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I. Executive Summary

This case study for LSC, a prominent producer in the instant coffee industry, examines strategic capacity planning to accommodate projected demand for 2025. LSC's diverse product portfolio - 3-in-1 coffee, espresso, and pure black coffee - has contributed to its leadership in the market, with anticipated revenues of $388 million in 2025. Given seasonal fluctuations in demand, the company faces the challenge of aligning production capabilities with market needs while minimizing inventory costs and maintaining product quality. The objective is to develop a capacity plan that enables LSC to optimize its production processes and sustain its competitive edge in a rapidly evolving FMCG market.

Through rigorous analysis, this report identifies the limitations of LSC's current production model in meeting peak demand periods, particularly under a one-month lead-time strategy. The findings recommend a two-month lead time supported by expanded machine capacity and subcontracted labor, enabling the company to meet its demand projections more effectively. This approach leverages flexible, demand-driven production to reduce inventory holding costs and improve responsiveness, aligning with industry best practices for supply chain optimization.

To support these short-term measures, the report advocates a long-term investment in a new production line. This investment would mitigate operational bottlenecks, reduce dependency on seasonal adjustments, and enhance overall efficiency. Additionally, adopting the FIFO (First In, First Out) inventory strategy would enable LSC to manage shelf life more effectively, ensuring that product quality standards align with market requirements.

This report combines industry-relevant solutions and academic insights into capacity planning and supply chain management, offering a robust framework for LSC to navigate future challenges. By balancing immediate operational improvements with strategic investments, LSC is well-positioned to adapt to demand fluctuations and sustain growth in the competitive instant coffee market.

II. Overview

About LSC

LSC, a leading producer in the instant coffee market, faces the challenge of aligning its production capacity with the forecasted demand for its instant coffee products in 2025. The company's product portfolio spans three main categories - 3-in-1, espresso, and pure black coffee - each with varying product options that cater to different customer preferences. Within each group, LSC offers a range

of product options with different quantities of coffee sticks per bag or box, providing customers with a diverse selection tailored to their needs

Categories	SKU code	Description
3In1	LSC3IN100050	3In1 Instant Coffee – Bag 50 sticks
	LSC3IN100100	3In1 Instant Coffee – Bag 100 sticks
	LSC3IN100020	3In1 Instant Coffee – Box 20 sticks
	LSC3IN100024	3In1 Instant Coffee – Box 24 sticks
Espresso	LSCESP000015	Espresso Instant Coffee – Box 15 sticks
	LSCESP000050	Espresso Instant Coffee – Box 50 sticks
	LSCESP000100	Espresso Instant Coffee – Box 100 sticks
Pure Black	LSCPUR000015	Pure Black Coffee – Box 15 sticks
	LSCPUR000020	Pure Black Coffee – Box 20 sticks
	LSCPUR000024	Pure Black Coffee – Bag 24 sticks

Table 1: LSC's products line

As LSC looks ahead to 2025, it anticipates generating a total revenue of $388 million from its instant coffee portfolio. Notably, 3-in-1 coffee is expected to contribute the largest share, accounting for 62% of total income, followed by espresso at 22%, and pure black coffee at 16%. This projected revenue underscores LSC's market strength and highlights the challenges it faces in aligning production capacities with demand across product categories.

Production line:

The instant coffee manufacturing process at LSC involves a meticulous multi-step process to ensure the final product's quality and consistency (Figure 1). The first step, extraction, separates flavors and oils from the ground coffee, creating a base for the instant product. This is followed by spray drying, which converts

the extracted coffee liquid into a soluble powder, preserving flavor and freshness. Afterward, the mixing stage blends the coffee powder with needed additives or flavorings. Notably, 3In1 and Espresso are required for this stage, whereas Pure Black's powder goes straight to the next step. This mixed powder is then packaged into individual coffee sticks by machine. The final stage involves workers packing these coffee sticks into bags or boxes for distribution.

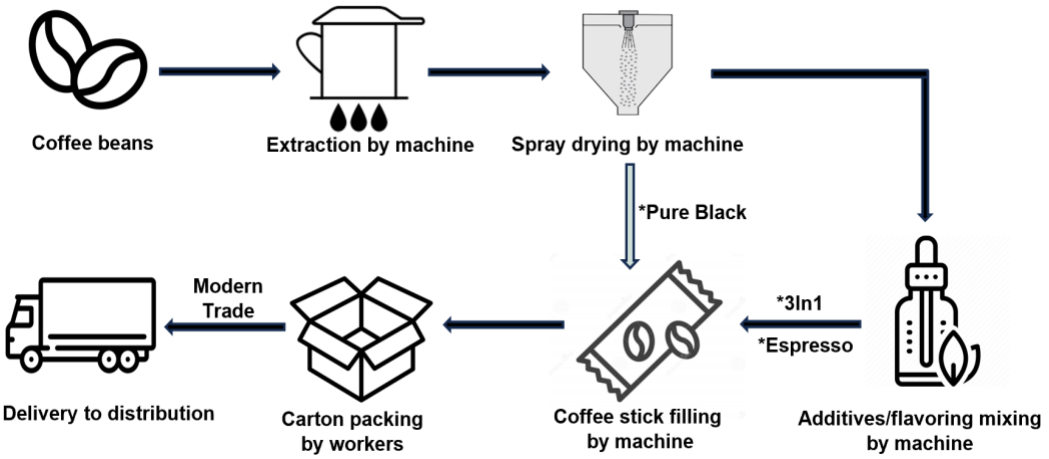


Figure 1: LCS's instant coffee manufacturing process

III. Analysis:

1. Estimate future capacity requirements:

Month	Index	total demand	3in1	Espresso	Pure black
1	89,50%	28.938.333,33	17.941.766,67	6.366.433,33	4.630.133,33
2	102,00%	32.980.000,00	20.447.600,00	7.255.600,00	5.276.800,00
3	97,70%	31.589.666,67	19.585.593,33	6.949.726,67	5.054.346,67
4	94,60%	30.587.333,33	18.964.146,67	6.729.213,33	4.893.973,33
5	67,90%	21.954.333,33	13.611.686,67	4.829.953,33	3.512.693,33
6	41,50%	13.418.333,33	8.319.366,67	2.952.033,33	2.146.933,33
7	171,40%	55.419.333,33	34.359.986,67	12.192.253,33	8.867.093,33
8	61,00%	19.723.333,33	12.228.466,67	4.339.133,33	3.155.733,33
9	94,70%	30.619.666,67	18.984.193,33	6.736.326,67	4.899.146,67
10	71,20%	23.021.333,33	14.273.226,67	5.064.693,33	3.683.413,33
11	189,40%	61.239.333,33	37.968.386,67	13.472.653,33	9.798.293,33
12	119,10%	38.509.000,00	23.875.580,00	8.471.980,00	6.161.440,00

Table 2: Monthly demand planning

With an anticipated total revenue of $388,000,000 and a set of seasonal indexes, the monthly demand for each product type can be determined (Table 2). However, we will change the unit of measurement, they must be converted into monthly kilograms for each product and SKU. This complex conversion process begins by calculating the number of cartons required per SKU per month, followed by determining the total number of bags per SKU. Finally, to determine

the kilograms, we will utilize the weight of each stick of each SKU and the quantity of sticks featured on each container.

	carton per sku												
		1	2	3	4	5	6	7	8	9	10	11	12
3in1 (1)	LSC3IN100050	312.030,72	355.610,43	340.619,01	329.811,25	236.724,99	144.684,64	597.564,99	212.668,99	330.159,88	248.230,03	660.319,77	415.227,48
3in1 (2)	LSC3IN100100	242.690,56	276.585,89	264.925,90	256.519,86	184.119,43	112.532,50	464.772,77	165.409,21	256.791,02	193.067,80	513.582,04	322.954,71
3in1 (3)	LSC3IN100020	108.737,98	123.924,85	118.700,57	114.934,22	82.495,07	50.420,40	208.242,34	74.111,92	115.055,72	86.504,40	230.111,43	144.700,48
3in1 (4)	LSC3IN100024	181.842,23	207.239,19	198.502,64	192.204,19	137.956,28	84.317,91	348.243,11	123.937,16	192.407,36	144.661,08	384.814,73	241.982,23
Es (1)	LSCESP000015	129.125,19	147.159,44	140.955,66	136.483,16	97.962,02	59.873,69	247.285,56	88.007,11	136.627,44	102.723,06	273.254,87	171.830,28
Es (2)	LSCESP000050	44.177,26	50.347,26	48.224,78	46.694,62	33.515,48	20.484,43	84.603,15	30.109,64	46.743,98	35.144,36	93.487,96	58.787,83
Es (3)	LSCESP000100	44.177,26	50.347,26	48.224,78	46.694,62	33.515,48	20.484,43	84.603,15	30.109,64	46.743,98	35.144,36	93.487,96	58.787,83
Pure (1)	LSCPUR000015	83.599,63	95.275,56	91.259,04	88.363,41	63.423,63	38.764,07	160.100,30	56.978,52	88.456,81	66.506,07	176.913,63	111.248,22
Pure (2)	LSCPUR000020	44.744,99	50.994,29	48.844,53	47.294,70	33.946,20	20.747,68	85.690,40	30.496,58	47.344,69	35.596,01	94.689,39	59.543,33
Pure (3)	LSCPUR000024	73.926,50	84.251,43	80.699,65	78.139,07	56.085,02	34.278,77	141.575,44	50.385,66	78.221,67	58.810,80	156.443,34	98.375,93

