Research Note

Economic Viability of Henna in Semi-arid Rajasthan*

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Abstract

Henna (*Lawsonia sp.*) is a rainfed plantation crop commercially cultivated in Rajasthan on 32,084 ha (2001-02) for its leaves, which are important source of a natural dye. The present study has assessed the profitability and economic viability of henna cultivation based on the data collected from a sample of 100 farmers during 2003-04 in the Pali district of Rajasthan. Based on the factors like net present value, internal rate of return, benefit-cost ratio, henna cultivation practised by the farmers has been found to be a financially viable proposition. The financial viability parameters have been found to be more sensitive to changes in prices than cost.

Introduction

Henna (*Lawsonia inermis* L.), popularly known as *Mehndi*, has long been used in India and the Middle East countries for colouring palms of hands, soles of feet and finger nails. It is also used for dying of hairs, beard and eye brows, for personal adornment. Tails and manes of horses are also sometimes dyed with henna. It is also used for colouring leathers and skins (Sastri, 1962). Recently, there has been an increase in its use as a hair dye in the Western Europe and North America (Green, 1995). In 1955, India produced 2800 tonnes of henna and Punjab and Gujarat were the major henna-producing states while Rajasthan had only 5 per cent share in the total production (Sastri, 1962). In 2003-04, the production of henna in Rajasthan was of 37,540 tonnes, with 90 per cent share in the total henna

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production of the country. The trade of dried henna leaves in the Sojat city regulated market (the only regulated market of henna in the country) increased from 10,264 tonnes to 24,744 tonnes, at an annual compound growth rate (ACGR) of 9 per cent during the period 1995-2003 (Narain *et al.*, 2005). As per the FAO report, India exported 4500 tonnes to 7600 tonnes of henna per annum during the period 1988-93 (Green, 1995). In the year 2003-04, the estimated export of henna, in all forms, was around 10,500 tonnes with a value of around Rs 91 crores (Narain *et al.*, 2005).

Deep, fine sandy or medium-textured, well-drained soil is considered best for henna cultivation. As a dye crop it requires hot, dry and sunny weather conditions for higher dye content and proper maturity of leaves. It is mainly cultivated as a rainfed-*kharif* season crop in the semi-arid areas, with average annual rainfall of about 450 mm (Rao *et al.*, 2002). The cultivation practices of henna crop have been developed indigenously over the past five decades. Seeds are sown in the month of March in nursery and seedlings (two-month old) are transplanted in the well-prepared fields during July to August, coinciding with monsoon rains. Transplanting is a very much specified operation which includes preparation of seedlings (separation of better ones from the lot and cutting from shoot and root portion), opening of hole by a pointed iron bar/ share of plough, placement of seedling and packing of holes; and all these operations require skilled labourers. The crop, if established properly, starts giving returns from the establishment year itself, but yield is nominal and normally doesn't exceeds the maintenance cost (hoeing and weeding operations). From second year onwards the economic yields are harvested by the farmers which continues for 25 years with incurring of only maintenance cost in the form of hoeing, weeding and harvesting, which is again very much specified and requires skilled labourers. Generally, no manures and fertilizers and plant protection measures are used and a single cutting of leaf is taken every year under the rainfed conditions. The crop is highly susceptible to rainfall during its harvest stage and areas receiving very good rainfall during the months of Oct-Nov are not suitable for its cultivation.

The state of Rajasthan has 32,084 ha area under henna cultivation, in which the Pali district alone occupies 30,418 ha (95%) area (Govt. of Rajasthan, 2004). During the period 1991-92 to 2001-02, a significant ACGR of 7.75 per cent was observed in the area of henna in the Pali district (Khem Chand *et al.*, 2005), indicating the increasing popularity of henna cultivation among the farmers. Sustainable income from henna cultivation largely benefits the farmers of the district as other *kharif* season arable crops (Pearl millet, sorghum, sesame, pulses and others) frequently fail due to droughts. In henna crop, leaves are harvested as a produce of commercial

value from the second year onwards. Though, henna cultivation was introduced long back in the semi-arid Rajasthan, specifically in the Sojat area of Pali district, no detailed economic analysis has been carried out so far. This paper reports the results of an attempt made in that direction with the following specific objectives:

(1)   To analyse the costs and returns in henna plantation,

(2)   To assess the economic viability of henna plantation, and

(3)   Sensitivity analysis of economic viability of henna plantation.

