

Doi: [HTTPS://DOI.ORG/10.23910/2/2021.0415b](https://doi.org/10.23910/2/2021.0415b)

## Feasibility and Economical Returns from Harar Cultivation

Samanpreet Singh, Kamal Sharma, Avinash Kumar Bhatia\* and Nancy Chaudhary

Dr. Y. S. Parmar University of Horticulture and Forestry, Nauni, Solan, H.P. (173 230), India

### Corresponding Author

Avinash Kumar Bhatia  
e-mail: [avinashgolu1997@gmail.com](mailto:avinashgolu1997@gmail.com)

### Article History

Article ID: IJEP0415b  
Received on 12<sup>th</sup> February, 2021  
Received in revised form 24<sup>th</sup> April, 2021  
Accepted in final form 18<sup>th</sup> May, 2021

### Abstract

For exploring the feasibility of Harar cultivation in lower Himachal, economic analysis was carried out in College of Horticulture and Forestry, Experimental Farm at Khaggal-Neri to computing the total cost of production; Fixed (Land value, Machinery, Implements and Deprecation) and variable (Cost and inputs like FYM, fertilizer, plant material, labour, etc.) and total returns realized from 5<sup>th</sup> year onward. Grafted Harar cultivation could be a possible alternate to crop diversification especially in frost prone and monkey affected areas. The cost of establishment, benefit-cost ratio, and net returns is determined to analyze the economic feasibility of investment in grafted Harar cultivation. Benefit:cost ratios were computed for different years. The total fixed cost and overall cost of establishment were found out as INR 25,412.70 and INR 69,081.90, respectively. Returns from the fifth year were INR 9,600.00 whereas, the total returns realized up to tenth year were INR 2,02,100.00. Total net returns over total cost and variable cost were INR 1,33,018.10 and INR 1,58,430.80, respectively. B:C ratio worked out for fifth year was 1.41 and 2.93 for the tenth year. The cost of production, net returns and benefit:cost ratio clearly revealed that grafted Harar cultivation is a successful venture. Investment in grafted Harar seems to be stable and viable option for farmers to earn better returns.

**Keywords:** Analysis, cost, cultivation, farmers, Harar, production

### 1. Introduction

Harar is scientifically known as *Terminalia chebula* and belongs to family Combretaceae. It is found in mixed dry deciduous forests, mostly hilly tracks of tropical and sub-tropical zones in India (Troup, 1921). In North Western Himalayas, it is distributed between 500-1100 m elevation in the states of Jammu & Kashmir, Himachal Pradesh, Punjab, Haryana and Uttarakhand. In Himachal Pradesh, Harar is grows upto 1100 m elevation in Sirmour, Hamirpur, Mandi, Bilaspur, Kangra, and Una districts (Chauhan, 1999). It grows in varied environmental conditions. Harar grows in soil that widely differs in depth and composition. The mean maximum temperature in its habitat varies from 37°C to 48°C, absolute minimum temperature from 1°C to 15°C and annual rainfall from 750 to 3250 mm (Troup, 1921). *Terminalia chebula* is a rich source of tannin comprises of 27-40% (Thakur et al. 2008). Harar fruit is also considered as an antioxidant (Suchalata and Devi, 2005), antidiabetic (Rao and Nammi, 2006), anti-hyperlipidemic (Israni et al. 2010), anti-arthritic (Nair et al. 2010), anti-spasmodic (Dinesh et al., 2017), antibacterial and antiviral (Kim et al. 2006). Because of the presence of many alkaloids in the fruit, it is used in the Ayurvedic and Tibetan systems of medicine to treat a variety of ailments. Harar fruit has laxative, purgative, and astringent effects, as

well as antibacterial, antifungal, and antiviral properties. It has also authenticated therapeutic activity against Herpes simplex virus (HSV) both *in vitro* and *in vivo* (Kurowa et al., 1995) and is also usable in sexual transmitted diseases and AIDS (Vermani and Garg, 2002). It is a large deciduous tree with a spherical crown, spreading branches and 1.5–2.5 m in diameter. The fruit is a drupe, 3–5 cm long, ellipsoidal, obovoid, or ovoid in shape, yellow to orange brown in color, and hardens when it ripens (Sankanur et al., 2014). Some minor constituents in Harar fruits are polyphenols such as corilagin, galloyl glucose, punicalagin, terflavin A, terflavin B, maslinic acid, etc. (Riaz et al., 2017). Wood of Harar is used for building construction, agricultural implements, cabinet work, furniture, interior fitting (Sambamurthy, 2005), plywood and match box industry (Singh et al., 2003). Larger sized fruits fetch higher price in both domestic and foreign markets, so fruit size is an important consideration. Fruits sold at a price of INR 10 to INR 60 kg<sup>-1</sup>. The demand for Harar fruit has burgeoned tremendously due to its medicinal value.

