2018-2019 ORANGE CROP FORECAST UPDATE FOR SÃO PAULO AND WEST-SOUTHWEST MINAS GERAIS CITRUS BELT – FINAL CROP FORECAST

Current forecast update (variation regarding the February forecast): **April 10, 2019**
Total orange crop production forecast[1]: 285.98 million boxes (increase of 0.39%)
Hamlin, Westin and Rubi: 50.70 million boxes (unchanged)
Other early season[2]: 14.66 million boxes (unchanged)
Pera Rio: 79.12 million boxes (increase of 0.58%)
Valencia and Valencia Folha Murcha: 107.91 million boxes (increase of 0.26%)
Natal: 33.59million boxes (decrease of 1.08%)

The orange production forecast of the 2019-2020 season will be released at 10:00 a.m. (BRT, GMT -3:00) on May 10, 2019.

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

Month	Forecast components				Crop forecast update 2018-2019			Crop forecast update 2018-2019		
	February/2019 and April/2019 (strike-through values were presented in February, to their left are their respective values updated in April)				February/2019			April/2019		
Sector and variety group	Bearing trees	Fruit per tree at stripping[3]	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.....	26,649	766	320	11.00	1.90	833	50.70	1.90	833	50.70
Other early[2].....	7,959	664	282	12.30	1.84	810	14.66	1.84	810	14.66
Pera Rio.....	61,575	454	261 ~~263~~	16.80	1.28	630	78.66	1.29	633	79.12
Valencia and Folha Murcha[4]..	59,583	560	224 ~~225~~	18.40	1.81	824	107.63	1.81	826	107.91
Natal.....	19,503	603	237 ~~240~~	23.80	1.70	757	33.23	1.72	765	33.59
Total.....	**175,269**	**564**	**259** ~~**260**~~	**16.70**	**1.63**	**753**	**284.88**	**1.63**	**756**	**285.98**
NORTH SECTOR										
Hamlin, Westin and Rubi.....	7,302	625	320	11.00	1.55	655	11.33	1.55	655	11.33
Other early[2].....	2,014	525	282	12.30	1.46	672	2.93	1.46	672	2.93
Pera Rio.....	12,120	305	261 ~~263~~	16.80	0.86	451	10.41	0.86	454	10.47
Valencia and Folha Murcha[4]..	14,055	449	224 ~~225~~	18.40	1.45	644	20.37	1.45	646	20.42
Natal.....	3,832	595	237 ~~240~~	23.80	1.68	722	6.44	1.70	730	6.51
Subtotal.....	**39,323**	**456**	**259** ~~**260**~~	**16.70**	**1.31**	**604**	**51.48**	**1.31**	**606**	**51.66**
NORTHWEST SECTOR										
Hamlin, Westin and Rubi.....	2,658	487	320	11.00	1.21	540	3.21	1.21	540	3.21
Other early[2].....	1,303	596	282	12.30	1.65	707	2.16	1.65	707	2.16
Pera Rio.....	8,814	262	261 ~~263~~	16.80	0.74	336	6.49	0.74	338	6.53
Valencia and Folha Murcha[4]..	3,864	235	224 ~~225~~	18.40	0.76	362	2.93	0.76	363	2.93
Natal.....	1,711	283	237 ~~240~~	23.80	0.80	362	1.37	0.81	366	1.38
Subtotal.....	**18,350**	**314**	**259** ~~**260**~~	**16.70**	**0.88**	**402**	**16.16**	**0.88**	**404**	**16.21**
CENTRAL SECTOR										
Hamlin, Westin and Rubi.....	6,782	685	320	11.00	1.70	730	11.54	1.70	730	11.54
Other early[2].....	2,938	637	282	12.30	1.77	728	5.19	1.77	728	5.19
Pera Rio.....	17,777	465	261 ~~263~~	16.80	1.31	654	23.23	1.31	658	23.37
Valencia and Folha Murcha[4]..	16,511	511	224 ~~225~~	18.40	1.65	742	27.21	1.65	744	27.29
Natal.....	4,585	587	237 ~~240~~	23.80	1.66	689	7.59	1.67	697	7.67
Subtotal.....	**48,593**	**533**	**259** ~~**260**~~	**16.70**	**1.54**	**704**	**74.76**	**1.54**	**707**	**75.06**
SOUTH SECTOR										
Hamlin, Westin and Rubi.....	4,923	833	320	11.00	2.07	940	10.19	2.07	940	10.19
Other early[2].....	550	636	282	12.30	1.76	750	0.97	1.76	750	0.97
Pera Rio.....	12,628	554	261 ~~263~~	16.80	1.56	727	19.67	1.57	731	19.78
Valencia and Folha Murcha[4]..	12,911	537	224 ~~225~~	18.40	1.73	754	22.36	1.74	756	22.42
Natal.....	3,323	583	237 ~~240~~	23.80	1.65	719	5.47	1.66	726	5.53
Subtotal.....	**34,335**	**592**	**259** ~~**260**~~	**16.70**	**1.71**	**767**	**58.66**	**1.72**	**770**	**58.89**
SOUTHWEST SECTOR										
Hamlin, Westin and Rubi.....	4,984	1,165	320	11.00	2.89	1,312	14.43	2.89	1.312	14.43
Other early[2].....	1,154	1,066	282	12.30	2.96	1,506	3.41	2.96	1.506	3.41
Pera Rio.....	10,236	655	261 ~~263~~	16.80	1.84	944	18.86	1.85	950	18.97
Valencia and Folha Murcha[4]..	12,242	880	224 ~~225~~	18.40	2.84	1,413	34.76	2.85	1.417	34.85
Natal.....	6,052	723	237 ~~240~~	23.80	2.04	983	12.36	2.06	994	12.50
Subtotal.....	**34,668**	**834**	**259** ~~**260**~~	**16.70**	**2.42**	**1,190**	**83.82**	**2.43**	**1.195**	**84.16**

