Supplementary Tables and Figures

Financial Analysis of Shipping Container-Based Mushroom Cultivation

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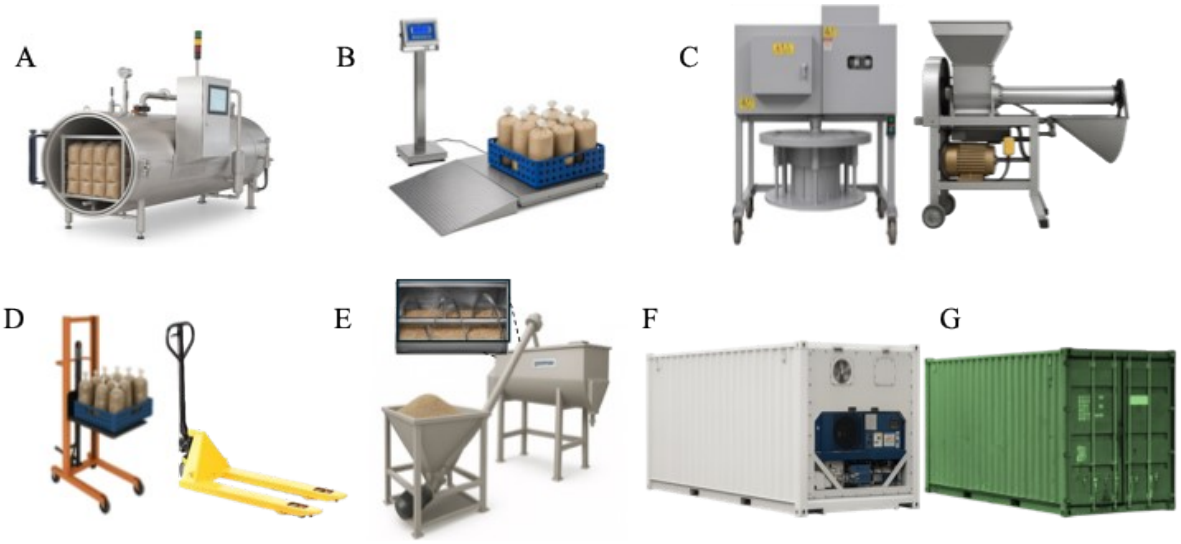

Figure S1. An overview of key machinery used in mushroom production. Here, A) sterilizers; B) weighing scales; C) substrate bottling or bagging machines; D) pallet jacks and tray lifting jacks; E) substrate hoppers and paddle mixers; F) refrigerated shipping containers; and G) non-insulated shipping containers.

