2021-2022 FINAL ORANGE CROP FORECAST UPDATE FOR THE SÃO PAULO AND WEST-SOUTHWEST MINAS GERAIS CITRUS BELT – APRIL/2022

Current forecast update (variation regarding the February forecast): **April 11, 2022**
Total orange crop production forecast: 262.97 million boxes (decreased of 0.4%)
Hamlin, Westin and Rubi: 47.16 million boxes (unchanged)
Other early season: 14.85 million boxes (decreased of)
Pera Rio: 74.78 million boxes (decreased of 0.1%)
Valencia and Valencia Folha Murcha: 96.59 million boxes (decreased of 0.7%)
Natal: 29.59 million boxes (decreased of 1.4%)

The orange production forecast of the 2022-2023 season will be released at 10:00 a.m. (BRT, GMT -3:00) on May 26, 2021.

Orange crop forecast update by sector and variety group – citrus belt

Month	Forecast components				Crop forecast update 2021-2022			Crop forecast update 2021-2022		
	February/2022 and April/2022 (strike-through values were presented in February, to their left are their respective values updated in April)				February/2022			April/2022		
Sector and variety group	Bearing trees	Fruit per tree at stripping	Fruit estimated per box	Estimated drop rate	Per tree	Per hectare	Total	Per tree	Per hectare	Total
	(1,000 trees)	(number)	(number)	(percentage)	(boxes/ tree)	(boxes/ hectare)	(1,000,000 boxes)	(boxes/ tree)	(boxes/ hectare)	(1,000,000 boxes)
CITRUS BELT										
Hamlin, Westin and Rubi....	25,410	780	332	12.0	1.86	819	47.16	1.86	819	47.16
Other early.....	9,003	614	289	13.5	1.65	804	14.85	1.65	804	14.85
Pera Rio.....	59,147	531	287 ~~290~~	23.8 ~~23.0~~	1.27	654	74.87	1.26	653	74.78
Valencia and Folha Murcha	54,121	696	262 ~~264~~	25.0 ~~24.0~~	1.80	844	97.26	1.78	838	96.59
Natal.....	18,878	638	269 ~~274~~	26.3 ~~24.0~~	1.59	744	30.00	1.57	734	29.59
Total.....	**166,560**	**639**	**285** ~~287~~	**21.8** ~~20.9~~	**1.59**	**763**	**264.14**	**1.58**	**760**	**262.97**
NORTH SECTOR										
Hamlin, Westin and Rubi....	6,620	826	332	12.0	1.97	808	13.01	1.97	808	13.01
Other early.....	2,088	770	289	13.5	2.07	1,022	4.32	2.07	1,022	4.32
Pera Rio.....	13,007	540	287 ~~290~~	23.8 ~~23.0~~	1.29	700	16.74	1.29	699	16.72
Valencia and Folha Murcha	13,637	765	262 ~~264~~	25.0 ~~24.0~~	1.98	893	26.96	1.96	887	26.78
Natal.....	4,313	635	269 ~~274~~	26.3 ~~24.0~~	1.58	714	6.82	1.56	703	6.72
Subtotal.....	**39,665**	**688**	**285** ~~287~~	**21.8** ~~20.9~~	**1.71**	**808**	**67.85**	**1.70**	**804**	**67.55**
NORTHWEST SECTOR										
Hamlin, Westin and Rubi....	2,245	553	332	12.0	1.31	597	2.95	1.31	597	2.95
Other early.....	1,661	512	289	13.5	1.37	668	2.28	1.37	668	2.28
Pera Rio.....	6,697	604	287 ~~290~~	23.8 ~~23.0~~	1.44	661	9.63	1.44	660	9.62
Valencia and Folha Murcha	3,597	575	262 ~~264~~	25.0 ~~24.0~~	1.49	724	5.35	1.48	719	5.31
Natal.....	1,771	411	269 ~~274~~	26.3 ~~24.0~~	1.02	491	1.81	1.01	486	1.79
Subtotal.....	**15,971**	**559**	**285** ~~287~~	**21.8** ~~20.9~~	**1.38**	**648**	**22.02**	**1.37**	**646**	**21.95**
CENTRAL SECTOR										
Hamlin, Westin and Rubi....	7,062	791	332	12.0	1.88	850	13.28	1.88	850	13.28
Other early.....	3,169	563	289	13.5	1.51	692	4.79	1.51	692	4.79
Pera Rio.....	17,647	485	287 ~~290~~	23.8 ~~23.0~~	1.16	601	20.41	1.16	601	20.39
Valencia and Folha Murcha	13,967	680	262 ~~264~~	25.0 ~~24.0~~	1.76	815	24.52	1.74	809	24.35
Natal.....	4,634	701	269 ~~274~~	26.3 ~~24.0~~	1.74	768	8.08	1.72	757	7.97
Subtotal.....	**46,479**	**617**	**285** ~~287~~	**21.8** ~~20.9~~	**1.53**	**732**	**71.08**	**1.52**	**729**	**70.78**
SOUTH SECTOR										
Hamlin, Westin and Rubi....	4,590	687	332	12.0	1.63	736	7.50	1.63	736	7.50
Other early.....	494	850	289	13.5	2.29	1,015	1.13	2.29	1,015	1.13
Pera Rio.....	12,310	488	287 ~~290~~	23.8 ~~23.0~~	1.16	591	14.32	1.16	590	14.30
Valencia and Folha Murcha	11,123	670	262 ~~264~~	25.0 ~~24.0~~	1.73	786	19.25	1.72	781	19.12
Natal.....	2,738	565	269 ~~274~~	26.3 ~~24.0~~	1.41	689	3.85	1.39	680	3.80
Subtotal.....	**31,255**	**595**	**285** ~~287~~	**21.8** ~~20.9~~	**1.47**	**702**	**46.05**	**1.47**	**699**	**45.85**
SOUTHWEST SECTOR										
Hamlin, Westin and Rubi....	4,894	895	332	12.0	2.13	969	10.42	2.13	969	10.42
Other early.....	1,591	544	289	13.5	1.46	834	2.33	1.46	834	2.33
Pera Rio.....	9,486	609	287 ~~290~~	23.8 ~~23.0~~	1.45	770	13.77	1.45	769	13.75
Valencia and Folha Murcha	11,796	695	262 ~~264~~	25.0 ~~24.0~~	1.80	918	21.18	1.78	912	21.03
Natal.....	5,422	699	269 ~~274~~	26.3 ~~24.0~~	1.74	862	9.44	1.72	850	9.31
Subtotal.....	**33,189**	**694**	**285** ~~287~~	**21.8** ~~20.9~~	**1.72**	**873**	**57.14**	**1.71**	**869**	**56.84**

