Current forecast update (variation regarding the September forecast):   **December, 10 2020**

Total orange crop production forecast: 269.36 million boxes (decreased of 6.05%)

Hamlin, Westin and Rubi: 47.00 million boxes (decreased of 1.88%)

Other early season: 13.85 million boxes (unchanged)

Pera Rio: 78.88 million boxes (decreased of 6.52%)

Valencia and Valencia Folha Murcha: 94.36 million boxes (decreased of 9.80%)

Natal: 35.27 million boxes (decreased of 1.97%)

Publication Schedule 2020-2021

3rd Crop forecast update: February 10, 2021
Final crop forecast: April 12, 2021

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

| Month	Forecast components September/2020 and December/2020 (strike-through values were presented in September, to their left are their respective values updated in December)				Crop forecast update 2020-2021 September/2020			Crop forecast update 2020-2021 December/2020		
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.......	26,889	620	278 274	12.80 12.10	1.78	812	47.90	1.75	797	47.00
Other early............................	7,892	565	255	11.50	1.75	827	13.85	1.75	827	13.85
Pera Rio................................	61,520	506	276	22.20 16.50	1.37	695	84.38	1.28	649	78.88
Valencia and Folha Murcha...	58,166	588	245 234	24.70 20.00	1.80	841	104.61	1.62	758	94.36
Natal....................................	19,786	634	247	22.70 21.00	1.82	840	35.98	1.78	824	35.27
Total...................................	**174,253**	**568**	**261 257**	**21.10 17.30**	**1.65**	**787**	**286.72**	**1.55**	**739**	**269.36**
NORTH SECTOR										
Hamlin, Westin and Rubi.......	7,450	557	278 274	12.80 12.10	1.60	695	11.92	1.57	681	11.69
Other early............................	1,947	622	255	11.50	1.94	924	3.77	1.94	924	3.77
Pera Rio................................	12,549	414	276	22.20 16.50	1.12	599	14.08	1.05	560	13.17
Valencia and Folha Murcha...	13,951	499	245 234	24.70 20.00	1.53	695	21.31	1.38	627	19.23
Natal....................................	3,891	626	247	22.70 21.00	1.80	764	6.99	1.76	749	6.85
Subtotal..............................	**39,789**	**502**	**261 257**	**21.10 17.30**	**1.46**	**687**	**58.07**	**1.38**	**647**	**54.71**
NORTHWEST SECTOR										
Hamlin, Westin and Rubi.......	2,405	572	278 274	12.80 12.10	1.64	729	3.95	1.61	716	3.88
Other early............................	1,339	320	255	11.50	0.99	436	1.33	0.99	436	1.33
Pera Rio................................	7,197	367	276	22.20 16.50	0.99	453	7.16	0.93	423	6.69
Valencia and Folha Murcha...	3,982	361	245 234	24.70 20.00	1.10	537	4.40	0.99	483	3.96
Natal....................................	1,866	190	247	22.70 21.00	0.55	264	1.02	0.54	259	1.00
Subtotal..............................	**16,788**	**372**	**261 257**	**21.10 17.30**	**1.06**	**492**	**17.86**	**1.00**	**464**	**16.86**
CENTRAL SECTOR										
Hamlin, Westin and Rubi.......	7,121	516	278 274	12.80 12.10	1.48	705	10.55	1.45	692	10.35
Other early............................	2,922	566	255	11.50	1.76	836	5.14	1.76	836	5.14
Pera Rio................................	18,640	475	276	22.20 16.50	1.29	663	24.00	1.20	619	22.43
Valencia and Folha Murcha...	16,090	545	245 234	24.70 20.00	1.67	781	26.86	1.51	705	24.23
Natal....................................	4,787	509	247	22.70 21.00	1.46	650	7.00	1.43	637	6.86
Subtotal..............................	**49,559**	**512**	**261 257**	**21.10 17.30**	**1.48**	**718**	**73.55**	**1.39**	**673**	**69.01**
SOUTH SECTOR										
Hamlin, Westin and Rubi.......	4,748	589	278 274	12.80 12.10	1.69	772	8.03	1.66	757	7.88
Other early............................	379	766	255	11.50	2.37	918	0.90	2.37	918	0.90
Pera Rio................................	12,976	548	276	22.20 16.50	1.49	717	19.28	1.39	670	18.02
Valencia and Folha Murcha...	11,986	608	245 234	24.70 20.00	1.86	825	22.30	1.68	744	20.11
Natal....................................	3,176	594	247	22.70 21.00	1.70	781	5.41	1.67	764	5.29
Subtotal..............................	**33,265**	**582**	**261 257**	**21.10 17.30**	**1.68**	**774**	**55.92**	**1.57**	**723**	**52.20**
SOUTHWEST SECTOR										
Hamlin, Westin and Rubi.......	5,166	907	278 274	12.80 12.10	2.60	1,221	13.45	2.56	1,199	13.20
Other early............................	1,305	669	255	11.50	2.08	1,091	2.71	2.08	1,091	2.71
Pera Rio................................	10,158	722	276	22.20 16.50	1.96	1,043	19.86	1.83	976	18.57
Valencia and Folha Murcha...	12,157	799	245 234	24.70 20.00	2.45	1,229	29.74	2.21	1,109	26.83
Natal....................................	6,065	895	247	22.70 21.00	2.57	1,284	15.56	2.52	1,260	15.27
Subtotal..............................	**34,852**	**804**	**261 257**	**21.10 17.30**	**2.33**	**1,181**	**81.32**	**2.20**	**1,112**	**76.58**