[1] Hamlin, Westin, Rubi, Valencia Americana, Seleta, Pineapple, Pera Rio, Valencia, Valencia Folha Murcha and Natal.
[2] Valencia Americana, Seleta and Pineapple.
[3] Weighted average per stratum bearing trees.
[4] Folha Murcha – Valencia Folha Murcha.

Final orange[1] crop forecast totals 285.98 million boxes

The 2018-2019 final orange crop forecast for São Paulo and West-Southwest Minas Gerais citrus belt, published on April 10, 2019 by Fundecitrus – performed in cooperation with Markestrat, FEA-RP/USP and FCAV/Unesp[2] – is of 285.98 million boxes of 40.8 kg each, which is 28.2% smaller in comparison to the previous crop (2017-2018) of 398.35 million boxes, and 11.6% below the crop average in the last ten years[3]. The survey's data show that final production was 0.8% smaller than the initial projection carried out in May 2018, of 288.29 million boxes. Final crop total includes:

- 50.70 million boxes of the Hamlin, Westin and Rubi varieties;
- 14.66 million boxes of the Valencia Americana, Seleta and Pineapple varieties;
- 79.12 million boxes of the Pera Rio variety;
- 107.91 million boxes of the Valencia and Valencia Folha Murcha varieties;
- 33.59 million boxes of the Natal variety.

Approximately 16.02 million boxes of the final crop were produced in West Minas Gerais.

This crop season, adverse weather conditions in the citrus belt, with the exception of the Southwest region, resulted in a lower yield in groves. Irregular climate in the crop season set in back in 2017 with delayed spring rains, which caused orange trees to bloom late. High temperatures after flowering hindered fruit set, ultimately reducing the number of oranges per tree.

