Original Article

Economics of Production and Processing of Seabuckthorn Value-added Products Commercialization of Sea buckthorn in Cold Desert Himalayas

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Abstract

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In India, seabuckthorn (Hippophae L.) grows naturally in high altitude areas of cold desert Himalayas, spread over 75,000 Sq. km area in Himachal Pradesh and Jammu and Kashmir. Fruit is very reach in phyto- nutrients and has potential in health food, cosmetic and drug industries. Plant is also a useful fuel wood, fodder and soil binder and a life line of the tribal people of Himachal Pradesh even then this plant was neglected due to unawareness of its economics. Keeping this backdrop in view the present study has been investigated through 40 farmers for base– line survey for the year 209-10, 56 orchardists who planted plants in 2010-11, 48 orchardists who planted plants in 2011-12, seven farmers started growing fodder in seabuckthorn orchards, two processing units in Lahual –Spiti district of Himacchal Pradeh, five processing units in Leh district of (J&K), one semi- processing units in Kullu district of HP and two semi-processing units out side HP i. e. Haryana & Delhi. Based upon the results of the study, the pertinent findings indicate that existing area under seabuckthorn was less than 1 per cent of the total geographical area, whereas as 5.2 per cent of the total cultivated area on an average farms and its share in farm income was only 1.05 per cent of the gross farm income (Rs. 3,14, 028) indicates potential for improvement. Benefit- cost ratio (BCR) in nursery raising ranged between 1.51 to 2.10. However, it was 3.26 in full life span period of the seabuckthorn orchards plus fodder crop (tall fescue, red clover and Lucerne grass) and 6.04 at full bearing stage of the orchard and fodder i. e. after 6th year of the plantation of plants. On an average per quintal loss borne by Lahaul (HP) processing units was Rs. 2,957. Whereas, on an average per quintal net returns of processing seabuckthorn fruits were Rs. 1973 in Leh area of Jammu & Kashmir. Break-even analysis indicates that in Lahaul area the processing units were running just above the shut down point, whereas on the other hand in Leh area these were earning profits. Benefit cost ratio of semi -processing units in the country vary between 1.44 to 1.90 . Based on the findings of the present paper, it is suggested that area under seabuckthorn plantation should be increased and enhance the wild seabuckthorn fruits collection through improving the harvesting technology and it is also suggested that there exists a need for development of its package of practices and efforts should be made to provide remunerative prices of seabuckthorn produce to the orchardists buy back system, besides this, nursery raising techniques and management should be imparted to the Forest Officials of the state Govt. Besides these, the entire stakeholder involved in its farming and business should be aware about the economics and benefits of this new venture.

Keywords: seabuckthorn; Orchards; Benefit- cost ratio (BCR).

Introduction

Sea buckthorn has been reported growing in about 40 countries. In India, Seabuckthorn (*Hippophae* L.) grows naturally in high altitude areas of cold desert Himalayas, spread over 75,000 sq. km area in Himachal Pradesh and Jammu & Kashmir. Fruit is very rich in phyto-nutrients and has potential in health food, cosmetic and drug industries. Plant is also a useful fuel wood, fodder and soil binder. In Himachal Pradesh seabuckthorn grows widely in the tribal cold desert areas, constituted about 42 per cent area of the state. It grows mainly in the districts of Lahaul-Spiti, parts of Kinnaur and Chamba, which are surrounded by Tibet, occupied by China and Ladakh region of Jammu & Kashmir state in the north on the southern side. Rainfall fluctuates from 50 to 700 mm per year depending on place to place. The mean temperature in Keylong, district head quarter and centre place of Lahaul-Spiti district, shows considerable variation in temperature throughout the year (a maximum of 27^0C in July and minimum of -16^0C in February). During the winter this region is affected by a series of western disturbances, which cause heavy snowfall (200-400cm/yr). Seabuckthorn grows at 2,500-3,300 m amsl in Lahaul Sub-Division of Lahaul-Spiti district.

In Spiti tehsil of Lahaul-Spiti district it grows from 3,120 m at Samdoh to 4,500 m amsl near Kunjam pass. Rainfall rarely crosses 100 mm per year. Seabuckthorn grows in Pooh tehsil of Kinnaur district and Pangi tehsil of Chamba district. It has also been found in upper areas of Shimla and Kullu districts. There is about 1200 ha area under this plant in tribal areas of Himachal Pradesh (Singh et al., 1995).

The people of the tribal area of the state have to face severe climate, cold desert winds, and lack of oxygen in the absence of vegetation in most parts of these areas can result in heart and breathing troubles and other body ailments. Even the inhabited area remain heavily covered under snow and cut off from the rest of the world for six to eight months (November to June) depending upon the late or early snowfall on the passes (Thakur and Moorti). Seabuckthorn is the only plant which survives in this harsh climate. The people use its shrubs for fuel and roofing the house and its leaves as a fodder for the animals. The traditional mediciners (Amchies) use its fruits far medicinal purposes.

Due to the severe climate, only one crop season is available for growing of agricultural crops in this area. The farmers of these areas were growing potato and pea only for their home consumption till early seventies. After the construction of roads in tribal areas these crops were introduced as commercial crops. However, seabuckthorn was a life line of the tribal people of Himachal Pradesh even then this plant was neglected due to unawareness of its importance and assured market for its products.

Farmers/ collectors were collecting fruits of widely growing seabuckthorn in cold desert areas of Himachal Pradesh and sell them to local traders and private organizations, which gave unsure market and exploited the situation for collectors/ farmers. In view of this, the farmers/ collectors do not get remunerative prices for their produce. Hence, most of the farmers are reluctant to grow seabuckthorn on there farm. To see the economics of this new venture, needs to be investigated through comprehensive study to assess economics of production and processing of end products. Keeping this background in view, the present study has been undertaken with the following specific objective.

Objectives

To study the existing position of seabuckthorn in the cropping pattern and farm income in the study area .

To assess economics of production and processing of end product of sea buckthorn.

Methodology

In Himachal Pradesh, seabuckthorn grows mainly in the districts of Lahaul-Spiti, parts of Kinnaur and Chamba districts. The maximum area under seabuckthorn is in Lahaul block of Lahaul-Spiti district. Therefore, this block has been selected purposely for the main activities of the study. Also, the farming community of this block is innovative and very receptive as for as the adoption of enterprise or technology is concerned.

For socio-economic baseline survey on a value chain on seabuckthorn out of 106 total villages falling under the selected block, 76 villages have been identified where the farmers are fully aware and willing to start the commercial cultivation of sea buckthorn. A sample of 10 villages was selected randomly to carry out the base line survey. Further, stratified random sampling technique was followed to select the sample respondents from the selected villages. A sample of 20-25 per cent of respondents was drawn from various categories of farmers randomly from 10 selected villages, thus making a total sample size of 40 farmers.

For economic analysis of nursery raising, the data relating to various costs, returns and marketing were collected (for the year 2010-11) from well maintained and successful seabuckthorn nursery units established in the study area by the State Department of Forest, Govt. of Himachal Pradesh and nursery raised at KVK Farm, Kukumseri (CSK HPKV) in Lahaul (for the year 2010-11). Besides this, complete farmers who have planted the seabuckthorn plants in the district Lahaul & Spiti in 210-11 (56) & 2011-12 (48) have been surveyed in 2012-13 for economic and management aspect of the orchards.

