

RESEARCH PAPER

# Economic Feasibility of Investment in Henna Cultivation in Pali District of Rajasthan

Shivraj Kumawat<sup>1</sup>, Sheela Kharkwal<sup>2\*</sup>, Vikas Chaudhary<sup>3</sup>, Subhita Kumawat<sup>2</sup> and Ramesh Chand Asiwat<sup>2</sup>

<sup>1</sup>Research Scholar, <sup>2</sup>Assistant Professor, Department of Agricultural Economics, Sri Karan Narendra Agriculture University, Jobner-Jaipur, Rajasthan, India

<sup>3</sup>Research Scholar, Division of Dairy Economics Statistics & Management, National Dairy Research Institute, Karnal, Haryana, India

\*Corresponding author: sheela.ageco@sknau.ac.in (ORCID: 0000-0002-1836-9629)

Received: 21-05-2025

Revised: 30-08-2025

Accepted: 07-09-2025

## ABSTRACT

This study explored the economic feasibility of henna cultivation in Pali district of Rajasthan. Information was gathered from 60 experienced henna farmers in the region using structured interviews in the year 2022-23. The costs (establishment and maintenance) and returns associated with henna cultivation over its economic lifespan of 24 years were assessed. Various discounting measures namely Net Present Worth (NPW), Benefit-Cost Ratio (BCR), and Payback Period (PBP) were employed to evaluate the feasibility of investing in henna cultivation in the study area. The initial establishment cost for henna was calculated to be ₹ 138308.63 per hectare in the first year and ₹ 52867.73 per hectare in the second year. The total maintenance costs from years 3 to 24 amounted to ₹ 1939006.47 per hectare. The overall cost of cultivation over the economic lifespan of henna was estimated at ₹ 2130182.83 per hectare, with gross returns of ₹ 3161426.00 per hectare. This resulted in a net return of ₹ 1031244.00 per hectare over the 24-year period. The financial feasibility analysis indicated that the investment in henna cultivation could be recouped within 8 years. The positive Net Present Worth (₹ 177065.87/ha) suggested that henna cultivation is economically worthwhile. Furthermore, the calculated Benefit-Cost Ratio of 1.24 at a discount rate of 10% underscored the profitability of henna cultivation.

## HIGHLIGHTS

- ① The investment in henna cultivation can be recovered within 8 years, with positive Net Present Worth and a calculated Benefit-Cost Ratio indicating profitability.
- ② The financial analysis suggests that despite requiring significant initial investment, henna cultivation proves economically viable, with a positive Net Present Worth and a Benefit-Cost Ratio indicating profitability, thereby offering significant returns over the 24-year period.

**Keywords:** Henna cultivation, Economic Feasibility, Investment, Discounted Measures, Rajasthan

The henna plant, known for its use in producing henna dye, is a resilient perennial flowering plant that thrives in tropical savannah and desert regions. Due to its strong regenerative capacity, it is often grown as a hedge plant and as an annual ratoon crop under cutting management. With an average lifespan of 25 years, which can be extended to 40-45 years with proper management, henna cultivation has gained commercial significance in countries like Afghanistan, India, Iran, Libya, Morocco, Pakistan,

Somalia, Sudan, and Yemen. The soil should be well moistened at the time of sowing of henna.

In India, henna cultivation predominantly occurs in arid and semiarid regions such as Rajasthan, Punjab, Madhya Pradesh, and Gujarat. Presently, the Pali district of Rajasthan leads in both the area

**How to cite this article:** Kumawat, S., Kharkwal, S., Chaudhary, V., Kumawat, S. and Asiwat, R.C. (2025). Economic Feasibility of Investment in Henna Cultivation in Pali District of Rajasthan. *Econ. Aff.*, 70(03): 283-289.

**Source of Support:** None; **Conflict of Interest:** None



and production of henna cultivation. Rajasthan has 40669 ha area under henna cultivation, in which the Pali district alone occupies 39248 ha (95%) area under this plant (Department of Ag. Statistics, Govt. of Rajasthan, 2021-22). About 90 percent of India's mehndi output comes from Sojat, Marwar junction and Jaitaran area of Pali district. There are about 160 small and large factories making mehndi in Pali area engaging over 20,000 people (District Industry and Commerce Department, Pali, 2021). Apart from this, on 14 Sept. 2021, Sojat mehndi received the geographical indication (GI) certificate, which is again supposed to give major impetus to its foreign trade.

