



Average Market Rate Recommendations - January 1, 2018

Executive Summary:

The Office of Research and Analysis (ORA) recommends the following Average Market Rates (AMRs) for use by the Colorado Department of Revenue (Department) in levying the excise tax on the sale or transfer of Retail Marijuana from a Retail Marijuana Cultivation Facility¹:

	Bud Rate (\$/lb)	Trim Rate (\$/lb)	Bud Allocated for Extraction Rate (\$/lb)	Trim Allocated for Extraction Rate (\$/lb)	Immature Plant Rate (\$/ea)	Wet Whole Plant Rate (\$/lb)	Seed Rate (\$/ea)
Average Market Rate	\$1,265	\$506	\$376	\$325	\$10	\$215	\$3

The AMRs were calculated based on retail marijuana transactions recorded from August 1, 2017 through October 31, 2017. Starting August 9, 2017, the AMR is required for transfers between affiliated businesses, whereas, the contract price is required for transfers between unaffiliated businesses. Beginning January 1, 2018, a rate for Contaminated Product Allocated for Extraction Rate (introduced on August 9, 2017) is no longer applicable and instead, the AMR includes two new categories: Bud Allocated for Extraction and Trim Allocated for Extraction.

Transactions excluded the following five types of data: 1) transfers containing processed products (e.g., PreRolls, PreRoll Cones, Joints, and Kief); 2) Medical Marijuana transfers; 3) transfers to testing facilities; 4) transfers between affiliated businesses; 5) transfers to retail cultivators.

Detailed information related to the methodology and estimation techniques used to arrive at these results can be found on pages 2-12 of this document.

¹ Starting August 9, 2017, the AMR is required for transfers between affiliated businesses, whereas, the contract price is required for transfers between unaffiliated businesses.

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Average Market Rate Methodology:

The Department's Taxation Division determined that the excise tax upon wholesale sales of Retail Marijuana can effectively be levied upon seven product categories (sources: Department of Revenue Retail Marijuana Rules 1 CCR 212-2 and 1 CCR 201-18):

1. Bud (product in the flowering stage);
2. Trim (any part of a plant other than the Bud or Wet Whole Plant);
3. Immature Plants (nonflowering plants that are no taller than eight inches and no wider than eight inches produced from a cutting, clipping or seedling);
4. Wet Whole Plants (plants that are cut off just above the roots and are not trimmed, dried, or cured; the plant must be weighed within 2 hours of the plant being harvested and without any further processing);
5. Seeds (the seeds of the marijuana plant);
6. Bud Allocated for Extraction (bud that is designated for the extraction of Retail Marijuana Concentrate and not for direct sale to consumers);
7. Trim Allocated for Extraction (bud that is designated for the extraction of Retail Marijuana Concentrate and not for direct sale to consumers).

In order to estimate the AMR for each of the categories and in order to comply with the rate-setting requirements of §39-28.8-101(1.5), C.R.S., ORA calculated the AMRs for January 1, 2018, based on transactions from August 1, 2017, through October 31, 2017, that originated from retail marijuana cultivators and were recorded by manifest numbers in the Marijuana Enforcement Tracking Reporting Compliance (METRC). Transactions excluded the following five types of data: 1) transfers containing processed products (e.g., PreRolls, PreRoll Cones, Joints, and Kief); 2) Medical Marijuana transfers; 3) transfers to testing facilities; 4) transfers between affiliated businesses; 5) transfers to retail cultivators.

Pursuant to §12-43.4-104, C.R.S., October 1, 2014, marked the beginning of the retail marijuana market for businesses which did not previously hold medical marijuana licenses. At that time, the Marijuana Enforcement Division updated the METRC system and required that price data be entered and recorded for wholesale marijuana transfers. Initially, price data for entire manifests containing multiple categories was entered into METRC, and as a result, category prices were not able to be calculated. However, in February 2015, the price field was revised to allow prices with multiple categories under the same manifest number. Additionally, in March 2016, the Department made modifications on the data collection in METRC by including the receiver wholesale price and item descriptions.

For the July 1, 2016 AMR, the Department calculated rates for two new categories, Whole Wet Plants and Seeds.

Starting with the July 1, 2017 AMR, the Department began calculating rates using the median instead of the mean.

For the August 9, 2017 AMR, the Department calculated a rate for the Contaminated Product Allocated for Extraction category.