For end product, the information was gathered from two well running processing units at Lahaul in Lahaul & Spiti district of Himachal Pradesh and 5 units out of 7 from Leh district of Jammu & Kashmir. The economics of semi-processing unit and juice and squash, has been analysed on the basis of information gathered from seabuckthorn processing unit of Lahaul Potato Growers Co-operative Society at Raison in Kullu district of Himachal Pradesh. The economics of various cosmetics like body lotion, face wash, shampoo, etc. and their processing was analysed by gathering information from semi-processing units, New Delhi and Faridabad in Haryana.

Analytical Tools and Methods

To meet out the objectives of the present study, various related statistical and economic tools such as averages, ratios, percentages, cropping pattern, standard cost methodology, gross income, benefit-cost ratio and break-even output, etc., have been applied for the analysis and interpretation of the data.

In order to achieve the requirements of first objective, the cropping pattern was examined on the sampled farms. The cropping pattern was computed as proportion of area under various crops to the operational holding the course of investigation. The formula used was as under:

$$P_{ij} = \frac{A_{ij}}{A_j} \times 100$$

Where,

P_{ij} = Proportion of area under i^{th} crop in j^{th} season

A_{ij} = Actual area under i^{th} crop in j^{th} season

A_j = Total sown area during jth season

To meet out the requirement of second objective of the study, the costs of nursery raising and orchard plantation of seabuckthorn were worked out through computing fixed and variable cost and also standard farm management cost concepts.

The gross returns of different crops were estimated by using the following relationship as used for seabuckthorn:

$$GR = Y_S \times P_S + Y_B \times P_B$$

Where,

GR = Gross returns from seabuckthorn in Rs / farm

Y_S = Yield of seabuckthorn fruits in q/farm

P_S = Price of seabuckthorn fruits in Rs/q

Y_B = Yield of seabuckthorn by- product in q/farm

P_B = Price of seabuckthorn by- product in Rs/farm

The net returns over total cost have been computed as follows:

Net Returns = Gross Returns – Total cost

$$\text{Output- Input ratio} = \frac{\text{Gross returns}}{\text{Total cost}}$$

Similarly, benefit -cost ratios were calculated as

1. $PVB = \delta_t(\Sigma B_t)$

$PVC = \delta_t(\Sigma C_t)$

$NPW = \delta_t(\Sigma B_t - (\Sigma C_t))$

2. $BCR = \delta_t(\Sigma B_t)/ \delta_t(\Sigma C_t)$

3.   IRR is the discount rate i.e. 8 percent per annum which makes PVB = PVC

Where,

PVB = Present value of benefits,

PVC = Present value of cost,

δ_t = Discount factor

B_t = Benefits from the seabuckthorn and fodder plantation,

C_t = Cost involved in the seabuckthorn and fodder plantation,

t = Time period

Break- even analysis has been calculated. The point at which two curves, total cost curve and total revenue curve intersect each other is called the break –even point (BEP) which indicates the level of production at which the producer neither loses money nor makes a profit. In other words, the quantity at which all costs allocated to a product are equal to all revenues from its sale is known as break-even point. At quantities smaller than the break-even point, there is loss and at larger quantities there is a profit. The break-even output has been calculated with the following algebraic method:

BEP= F/ (P-V)

Where,

F   = Fixed cost of the processing unit

P   = Price per quintal of seabuckthorn in rupees

V   = Variable costs per quintal of seabuckthorn in rupees

Shutdown point has been calculated, when total fixed cost of the processing unit is equal to total revenue of the processed products.

Results and Discussion

Cropping pattern

There is only one cropping season starting from April to September. Generally farmers allocate land among different crops according to local climatic conditions, market availability, soil type, resource availability and technology. Some other considerations include increased income and risk minimization. Thus cropping pattern of an area may be outcome of trial and adjustments. It can be seen from Table 1 that in the overall cropping pattern of potato and peas dominated the scene by occupying more than 71 per cent of the total cultivated area. Next in importance was apple covering an area of 9.36 per cent of the total. The sea buckthorn occupied 5.2 per cent of the total cultivated area per farm.

Farm Incomes

The gross farm income from main product of crops has been depicted in Table-2. It can be seen from the table that on an average gross income per farm was estimated to Rs.3,05,492 where as income from by-product was Rs.8,536 only. A critical analysis of Table-2 shows that 86 per cent of the gross income was provided by two crops i.e.potato and pea. The rest of the income was mainly contributed by kuth, manoo and other crops.Table-2 shows the gross income and marketed surplus. The crops like potato, pea, cauliflower, cabbage, carrot, *kuth, patish* and sea buckthorn were found to be very important crops contributing 77 per cent to 100 per cent of the marketed surplus.

Comparative Economics of Seabuckthorn Nursery Raising

Economics of seabuckthorn orchards is also effected by the initial cost of the plants purchased for the plantation in the farmers' field. Considering this aspect of the costs, the economics of seabuckthorn nursery raising at KVK Farm, Kukumseri (CSK HPKV) in Lahaul and economics of seabuckthorn nursery raised at Himachal Pradesh Government Forest Nursery in Lahaul have been analysed for the agricultural year 2010-11(Table 3).

Economics of Seabuckthorn Nursery Raised at University Farm

Data relating to various costs, returns and marketing aspects were collected from University farm. The data were tabulated, processed and analysed for arriving at the final economics of seabuckthorn nursery raising (Table 3). It can be seen from the table that major inputs cost was the variable cost, among variable costs the main cost was human labour that accounts for about 52 per cent in the seabuckthorn nursery raising in university farm. The next important is the material cost that contributes around 43 per cent of the total cost. The fixed investment in university farm is negligible. The average sale price and cost per plant were Rs. 10/- and Rs.4.76/- respectively and as such, the net profit earned by the nursery units was approximately Rs. 71,309/- per bigha (0.08 ha) and benefit cost ratio was 2.10.

Table 1: Cropping pattern on the sample farms in study area   Per/farm

Sr. No.	Crops	Area (ha)	Per cent
A.	**Agricultural and Horticultural Crops**		
1.	Barley	0.015	1.20
2.	Kathu/ Buckwheat	0.017	1.36
3.	Rajmash	0.019	1.52
4.	Sarson	0.001	0.08
5.	Potato	0.491	39.28
6.	Pea	0.407	32.56
7.	Cauliflower	0.007	0.56
8.	Cabbage	0.007	0.56
9.	Carrot	0.004	0.32
10.	Manoo	0.053	4.24
11.	Kuth	0.033	2.64
12.	Patish	0.003	0.24
13.	Oat	0.011	0.88
14.	Apple	0.117	9.36
15.	Sea buckthorn	0.065	5.20
	Total:	1.250	100.00

Table 2: Gross farm income from main product and by-product on the sample farmers   Per/Farm