Orange production for the 2021-2022 crop season totaled 262.97 million boxes[1]

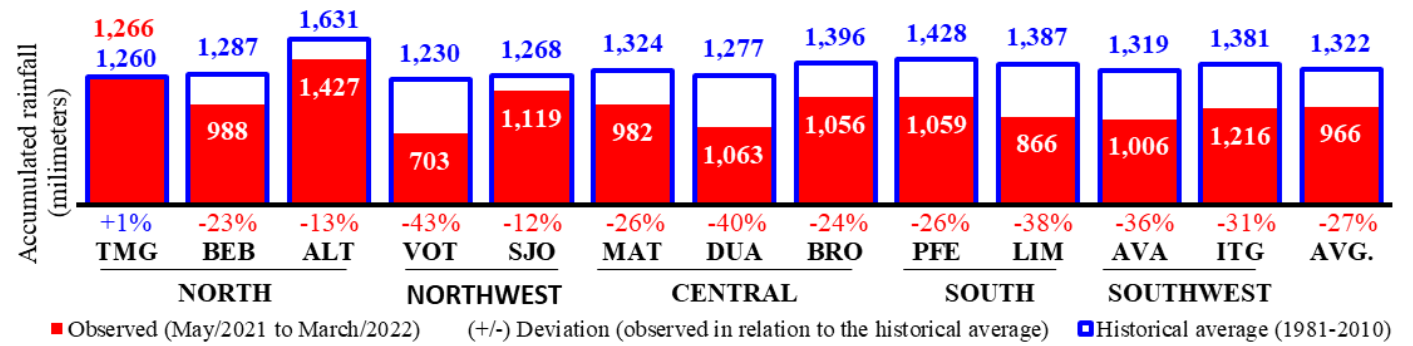
The 2021-2022 orange crop for the São Paulo and West-Southwest Minas Gerais citrus belt, published on April 11, 2022, by Fundecitrus – performed in cooperation with Markestrat, FEA-RP/USP and FCAV/Unesp[2] – is 262.97 million boxes of 40.8 kg each. Approximately 23.35 million boxes were produced in West Minas Gerais.

