



Estimating the Per-Pound Cost of a Dried or Condensed Food Based on Process Yield and Farm-Gate Price

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Food processed by drying or other forms of condensing offers the entrepreneur a way to provide customers with a product that has longer and more stable shelf life. Agricultural products can be reduced in weight by removing unwanted parts of the fresh product, and they can then be further concentrated by reducing moisture content. Examples of such processing include whole oranges converted to juice concentrate, dried chili pepper, dried and milled taro flour, "jerked" beef or fish, powdered milk and coconut meat, and dried banana chips.

When thinking about opportunities to add value to a product by processing, it is important to realize that in the process the fresh product may be reduced to only a fraction of its original weight. Raw agricultural products typically contain large amounts of water, as well as unwanted parts such as skin, structural tissues, and seeds, which are removed during processing. It is easy to confuse the cost of a raw product with the actual cost of the same product when it has been reduced in weight. This difference is important to consider, and calculations must be done when a business plan is being made to avoid overestimating potential revenue.

For example, 10 pounds of raw taro purchased for \$0.50 per pound could be reduced by 80 percent to 2 pounds of dried taro flour. Thus the "yield" of taro flour from raw taro (the product "recovery rate") is approximately 20 percent, and the material cost of the final 2 pounds of flour is not the \$0.50 per pound paid for the raw product, but \$2.50 per pound. This is the cost for the processed raw material before any of your business costs, including those incurred in processing, are applied. The processing costs can be considerable, especially the labor cost for handling (e.g., peeling) and the energy cost to remove moisture with heat.

The table below illustrates for some typical raw foods how removing water and refuse (skin, seeds, defects) can result in widely various yields of dehydrated product. Even the amounts given for each commodity are estimates that also could vary, for numerous reasons. To estimate the yield of any product you are processing, it is important to perform many process-yield tests, under commercial conditions if possible. Commercial-scale and home process yields can be considerably different.

In general, most "dried" foods are not completely devoid of moisture, and dehydration yield varies. The yields in the table are based on mechanical drying, which generally leaves about 4% water in vegetables and fruits and 10% water in starch staples. To illustrate processing yield variability, sun-dried apples have about 24% moisture content, versus 4% for machine-dried ones.

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Water content, refuse content, and dehydration yield of selected foods.

Food	Water (%)	Refuse (%)	Dehydration yield (%)*
Apple	84	24	12
Banana	76	45	19
Beef	52	17	42
Coconut meat	51	0	51
Onion	89	9	10
Papaya	88	33	8
Pepper	74	4	64
Taro	73	26	21

Source: U.S. Department of Agriculture, Agricultural Research Service, *Nutrient Database for Standard Reference*, Release 12, 1998.

*These values are estimates; actual recovery could be lower.

Estimated cost per pound of a dry or condensed product . . .

Farm-gate price
per pound
for raw
product

Percent yield from raw product to a drier product (does not include the cost of processing)