Sr. No.	Crops	Production (qtl./farm)		Price (Rs. /qtl.)		Value (Rs.)		Gross Income (Rs.)	Marketed surplus of the main product (%)
		Main product	By product	Main product	By product	Main product	By product		
1.	Barley	0.18	0.27	1600	300	288	19	307	-
2.	Kathu/ Buckwheat	0.25	0.12	1000	250	250	30	280	-
3.	Rajmash	0.28	0.060	4500	320	1260	19	1279	15.98
4.	Sarson	0.02	0.02	3000	250	60	5	65	-
5.	Potato	109.03	10.90	1121	250	122259	2725	124984	88.22
6.	Pea	52.57	10.52	2698	320	141815	3366	145181	94.90
7.	Cauliflower	0.63	-	1500	-	945	-	945	86.84
8.	Cabbage	0.80	-	1167	-	933	-	933	89.58
9.	Carrot	0.18	-	1500	-	270	-	270	77.27
10.	Manoo	2.68	-	7000	-	18760	-	18760	96.91
11.	Kuth	2.03	-	7000	-	14210	-	14210	96.86
12.	Patish	0.03	-	7000	-	210	-	210	94.44
13.	Oat	2.86	2.86	200	200	572	572	1144	-
14.	Apple	0.60	-	3600	-	2160	-	2160	55.56
15.	Sea buckthorn	0.30	SBT fodder=1.0 Fuel= 4.0)	5000	SBT fodder=200 Fuel= 400	1500	1800	3300	100.00
	Total:	-		-		3,05,492	8,536	3,14,028	

Table 3: Economics of seabuckthorn nursery raised in the study area (2010-11)   Rs./ Bigha**

Sr. No.	Particulars	KVK, Kukumseri (CSK HPKV, Palampur)	Forest Deptt. , Govt. of H.P.
I.	Fixed Investment		
	Total Fixed Cost (Depreciation + interest on fixed capital)	18	3219
II.	Variable Costs		
A.	Material Cost	28025	42322
B.	Labour Cost(Human and Bullock)	33568	29716
i)	Interest on total variable cost @10% for half of the period (A+B)/ @10 per cent for six months	3080	3602
ii)	Total variable cost	64673	75640
C.	Total cost (fixed cost+variable cost)	64691	78859
III.	Nursery plant raised/ mortality		
a)	Cuttings/ sapling planted (No.)	22400	16875
b)	Cuttings/ sapling mortality(No.)	8800	5375
c)	Plant mortality (%)	39.29	31.85
d)	Sapling raised successfully(No.)	13,600	11,500
e)	Sale price (Rs./ plant)	10.00*	10.36
IV.	Returns	71309	40281
V.	Per plant economics		
a)	Per plant cost of raising nursery(Rs.)	4.76	6.86
b)	Per plant profit (Rs.)	5.24	3.50
c)	Output- input ratio	2.10	1.51

Note: * = Rs. 10 per plant has been fixed for agencies other than farmers. The sale price for farmers in Lahaul has been fixed Rs. 0.50 per plant.

   ** =1 Bigha = 2 Kanal = 0.08 ha

Economics of Seabuckthorn Nursery Raised at Forest Nurseries in Lahaul

Economics of nursery raised on university farm was compared with the nursery raised by the Forest Department, Govt. of Himachal Pradesh as presented in Table 3. The data relating to various costs and returns were collected from well maintained and successful seabuckthorn nursery units established in the study area by the Department of Forest, Govt. of Himachal Pradesh. The variable cost contributed 96 per cent of the total cost incurred in seabuckthorn nursery raising in Government farm. The material cost (plant) was the main cost incurred in the variable costs as accounted for 57 per cent of the total cost in nursery raising. The Next important variable cost was human labour which accounts for about 38 per cent of the total cost. The fixed investment accounted for only 4 per cent of the total cost in nursery raising by the Forest Department of Govt. of Himachal Pradesh. The Output- input ratio was lower in forest nursery (1.51) as compared to university farm nursery (2.10), even at a higher sale price at forest nursery.

Table 4: Expected costs and returns from seabuckthorn plus fodder per bigha on sample farms(orchards)

Sr. No.	Years	Fixed Investment on seabuckthorn	Seabuckthorn O & M cost	Project Costs Investment + O & M cost of grass	Total costs	DF@8%	Present worth @8%	Total Value of Production SBT (fruit+ fuel)	Fodder	Benefits Total	DF@8%	Present worth @8%
1	2011-12	5614	2400	2000	10014	0.93	9313.02	-	-		0.93	0
2	2012-13	2807	3400	2000	8207	0.86	7058.02	-	2400	2400	0.86	2064
3	2013-14	1404	3400	2000	6804	0.79	5375.16	3060	2400	5460	0.79	4313.4
4	2014-15		3400	2000	5400	0.74	3996	6120	3600	9720	0.74	7192.8
5	2015-16		3400	2000	5400	0.68	3672	12240	3600	15840	0.68	10771.2
6	2016-17		3400	2000	5400	0.63	3402	24480	3600	28080	0.63	17690.4
7	2017-18		3400	2000	5400	0.58	3132	24480	3600	28080	0.58	16286.4
8	2019-20		3400	2000	5400	0.54	2916	24480	3600	28080	0.54	15163.2
9	2020-21		3400	2000	5400	0.54	2916	24480	3600	28080	0.54	15163.2
10	2021-22		3400	2000	5400	0.54	2916	24480	3600	28080	0.54	15163.2
11	2022-23		3400	2000	5400	0.43	2322	24480	3600	28080	0.43	12074.4
12	2023-24		3400	2000	5400	0.4	2160	24480	3600	28080	0.4	11232
13	2024-25		3400	2000	5400	0.37	1998	24480	3600	28080	0.37	10389.6
14	2025-26		3400	2000	5400	0.34	1836	24480	3600	28080	0.34	9547.2
15	2026-27		3400	2000	5400	0.32	1728	24480	3600	28080	0.32	8985.6
16	2027-28		3400	2000	5400	0.29	1566	24480	3600	28080	0.29	8143.2
17	2028-29		3400	2000	5400	0.27	1458	24480	3600	28080	0.27	7581.6
18	2029-30		3400	2000	5400	0.25	1350	24480	3600	28080	0.25	7020
19	2030-31		3400	2000	5400	0.23	1242	24480	3600	28080	0.23	6458.4
20	2031-32		3400	2000	5400	0.22	1188	24480	3600	28080	0.22	6177.6
21	2032-33		3400	2000	5400	0.2	1080	24480	3600	28080	0.2	5616
22	2033-34		3400	2000	5400	0.18	972	24480	3600	28080	0.18	5054.4
23	2034-35		3400	2000	5400	0.17	918	24480	3600	28080	0.17	4773.6
24	2035-36		3400	2000	5400	0.16	864	24480	3600	28080	0.16	4492.8
25	2036-37		3400	2000	5400	0.15	810	22032	3600	25632	0.15	3844.8
26	2037-38		3400	2000	5400	0.14	756	19829	3600	23429	0.14	3280.06
27	2038-39		3400	2000	5400	0.13	702	17846	3600	21446	0.13	2787.98
28	2039-40		3400	2000	5400	0.12	648	16061	3600	19661	0.12	2359.32
29	2040-41		3400	2000	5400	0.11	594	14455	3600	18055	0.11	1986.05
30	2041-42		3400	2000	5400	0.1	540	13010	3600	16610	0.1	1661
31	2042-43		3400	2000	5400	0.09	486	11709	3600	15309	0.09	1377.81
32	2042-43		3400	2000	5400	0.09	486	10538	3600	14138	0.09	1272.42
33	2043-44		3400	2000	5400	0.08	432	9484	3600	13084	0.08	1046.72
34	2044-45		3400	2000	5400	0.07	378	8536	3600	12136	0.07	849.52
	Total	9825	114600	68000	192425	11.74	71210.2	630040	116400	746440	11.74	231819.88

Note: O&M= Operational and maintenance cost include preparation of land , training and pruning, labour charges, irrigation, harvesting of fruit and grass, watch and ward services, FYM and fertilizers, etc.

