high, but we saw that they were increasing in the region, which really worried us. There were many small growers with improper greening management in the surroundings of their farms, abandoned groves and plants in backyards and on sidewalks", he says. "As a result of this work, there was no increase in greening in young groves and new areas planted. In groves of five to eight years of age there was a decrease from 11% to 3.5%".

Part of the actions was carried out in partnership with other citrus growers. "Teamwork makes it easier. Unity makes strength in this case, since the disease is endemic", he assesses. "We replaced a large number of trees and today work continues on rescouting areas. That was fundamental to the successful control of the vector insect".

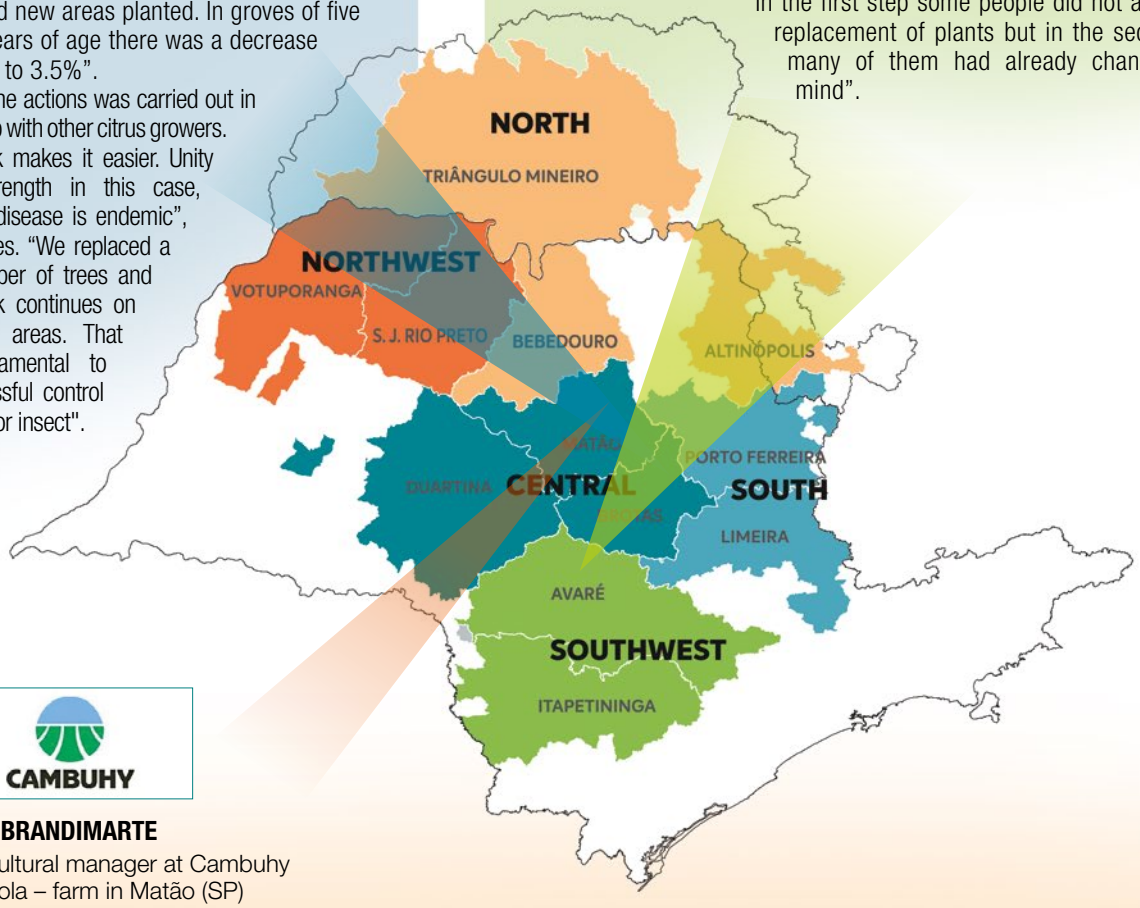
APRÍGIO TANK JÚNIOR

Agricultural production manager at Agroterenas S/A - Citrus – farms in the regions of Santa Cruz do Rio Pardo and Duartina (SP)

"The increase in greening in the last years showed that the management in place in the region was not enough. Therefore, according to the pillars recommended by Fundecitrus, we started the external management. As of then, the disease stabilized and its rate decreased on farms", he says.

External actions started in 2018, with our own team. "Soon after that, due to the high demand of work, a need arose for teams to be formed by bringing together citrus growers in the region, both for sharing costs and for supplying nursery plants and materials. The area traveled surpassed the radius of five kilometers initially estimated. The cost-benefit has been quite satisfactory in view of results, with stabilization and then decrease of the disease".