	2%	4%	6%	8%	10%	12%	14%	16%	18%	20%	22%	24%	26%	28%	30%	32%	34%
\$0.05	2.50	1.25	0.83	0.63	0.50	0.42	0.36	0.31	0.28	0.25	0.23	0.21	0.19	0.18	0.17	0.16	0.15
\$0.06	3.00	1.50	1.00	0.75	0.60	0.50	0.43	0.38	0.33	0.30	0.27	0.25	0.23	0.21	0.20	0.19	0.18
\$0.07	3.50	1.75	1.17	0.88	0.70	0.58	0.50	0.44	0.39	0.35	0.32	0.29	0.27	0.25	0.23	0.22	0.21
\$0.08	4.00	2.00	1.33	1.00	0.80	0.67	0.57	0.50	0.44	0.40	0.36	0.33	0.31	0.29	0.27	0.25	0.24
\$0.09	4.50	2.25	1.50	1.13	0.90	0.75	0.64	0.56	0.50	0.45	0.41	0.38	0.35	0.32	0.30	0.28	0.26
\$0.10	5.00	2.50	1.67	1.25	1.00	0.83	0.71	0.63	0.56	0.50	0.45	0.42	0.38	0.36	0.33	0.31	0.29
\$0.11	5.50	2.75	1.83	1.38	1.10	0.92	0.79	0.69	0.61	0.55	0.50	0.46	0.42	0.39	0.37	0.34	0.32
\$0.12	6.00	3.00	2.00	1.50	1.20	1.00	0.86	0.75	0.67	0.60	0.55	0.50	0.46	0.43	0.40	0.38	0.35
\$0.13	6.50	3.25	2.17	1.63	1.30	1.08	0.93	0.81	0.72	0.65	0.59	0.54	0.50	0.46	0.43	0.41	0.38
\$0.14	7.00	3.50	2.33	1.75	1.40	1.17	1.00	0.88	0.78	0.70	0.64	0.58	0.54	0.50	0.47	0.44	0.41
\$0.15	7.50	3.75	2.50	1.88	1.50	1.25	1.07	0.94	0.83	0.75	0.68	0.63	0.58	0.54	0.50	0.47	0.44
\$0.16	8.00	4.00	2.67	2.00	1.60	1.33	1.14	1.00	0.89	0.80	0.73	0.67	0.62	0.57	0.53	0.50	0.47
\$0.17	8.50	4.25	2.83	2.13	1.70	1.42	1.21	1.06	0.94	0.85	0.77	0.71	0.65	0.61	0.57	0.53	0.50
\$0.18	9.00	4.50	3.00	2.25	1.80	1.50	1.29	1.13	1.00	0.90	0.82	0.75	0.69	0.64	0.60	0.56	0.53
\$0.19	9.50	4.75	3.17	2.38	1.90	1.58	1.36	1.19	1.06	0.95	0.86	0.79	0.73	0.68	0.63	0.59	0.56
\$0.20	10.00	5.00	3.33	2.50	2.00	1.67	1.43	1.25	1.11	1.00	0.91	0.83	0.77	0.71	0.67	0.63	0.59
\$0.21	10.50	5.25	3.50	2.63	2.10	1.75	1.50	1.31	1.17	1.05	0.95	0.88	0.81	0.75	0.70	0.66	0.62
\$0.22	11.00	5.50	3.67	2.75	2.20	1.83	1.57	1.38	1.22	1.10	1.00	0.92	0.85	0.79	0.73	0.69	0.65
\$0.23	11.50	5.75	3.83	2.88	2.30	1.92	1.64	1.44	1.28	1.15	1.05	0.96	0.88	0.82	0.77	0.72	0.68
\$0.24	12.00	6.00	4.00	3.00	2.40	2.00	1.71	1.50	1.33	1.20	1.09	1.00	0.92	0.86	0.80	0.75	0.71
\$0.25	12.50	6.25	4.17	3.13	2.50	2.08	1.79	1.56	1.39	1.25	1.14	1.04	0.96	0.89	0.83	0.78	0.74
\$0.26	13.00	6.50	4.33	3.25	2.60	2.17	1.86	1.63	1.44	1.30	1.18	1.08	1.00	0.93	0.87	0.81	0.76
\$0.27	13.50	6.75	4.50	3.38	2.70	2.25	1.93	1.69	1.50	1.35	1.23	1.13	1.04	0.96	0.90	0.84	0.79
\$0.28	14.00	7.00	4.67	3.50	2.80	2.33	2.00	1.75	1.56	1.40	1.27	1.17	1.08	1.00	0.93	0.88	0.82
\$0.29	14.50	7.25	4.83	3.63	2.90	2.42	2.07	1.81	1.61	1.45	1.32	1.21	1.12	1.04	0.97	0.91	0.85
\$0.30	15.00	7.50	5.00	3.75	3.00	2.50	2.14	1.88	1.67	1.50	1.36	1.25	1.15	1.07	1.00	0.94	0.88
\$0.31	15.50	7.75	5.17	3.88	3.10	2.58	2.21	1.94	1.72	1.55	1.41	1.29	1.19	1.11	1.03	0.97	0.91