### 2. Materials and Methods

To determine the feasibility of Harar cultivation in lower Himachal, an economic study was performed and that included estimating the cost of cultivation, net returns, and



benefit-cost ratio. The fruit yield data was obtained from a college farm in Khaggal-Hamirpur, where a 12-year-old grafted Harar plantation with a spacing of 8×8 m<sup>2</sup> existed. Harar is cultivated in the same environment as mango. Hence the package of practices for both mango and Harar has been considered in estimating the cost of establishment and maintenance. Based on these hypotheses, a financial analysis of grafted Harar was performed, and the findings are detailed in the forthcoming section. Gross returns, net returns, and benefit cost ratio were used to analyze the economic returns and feasibility of investment in grafted Harar cultivation. To derive the results, the following equations were assumed.

### 2.1. Gross returns

The fruit yield was converted into gross returns hectare<sup>-1</sup> at the prevailing local market prices. Gross returns were obtained when the quantity of produce was compared with the existing market prices.

### 2.2. Net returns

Net returns were worked out by subtracting the cost of cultivation from the gross returns.

Net returns ha<sup>-1</sup>=Gross returns ha<sup>-1</sup>-Cost of cultivation ha<sup>-1</sup>

### 2.3. Benefit cost ratio

The benefit-cost ratio of an investment is ratio of the discounted value of all cash inflows to the discounted value of all cash outflows during the life of the project and computed as:

$$B:C \text{ Ratio} = (\sum(B_t / (1+r)^t)) / (\sum(C_t / (1+r)^t))$$

## 3. Results and Discussion

It is important to consider the economic feasibility of any project before reaching a choice about which preposition to use. Harar is a perennial crop that can bear fruit for up to 25 years. Furthermore, it was thought that after the age of 25, the Harar yield begins to decline. The cost of establishment, benefit-cost ratio, and net returns is determined to analyze the economic feasibility of investment in grafted Harar cultivation. The net return amounts were determined at 10%, the rate of interest; institutional investors are advancing short-term loans to farmers. As per the data collection, the duration of returns was 9 years.

Grafted Harar cultivation could be a possible alternate to crop diversification especially in frost prone and monkey affected areas if infrastructure facilities for scientific post-harvest handling, transportation, packing, transport and marketing are strengthened. Relied on these suppositions, the financial analysis of grafted Harar was carried out (Table 1 and Table 2). It was calculated that average variable cost for the first year was INR 11404.28, out of which labour component and material cost were INR 6830.00 and INR 3240.00, respectively. The interest on variable cost for the first year was INR 327.28 whereas managerial cost was INR 1007.00. Weeding was the only labour component from the second year till tenth year and it varied from INR 750 to INR 1000. Total cost of weeding as a whole was INR 7800 whereas total labour cost and total variable cost were workout as INR 13880 and INR 43669, respectively.

Table 1: Establishment cost of grafted Harar ha<sup>-1</sup> with spacing of 8×8 m<sup>2</sup>

Particulars	Value (INR)									
	2010	2011	2012	2013	2014	2015	2016	2017	2018	Total
Labour cost										
Bush clearing	5000	0	0	0	0	0	0	0	0	5000
Digging of pits	720	0	0	0	0	0	0	0	0	720
Mixing of FYM	120	0	0	0	0	0	0	0	0	120
Filling of pits and plantation	240	0	0	0	0	0	0	0	0	240
Weeding (annual)	750	750	750	850	850	900	950	1000	1000	7800
Sub-total	6830	750	750	850	850	900	950	1000	1000	13880
Material cost										
Planting material	720	0	0	0	0	0	0	0	0	720
FYM and fertilizer	1720	1740	1760	1780	1800	1820	1840	1860	1880	16200
Pesticide	800	800	820	840	860	880	900	920	940	7760
Sub-total	3240	2540	2580	2620	2660	2700	2740	2780	2820	24680
Interest on variable cost	327.28	106.93	108.23	112.78	114.08	117.00	119.93	122.85	124.15	1253.20
Managerial cost	1007	329	333	347	351	360	369	378	382	3856
Total variable cost	11404.28	3725.93	3771.23	3929.78	3975.08	4077.00	4178.93	4280.85	4326.15	43669.20