	bag/box per sku												
		1	2	3	4	5	6	7	8	9	10	11	12
3in1 (1)	LSC3IN100050	3.120.307,25	3.556.104,35	3.406.190,14	3.298.112,46	2.367.249,86	1.446.846,38	5.975.649,86	2.126.689,86	3.301.598,84	2.482.300,29	6.603.197,68	4.152.274,78
3in1 (2)	LSC3IN100100	1.213.452,82	1.382.929,47	1.324.629,50	1.282.599,29	920.597,17	562.662,48	2.323.863,83	827.046,05	1.283.955,10	965.339,00	2.567.910,21	1.614.773,53
3in1 (3)	LSC3IN100020	2.609.711,52	2.974.196,36	2.848.813,58	2.758.421,33	1.979.881,70	1.210.089,70	4.997.816,24	1.778.686,06	2.761.337,21	2.076.105,70	5.522.674,42	3.472.811,64
3in1 (4)	LSC3IN100024	4.364.213,51	4.973.740,54	4.764.063,24	4.612.900,54	3.310.950,81	2.023.629,73	8.357.834,59	2.974.491,89	4.617.776,76	3.471.865,95	9.235.553,51	5.807.573,51
Es (1)	LSCESP000015	5.165.007,64	5.886.377,43	5.638.226,22	5.459.326,51	3.918.480,66	2.394.947,68	9.891.422,46	3.520.284,54	5.465.097,47	4.108.922,28	10.930.194,94	6.873.211,29
Es (2)	LSCESP000050	1.060.254,12	1.208.334,31	1.157.394,73	1.120.670,84	804.371,57	491.626,21	2.030.475,50	722.631,30	1.121.855,48	843.464,73	2.243.710,96	1.410.908,00
Es (3)	LSCESP000100	530.127,06	604.167,15	578.697,36	560.335,42	402.185,78	245.813,11	1.015.237,75	361.315,65	560.927,74	421.732,37	1.121.855,48	705.454,00
Pure (1)	LSCPUR000015	5.015.977,78	5.716.533,33	5.475.542,22	5.301.804,44	3.805.417,78	2.325.844,44	9.606.017,78	3.418.711,11	5.307.408,89	3.990.364,44	10.614.817,78	6.674.893,33
Pure (2)	LSCPUR000020	2.684.699,16	3.059.657,14	2.930.671,60	2.837.682,02	2.036.771,76	1.244.860,50	5.141.423,87	1.829.794,96	2.840.681,68	2.135.760,67	5.681.363,36	3.572.599,66
Pure (3)	LSCPUR000024	3.696.324,93	4.212.571,43	4.034.982,63	3.906.953,50	2.804.250,98	1.713.938,38	7.078.771,99	2.519.282,91	3.911.083,47	2.940.540,06	7.822.166,95	4.918.796,64

	stick per sku												
		1	2	3	4	5	6	7	8	9	10	11	12
3in1 (1)	LSC3IN100050	156.015.362,32	177.805.217,39	170.309.507,25	164.905.623,19	118.362.492,75	72.342.318,84	298.782.492,75	106.334.492,75	165.079.942,03	124.115.014,49	330.159.884,06	207.613.739,13
3in1 (2)	LSC3IN100100	121.345.281,80	138.292.946,86	132.462.950,08	128.259.929,15	92.059.716,59	56.266.247,99	232.386.383,25	82.704.605,48	128.395.510,47	96.533.900,16	256.791.020,93	161.477.352,66
3in1 (3)	LSC3IN100020	52.194.230,30	59.483.927,27	56.976.271,52	55.168.426,67	39.597.633,94	24.201.793,94	99.956.324,85	35.573.721,21	55.226.744,24	41.522.113,94	110.453.488,48	69.456.232,73
3in1 (4)	LSC3IN100024	104.741.124,32	119.369.772,97	114.337.517,84	110.709.612,97	79.462.819,46	48.567.113,51	200.588.030,27	71.387.805,41	110.826.642,16	83.324.782,70	221.653.284,32	139.381.764,32
Es (1)	LSCESP000015	77.475.114,64	88.295.661,38	84.573.393,30	81.889.897,71	58.777.209,88	35.924.215,17	148.371.336,86	52.804.268,08	81.976.462,08	61.633.834,22	163.952.924,16	103.098.169,31
Es (2)	LSCESP000050	53.012.706,25	60.416.715,50	57.869.736,31	56.033.542,02	40.218.578,26	24.581.310,72	101.523.774,87	36.131.565,15	56.092.774,09	42.173.236,70	112.185.548,19	70.545.400,15
Es (3)	LSCESP000100	53.012.706,25	60.416.715,50	57.869.736,31	56.033.542,02	40.218.578,26	24.581.310,72	101.523.774,87	36.131.565,15	56.092.774,09	42.173.236,70	112.185.548,19	70.545.400,15
Pure (1)	LSCPUR000015	75.239.666,67	85.748.000,00	82.133.133,33	79.527.066,67	57.081.266,67	34.887.666,67	144.090.266,67	51.280.666,67	79.611.133,33	59.855.466,67	159.222.266,67	100.123.400,00
Pure (2)	LSCPUR000020	53.693.983,19	61.193.142,86	58.613.431,93	56.753.640,34	40.735.435,29	24.897.210,08	102.828.477,31	36.595.899,16	56.813.633,61	42.715.213,45	113.627.267,23	71.451.993,28
Pure (3)	LSCPUR000024	88.711.798,32	101.101.714,29	96.839.583,19	93.766.884,03	67.302.023,53	41.134.521,01	169.890.527,73	60.462.789,92	93.866.003,36	70.572.961,34	187.732.006,72	118.051.119,33

UOM	kgs per sku												
		1	2	3	4	5	6	7	8	9	10	11	12
3in1 (1)	LSC3IN100050	2.496.245,80	2.844.883,48	2.724.952,12	2.638.489,97	1.893.799,88	1.157.477,10	4.780.519,88	1.701.351,88	2.641.279,07	1.985.840,23	5.282.558,14	3.321.819,83
3in1 (2)	LSC3IN100100	1.941.524,51	2.212.687,15	2.119.407,20	2.052.158,87	1.472.955,47	900.259,97	3.718.182,13	1.323.273,69	2.054.328,17	1.544.542,40	4.108.656,33	2.583.637,64
3in1 (3)	LSC3IN100020	835.107,68	951.742,84	911.620,34	882.694,83	633.562,14	387.228,70	1.599.301,20	569.179,54	883.627,91	664.353,82	1.767.255,82	1.111.299,72
3in1 (4)	LSC3IN100024	1.675.857,99	1.909.916,37	1.829.400,29	1.771.353,81	1.271.405,11	777.073,82	3.209.408,48	1.142.204,89	1.773.226,27	1.333.196,52	3.546.452,55	2.230.108,23
Es (1)	LSCESP000015	193.687,79	220.739,15	211.433,48	204.724,74	146.943,02	89.810,54	370.928,34	132.010,67	204.941,16	154.084,59	409.882,31	257.745,42
Es (2)	LSCESP000050	390.038,41	444.513,04	425.773,77	412.264,06	295.906,23	180.855,80	746.956,23	265.836,23	412.699,86	310.287,54	825.399,71	519.034,35
Es (3)	LSCESP000100	303.363,20	345.732,37	331.157,38	320.649,82	230.149,29	140.665,62	580.965,96	206.761,51	320.988,78	241.334,75	641.977,55	403.693,38
Pure (1)	LSCPUR000015	52.194,23	59.483,93	56.976,27	55.168,43	39.597,63	24.201,79	99.956,32	35.573,72	55.226,74	41.522,11	110.453,49	69.456,23
Pure (2)	LSCPUR000020	53.693,98	61.193,14	58.613,43	56.753,64	40.735,44	24.897,21	102.828,48	36.595,90	56.813,63	42.715,21	113.627,27	71.451,99
Pure (3)	LSCPUR000024	88.711,80	101.101,71	96.839,58	93.766,88	67.302,02	41.134,52	169.890,53	60.462,79	93.866,00	70.572,96	187.732,01	118.051,12
	Total	8030426,389	9151995,18	8766176,86	8488029,048	6092361,245	3723611,069	15378944,56	5473258,824	8497006,59	6388460,142	16994006,18	10686309,92