Cost of seabuckthorn plant at approved rate @ Rs.0 .50/- per plant by CSK HPKV, Palampur. DF= Discount factor, it was assumed 8% as prevailing interest rate of the banks on fixed deposit in the study area. Analysis of project has been carried out on the basis of per bigha (1 bigha = 2 kanal =0.08 ha) plantation of seabuckthorn plants and grasses by the farmers. Break -even point = 6 Years

$$\text{Benefit -Cost Ratio} = \frac{231820}{71210} = 3.26$$

Note:

1. Break even point=6th year after the establishment of the seabuckthorn orchards and grass by the farmers

2. This Benefit-cost ratio (3.26) has been calculated on the bases of farmers' costs and returns. However, BCR would be many folds higher if we include other sectors of the economy related to seabuckthorn.

3. Current prices have been considered for the analysis.

4. The cost and returns will be almost same after 6th to 24th years of the plantation of seabuckthorn plants and grasses by the farmers, however, seabuckthorn returns will be start reducing after 25th years @10% every year.

Economics of Seabuckthorn orChards

The various aspects of management which affect the economics of seabuckthorn orchards is as follows:

Plantations and Management Aspects

Economics of seabuckthorn orchard depends upon plantations method, time of plantations, appropriate ratio and management of male and female plants, spacing and distance of plants which will ensure well establishment of the plants and better growth. To assess all these things, the survey was conducted during 2010-11 and 2011-12. The expected economics of orchard on the bases of survey report on plantation and management aspects of seabuckthorn on marginal lands in the study area has been presented in Table-4.

Expected economics of seabuckthorn orchard on the basis of sample farms (orchards)

Expected economics of seabuckthorn orchards has been analysed on the basis of costs incurred on investment and maintenance by the orchardists for establishing the orchards and actual returns on the basis of sample bearing trees in the newly established orchards and expected returns of the orchards. It can be seen from the Table 4 that the total life span of seabuckthorn orchards was expected 34 years and the fixed investment on seabuckthorn orchards was Rs.9,825 and seabuckthorn operation and maintenance costs was expected Rs.1,14,600 and investment plus operational and maintenance costs of grass was Rs.68,000. The total cost of seabuckthorn orchard was expected to be Rs. 1, 92,425/- and the present worth of total cost @ 8% discount factor was Rs. 71,210. Total value of production of orchards was expected Rs. 7,46,440 out of which Rs. 6,30,040 was expected from seabuckthorn fruit and fuel whereas, Rs. 1,16,400 was expected from grass. The total present worth/value of the production @ 8% discount

factor was expected Rs. 2, 31,820. The table revealed that break-even point will be there after 6th years of establishing the seabuckthorn orchards and the benefit-cost ratio will be 3.26 in the full life span of the seabuckthorn orchards. However, benefit- cost ratio would be many fold higher if we include tangible and intangible benefits of other sector of the economy related to seabuckthorn. It is amply clear from the table that commercializing seabuckthorn orchards along with fodder crops have potential to become economically viable in the long run as displayed in the Table 4.

Expected Economics of Seabuckthorn orChard at Full Bearing Stage

Expected economics of seabuckthorn orchard has been analysed on the basis of expected cost and returns. Data collected from the sample farmers who have purchased the nursery plants and grass roots from University and Forest Department are presented in Table-5 & 6. Table 5 reveals that although fixed investment on seabuckthorn orchard was the highest cost (Rs.5,614/bigha). By apportioning this cost to the full life period of the orchard and was estimated only Rs.160/- per bigha per year which was lower than the estimated interest (Rs.449 per year) of the total cost per year (Rs 4,449). The major cost to establish and maintain the seabuckthorn orchard was operational and maintenance cost of seabuckthorn plant and grass per year (86 per cent).

Expected income from seabuckthorn orchard and fodder at full bearing stage per year was accounted for Rs. 26,880 per bigha and benefit cost ratio was 6.04. The high benefit- cost ratio of seabuckthorn orchard indicates that establishing the seabuckthorn orchard is a profitable venture.

Economics of Seabuckthorn Processing

The shelf life of seabuckthorn fruit is very less so it needs processing. By processing, it is converted into form utility and can be used for longer period. Seabuckthorn fruits are utilized in preparation of beer, syrup, jam, squash and juice. Its fruit oil is extracted from seeds and used for pharmaceutical industry to prepare medicinal and cosmetic preparations. *Mehandi* and tea are prepared from seabuckthorn leaves. To see technical feasibility and economic viability of the seabuckthorn industry, the economics of seabuckthorn processing units and its products is necessary. Therefore, economics of processing units and products are presented in this section.

Table 5: Expected plantation cost of seabuckthorn orchard and grass per year after 6ᵗʰ Year

Sr. No.	Particulars	Cost (Rs./ Bigha)
1.	Fixed Investment 267 plants(Female=240+ Male=27) and grass	5,614.00
2.	Apportioning of fixed investment for 35 years (planting the plant and grass per year)	160
3.	Interest @ 8% per year of the total investment	449.00
4.	Operational and Maintenance cost of Seabuckthorn per year	2,400.00
5.	Operational and Maintenance cost of Grass per year	1,440.00
	Total Cost per year	**4,449.00**

Note:
1. Operational and maintenance costs include preparation of land, training and pruning, labour charges, irrigation, harvesting of fruit and grass, watch and ward services, etc.
2. Cost of seabuckthorn plant at approved rate of Rs. 0.50/ plant by HPAU, Palampur.
3. 1 bigha = 2 Kanal = 0.08 ha

Table 6: Expected income from seabuckthorn orchard and fodder at full bearing stage per year

Sr. No.	Particulars	Income (Rs./ Bigha)
I.	Income from sea buckthorn after 6ᵗʰ year (9.6 qtl./ bigha @Rs. 25/- per kg)	24,000.00
2.	Income from Fodder (Rs.200/ qtl.)	2,400.00
3.	Income from fuel (Rs. 300/ qtl.)	480.00
	Total Return	26,880.00
	Total Cost	4,449.00
	Net Income	22,431.00
	Benefit -cost ratio	6.04

Note:
1. Harvesting of fruit and cutting of grass charges have been included in operational and maintenance costs.
2. This cost and returns will be almost same after 6thʰ to 25ᵗʰ years of the plantation seabuckthorn plants by the farmers

Table 7: Economics of processing units of Lahaul, Himachal Pradesh (2011-12)

