

ECONOMIC VIABILITY OF JATROPHA

Table 5.3.1: Year-wise Per Hectare Net Income and Cumulative Net Cash Flow with a Production Standard of 1.5 Tons Seed with Market Price of Rs. 5

Costs and returns	Establishment Year (0 year)	1st year	2nd year	3rd year	4th year	5th year	6th year	7th year	8th year	9th year	10th year	Total
1. Establishment cost (in Rs.)	15,929	0	0	0	0	0	0	0	0	0	0	15,929
a. Seedling costs	7,266	0	0	0	0	0	0	0	0	0	0	7,266
b. Labor costs on various operations	8,663	0	0	0	0	0	0	0	0	0	0	8,663
i. Land preparation	4,405	0	0	0	0	0	0	0	0	0	0	4,405
ii. Digging	2,554	0	0	0	0	0	0	0	0	0	0	2,554
iii. Planting	1,704	0	0	0	0	0	0	0	0	0	0	1,704
2. Operation and maintenance cost	1,280	5,020	3,905	3,905	900	2,474	900	2,474	900	2,474	900	25,132
a. Cost of cleaning and weeding	1,280	3,200	3,200	3,200	900	900	900	900	900	900	900	17,180
b. Cost on pruning	0	705	705	705	0	1,574	0	1,574	0	1,574	0	6,837
c. Cost on replanting	0	1,115	0	0	0	0	0	0	0	0	0	1,115
3. Other costs	0	300	720	1,440	2,304	3,600	3,600	3,600	3,600	3,600	3,600	26,364
a. Cost on harvesting and seed separation	0	300	720	1,440	2,304	3,600	3,600	3,600	3,600	3,600	3,600	26,364
4. Total costs of establishment, maintenance and harvesting	17,209	5,320	4,625	5,345	3,204	6,074	4,500	6,074	4,500	6,074	4,500	67,425
5. Production of seed	0	125	300	600	960	1,500	1,500	1,500	1,500	1,500	1,500	10,985
6. Gross income	0	625	1,500	3,000	4,800	7,500	7,500	7,500	7,500	7,500	7,500	54,925
7. Net income	-17,209	-4,695	-3,125	-2,345	1,596	1,426	3,000	1,426	3,000	1,426	3,000	-12,500
8. Cumulative net cash flow	-17,209	-21,904	-25,029	-27,374	-25,778	-24,352	-21,352	-19,926	-16,926	-15,500	-12,500	-

Table 5.3.2: Year-wise Per Hectare Net Income and Cumulative Net Cash Flow at Production Standard of 1.5 Tons and 2.5 Tons Seed with Market Price of Rs. 8, Rs. 10, and Rs. 12