Table 3, 4,5: Monthly demand in different UOM per SKU

2. Existing Capacity Analysis

First, LSC has to evaluate each step's maximum capacity per month, determining whether each can fulfill the production plan required for the whole of 2025. We determined that the machines required for the production process require 26 working days, equivalent to the number of working days of labor per month. This is because the machines are unable to operate independently without human supervision. Moreover, we also assume that LCS performs the packing process within 1 shift every day. To determine the utmost capacity per month of each

machine, the product of the number of machines, the number of shifts per day, the capacity per shift, and the number of operating days per month is determined. After calculation, we have the result as shown below:

Extraction	Unit	Quantity	Shift per day	Days of working	Capa per machine per shift	Maximum capa per month	
	kgs	2	3	26	48.000	7.488.000	
Spray drying	Unit	Quantity	Shift per day	Days of working	Capa per machine per shift	Maximum capa per month	
	kgs	2	3	26	41.800	6.520.800	
Mixing							
3In1	Unit	Quantity	Shift per day	Days of working	Capa per machine per shift	Maximum capa per month	
	kgs	2	3	26	37.150	5.795.400	
Espresso	Unit	Quantity	Shift per day	Days of working	Capa per machine per shift	Maximum capa per month	
	kgs	2	3	26	2.880	449.280	
Stick filling							
3In1	Unit	Quantity	Shift per day	Days of working	Capa per machine per shift	Maximum capa per month	Convert into kg
	Sticks	2	3	26	2.400.000	374.400.000	5990400
Espresso	Unit	Quantity	Shift per day	Days of working	Capa per machine per shift	Maximum capa per month	Convert into kg
	Sticks	2	3	26	1.200.000	187.200.000	468000
Pure Black	Unit	Quantiy	Shift per day	Days of working	Capa per machine per shift	Maximum capa per month	Convert into kg
	Stick	2	3	26	1.300.000	202.800.000	202800
Packing	Unit	Quantity labour per shift	Shift per day	Days of working	Capa per machine per shift	Maximum capa per month	
	Cartons	710	1	26	50	923.000	

Table 4: LCS's maximum capacity analysis

The machine maintenance time of 24 hours every two months is entirely disregarded in this calculation, as we assume that the company will utilize the weekend for maintenance to prevent any impact on the highest productivity.

3. Compare maximum capacity with future demand.

As previously stated, instant coffee has a shelf life of two years, whereas MT distributors of LSC only accept products that have at least 90% of their shelf life remaining. Therefore, to develop a comprehensive capacity plan for the entire year, it is necessary to determine the longest duration for which the product can bestored.

Given that 90% of two years is equal to 21.6 months, the product must have a minimum of 21.6 months of shelf life remaining when it reaches the MT distributors. This corresponds to a maximum time from production to MT of 2.4 months, calculated as 24-21.6. Consequently, to prevent the production of products that do not satisfy the specifications of MT distributors, LCS is obligated to commence production as early as **November 2024** to prepare for sales in January 2025. Due to our emphasis on inventory cost reduction, we will first contemplate commencing production in December 2024 to mitigate elevated inventory expenses.

3.1. Production starts in December 2024

Extraction (kgs)	Sum of Dec-24	Sum of Jan-25	Sum of Feb-25	Sum of Mar-25	Sum of Apr-25	Sum of May-25	Sum of Jun-25	Sum of Jul-25	Sum of Aug-25	Sum of Sep-25	Sum of Oct-25	Sum of Nov-25
Openning inventory	0	(582.425)	(2.286.419)	(3.604.592)	(4.644.617)	(3.288.974)	435.421	(7.495.516)	(5.520.767)	(6.569.765)	(5.510.215)	(15.056.210)
Production	7.448.000	7.448.000	7.448.000	7.448.000	7.448.000	7.448.000	7.448.000	7.448.000	7.448.000	7.448.000	7.448.000	7.448.000
Demand	8.030.425	9.151.993	8.766.174	8.488.025	6.092.356	3.723.605	15.378.938	5.473.251	8.496.998	6.388.450	16.993.995	10.686.298
Closing inventory	(582.425)	(2.286.419)	(3.604.592)	(4.644.617)	(3.288.974)	435.421	(7.495.516)	(5.520.767)	(6.569.765)	(5.510.215)	(15.056.210)	(18.294.508)

Spray drying (kgs)	Sum of Dec-24	Sum of Jan-25	Sum of Feb-25	Sum of Mar-25	Sum of Apr-25	Sum of May-25	Sum of Jun-25	Sum of Jul-25	Sum of Aug-25	Sum of Sep-25	Sum of Oct-25	Sum of Nov-25
Openning inventory	-	(1.509.625)	(4.140.819)	(6.386.192)	(8.353.417)	(7.924.974)	(5.127.779)	(13.985.916)	(12.938.367)	(14.914.565)	(14.782.215)	(25.255.410)
Production	6.520.800	6.520.800	6.520.800	6.520.800	6.520.800	6.520.800	6.520.800	6.520.800	6.520.800	6.520.800	6.520.800	6.520.800
Forecast	8.030.425	9.151.993	8.766.174	8.488.025	6.092.356	3.723.605	15.378.938	5.473.251	8.496.998	6.388.450	16.993.995	10.686.298
Closing inventory	(1.509.625)	(4.140.819)	(6.386.192)	(8.353.417)	(7.924.974)	(5.127.779)	(13.985.916)	(12.938.367)	(14.914.565)	(14.782.215)	(25.255.410)	(29.420.908)

Mixing (3in1) (kgs)	Sum of Dec-24	Sum of Jan-25	Sum of Feb-25	Sum of Mar-25	Sum of Apr-25	Sum of May-25	Sum of Jun-25	Sum of Jul-25	Sum of Aug-25	Sum of Sep-25	Sum of Oct-25	Sum of Nov-25
Openning inventory	-	(1.153.336)	(3.277.166)	(5.067.146)	(6.616.443)	(6.092.766)	(3.519.405)	(11.031.417)	(9.972.027)	(11.529.089)	(11.261.622)	(20.171.144)
Production	5.795.400	5.795.400	5.795.400	5.795.400	5.795.400	5.795.400	5.795.400	5.795.400	5.795.400	5.795.400	5.795.400	5.795.400
Forecast	6.948.736	7.919.230	7.585.380	7.344.697	5.271.723	3.222.040	13.307.412	4.736.010	7.352.461	5.527.933	14.704.923	9.246.865
Closing inventory	(1.153.336)	(3.277.166)	(5.067.146)	(6.616.443)	(6.092.766)	(3.519.405)	(11.031.417)	(9.972.027)	(11.529.089)	(11.261.622)	(20.171.144)	(23.622.610)

Mixing (Espresso) (kgs)	Sum of Dec-24	Sum of Jan-25	Sum of Feb-25	Sum of Mar-25	Sum of Apr-25	Sum of May-25	Sum of Jun-25	Sum of Jul-25	Sum of Aug-25	Sum of Sep-25	Sum of Oct-25	Sum of Nov-25
Openning inventory	-	(437.809)	(999.514)	(1.518.599)	(2.006.957)	(2.230.676)	(2.192.728)	(3.442.298)	(3.597.627)	(4.086.976)	(4.343.403)	(5.771.383)
Production	449.280	449.280	449.280	449.280	449.280	449.280	449.280	449.280	449.280	449.280	449.280	449.280
Forecast	887.089	1.010.985	968.365	937.639	672.999	411.332	1.698.851	604.608	938.630	705.707	1.877.260	1.180.473
Closing inventory	(437.809)	(999.514)	(1.518.599)	(2.006.957)	(2.230.676)	(2.192.728)	(3.442.298)	(3.597.627)	(4.086.976)	(4.343.403)	(5.771.383)	(6.502.576)