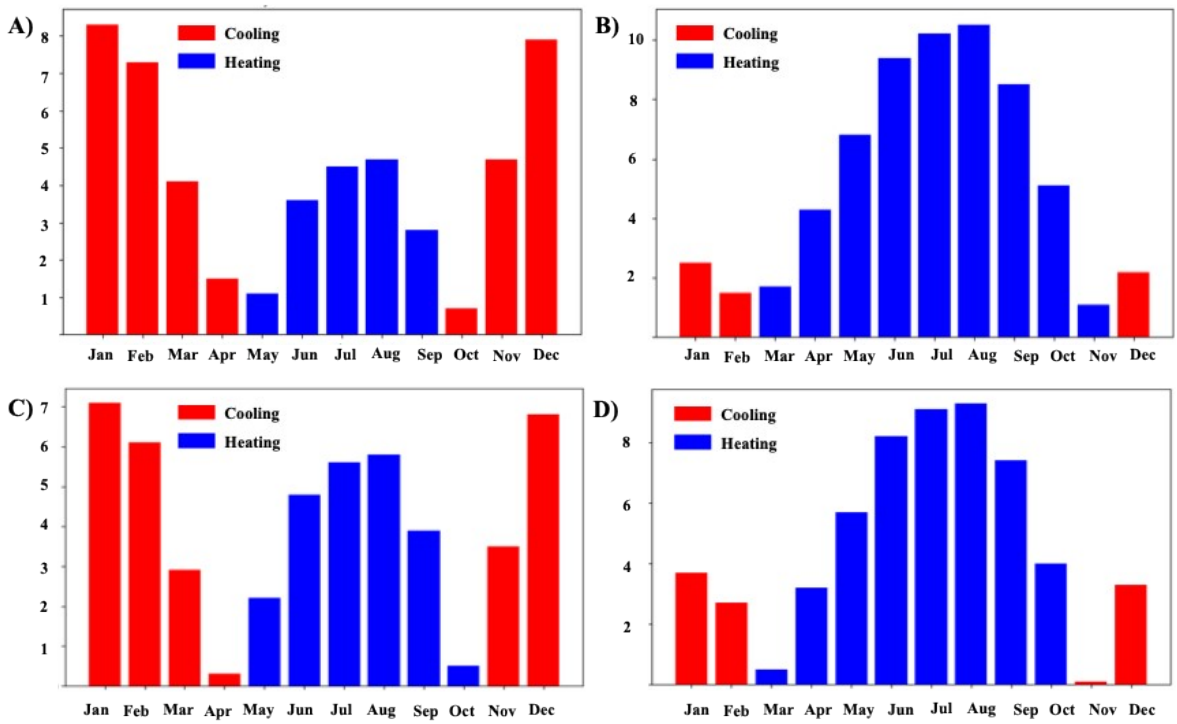

Fig S2. Monthly cooling and heating ventilation energy (E_{vent}) for each mushroom species across the year, based on Houston ambient temperatures. Here, A) Oyster, B) Maitake, C) Lion's Mane, and D) Enoki.