Methodology

Henna being grown mainly in the Pali district of semi-arid Rajasthan, it was purposively selected for the study. From nine tehsils of the Pali district, two tehsils, Sojat and Marwar Jn, having maximum area (65.24% and 27.86% area, respectively) under henna cultivation were selected purposively. Two villages from each tehsil having maximum area under henna cultivation were selected. A list of farmers cultivating henna under rainfed condition in the selected villages was prepared. Finally, 100 farmers were selected based on the probability proportionate to the number of farmers in each selected village. In the beginning, henna yields are low but attain peak production from the fourth year onwards which continues up to 15 years of plantation. Thereafter, it gradually declines but remains economic up to 25th year of plantation. Taking this fact into consideration, the samples were post-classified into three categories on the basis of age of the henna plantation. The first category is comprised of those farmers which were having henna plantation of less than four years (23), the second had plantations of 4-15 years (33), and the third had plantations of more than 15 years (44). The relevant primary data were collected by the survey method with the help of a specifically designed questionnaire. The study pertains to the crop year, 2003-04.

Costs and Returns

The costs of cultivation was divided into establishment and maintenance costs. The expenditure incurred by a farmer in the first year was termed as establishment cost and was assumed to be a fixed cost for the remaining life of the plantation. It was, therefore, amortized (Subrahmanyam and Mohandoss, 1982) over the economic life of henna plantation which has been estimated as 25 years, using 10.5 per cent rate of interest (the rate at which banks advance loans for plantation crops). The cost on maintenance of henna included expenses on human labour, interest on working capital, expenses incurred on material inputs, depreciation and interest on fixed

investment, land revenue and taxes, imputed rental value of land, imputed value of risk factor and management input at 10 per cent each of the working capital and amortized annual/ prorated establishment cost (Singh and Singh, 2001; Bhatti *et al.*, 1991). Since, henna is a perennial crop, the economic viability was assessed using project worth measures such as net present value (NPV), pay-back period, internal rate of return (IRR) and benefit-cost ratio (BCR); and these measures were computed using the standard methods (Gittinger, 1972). As the rate of returns from an investment was affected by the future expectations of yields, input and output prices, etc. the sensitivity analysis was carried out to account for these factors.

Results and Discussion

Establishment Cost of Henna Plantation

The establishment cost gives the minimum net income required before taking investment/ replacement decision (Subrahmanyam and Mohandoss, 1982). The total establishment cost (per ha) worked out for henna plantation was Rs 30,787 (Table 1), this implies that it is a highly capital-intensive crop. In the total establishment cost, variable cost took a lion's share of 93.63 per cent. In various components of variable cost, material cost accounted for 38.13 per cent of total established cost, followed by labour (23.25%), and field preparation cost (13.38%). The cost of seedlings was the major component in material cost, with 36.10 per cent share in the total establishment cost. Uma Devi and Pandurangarao (2003) have also reported maximum share of planting material (25.53%) in the total establishment cost of coffee plantation in the first year. In the case of henna, it may be due to the fact that henna nurseries are raised only in a few pockets of the Pali district, which have assured supply of quality irrigation water in hot summer months (March-June). Thus, demand of quality seedlings generally exceeds the supply, resulting in higher sale price to buyers. Labour wage rates are generally high during the henna transplantation period because of high demand of skilled labourers and limited time span available for transplantation[1], and hence it contributes considerably (23.25 per cent) in total establishment cost.

Maintenance Cost of Henna Plantation

The costs on maintenance of henna varies in different age groups, and was worked out separately for the three age groups (Table 2). The variable cost amounted to about 67 per cent and fixed cost 33 per cent of the total maintenance cost, which worked out to be Rs 16,482 per ha and varied

Table 1. Establishment cost of henna in Pali district of Rajasthan

Cost components	Rs per ha	Per cent
A. Variable cost		
I. Field preparation	4119	13.38
II. Labour cost		
a. Preparation of seedlings	819	2.66
b. Layout and opening of holes	1267	4.11
c. Placement of seedlings	2282	7.41
d. Packing of holes	2789	9.06
Total labour cost	7157	23.25
III. Material cost		
a. Seedlings	11114	36.10
b. Plant protection chemicals	625	2.03
Total material cost	11739	38.13
IV. Interest on working capital (@ 10.5%)	1208	3.92
V. Risk margin @ 10% of total working capital	2302	7.48
VI. Managerial cost @ 10% of total working capital	2302	7.48
Total variable cost (I+II+III+IV+V+VI)	28826	93.63
B. Fixed cost		
I. Land revenue and taxes	8	0.03
II. Depreciation on implements	108	0.35
III. Interest on fixed capital	45	0.15
IV. Rental value of owned land	1800	5.85
Total fixed cost	1961	6.37
Total establishment cost (A+B)	30787	100.00

from Rs 14,938 (in less than 4-year group) to Rs 16,920 (4-15 year age group). Once henna was established, only hoeing, weeding and harvesting were the major operations and these accounted for more than 50 per cent of the total cost[2]. Traditionally, farmers have not been using any material inputs (chemical fertilizers, plant protection measure, etc.) in henna cultivation, but in recent years sporadic or epidemic incidence of castor semi-looper (*Achoea janata*), causing damage to henna leaves, has compelled the farmers for random use of plant protection chemicals. Thus, material cost had a meagre share in the total maintenance cost.