In January 2020, rescouting started in the areas included in this work. "People's acceptance was excellent, much better than expected. In the first step some people did not accept the replacement of plants but in the second step many of them had already changed their mind".



IVAN BRANDIMARTE

Agricultural manager at Cambuhy Agrícola – farm in Matão (SP)

Cambuhy was one of the first farms to carry out external actions, in 2011. "We realized it was not possible to control the disease by acting only within the farm and then we started external management actions that were intensified in 2018 through the partnership with Fundecitrus. We saw the decreased capture of psyllids, then a significant drop in the incidence of greening and for three years the disease rate has been stable and around 1.2%", he says. "External management has a very low cost of 1 to 1.5% of the cost of greening control, in relation to the benefits it offers", he assesses.

The farm believes in the continuity and expansion of external actions. "Work has been done in a radius of five kilometers. Soon we will rescout and the idea is to enlarge this area to reduce the disease even further. It is work that cannot stop", he says. "Today this is essential to control the disease and has to be expanded to all regions of the citrus belt".

Revitalized urban forests

ACTION IN GAVIÃO PEIXOTO (SP) REPLACES CITRUS AND ORANGE JASMINE PLANTS WITH TWICE AS MANY OTHER FRUIT AND ORNAMENTAL SPECIES

Visit the Fundecitrus's YouTube channel to see this and other actions

In 2018, external actions against greening (huanglongbing/HLB) were carried out in Gavião Peixoto (SP), a city in the Central sector of the citrus belt with approximately 4.8 thousand inhabitants (IBGE, 2019), as a result of a partnership among Fundecitrus, city hall and citrus growers in the region. The result, besides collaborating to local citriculture, contributed to revitalize the urban forest in the city: more than 600 nursery plants of other fruit and ornamental species were donated, i.e. twice the number of citrus and orange jasmine plants found.

"Gavião Peixoto is an important citrus growing city where producing areas are close to the urban area, therefore the need to replace plants that are sources of contamination with greening", explains Fundecitrus agronomist Ivaldo Sala. "Population adherence was high, with almost all citrus and orange jasmine plants being replaced in squares, gardens and on sidewalks. Two years after the action, it is already possible to see the new trees growing and changing the landscape", he says.

Gavião Peixoto resident Ester Lustre allowed the replacement of two trees that were on the sidewalk by her house. According to her, her decision considered the relevance of citriculture to job creation and income generation to so many families. "Growing oranges is what we have always done for a living, it used to be my job and now it is what my son does for a living", she comments.

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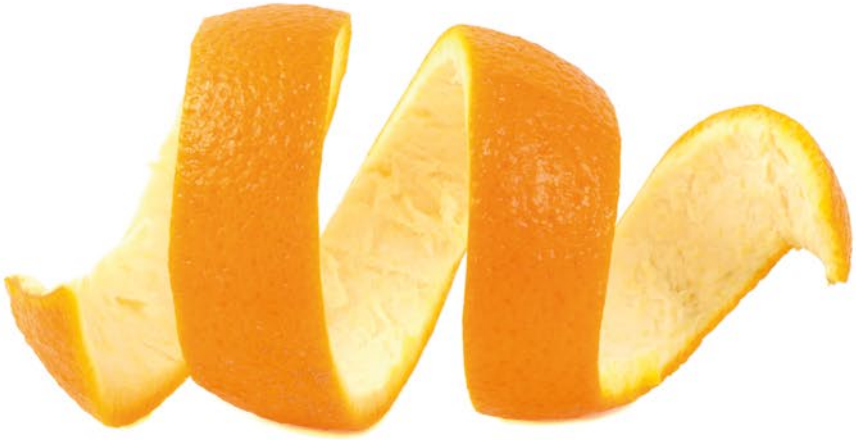
Caring for the health of groves. And the health of people.

The culture of prevention is in the DNA of citrus growers in São Paulo and Minas Gerais who, for decades, have faced viruses, bacteria and fungi that threaten citriculture. Their learning can be quite important at this time of the Covid-19 pandemic. Use your plant health knowledge to care for people. The adoption of prevention measures is fundamental to avoid contamination and spread of the new coronavirus.



In citriculture, harvesting is manual and labor dependent. But actually, people depend on citriculture. Besides creating 200 thousand direct and indirect jobs in Brazil, this activity bears valuable fruit to boost our immune system.

For further information, visit **www.fundecitrus.com.br** and see the **Handbook with Recommendations to Prevent Covid-19 in the Citrus Sector.**

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SCIENCE AND SUSTAINABILITY IN CITRICULTURE

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