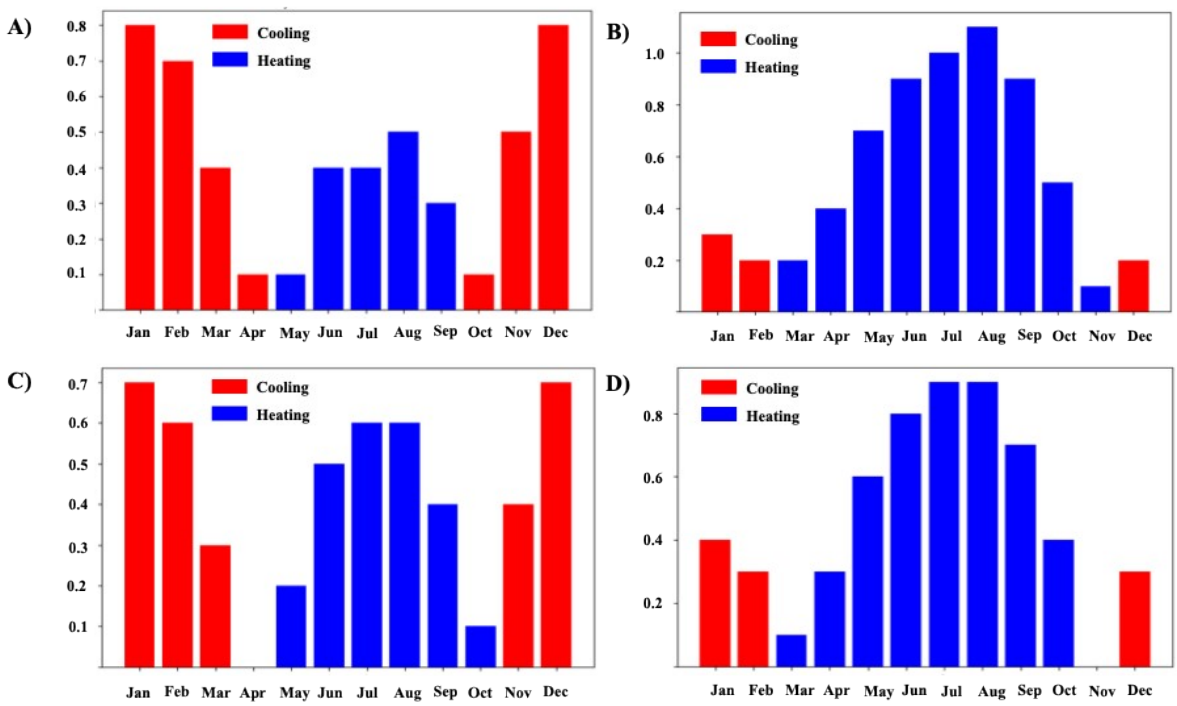

Fig S3. Seasonal transmission energy (E_{trans}) requirements for Oyster, Maitake, Lion's Mane, and Enoki mushrooms. Positive bars indicate cooling-related conductive heat gain, while negative bars indicate heat loss requiring heating. Here, A) Oyster, B) Maitake, C) Lion's Mane, and D) Enoki.

Table S1 Comparison of yield and cultivation metrics between bottle and bag substrates, showing differences in cycle time, substrate volume, density, and 90-day productivity.

Parameters	**Bottle (Enoki, Morel)**	**Bag (Maitake, Oyster)**
		
Number of flushes	1	3
Dimensions of trays and bags (W x L x H and D x H) (in inches)	W = 12″ L = 16″ H = 10″	D= 18″ H= 33.8″
No. of trays and bags in a 40-ft shipping container	228 Trays 2736 Bottles	88
Amount of mushroom produced in a 40-ft growth chamber	Enoki = 1880 lb Morel = 1000 lb	Oyster = 1560 lb Maitake = 540 lb

Table S2 Summary of equipment, container, and land requirements across production scales. The quantities of equipment, number of containers, and land area needed to support mushroom cultivation at different levels of production are provided.

Equipment	Mushroom farm's production capacity			
	50 lb/day	**100 lb/day**	**200 lb/day**	**500 lb/day**
Autoclave	1	2	3	3
Industrial balance	1	1	2	3
Filling machine	1	2	3	3
Ribbon mixer	1	2	3	3
Industrial stacker	1	1	2	2
Refrigerated container	2	4	10	21
Regular container	5	7	7.5	12
Containers area (ft^2)	5,000	10,000	15,000	25,000

Table S3 Capital and variable cost assumptions.

Cost	Min (USD/Unit)	Max (USD/Unit)	Average (USD/Unit)
Capital Cost			
Autoclave	40,000	80,000	60,000
Industrial balance	1,600	1,800	1,700
Filling machine	2,000	4,000	3,000
Ribbon mixer	15,000	20,000	17,500
Industrial stacker	5,000	10,000	7,500
Others (Office and lab supplies)	16,440	48,720	32,580
Per Unit Variable Cost			
Water (gal)	0.002	0.003	0.0025
Pelleted substrate (lb)	0.08	0.10	0.09
Spawn (lb)	0.75	0.10	0.40
Electricity (kWh)	0.07	0.08	0.075
Human labor (hour)	7.00	8.00	7.50

Table S4 Daily electricity consumption by production scale. Total power usage (kWh/day) across all containers, including substrate preparation, cultivation, and access areas, as well as associated equipment, for each level of mushroom production.