Economic feasibility refers to the viability or suitability of a project, emphasizing its profitability over its lifespan. Conducting an economic feasibility analysis is vital in decision-making processes, as it guides stakeholders in allocating resources efficiently. Through evaluating potential risks and benefits, such assessments ensure wise investment decisions and contribute positively to overall economic growth and development. Being a perennial crop, it requires initial investment for establishment and it gives returns to up to 24 years. Economic viability of henna and other perennial crops indicates the worthiness and profitability of investment (Chand *et al.* 2007; Kumar *et al.* 2018).

Given the arid climate and water scarcity issues in Rajasthan, which directly impact agricultural productivity and livelihoods in the region, assessing the economic viability of henna cultivation was deemed essential. Henna's adaptability to such conditions, along with its minimal maintenance requirements, presents an appealing opportunity for farmers. However, despite its attractiveness, widespread commercial henna cultivation remains limited to a select few. The potential for employment generation through henna cultivation in arid regions is substantial. Therefore, comprehending the economic feasibility of henna cultivation would not only aid in resource allocation decisions but also hold promise for strengthening the overall economic growth and resilience of Rajasthan's agricultural sector. In this backdrop, this study was undertaken to assess the economic feasibility of investment in henna cultivation in Pali district of Rajasthan.

## MATERIALS AND METHODS

The study was confined to Pali district of Rajasthan state as this district ranks first in area and production of henna. Out of 10 tehsils, two tehsils, namely Sojatcity and Marwar Junction were selected on the basis of maximum cultivated area under henna. Four villages namely Bilawas, Kharia from Sojatcity tehsil and Kharchi, Hemkhurd from Marwar Junction tehsil were selected. Then, sixty henna growers, who had adequate experience in henna cultivation, were selected through snowball sampling method. Primary data on establishment and maintenance, returns aspects about the economics of production of henna cultivation were collected from the selected farmers during 2022-23 through personal interview method with the help of pre-structured schedule. The future costs and returns streams were prepared by valuing the future quantities with the predicted prices on the basis of consumer price index trends with base year 2022. The data were analysed using averages and financial feasibility tests. Economic feasibility for henna cultivation was attempted through the financial feasibility tests i.e., net present worth (NPW), benefit-cost ratio (BCR) and payback period (PBP).

### Net present worth

$$NPW = \sum_{t=1}^n \frac{B_t - C_t}{(1+r)^t}$$

### Benefit – Cost ratio

$$BCR = \frac{\sum_{t=1}^n \frac{B_t}{(1+r)^t}}{\sum_{t=1}^n \frac{C_t}{(1+r)^t}}$$

Where,

$B_t$  = Benefit from henna cultivation in each year

$C_t$  = Cost of henna cultivation in each year

$r$  = Discount rate at 10 per cent,  $t = 1, 2, 3, \dots, n$ , the entire life of henna plantation

### Payback period

In case of henna, cash flows were uneven so the following formula was used for calculating the payback period.

$$\sum_{i=1}^n R_i = K$$

where,

$i = 1, 2, 3, \dots, 24$  years

$R$  = Return over a number of years,

$K$  = Investment cost on henna for cultivation.

### Assumptions

The cash flow streams are based on following assumptions:

1. The economic life of henna was considered to be 24 years.
2. The cost and returns were discounted at the rate of 10 per cent per annum, prevailing rate of interest for long term loans.
3. Henna plant starts giving yields after the gestation period of two years and reach at peak level till 6 years. It was assumed that yields of henna stabilized after reaching to peak from 7-15 years.
4. Further, the henna yield was assumed to decrease from 20 to 30 per cent after 15 years and input quantity was also decreased from 10 per cent till its economic life.
5. Cost and return stream were created by multiplying the quantities of input with the estimated prices in subsequent years on the basis of CPI trends.
6. The maintenance period of henna in the study area was assumed to be 3 to 24 years.

## RESULTS AND DISCUSSION

### Cost structure and returns for henna cultivation

In perennial crops costs divided into two groups *viz.*, establishment cost and maintenance cost (Chand *et al.* 2007; Lokappa *et al.* 2018; Zore *et al.* 2019 etc.). Henna being a perennial crop, cost structure has been divided into two categories *viz.*, establishment cost and maintenance cost.

### Establishment costs

A set of fixed and variable costs borne by orchard

growers from preparation of land till it gets ready for the first harvest, were considered as an establishment cost. Initial two years are considered as establishment period. During the establishment period, henna investment consisted of expenditure towards field preparation, labour costs, material costs, interest on working capital, risk margin costs, managerial cost and fixed costs. The details on establishment costs in henna cultivation was analysed and results are presented in Table 1.