Updated orange[1] crop forecast totals 269.36 million boxes

The 2020-2021 orange crop forecast update for the São Paulo and West-Southwest Minas Gerais citrus belt, published on December 10, 2020 by Fundecitrus – performed in cooperation with Markestrat, FEA-RP/USP and FCAV/Unesp[2] –, is 269.36 million boxes of 40.8 kg each. The first forecast update, published in September, already showed a drop as compared to the initial projection, but the expected production was significantly hindered by late rainfall in the spring and intense heat. In this second forecast update, a decrease of 18.40 million boxes represents a drop of 6.39% in relation to the initial forecast. Should this new projection hold true until harvest ends, it will result in the largest crop loss for the citrus belt since the beginning of the historical series in 1988-1989 and a downturn of 30.36% in comparison to the previous crop season. Approximately 19.35 million boxes of the total crop should be produced in West Minas Gerais.

A poor outlook for rainfall was expected in 2020 due to the possibility of the climate event La Niña forming, which was officially confirmed in September. However, other phenomena, such as the so-called Atlantic Multidecadal Oscillation, simultaneously contributed to less rainfall and increased temperatures that reached unprecedented levels in several regions of the citrus belt. Consequently, the effects on groves resulting from adverse weather conditions this year were much worse as compared to those observed during the last La Niña, between November 2017 and April 2018. Besides La Niña being more intense, other factor that caused worse damage was the period when it hit. In 2017, when La Niña was confirmed in November, approximately 80% of the production had already been harvested and therefore the major damage was in fruit setting for the following crop season. Except that this year, La Niña arrived earlier, in early September, when harvest had reached only 30% of the production.

As these climatic phenomena intensified, rainfall volumes were reduced in relation to the historical average for all regions of the citrus belt. From May to August, accumulated rainfall was 14% below historical average and reached the negative index of 41% for the accumulated volume from September to November. For the whole period, from May to November, the average rainfall in the citrus belt was 337 millimeters, which is approximately 150 millimeters less than the normal for the period and a volume that is 32% lower than the historical average (1981-2010), according to data from Somar Meteorologia.