\$0.32	16.00	8.00	5.33	4.00	3.20	2.67	2.29	2.00	1.78	1.60	1.45	1.33	1.23	1.14	1.07	1.00	0.94
\$0.33	16.50	8.25	5.50	4.13	3.30	2.75	2.36	2.06	1.83	1.65	1.50	1.38	1.27	1.18	1.10	1.03	0.97
\$0.34	17.00	8.50	5.67	4.25	3.40	2.83	2.43	2.13	1.89	1.70	1.55	1.42	1.31	1.21	1.13	1.06	1.00
\$0.35	17.50	8.75	5.83	4.38	3.50	2.92	2.50	2.19	1.94	1.75	1.59	1.46	1.35	1.25	1.17	1.09	1.03
\$0.40	20.00	10.00	6.67	5.00	4.00	3.33	2.86	2.50	2.22	2.00	1.82	1.67	1.54	1.43	1.33	1.25	1.18
\$0.45	22.50	11.25	7.50	5.63	4.50	3.75	3.21	2.81	2.50	2.25	2.05	1.88	1.73	1.61	1.50	1.41	1.32
\$0.50	25.00	12.50	8.33	6.25	5.00	4.17	3.57	3.13	2.78	2.50	2.27	2.08	1.92	1.79	1.67	1.56	1.47
\$0.55	27.50	13.75	9.17	6.88	5.50	4.58	3.93	3.44	3.06	2.75	2.50	2.29	2.12	1.96	1.83	1.72	1.62
\$0.60	30.00	15.00	10.00	7.50	6.00	5.00	4.29	3.75	3.33	3.00	2.73	2.50	2.31	2.14	2.00	1.88	1.76
\$0.65	32.50	16.25	10.83	8.13	6.50	5.42	4.64	4.06	3.61	3.25	2.95	2.71	2.50	2.32	2.17	2.03	1.91
\$0.70	35.00	17.50	11.67	8.75	7.00	5.83	5.00	4.38	3.89	3.50	3.18	2.92	2.69	2.50	2.33	2.19	2.06
\$0.75	37.50	18.75	12.50	9.38	7.50	6.25	5.36	4.69	4.17	3.75	3.41	3.13	2.88	2.68	2.50	2.34	2.21
\$0.80	40.00	20.00	13.33	10.00	8.00	6.67	5.71	5.00	4.44	4.00	3.64	3.33	3.08	2.86	2.67	2.50	2.35
\$0.85	42.50	21.25	14.17	10.63	8.50	7.08	6.07	5.31	4.72	4.25	3.86	3.54	3.27	3.04	2.83	2.66	2.50
\$0.90	45.00	22.50	15.00	11.25	9.00	7.50	6.43	5.63	5.00	4.50	4.09	3.75	3.46	3.21	3.00	2.81	2.65
\$0.95	47.50	23.75	15.83	11.88	9.50	7.92	6.79	5.94	5.28	4.75	4.32	3.96	3.65	3.39	3.17	2.97	2.79
\$1.00	50.00	25.00	16.67	12.50	10.00	8.33	7.14	6.25	5.56	5.00	4.55	4.17	3.85	3.57	3.33	3.13	2.94
\$1.10	55.00	27.50	18.33	13.75	11.00	9.17	7.86	6.88	6.11	5.50	5.00	4.58	4.23	3.93	3.67	3.44	3.24
\$1.20	60.00	30.00	20.00	15.00	12.00	10.00	8.57	7.50	6.67	6.00	5.45	5.00	4.62	4.29	4.00	3.75	3.53
\$1.30	65.00	32.50	21.67	16.25	13.00	10.83	9.29	8.13	7.22	6.50	5.91	5.42	5.00	4.64	4.33	4.06	3.82
\$1.40	70.00	35.00	23.33	17.50	14.00	11.67	10.00	8.75	7.78	7.00	6.36	5.83	5.38	5.00	4.67	4.38	4.12
\$1.50	75.00	37.50	25.00	18.75	15.00	12.50	10.71	9.38	8.33	7.50	6.82	6.25	5.77	5.36	5.00	4.69	4.41
\$1.60	80.00	40.00	26.67	20.00	16.00	13.33	11.43	10.00	8.89	8.00	7.27	6.67	6.15	5.71	5.33	5.00	4.71
\$1.70	85.00	42.50	28.33	21.25	17.00	14.17	12.14	10.63	9.44	8.50	7.73	7.08	6.54	6.07	5.67	5.31	5.00
\$1.80	90.00	45.00	30.00	22.50	18.00	15.00	12.86	11.25	10.00	9.00	8.18	7.50	6.92	6.43	6.00	5.63	5.29
\$1.90	95.00	47.50	31.67	23.75	19.00	15.83	13.57	11.88	10.56	9.50	8.64	7.92	7.31	6.79	6.33	5.94	5.59
\$2.00	100.00	50.00	33.33	25.00	20.00	16.67	14.29	12.50	11.11	10.00	9.09	8.33	7.69	7.14	6.67	6.25	5.88