Table 2: Cost and returns of grafted Harar ha<sup>-1</sup> with spacing of 8×8 m<sup>2</sup>

Items of cost	Value (INR)									
	2010	2011	2012	2013	2014	2015	2016	2017	2018	Total
Fixed cost										
Land revenue	31.5	31.5	31.5	31.5	31.5	31.5	31.5	31.5	31.5	283.5
Rental value of land	2265	2265	2265	2265	2265	2265	2265	2265	2265	20385
Interest on fixed capital	263.8	262.15	260.85	258.65	256.65	255.15	252.65	251.15	249.15	2310.2
Depreciation	342	325	312	290	270	255	230	215	195	2434
Total fixed cost	2902.30	2883.65	2869.35	2845.15	2823.15	2806.65	2779.15	2762.65	2740.65	25412.70
Total cost	14306.58	6609.58	6640.58	6774.93	6798.23	6883.65	6958.08	7043.50	7066.80	69081.90
Net returns	0	0	0	0	9600	18500	32000	60000	82000	202100
Net return over total cost	-14306.58	-6609.58	-6640.58	-6774.93	2801.78	11616.35	25041.93	52956.50	74933.20	133018.10
Net return over variable cost	-11404.28	-3725.93	-3771.23	-3929.78	5624.93	14423.00	27821.08	55719.15	77673.85	158430.80
Benefit-cost ratio	0	0	0	0	1.41	2.69	4.60	8.52	11.60	2.93

Fixed cost includes land revenue, rental value of the land, interest on fixed capital and depreciation. Land revenue and rental value of the land remained the same in all years however, interest on fixed capital and depreciation reduced continuously from first year up to the year of data collection. The total fixed cost and total cost of cultivation were computed as INR 25412.70 and INR 69081.90, respectively. The returns were started from the fifth year and continued till tenth year. Returns from the fifth year were INR 9600.00 whereas the total returns up to tenth year were INR 202100.00. Total net returns over total cost and total net returns over variable cost were INR 133018.10 and INR 158430.80, respectively. Benefit-cost ratio was 1.41 in the fifth year and 2.93 in the tenth year.

Grafted Harar start bearing fruit from the fourth year onwards and fruit yield continues for about 25 to 40 years but reasonable rate of return can be expected up to 25 years. These cost parameters like cost of cultivation, net returns and benefit-cost ratio explicitly demonstrated that grafted Harar cultivation is a successful enterprise. As a result, investment in grafted Harar proved to be stable and suitable option for farmers to gain maximum profits as well as better returns.

Our study is supported by the findings of Singh et al. (2016) reported that the average cost hectare<sup>-1</sup> in aonla production was INR 27386.02. The overall net income came out to INR 149273.98. Aonla crop accrued INR 5.45 average return on an investment of INR 1 as indicated by the benefit cost analysis. Sekhar et al. (2015) worked out Net Present Value (NPV) realized from the Jamun orchards was arrived at INR 6.48 lakhs. The Benefit Cost Ratio (BCR) derived from Jamun orchards found out 3.13 revealed that for a rupee of investment. The Internal Rate of Return (IRR) realized from the plantation was arrived at around 44% indicating that the investment in Jamun orchard is highly profitable according to the parameters. Datarkar et al. (2014) reported that per hectare establishment cost of mango orchard during five years for overall age groups of orchards was INR 41796.08. In total, average gross return per year came out to INR 21026.30 other than that of the different age groups of mango. Per hectare establishment cost for bearing life of the orchard i.e. 20 years was INR 2089.80. Cost of cultivation worked out for mango orchard (ha<sup>-1</sup>) as a whole was INR 63964.85. Average gross income was INR 148956.00 year<sup>-1</sup>. The net returns obtained on an overall basis were INR 6322.45. Sari et al. (2020) analysed



the lime farming which showed that the interest rate was 13 % and the selling price was IDR 4.300 kg<sup>-1</sup> during the productive age (15 years), the value of B:C was 1.92, NPV was IDR 51,809,117 and IRR was 37%. Sensitivity analysis shows that the selling price was IDR 500 Kg, the business was not feasible. While the selling price of IDR 846 kg<sup>-1</sup>, Break Event Point (BEP) was reached. It can be concluded that lime farming is feasible.