1.5 tons seed												
Costs and returns	Establishment Year	1st year	2nd year	3rd year	4th year	5th year	6th year	7th year	8th year	9th year	10th year	Total
1. Total costs of establishment, maintenance and harvesting	17,209	5,320	4,625	5,345	3,204	6,074	4,500	6,074	4,500	6,074	4,500	67,425
2. Production of seed	0	125	300	600	960	1,500	1,500	1,500	1,500	1,500	1,500	10,985
3.1 Net income at price (Rs. 8)	-17,209	-4,320	-2,225	-545	4,476	5,926	7,500	5,926	7,500	5,926	7,500	20,455
3.2 Net income at price (Rs. 10)	-17,209	-4,070	-1,625	655	6,396	8,926	10,500	8,926	10,500	8,926	10,500	42,425
3.3 Net income at price (Rs. 12)	-17,209	-3,820	-1,025	1,855	8,316	11,926	13,500	11,926	13,500	11,926	13,500	64,395
4.1 Cumulative net cash flow (Rs. 8)	-17,209	-21,529	-23,754	-24,299	-19,823	-13,897	-6,397	-471	7,029	12,955	20,455	
4.2 Cumulative net cash flow (Rs. 10)	-17,209	-21,279	-22,904	-22,249	-15,853	-6,927	3,573	12,499	22,999	31,925	42,425	
4.3 Cumulative net cash flow (Rs. 12)	-17,209	-21,029	-22,054	-20,199	-11,883	43	13,543	25,469	38,969	50,895	64,395	
2.5 tons seed												
1. Total costs of establishment, maintenance and harvesting	17,209	5,620	5,105	6,305	4,740	8,474	6,900	8,474	6,900	8,474	6,900	85,101
2. Production of seed	0	250	500	1,000	1,600	2,500	2,500	2,500	2,500	2,500	2,500	18,350
3.1 Net income at price (Rs. 5)	-17,209	-4,370	-2,605	-1,305	3,260	4,026	5,600	4,026	5,600	4,026	5,600	6,649
3.2 Net income at price (Rs. 8)	-17,209	-3,620	-1,105	1,695	8,060	11,526	13,100	11,526	13,100	11,526	13,100	61,699
3.3 Net income at price (Rs. 10)	-17,209	-3,120	-105	3,695	11,260	16,526	18,100	16,526	18,100	16,526	18,100	98,399
3.4 Net income at price (Rs. 12)	-17,209	-2,620	895	5,695	14,460	21,526	23,100	21,526	23,100	21,526	23,100	135,099
4.1 Cumulative net cash flow (Rs. 5)	-17,209	-21,579	-24,184	-25,489	-22,229	-18,203	-12,603	-8,577	-2,977	1,049	6,649	
4.2 Cumulative net cash flow (Rs. 8)	-17,209	-20,829	-21,934	-20,239	-12,179	-653	12,447	23,973	37,073	48,599	61,699	
4.3 Cumulative net cash flow (Rs. 10)	-17,209	-20,329	-20,434	-16,739	-5,479	11,047	29,147	45,673	63,773	80,299	98,399	
4.4 Cumulative net cash flow (Rs. 12)	-17,209	-19,829	-18,934	-13,239	1,221	22,747	45,847	67,373	90,473	111,999	135,099	

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Table 5.3.3: Year-wise Per Hectare Net Income and Cumulative Net Cash Flow at Production Standard of 5 Tons and 7.5 Tons Seed with Market Price of Rs. 5, Rs. 8, Rs. 10, and Rs. 12

5 tons seed												
Costs and returns	Establishment Year	1st year	2nd year	3rd year	4th year	5th year	6th year	7th year	8th year	9th year	10th year	Total
1. Total costs of establishment, maintenance, and harvesting	17,209	5,620	5,105	6,305	4,740	8,474	6,900	8,474	6,900	8,474	6,900	85,101
2. Production of seed	0	0	1,500	2,375	3,300	5,000	5,000	5,000	5,000	5,000	5,000	37,175
3.1 Net income at price (Rs. 5)	-17,209	-5,020	-5	2,270	7,680	10,526	12,100	10,526	12,100	10,526	12,100	55,594
3.2 Net income at price (Rs. 8)	-17,209	-5,020	4,495	9,395	17,580	25,526	27,100	25,526	27,100	25,526	27,100	167,119
3.3 Net income at price (Rs. 10)	-17,209	-5,020	7,495	14,145	24,180	35,526	37,100	35,526	37,100	35,526	37,100	241,469
3.4 Net income at price (Rs. 12)	-17,209	-5,020	10,495	18,895	30,780	45,526	47,100	45,526	47,100	45,526	47,100	315,819
4.1 Cumulative net cash flow (Rs. 5)	-17,209	-22,229	-22,234	-19,964	-12,284	-1,758	10,342	20,868	32,968	43,494	55,594	-
4.2 Cumulative net cash flow (Rs. 8)	-17,209	-22,229	-17,734	-8,339	9,241	34,767	61,867	87,393	114,493	140,019	167,119	
4.3 Cumulative net cash flow (Rs. 10)	-17,209	-22,229	-14,734	-589	23,591	59,117	96,217	131,743	168,843	204,369	241,469	
4.4 Cumulative net cash flow (Rs. 12)	-17,209	-22,229	-11,734	7,161	37,941	83,467	130,567	176,093	223,193	268,719	315,819	
7.5 tons seed												
1. Total costs of establishment, maintenance and harvesting	17,209	5,620	5,105	6,305	4,740	8,474	6,900	8,474	6,900	8,474	6,900	85,101
2. Production of seed	0	0	2,500	3,750	5,000	7,500	7,500	7,500	7,500	7,500	7,500	56,250
3.1 Net income at price (Rs. 5)	-17,209	-5,020	2,595	5,845	12,100	17,026	18,600	17,026	18,600	17,026	18,600	105,189
3.2 Net income at price (Rs. 8)	-17,209	-5,020	10,095	17,095	27,100	39,526	41,100	39,526	41,100	39,526	41,100	273,939
3.3 Net income at price (Rs. 10)	-17,209	-5,020	15,095	24,595	37,100	54,526	56,100	54,526	56,100	54,526	56,100	386,439
3.4 Net income at price (Rs. 12)	-17,209	-5,020	20,095	32,095	47,100	69,526	71,100	69,526	71,100	69,526	71,100	498,939
4.1 Cumulative net cash flow (Rs. 5)	-17,209	-22229	-19634	-13,789	-1,689	15,337	33,937	50,963	69,563	86,589	105,189	-
4.2 Cumulative net cash flow (Rs. 8)	-17,209	-22,229	-12,134	4,961	32,061	71,587	112,687	152,213	193,313	232,839	273,939	
4.3 Cumulative net cash flow (Rs. 10)	-17,209	-22,229	-7,134	17,461	54,561	109,087	165,187	219,713	275,813	330,339	386,439	
4.4 Cumulative net cash flow (Rs. 12)	-17,209	-22,229	-2,134	29,961	77,061	146,587	217,687	287,213	358,313	427,839	498,939	