Stick filling (3in1) (kgs)	Sum of Dec-24	Sum of Jan-25	Sum of Feb-25	Sum of Mar-25	Sum of Apr-25	Sum of May-25	Sum of Jun-25	Sum of Jul-25	Sum of Aug-25	Sum of Sep-25	Sum of Oct-25	Sum of Nov-25
Openning inventory	-	(958.336)	(2.887.166)	(4.482.146)	(5.836.443)	(5.117.766)	(2.349.405)	(9.666.417)	(8.412.027)	(9.774.089)	(9.311.622)	(18.026.144)
Production	5.990.400	5.990.400	5.990.400	5.990.400	5.990.400	5.990.400	5.990.400	5.990.400	5.990.400	5.990.400	5.990.400	5.990.400
Forecast	6.948.736	7.919.230	7.585.380	7.344.697	5.271.723	3.222.040	13.307.412	4.736.010	7.352.461	5.527.933	14.704.923	9.246.865
Closing inventory	(958.336)	(2.887.166)	(4.482.146)	(5.836.443)	(5.117.766)	(2.349.405)	(9.666.417)	(8.412.027)	(9.774.089)	(9.311.622)	(18.026.144)	(21.282.610)

Stick filling (Espresso) (kgs)	Sum of Dec-24	Sum of Jan-25	Sum of Feb-25	Sum of Mar-25	Sum of Apr-25	Sum of May-25	Sum of Jun-25	Sum of Jul-25	Sum of Aug-25	Sum of Sep-25	Sum of Oct-25	Sum of Nov-25
Openning inventory	-	(419.089)	(962.074)	(1.462.439)	(1.932.077)	(2.137.076)	(2.080.408)	(3.311.258)	(3.447.867)	(3.918.496)	(4.156.203)	(5.565.463)
Production	468.000	468.000	468.000	468.000	468.000	468.000	468.000	468.000	468.000	468.000	468.000	468.000
Forecast	887.089	1.010.985	968.365	937.639	672.999	411.332	1.698.851	604.608	938.630	705.707	1.877.260	1.180.473
Closing inventory	(419.089)	(962.074)	(1.462.439)	(1.932.077)	(2.137.076)	(2.080.408)	(3.311.258)	(3.447.867)	(3.918.496)	(4.156.203)	(5.565.463)	(6.277.936)

Stick filling (Pure Black) (kgs)	Sum of Dec-24	Sum of Jan-25	Sum of Feb-25	Sum of Mar-25	Sum of Apr-25	Sum of May-25	Sum of Jun-25	Sum of Jul-25	Sum of Aug-25	Sum of Sep-25	Sum of Oct-25	Sum of Nov-25
Openning inventory	-	8.200	(10.779)	(20.408)	(23.297)	31.868	144.434	(25.441)	44.727	41.620	89.610	(119.403)
Production	202.800	202.800	202.800	202.800	202.800	202.800	202.800	202.800	202.800	202.800	202.800	202.800
Forecast	194.600	221.779	212.429	205.689	147.635	90.234	372.675	132.632	205.906	154.810	411.813	258.959
Closing inventory	8.200	(10.779)	(20.408)	(23.297)	31.868	144.434	(25.441)	44.727	41.620	89.610	(119.403)	(175.562)

Packing (cartons)	Sum of Dec-24	Sum of Jan-25	Sum of Feb-25	Sum of Mar-25	Sum of Apr-25	Sum of May-25	Sum of Jun-25	Sum of Jul-25	Sum of Aug-25	Sum of Sep-25	Sum of Oct-25	Sum of Nov-25
Openning inventory	-	(342.052)	(860.788)	(1.318.745)	(1.732.884)	(1.769.628)	(1.433.217)	(2.932.898)	(2.872.112)	(3.287.665)	(3.371.053)	(5.125.158)
Production	923.000	923.000	923.000	923.000	923.000	923.000	923.000	923.000	923.000	923.000	923.000	923.000
Forecast	1.265.052	1.441.736	1.380.957	1.337.139	959.744	586.589	2.422.681	862.214	1.338.553	1.006.388	2.677.105	1.683.438
Closing inventory	(342.052)	(860.788)	(1.318.745)	(1.732.884)	(1.769.628)	(1.433.217)	(2.932.898)	(2.872.112)	(3.287.665)	(3.371.053)	(5.125.158)	(5.885.596)

Table 6: Comparison between maximum capacity and demand planning when producing 1 month in advance.

The figure above indicates that if LCS opts to manufacture one month in advance to satisfy the 2024 demand, even with all equipment operating at maximum capacity, it would still fall well short of the estimated demand projection. Consequently, the decision to manufacture in December 2024 is entirely impractical. Therefore, we will continue to consider adopting a 2-month early production strategy.

3.2. Production starts in November 2024

Although there has been an improvement in production since November 2024, due to an additional month of maximum production capacity, there is still a shortage in certain stages to meet the forecasted demand, including Extraction, Spray Drying, and Mixing,... Consequently, it is also not feasible to produce 2 months in advance. Therefore, we have decided to produce 2 months in advance, with increases in the capacity of the machines and subcontracting more labor to fully meet the forecasted demand.

Extraction (kgs)	Sum of Nov-24	Sum of Dec-24	Sum of Jan-25	Sum of Feb-25	Sum of Mar-25	Sum of Apr-25	Sum of May-25	Sum of Jun-25	Sum of Jul-25	Sum of Aug-25	Sum of Sep-25	Sum of Oct-25	Sum of Nov-25
Openning inventory	-	7.448.000	6.865.575	5.161.581	3.843.408	2.803.383	4.159.026	7.883.421	(47.516)	1.927.233	878.235	1.937.785	(7.608.210)
Production	7.448.000	7.448.000	7.448.000	7.448.000	7.448.000	7.448.000	7.448.000	7.448.000	7.448.000	7.448.000	7.448.000	7.448.000	7.448.000
Forecast		8.030.425	9.151.993	8.766.174	8.488.025	6.092.356	3.723.605	15.378.938	5.473.251	8.496.998	6.388.450	16.993.995	10.686.298
Closing inventory	7.448.000	6.865.575	5.161.581	3.843.408	2.803.383	4.159.026	7.883.421	(47.516)	1.927.233	878.235	1.937.785	(7.608.210)	(10.846.508)

Spray drying (kgs)	Sum of Nov-24	Sum of Dec-24	Sum of Jan-25	Sum of Feb-25	Sum of Mar-25	Sum of Apr-25	Sum of May-25	Sum of Jun-25	Sum of Jul-25	Sum of Aug-25	Sum of Sep-25	Sum of Oct-25	Sum of Nov-25
Openning inventory	-	6.520.800	5.011.175	2.379.981	134.608	(1.832.617)	(1.404.174)	1.393.021	(7.465.116)	(6.417.567)	(8.393.765)	(8.261.415)	(18.734.610)
Production	6.520.800	6.520.800	6.520.800	6.520.800	6.520.800	6.520.800	6.520.800	6.520.800	6.520.800	6.520.800	6.520.800	6.520.800	6.520.800
Forecast		8.030.425	9.151.993	8.766.174	8.488.025	6.092.356	3.723.605	15.378.938	5.473.251	8.496.998	6.388.450	16.993.995	10.686.298
Closing inventory	6.520.800	5.011.175	2.379.981	134.608	(1.832.617)	(1.404.174)	1.393.021	(7.465.116)	(6.417.567)	(8.393.765)	(8.261.415)	(18.734.610)	(22.900.108)

Mixing (3In1) (kgs)	Sum of Nov-24	Sum of Dec-24	Sum of Jan-25	Sum of Feb-25	Sum of Mar-25	Sum of Apr-25	Sum of May-25	Sum of Jun-25	Sum of Jul-25	Sum of Aug-25	Sum of Sep-25	Sum of Oct-25	Sum of Nov-25
Openning inventory	-	5.795.400	4.642.064	2.518.234	728.254	(821.043)	(297.366)	2.275.995	(5.236.017)	(4.176.627)	(5.733.689)	(5.466.222)	(14.375.744)
Production	5.795.400	5.795.400	5.795.400	5.795.400	5.795.400	5.795.400	5.795.400	5.795.400	5.795.400	5.795.400	5.795.400	5.795.400	5.795.400
Forecast		6.948.736	7.919.230	7.585.380	7.344.697	5.271.723	3.222.040	13.307.412	4.736.010	7.352.461	5.527.933	14.704.923	9.246.865
Closing inventory	5.795.400	4.642.064	2.518.234	728.254	(821.043)	(297.366)	2.275.995	(5.236.017)	(4.176.627)	(5.733.689)	(5.466.222)	(14.375.744)	(17.827.210)