This final figure was 10.61% smaller than the initially expected volume published in May 2021, corresponding to a significant crop loss of 31.20 million boxes. Although this was an "on-year" for the alternate-bearing, when plants produced a larger amount of fruit, a sharp decrease in rainfall and more intense atypical frosts inhibited the growth of oranges and contributed to an increased early fruit drop, therefore reducing the number of oranges at harvest. Under those conditions, there was a yield loss in groves, which made the crop decrease 2.11% as compared to the previous one, resulting in a small crop for the second consecutive year. Total orange production included:

- 47.16 million boxes of the Hamlin, Westin and Rubi early-season varieties;
- 14.85 million boxes of the Valencia Americana, Seleta and Pineapple early-season varieties;
- 74.78 million boxes of the Pera Rio mid-season variety;
- 96.59 million boxes of the Valencia and Valencia Folha Murcha late-season varieties;
- 29.59 million boxes of the Natal late-season variety.

The May 2021 forecast considered that the yield of groves would be affected due to the lower rainfall volume that was already forecast for 2021. However, forecasts did not point to climate conditions as extreme as those observed, which brought greater than expected damage. The prolonged dry spell turned out to be the worst drought in almost a century, with water shortage in practically all regions of the citrus belt. That critical situation severely impacted rainfed groves, which encompass approximately 70% of the total area and inevitably rely on rainfall. But even irrigated groves were affected by drought. In many locations, rivers and reservoirs reached the most critical levels ever recorded, restricting water use for irrigation. This crop's most critical period was from May to September 2021, when accumulated rainfall was almost 70% below historical average. The scenario started to improve in late September and early October when spring came.

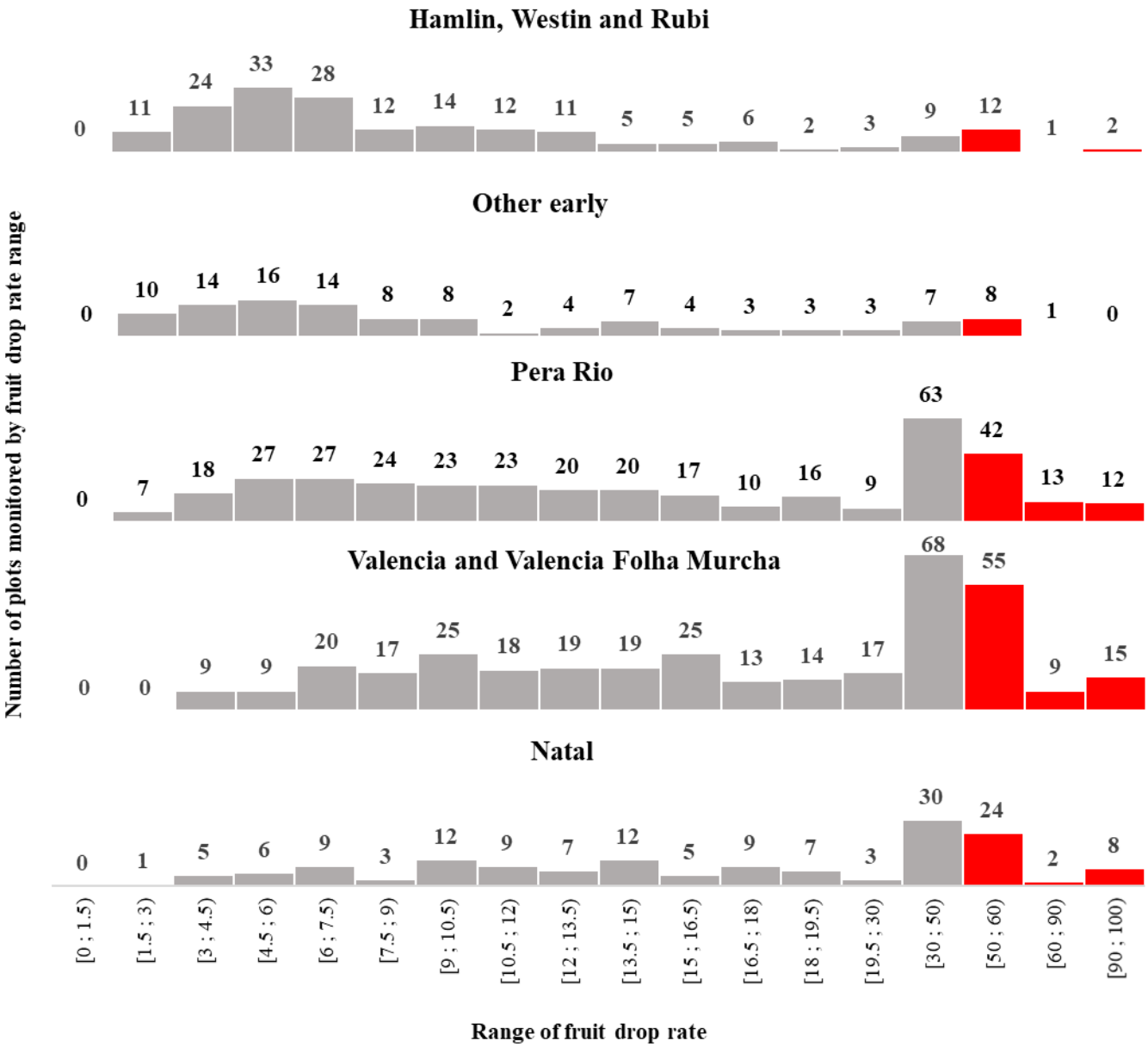
In the entire crop season, from May 2021 to March 2022, the accumulated average rainfall in the citrus belt was 966 millimeters, that is, 366 millimeters or 27% below the historical average of 1,332 millimeters, according to data from Somar/Climatempo Meteorologia. In all regions except for Triângulo Mineiro, accumulated figures were below their respective climatological normals (1981-2010). In absolute figures, the lowest accumulated rainfalls were observed in the regions of Votuporanga (703 millimeters), Duartina (760 millimeters), Avaré (846 millimeters), Limeira (866 millimeters), Itapetininga (947 millimeters), Matão (982 millimeters) and Bebedouro (988 millimeters). In five regions, the accumulated rainfall surpassed 1,000 millimeters: Brotas (1,056 millimeters), Porto Ferreira (1,059 millimeters), São José do Rio Preto (1,119 millimeters), Triângulo Mineiro (1,266 millimeters) and Altinópolis (1,427 millimeters), as presented in Graph 1.