Table 5.3.4: Per Hectare Net Income and Cumulative Net Cash Flow with a Production Standard of 1.5 Tons Seed

Year	Net Income				Cumulative net cash flow			
	@ Rs. 5	@ Rs. 8	@ Rs. 10	@ Rs. 12	@ Rs. 5	@ Rs. 8	@ Rs. 10	@ Rs. 12
Establishment Year	-17,209	-17,209	-17,209	-17,209	-17,209	-17,209	-17,209	-17,209
1st year	-4,695	-4,320	-4,070	-3,820	-21,904	-21,529	-21,279	-21,029
2nd year	-3,125	-2,225	-1,625	-1,025	-25,029	-23,754	-22,904	-22,054
3rd year	-2,345	-545	655	1,855	-27,374	-24,299	-22,249	-20,199
4th year	1,596	4,476	6,396	8,316	-25,778	-19,823	-15,853	-11,883
5th year	1,426	5,926	8,926	11,926	-24,352	-13,897	-6,927	43
6th year	3,000	7,500	10,500	13,500	-21,352	-6,397	3,573	13,543
7th year	1,426	5,926	8,926	11,926	-19,926	-471	12,499	25,469
8th year	3,000	7,500	10,500	13,500	-16,926	7,029	22,999	38,969
9th year	1,426	5,926	8,926	11,926	-15,500	12,955	31,925	50,895
10th year	3,000	7,500	10,500	13,500	-12,500	20,455	42,425	64,395
Total	-12,500	20,455	42,425	64,395				
Payback period (in years)					16	8	6	5

Note: 16 years is the payback period at the production standard 1.5 tons and at price Rs. 5 (Not shown here)

Table 5.3.5: Per Hectare Net Income and Cumulative Net Cash Flow with a Production Standard of 2.5 Tons Seed

Year	Net Income				Cumulative net cash flow			
	@ Rs. 5	@ Rs. 8	@ Rs. 10	@ Rs. 12	@ Rs. 5	@ Rs. 8	@ Rs. 10	@ Rs. 12
Establishment Year	-17,209	-17,209	-17,209	-17,209	-17,209	-17,209	-17,209	-17,209
1st year	-4,370	-3,620	-3,120	-2,620	-21,579	-20,829	-20,329	-19,829
2nd year	-2,605	-1,105	-105	895	-24,184	-21,934	-20,434	-18,934
3rd year	-1,305	1,695	3,695	5,695	-25,489	-20,239	-16,739	-13,239
4th year	3,260	8,060	11,260	14,460	-22,229	-12,179	-5,479	1,221
5th year	4,026	11,526	16,526	21,526	-18,203	-653	11,047	22,747
6th year	5,600	13,100	18,100	23,100	-12,603	12,447	29,147	45,847
7th year	4,026	11,526	16,526	21,526	-8,577	23,973	45,673	67,373
8th year	5,600	13,100	18,100	23,100	-2,977	37,073	63,773	90,473
9th year	4,026	11,526	16,526	21,526	1,049	48,599	80,299	111,999
10th year	5,600	13,100	18,100	23,100	6,649	61,699	98,399	135,099
Total	6,649	61,699	98,399	135,099				
Payback period (in years)					9	6	5	4