Mixing (Espresso) (kgs)	Sum of Nov-24	Sum of Dec-24	Sum of Jan-25	Sum of Feb-25	Sum of Mar-25	Sum of Apr-25	Sum of May-25	Sum of Jun-25	Sum of Jul-25	Sum of Aug-25	Sum of Sep-25	Sum of Oct-25	Sum of Nov-25
Openning inventory	-	449.280	11.471	(550.234)	(1.069.319)	(1.557.677)	(1.781.396)	(1.743.448)	(2.993.018)	(3.148.347)	(3.637.696)	(3.894.123)	(5.322.103)
Production	449.280	449.280	449.280	449.280	449.280	449.280	449.280	449.280	449.280	449.280	449.280	449.280	449.280
Forecast		887.089	1.010.985	968.365	937.639	672.999	411.332	1.698.851	604.608	938.630	705.707	1.877.260	1.180.473
Closing inventory	449.280	11.471	(550.234)	(1.069.319)	(1.557.677)	(1.781.396)	(1.743.448)	(2.993.018)	(3.148.347)	(3.637.696)	(3.894.123)	(5.322.103)	(6.053.296)

Stick filling (3In1) (kgs)	Sum of Nov-24	Sum of Dec-24	Sum of Jan-25	Sum of Feb-25	Sum of Mar-25	Sum of Apr-25	Sum of May-25	Sum of Jun-25	Sum of Jul-25	Sum of Aug-25	Sum of Sep-25	Sum of Oct-25	Sum of Nov-25
Openning inventory	-	5.990.400	5.032.064	3.103.234	1.508.254	153.957	872.634	3.640.995	(3.676.017)	(2.421.627)	(3.783.689)	(3.321.222)	(12.035.744)
Production	5.990.400	5.990.400	5.990.400	5.990.400	5.990.400	5.990.400	5.990.400	5.990.400	5.990.400	5.990.400	5.990.400	5.990.400	5.990.400
Forecast		6.948.736	7.919.230	7.585.380	7.344.697	5.271.723	3.222.040	13.307.412	4.736.010	7.352.461	5.527.933	14.704.923	9.246.865
Closing inventory	5.990.400	5.032.064	3.103.234	1.508.254	153.957	872.634	3.640.995	(3.676.017)	(2.421.627)	(3.783.689)	(3.321.222)	(12.035.744)	(15.292.210)

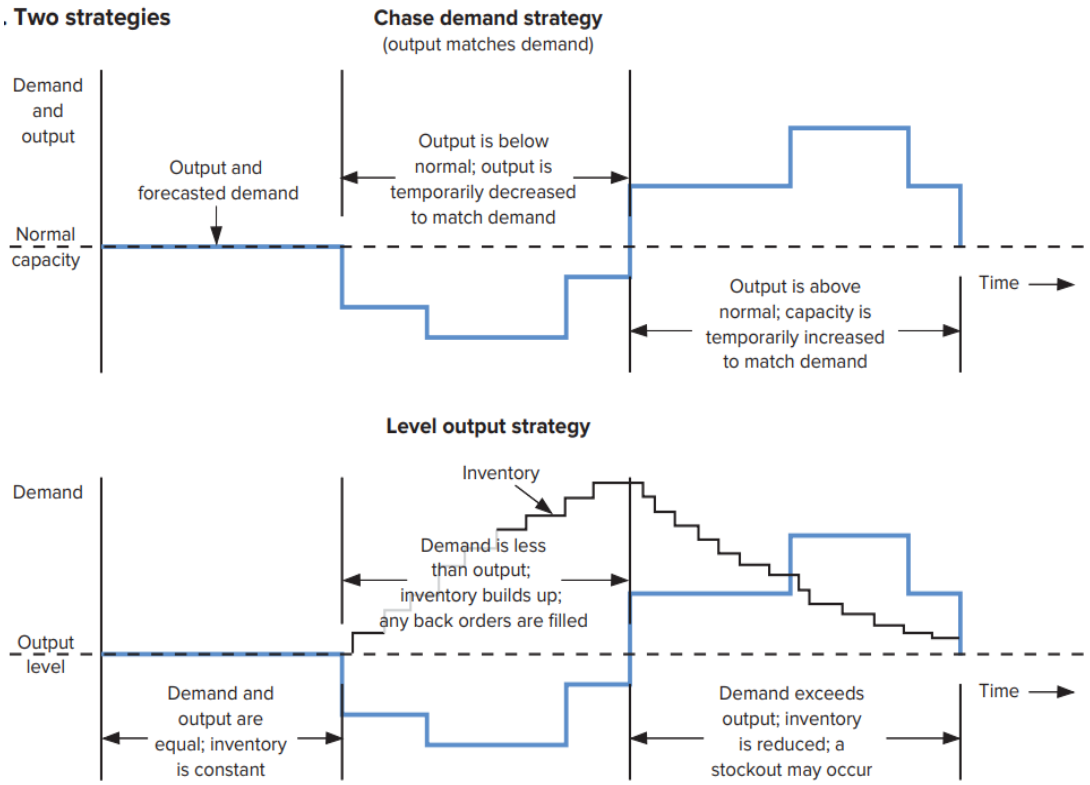
Stick filling (Esspreso) (kgs)	Sum of Nov-24	Sum of Dec-24	Sum of Jan-25	Sum of Feb-25	Sum of Mar-25	Sum of Apr-25	Sum of May-25	Sum of Jun-25	Sum of Jul-25	Sum of Aug-25	Sum of Sep-25	Sum of Oct-25	Sum of Nov-25
Openning inventory	-	468.000	48.911	(494.074)	(994.439)	(1.464.077)	(1.669.076)	(1.612.408)	(2.843.258)	(2.979.867)	(3.450.496)	(3.688.203)	(5.097.463)
Production	468.000	468.000	468.000	468.000	468.000	468.000	468.000	468.000	468.000	468.000	468.000	468.000	468.000
Forecast		887.089	1.010.985	968.365	937.639	672.999	411.332	1.698.851	604.608	938.630	705.707	1.877.260	1.180.473
Closing inventory	468.000	48.911	(494.074)	(994.439)	(1.464.077)	(1.669.076)	(1.612.408)	(2.843.258)	(2.979.867)	(3.450.496)	(3.688.203)	(5.097.463)	(5.809.936)

Stick filling (Pure Black) (kgs)	Sum of Nov-24	Sum of Dec-24	Sum of Jan-25	Sum of Feb-25	Sum of Mar-25	Sum of Apr-25	Sum of May-25	Sum of Jun-25	Sum of Jul-25	Sum of Aug-25	Sum of Sep-25	Sum of Oct-25	Sum of Nov-25
Openning inventory	-	202.800	211.000	192.021	182.392	179.503	234.668	347.234	177.359	247.527	244.420	292.410	83.397
Production	202.800	202.800	202.800	202.800	202.800	202.800	202.800	202.800	202.800	202.800	202.800	202.800	202.800
Forecast		194.600	221.779	212.429	205.689	147.635	90.234	372.675	132.632	205.906	154.810	411.813	258.959
Closing inventory	202.800	211.000	192.021	182.392	179.503	234.668	347.234	177.359	247.527	244.420	292.410	83.397	27.238

Packing (cartons)	Sum of Nov-24	Sum of Dec-24	Sum of Jan-25	Sum of Feb-25	Sum of Mar-25	Sum of Apr-25	Sum of May-25	Sum of Jun-25	Sum of Jul-25	Sum of Aug-25	Sum of Sep-25	Sum of Oct-25	Sum of Nov-25
Openning inventory	-	923.000	580.948	62.212	(395.745)	(809.884)	(846.628)	(510.217)	(2.009.898)	(1.949.112)	(2.364.665)	(2.448.053)	(4.202.158)
Production	923.000	923.000	923.000	923.000	923.000	923.000	923.000	923.000	923.000	923.000	923.000	923.000	923.000
Forecast		1.265.052	1.441.736	1.380.957	1.337.139	959.744	586.589	2.422.681	862.214	1.338.553	1.006.388	2.677.105	1.683.438
Closing inventory	923.000	580.948	62.212	(395.745)	(809.884)	(846.628)	(510.217)	(2.009.898)	(1.949.112)	(2.364.665)	(2.448.053)	(4.202.158)	(4.962.596)

Table 7: Comparison between maximum capacity and demand planning when producing 2 months in advance.