Graph 1: Accumulated rainfall from May 2021 to April 2022 in the citrus belt
Source: Fundecitrus, according to data supplied by Somar/Climatempo Meteorologia

In addition to negative precipitation anomalies, rains were scattered or isolated and irregularly distributed, causing even more intense regional dry spells, meaning there was a large variation in rainfall frequency and intensity in cities of the same region. In the Votuporanga region, for instance, the city of Sud Mennuci recorded 905 millimeters of rain, whereas Jales, located less than 100 kilometers away, recorded only 326 millimeters. Other example of that is found in the Limeira region, where rainfall in the city of Mogi Guaçu totaled 1,124 millimeters, whereas in Limeira, a mere 70 kilometers away, rainfall was only 435 millimeters.

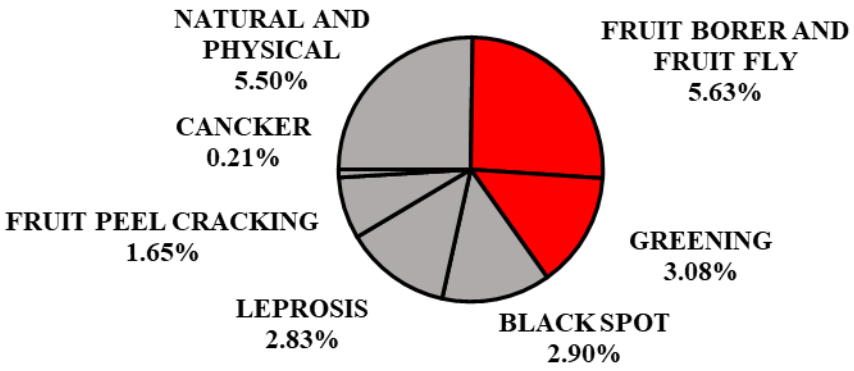
The average fruit drop rate for the citrus belt, accumulated since the beginning of the crop season, was estimated at 21.80%, which is within the margin of error of plus or minus 0.96 percentage point, with 95% confidence. In addition to the fruit drop rate being the highest since Fundecitrus surveys started in the 2015-2016 crop season, it is also of concern due to the large concentration of plots with extremely high drop rates. As shown in the histograms (Graph 2), approximately 18% of Pera Rio plots and 22% of plots with late varieties presented drop rates above 50%, which is to say that more than half the fruit produced in those plots never made it to harvest.