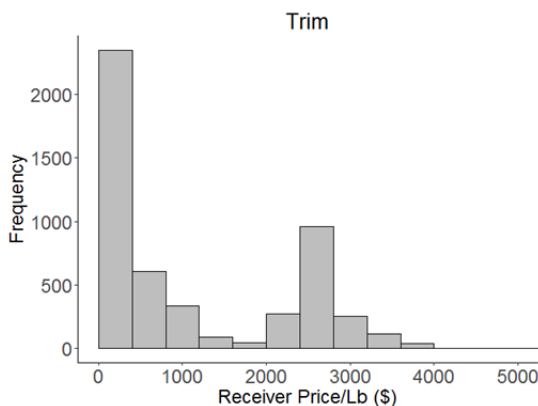
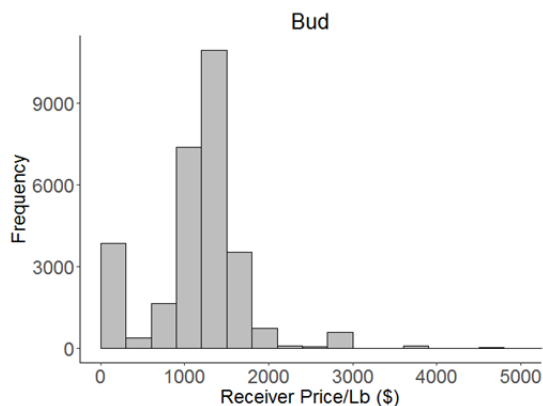
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For the January 1, 2018 AMR, prices per pound (for bud, trim, bud allocated for extraction, trim allocated for extraction, and wet whole plant) and prices each (for immature plants and seeds) were calculated for each item. The distribution of price frequencies was assessed to identify potential outliers or data entry errors. The following tables and graphs display the raw data of all single item transfer manifests from August 1, 2017, through October 31, 2017.

The frequency tables, histograms, and summary statistics for the raw data are shown below.

Raw Frequencies	
Bud	
Rate (\$/lb)	Frequency
\$0 - \$300	3,842
\$301 - \$600	379
\$601 - \$900	1,638
\$901 - \$1,200	7,377
\$1,201 - \$1,500	10,949
\$1,501 - \$1,800	3,532
\$1,801 - \$2,100	729
\$2,101 - \$2,400	75
\$2,401 - \$2,700	52
\$2,701 - \$3,000	587
\$3,001 and over	135
Total	29,295

Raw Frequencies	
Trim	
Rate (\$/lb)	Frequency
\$0 - \$400	2,349
\$401 - \$800	607
\$801 - \$1,200	335
\$1,201 - \$1,600	87
\$1,601 - \$2,000	41
\$2,001 - \$2,400	273
\$2,401 - \$2,800	957
\$2,801 - \$3,200	254
\$3,201 - \$3,600	112
\$3,601 - \$4,000	36
\$4,001 and over	7
Total	5,058



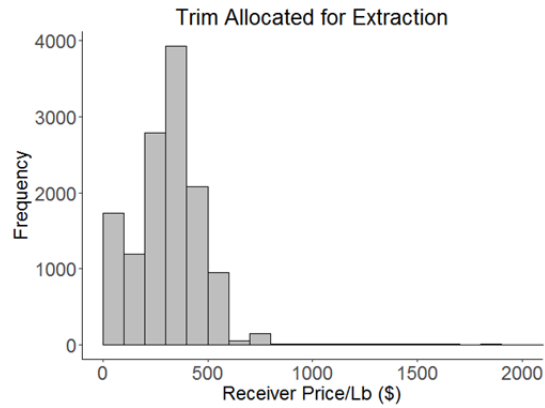
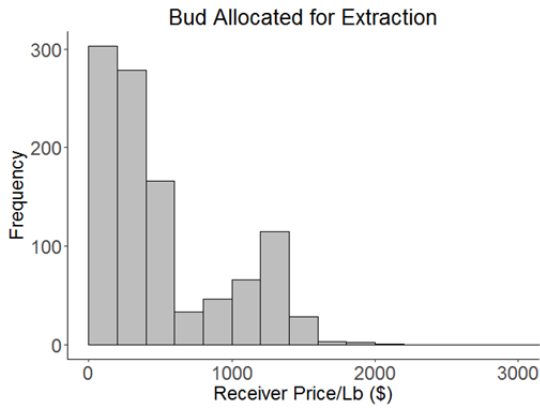
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Raw Frequencies

