

Industrial Hemp for CBD Planning Budget

This guide presents information useful to farmers considering industrial hemp production for cannabidiol (CBD) in the 2021 crop year. Table 1 presents income and cost estimates for industrial hemp CBD production in Missouri based on prices in October 2020. Industrial hemp is more regulated than most Missouri agricultural commodities. These budgets contain cost estimates for state registration, grower background checks and product sampling and testing costs. It is suggested that producers contact the Missouri Department of Agriculture Industrial Hemp Program to learn the latest regulations surrounding industrial hemp production.

Table 1. Missouri industrial hemp for CBD planning budget for 2021.

	Dollars per acre ¹	Your estimate
Income		
Hemp CBD biomass	9,000.00	
Total income	9,000.00	
Operating costs		
Clones	5,717.25	
Fertilizer	99.70	
Irrigation - supplies and fuel	554.25	
Custom hire, machinery fuel, and variable costs	119.26	
Supplies	624.21	
Labor	3,839.73	
Registration and background check	320.00	
Sampling costs	300.00	
Operating interest	260.39	
Total operating costs	11,834.83	
Ownership costs		
Machinery ownership	41.90	
Real estate charge	150.00	
Drying and storage facility	1,950.00	
Irrigation well and pump	284.00	
Total ownership costs	2,425.90	
Total costs	14,259.20	
Income over operating costs	-2,834.83	
Income over total costs	-5,260.73	

¹ Totals may not sum due to rounding.

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Table 2 summarizes quantities of yield and inputs along with their prices. This budget assumes a labor-intensive method of production. Table 3 summarizes how this labor is allocated to various production activities. Assumed production is 2.5 acres. Table 4 details the equipment used to estimate the cost of production in this budget. To account for the increased uncertainty in industrial hemp production and marketing, a sensitivity analysis showing the impact on profit of various CBD yield and price combinations for grain is included in Table 5. Table 6 presents a sensitivity analysis of various CBD yields and biomass yields assuming a known price for percent CBD in the biomass.

Table 2. Input assumptions used in Missouri industrial hemp for CBD planning budget for 2021.

Selected quantities	Per acre	Selected prices	Dollars per unit
Biomass yield, pounds	1,500	Biomass price, per pound per percent CBD	0.75
CBD content, percentage	8		
Clones purchased	1,906	Clone, per plant	3.00
Nitrogen rate, pounds N	150	Nitrogen, per pound N	0.31
Phosphorus rate, pounds P ₂ O ₅	70	Phosphorus, per pound P ₂ O ₅	0.38
Potassium rate, pounds K ₂ O	50	Potassium, per pound K ₂ O	0.28
Lime rate, tons	0.6	Lime, per ton	21.00
Fuel for machinery and drying, gallons	2.9	Fuel, per gallon	2.38
Labor, hours	246.3	Unskilled labor, per hour	15.50

Table 3. Labor assumptions used in Missouri industrial hemp for CBD planning budget for 2021, on a per acre basis.

Labor activity	Hours per acre	Dollars per hour	Total cost (dollars)	Description
Labor for pre-plant and planting	4.8	20	96.48	Disking, fertilizer, laying plastic and drip tape, planting clones
Labor for irrigation	10.0	15.50	155.00	
Labor for in-season weed control	50.0	15.50	775.00	Hand hoeing
Labor for in-season "trimming"	61.0	15.50	937.75	Two minutes per plant to increase bud development
Labor for harvest	61.0	15.50	937.75	Cut and haul plants to barn
Labor for post-harvest	61.0	15.50	937.75	Harvest dried material and load into totes
Total	246.3		3,839.73	

Table 4. Machinery used in Missouri industrial hemp for CBD planning budget for 2021, on a per acre basis.

Machinery activity (including custom fieldwork)	Labor (hours)	Fuel (gallons)	Operating costs ¹ (dollars)	Ownership costs ¹ (dollars)	Total costs (dollars)	Trips across field
Anhydrous application, 200 MFWD	0.08	0.64	3.07	7.30	10.37	1
Tandem disk, fold (21 feet), 160 MFWD	0.16	1.48	3.54	19.92	23.46	2
Black plastic mulch layer, 80 HP	1.41	0.38	0.90	7.35	8.25	1
Water wheel planter, 80 HP	3.17	0.38	0.90	7.35	8.25	1
Dry fertilizer, custom rate					12.40	2
Hauling hemp to processor, custom rate					100.00	
Total²	4.82	2.88	8.40	41.90	162.70	7

¹ Machinery operating cost is the sum of repairs and maintenance. Machinery ownership cost is the sum of overhead and depreciation.

² Totals may not sum due to rounding.

Abbreviations: MFWD = mechanical front-wheel drive tractor; HP = horsepower.

Table 5. Sensitivity analysis: income over total costs per acre, assuming 1,200 pounds of biomass per acre.

Market price (dollars per percent CBD content per pound)	CBD yield (percent CBD content per pound biomass)							
	5	6	7	8	9	10	11	12
0.50	-10,511	-9,761	-9,011	-8,261	-7,511	-6,761	-6,011	-5,261
0.75	-8,636	-7,511	-6,386	-5,261	-4,136	-3,011	-1,886	-761
1.00	-6,761	-5,261	-3,761	-2,261	-761	739	2,239	3,739
1.50	-3,011	-761	1,489	3,379	5,989	8,239	10,489	12,739
2.50	4,489	8,239	11,989	15,739	19,489	23,239	26,989	30,739

Table 6. Sensitivity analysis: income over total costs per acre, assuming \$0.75 per percent CBD.

Biomass yield (pounds biomass per acre)	CBD yield (percent CBD content per pound biomass)							
	7	8	9	10	11	12	13	14
800	-10,061	-9,461	-8,861	-8,261	-7,661	-7,061	-6,461	-5,861
1,000	-9,011	-8,261	-7,511	-6,761	-6,011	-5,261	-4,511	-3,761
1,200	-7,961	-7,061	-6,161	-5,261	-4,361	-3,461	-2,561	-1,661
1,400	-6,911	-5,861	-4,811	-3,761	-2,711	-1,661	-611	439
1,600	-5,861	-4,661	-3,461	-2,261	-1,061	139	1,339	2,539

Farmers can also develop their own custom budget by using the Missouri Industrial Hemp Budget Generator (<https://extension.missouri.edu/media/wysiwyg/Extensiondata/Pro/AgBusinessPolicyExtension/Docs/IndustrialHempBudget.xlsx>).