IV. Recommendation



To tackle the problem of lower capacity compared to demand in peak months, LSC should apply the Hybrid approach method, combining the maintaining a certain level of inventory as a buffer (Level Output Strategy) and temporary increase in capacity by subcontracting or Overtime to fully match the demand (Chase Demand Strategy). To explain, since LSC's products are perishable, a demand-driven production can reduce holding costs by ensuring inventory remains fresh while minimizing the sales loss (**Palanivel et al. 2024)**. However, as the gap between existing and future demand is significantly high in all steps of the production line, stockouts could lead to the switching of LSC's customers to other competitors. Therefore, LSC has to also produce at a certain level 2 months in advance to maintain inventory for peak months.

To sum up, a hybrid approach might involve maintaining steady production for core products while increasing production of peak months through overtime, temporary labor, or outsourcing as needed. This approach provides stability for regular operations but adds flexibility to meet demand surges for seasonal fluctuation in 2025 (**Agrawal et al. 2024).**

Note that: the inventory levels are still acceptable for distribution to Modern Trade, proved by the explanation in III. part 4.

1. Short to Medium-term:

Subcontracting

To effectively implement the chase demand strategy outlined above, LSC should focus on **subcontracting** as a key short- to medium-term solution for temporarily enhancing production capacity. This agreement is advantageous for the manufacturer in that it allows for the temporary acceleration of production processes and the enhancement of overall supply chain responsiveness, while also avoiding the substantial costs associated with the development of a new product line. Subcontracting is implemented only when it is required and is compensated based on the volume of production received(**Tan and Gershwin 2004; Ivanov and Jaff 2017).** Therefore, subcontracting can alleviate LSC's capacity constraints and maintain customer satisfaction in 2025 when the demand is expected to significantly increase.

However, the outsourced manufacturing equipment, labor, and inventory costs associated with subcontracts need to be carefully evaluated to avoid waste and inefficiency.

Outsourced manufacturing equipment cost

Assuming the minimum monthly order quantity is the smallest increase in outsourced capacity required for machine-based production processes. To meet the minimum monthly order quantity of 5000 tons, LSC must increase its capacity in several steps. This requires adding 0.840 tons to extraction, 1.770 tons to spray drying, 1.380 tons to 3-in-1 mixing, 0.460 tons to espresso mixing, 1.177 tons to 3-in-1 stick filling, and 0.447 tons to espresso stick filling per month. How to calculate the additional capacity in each step is shown in the production plan part. The total cost of acquiring additional equipment is $15,808,0000 for the whole production plan.

Minimum order quantity(kgs)	5.000.000	kg
Order quantity each month(kgs)	6.080.000	kg
Ordering cost per ton	$200,00	
Outsourcing cost per month	$1.216.000	
Outsourcing cost for the whole plan	$15.808.000	

The order quantity each month This subcontract is feasible since the total capacity increase does not exceed the maximum capacity allowed (<30%)

Total capacity of machine per month	26.874.680
Percentage of outsourcing machine	22,62%

Outsourced Labor costs of the Packing step

Comparison to Overtime Option:

Option 1: Overtime													
Packing (cartons)	Sum of Nov-24	Sum of Dec-24	Sum of Jan-25	Sum of Feb-25	Sum of Mar-25	Sum of Apr-25	Sum of May-25	Sum of Jun-25	Sum of Jul-25	Sum of Aug-25	Sum of Sep-25	Sum of Oct-25	Sum of Nov-25
Openning inventory	-	1.384.500	1.503.948	1.446.712	1.450.255	1.497.616	1.922.372	2.720.283	1.682.102	2.204.388	2.250.335	2.628.447	1.335.84
Production	1.384.500	1.384.500	1.384.500	1.384.500	1.384.500	1.384.500	1.384.500	1.384.500	1.384.500	1.384.500	1.384.500	1.384.500	1.384.5
Forecast		1.265.052	1.441.736	1.380.957	1.337.139	959.744	586.589	2.422.681	862.214	1.338.553	1.006.388	2.677.105	1.683.4
Closing inventory	1.384.500	1.503.948	1.446.712	1.450.255	1.497.616	1.922.372	2.720.283	1.682.102	2.204.388	2.250.335	2.628.447	1.335.842	1.036.90

Table 8: Packing process when using overtime strategy

Regarding option 1 of using overtime for Packing labor, the monthly capacity would be

=50 cartons per person per shift x 710 people x Max 1.5shift/ per day x 26 days/per month = 1.384.500 cartons per month.

Next, Overtime labor cost per month equals

= 4 hours/per day x 51,000/hour x 710people x 26 days/month = 3 765 840 000 VND.

Therefore, the total labor cost per month when using overtime will be

= (7 072 000 VND/per person per month x 710 people) + overtime cost = 5 021 120 000 VND + 3 765 840 000 VND = 8 786 960 000 VND

Simultaneously, the use of an outsourcing approach enhances the packing process, as seen in Table 9 below.

Option 2: Outsource													
Packing (cartons)	Sum of Nov-24	Sum of Dec-24	Sum of Jan-25	Sum of Feb-25	Sum of Mar-25	Sum of Apr-25	Sum of May-25	Sum of Jun-25	Sum of Jul-25	Sum of Aug-25	Sum of Sep-25	Sum of Oct-25	Sum of Nov-25
Openning inventory	-	1.305.000	1.344.948	1.208.212	1.132.255	1.100.116	1.445.372	2.163.783	1.046.102	1.488.888	1.455.335	1.753.947	381.842
Production	923.000	923.000	923.000	923.000	923.000	923.000	923.000	923.000	923.000	923.000	923.000	923.000	923.000
Forecast		1.265.052	1.441.736	1.380.957	1.337.139	959.744	586.589	2.422.681	862.214	1.338.553	1.006.388	2.677.105	1.683.438
Closing inventory	923.000	962.948	826.212	750.255	718.116	1.063.372	1.781.783	664.102	1.106.888	1.073.335	1.371.947	(158)	(378.596)
Outsource	382.000	382.000	382.000	382.000	382.000	382.000	382.000	382.000	382.000	382.000	382.000	382.000	382.000
Closing Inventory after outsource	1.305.000	1.344.948	1.208.212	1.132.255	1.100.116	1.445.372	2.163.783	1.046.102	1.488.888	1.455.335	1.753.947	381.842	3.404

Table 9: Packing process when using an outsourcing strategy

To fulfill the shortage of 4.962.596 cartons in the Packing step, LSC has to first define how many cartons need to be outsourced by dividing 4.962.596 for 13 production months, equalling approximately 382.000 cartons per month (Table). After that, each person per shift can pack 50 cartons, so each month the company needs 7640 outsourced shifts to pack 382000 shortage cartons (Table). Therefore, the total cost for outsourced labor could be:

7640 shifts x 8 hours/shift 44 000 VND/hour = 2 689 280 000 VND

= > Total labor cost per month for packing step:

= 7 072 000 VND x 710 people + 2 689 280 000 VND = 7 710 400 000 VND (Table).

After comparison between the option of overtime labor and outsourced labor, the monthly labor cost from option 1 is completely higher (8.786.960.000 > 7.710.400.000). As a result, LSC should decide to outsource to increase the capacity, fulfilling the shortage.

Cost Estimation for option 1 of Packing step (Overtime)	
Basic Salary per month (26 days)	7.072.000 đ
Number of Days per month	26
Basic salary per person per shift	272.000 đ
Basic salary per person per hour	34.000 đ
Overtime Salary per person per hour	51.000 đ
Labor cost per person per day	476.000 đ
Total labor cost per month	8.786.960.000 đ
Total labor cost for the whole year	114.230.480.000 đ
Cost Estimation for option 2 of the Packing step (Outsource)	
Basic Salary per month (26 days)	7.072.000
Number of Days per month	26
Basic salary per person per shift	272.000 đ
Basic salary per person per hour	34.000 đ
Outsourcing Salary per person per shift	352.000 đ
Shift required	7640
Total labor cost per month	7.710.400.000 đ
Total labor cost for the whole plan	100.235.200.000 đ

Table 10: the calculation of labor costs in 2 scenarios: outsourcing and working OT

Total cost for out-sourcing resource

The total cost of labor and hired equipment is calculated by summing the cost of hiring machines and the cost of labor, including outsourcing. Since the labor cost is currently in Vietnamese Dong (VND), it must be converted to US Dollars. Using the current exchange rate of 25.329 VND/USD, the labor cost in USD is approximately $3.963.137.

The total operational cost for the plan is:

3.963.137 + 15.808.000=19.771.137(USD)

Inventory cost First In First Out (FIFO) strategy

As instant coffee is a commodity with a finite storage life, we will prioritize its use FIFO. FIFO in inventory management and accounting is a method in which the oldest items in stock are sold or used first. In a FIFO system, goods are arranged so that the earliest acquired inventory items are the first to be removed from storage, whether sold, consumed, or processed.