Graph 2: Frequency distribution of plots monitored according to their fruit drop rate
Source: Fundecitrus

The main reason accounting for 5.50% of total fruit drop is still the category including physiological drop (4.52%) and mechanical drop (0.98%) mainly caused by pruning and machinery traffic. Once again, significant fruit drop resulted from fruit peel cracking due to loss of peel plasticity as a consequence of the severe drought, which accounted for 1.65% of the drop of premature fruit.

Ranking first again among main pests and diseases that caused fruit drop was fruit borer together with fruit fly, at a rate of 5.63%. An increased population of those insects was observed in the 2018-2019 crop season and since then has been the first or second leading cause of fruit drop. Greening ranked second, at a rate of 3.08%, because of the high disease intensity. Black spot ranked third, at 2.90%, showing that the occurrence of multiple blooms made the disease harder to control also in this crop season. Leprosis ranked fourth, at 2.83%, due to a larger infestation of mites in plants greatly affected by the water deficit. Citrus canker ranked last, at a rate of 0.21%, as shown in Graph 3.



Graph 3: Causes comprising the average fruit drop rate, with emphasis on pests and diseases.
Source: Fundecitrus.

As far as the drop rate distribution among varieties is concerned, Hamlin, Westin and Rubi totaled 12.0% and margin of error of ± 1.7 percentage point; other early-season varieties totaled 13.5% and margin of error of ± 1.5 percentage point; Pera Rio totaled ± 23.8 and margin of error of ± 1.9 percentage point; Valencia and Valencia Folha Murcha totaled 25.0% and margin of error of ± 2.0 percentage points; and Natal totaled 26.3% and margin of error of ± 2.6 percentage points.

Owing to the critical climate situation, most groves faced water shortage leading to a reduced growth of fruit already developed. The average orange weight was 143 grams (5.04 oz), which is 15% lower than that in the last five crop seasons (169 grams average). Fruit weight was initially projected to reach 157.5 grams (5.56 oz) at harvest.

In the analysis by variety, an average weight of 305 fruits per box (134 grams/4.73 oz per fruit) projected in May 2021 for the group that includes Hamlin, Westin and Rubi was updated at the end of the crop season to 332 fruits per box (123 grams/4.34 oz per fruit). The average weight of 259 fruits per box (158 grams/5.57 per fruit) projected in May 2021 for oranges of other early varieties was updated to 289 fruits per box (141grams/4.97 oz per fruit). The initial projection of 260 fruits per box (157 grams/5.54 per fruit) for Pera Rio was updated to 287 fruits per box (142 grams/5.01 per fruit). The average fruit size projection for Valencia and Valencia Folha Murcha in May 2021 of 240 fruits per box (170 grams/6.0 oz per fruit) was updated to 262 fruits per box (156 grams/5.50 oz per fruit) at the end of the crop season. The initial projection for Natal of 243 fruits per box (168 grams/5.93 per fruit) was updated to 269 fruits per box (152 grams/5.36 oz per fruit)) in this final crop forecast.

Data collected in the field survey and used for forecast updates was obtained by stratified sampling according to region, variety, and age. The survey started in May 2021 on 1,200 plots that were visited and sampled on a monthly basis until harvest was complete. Other data used in this study was size of fruit received throughout the crop season by orange juice companies associated to Fundecitrus – Citrosuco, Cutrale and Louis Dreyfus – for industrial processing. Each processing company supplies individual data under confidentiality to the independent consulting firm for the calculation of the average size of processed fruit.

2022-2023 crop forecast

The orange crop forecast and tree inventory update announcement will be held at 10:00 a.m. (BRT, GMT -3:00) on May 26, 2022 in an in-person event at Fundecitrus – broadcast live with simultaneous interpretation in English on the Fundecitrus YouTube channel.

[1] Hamlin, Westin, Rubi, Valencia Americana, Seleta, Pineapple, Pera Rio, Valencia, Valencia Folha Murcha and Natal.
[2] Department of math and science, FCAV/Unesp Jaboticabal Campus.