... based on farm-gate price and average percent final yield

Percent yield from raw product to a drier product (does not include the cost of processing)

36%	38%	40%	42%	44%	46%	48%	50%	52%	54%	56%	58%	60%	62%	64%	66%	68%	70%	72%	74%
0.14	0.13	0.13	0.12	0.11	0.11	0.10	0.10	0.10	0.09	0.09	0.09	0.08	0.08	0.08	0.08	0.07	0.07	0.07	0.07
0.17	0.16	0.15	0.14	0.14	0.13	0.13	0.12	0.12	0.11	0.11	0.10	0.10	0.10	0.09	0.09	0.09	0.09	0.08	0.08
0.19	0.18	0.18	0.17	0.16	0.15	0.15	0.14	0.13	0.13	0.13	0.12	0.12	0.11	0.11	0.11	0.10	0.10	0.10	0.09
0.22	0.21	0.20	0.19	0.18	0.17	0.17	0.16	0.15	0.15	0.14	0.14	0.13	0.13	0.13	0.12	0.12	0.11	0.11	0.11
0.25	0.24	0.23	0.21	0.20	0.20	0.19	0.18	0.17	0.17	0.16	0.16	0.15	0.15	0.14	0.14	0.13	0.13	0.13	0.12
0.28	0.26	0.25	0.24	0.23	0.22	0.21	0.20	0.19	0.19	0.18	0.17	0.17	0.16	0.16	0.15	0.15	0.14	0.14	0.14
0.31	0.29	0.28	0.26	0.25	0.24	0.23	0.22	0.21	0.20	0.20	0.19	0.18	0.18	0.17	0.17	0.16	0.16	0.15	0.15
0.33	0.32	0.30	0.29	0.27	0.26	0.25	0.24	0.23	0.22	0.21	0.21	0.20	0.19	0.19	0.18	0.18	0.17	0.17	0.16
0.36	0.34	0.33	0.31	0.30	0.28	0.27	0.26	0.25	0.24	0.23	0.22	0.22	0.21	0.20	0.20	0.19	0.19	0.18	0.18
0.39	0.37	0.35	0.33	0.32	0.30	0.29	0.28	0.27	0.26	0.25	0.24	0.23	0.23	0.22	0.21	0.21	0.20	0.19	0.19
0.42	0.39	0.38	0.36	0.34	0.33	0.31	0.30	0.29	0.28	0.27	0.26	0.25	0.24	0.23	0.23	0.22	0.21	0.21	0.20
0.44	0.42	0.40	0.38	0.36	0.35	0.33	0.32	0.31	0.30	0.29	0.28	0.27	0.26	0.25	0.24	0.24	0.23	0.22	0.22
0.47	0.45	0.43	0.40	0.39	0.37	0.35	0.34	0.33	0.31	0.30	0.29	0.28	0.27	0.27	0.26	0.25	0.24	0.24	0.23
0.50	0.47	0.45	0.43	0.41	0.39	0.38	0.36	0.35	0.33	0.32	0.31	0.30	0.29	0.28	0.27	0.26	0.26	0.25	0.24
0.53	0.50	0.48	0.45	0.43	0.41	0.40	0.38	0.37	0.35	0.34	0.33	0.32	0.31	0.30	0.29	0.28	0.27	0.26	0.26
0.56	0.53	0.50	0.48	0.45	0.43	0.42	0.40	0.38	0.37	0.36	0.34	0.33	0.32	0.31	0.30	0.29	0.29	0.28	0.27
0.58	0.55	0.53	0.50	0.48	0.46	0.44	0.42	0.40	0.39	0.38	0.36	0.35	0.34	0.33	0.32	0.31	0.30	0.29	0.28
0.61	0.58	0.55	0.52	0.50	0.48	0.46	0.44	0.42	0.41	0.39	0.38	0.37	0.35	0.34	0.33	0.32	0.31	0.31	0.30
0.64	0.61	0.58	0.55	0.52	0.50	0.48	0.46	0.44	0.43	0.41	0.40	0.38	0.37	0.36	0.35	0.34	0.33	0.32	0.31
0.67	0.63	0.60	0.57	0.55	0.52	0.50	0.48	0.46	0.44	0.43	0.41	0.40	0.39	0.38	0.36	0.35	0.34	0.33	0.32
0.69	0.66	0.63	0.60	0.57	0.54	0.52	0.50	0.48	0.46	0.45	0.43	0.42	0.40	0.39	0.38	0.37	0.36	0.35	0.34
0.72	0.68	0.65	0.62	0.59	0.57	0.54	0.52	0.50	0.48	0.46	0.45	0.43	0.42	0.41	0.39	0.38	0.37	0.36	0.35