Electricity equipment usage (kwh)				
Production Scale	**50 lb/day**	**100 lb/day**	**200 lb/day**	**500 lb/day**
Ventilation system	93.2	146.5	233.1	439.6
Heating/Cooling System (HVAC)	193.2	303.6	483.0	910.8
Humidification System	8.6	17.3	43.2	90.7
Lighting	8.6	17.3	43.2	90.7
Water Pump & Irrigation	0.4	0.8	2.1	4.4
Monitoring & Control Systems	1.7	3.4	8.4	17.6
Autoclave	21.0	42.0	63.0	63.0
Industrial balance	0.6	0.6	1.2	1.8
Filling machine	1.5	3.0	9.0	9.0
Industrial Stacker	2.3	2.3	4.6	4.6
Ribbon Mixer	8.0	16.0	24.0	24.0
Total	339.2	552.8	914.8	1656.3
Internal Electrical Heat Gain (kWh)				
Ventilation system	28.0	44.0	69.9	131.9
Humidification System	2.6	5.2	13.0	27.2
Lighting (Supplementary)	2.6	5.2	13.0	27.2
Water Pump & Irrigation	0.1	0.3	0.6	1.3
Monitoring & Control Systems	0.5	1.0	2.5	5.3
Autoclave	6.3	12.6	18.9	18.9
Industrial balance	0.2	0.2	0.4	0.5
Filling machine	0.5	0.9	2.7	2.7
Industrial Stacker	0.7	0.7	1.4	1.4
Ribbon Mixer	2.4	4.8	7.2	7.2
Total	43.8	74.8	129.5	223.6
Ventilation Heat Load				
Oyster	13.4	21.1	33.6	63.4
Maitake	53.8	84.5	134.5	253.6
Lion's Mane	21.5	33.8	53.8	101.4
Enoki	45.7	71.9	114.3	215.6
Transmission Thermal Heat (kWh)				
Oyster	1.4	2.1	3.4	6.4

Maitake	5.4	8.5	13.5	25.5
Lion's Mane	2.2	3.4	5.4	10.2
Enoki	4.6	7.2	11.5	21.7
Biological Product Heat (kWh)				
All Mushrooms	5.4	10.8	21.7	54.2
Total kWh				
Oyster	403.2	661.6	1103.0	2003.9
Maitake	447.6	731.4	1214.0	2213.2
Lion's Mane	412.1	675.6	1125.2	2045.7
Enoki	438.8	717.5	1191.8	2171.3

Table S5 Financial performance of Oyster mushroom produced at four scales. This table presents 10-year projections for daily production outputs of 50, 100, 200, and 500 lb, detailing revenue and Net Cash Flow for 10 years.

Years	Revenue				Discounted Net Cash Flow			
	50 lb/day	100 lb/day	200 lb/day	500 lb/day	50 lb/day	100 lb/day	200 lb/day	500 lb/day
1	$105,080	$210,160	$420,319	$1,050,798	-$17,138	$16,465	$71,850	$384,901
2	$115,974	$231,949	$463,898	$1,155,000	-$8,971	$850	$89,594	$418,645
3	$118,874	$237,747	$475,495	$1,183,875	-$8,418	$432	$86,251	$403,005
4	$121,846	$243,691	$487,382	$1,213,472	-$7,902	$59	$83,026	$387,940
5	$124,892	$249,783	$499,567	$1,243,809	-$7,420	$274	$79,917	$373,431
6	$128,014	$256,028	$512,056	$1,274,904	-$6,971	$569	$76,918	$359,458
7	$131,214	$262,429	$524,857	$1,306,776	-$6,551	$830	$74,027	$346,000
8	$134,495	$268,989	$537,979	$1,339,446	-$6,159	$1,059	$71,240	$333,040
9	$137,857	$275,714	$551,428	$1,372,932	-$5,794	$1,260	$68,554	$320,559
10	$141,304	$282,607	$565,214	$1,407,255	-$5,452	$1,434	$65,965	$308,540

Table S6 Financial performance of Lion's Mane mushrooms produced at four scales. This table presents 10-year projections for daily production outputs of 50, 100, 200, and 500 lb, detailing revenue and Net Cash Flow for 10 years.