The change in the rainfall pattern was less marked only in three out of the 12 regions of the citrus belt, with accumulated volumes above the average for the citrus belt but still below historical volumes: Itapetininga, with 612 millimeters (-24% in relation to the historical average); Avaré, with 493 millimeters (-13% in relation to the historical average); and Duartina, with 447 millimeters (-15% in relation to the historical average). In the other regions, extremely severe drought conditions were observed, with accumulated volumes varying from 161 millimeters (-61% in relation to the historical average) in the region of Votuporanga to 336 millimeters (-35% in relation to the historical average) in the region of Porto Ferreira, as presented in Graph 1.
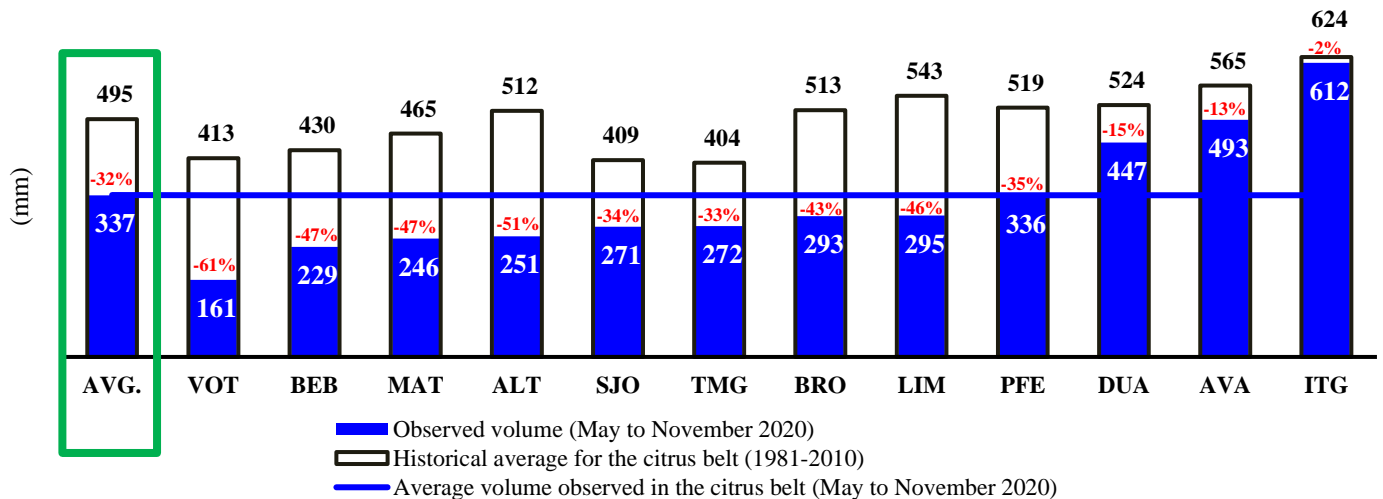
Graph 1: Accumulated rainfall from May to November 2020 in citrus belt regions.
Source: Fundecitrus, from data supplied by Somar Meteorologia.

In the nine regions with larger rainfall deficits, few more significant rains between May and October were scattered and interspersed with long drought periods. The number of consecutive days without rainfall above 10 millimeters was 145 in the North sector, comprising the regions of Altinópolis, Bebedouro and Triângulo Mineiro; 120 in the Northwest sector, comprising the regions of Votuporanga and São José do Rio Preto; almost 80 days in a row in average in the Central sector, although there was considerable variation among its regions: Matão (105 days), Duartina (53 days) and Brotas (77 days); about 90 straight days in the South sector, comprising the regions of Porto Ferreira and Limeira; and finally 55 consecutive days in the Southwest, comprising the regions of Avaré and Itapetininga. Rains that broke the drought were so localized that in many cases they fell in isolated areas within a same farm, with insufficient accumulated volumes to balance the water deficit. In November, the rainfall volume increased and, although still below historical average, enabled a slight recovery of fruit weight.

Monthly maximum average temperatures in the citrus belt were above the climatological normal throughout the year of 2020, except for the months of February and August. The hottest months were September and October, when maximum average temperatures were respectively 4.4ºC (39.9ºF) and 3.1ºC (37.6 ºF) above historical maximum average temperatures for those months. This past October, in the city of Lins, in the region of Duartina, the automatic weather station recorded 43.5ºC (110.3 ºF), the highest temperature in the history of the state of São Paulo since 1933, when the series began.