Bud Allocated for Extraction	
Rate (\$/lb)	Frequency
\$0 - \$200	303
\$201 - \$400	279
\$401 - \$600	166
\$601 - \$800	33
\$801 - \$1,000	46
\$1,001 - \$1,200	66
\$1,201 - \$1,400	115
\$1,401 - \$1,600	28
\$1,601 - \$1,800	3
\$1,801 and over	4
Total	1,043

Raw Frequencies

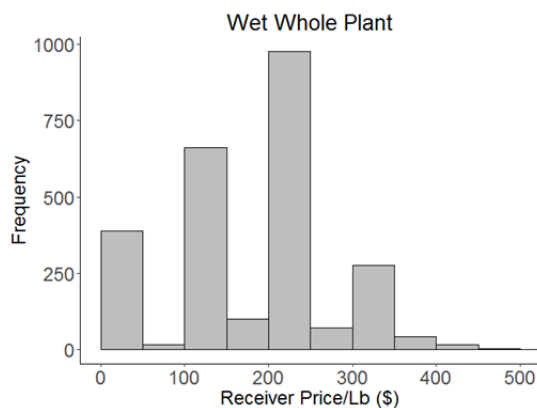
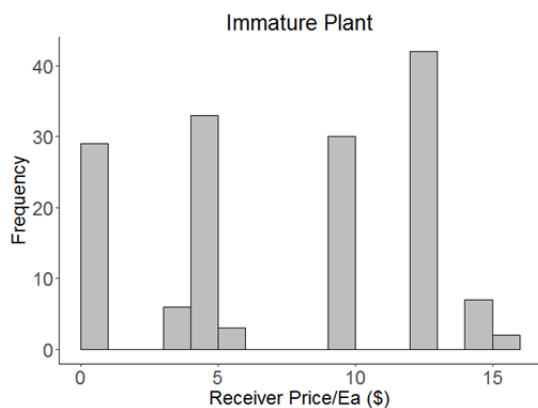
Trim Allocated for Extraction	
Rate (\$/lb)	Frequency
\$0 - \$100	1,736
\$101 - \$200	1,187
\$201 - \$300	2,791
\$301 - \$400	3,929
\$401 - \$500	2,075
\$501 - \$600	944
\$601 - \$700	46
\$701 - \$800	141
\$801 - \$900	13
\$901 and over	87
Total	12,949



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Raw Frequencies	
Immature Plant	
Rate (\$/ea)	Frequency
\$0.00 - \$1.00	29
\$1.01 - \$2.00	0
\$2.01 - \$3.00	0
\$3.01 - \$4.00	6
\$4.01 - \$5.00	33
\$5.01 - \$6.00	3
\$6.01 - \$7.00	0
\$7.01 - \$8.00	0
\$8.01 - \$9.00	0
\$9.01 - \$10.00	30
\$10.01 - \$11.00	0
\$11.01 - \$12.00	0
\$12.01 - \$13.00	42
\$13.01 - \$14.00	0
\$14.01 and over	9
Total	152

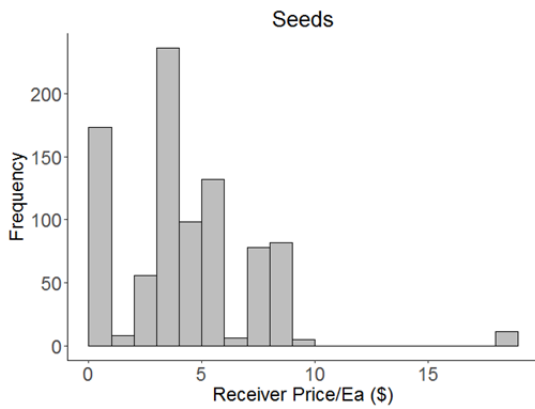
Raw Frequencies	
Wet Whole Plant	
Rate (\$/lb)	Frequency
\$0 - \$50	388
\$51 - \$100	16
\$101 - \$150	663
\$151 - \$200	98
\$201 - \$250	977
\$251 - \$300	71
\$301 - \$350	275
\$351 - \$400	42
\$401 - \$450	15
\$451 and over	6
Total	2,511



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Raw Frequencies

Seeds	
Rate (\$/ea)	Frequency
\$0 - \$1.00	173
\$1.01 - \$2.00	8
\$2.01 - \$3.00	56
\$3.01 - \$4.00	236
\$4.01 - \$5.00	98
\$5.01 - \$6.00	132
\$6.01 - \$7.00	6
\$7.01 - \$8.00	78
\$8.01 - \$9.00	82
\$9.01 - \$10.00	5
\$10.01 - \$11.00	0
\$11.01 - \$12.00	0
\$12.01 - \$13.00	0
\$13.01 - \$14.00	0
\$14.01 - \$15.00	0
\$15.01 - \$16.00	0
\$16.01 - \$17.00	0
\$17.01 - \$18.00	0
\$18.01 - \$19.00	11
Total	885