During fruit development and harvesting from May 2018 to March 2019, the accumulated rainfall in the citrus belt was 1,295 millimeters, which is 3% below historical average (1981-2010), according to data from Somar Meteorologia. The months of May 2018 to July 2018 were drier than expected, with rainfall well below average. With decreased rainfall, fruit size did not reach the average 256 fruits per box (159 grams per fruit) projected in May 2018. Three fruits above projection were necessary to fill a 40.8 kg box. Therefore, the final average size for all varieties was 259 fruits per box (158 grams per fruit). The deviation between final average size (April 2019) and projected size (May 2018) was small, although deviation for each variety was more significant due to irregular rainfall distribution and fruit harvesting time.

The largest deviations were observed in early varieties because of the water shortage in the beginning of the crop season, which coincided with the harvest of those orange varieties. Average fruit size projected in May 2018 for the group of varieties Hamlin, Westin and Rubi was 292 fruits per box, which differed from the actual 320 fruits per box at the end of the crop season. Fruit size of other early varieties moved from 255 fruits per box in May 2018 to 282 fruits per box. The Pera Rio variety was less impacted by the drought in comparison to early varieties, changing from the initial projection of 255 fruits per box to 261 fruits per box. Conversely, late varieties benefitted from rainfall above historical average from August 2018 to November 2018 and despite the Indian summers in December 2018 and January 2019, the rainfall accumulated until the end of the harvest was enough to guarantee fruit growth. The average fruit size projected in May 2018 of 240 fruits per box for the Valencia and Valencia Folha Murcha varieties moved to 224 fruits per box at the end of the crops season. The fruit size for the Natal variety changed from the initial projection of 240 fruits per box to 237 fruits per box in this update.

Average fruit drop rate in the citrus belt accumulated from the beginning of the crop season until harvest was 0.30 percentage point below projection and closed at 16.70%. Margin of error is of plus or minus 0.69 percentage point with 95 percent confidence. The fruit drop rate breaks down into the following causes for fruit drop: 5.16% natural drop, mechanization or adverse climate, 5.70% fruit borer and fruit flies, 2.70% greening, 2.02% black spot, 0.82% leprosis and 0.30% citrus canker. The largest losses due to fruit drop were caused by fruit borer and fruit flies, whose percentage more than doubled as compared to that of the previous crop. One of the reasons for this increase was the availability of fruit on trees for a longer period, owing to the higher proportion of fruit from the 3rd and 4th blooms produced in this crop season and harvested at a later time, therefore enabling the continuity of the life cycle of these pests. The drop rate distribution for varieties showed the lowest rate of 11.00% and margin of error of ± 1.00 percentage point for Hamlin, Westin and Rubi, a rate of 12.30% and margin of error of ± 1.23 percentage point for other early varieties, 16.80% and margin of error of ± 1.14 percentage point for Pera Rio, 18.40% ± 1.49 percentage point for Valencia and Valencia Folha Murcha, and 23.80% ± 2.86 percentage point for Natal.

Crop estimate and updates were performed by employing the objective method based on quantitative data – field measurements, fruit counting and weighing. The four main components of the model are: (1) bearing trees, (2) fruit per tree, (3) drop rate, and (4) fruits per box (fruit size). The first two remained unchanged from May 2018 to April 2019 and were obtained respectively from the tree inventory and fruit stripping from 2,560 trees. The components 'drop rate' and 'fruit per box' were updated according to survey data gathered from monitoring 1,200 plots since May until their harvest is complete. Other data included in this study was size of fruit received throughout the crop 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.

1 Hamlin, Westin, Rubi, Valencia Americana, Seleta, Pineapple, Pera Rio, Valencia, Valencia Folha Murcha and Natal.

2 Department of Math and Science at FCAV/Unesp, Jaboticabal Campus.

3 Average production for the last decade is of 323.34 million boxes. Data for crops 2008/2009 to 2014/2015 supplied by orange juice companies associated to Fundecitrus – Citrosuco, Cutrale and Louis Dreyfus, which, individually, have estimated their crop for the citrus planted area since 1988, through objective methodology. Data for the 2015/2016 and 2016/2017 crops supplied by Fundecitrus.