By prioritizing the sale of the oldest stock first, FIFO enables LSC to address the shelf-life constraints on its products. Since older inventory is sold first, LSC can move stock through the supply chain efficiently with the required shelf-life duration of instant coffee.

Another advantage of FIFO is its effect on cost accounting and pricing decisions. In a business environment where production costs or material prices may fluctuate, FIFO helps account for older inventory at its original cost. This practice can influence the cost of goods sold (COGS) and lead to a lower taxable income when inflation or cost increases are factored in. As LSC gains a clearer picture of its inventory costs, it can adjust its pricing to reflect current market conditions and optimize profitability. This level of insight enables more strategic decision-making in areas like pricing and production planning.

Drawback of Subcontract

Although subcontracting can benefit the company by sharing the workload and saving investment on specialized machines, it creates higher risks of quality control when the subcontractors do not meet your products' standards. There are many reasons for poor-quality products produced by subcontractors. Firstly, contractors tend to negotiate and select the cheapest deal with subcontractors, leading contractors to prioritize cost-cutting methods to maximize profit, but causing inconsistency in the quality of products (Yik et al. 2006). Moreover, subcontracting companies are often small and do not have the resources to adopt modern quality management systems, leading to higher risks of defects in production (Karim el al. 2006). Lastly, communication between the two parties is crucial to maintain the quality of products, this is because one-off relationships between subcontractors and contractors cause a lack of understanding of each other, making subcontractors sometimes fail to complete the requirements (Lin and Gibson 2011). Therefore, if LSC chooses subcontracting, those quality controls also need to be carefully considered.

2. Long-term:

Investment in the production line:

Investing in a new production line is a strategic decision for LSC, as it navigates a growing global demand for instant coffee and faces production constraints during peak seasons. In the context of LSC's long-term growth, an additional production line offers potential benefits, such as increased capacity, reduced dependence on seasonal adjustments, enhanced operational efficiency, and strengthened competitive advantage.

The investment comes with many advantages. LSC's current capacity constraints require significant adjustments between high- and low-demand months, which can create inefficiencies and strain the production process. With a new production line, LSC would benefit from greater flexibility in its production scheduling, allowing it to better manage inventory and avoid sharp fluctuations in production volume. This flexibility could reduce the strain on existing production resources and create a smoother operational flow year-round, thus enhancing LSC's ability to adapt to demand variability with less disruption. A new production line also offers the opportunity to **increase operational efficiency**. Advanced production technology can significantly improve productivity by automating or streamlining various aspects of the manufacturing process. For instance, if the new production line includes more adaptable machinery, LSC could mitigate the inefficiencies associated with switching between espresso and pure black coffee production, a current limitation that reduces capacity by half when changing products. Enhanced operational efficiency would lower production costs over time, thus improving profit margins and contributing to LSC's long-term financial stability.

However, the decision to invest in a new production line must also consider potential drawbacks, particularly the high initial capital investment involved. Establishing a new production line entails substantial costs, including machinery acquisition, facility upgrades, and training for additional personnel. This requires companies to prepare and consider financial factors when applying this strategy.

VI. Capacity plan:

After executing the production plan from November with the company's current capacity, a significant amount of backlog remained for each production stage. This has forced the company to outsource the unfinished workload. By dividing the remaining backlog at the end of the year in the table by 13 production months, we can obtain the quantity of goods that need to be outsourced for the production timeline. Except for the stick-filling process for the pure black category, there is no need to increase the capacity level.

Extraction (kgs)	Sum of Nov-24	Sum of Dec-24	Sum of Jan-25	Sum of Feb-25	Sum of Mar-25	Sum of Apr-25	Sum of May-25	Sum of Jun-25	Sum of Jul-25	Sum of Aug-25	Sum of Sep-25	Sum of Oct-25	Sum of Nov-25
Openning inventory	-	8.288.000	8.545.575	7.681.581	7.203.408	7.003.383	9.199.026	13.763.421	6.672.484	9.487.233	9.278.235	11.177.785	2.471.790
Production	7.448.000	7.448.000	7.448.000	7.448.000	7.448.000	7.448.000	7.448.000	7.448.000	7.448.000	7.448.000	7.448.000	7.448.000	7.448.000
Forecast		8.030.425	9.151.993	8.766.174	8.488.025	6.092.356	3.723.605	15.378.938	5.473.251	8.496.998	6.388.450	16.993.995	10.686.298
Closing inventory	7.448.000	7.705.575	6.841.581	6.363.408	6.163.383	8.359.026	12.923.421	5.832.484	8.647.233	8.438.235	10.337.785	1.631.790	(766.508)
Outsource	840.000	840.000	840.000	840.000	840.000	840.000	840.000	840.000	840.000	840.000	840.000	840.000	840.000
Result after outsource	8.288.000	8.545.575	7.681.581	7.203.408	7.003.383	9.199.026	13.763.421	6.672.484	9.487.233	9.278.235	11.177.785	2.471.790	73.492

Spray drying (kgs)	Sum of Nov-24	Sum of Dec-24	Sum of Jan-25	Sum of Feb-25	Sum of Mar-25	Sum of Apr-25	Sum of May-25	Sum of Jun-25	Sum of Jul-25	Sum of Aug-25	Sum of Sep-25	Sum of Oct-25	Sum of Nov-25
Openning inventory	-	8.290.800	8.551.175	7.689.981	7.214.608	7.017.383	9.215.826	13.783.021	6.694.884	9.512.433	9.306.235	11.208.585	2.505.390
Production	6.520.800	6.520.800	6.520.800	6.520.800	6.520.800	6.520.800	6.520.800	6.520.800	6.520.800	6.520.800	6.520.800	6.520.800	6.520.800
Forecast		8.030.425	9.151.993	8.766.174	8.488.025	6.092.356	3.723.605	15.378.938	5.473.251	8.496.998	6.388.450	16.993.995	10.686.298
Closing inventory	6.520.800	6.781.175	5.919.981	5.444.608	5.247.383	7.445.826	12.013.021	4.924.884	7.742.433	7.536.235	9.438.585	735.390	(1.660.108)
Outsource	1.770.000	1.770.000	1.770.000	1.770.000	1.770.000	1.770.000	1.770.000	1.770.000	1.770.000	1.770.000	1.770.000	1.770.000	1.770.000
Result after outsource	8.290.800	8.551.175	7.689.981	7.214.608	7.017.383	9.215.826	13.783.021	6.694.884	9.512.433	9.306.235	11.208.585	2.505.390	109.892

Mixing (3In1) (kgs)	Sum of Nov-24	Sum of Dec-24	Sum of Jan-25	Sum of Feb-25	Sum of Mar-25	Sum of Apr-25	Sum of May-25	Sum of Jun-25	Sum of Jul-25	Sum of Aug-25	Sum of Sep-25	Sum of Oct-25	Sum of Nov-25
Openning inventory	-	7.175.400	7.402.064	6.658.234	6.248.254	6.078.957	7.982.634	11.935.995	5.803.983	8.243.373	8.066.311	9.713.778	2.184.256
Production	5.795.400	5.795.400	5.795.400	5.795.400	5.795.400	5.795.400	5.795.400	5.795.400	5.795.400	5.795.400	5.795.400	5.795.400	5.795.400
Forecast		6.948.736	7.919.230	7.585.380	7.344.697	5.271.723	3.222.040	13.307.412	4.736.010	7.352.461	5.527.933	14.704.923	9.246.865
Closing inventory	5.795.400	6.022.064	5.278.234	4.868.254	4.698.957	6.602.634	10.555.995	4.423.983	6.863.373	6.686.311	8.333.778	804.256	(1.267.210)
Outsource	1.380.000	1.380.000	1.380.000	1.380.000	1.380.000	1.380.000	1.380.000	1.380.000	1.380.000	1.380.000	1.380.000	1.380.000	1.380.000
Result after outsource	7.175.400	7.402.064	6.658.234	6.248.254	6.078.957	7.982.634	11.935.995	5.803.983	8.243.373	8.066.311	9.713.778	2.184.256	112.790