**Table 1:** Establishment costs of henna cultivation

Establishment costs (₹/ha)			
Sl. No.	Cost components	1 <sup>st</sup> year	2 <sup>nd</sup> year
A.	Variable costs	₹/ha	₹/ha
1	<b>Field preparation</b>	10733.78 (7.76)	—
2	<b>Labour costs</b>		
(i)	FYM application	9309.75 (6.73)	—
(ii)	Layout and opening of holes	4800.00 (3.47)	—
(iii)	Transplanting and packing of holes	20226.67 (14.62)	3760.00 (7.11)
(iv)	Irrigation application	6425.00 (4.65)	6336.00 (11.98)
(v)	Fertilizer application	170.00 (0.12)	174.31 (0.33)
(vi)	Weeding	10380.00 (7.50)	10841.33 (20.51)
(vii)	Plant protection chemical application	— (0.00)	1659.88 (3.14)
	<b>Total Labour costs</b>	<b>51311.42 (37.10)</b>	<b>22771.52 (43.07)</b>
3	<b>Material Costs</b>		
(i)	Seedling	22731.83 (16.44)	3631.53 (6.87)
(ii)	Irrigation	1766.67 (1.28)	1599.17 (3.02)
(iii)	Plant protection chemical	1745.40 (1.26)	2161.32 (4.09)
(iv)	Fertilizer	1201.60 (0.87)	1201.60 (2.27)
(v)	FYM	10300 (7.45)	—
	<b>Total Material Costs</b>	<b>37745.50 (27.29)</b>	<b>8593.62 (16.25)</b>

4	Interest On W.C @7%	6985.35 (5.05)	2195.56 (4.15)
5	Risk Margin @ 10% of W.C.	9979.07 (7.22)	3136.51 (5.93)
6	Managerial Cost @ 10% of W.C.	9979.07 (7.22)	3136.51 (5.93)
<b>Total Variable Costs</b>		<b>126734.19 (91.63)</b>	<b>39833.72 (75.35)</b>
<b>B. Fixed Costs</b>			
1	Depreciation	522.22 (0.38)	522.22 (0.99)
2	Rental value of own land	10000.00 (7.23)	11326.88 (21.42)
3	Interest on fixed capital @10%	1052.22 (0.76)	1184.91 (2.24)
Total Fixed Costs		11574.44 (8.37)	13034.01 (24.65)
<b>Total Establishment Costs (₹/ha)</b>		<b>138308.63 (100.00)</b>	<b>52867.73 (100.00)</b>

**Note:** Figures in parentheses represent percentage to the total establishment costs in respective years.

The Table 1 reveals that total establishment costs for the first year was ₹ 1,38,308.63 per hectare. Out of which, total variable costs contributed 91.63 per cent *i.e.* ₹ 1,26,734.19 per hectare while total fixed costs contributed 8.37 per cent *i.e.* ₹ 11574.44 per hectare. Among variable cost items, labour costs had the highest share of 37.10 per cent (₹ 51311.42/ha) and least share of interest on working capital was 5.05 per cent (₹ 6985.35/ha). In fixed costs, rental value of owned land was contributed highest share 7.23 per cent (₹ 10000/ha) and least share of depreciation on implements was 0.38 per cent (₹ 522.22/ha) of the total establishment costs.

It is evident from the Table 1 that the total establishment costs of henna for second year were ₹ 52867.73 per hectare. Out of which, the total variable costs contributed for 75.35 per cent *i.e.*, ₹ 39833.72 per hectare and fixed costs was contributed 24.65 per cent *i.e.*, ₹ 13034.01 per hectare. Among variable cost items, labour costs were highest share 43.07 per cent (₹ 22771.52/ha) and least share of interest on working capital was 4.15 per cent (₹ 2195.56/ha). In total fixed costs, rental value of owned land had maximum share of 21.42 per cent (₹ 11326.88/ha) and least share of depreciation was 0.99 per cent (₹ 522.22/ha) of the total establishment costs. The present findings are

consonance with the findings of Chand *et al.* (2002), Uma devi and Pandurangarao (2003), Lokappa *et al.* (2018), Kumar *et al.* (2019).

## Maintenance costs

The maintenance costs are the recurring cost incurred after the establishment of the orchard from third year onwards for maintenance of the plants so that good yield could be obtained over the economic life span of the plants *i.e.*, for 24 years. During maintenance of henna expenditure includes on labour for weeding, harvesting and threshing etc., material costs, interest on working capital, risk margin, managerial cost and fixed cost during 3 to 24 years. The maintenance costs are estimated and results are presented in Table 2.