Sr. No.	Particulars	Qty.	Value (Rs.)
A.	**Fixed Cost**		
i)	Rental value of building per year	No.1	60,000
ii)	Investment on machinery	Rs, 1,50, 000	-
a)	Depreciation of machinery per year @ 5 per cent on the invested cost of machinery	Life of machinery is about 20 years	7,500
b)	Interest on fixed investment of the machinery @ 10 per cent per annum	-	15,000
iii)	Repairs and maintenance cost of the machinery	-	2,500
iv)	Wages of permanent labour/ watch and ward per year	-	30,000
	Total fixed cost	**-**	1,15,000
B.	Operational/ variable cost		
i)	Cost of seabuckthorn fruit @Rs. 3,000/ q	14.5 q purchased	43,500
ii)	Transportation charges @ Rs. 50/ q	14.5 q	725
iii)	Wages of the operators @ Rs. 120 per day	145 days	17,400
iv)	Electricity charges @ Rs.100/q on pulp	12.5 q	1,250
	Total operational/ variable cost	-	62,875
C.	Total cost (A+B)	-	1,77,875
D.	Income:		
i)	Pulp @ Rs. 10,000/q sale price	12.5 q	1,25,000
ii)	Seed @ Rs. 5000/ q sale	1 q	5,000
iii)	Residue @ Rs. 5,000/ q sale price	1 q	5,000
	Total income	-	1,35,000
	Net return over variable cost/ operational cost	-	72,125
	Net return over fixed investment	-	20,000
	Net return over total cost	-	-42875
	Average fixed cost per q	-	7,931
	Average variable cost per q	-	4,336
	Average total cost per q	-	12,267
	Average return per q	-	9,310
	Net return over variable cost per q	-	4,974
	Net loss per q	-	2,957

The economics of processing unit depends upon availability of land, labour, raw materials (fruits, etc.) and capital investment in the processing unit. It can be seen from Table 7 that fixed investment/ cost was the major cost in the total cost of the processing unit. On an average fixed cost was Rs. 1,15,000 per processing unit which accounted for about 65 per cent of the total investment of the processing unit in Lahaul area. The variable cost of the processing unit was Rs. 62,875 (35 per cent) out of the total cost (Rs. 1,77,875) per annum.

The total income of the processing unit was estimated to be Rs. 1,35,000 per annum through sale of seabuckthorn pulp, seed and residue. The net returns over variable cost were Rs. 72,125, net return over fixed cost was Rs. 20,000 and net loss instead of making profit per processing unit per annum was Rs. 42,875 due to low volume of seabuckthorn fruits which was purchased/ handled from the collectors, who collected from the forest area.

Besides this, bulk bearing of seabuckthorn plants has started now in the farmers' field in the project area. The entrepreneur of processing unit also expected uncertain demand and low price in the market. On an average per quintal loss borne by the processing unit was Rs. 2,957.

The economics of processing unit of Leh area of Jammu & Kashmir has been presented in Table 8. It can be seen from the table that in Leh area major cost of the processing unit was variable cost (Rs.10,20,070) and accounted for 76 per cent of the total cost of the processing unit. The fixed cost on an average was 24 per cent (Rs.3,17,425) of the total cost (Rs. 13,37,495) incurred per processing unit in Leh area.

The total return per processing unit was estimated to be Rs.17,01, 800 per annum through sale of seabuckthorn pulp, jam, juice, squash, lolleypope, seed and residue. The net return over fixed cost was Rs. 15,70,455, net return over variable cost was 8,67,810 and net return over total cost was Rs. 5,50,385 per processing unit in Leh area. On an average per quintal net returns of processing seabuckthorn fruits were Rs. 1973 in Leh area of Jammu & Kashmir.

Some of the problems highlighted by the entrepreneurs of seabuckthorn processing units of the Lahaul and Leh at the time of survey were lack of electricity supply, remunerative prices of the processed produce of seabuckthorn, market for seed and residue; fund for proper running of the processing units, adequate labour at reasonable wages and availability of Follow on Public Offer (FPO) certificate.

Break-Even Analysis

Break-even analysis is important concept to examine the business performance of processing units. The break-even output is that level of output below which the processing units would not be in a position to cover the fixed costs besides variable costs (both manufacturing and selling) and eventually might incur losses. On the other hand, the processing capacity achieved above break-even output would start yielding net profit to the processing units of seabuckthorn fruits. Based upon cost and return structure the seabuckthorn levels of outputs for two areas Lahaul in Himachal Pradesh and Leh in J & K processing units have been presented in Table- 9 & 10. It was estimated in Table 9 that seabuckthorn processing unit should process minimum quantity of 23 quintals of seabuckthorn fruits per year in Lahaul area, and then utilize the plant capacity to stay in business since at this level of plant capacity the unit would be able to cover both variable and fixed costs of processing of fruits. At this level total return and total cost is equal (Rs. 2.14 lakhs).

It can be visualized from the Table-9 that in Lahaul area the processing unit was running just above the shut down point (12.5 quintals) of fruits of seabuckthorn processed per annum. The unit was covering only fixed cost and part of the variable cost. Thereby it indicates that this industry is in initial stage in Lahaul area and it needs to create awareness amongst the growers (seabuckthorn orchardists), collectors of seabuckthorn from forest area and traders for sustainable linkages with the traders in the market for assured and remunerative prices from its products.

Table 10 indicates that the break-even point of Leh processing unit is reached at 102 quintals of fruits processed per unit. Whereas at present these units were processing 279 quintals of seabuckthorn fruits per unit. These units were covering fixed and variable costs and earning Rs. 5,50,385 profit per unit. It indicates that the processing units at Leh in J&K are in viable position. Although at present these units totally depend upon the forest produce.

Economics of Semi-Processing Unit in Himachal Pradesh

The economics of seabuckthorn semi-processing unit gives the sustainability of the functionaries involved in the value addition of this industry. Seabuckthorn juice and squash processing unit at Raison, Distt. Kullu, Himachal Pradesh is the main semi-processing unit in Himachal Pradesh which converts whole seabuckthorn pulp of Lahaul & Spiti processing units into final finished products' consumable to the consumers. It can be seen from the

Table 11 that 12 quintal of seabuckthorn pulp was purchased by this unit from the Lahaul processing units. The total fixed cost of this processing unit incurred on handling seabuckthorn pulps and products was Rs. 67,000. This processing unit produces juice and squash from seabuckthorn pulp as presented in Table 11. During, 2011-12 this unit has made 12,000 bottles of juice from 2.5 quintal of pulp and 560 bottles of squash from 1 quintal seabuckthorn pulp out of the total pulp (12q) purchased by this semi-processing unit from the Lahaul's processing units. The total operational/ variable cost incurred on preparation of these

produce was Rs.1,26,611 out of which Rs.96,575 incurred on juice and Rs.30,036 incurred on preparation of squash as presented in table. The material and handling charges accounted for 98 per cent of the variable cost and only 2 per cent was the marketing cost. Total income earned by the processing unit from preparation of 12,000 bottles of juice and 560 bottles of squash was Rs. 2,31,200. Net return over total cost was Rs. 1,04,589 in which Rs. 95,425 from juice and Rs.9,164 from squash. Net return per quintal of seabuckthorn pulp was estimated to be Rs.3,970 from juice and Rs.2,337 from squash.