Mixing (Espresso) (kgs)	Sum of Nov-24	Sum of Dec-24	Sum of Jan-25	Sum of Feb-25	Sum of Mar-25	Sum of Apr-25	Sum of May-25	Sum of Jun-25	Sum of Jul-25	Sum of Aug-25	Sum of Sep-25	Sum of Oct-25	Sum of Nov-25
Openning inventory	-	915.280	943.471	847.766	794.681	772.323	1.014.604	1.518.552	734.982	1.045.653	1.022.304	1.231.877	269.897
Production	449.280	449.280	449.280	449.280	449.280	449.280	449.280	449.280	449.280	449.280	449.280	449.280	449.280
Forecast		887.089	1.010.985	968.365	937.639	672.999	411.332	1.698.851	604.608	938.630	705.707	1.877.260	1.180.473
Closing inventory	449.280	477.471	381.766	328.681	306.323	548.604	1.052.552	268.982	579.653	556.304	765.877	(196.103)	(461.296)
Outsource	466.000	466.000	466.000	466.000	466.000	466.000	466.000	466.000	466.000	466.000	466.000	466.000	466.000
Result after outsource	915.280	943.471	847.766	794.681	772.323	1.014.604	1.518.552	734.982	1.045.653	1.022.304	1.231.877	269.897	4.704

Stick filling (3In1) (kgs)	Sum of Nov-24	Sum of Dec-24	Sum of Jan-25	Sum of Feb-25	Sum of Mar-25	Sum of Apr-25	Sum of May-25	Sum of Jun-25	Sum of Jul-25	Sum of Aug-25	Sum of Sep-25	Sum of Oct-25	Sum of Nov-25
Openning inventory	-	7.167.400	7.386.064	6.634.234	6.216.254	6.038.957	7.934.634	11.879.995	5.739.983	8.171.373	7.986.311	9.625.778	2.088.256
Production	5.990.400	5.990.400	5.990.400	5.990.400	5.990.400	5.990.400	5.990.400	5.990.400	5.990.400	5.990.400	5.990.400	5.990.400	5.990.400
Forecast		6.948.736	7.919.230	7.585.380	7.344.697	5.271.723	3.222.040	13.307.412	4.736.010	7.352.461	5.527.933	14.704.923	9.246.865
Closing inventory	5.990.400	6.209.064	5.457.234	5.039.254	4.861.957	6.757.634	10.702.995	4.562.983	6.994.373	6.809.311	8.448.778	911.256	(1.168.210)
Outsource	1.177.000	1.177.000	1.177.000	1.177.000	1.177.000	1.177.000	1.177.000	1.177.000	1.177.000	1.177.000	1.177.000	1.177.000	1.177.000
Result after outsource	7.167.400	7.386.064	6.634.234	6.216.254	6.038.957	7.934.634	11.879.995	5.739.983	8.171.373	7.986.311	9.625.778	2.088.256	8.790

Stick filling (Esspreso) (kgs)	Sum of Nov-24	Sum of Dec-24	Sum of Jan-25	Sum of Feb-25	Sum of Mar-25	Sum of Apr-25	Sum of May-25	Sum of Jun-25	Sum of Jul-25	Sum of Aug-25	Sum of Sep-25	Sum of Oct-25	Sum of Nov-25
Openning inventory	-	915.000	942.911	846.926	793.561	770.923	1.012.924	1.516.592	732.742	1.043.133	1.019.504	1.228.797	266.537
Production	468.000	468.000	468.000	468.000	468.000	468.000	468.000	468.000	468.000	468.000	468.000	468.000	468.000
Forecast		887.089	1.010.985	968.365	937.639	672.999	411.332	1.698.851	604.608	938.630	705.707	1.877.260	1.180.473
Closing inventory	468.000	495.911	399.926	346.561	323.923	565.924	1.069.592	285.742	596.133	572.504	781.797	(180.463)	(445.936)
Outsource	447.000	447.000	447.000	447.000	447.000	447.000	447.000	447.000	447.000	447.000	447.000	447.000	447.000
Result after outsource	915.000	942.911	846.926	793.561	770.923	1.012.924	1.516.592	732.742	1.043.133	1.019.504	1.228.797	266.537	1.064

Stick filling (Pure Black) (kgs)	Sum of Nov-24	Sum of Dec-24	Sum of Jan-25	Sum of Feb-25	Sum of Mar-25	Sum of Apr-25	Sum of May-25	Sum of Jun-25	Sum of Jul-25	Sum of Aug-25	Sum of Sep-25	Sum of Oct-25	Sum of Nov-25
Openning inventory	-	202.800	211.000	192.021	182.392	179.503	234.668	347.234	177.359	247.527	244.420	292.410	83.397
Production	202.800	202.800	202.800	202.800	202.800	202.800	202.800	202.800	202.800	202.800	202.800	202.800	202.800
Forecast		194.600	221.779	212.429	205.689	147.635	90.234	372.675	132.632	205.906	154.810	411.813	258.959
Closing inventory	202.800	211.000	192.021	182.392	179.503	234.668	347.234	177.359	247.527	244.420	292.410	83.397	27.238

Outsource Option

Packing (cartons)	Sum of Nov-24	Sum of Dec-24	Sum of Jan-25	Sum of Feb-25	Sum of Mar-25	Sum of Apr-25	Sum of May-25	Sum of Jun-25	Sum of Jul-25	Sum of Aug-25	Sum of Sep-25	Sum of Oct-25	Sum of Nov-25
Openning inventory	-	1.305.000	1.344.948	1.208.212	1.132.255	1.100.116	1.445.372	2.163.783	1.046.102	1.488.888	1.455.335	1.753.947	381.842
Production	923.000	923.000	923.000	923.000	923.000	923.000	923.000	923.000	923.000	923.000	923.000	923.000	923.000
Forecast		1.265.052	1.441.736	1.380.957	1.337.139	959.744	586.589	2.422.681	862.214	1.338.553	1.006.388	2.677.105	1.683.438
Closing inventory	923.000	962.948	826.212	750.255	718.116	1.063.372	1.781.783	664.102	1.106.888	1.073.335	1.371.947	(158)	(378.596)
Outsource	382.000	382.000	382.000	382.000	382.000	382.000	382.000	382.000	382.000	382.000	382.000	382.000	382.000
Closing Inventory after outsource	1.305.000	1.344.948	1.208.212	1.132.255	1.100.116	1.445.372	2.163.783	1.046.102	1.488.888	1.455.335	1.753.947	381.842	3.404

Option 2: Outsource

Packing (cartons)	Sum of Nov-24	Sum of Dec-24	Sum of Jan-25	Sum of Feb-25	Sum of Mar-25	Sum of Apr-25	Sum of May-25	Sum of Jun-25	Sum of Jul-25	Sum of Aug-25	Sum of Sep-25	Sum of Oct-25	Sum of Nov-25
Openning inventory	-	1.305.000	1.344.948	1.208.212	1.132.255	1.100.116	1.445.372	2.163.783	1.046.102	1.488.888	1.455.335	1.753.947	381.842
Production	923.000	923.000	923.000	923.000	923.000	923.000	923.000	923.000	923.000	923.000	923.000	923.000	923.000
Forecast		1.265.052	1.441.736	1.380.957	1.337.139	959.744	586.589	2.422.681	862.214	1.338.553	1.006.388	2.677.105	1.683.438
Closing inventory	923.000	962.948	826.212	750.255	718.116	1.063.372	1.781.783	664.102	1.106.888	1.073.335	1.371.947	(158)	(378.596)
Outsource	382.000	382.000	382.000	382.000	382.000	382.000	382.000	382.000	382.000	382.000	382.000	382.000	382.000
Closing Inventory after outsource	1.305.000	1.344.948	1.208.212	1.132.255	1.100.116	1.445.372	2.163.783	1.046.102	1.488.888	1.455.335	1.753.947	381.842	3.404

Table 11: Production plan reinforced with outsourcing resources

After simulating this production plan, a surplus of goods can be used to supply the following year's plan.

VI. Conclusion:

In conclusion, LSC faces a significant challenge in aligning its production capacity with the projected demand for 2025. The current production model, constrained by seasonal fluctuations and limited machine capacity, necessitates a strategic approach to optimize operations and maintain market competitiveness.

To address short-term capacity constraints, a hybrid approach combining inventory buffering and flexible capacity expansion through subcontracting and overtime is recommended. This approach ensures product availability, minimizes inventory costs, and aligns production with fluctuating demand.

Additionally, producing two months in advance will help mitigate the impact of seasonal fluctuations and ensure a steady supply of products.

For long-term growth, a strategic investment in a new production line is crucial. This investment would enhance operational efficiency, reduce reliance on seasonal adjustments, and position LSC for future market expansion. Additionally, adopting the FIFO inventory strategy can optimize product shelf life and minimize waste.

By implementing these recommendations, LSC can effectively navigate the complexities of capacity planning, improve operational efficiency, and solidify its market position in the competitive instant coffee industry.

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