Years	Revenue				Discounted Net Cash Flow			
	50 lb/day	100 lb/day	200 lb/day	500 lb/day	50 lb/day	100 lb/day	200 lb/day	500 lb/day
1	$186,809	$373,618	$747,235	$1,868,088	$240,907	$36,977	$85,022	$807,759
2	$225,675	$451,350	$902,700	$2,256,750	$316,364	$56,711	$124,077	$988,708
3	$231,317	$462,634	$925,268	$2,313,169	$304,545	$54,594	$119,442	$951,759
4	$237,100	$474,200	$948,399	$2,370,998	$293,161	$52,553	$114,977	$916,184
5	$243,027	$486,055	$972,109	$2,430,273	$282,197	$50,586	$110,676	$881,930
6	$249,103	$498,206	$996,412	$2,491,030	$271,637	$48,691	$106,532	$848,950
7	$255,331	$510,661	$1,021,322	$2,553,305	$261,468	$46,866	$102,540	$817,196
8	$261,714	$523,428	$1,046,855	$2,617,138	$251,675	$45,107	$98,695	$786,623
9	$268,257	$536,513	$1,073,027	$2,682,567	$242,245	$43,413	$94,991	$757,189
10	$274,963	$549,926	$1,099,852	$2,749,631	$233,163	$41,781	$91,424	$728,849

Table S7 Financial performance of Maitake mushrooms produced at four scales. This table presents 10-year projections for daily production outputs of 50, 100, 200, and 500 lb, detailing revenue and Net Cash Flow for 10 years.

Years	Revenue				Discounted Net Cash Flow			
	50 lb/day	100 lb/day	200 lb/day	500 lb/day	50 lb/day	100 lb/day	200 lb/day	500 lb/day
1	$149,466	$298,931	$597,862	$1,494,656	$9,881	$38,604	$149,670	$580,534
2	$180,562	$361,125	$722,250	$1,805,625	$30,117	$71,444	$211,656	$727,772
3	$185,077	$370,153	$740,306	$1,850,766	$28,993	$68,777	$203,750	$700,577
4	$189,703	$379,407	$758,814	$1,897,035	$27,909	$66,206	$196,134	$674,390
5	$194,446	$388,892	$777,784	$1,944,461	$26,864	$63,728	$188,796	$649,174
6	$199,307	$398,614	$797,229	$1,993,072	$25,856	$61,339	$181,728	$624,894
7	$204,290	$408,580	$817,160	$2,042,899	$24,884	$59,036	$174,920	$601,515
8	$209,397	$418,794	$837,589	$2,093,971	$23,947	$56,817	$168,362	$579,004
9	$214,632	$429,264	$858,528	$2,146,321	$23,043	$54,678	$162,045	$557,329
10	$219,998	$439,996	$879,991	$2,199,979	$22,173	$52,618	$155,962	$536,461

Table S8 Financial performance of Enoki mushrooms produced at four scales. This table presents 10-year projections for daily production outputs of 50, 100, 200, and 500 lb, detailing revenue and Net Cash Flow for 10 years.

Years	Revenue				Discounted Net Cash Flow			
	50 lb/day	100 lb/day	200 lb/day	500 lb/day	50 lb/day	100 lb/day	200 lb/day	500 lb/day
1	$149,840	$299,680	$599,359	$1,498,398	$23,624	$58,751	$188,798	$678,136
2	$165,375	$330,750	$661,500	$1,653,750	$30,029	$71,129	$210,887	$725,640
3	$169,509	$339,019	$678,038	$1,695,094	$28,909	$68,474	$203,010	$698,524
4	$173,747	$347,494	$694,988	$1,737,471	$27,828	$65,914	$195,421	$672,414
5	$178,091	$356,182	$712,363	$1,780,908	$26,785	$63,447	$188,110	$647,272
6	$182,543	$365,086	$730,172	$1,825,431	$25,780	$61,068	$181,068	$623,063
7	$187,107	$374,213	$748,427	$1,871,066	$24,811	$58,776	$174,284	$599,752
8	$191,784	$383,569	$767,137	$1,917,843	$23,877	$56,566	$167,750	$577,307
9	$196,579	$393,158	$786,316	$1,965,789	$22,976	$54,437	$161,456	$555,696
10	$149,840	$299,680	$599,359	$1,498,398	$22,108	$52,386	$155,394	$534,888