Table 8: Economics of processing units of Leh in Jammu & Kashmir (2011-12)   (Unit/annum)

Sr. No.	Particulars	Qty.	Value (Rs.)
A.	Fixed Cost		
i)	Building cost	Rs. 5,65,000	-
a)	Depreciation cost of the building @ 2.5 per cent per annum	Life of the building is 40 years	14,125
b)	Interest on fixed investment of building @ 10 per cent per annum	-	56,500
ii)	Investment on machinery:	Rs. 6,40,000	-
a)	Own fund	Rs. 3,60,000	-
b)	Loan	Rs. 2,80,000	-
c)	Interest on fund @ 10 per cent per annum	Rs. 3,60,000 (own fund)	36,000
d)	Interest on loan paid @ 13 per cent per annum	Rs. 2,80,000 (borrowed money)	36,400
e)	Repairs and maintenance cost of machinery	-	16,000
f)	Wages of permanent labour/ watch and ward per year	-	1,58,400
	Total fixed cost	-	3,17,425
B.	Operational/ variable cost		
i)	Cost of seabuckthorn fruit @Rs.2380/ q	279 q purchased	6,64,020
ii)	Transportation charges @ Rs. 50/ q	279 q	13, 950
iii)	Wages of the operators @ Rs. 352 per day	790 days	2,78,080
iv)	Electricity charges @ Rs.100/q on pulp	254 q	25,400
v)	Jam:		
	Material cost of the Jam excluding pulp @ Rs. 36/ kg	350 (kg)	12,600
vi)	Juice:		
	Material cost of the juice excluding pulp cost @Rs. 21/ ltr.	620 (ltr.)	13,020
vii)	Squash:		
	Material cost of the squash excluding pulp cost @ Rs. 36/ ltr.	350 (ltr.)	12,600
viii)	Lolleypope:		
	Material cost of the Lolleypope excluding pulp cost @ Rs. 2/ No.	200(No.)	400
	Total operational/ variable cost	-	10,20,070
C.	Total cost (A+B)	-	13,37,495
D.	Income:	-	
i)	Pulp @ Rs. 6700/ q sale price)	254 (q)	17,01,800
ii)	Jam @ Rs. 160/ kg sale price	350 (kg)	56,000
iii)	Juice @ Rs. 100/ ltr. sale price	620 (ltr.)	62,000
iv)	Squash @ Rs. 120/ ltr. sale price	350 (ltr.)	42,000
v)	Lolleypope @ Rs. 5/ No. sale price	200 (No.)	1,000
vi)	Seed @ Rs. 40/ kg sale price	195 (kg)	7,800
vii)	Residue @ Rs. 54/ kg sale price	320(kg)	17,280
	Total income:		18,87,880
	Net return over variable cost/ operational cost		8,67, 810
	Net return over fixed cost		15,70, 455
	Net return over total cost		5,50,385
	Average fixed cost per q		1,138
	Average variable cost per q		3,656
	Average total cost per q		4,794
	Average return per q		6, 767
	Net return over fixed cost per q		5, 629
	Net return over variable cost per q		3,110
	Net return over total cost per q		1973

Table 9: Break-even analysis of seabuckthorn processing unit at Lahaul in Himachal Pradesh (2011-12)   (Unit/ annum)

Seabuckthorn fruits processed per unit (q)	Total revenue (Rs.)	Total cost (Rs.) (Total fixed cost+Total variable cost)
0	0	1,15,000
10	93,100	1,58,360
12.35	1,15,000	1,68,550*
14.5	1,35,000	1,77,875**
23	2,14,130	2,14,728***
30	2,79,300	2,45,080
100	9,31,000	5,48,600

*Shut down point, **Present status ***Break-even point

Table 10: Break-even analysis of seabuckthorn processing unit at Leh, Jammu & Kashmir (2011-12)   (Unit/ annum)

Seabuckthorn fruits processed per unit (q)	Total revenue (Rs.)	Total cost (Rs.) (Total fixed cost+total variable cost)
0	0	3,17,425
100	6,76,700	6,83,041
102	6,90,234	6,90,337*
200	13,53,400	10,48,625
279	18,87,880	13,37,495**
300	20,30,100	14,14,225

*Indicate the break-even point, ** Present position per processing unit

The expected economics of seabuckthorn processing unit has been portrayed in Table 11. The table revealed that net return of the processing unit would be Rs.42,039 if all the seabuckthorn pulp is converted into same ratio of juice and squash. The minimum and maximum expected income ranged between Rs.32,147 to Rs.46,007 depending upon the ratio of juice and squash prepared by the processing unit.

Table 11: Economics of seabuckthorn juice & squash processing unit at raison distt. kullu, himachal pradesh (2011-12)
(Unit/ annum)

Sr. No.	Particulars	Qty.		Value (Rs.	
A.	Expected fixed cost to processing of 12 quintals of seabuckthorn produce	12 q		-	
i)	Approximate building cost	Rs.10,00,000		-	
ii)	Imputed rental value of rooms used for seabuckthorn products per annum	2 rooms		12,000	
iii)	Investment on machinery used for seabuckthorn products	Rs. 50,000		-	
a)	Depreciation on machinery per year @5% on the investment cost of machinery	Life of machinery is about 20 years		2,500	
b)	Interest on fixed investment of the machinery @10% per annum			5,000	
c)	Repairs and maintenance cost of the machinery			2,500	
iv)	Wages of permanent labour and management	One month payment of the whole staff		45,000	
	Total fixed cost:			67,000	
B.	Operational/ variable cost of processed produce(2011-12)	Juice		Squash		Total value
		Qty.	Value (Rs.)	Qty.	Value (Rs.)	(Rs.)
1)	Material cost and handling charges					
i)	Seabuckthorn pulp	2.5q	25,000	1q	10,000	35,000
ii)	Sugar	3q	9,000	2.25q	6.750	15,750
iii)	Colour		200		100	300
iv)	Citric acid		200		100	300
v)	Essence		60		50	110
vi)	Bottle @Rs 2/- per juice bottle of 200ml. and Rs.6/- per squash bottle of 700ml. packing	Packing of 12,000 bottles/ 2,400 litre juice	24,000	Packing of 560 bottles/ 392 litre squash	3,360	27,360
vi)	Cork @Rs.0.50/- per cork	12,000	6,000			6,000
vii)	Packing and labeling		10,000		1,200	11,200
viii)	Electricity charges		857		243	1,100
ix)	Fuel/ diesel		3,000		500	3,500
x)	Contractual labour		3,000		1,500	4,500
	Sub-total:		81,317		23,803	1,05,120
2)	Marketing cost					
i)	Loading & unloading charges		200		100	300
ii)	Transportation charges		500		250	750
iii)	Permanent labour for marketing		600		300	900
	Sub-total:		1,300		650	1,950
	Total operational/ variable cost (1+2)		82,617		24,453	1,07,070

Total fixed cost of the processed products out of the total pulp (12q) procured by processing unit	2.5q	13,958	1q	5,583	19,541
Total operational/ variable cost	2.5q	82,617	1q	24,453	1,07,070
Total cost:	2.5q	96,575	1Q	30,036	1,26,611
Total Income: 2,400 litre juice and 392 litre squash	12,000 bottles of 200 ml. @Rs. 16/- per bottle	1,92,000	560 bottles of 700 ml. @Rs.70/- bottle	39,200	2,31,200
Net return over fixed cost	2.5q (pulp)	1,78,042	1q (pulp)	33,617	2,11,659
Net return over variable cost	2.5q (pulp)	1,09,383	1q (pulp)	14,747	1,24,130
Net return over total cost	2.5q (pulp)	95,425	1q (pulp)	9,164	1,04,589
Net return per bottle	200ml.	7.94	700ml.	16.36	24.30
Net return per litre	1 litre	39.70	1 litre	23.37	63.07
Net return per q of seabuckthorn pulp	1q	3970	1q	2337	6307
Economics of seabuckthorn processing unit:					
i) Net return of the processing unit, if all the pulp converted into same ratio of juice & squash	8.75q	34,023	3.43q	8,016	42,039
ii) Net return, if rest of the pulp (12q-3.50=8.50q) converted into juice	11q	43,670	1q	2,337	46,007
iii) Net return, if rest of the pulp converted into squash (12q-3.50q=8.50q)	2.5q	9,945	9.5q	22,202	32,147

Economics of Semi-Processing units outside Himachal Pradesh

The information regarding semi-processing units has been gathered from two main semi-processing units i.e. from Faridabad (Haryana) and New-Delhi for the year 2011-12. These two semi-processing units in India consumed maximum seabuckthorn pulp, seed, residue and leaves and converted into seabuckthorn cosmetics, juice and jam, etc.