The perusal of the Table 2 shows that in 3 to 6 year the total maintenance costs was ₹ 271602.30 per hectare, from which total variable cost contributed 76.86 per cent *i.e.*, ₹ 208754.80 per hectare while total fixed cost contributed 23.14 per cent *i.e.*, ₹ 62847.48 per hectare. Among variable cost items, labour costs had the highest share of 56.87 per cent (₹ 154463.50/ha) and least share of material costs was 3.65 per cent (₹ 9910.31/ha). In fixed costs, rental value of owned land was contributed highest share 20.27 per cent (₹ 55045.15/ha) and least share of depreciation on implements was 0.77 per cent (₹ 2088.92/ha) of the total maintenance costs.

Form 7<sup>th</sup> year onwards, the peak yields and input quantities were assumed to be stable and costs and returns were valued on the basis of predicted prices. Table 2 reveals that during 7 to 15 years the total maintenance costs was ₹ 775075.32 per hectare. During 7 to 15 years *i.e.*, 9 years on an average the maintenance costs were ₹ 86119.48 per hectare. In which total variable costs contributed 78.36 per cent *i.e.*, ₹ 607334.40 per hectare and remaining 21.64 per cent *i.e.*, ₹ 167740.92 per hectare were total fixed costs. Among variable costs items, labour cost had the highest 58.29 per cent share (₹ 451817.55/ha) and lowest share of total material cost was 3.41 per cent (₹ 26398.53/ha). In fixed cost, rental value of own land was the highest share 18.92 per cent (₹ 146630.97/ha) and least share of depreciation on implements was 0.76 per cent (₹ 5860.80/ha) of the total maintenance costs.

**Table 2:** Maintenance costs of henna cultivation

S.No.	Particulars	Maintenance costs (₹/ha)			Total costs
		3-6 year	7-15 year	16-24 year	
<b>A</b>	<b>Variable costs</b>				
1	Labour	₹/ha	₹/ha	₹/ha	₹/ha
(i)	Fertilizer application	179.18 (0.07)	—	—	179.18 (0.01)
(ii)	Weeding	36452.46 (13.42)	90386.28 (11.66)	101669.85 (11.39)	228508.59 (11.78)
(iii)	Plant protection chemical application	6836.97 (2.51)	19152.27 (2.47)	21515.49 (2.41)	47504.73 (2.45)
(iv)	Harvesting	71106.06 (26.18)	204957.54 (26.44)	230543.91 (25.84)	506607.51 (26.13)
(v)	Assembling	14926.18 (5.50)	51239.34 (6.61)	57636.0 (6.46)	123801.52 (6.39)
(vi)	Threshing	24962.69 (9.19)	86082.12 (11.11)	96828.39 (10.85)	207873.20 (10.72)
	<b>Total labour costs</b>	154463.50 (56.87)	451817.55 (58.29)	508193.64 (56.95)	1114474.73 (57.48)
<b>2</b>	<b>Material costs</b>				
(i)	Plant protection chemical	8730.11 (3.22)	26398.53 (3.41)	29679.30 (3.33)	64807.94 (3.34)
(ii)	Fertilizer	1180.2 (0.43)	—	—	1180.20 (0.06)
	<b>Total material costs</b>	9910.31 (3.65)	26398.53 (3.41)	29679.30 (3.33)	65988.14 (3.40)
3	Interest on w.c. @7%	11506.17 (4.24)	33475.14 (4.32)	37651.14 (4.22)	82632.45 (4.26)
4	Risk margin @ 10% w.c.	16437.38 (6.05)	47821.59 (6.17)	53787.35 (6.03)	118046.32 (6.09)
5	Managerial cost @ 10% w.c.	16437.38 (6.05)	47821.59 (6.17)	53787.35 (6.03)	118046.32 (6.09)
	<b>Total variable costs</b>	208754.80 (76.86)	607334.40 (78.36)	683098.78 (76.55)	1499187.96 (77.32)
<b>B</b>	<b>Fixed costs</b>				
1	Depreciation	2088.92 (0.77)	5860.8 (0.76)	6946.92 (0.78)	14896.64 (0.77)
2	Rental value of own land	55045.15 (20.27)	146630.97 (18.92)	183262.23 (20.54)	384938.35 (19.85)
3	Interest on fixed capital @10%	5713.41 (2.10)	15249.15 (1.97)	19020.96 (2.13)	39983.52 (2.06)
4	Total fixed costs	62847.48 (23.14)	167740.92 (21.64)	209230.11 (23.45)	439818.51 (22.68)
	<b>Total maintenance costs (₹/ha)</b>	271602.30 (100)	775075.32 (100)	892328.89 (100)	1939006.47 (100)