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Summary statistics (the minimum, maximum, median, mean, mode, median absolute deviation, standard deviation, skewness, kurtosis, and number of records) related to the distribution of prices in each category are shown in the table below. The median absolute deviation is a robust measure of how spread out the values are, relative to the median. Skewness is a measure of the asymmetry of a distribution. A symmetric distribution has skewness = 0. Kurtosis is a measure of the size and shape of the distribution's tails. A normal distribution has kurtosis = 3.

Summary Statistics (Raw Data)

Descriptive Statistics	Bud Rate (\$/lb)	Trim Rate (\$/lb)	Bud Allocated for Extraction Rate (\$/lb)	Trim Allocated for Extraction Rate (\$/lb)	Immature Plant Rate (\$/ea)	Wet Whole Plant Rate (\$/lb)	Seed Rate (\$/ea)
Min	\$0	\$0	\$0	\$0	\$0	\$0	\$0
Max	\$1,398,741	\$136,078	\$25,314	\$51,255	\$16	\$1,247	\$19
Median	\$1,215	\$448	\$362	\$304	\$10	\$201	\$3
Mean	\$1,193	\$1,232	\$525	\$318	\$8	\$178	\$4
Mode	\$1,210	\$2,722	\$354	\$354	\$5	\$127	\$3
Median Absolute Deviation	\$313	\$657	\$354	\$150	\$7	\$110	\$3
Standard Deviation	\$8,205	\$3,497	\$891	\$561	\$5	\$103	\$3
Distribution Statistics							
Skewness	169	34	21	62	0	0	1
Kurtosis	28,733	1,312	576	5,317	2	9	7
Number of records	29,295	5,058	1,043	12,949	152	2,551	885

Some extreme outliers in each product category that were likely errors were identified.

It is ORA's recommendation that the Department should levy the excise tax using the median for each category after removing the following outliers:

- **For all product categories:** Receiver Wholesale Prices <= \$.01

Additionally, the following outliers were removed for these five categories:

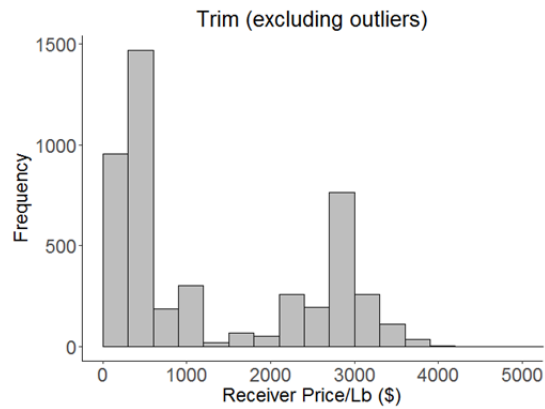
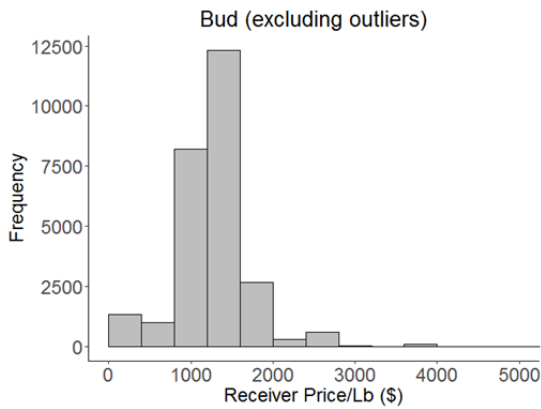
- **Bud:** Receiver Price/lb >= \$10,000 or Weight Received >= 100 lb
- **Trim:** Receiver Price/lb >= \$10,000 or Weight Received >= 100 lb
- **Bud Allocated for Extraction:** Receiver Price/lb >= \$10,000 or Weight Received >= 100 lb
- **Trim Allocated for Extraction:** Receiver Price/lb >= \$10,000 or Weight Received >= 100 lb
- **Wet Whole Plant:** Receiver Price/lb >= \$500

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The frequency tables, histograms, and summary statistics for the data excluding outliers are shown below.