The most important component of fixed cost of maintenance was prorated establishment cost, followed by imputed rental value of owned land. Both these components accounted for more than 32 per cent of total maintenance cost. Singh and Singh (2001) and Kumar and Singh (2003) have also found similar results while analysing the economics of Damask rose and mango & kinnow plantations, respectively in Himachal Pradesh.

Table 2. The share of various components in the cost of maintenance of henna plantation by age groups

(in per cent)

Components	Age of plantation (years)			Pooled
	<4	4-15	16-25	
A. Variable cost				
I. Labour cost				
a. Replacing of dead plants	2.65	0.00	0.00	0.20
b. Hoeing and weeding	18.89	18.03	17.65	17.94
c. Plant protection measures	0.76	0.67	0.70	0.69
d. Harvesting	22.95	33.62	32.80	32.48
Total labour cost	45.26	52.33	51.16	51.31
II. Material used				
a. Seedlings	4.12	0.00	0.00	0.31
b. Plant protection chemicals	1.22	0.89	0.92	0.93
c. Gunny bags for packaging	1.00	1.54	1.46	1.46
Total material cost	6.34	2.42	2.38	2.70
III. Transport of produce (field to home)	0.50	0.77	0.73	0.73
IV. Interest on working capital @ 10.5%	0.91	0.97	0.95	0.96
V. Risk margin @ 10% of total working capital	5.21	5.55	5.43	5.47
VI. Managerial cost @ 10% of total working capital	5.21	5.55	5.43	5.47
Total variable cost (A+B+C+D+E+F)	63.43	67.59	66.07	66.65
B. Fixed cost				
I. Land revenue	0.05	0.05	0.05	0.05
II. Depreciation on implements	0.58	0.64	0.88	0.73
III. Interest on fixed capital	0.30	0.27	0.28	0.27
IV. Rental value of owned land	12.05	10.64	11.07	10.92
V. Prorated establishment cost	23.58	20.82	21.66	21.37
Total fixed cost	36.56	32.41	33.93	33.35
Total maintenance cost (A+B) (Rs/ha)	14938	16920	16264	16482

Farm Efficiency Measures

Different income measures associated with different cost concepts were used to study the efficiency of henna plantation, following Kahlon and Singh (1992) and the results have been presented in Table 3. The net returns per ha were highest (Rs 9,666) in 4-15 years age group, followed by Rs 7,840 in 16-25 years age group and Rs 2,786 in less than 4 years age group. The average net return was found to be Rs 8,332/ha. However, net profit of Rs 36,000 per ha reported by Kavia and Verma (2001) at the production level of 32 quintal dried leaves under the rainfed conditions in the Pali district

Table 3. Farm efficiency measures of Henna cultivation

(Rs/ha)

S. No.	Components	Age of plantation (years)			Pooled
		<4	4-15	16-25	
1.	Gross returns	17724	26586	24104	24813
2.	Total cost	14937	16920	16264	16481
3.	Net returns	2786	9665	7840	8331
4.	Family labour income	4347	11710	9762	10285
5.	Farm business income	6139	13502	11554	12077
6.	Farm investment income	4586	11465	9640	10131

appeared to be exaggerated, since such yield levels were possible only under irrigated conditions[3]. The other efficiency measures, viz. family-labour income, farm-business income and farm-investment income were also found to be highest in the 4-15 years age group. These results were on expected lines as henna yields reach the peak in the fourth year and continue up to 15th year of plantation age and then start declining gradually.