0.75	0.71	0.68	0.64	0.61	0.59	0.56	0.54	0.52	0.50	0.48	0.47	0.45	0.44	0.42	0.41	0.40	0.39	0.38	0.36
0.78	0.74	0.70	0.67	0.64	0.61	0.58	0.56	0.54	0.52	0.50	0.48	0.47	0.45	0.44	0.42	0.41	0.40	0.39	0.38
0.81	0.76	0.73	0.69	0.66	0.63	0.60	0.58	0.56	0.54	0.52	0.50	0.48	0.47	0.45	0.44	0.43	0.41	0.40	0.39
0.83	0.79	0.75	0.71	0.68	0.65	0.63	0.60	0.58	0.56	0.54	0.52	0.50	0.48	0.47	0.45	0.44	0.43	0.42	0.41
0.86	0.82	0.78	0.74	0.70	0.67	0.65	0.62	0.60	0.57	0.55	0.53	0.52	0.50	0.48	0.47	0.46	0.44	0.43	0.42
0.89	0.84	0.80	0.76	0.73	0.70	0.67	0.64	0.62	0.59	0.57	0.55	0.53	0.52	0.50	0.48	0.47	0.46	0.44	0.43
0.92	0.87	0.83	0.79	0.75	0.72	0.69	0.66	0.63	0.61	0.59	0.57	0.55	0.53	0.52	0.50	0.49	0.47	0.46	0.45
0.94	0.89	0.85	0.81	0.77	0.74	0.71	0.68	0.65	0.63	0.61	0.59	0.57	0.55	0.53	0.52	0.50	0.49	0.47	0.46
0.97	0.92	0.88	0.83	0.80	0.76	0.73	0.70	0.67	0.65	0.63	0.60	0.58	0.56	0.55	0.53	0.51	0.50	0.49	0.47
1.11	1.05	1.00	0.95	0.91	0.87	0.83	0.80	0.77	0.74	0.71	0.69	0.67	0.65	0.63	0.61	0.59	0.57	0.56	0.54
1.25	1.18	1.13	1.07	1.02	0.98	0.94	0.90	0.87	0.83	0.80	0.78	0.75	0.73	0.70	0.68	0.66	0.64	0.63	0.61
1.39	1.32	1.25	1.19	1.14	1.09	1.04	1.00	0.96	0.93	0.89	0.86	0.83	0.81	0.78	0.76	0.74	0.71	0.69	0.68
1.53	1.45	1.38	1.31	1.25	1.20	1.15	1.10	1.06	1.02	0.98	0.95	0.92	0.89	0.86	0.83	0.81	0.79	0.76	0.74
1.67	1.58	1.50	1.43	1.36	1.30	1.25	1.20	1.15	1.11	1.07	1.03	1.00	0.97	0.94	0.91	0.88	0.86	0.83	0.81
1.81	1.71	1.63	1.55	1.48	1.41	1.35	1.30	1.25	1.20	1.16	1.12	1.08	1.05	1.02	0.98	0.96	0.93	0.90	0.88
1.94	1.84	1.75	1.67	1.59	1.52	1.46	1.40	1.35	1.30	1.25	1.21	1.17	1.13	1.09	1.06	1.03	1.00	0.97	0.95
2.08	1.97	1.88	1.79	1.70	1.63	1.56	1.50	1.44	1.39	1.34	1.29	1.25	1.21	1.17	1.14	1.10	1.07	1.04	1.01
2.22	2.11	2.00	1.90	1.82	1.74	1.67	1.60	1.54	1.48	1.43	1.38	1.33	1.29	1.25	1.21	1.18	1.14	1.11	1.08
2.36	2.24	2.13	2.02	1.93	1.85	1.77	1.70	1.63	1.57	1.52	1.47	1.42	1.37	1.33	1.29	1.25	1.21	1.18	1.15
2.50	2.37	2.25	2.14	2.05	1.96	1.88	1.80	1.73	1.67	1.61	1.55	1.50	1.45	1.41	1.36	1.32	1.29	1.25	1.22
2.64	2.50	2.38	2.26	2.16	2.07	1.98	1.90	1.83	1.76	1.70	1.64	1.58	1.53	1.48	1.44	1.40	1.36	1.32	1.28
2.78	2.63	2.50	2.38	2.27	2.17	2.08	2.00	1.92	1.85	1.79	1.72	1.67	1.61	1.56	1.52	1.47	1.43	1.39	1.35
3.06	2.89	2.75	2.62	2.50	2.39	2.29	2.20	2.12	2.04	1.96	1.90	1.83	1.77	1.72	1.67	1.62	1.57	1.53	1.49