Excluding Outliers Frequencies	
Bud	
Rate (\$/lb)	Frequency
\$0 - \$400	1,344
\$401 - \$800	992
\$801 - \$1,200	8,197
\$1,201 - \$1,600	12,318
\$1,601 - \$2,000	2,673
\$2,001 - \$2,400	294
\$2,401 - \$2,800	610
\$2,801 - \$3,200	31
\$3,201 - \$3,600	4
\$3,601 - \$4,000	93
\$4,001 - \$4,400	8
\$4,401 - \$4,800	11
\$4,801 and over	12
Total	26,587

Excluding Outliers Frequencies	
Trim	
Rate (\$/lb)	Frequency
\$0 - \$300	954
\$301 - \$600	1,468
\$601 - \$900	185
\$901 - \$1,200	303
\$1,201 - \$1,500	20
\$1,501 - \$1,800	69
\$1,801 - \$2,100	52
\$2,101 - \$2,400	260
\$2,401 - \$2,700	194
\$2,701 - \$3,000	763
\$3,001 - \$3,300	257
\$3,301 - \$3,600	109
\$3,601 - \$3,900	35
\$3,901 and over	4
Total	4,673



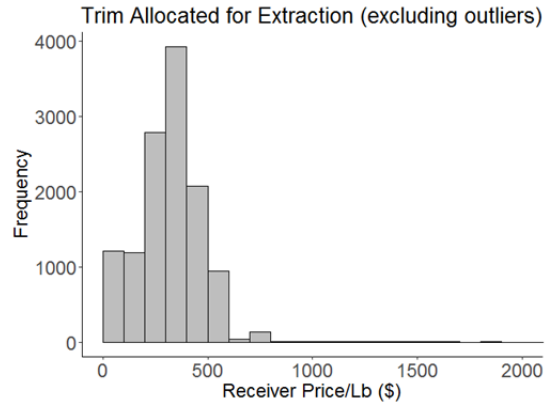
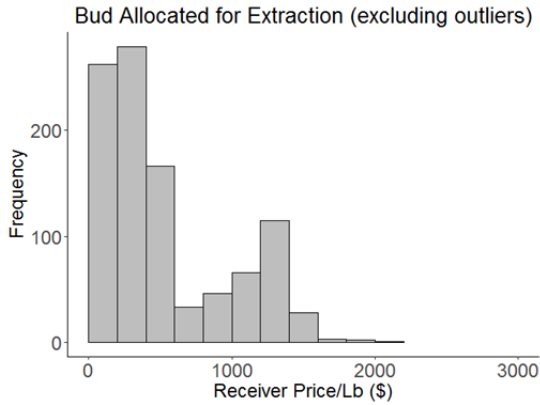
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Excluding Outliers Frequencies

Bud Allocated for Extraction	
Rate (\$/lb)	Frequency
\$0 - \$200	262
\$201 - \$400	279
\$401 - \$600	166
\$601 - \$800	33
\$801 - \$1,000	46
\$1,001 - \$1,200	66
\$1,201 - \$1,400	115
\$1,401 - \$1,600	28
\$1,601 - \$1,800	3
\$1,801 and over	3
Total	1,001

Excluding Outliers Frequencies

Trim Allocated for Extraction	
Rate (\$/lb)	Frequency
\$0 - \$100	1,213
\$101 - \$200	1,187
\$201 - \$300	2,791
\$301 - \$400	3,929
\$401 - \$500	2,075
\$501 - \$600	944
\$601 - \$700	46
\$701 - \$800	141
\$801 - \$900	13
\$901 - \$1,000	6
\$1,001 and over	77
Total	12,422



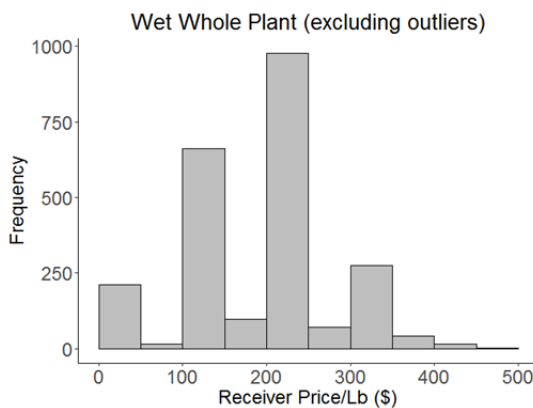
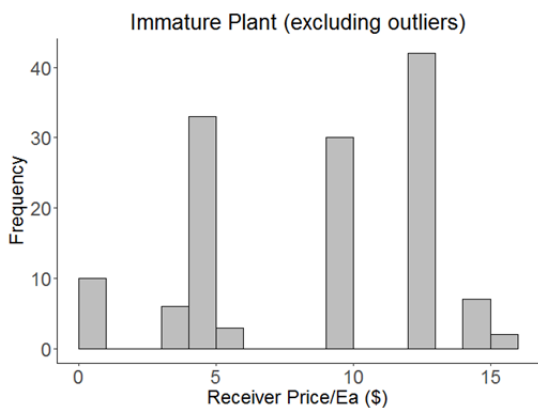
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Excluding Outliers Frequencies