Economic Viability of Henna Plantation

The financial viability of henna plantation was worked out using both undiscounted and discounted measures and the results have been presented in Table 4. It is evident from this table that the minimum net income required before replacement was Rs 30,787/ha and pay back period was 8.5 years. The henna cultivation was found economically viable at the 10.5 per cent discount rate in terms of both NPV and BCR criteria, as NPV was positive and BCR was greater than one. The IRR estimated to be 22.68 per cent was the maximum paying capacity of the henna plantation. It implies that it would be economically viable to invest money in henna plantation as long as the rate of interest on plantation loans is equal to or less than 22.68 per cent. Tewari and Singh (1984), Kumar and Singh (2003), and Uma Devi and

Table 4. Measure of investment worth of henna plantation

(per ha)

S. No.	Measures of investment worth	Values
1.	Pay-back period (Years)	8.50
2.	Net present value at discount rate of 10.5 percent (Rs)	34410
3.	Internal rate of return (%)	22.68
4.	Gross benefit-cost ratio at discount rate of 10.5 percent	1.22
5.	Annuity value at 10.5 percent discount rate (Rs)	3937
6.	Minimum net income required before replacement (Rs)	30787

Table 5. Sensitivity analysis of henna cultivation in the Pali district (Rajasthan)

Measures of investment worth	5%	10%	15%	20%
Situation -I (Increase in cost)				
Net present value at discount rate of 10.5 per cent (Rs/ ha)	26578	18747	10916	3085
Internal rate of return (%)	19.86	16.95	13.86	11.46
Gross benefit-cost ratio at discount rate of 10.5 per cent	1.16	1.11	1.06	1.02
Situation -II (Decrease in price)				
Net present value at discount rate of 10.5 per cent (Rs/ ha)	24858	15306	5754	(-)3796
Internal rate of return (%)	19.45	16.37	12.46	8.18
Gross benefit-cost ratio at discount rate of 10.5 per cent	1.16	1.10	1.04	0.98

Pandurangarao (2003) have also found IRR greater than discount rates for chir, mango & kinnow and coffee plantations, respectively and have confirmed economic viability of these crops. The annuity value of henna (Rs 3,937/ha) was found to be quite high in comparison to net returns from the arable crops of the area, viz. pearl millet (Rs 1,549/ha), cluster bean (Rs 3,340/ha), mung bean (Rs 2,242/ha) and moth bean (Rs 1480/ha), etc. as reported by Gajja *et al.* (1999). Thus, it is clear that it would be not only economically viable but more remunerative also to the farmers of the area to invest in henna plantation.

Sensitivity Analysis

The effect of changes in costs and returns on the economic viability of henna plantation was analysed under two assumed discrete situations. The first situation entailed 5 per cent, 10 per cent, 15 per cent and 20 per cent increase in cost flows and no change in returns. The second situation called for 5 per cent, 10 per cent, 15 per cent and 20 per cent fall in prices and no change in cost. Under the rising cost flow scenario, the NPV's remained positive and IRRs were more than 10.5 per cent (interest rate on plantation crop loan), indicating that henna plantation will be economically viable up to 20 per cent increase in cost. Under the second situation, up to 15 per cent fall in henna prices, NPV remained positive, BCR was more than one and IRR was more than the opportunity cost of capital, while at 20 per cent fall in henna prices, the NPV was negative and BCR was less than one, implying that it was not an economically viable proposition. The IRR was estimated to be 8.18 per cent. It means that henna plantation project cannot afford to bear the interest rate exceeding 8 per cent, if the price of henna goes down

by more than 20 per cent. Tewari and Singh (1984) had also observed similar findings in chir plantation.

Conclusions

Henna is a perennial plantation crop with economic life-span of 25 years. It is a highly capital intensive crop as it requires about Rs 30,800 per ha for establishment. On an average, it provides a net return of about Rs 8,300 per ha with BCR more than one, positive NPV and IRR higher than the opportunity cost of capital. Thus henna cultivation has been found profitable and economically viable and provides a sustainable income to the farmers of arid fringes of Rajasthan. The economic viability parameters for henna plantations have been found more sensitive to changes in price than cost. Introduction of some improved implements or automatic machines for hoeing, weeding and harvesting, etc. can bring down the labour cost and consequently will provide higher returns to farmers.

Notes

[1] Transplantation of seedlings is most important and specified operation in henna plantation and its quality only decides the survival of transplanted seedlings which in turn decide the coming crop stand and plant population. For a better crop stand, every farmer wants to complete it within shortest possible period taking advantage of available soil moisture (directly related to better establishment), but there is a tough competition for skilled labourers for this work, which results in high wage rates.

[2] The wage rates are generally high as skilled labourers are required specially in harvesting which is to be completed in the shortest period, as there is a threat of quality degradation of harvest leaves due to rains.

[3] Henna is also cultivated under irrigated conditions (but the area is only less than 5 per cent of total henna area in Pali district) which is harvested 2-3 times in a year; it gives more yields and returns per ha.

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