3.33	3.16	3.00	2.86	2.73	2.61	2.50	2.40	2.31	2.22	2.14	2.07	2.00	1.94	1.88	1.82	1.76	1.71	1.67	1.62
3.61	3.42	3.25	3.10	2.95	2.83	2.71	2.60	2.50	2.41	2.32	2.24	2.17	2.10	2.03	1.97	1.91	1.86	1.81	1.76
3.89	3.68	3.50	3.33	3.18	3.04	2.92	2.80	2.69	2.59	2.50	2.41	2.33	2.26	2.19	2.12	2.06	2.00	1.94	1.89
4.17	3.95	3.75	3.57	3.41	3.26	3.13	3.00	2.88	2.78	2.68	2.59	2.50	2.42	2.34	2.27	2.21	2.14	2.08	2.03
4.44	4.21	4.00	3.81	3.64	3.48	3.33	3.20	3.08	2.96	2.86	2.76	2.67	2.58	2.50	2.42	2.35	2.29	2.22	2.16
4.72	4.47	4.25	4.05	3.86	3.70	3.54	3.40	3.27	3.15	3.04	2.93	2.83	2.74	2.66	2.58	2.50	2.43	2.36	2.30
5.00	4.74	4.50	4.29	4.09	3.91	3.75	3.60	3.46	3.33	3.21	3.10	3.00	2.90	2.81	2.73	2.65	2.57	2.50	2.43
5.28	5.00	4.75	4.52	4.32	4.13	3.96	3.80	3.65	3.52	3.39	3.28	3.17	3.06	2.97	2.88	2.79	2.71	2.64	2.57
5.56	5.26	5.00	4.76	4.55	4.35	4.17	4.00	3.85	3.70	3.57	3.45	3.33	3.23	3.13	3.03	2.94	2.86	2.78	2.70

Thus the dehydration yield of sun-dried apples would be 16%, rather than the 12% listed in the table.

Given an indication of yield (percent recovery) for your commodity and its processed product, you can estimate the cost of the final product (not including processing costs) using the table on pages 2–3. Find the farm-gate price you are paying for a commodity in the left-hand column. Then look across the chart and find the percent yield from 1 pound of the original material. Using the example of taro given above, starting in the left column at \$0.50 per pound and moving across to the 20% yield column, you find that the cost per pound of processed product is \$2.50. The table calculates some of the values for cost between \$0.05 and \$2.00 per pound and yield from 2 to 74 percent, using the formula:

$$\frac{\text{Farm-gate price of fresh material}}{\text{Percent yield} / 100} = \text{Cost of the dryer material}$$

One thing the table on p. 2–3 illustrates is that cost of the processed product is very sensitive to yield when yield is low. A small increase in percent yield, from 2 to 4% for example, can halve the per-pound cost of the product. While for any commodity the cost can be halved by doubling the yield of finished product, it is usually easier to double yield at low levels of yield than at higher levels. This sensitivity of cost to yield should be considered when you do tests to estimate yield. Careful processing to yield as much product as possible can hold down costs and keep revenues as high as possible.