Immature Plant	
Rate (\$/ea)	Frequency
\$0 - \$1	10
\$1.01 - \$2.00	0
\$2.01 - \$3.00	0
\$3.01 - \$4.00	6
\$4.01 - \$5.00	33
\$5.01 - \$6.00	3
\$6.01 - \$7.00	0
\$7.01 - \$8.00	0
\$8.01 - \$9.00	0
\$9.01 - \$10.00	30
\$10.01 - \$11.00	0
\$11.01 - \$12.00	0
\$12.01 - \$13.00	42
\$13.01 and over	9
Total	133

Excluding Outliers Frequencies

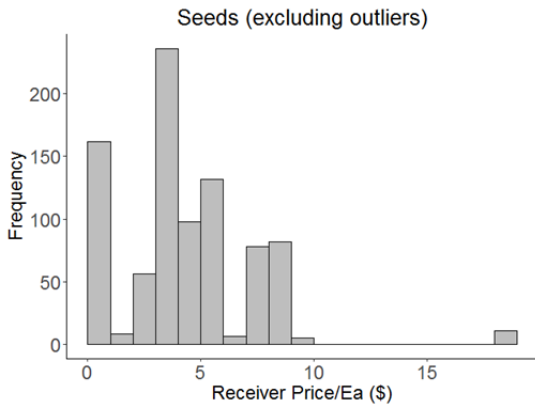
Wet Whole Plant	
Rate (\$/lb)	Frequency
\$0 - \$50	211
\$50 - \$100	16
\$101 - \$150	663
\$151 - \$200	98
\$201 - \$250	977
\$251 - \$300	71
\$301 - \$350	275
\$351 - \$400	42
\$401 - \$450	15
\$451 - \$500	3
Total	2,371



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Excluding Outliers Frequencies

Seeds	
Rate (\$/ea)	Frequency
\$0 - \$1.00	162
\$1.01 - \$2.00	8
\$2.01 - \$3.00	56
\$3.01 - \$4.00	236
\$4.01 - \$5.00	98
\$5.01 - \$6.00	132
\$6.01 - \$7.00	6
\$7.01 - \$8.00	78
\$8.01 - \$9.00	82
\$9.01 - \$10.00	5
\$10.01 - \$11.00	0
\$11.01 - \$12.00	0
\$12.01 - \$13.00	0
\$13.01 - \$14.00	0
\$14.01 - \$15.00	0
\$15.01 - \$16.00	0
\$16.01 - \$17.00	0
\$17.01 - \$18.00	0
\$18.01 - \$19.00	11
Total	874



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Summary Statistics (Excluding Outliers)

Descriptive Statistics	Bud Rate (\$/lb)	Trim Rate (\$/lb)	Bud Allocated for Extraction Rate (\$/lb)	Trim Allocated for Extraction Rate (\$/lb)	Immature Plant Rate (\$/ea)	Wet Whole Plant Rate (\$/lb)	Seed Rate (\$/ea)
Min	\$0	\$0	\$0	\$0	\$0	\$0	\$0
Max	\$9,991	\$7,056	\$2,117	\$7,935	\$16	\$487	\$19
Median	\$1,265	\$506	\$376	\$325	\$10	\$215	\$3
Mean	\$1,256	\$1,242	\$522	\$324	\$9	\$190	\$4
Mode	\$1,210	\$2,722	\$354	\$354	\$5	\$127	\$3
Median Absolute Deviation	\$276	\$731	\$276	\$119	\$4	\$131	\$3
Standard Deviation	\$480	\$1,175	\$448	\$272	\$4	\$90	\$3
Distribution Statistics							
Skewness	1	1	1	13	0	0	1
Kurtosis	17	2	3	262	2	3	7
Number of records	26,587	4,673	1,001	12,422	133	2,371	874