Damage caused by adverse weather varied from region to region or even from plot to plot within a same farm. However, trees with water stress signals were found in practically all regions of the citrus belt. Symptoms first appeared in plants grafted onto less drought-resistant rootstocks, such as Swingle citrumelo, but were soon also noticed in orange trees grafted onto Rangpur lime and other rootstocks. In regions with larger rainfall deficits, groves were more often found to have trees with leaf curling, different shades of green, intense defoliation and twig dieback, sunburnt, wilted and stunted fruit with decreased juice content. The occurrence of scattered rains followed by dry periods led to a new fruit growth phase, although in some cases the inner structure of the peel did not have plasticity enough to prevent sunken spots and cracks that caused their early drop. Trees that were further debilitated by some nutritional deficiency or phytosanitary problems, such as the greening disease, were more susceptible to the effects of the drought, produced smaller oranges and presented a more marked fruit drop.

In many groves, the long-lasting drought and the intense heat caused irreversible damage such as the death of plants spread out throughout plots. More drastic cases were observed in some non-irrigated plots especially in the North, Northwest and Central sectors, where all or almost all trees died. The number of dead trees will be determined from the sampling survey to be carried out in the first quarter of 2021 in 5% of plots distributed throughout the whole citrus belt, aiming at the update of the tree inventory for the next crop season. That information will provide more precision to the crop forecast since trees that died as a result of the drought before their fruit was harvested will be excluded from the total bearing trees accounted for in this crop season. That result will be presented in the final crop forecast on April 12, 2021.

Crop loss was not even larger only because a considerable share of the production was less exposed to adverse weather conditions. Overall, this share was comprised of the production of 34.78 million orange trees of early varieties that were largely harvested before the most critical drought period, the production of 43.36 million trees of mid-season and late varieties in irrigated groves, and also the production of 26.41 million trees of mid-season and late varieties in groves located in the regions of Itapetininga and Avaré, with smaller rainfall deficits. Those trees added together account for 60% of the bearing trees in the citrus belt.

Owing to adverse weather conditions and to a larger amount of fruit from the second bloom in this crop, harvest is at a much slower pace as compared to that in previous years. Field survey data shows that harvest reached 58% of the production in November, whereas at the same time last year that rate was 74%. Harvest of the early varieties Hamlin, Westin and Rubi is complete; harvest reached 97% for the other early varieties Valencia Americana, Seleta and Pineapple; 58% for Pera Rio; 43% for Valencia and Valencia Folha Murcha; and 33% for Natal.

Considering all varieties, the average size projected in May of 257 fruits to fill a 40.8 kg box, equivalent to oranges with an average weight of 159 grams (5.60 oz), was updated to 261 fruits per box, which means fruits should be even smaller, with a weight of 156 grams (5.51 oz). If that weight is confirmed, oranges will be harvested at a weight that is 8% lower than the average for the last five crop seasons (169 grams or 5.96 oz).

Fruits of the early varieties Hamlin, Westin and Rubi had a final average weight of 147 grams (5.18 oz), which is smaller than the 149 grams (5.25 oz) projected in September. Therefore, fruit size for these varieties in this forecast update changes to 278 fruits per box, whereas in September it had been projected at 274 fruits per box. Fruit weight for the other early varieties Valencia Americana, Seleta and Pineapple remains at 160 grams (5.64 oz), as projected in September, with a size of 255 fruits per box. Mid-season Pera Rio also remains at 148 grams per fruit (5.21 oz), equivalent to 276 fruits per box, as projected in September. Late varieties Valencia and Valencia Folha Murcha had their average weight reduced for the second time, from 174 (6.15 oz) to 167 grams (5.87 oz) per fruit, corresponding to a variation in size from 234 to 245 fruits per box. Fruit size for the late variety Natal did not change due to its low harvested volume.

The projected fruit drop rate rose again from 17.30% to 21.10% average for all varieties, reaching its highest level since the survey started in 2015. Except for the early varieties Valencia Americana, Seleta and Pineapple, all other varieties have presented higher fruit drop rates than initially projected. Fruit drop rate for the variety Pera Rio increased the most, from 16.50% to 22.20%, although the varieties Valencia and Valencia Folha Murcha should present the highest fruit drop rate, of 24.70%.

The method used for the update is the same adopted in the previous crop season. Information was obtained from the monitoring survey started in May on 1,200 plots that are no longer visited when fruit harvest is 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.

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[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.