Natural Bath & Body Products Pvt. Ltd., Faridabad

This semi-processing unit has been established at Gurukul Industrial Area, Faridabad (Haryana). The different Natural Bath and Body Products produced by this unit have been displayed in Table 12. In 2011-12 this processing unit purchased 200 quintal pulp, 50 quintal seed, 10 quintal residue and 1.5 quintal leaves and total cost accounted for Rs. 20,67,000 as displayed in the Table 12. The fixed cost has been incurred to the tune of Rs. 9,62,500 for manufacturing different products of seabuckthorn as displayed in the table. Operational/ variable costs of processed products were Rs. 35,52,254 which compasses seabuckthorn material used (Rs.1,02,317) on about 5 quintal of seabuckthorn pulp, seed, residue and leaves; manufacturing & handling charges (Rs.30,29,375) and marketing cost (Rs. 4,20,563). The total cost on different products produced in the unit has been assumed to be Rs. 45,14,754. The total income from different seabuckthorn products produced in the unit has been estimated to be Rs. 65,07,500. The net return over total cost of the unit for the year 2011-12 has been estimated to be Rs.19,92,746. The benefit- cost ratio has been estimated to be 1.44.

Seabuck Care Pvt. Ltd., New Delhi

This semi-processing unit has been established at Zamroodpur, Greater Kailash Part-1, New Delhi. The raw material is purchased by this processing unit from Leh crushing of fruit units. The quantity-wise material purchased by this processing unit has been presented in Table13. The economics of this processing unit has been analysed on the basis of sampled cosmetics and other products as presented in the table. It can be seen from the table that the total manufacturing and material cost of 8 quintal sampled products was Rs. 2,24,000 and total marketing cost was estimated Rs. 2,21,551. Total operational and variable cost of the sampled products was Rs. 4,45,551 accounted for 76 per cent of the total cost(Rs.5,84,049). Total income of the sampled products has been estimated to be Rs. 11,07,750 and net return over total cost was Rs. 2,23,701. Benefit-cost ratio of sampled product produced by the processing unit was 1.90.

The minimum estimated total income of the semi-processing unit for the year 2011-12 was Rs. one crore. Total fixed cost, total variable cost and total cost were estimated to be Rs. 12,50,260, Rs 40,22,126

Table 12: Economics of Natural Bath & Body Products Pvt. Ltd., at Faridabad (Haryana)-2011-12

Sr. No.	Particulars	Qty.(q)	Value (Rs.)
A.	Seabuckthorn material purchased from Leh for preparing products		
i)	Seabuckthorn pulp @ Rs.80,000/-q	200 q (Rs.16,00,000)	
ii)	Seabuckthorn seed @Rs.8,000/-q	50 q (Rs.4,00,000)	
iii)	Seabuckthorn residue @ Rs.2,500/-q	10 q (Rs.25,000)	
iv)	Seabuckthorn leaves @Rs. 28,000/-q	1.5 q (Rs. 42,000)	
	Total Cost:	Rs.20,67,000	
B.	Fixed Cost		
1.	Building cost	Rs.25,00,000	
a)	Depreciation on building per year @2.5% per annum	Life span of building is 40 years	62,500
2.	Investment on machinery	20,00,000	-
a)	Depreciation on machinery per year @ 5% on the investment cost of machinery	Life span of machinery is 20 years	1,00,000
b)	Interest on fixed investment of the machinery @ 10% per annum	-	2,00,000
3.	Repairs and maintenance cost of machinery	-	1,00,000
4.	Wages of permanent labour/ watch and ward services per year	-	2,00,000
5.	Miscellaneous costs	-	3,00,000
	Total fixed cost:	**-**	**9,62,500**
C.	**Operational/ variable cost of processed produce**		
1.	Seabuckthorn material used (pulp, residue, seed & leaves)	4.95q	1,02,317
1.	**Manufacturing & handling charges**		
2.			
i)	Manufacturing charges		
a)	Seabuckthorn Lip Balm	0.5q	1,80,000
b)	Seabuckthorn under Eye Gel	1q	1,26,000
c)	Seabuckthorn Body Butter	4q	2,70,000
d)	Seabuckthorn Acne Control Cream	3.5q	2,67,750
e)	Seabuckthorn Body Lotion	10q	4,50,000
f)	Seabuckthorn Body Message Oil	4q	2,70,000
g)	Seabuckthorn Body Wash	9q	2,43,000
h)	Seabuckthorn Conditioner	10q	4,50,000
i)	Seabuckthorn Shampoo	10q	2,70,000
j)	Seabuckthorn Face Wash	5q	1,80,000
k)	Seabuckthorn Jam	10q	36,000
l)	Seabuckthorn Juice	10q	45,000
m)	Seabuckthorn Mehandi	5q	1,40,625
	Sub-total:		**29,28,375**
ii)	Other charges		
a)	Electricity Charges	-	21,000
b)	Contractual labour	-	80,000
	Sub-total		**1,01,000**
	Total(i+ii)		**30,29,375**
3.	Marketing Cost		
i)	Loading & unloading charges	-	1,40,188
ii)	Transportation charges	-	2,80,375
	Sub-total		**4,20,563**
	Total operational/ variable cost(1+2+3)	**-**	**35,52,254**
	Total Cost (B+C)	**-**	**45,14,754**
D.	Income from seabuckthorn products		
1.	Seabuckthorn Lip Balm sale price @Rs.8,00/ kg	0.5q	4,00,000
2.	Seabuckthorn under Eye Gel sale price @& Rs.2,800/ kg	1q	2,80,000
3.	Seabuckthorn Body Butter sale price @ Rs.1,500/ kg	4q	6,00,000
4.	Seabuckthorn Acne Control Cream sale price @ Rs.1,700/ kg	3.50q	5,95,000
5.	Seabuckthorn Body Lotion sale price @ Rs.1,000/ kg	10q	10,00,000
6.	Seabuckthorn Body Message Oil sale price @ Rs.1,500/ kg	4q	6,00,000
7.	Seabuckthorn Body Wash sale price @ Rs.600/ kg	9q	5,40,000
8.	Seabuckthorn Conditioner sale price @ Rs.1,000/ kg	10q	10,00,000
9.	Seabuckthorn Shampoo sale price @ Rs.600/ kg	10q	6,00,000
10.	Seabuckthorn Face Wash sale price @ Rs.800/ kg	5q	4,00,000

and Rs. 52,72,386 respectively. The estimated net return over total cost was Rs. 47,27,614 and benefit-cost ratio was estimated 1.90. It seems that all the semi-processing units in the value chain of seabuckthorn are technically feasible and economically viable.