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Table 5.3.6: Per Hectare Net Income and Cumulative Net Cash Flow with a Production Standard of 5 Tons Seed

Year	Net Income				Cumulative net cash flow			
	@ Rs. 5	@ Rs. 8	@ Rs. 10	@ Rs. 12	@ Rs. 5	@ Rs. 8	@ Rs. 10	@ Rs. 12
Establishment Year	-17,209	-17,209	-17,209	-17,209	-17,209	-17,209	-17,209	-17,209
1st year	-5,020	-5,020	-5,020	-5,020	-22,229	-22,229	-22,229	-22,229
2nd year	-5	4,495	7,495	10,495	-22,234	-17,734	-14,734	-11,734
3rd year	2,270	9,395	14,145	18,895	-19,964	-8,339	-589	7,161
4th year	7,680	17,580	24,180	30,780	-12,284	9,241	23,591	37,941
5th year	10,526	25,526	35,526	45,526	-1,758	34,767	59,117	83,467
6th year	12,100	27,100	37,100	47,100	10,342	61,867	96,217	130,567
7th year	10,526	25,526	35,526	45,526	20,868	87,393	131,743	176,093
8th year	12,100	27,100	37,100	47,100	32,968	114,493	168,843	223,193
9th year	10,526	25,526	35,526	45,526	43,494	140,019	204,369	268,719
10th year	12,100	27,100	37,100	47,100	55,594	167,119	241,469	315,819
Total	55,594	167,119	241,469	315,819				
Payback period (in years)					6	4	3-4	3

Table 5.3.7: Per Hectare Net Income and Cumulative Net Cash Flow with a Production Standard of 7.5 Tons Seed

Year	Net Income				Cumulative net cash flow			
	@ Rs. 5	@ Rs. 8	@ Rs. 10	@ Rs. 12	@ Rs. 5	@ Rs. 8	@ Rs. 10	@ Rs. 12
Establishment Year	-17,209	-17,209	-17,209	-17,209	-17,209	-17,209	-17,209	-17,209
1st year	-5,020	-5,020	-5,020	-5,020	-22,229	-22,229	-22,229	-22,229
2nd year	2,595	10,095	15,095	20,095	-19,634	-12,134	-7,134	-2,134
3rd year	5,845	17,095	24,595	32,095	-13,789	4,961	17,461	29,961
4th year	12,100	27,100	37,100	47,100	-1,689	32,061	54,561	77,061
5th year	17,026	39,526	54,526	69,526	15,337	71,587	109,087	146,587
6th year	18,600	41,100	56,100	71,100	33,937	112,687	165,187	217,687
7th year	17,026	39,526	54,526	69,526	50,963	152,213	219,713	287,213
8th year	18,600	41,100	56,100	71,100	69,563	193,313	275,813	358,313
9th year	17,026	39,526	54,526	69,526	86,589	232,839	330,339	427,839
10th year	18,600	41,100	56,100	71,100	105,189	273,939	386,439	498,939
Total	105,189	273,939	386,439	498,939				
Payback period (in years)					5	3	3	3

5.4 NET PRESENT VALUE OF JATROPHA PLANTATION

The net cash flows, calculated for 10 years, do not reveal a true picture of the actual returns. The cash flows occur after 10 years may have a different meaning today. Therefore, net present value is calculated for 10 years by discounting the future cash flows. However, the choice of discounting factor or discount rate in such calculations plays an important role. In this analysis, it is assumed as a rate of return that could be

possible from an alternative venture with the same capital. These values are presented in Table 5.4.1.