**Note:** Figures in parentheses represent percentage to the total maintenance costs in respective years.



After 15 years, the yields and corresponding returns were assumed to decrease till the economic life of henna plant. The perusal of Table 2 again indicates that during 16 to 24 years, the total maintenance costs was ₹ 892328.89 per hectare and on an average the maintenance cost was estimated to be ₹ 99147.65 per hectare for 9 years. In which total variable costs contributed 76.55 per cent i.e., ₹ 683098.78 per hectare and remaining 23.45 per cent i.e., ₹ 209230.11 per hectare was fixed costs. Among variable costs items, labour cost had the highest share of 56.95 per cent (₹ 56465.96/ha) and least share of total material costs was 3.33 per cent (₹ 29679.30/ha). In fixed cost, rental value of own land had the highest share 20.54 per cent (₹ 183262.33/ha) and least share of depreciation on implements was 0.78 per cent (₹ 6946.92/ha) of the total maintenance costs.

In nutshell, it may be concluded that the maintenance costs of henna plant changes with the age of plant. It is apparent that henna is a labour-intensive crop and requires labour for intercultural and harvesting, assembling and threshing operations. The present findings are consonance with the findings of Chand *et al.* (2007), Ravikumar *et al.* (2011), Lokappa *et al.* (2018). Results were in controverted to the results of Zore *et al.* (2019).

### Total cost and returns analysis of henna cultivation under study area

Table 3 reveals that the total cost of cultivation for economic life of henna was estimated to be ₹ 21,30,182.83 per hectare with gross returns ₹ 31,61,426.00 per hectare. For initial three years, net returns were noticed to be negative and became positive four year onwards for remaining years. Thus, net returns from henna cultivation were estimated to be ₹ 10,31,244.00 per hectare.

**Table 3:** Total costs and returns of henna cultivation

Year	Cost (₹/ha)	Gross Returns (₹/ha)	Net returns (₹/ha)
1	138308.63	0	-138309
2	52867.73	0	-52867.70
3	65601.65	49072.92	-16528.70
4	62941.47	68499.81	5558.34
5	68849.44	100753.70	31904.28
6	74209.70	134069.30	59859.57
7	76601.83	138390.50	61788.63
8	78972.42	142711.60	63739.22

9	81343.02	147032.80	65689.81
10	83713.61	151354.00	67640.40
11	86147.72	155675.20	69527.48
12	88518.32	159996.40	71478.07
13	90888.91	164317.60	73428.66
14	93259.51	168638.80	75379.25
15	95630.11	172959.90	77329.83
16	90376.93	159547.30	69170.41
17	92560.08	159810.00	67249.96
18	94743.23	158020.10	63276.87
19	96926.38	157796.50	60870.17
20	99109.52	157520.50	58411.00
21	101378.43	157073.00	55694.60
22	103561.58	156454.10	52892.50
23	105744.73	153538.60	47793.84
24	107927.88	148193.70	40265.86
<b>Total</b>	<b>2130182.83</b>	<b>3161426.00</b>	<b>1031244.00</b>

### Economic feasibility of investment in henna cultivation

**Table 4:** Financial feasibility of henna cultivation

Sl. No.	Particulars	Value
1	Discounted cost (₹/ha)	753082.70
2	Discounted gross returns (₹/ha)	930148.57
3	Discounted net returns [NPW] (₹/ha)	177065.87
4	Benefit-Cost ratio	1.24
5	Payback period (year)	8

Table 4 explains the total discounted cash outflows (cost of henna cultivation) in the study area and it was estimated at ₹ 753082.70 per hectare at 10 per cent discount rate. The discounted cash inflows (gross return of henna) in the study area were worked out to be ₹ 930148.57 per hectare. Economic feasibility indicators i.e., NPW and BCR, PBP were found as ₹ 177065.87 per hectare, 1.24 and 8 years for the henna cultivation, respectively. NPW and BC Ratio back the soundness of investment in henna in the study area. The present findings are in consonance with the findings of Chand *et al.* (2007), Dahiya *et al.* (2002), Dhandhalya and Shiyani (2012), Ramanan (2012), Kumar *et al.* (2018), Surwase *et al.* (2018) and Suresh *et al.* (2019) on different plantation crops.

Henna cultivation even though a capital intensive but found to be highly profitable agricultural

enterprise besides being the generator of sufficient employment opportunities. Although there was shortage of skilled labour. Hence, the provision of better access of capital, training to the labours and supply of improved quality planting materials including a wide network of vibrant extension machinery would make henna cultivation much more profitable venture. The returns from henna cultivation are very attractive with better B-C ratio and higher NPW compared many farm commodities. Another important aspect of henna is that providing loan facility in early phase of henna cultivation and government should introduce pricing scheme like MSP and insurance scheme.

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