Table 13: Economics of Seabuck care Pvt. Ltd., at New Delhi-2011-12

Sr.No.		Particulars	Qty.(q)	Value (Rs./q)
A.		Seabuckthorn material purchased from Leh for preparing products		
	i)	Seabuckthorn pulp @ Rs.10,000/-q	5 q (Rs.5,000)	
	ii)	Seabuckthorn seed @Rs.8,000/-q	20 q (Rs.16,000)	
	ii)	Seabuckthorn leaves @Rs. 27,500/-q	1q (Rs. 27, 500)	
		Total Cost:	Rs. 93,500	
B.		Fixed Cost		
1.		Building cost	Rs. 22,00,000	
	a)	Depreciation on building per year @3.33% per annum	Life span of building is 30 years	73,260
	b)	Imputed rental value of rooms used for SBT products per annum	4 rooms	32,000
2.		Investment on machinery	20,00,000	-
	a)	Depreciation on machinery per year @ 5% on the investment cost of machinery	Life span of machinery is 20 years	1,00,000
	b)	Interest on fixed investment of the machinery @ 10% per annum	-	2,00,000
	c)	Others instrumental cost (crate, drums, containers, etc.)	7,50,000	-
	i)	Depreciation on others instrumental cost (crate, drums, containers, etc.) @20%	Expected life span of the crate, drums, containers, etc. has been assumed 5 years	1,50,000
	ii)	Interest on others instrumental cost (crate, drums, containers, etc.) @10%	-	75,000
3.		Repairs and maintenance cost of machinery	-	2,00,000
4.		Wages of permanent labour/ watch and ward services per year	-	4,20,000
		Total fixed cost:		**12,50,260**
C.		Operational/ variable cost of processed produce		
	i)	Approximate manufacturing & material cost		
	a)	Seabuckthorn Essence Message Cream	1q	30,000
	b)	Seabuckthorn Fruit Sking Glowing Pack	1q	27,000
	c)	Seabuckthorn Facial War	1q	25,000
	d)	Seabuckthorn Mehandi	1q	22,000
	e)	Seabuckthorn Anti-aging Cream	1q	20,000
	f)	Seabuckthorn Ultra-violet Pack	1q	34,000
	g)	Seabuckthorn Gold Shine	1q	35,000
	h)	Seabuckthorn Chocolate	1q	31,000
		Sub-total:	**8q**	**2,24,000**
	ii)	Marketing Cost		
	a)	Advertisement cost @5%	-	55,388
	b)	Loading & unloading cost @ 2.5%	-	27,694
	c)	Transportation cost @2.5%	-	27,694
	d)	Handling & management cost	-	1,10,775
		Sub-total	**-**	**2,21,551**
		Total(i+ii)	**-**	**4,45,551**
		Total fixed cost	**-**	**1,38,498**
		Total Cost (B+C)	**-**	**5,84,049**
D.		Income from sampled produce		
	a)	Seabuckthorn Essence Message Cream	1q	1,80,000
	b)	Seabuckthorn Fruit Skiing Glowing Pack	1q	1,50,000
	c)	Seabuckthorn Facial War	1q	70,000
	d)	Seabuckthorn Mehandi	1q	62,500
	e)	Seabuckthorn Antiaging Cream	1q	45,000
	f)	Seabuckthorn Ultra-violet Pack	1q	2,11,250
	g)	Seabuckthorn Gold Shine	1q	2,41,750
	h)	Seabuckthorn Chocolate	1q	1,47,250
		Total Income from seabuckthorn products:	**8q**	**11,07,750**
		Net return over fixed cot		9,69,252
		Net return over operational/ variable cost		6,62,199
		Net return over total cost		5,23,701
		Benefit-cost ratio of sampled produce		1.90
		Overall estimated total income of the semi-processing unit for the year 2011-12	8-10 lakh per month	1,00,000,00
		Total fixed cost		12,50, 260

Conclusions and Policy Implication

The area already existing under seabuckthorn was less than 1 per cent of the total geographical area, whereas as 5.2per cent of the total cultivated area on an average farms indicates that farmers are more receptive to commercialization of this crop. The production of this crop shows very less 30 kg per farm and share in farm income was only 1.05 per cent of the gross farm income (Rs. 3,14, 028) indicates potential for improvement. Therefore there exists a need for development of its package of practices and also efforts should be made to provide remunerative prices of seabuckthorn produce to the orchardists.

It has been noticed that seabuckthorn nursery raising is a profitable venture. However benefit-cost ratio was lower in the Forest Nursery (1.51), as compared to University Farm Nursery (2.10) even at higher sale price at Forest Nursery. Therefore it is suggested that nursery raising techniques and management should be imparted to the Forest Officials.

The expected economics of seabuckthorn orchards on the basis of sample farms revealed that break-even point will be after 6th year of establishing the seabuckthorn orchards and the benefit– cost ratio will be 3.26 in the full span of the seabuckthorn orchards. Benefit cost ratio would be many folds higher if we include tangible and intangible benefits of other sectors of the economy related to seabuckthorn. The expected income from seabuckthorn orchard plus fodder crop at full bearing stage per year was accounted for Rs. 26,880 per bigha (0.08 ha) and benefit- cost (BCR) was 6.04. It is amply clear from above analyses that commercializing seabuckthorn orchards alongwith fodder crops have potential to become economically viable in the long run.

The processing unit at Lahau (L& S) is running below full capacity utilization due to inadequate availability of raw materials (fruits) and also expected uncertain demand and low prices in the market. On an average per quintal loss borne by Lahaul (HP) processing units was Rs. 2,957. Whereas, on an average per quintal net returns of processing seabuckthorn fruits were Rs. 1973 in Leh area of Jammu & Kashmir. So, it is suggested that area under seabuckthorn plantation should be increased and enhance the wild seabuckthorn fruit collection through improving the harvesting technology and provide assured electricity supply, etc to the processing units..

Break-even analysis indicates that the break-even point of Leh processing unit is reached at 102 quintals of fruits processing per unit, whereas at present these units were processing 279 quintals of seabuckthorn fruits per unit and covering fixed and variable cost and earning Rs. 5,50,385 per unit per annum. Although at present these units totally depends upon forest produce. On the other hand in lahaul area the processing unit was running just above the shut down point (12.05 quintals) fruits of seabuckthorn processed per annum. The unit was covering only fixed cost and part of the variable cost. Thereby it indicates that this industry is in initial stage in lahaul area and it needs to create awareness amongst the growers (seabuckththorn Orchardists) for increasing area under this crop, collectors of seabuckthorn from forest area and local traders for sustainable linkages with the traders in the market for sure and remunerative prices from its products.

The expected economics of semi- processing unit in Himachal Pradesh revealed that net return over total cost was Rs. 1,04,589 in which Rs. 95,425 from juice and Rs. 9,164 from squash. The net return over total cost of Natural Bath and Body Products Pvt., Faridabad unit (Haryana) for the year 2011-12 has been estimated to be Rs. 19,92,746 and benefit– cost ratio has been estimated to be 1.44. Whereas, the net return over total cost of Seabuck Care Pvt. Ltd., New Delhi unit Rs. 47,27, 614 and benefit– cost ratio was estimated 1.90. It seems that all the semi- processing units in the country in value chain of seabuckthorn are technically feasible and economically viable.

Acknowledgement

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