#### 4. Conclusion

Economic feasibility of Harar cultivation in low hills of Himachal Pradesh revealed that total fixed cost and overall cost of establishment were INR 25412.70 and INR 69081.90, respectively. Total net returns over total cost and variable cost were INR 133018.10 and INR 158430.80, respectively. B : C ratio worked out was 1.41 and 2.93 for fifth and tenth year, respectively. Grafted Harar cultivation is a successful venture hence investment in grafted Harar seems to be stable and viable option.

#### 5. References

- Chauhan, N.S., 1999. Medicinal and aromatic plants of Himachal Pradesh. Indus Publishing Company, Delhi
- Datarkar, S.B., Darekar, A.S., Dangore, U.T., Parshuramkar, K.H., 2014. Economic of production and marketing of mango in Gadchiroli district of Maharashtra. International Research Journal of Agricultural Economics and Statistics 5, 278–283.
- Dinesh, M.D., Soorya, T.M., Vismaya, M.R., Janardhanan, D., Athira, T.P., Nidhin, K.B., Ajeesh, P.P., 2017. *Terminalia chebula* A traditional herbal drug – A short review. International Journal of Pharmaceutical Science Invention 6, 39–40.
- Israni, D.A., Patel, K.V., Gandhi, T.R., 2010. Anti-hyperlipidemic activity of aqueous extract of *Terminalia chebula* and Gaumutra in high cholesterol diet fed rats. International Journal of Pharmaceutical Science 1, 48–59.
- Kim, H.G., Cho, J.H., Jeong, E.Y., Lim, J.H., Lee, S.H., 2006. Growth inhibitory activity of active component of *Terminalia chebula* fruits against intestinal bacteria. Journal of Food Protection 69(9), 2205–2209.
- Kurowa, M., Nagasaka, K., Hirabayashi, T., Uyama, S., Sato, H., Kagiya, T., Kodata, S., Ohyama, H., Hzummi, T., Namba, T., 1995. Efficacy of Traditional Herbal Medicines in Combination with Acyclovir against *Herpes Simplex Virus-1* Infection *in Vitro* and *in Vivo*. Antiviral Research 27, 19–37.
- Nair, V., Surender, S., Gupta, Y.K., 2010. Anti-arthritis and disease modifying activity of *Terminalia chebula* Retz. in experimental models. Journal of Pharmacy and Pharmacology 62, 1801–1806.
- Rao, N.K., Nammi, S., 2006. Antidiabetic and renoprotective effects of the chloroform extract of *Terminalia chebula* Retz. seeds in streptozotocin-induced diabetic rats. BMC Complement Alternative Medicine, 6, 17–22.
- Riaz, M., Khan, O., Sherkheli, M.A., Khan, M.Q., Rashid, R., 2017. Chemical constituents of *Terminalia chebula*. Indian Journal of Natural Products and Resources 13, 112.
- Sambamurthy, A.V.S.S., 2005. Taxonomy of angiosperms. I. K. International Pvt. Ltd. New Delhi, 366–371.
- Sari, R., Nofialdi, P.A., 2020. Financial feasibility of lime (*Citrus aurantifolia*) farming in Tanah Datar District, West Sumatra. Earth and Environmental Science 583, 1–6.
- Sekhar, C., Rajesh, R., Vani, V., 2015. Role of jamun (*Syzygium cumini*) in enhancing the agripreneurial status of a farmer – A case study in Dindigul district of Tamil Nadu. Journal of International Academic Research for Multidisciplinary 3, 270–290.
- Singh, D.R.R., Dhir, K.K., Vij, S.P., Nayyar, H., Singh, K., 2003. Study of genetic improvement technique of *Terminalia chebula* Retz– an important multipurpose tree species of India. Indian Forester 129, 154–168.
- Singh, P.P., Singh, A.K., 2016. Variability Studies in Aonla Wild Genotypes for Fruit Character from the North-Eastern Region of India. International Journal of Basic and Applied Biology 3, 170–172.
- Suchalatha, S., Devi, C.S., 2005. Antioxidant activity of ethanolic extract of *Terminalia chebula* fruit against isoproterenol-induced oxidative stress in rats. Indian Journal of Biochemistry and Biophysics 42, 246–249.
- Thakur, M., Rana, R.C., Thakur, S., 2008. Physicochemical evaluation of *Terminalia chebula* fruits. Journal of Non Timber Forest Products 15, 37–42.
- Troup, R.S., 1921. Silviculture of Indian trees. International Book Depot. Dehradun. Uttarakhand, India, 1195.
- Vermani, K., Garg, S., 2002. Herbal medicines for sexually transmitted diseases and AIDS. Journal of Ethnopharmacology 80, 49–66.