Table 5.4.1: Net Present Value of Jatropha Plantation on Different Discount Rates and Prices with a Production Standards of 1.5 Tons, 2.5 Tons, 5 Tons, and 7.5 Tons of Seed (Up to 10 Years)

Assuming 1.5 tons seed per hectare				
Discount rate (%)	Rs. 5	Rs. 8	Rs. 10	Rs. 12
30.00	-21,226	-14,413	-9,871	-5,330
20.00	-20,445	-9,860	-2,803	4,253
16.50	-19,896	-7,326	1,054	9,434
10.00	-18,216	-303	11,639	23,581
8.00	-17,480	2,630	16,036	29,442
7.75	-17,394	2,886	16,407	29,927
6.50	-16,843	4,960	19,495	34,031
Assuming 2.5 tons seed per hectare				
30.00	-17,206	-5,756	1,878	9,511
20.00	-14,239	3,507	15,337	27,168
16.50	-12,540	8,517	22,556	36,594
10.00	-7,767	22,202	42,181	62,160
8.00	-5,761	27,871	50,292	72,713
7.75	-5,576	28,341	50,952	73,563
6.50	-4,144	32,312	56,616	80,920
Assuming 5 tons seed per hectare				
30.00	-6,978	16,273	31,774	47,275
20.00	1,650	37,729	61,781	85,833
16.50	6,308	49,114	77,651	106,188
10.00	19,012	79,879	120,457	161,036
8.00	24,267	92,545	138,064	183,583
7.75	24,704	93,560	139,463	185,367
6.50	28,386	102,377	151,704	201,032
Assuming 7.5 tons seed per hectare				
30.00	3,749	39,379	63,132	86,885
20.00	18,080	73,117	109,808	146,499
16.50	25,714	90,912	134,377	177,842
10.00	46,382	138,831	200,463	262,096
8.00	54,896	158,516	227,596	296,676
7.75	55,587	160,077	229,737	299,397
6.50	61,527	173,757	248,577	323,397

5.5 THE BENEFIT COST RATIO OF JATROPHA PLANTATION

The benefit cost ratio (BCR) is a measure of profitability per rupee involved. It is the ratio of the present values of the cash flows generated to the present values of the cash flows invested. An increase in the price or yield and/or a decrease in the interest rate leads to higher BCR, which indicates higher profitability. Considering the seven discount rates (i.e., 30%, 20%, 16.5%, 10%, 8%, 7.75%, and 6.5%), the ratios are calculated for the initial 10 years by taking the four different production standards and four different price standards.

Table 5.5.1: Benefit Cost Ratio of a Hectare of Jatropha Plantation for 10 Years at Different Discount Rates and Prices with Production Standards of 1.5 Tons, 2.5 Tons, 5 Tons, and 7.5 Tons of Seed

Production standards	Price (Rs.)	Discount rates (%)						
		30	20	16.5	10	8	7.75	6.5
1.5 tons	5	0.37	0.48	0.53	0.64	0.68	0.68	0.70
	8	0.58	0.77	0.85	1.03	1.08	1.09	1.13
	10	0.73	0.97	1.07	1.28	1.36	1.36	1.41
	12	0.88	1.16	1.28	1.54	1.63	1.63	1.69
2.5 tons	5	0.55	0.70	0.77	0.89	0.93	0.94	0.96
	8	0.88	1.13	1.22	1.43	1.50	1.50	1.54
	10	1.10	1.41	1.53	1.79	1.87	1.88	1.93
	12	1.33	1.69	1.84	2.14	2.24	2.25	2.31
5 tons	5	0.87	1.05	1.12	1.25	1.29	1.29	1.32
	8	1.36	1.68	1.79	2.00	2.06	2.07	2.11
	10	1.74	2.10	2.24	2.50	2.58	2.59	2.63
	12	2.09	2.52	2.69	3.00	3.09	3.10	3.16
7.5 tons	5	1.09	1.27	1.33	1.45	1.48	1.48	1.51
	8	1.75	2.03	2.13	2.32	2.37	2.38	2.41
	10	2.19	2.54	2.66	2.90	2.96	2.97	3.01
	12	2.62	3.04	3.19	3.47	3.56	3.56	3.61

Table 5.5.2: Internal Rate of Return of Jatropha Plantation at Different Production Standards and Prices

Price of seed (Rs)	Production standards			
	1.5 tons	2.5 tons	5 tons	7.5 tons
5	-8.6352	3.5547	21.4749	34.0343
8	9.6556	23.0727	45.3788	62.6926
10	17.3667	32.0508	57.0128	77.0932
12	23.6724	39.6413	67.0073	89.6216